Maryland Offshore Wind Project

Indian River Bay Turbidity Minimization and Monitoring Plan

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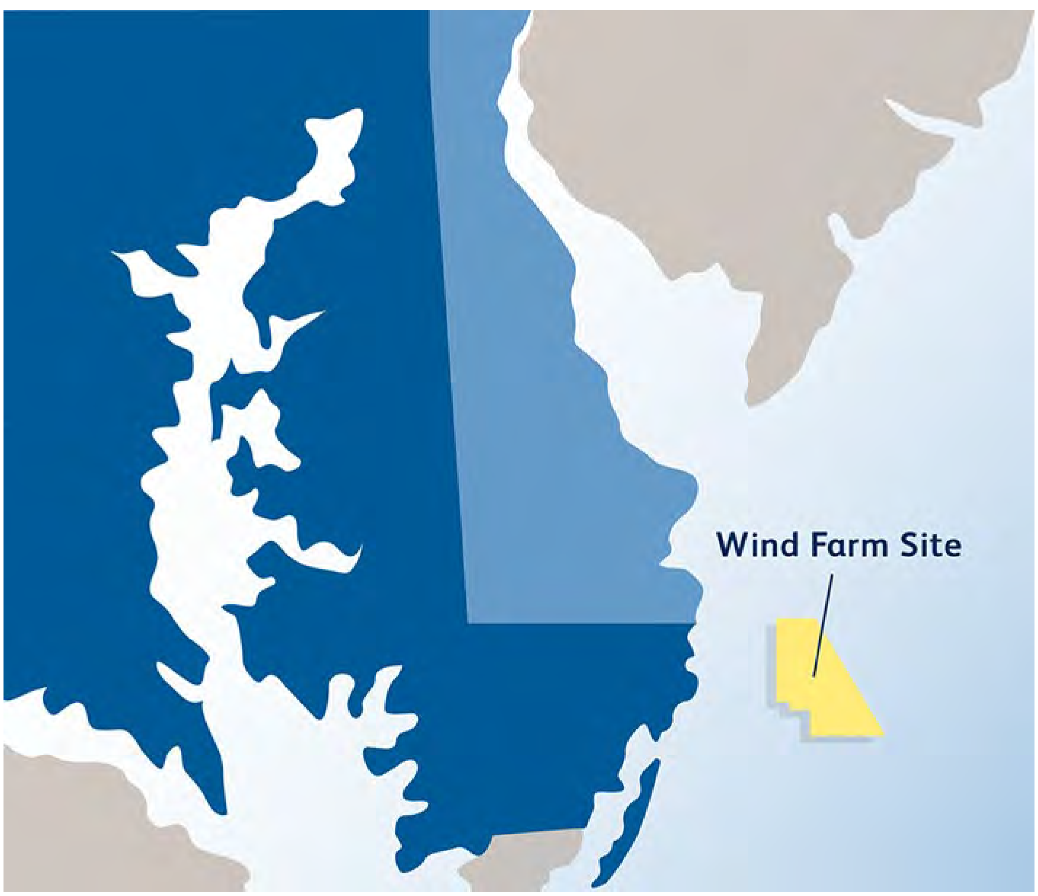

TABLE OF CONTENTS

TABLES

FIGURES

1.0 Introduction

US Wind, Inc. (US Wind) is developing the Maryland Offshore Wind Project (the Project), an offshore wind project of up to 2 gigawatts within OCS-A 0490 (the Lease), an area off the coast of Maryland on the Outer Continental Shelf. US Wind obtained the Lease in 2014 when the company won an auction for two leases from the Bureau of Ocean Energy Management (BOEM) which in 2018 were combined into the Lease. The Project would include up to 114 wind turbine generators (WTG), up to four (4) offshore substations (OSS), and one (1) Meteorological Tower in the roughly 80,000-acre Lease area. The Project is proposed to be interconnected to the onshore electric grid by up to four new 230-275 kV export cables into a substation in Delaware.

US Wind's proposed export cables would come ashore from the Lease area to land at 3R's Beach Parking Lot, south of Indian River Inlet Bridge, via horizontal directional drilling (HDD). Transition vaults are proposed to be buried under the existing parking lot. From the transition vaults the export cables would enter Indian River Bay via HDD, traverse the bay with cables buried to a target depth of 1.8 meters (6 feet), and exit Indian River to the onshore substation location near the Indian River Power Plant. The cable route through Indian River Bay is referred to as the Onshore Export Cable South Corridor in US Wind's Construction and Operations Plan submitted to BOEM and is used in the Indian River Bay Turbidity Minimization and Monitoring Plan for consistency.

The proposed export cable route through Indian River Bay is provided in Figure 1-1.

Figure 1-1. Onshore Export Cable South Corridor

The Indian River Bay Turbidity Minimization and Monitoring Plan presented herein is designed to minimize turbidity in Indian River Bay through best management practices and potentially engineering controls. Refinement of the installation process, particularly in the Onshore Export Cable South Corridor through Indian River Bay, would be discussed with Delaware Department of Natural Resources and Environmental Control (DNREC) to incorporate additional impact minimization and avoidance measures requested by the agency.

1.1 Existing Conditions

1.1.1 Water Quality

The Delaware Water Quality Portal provides access to water quality data in Delaware waters since 2000.[1] Data is collected by DNREC's Surface Water Quality Monitoring Program, DNREC Recreational Water Program, Delaware River Basin Commission Boat Run Program (run by DNREC), and the University of Delaware's Citizen Monitoring Program (CMP). Thirty sites are

[1] Delaware Water Quality Portal. https://cema.udel.edu/applications/waterquality/about

identified in the portal as being part of the Indian River (19 sites) or Indian River Bay (11 sites) watersheds, with additional CMP locations on the shoreline (Figure 1-2).

Figure 1-2. Delaware Water Quality Portal Stations
Accessed August 30, 2024. https://cema.udel.edu/applications/waterquality/

Buoy 20 (Station ID 306121) is located in the center of Indian River Bay, circled in red in Figure 1-2. This station has been active from March 9, 2000, to December 13, 2023. Total suspended solids (TSS; in mg/L) were recorded during that time and shown in Figure 1-3 as an example of the variation within Indian River Bay. The historical TSS during the period of monitoring ranges from 0.5 mg/L to 184 mg/L.

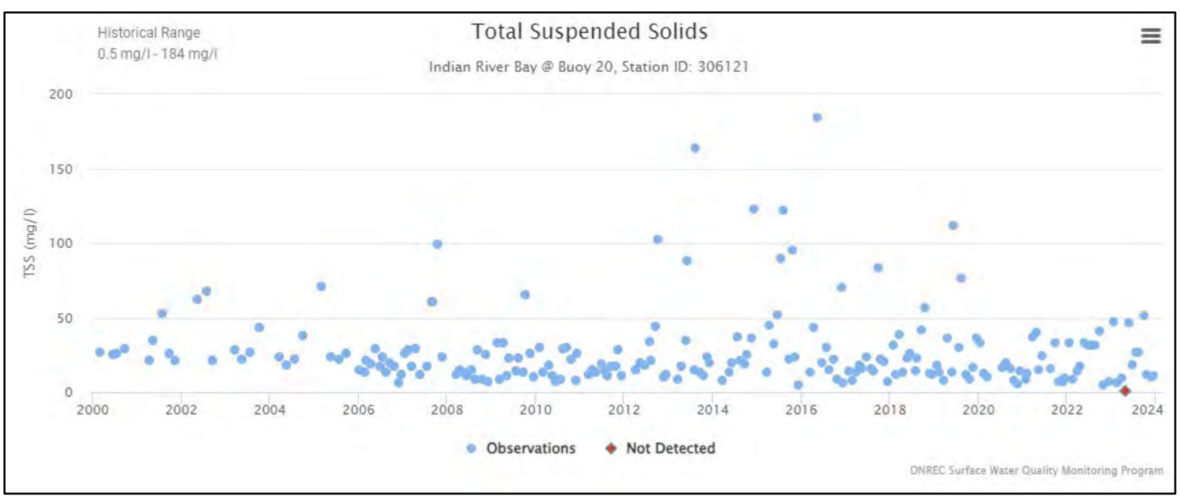

Figure 1-3. TSS in Indian River Bay Buoy 20 from 2000-2023
Accessed August 30, 2024. https://cema.udel.edu/applications/waterquality/

Monthly averages are provided in Table 1-1, demonstrating the variation in TSS that occurs throughout the year. The stations considered included Buoy 20 described above and the additional sites circled in yellow in Figure 1-2: Station 306331 (Indian River at Island Creek), Station 306181 (Indian River @ Buoy 49, or Swan Creek), and Station 308071 (Millsboro Pond at John Williams Highway/Route 24).

Table 1-1. Monthly TSS Averages in Indian River Bay

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Station 306121: Indian River Bay @ Buoy 20 (March 9, 2000, to December 13, 2023)												
Minimum	8.7	6.1	7.9	0.5	11	7	9	9	12.1	4.6	5.7	5
Average	25.2	16.1	19.4	23.3	30.9	31.5	28.4	38.7	30.8	33.3	20.8	19.3
Maximum	47.4	33	71	45	184	112	90	164	83.7	102	70.4	123
Station 306331: Indian River @ Island Creek (March 9, 2000, to November 29, 2023)												
Minimum	10	10.4	7	13.4	7	21	20.4	22	11	5	7	6.8
Average	20.2	58	20.6	28.1	34.9	30.8	46.1	52.2	37.9	28.1	13.7	20.6
Maximum	34	256	61	53.8	88	49.5	110	92	76	182	30.3	45.8
Station 306181: Indian River @ Buoy 49 (Swan Creek) (March 9, 2000, to November 29, 2023)												
Minimum	13.8	12.2	7	14	8	20	29	44	17	7.7	10.9	7.4
Average	21.8	27.9	33.5	45.6	32.3	37.2	57.7	70.6	41.7	37	19.4	17.5
Maximum	32.8	81	234	164	93.3	63.8	139	96.1	86	105	62.3	36
Station 308071: Millsboro Pond @ John Williams Hwy. (Route 24) (March 7, 2000, to December 13, 2023)												
Minimum	0.5	0.5	0.5	2	1	2	1	2.4	1.6	1	0.5	0.5
Average	5.7	2.7	3.5	4.3	4.6	5	4.4	10.9	6.3	5	2.4	2.7
Maximum	36	6	9	7	12.4	11.3	11.4	29	27	20.4	4	8

**Delaware Water Quality Portal: https://cema.udel.edu/applications/waterquality/*

The Delaware Center for the Inland Bays uses the long-term monitoring sites described above in its consideration of water quality for its State of the Bays report, most recently published in 2023.[2] Overall, the Inland Bays receive a "Poor" Water Quality Index rating, equivalent to a grade of D. Water clarity is deemed poor, although open portions of the bays experience better clarity than creeks and tributaries due to tidal flushing. The long-term trend within the Inland Bays is mixed, with six stations degrading in water clarity and five sites improving; however, fewer sites in the 2023 report than in the 2015 State of the Bays report meet the water clarity standard.

[2] M. Walch, A. McGowan, L. Swanger, C. Chaney, and M. Goss. 2023. State of the Delaware Inland Bays, 2021. Delaware Center for the Inland Bays, March 2023, 104 pp. inlandbays.org.

In Indian River Bay and Indian River specifically, the State of the Delaware Inland Bays 2021 report states that water quality conditions are degrading. This is mostly due to nonpoint sources of nitrogen and phosphorous, of which nitrogen average loads are more than six times the healthy limit.[3] Indian River received low Water Quality Index scores, indicating very poor water quality.[4] The water clarity within Indian River Bay ranges from very clear to clear water, mainly due to the tidal flushing from the inlet; however, clarity is degrading at two locations.[5] In Indian River, the water is murky or very murky with no trend present.

1.1.2 Potentially Sensitive Receptors

Potentially sensitive receptors along the shoreline of Indian River Bay or Indian River include Holts Landing State Park and an area designated for potential shellfish aquaculture.

Holts Landing State Park is located on the southern shoreline of Indian River Bay in Dagsboro, Delaware.[6] The park includes hiking trails, a boat ramp, and primitive camp site. It is a popular location for catching blue crabs, kayaking, and fishing. Habitats along the trails include maritime forest, salt marsh, and freshwater habitats. A living shoreline has been established at the park to protect the shoreline, improve wildlife habitat, and enhance recreational opportunities.[7]

DNREC's Division of Fish and Wildlife maintains lands within the Inland Bays that are available for leases for shellfish aquaculture, defined as Shellfish Aquaculture Development Areas (SADA).[8] There is a SADA located offshore of the Assawoman Wildlife Area, Piney Point Tract. Within this area, two plots are designated as unleasable due to high clam density and one plot is pending (Figure 1-4).

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[3] Walch et al. 2022. State of the Delaware Inland Bays, 2021. Input of Nutrients from Nonpoint Sources, page 34.
[4] Walch et al. 2022. State of the Delaware Inland Bays, 2021. Water Quality Index, pages 44-45.
[5] Walch et al. 2022. State of the Delaware Inland Bays, 2021.Water Clarity, page 50.
[6] Delaware State Parks, Holts Landing State Park. https://destateparks.com/holtslanding
[7] Biohabitats. Holts Landing State Park Shoreline Stabilization & Crabbing Pier. Accessed September 13, 2024. https://www.biohabitats.com/project/holts-landing-state-park-shoreline-stabilization/
[8] Shellfish Aquaculture. DNREC Division of Fish and Wildlife. https://dnrec.delaware.gov/fish-wildlife/fishing/shellfish-aquaculture/

Figure 1-4. Shellfish Aquaculture Development Area in Indian River Bay
Accessed September 9, 2024[9]

2.0 Proposed Activity

The export cable installation in Indian River Bay includes the following activities.

- Dredging for cable burial installation.
- Dredged material dewatering at an upland location and return of filtrate water to bay.
- Insertion of gravity cells, if required, and installation of HDD ducts at landfall.
- Equipment installation trial.
- Pull-in of the cables through HDD ducts into jointing/transition vaults.
- Route clearance including a pre-installation survey and grapnel run.
- Installation and jetting of cable.
- Post-lay burial, if needed.

Time of year restrictions have been adopted per the DNREC Environmental Review[10]. Time of year restrictions are included in US Wind's federal and state permit applications as applicant-proposed measures and are considered adopted. Construction activities at 3R's Beach Parking

[9] Map of Shellfish Aquaculture. DNREC Division of Fish and Wildlife, Fisheries. https://dnrec.maps.arcgis.com/apps/PublicInformation/index.html?appid=50d387d56725401e920001e46fa73f27
[10] DNREC, Department of Natural Resources and Environmental Control Division of Fish and Wildlife. 2023. US Wind 2023 Maryland Offshore Wind (Environmental Review on Rare, Threatened, and Endangered Species).

Lot are planned in the September-March window. In-water work in Indian River Bay would be restricted to October 1 through February 28.

Descriptions of required activities and parameters, such as burial depths and material volumes, follow in subsections by activity and expected sequence.

2.1 Dredging within Indian River Bay

US Wind anticipates dredging would be necessary in locations along the cable routes for cable burial. Maximum dredging disturbance is assumed to be within a 76 m (249 ft)-wide corridor along defined portions of the route. The dredging area footprint is within the 183-m (600 ft) area of potential temporary construction disturbance shown in Figure 2-1.

Figure 2-1. Cable Burial Dredging Areas within Indian River Bay

Dredging along the routes would be a maximum depth of 1.8 m (6 ft), varying from 1-6 ft (0.3-1.8 m) depending on location. Much of the route would be 1 m (3 ft) or less. The maximum volume of dredging, assuming all 4 cables installed, is estimated to be 73,676 cubic yards over an anticipated two construction seasons or “campaigns” where one cable would be installed in Campaign 1 and three cables installed in Campaign 2.

The draft of the cable lay barge is assumed to be 1.5 m (5 ft).

US Wind would continue to work with contractors to optimize installation methods. The dredge volumes assume all dredging would be conducted by US Wind for cable installation and does not account for maintenance dredging projects that may overlap US Wind's area of construction.

The estimated maximum dredging volumes for Campaign 1 and Campaign 2 are provided in Table 2-1.

Table 2-1. Estimated Maximum Dredging Volumes

Dredging volume	Onshore Export Cable South Corridor (cubic yards)
Campaign 1	30,278
Campaign 2	43,398
Total (2 campaigns)	**73,676**

Dewatering of dredge materials is planned to utilize geotextile tubes (geobags) for passive dewatering on land near the US Wind substations. Dredged material would be pumped from the dredge location via a 30.5 centimeter (12-inch) pipe into the geobags and water would be returned to Indian River via a similar-sized pipe.

The slurry from the dredge will be transported via pipeline to the geobags, which will be deployed in the dewatering pad area. Polymers and flocculants may be added to the slurry to reduce particulates/total suspended solids (TSS) in the discharged water. Please refer to Section 3.2.1 for discussion of controls proposed for dewatering.

After the completion of dewatering, dredged materials would be placed in trucks for disposal/placement at an upland landfill location within 161 km (100 mi) of the US Wind Substations area. The proposed disposal site is the Jones Crossroads Landfill, approximately 20.9 km (13 mi) from the dewatering site. Jones Crossroads Landfill is authorized to receive dewatered dredged material and has capacity for over 74,000 cubic yards of material.

2.2 Horizontal Directional Drilling

HDD operations would be employed within Onshore Export Cable South Corridor to install cable ducts that allow for the installation of the export cables at the transition points between water and land. The Project as proposed includes HDD's at up to two locations within Indian River Bay: from 3R's Beach into Indian River Bay and from Indian River to the US Wind onshore substations (see Figures 2-2 and 2-3). The HDD work may be conducted simultaneously or in stages depending on the final design of the Project.

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 equipment for HDD at would be confined within 3R's Beach Parking Lot to avoid impacts to sensitive coastal habitats. At the western US

Wind Substations site, land side HDD operations would be within the Project-defined limit of disturbance to avoid impacts to sensitive habitats and potential cultural resources. The approximate footprint, required for HDD land side HDD operations, is 60 by 46 m (200 by 150 ft).

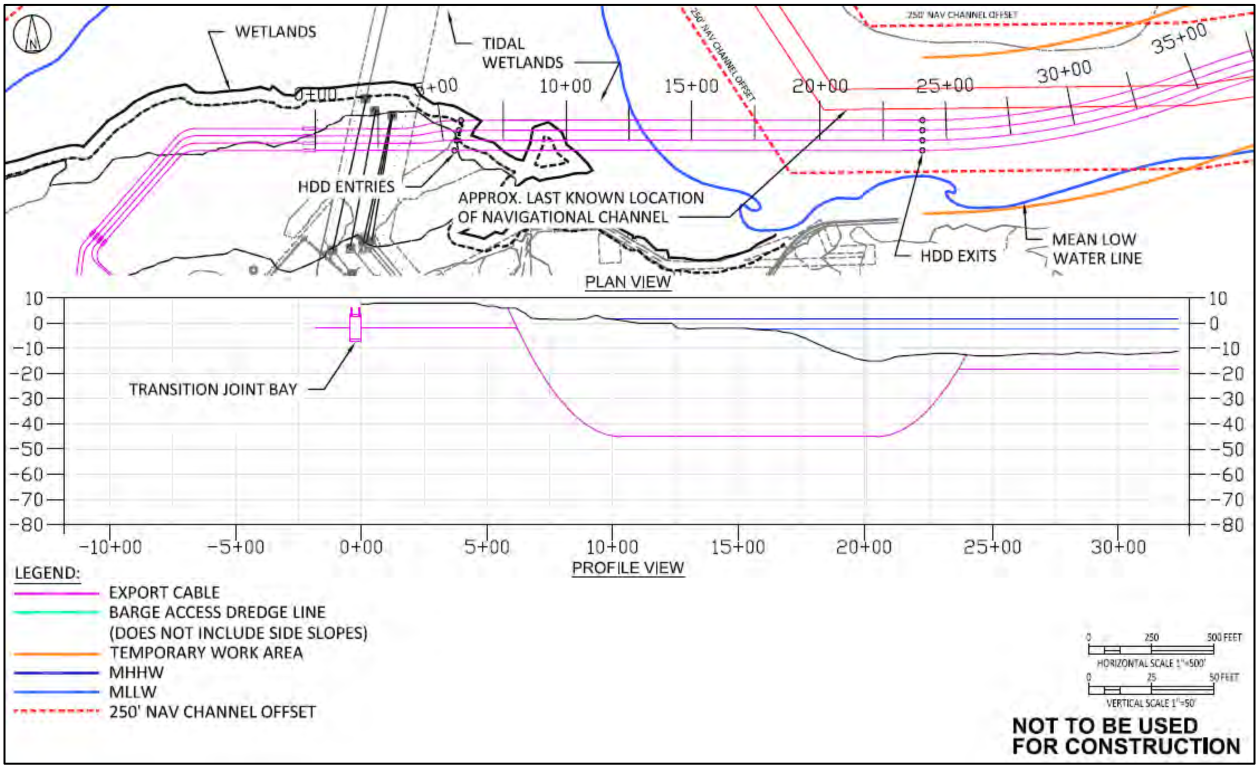

Figure 2-2. HDD Profile at US Wind Substations Site

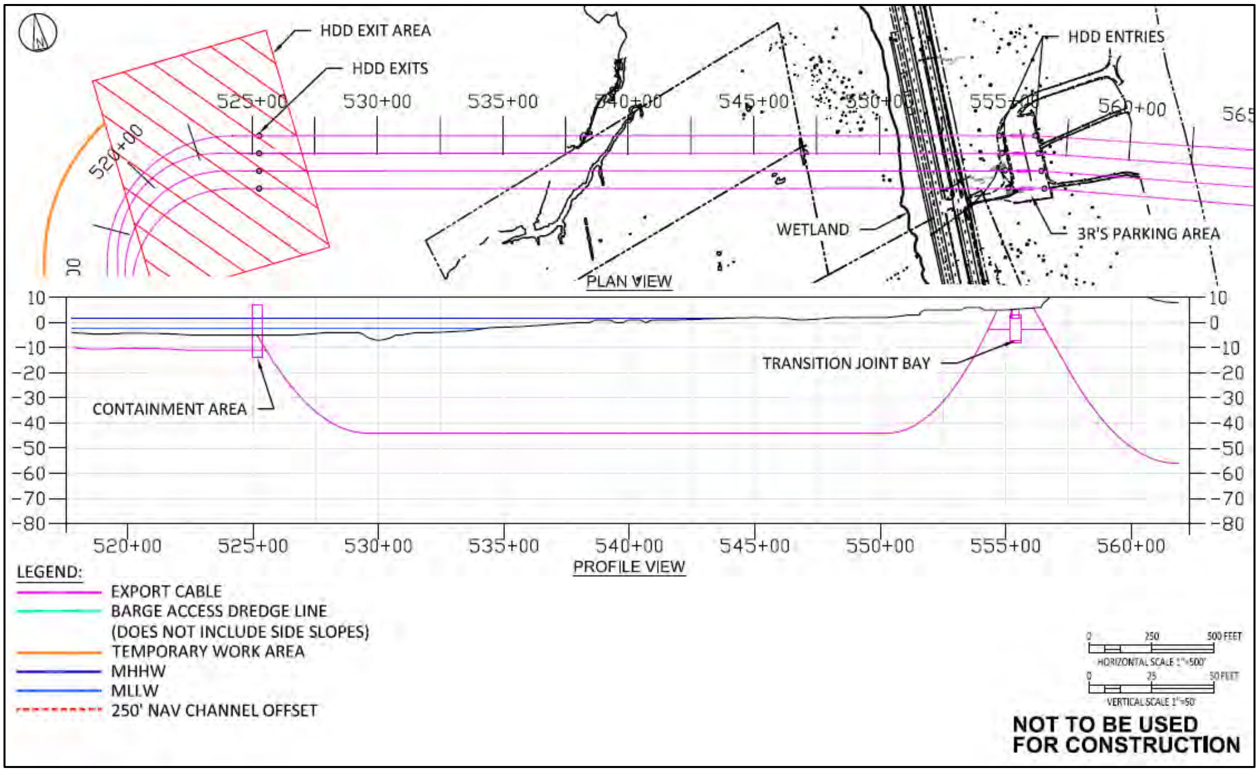

Figure 2-3. HDD Profile at the Start of Onshore Export Cable South Corridor

Water side HDD equipment would vary based on the installation location but would generally consist of a work platform (either a barge or small jack-up) and associated support vessels (such as tugs and small work boats). The work platform would 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 to be based on a barge equipped with spuds for positioning. An anchor spread may be employed if required.

The HDD process would follow industry practice and would utilize detailed operating procedure including fluids containment plans. Lubrication of the HDD drill bit and sealing of the HDD borehole would be provided through the use of a non-toxic/non-hazardous bentonite water-based drilling mud. During the installation process, temporary excavation pits would be required at the onshore locations and gravity cells may be required at the in-water termination of the HDD bore.

Final HDD lengths would 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. Areas where the HDD punch-out locations may occur are subject to additional review of site conditions and micro-siting.

2.3 Onshore Export Cables

2.3.1 Pre-Lay Grapnel Run

Prior to installation in Indian River Bay, route clearance activities would be conducted including pre-installation survey and debris removal and disposal, as needed. Pre-lay grapnel run operations would occur to remove debris and obstructions along the cable route by moving any objects out of the cable corridor to allow for safe cable lay operations and to achieve the specified burial depth. The vessel used would be equipped with a navigation spread, double drum winch, crane, and stern roller, de-trenching grapnel, tool container with appropriate rigging, cutting and welding equipment, and equipment and grapnel spares. A representative grapnel type is shown in Figure 2-4.

Figure 2-4. Representative Grapnel

2.3.2 Cable Installation

Up to four 230-275 kV export cables would be installed beneath the bay bottom. Each export cable is a maximum 300 millimeters (12 inches) in diameter and would be placed within a 40 m-wide route to allow for appropriate cable spacing. Conditions may necessitate a route wider than 40 m in some instances. Where the cable alignment overlaps portions of the federal navigation channel within Indian River, the United States Army Corps of Engineers (USACE) directed US Wind to bury cables at least 1.8 m (6 ft) below the lowest channel maintenance depth to avoid interference with future maintenance dredging and to protect the cables in such instances. Additionally, US Wind has added a 76.2-m (250-ft) buffer to the north and south of the last known location of the channel to account for the movement of the channel alignment over time. In areas in the vicinity of the channel, export cables would be buried 16 ft below MLLW to abide by USACE guidance. Cables in the areas outside the navigation channel would be targeted to a burial depth of 1.8 m (6 ft).

A cable storage barge would be equipped with a turntable, loading arm, and cable roller highway towards a cable installation barge. In support of the cable lay barge, an auxiliary construction barge would be outfitted with the necessary equipment to perform work in shallow waters. The barges would be suitable for positioning close to the HDD exit points due to the flat bottom and shallow draft. The draft of the cable lay barge is assumed to be 1.5 m (5 ft).

It is expected that the cable lay barge would be moved along the cable route using a six-point anchor system, assisted by an anchor handling tug, in combination with spud piles. The cables would be floated into place near the HDD ducts using small boats and floatation devices where they would subsequently be pulled through the ducts into the jointing/transition bays. The cable lay barge would lay the cables between the two end points maneuvering along the cable route using its anchoring system and positioned using spuds as required. US Wind proposes using a jet sled with an embedment tool to bury the export cables to the target burial depth (see Section 3.1.1). An example of a barge-based installation can be seen in Figure 2-5. Shallow water installation is shown in Figure 2-6.

Figure 2-5. Block Island Cable Installation
Source: www.oceannews.com

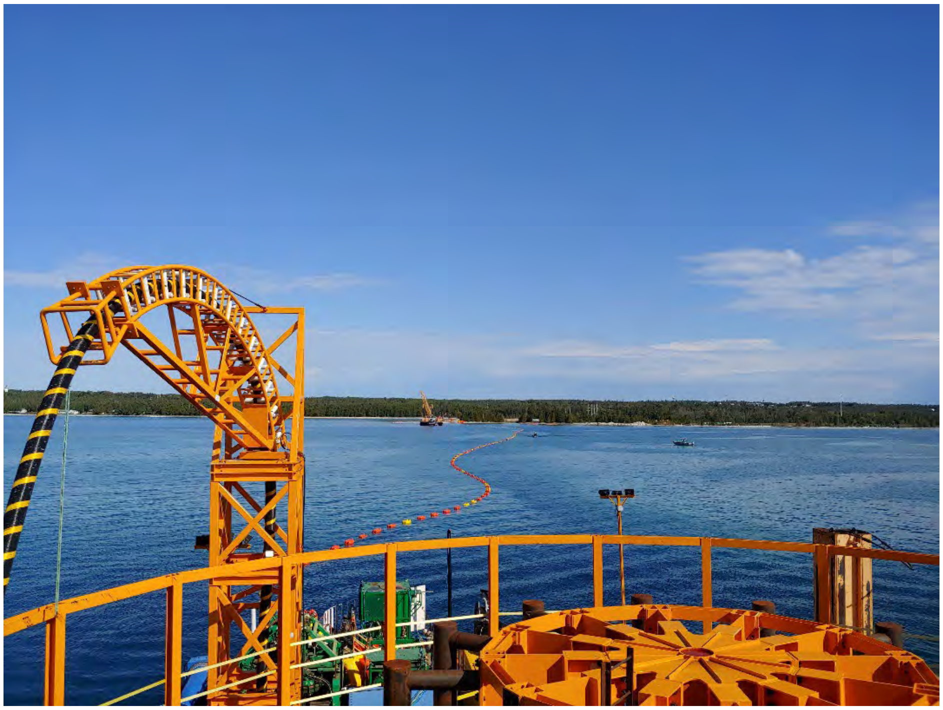

Figure 2-6. Example of Shallow Water Cable Installation

Cable installation is planned over two construction seasons in Campaign 1 and 2, within a construction window considered to be October 1 - February 28 based on feedback from DNREC's Environmental Review received December 21, 2023, and prior dredging projects in Indian River Bay. Cable installation operations would be planned, to the greatest extent practicable, during periods of higher water in the shallow portions of Indian River Bay. Construction operations would be paused during low water conditions. By increasing the size of a cable lay barge to distribute weight of the cable and by accepting downtime during construction, US Wind would avoid the need for dredging for barge access in the shallow, southern portions of Indian River Bay.

After the cable is installed a post-installation survey would be performed as well as videoing the cable route for a real-time visual of installed conditions. Based on surveys of the bay bottom and sub bottom, target cable burial depth should be achievable and cable protection is not anticipated or proposed.

3.0 Alternatives Analysis of Turbidity Minimization and Control Methods

US Wind and its consultants conducted an alternatives analysis of available methods for cable installation and turbidity controls. This section provides information about the methods and equipment reviewed along with the benefits and challenges associated with each. US Wind's proposed installation methods and controls provide a balance of efficient installation – meaning the least amount of time in the water and disturbing the bay bottom – and reductions in turbidity.

Indian River Bay, west of 3 R's Beach, consists of estuarine subtidal unconsolidated bottom. Jet sled installation is considered the best option for the routing of export cables through the Indian River Bay due to its localized and temporary disturbance and substantial advantages versus other installation methods due to constructability in unconsolidated sediments. Other cable installation methods considered included open trenching, vertical injector and post lay cable burial. Table 3-1 below provides a comparative summary of the installation techniques.

Table 3-1. Comparison of Cable Installation Methods

Method	Pros	Cons	US Wind Determination
Jet Sled	Feasible in IRB Rapid installation Optimizations available to reduce turbidity Proven method	N/A	**Proposed**
Vertical Injector	Similar method to jet sled	Deep-draft vessel required, infeasible in shallow portions of IRB Complex installation in IRB conditions	Not Proposed
Open Trenching	Feasible in IRB	Significant turbidity Slow installation	Not Proposed
Post Lay Burial	Feasible in IRB	Slow installation	**May be implemented in limited locations to achieve required burial depth**

Engineering controls to reduce turbidity are limited in effectiveness and feasibility in the shallow tidal waters of Indian River Bay. US Wind would transition from the onshore locations into Indian River Bay using HDD. Gravity cells would be deployed at the HDD punch out sites, turbidity curtains along specified, limited portions of the cable corridor at sites requiring additional protection, and optimization of the jet sled/embedment tool would be the most successful methods to reduce and control turbidity during the temporary disturbance from cable burial in Indian River Bay. These best management practices would be coupled with a robust monitoring program as outlined in Section 4.

Table 3-2. Comparison of Turbidity Controls

Method	Pros	Cons	US Wind Determination
Gravity Cells at HDD	Contains drilling fluids and sediment at entry/exit locations	Additional complexity during operations	**Proposed**
Turbidity Curtains	Minimizes sediment transport to adjacent areas Feasible in low energy environments. i.e. not the majority of IRB	Use in high energy (tide. wind) environments strains curtains and moorings Deployment not in contact with bay bottom where sediments being disturbed Redeployments would create additional bottom disturbance Significant increase in cable installation time	**Proposed in vicinity of SADA and Holts Landing State Park**
Air Curtain	Minimizes sediment transport to adjacent areas Feasible in low energy environments. i.e. not the majority of IRB	Less effective than physical barriers Infeasible in high flow environments	Not Proposed
Jet Sled Optimization	Reduces turbidity and total suspended solids Feasible to employ in IRB Does not impede efficient cable installation	Additional complexity during operations	**Proposed**

3.1 Cable Installation Methods

Multiple cable installation techniques were evaluated to determine which method would be the least impactful, shortest duration, and technically feasible based upon Indian River Bay. Summaries of the various installation methods are described below.

3.1.1 Jet Sled (Proposed Method)

The preferred installation method is to install the submarine cable via jet sled (shown in Figures 3-1 and 3-2). A jet sled is a specialized piece of equipment used in the installation of submarine high voltage cables. It would be towed along the bay bottom by a vessel. The jet sled is a single pass installation burial tool designed to simultaneously lay and bury cables, making the process more efficient. If conditions permit the jet sled could proceed in Indian River Bay at a rate of 10-15 feet per minute which would significantly reduce in-water construction time. Installation of a cable is anticipated to require less than two weeks, including downtime.

Jet sleds are designed to inject water into the bottom surface to liquify the sediment to a depth sufficient for allowing an embedment blade to lay the cable and bury it at the specified depth. Injection nozzles are spaced equally along the face of the embedment blade, pointing forward into the sediment to create the liquified trench. This allows the blade to operate at maximum efficiency at the burial depth required.

The embedment blade can be raised and lowered to accommodate changing burial depths. The cable trench in the bay bottom would be narrow, about one meter, and would collapse immediately after the cable has been depressed into the trench.

Figure 3-1. Representative Jet Sled

The jet sled would be assembled at the installation barge docking location. The jet sled would then be lifted onto the installation barge. From there the umbilical cord, air hoses, other electronic data equipment would be hooked up and calibrated following the manufacturers recommendations prior to sea trial testing. The subsea pressure housing of the jet sled electronics would be installed on the sled. This houses all the sensors (pitch and roll, hydraulic ram, water pressure, water depth) used to monitor the sled during the cable lay. A single armored umbilical is used to transmit the sled sensor data and camera feeds from the electronic pod on the sled to control station on the deck of the cable lay barge. The sled's position would be monitored using positioning systems such as ultra-shore baseline (USBL) and Global Positioning Systems (GPS) antennas.

Figure 3-2. Sequence depicting representative sled and blade prior to penetration, side-view of installation, and surface view of installation

Sediment transport models were completed for the installation process proposed. Model results indicate that most of the fluidized sediments return to the trench quickly without being carried by the water column. Results indicate that the bulk of sediment carried away by the current will settle within 78 feet of the cables, with an expected thickness of 0.2 inches at that distance. Suspended sediment concentrations are also predicted to be temporary in nature. Suspended sediment concentrations are predicted to be below 50 mg/L within 12 hours from the passage of the jet plow. All suspended sediment concentrations are predicted to be below 10 mg/L within 24 hours.

Two recent projects using jet sleds for cable installation studied turbidity. Both BOEM and environmental scientists constructed models to predict the suspension of materials in the water column. Following installation, the field measurements were included in the studies. Both studies found the actual turbidity levels were less than 1% of the predicted levels in the models.

Jet sleds are the industry standard for installing cables below ocean/bay floor surfaces. There are several examples of State Department of Environment's selection of jet sled cable installation as the best of several alternative means of installation:

- Little Bay (New Hampshire) Seacoast Reliability Project
  - New transmission line connecting two substations.
  - The New Hampshire Department of Environmental Services recommended approval of the installation of the submarine cables using the jet sled method.
  - Was considered the most reliable, technically feasible, and environmental impacts were described as temporary in nature.
- Transmission line between New York and Vermont under Lake Champlain.
  - 4 cable crossings
  - Jet plow technology was selected both for schedule benefits and because the anticipated impacts from suspended sediments were temporary. The nature of water moving would quickly restore the backfilled trench to original conditions.
- Neptune transmission line
  - 25-mile section of the Neptune transmission line between New Jersey and Long Island, NY
  - Cable buried approximately 6 feet deep.
  - Approving environmental agencies determined jet plowing had minimal impact compared to alternatives.
- NSTAR Falmouth-Martha's Vineyard hybrid transmission/communication cable in Massachusetts
  - Project included a 6.27-mile-long underwater route.
  - MassDEP determined that jet plow would minimize the amount of seafloor disturbance.
- Cross-Sound Cable Project
  - 25-mile, high-voltage, direct-current buried power cable between New Haven, CT and Shoreham, NY.
  - Jet plow technology was selected because it facilitated minimal and temporary impacts in a delicate ecosystem.

Based on the sediments observed along Onshore Export Cable South Corridor, US Wind assumes that the jet sled, which fluidizes the soil and simultaneously buries the cable, would be the primary installation tool for the cable.

3.1.2 Vertical Injector

Vertical injectors use the same burial method as a jet sled by injecting water in the bottom to fluidize the sediment and bury the cable. A vertical injector is mounted to a vessel during cable installation with a large crane on the cable lay barge. The additional weight of the crane would require a deeper draft vessel and therefore to install the cables in the shallowest portions of the bay dredging would be necessary in an area DNREC sought to avoid dredging. Given the tidal fluctuations in Indian River Bay the tool would have to be moved up and down, which could challenge cable installation rates and require more time in the water for construction.

3.1.3 Open Trenching

Open trenching would be accomplished with tracked amphibious excavators, which would result in scarring and increased turbidity generation as compared to the other evaluated installation methods. Material would be sidecast during the digging of the trench and may migrate back into the trench due to weather conditions and tidal cycles. This would require retrenching areas multiple times, with an increase in turbidity associated with each retrenching effort. If the trench remains open, excavated material would be used to backfill the trench and cause additional turbidity. Each step in the process: excavation, placement of excavated material, and backfilling are all turbidity generating activities. Due to the additional passes needed during installation the construction timeframe would be longer than utilizing the jet sled.

3.1.4 Post Lay Burial

Submarine cables can be buried after installation using a Remote Operated Vehicle equipped with dual water jetting wands that run parallel to the cable and operate like a jet sled. It can be operated using jets or can walk along the bottom if conditions are suitable. However, an ROV may need multiple passes to achieve the specified burial depth, resulting in turbidity during each pass. In addition, the water depth must be deep enough to operate the tool sufficiently. Indian River Bay is considered too shallow for this option.

Divers equipped with an injection tool could also post-lay bury the cable, with water only being injected when the nozzle is beneath the sediments. However, this could also require multiple passes to create slack and would not meet the specified burial depth.

The amount of disturbed sediment in post lay burial is generally greater than with simultaneous lay and bury. This is due to the potential for multiple passes required to reach the specified burial depths, which causes the upper layers of sediment to become less cohesive, resulting in increased turbidity.

US Wind identified post lay burial as a potential installation method only if there are limited locations where burial by jet sled is not possible. This method could be employed in locations where the burial depth is not achieved, rather than installing cable protection mattresses, or in locations where cable splices create an omega that requires burial.

3.2 Dredging

Dredging methods were evaluated to determine which method would be the least impactful and technically feasible based upon the site-specific conditions of Indian River Bay. Summaries of the main methods are described below.

Per Delaware Regulations Governing the Use of Subaqueous Lands (7 Del.C. §7504-4.11.4), the areas of proposed dredging have been sited to avoid biologically productive areas (i.e., potential submerged aquatic vegetation, shellfish beds, and nursery areas). Specifically, there would be no dredging along the eastern portion of Onshore Export Cable South Corridor in the vicinity of White Creek, which DNREC has stated in previous communications is an area of high shellfish density.[11]

Environmental impacts of dredging would be minimized by observing time of year restrictions provided by DNREC Fish & Wildlife, use of turbidity monitoring, use of turbidity curtains in some designated locations (see Table 3-2), use of hydraulic rather than mechanical dredging, and the optimization of the cable installation methods to reduce the areal extent of dredging to as small as practicable.

3.2.1 Hydraulic Dredging (Proposed Method)

Hydraulic dredging involves the removal of sediment by pumping a sediment and water slurry mixture through pipeline to a designated location for either placement or dewatering. There are various types and sizes of hydraulic dredges available, however for conditions similar to those in Indian River Bay the likely equipment would be 10- to 12-inch articulated cutterhead dredge, which has a rotating 'cutter' that removes in-situ sediment, allowing a pump system behind the cutter to carry the sediments once it has been dislodged. The cutterhead would be held at the end of an articulating ladder, which moves to achieve the desired dredge template. Material disturbed and pumped through the dredge would be transported as a low-density slurry mixture to the upland dewatering area, with a range of 5% to 15% solids by weight. Booster pumps (if necessary) would be used to aid in the transport of the slurry beyond 1-mile under typical conditions. Booster pumps would be staged on floating barges along the pipeline route.

Due to the relatively high water content in the slurry from the hydraulic dredging process, a dewatering system would be necessary to reduce the water content and a water treatment process would be integrated to manage effluent water for eventual return to the originating waterbody. Typical dewatering systems associated with hydraulic dredging operations include passive (geobags) or mechanical (presses) technologies located at an upland footprint near the dredging work. Turbidity generated during hydraulic dredging is generally concentrated at the point of removal near the dredge cutterhead and can be minimized through best management practices during dredging operations including reduction of cutterhead rotation speed and optimizing dredge equipment for anticipated material properties.

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[11] DNREC, Department of Natural Resources and Environmental Control Division of Fish and Wildlife. 2023. US Wind 2023 Maryland Offshore Wind (Environmental Review on Rare, Threatened, and Endangered Species).

Any additives, coagulants, or polymers used as part of the dewatering process will meet NSF Standard 60 requirements. To ensure compliance with NSF Standard 60, the contractor will be required to document that the proposed NSF-approved polymer meets the NSF standard maximum use level in the filtrate water. Discharge water from the geobags, along with any rainfall collected in the dewatering area, will be directed to a collection point on the dewatering pad, anticipated to consist of a lined sump and/or water holding tanks and held for a period sufficient to allow suspended particulates to settle to the bottom the sump and/or tanks. Additional polymers or flocculants may be added into the tank/sump to assist in this settling process. Water will then overflow or be pumped back to Indian River Bay. Return water will be tested a minimum of twice daily for TSS to ensure it meets project permit discharge requirements. The contractor will be required to provide a record of the amount of polymer used each day and the total amount of filtrate water returned each day to verify compliance with the NSF Standard 60. The return water pipeline will utilize a manifold-type diffuser attachment at the discharge point of the pipe. Turbidity curtains installed around the discharge point will be inspected daily.

3.2.2 Mechanical Dredging

Mechanical dredging involves the removal of sediment through mechanical means, typically consisting of an excavator with a bucket attachment or crane with cable-mounted bucket. Mechanical dredges remove sediment from the dredge surface by biting into the sediment surface and bringing the recovered sediment up through the water column and placing the dredged material into scows staged adjacent to the dredge platform.

Mechanical dredging equipment would typically be staged on floating barge platforms and maneuvered using support boats or similar equipment. Scows fully loaded with dredged material would then be transported via tugboat (or similar) to a designated shoreline location for material to be offloaded to an upland location for dewatering. Offloading is most generally conducted utilizing mechanical equipment but may involve high-solids pumping if site constraints do not allow for shoreline mechanical offloading. US Wind has not identified a location suitable for offloading material in the vicinity of the passive dewatering field. Decanting of barges at the location of dredging is typical to return water captured during the dredging process to the waterbody. Use of scuppers or other filtration equipment is often utilized to minimize turbidity during barge decanting. Solidification of the dredged material is often required at the offloading or dewatering area to reduce free liquids and meet required moisture content standards for off-site transportation and disposal.

Turbidity during mechanical dredging is highly variable depending upon dredge type, bucket type, and dredged material properties. Turbidity can be managed through best management practices such as reduced production rate, use of clamshell or specialty buckets. Generally, turbidity generated during mechanical dredging operations would extend through the full water column as result of bucket movement.

3.3 Turbidity Engineering Controls

Multiple control measures were evaluated to manage turbidity anticipated to be generated as part of the dredging, dewatering, and cable installation work. These evaluations focused on assessing the effectiveness of the various control measures as well as assessing the practicality of installing and maintaining these controls throughout the dredging, dewatering, and cable installation processes. Summaries of the various control measures are described below. In addition to the proposed control measures, a robust water quality monitoring is proposed to verify that suspended sediment concentrations remain below proposed action thresholds.

3.3.1 Gravity Cells at HDD (Proposed Method)

Gravity cells are the proposed method to be used during HDD operations. A gravity cell is a box-like structure constructed of steel, concrete, or other material placed around the HDD bore holes. US Wind proposes using four-sided gravity cells to contain drilling fluid and avoid the high-density material from escaping, which would require recovery that would disturb sediment in the surrounding area. The use of gravity cells in continuous contact with the bottom would help to contain sediment that becomes suspended in the water column. Some sediment may be displaced during the installation and removal of the gravity cells; however, this would be a relatively small volume of material that would settle out relatively quickly.

3.3.2 Turbidity Curtain (Proposed Method in Designated Areas)

Turbidity curtains serve as barriers to minimize sediment transport from a disturbed area to adjacent areas.[12] Turbidity curtains typically include a float on the top and are weighted on the bottom with an anchorage system to hold them in place. In water bodies with tidal or wave action, the curtain should not touch the bottom. A recommended 1-foot gap should exist between the weighted end of the curtain and the bay bottom at mean low water. Movement of the curtain over the bottom due to tide or wind could increase turbidity. It is seldom practical to install the curtain lower than 10 to 12 feet below the surface. The tidal movement would introduce large loads on the curtain and place strain on the materials and mooring system. In addition, for curtains used in tidal or wave action situations, curtains should be placed parallel to the current direction within a moving body of water and not placed across the main flow. Turbidity curtains work best in low-energy environments with consistent water surface elevations, which are not the conditions found within the majority of Indian River Bay.

Anchoring of turbidity curtains in open water environments with high flow conditions frequently requires installation of pilings or large anchoring systems which increase disturbance of the bottom surface and generate turbidity during installation. Marine piling (or similar structures) used to secure the curtains would also create hazards to boaters within the bay and buoys and/or signage would be required along the entire length of the turbidity curtain to notify boaters of these navigational hazards.

Pre-installing a turbidity curtain around the length of the cable installation area would be costly and likely create more turbidity in the deployment and recovery than the jet sled. Since the curtain would need to be moved to each installation area, this would create downtime for operations. During downtime, the jet sled would need water pumped through the jets to keep them clear, resulting in increased turbidity. The size of the turbidity curtains would make them susceptible to weather and tidal events, possibly damaging them and requiring maintenance. These same

[12] Floating Turbidity Barrier. Enviro-USA American Manufacturer. Cocoa, Florida.

events likely cause the turbidity curtains to drag along the bottom of Indian River Bay, causing scars and increased turbidity.

A turbidity curtain that is designed to move with the jet sled (i.e., moonpool assembly) would also create additional turbidity. The curtains are manufactured to operate at specific water depths; constantly adjusting the positioning of the curtain is against its design. Indian River Bay is very shallow and subject to variations in water level due to tides and wind. If the curtain is manufactured to suit the maximum water depth (i.e., 6 feet), then it would drag on the bottom when the water level is less than 6 feet. Maximum water depth occurs once or twice a day for very short periods. If the cable lay barge, with associated turbidity curtain, can only move at maximum water depth, then cable installation may not be complete during the required installation window based on time-of-year restrictions.

Turbidity curtains could be utilized in a stationary location where sensitive environmental resources (e.g. submerged aquatic vegetation, state parks, aquaculture areas) are documented to be present. To help protect these resources during cable installation, US Wind is proposing to place turbidity curtains between the proposed jet sled path and Holts Landing State Park and the DNREC designated aquaculture area to reduce the potential for suspended sediment to temporarily impact these resources.

Turbidity curtains are also proposed around the location of the return pipe during dewatering operations, in addition to other land-based erosion and sediment controls for the dewatering area. Turbidity curtains will be inspected daily to verify proper anchoring and acceptable condition of the curtains. Damaged curtains will be replaced immediately.

3.3.3 Air Curtain

Air curtains are intended to establish a vertical barrier within the water column surrounding an in-water work area similar to turbidity curtains but differ in that they utilize supplied air routed through permeated hosing placed on the bottom surface of waterbody rather than utilizing a physical barrier. Similar to turbidity curtains, air curtains have diminished performance expectations in environments with higher currents and flow rates. In general, air curtains are less effective in controlling turbidity than physical curtains and are used in specialty applications where turbidity curtains are not possible. While anchoring, and its associated additional bottom disturbance, is required to secure air curtain hosing in position on the bottom surface, piles or similar structures extending through the water column would not be necessary.

3.3.4 Jet Sled Optimization (Proposed Method)

US Wind and its contractors evaluated methods to adjust and optimize operation of the jet sled specifically to reduce turbidity and suspended sediments. Optimization of the jet sled for installation in Indian River Bay is feasible and would reduce turbidity. Proper control of the plow and jetting will limit suspended solids. Sediment within the bay is generally soft (i.e., mud, sand) and the embedment blade would pass through this layer with little effort. Measures that would be employed during jet sled operation to reduce turbidity include:

- Deploy the jets of the embedment tool to face forward such that liquification of material to each side is minimized. While this configuration likely results in decreased advance rate during installation, the targeted liquification is anticipated to result in an overall decrease in generated turbidity.

- Plumb the burial tool jets with steel pipe that is segmented into stages, which can be valved off as needed. For installation within Indian River Bay, the top jets would be valved off to reduce the risk of turbidity. Additional preparation of the burial tool will be necessary to ensure it operates in this manner.
- Right-size the embedment blade for the location to reduce unnecessary sediment disturbance. In the shallowest eastern portion of the bay a smaller blade would be used to reach the 1.8 m (6 ft) target burial depth. In the deeper, more western portion of the cable route a longer blade would be used. Embedment blades of specific sizes will need to be sourced to deploy on the jet sled.
- Install the cable at the greatest speed possible which would reduce the water used (pumped) through the burial tool. Reducing speed can increase the churn of the bottom.
- Equip the jet sled with floatation to control the elevation of the jet sled skis to minimize the depth of disturbed soil by the skis and to minimize the potential of becoming stuck in the soft bay bottom material. The precaution of adding floatation to the jet sled prevents the potential for increased sediment disturbance.

US Wind proposes that these optimizations be used when employing a jet sled to reduce turbidity to the greatest extent practicable during installation. Employing the optimizations above will require more specialized equipment and will increase the complexity of operations, however, these methods are feasible for the proposed cable installations.

4.0 Proposed Turbidity Monitoring Protocols

4.1 Exceedance Thresholds

Per Delaware's Surface Water Quality Standards, "Turbidity Measured as Nephelometric or Formazin Turbidity Units, in all waters of the State shall not exceed natural levels by more than 10 units" (7 Del. C. Section 7401 Surface Water Quality Standards). Ambient conditions would be established by sampling at an up current background station. Down-current measurements would be compared to up current background station measurements collected on the same day, during the same tidal stage, and at the same depth.

4.2 Proposed Thresholds

Based on the Indian River Bay Sediment Transport Modeling report,[13] the suspended sediment concentrations are modelled to be less than 200 mg/L at distances greater than 4,396 ft from dredging and cable installation activities. Plumes greater than 50 mg/L above ambient conditions are predicted to dissipate in less than 12 hours after passage of the jet plow, and suspended

[13] Matt Hodge, Hodge Water Resources, LLC. Suspended Sediment Transport Modelling Study, Indian River Bay Submarine Cable Installation, Maryland Offshore Wind Project. Prepared for TRC. March 27, 2023. Submitted to DNREC February 15, 2024. https://documents.dnrec.delaware.gov/Admin/Hearings/2024-P-MULTI-0007/exhibits/water/water-quality/Indian%20River%20Bay%20Sediment%20Transport%20Modeling%2C%202023.pdf

sediments of 10 mg/L greater than ambient are predicted to completely settle within 24 hours following the completion of Project activities.

US Wind recognizes that the Indian River Bay Sediment Transport Modeling report is a conservative evaluation of potential sediment concentrations and deposition. The modeling conducted also does not incorporate the controls and best practices US Wind proposes in Section 3.0. Additionally, the report assumes a relatively high loss factor that should be lessened by valving off the upper jets of the embedment tool, does not account for proposed dredging in locations identified in Section 2.1 that would presumably remove upper fine-grained sediment, and 30 days of continuous operations for each cable are expected. As noted in the discussion of use of jet sleds in Section 3.1.1, observed turbidity has been shown to be a small fraction of what was modeled prior to installation. However, the report includes the best available information to establish a protective threshold at the current time.

US Wind proposes to use the following monitoring requirements and compliance thresholds during dredging and cable installation operations:

- Ambient TSS measured daily at established compliance monitoring stations up current and down current of the work area prior to the start of daily operations. The average of the daily up current and down current ambient TSS levels would establish the baseline for compliance for operations each working day.
- TSS threshold 500 ft from Project activities: 200 mg/L above ambient

Additionally, US Wind proposes to confirm that temporary cable installation activities did not have a long-term impact by measuring baseline turbidity at 3 locations along and up-river from the export cable route approximately over 7 days prior to construction activities and 7 days after cable installation to confirm conditions are within 5 mg/L of background conditions, discounting any storms or unusual upset conditions.

4.3 Methodology

US Wind would conduct turbidity monitoring while performing cable installation activities in Indian River Bay, in accordance with the requirements contained in the USACE and DNREC permits. The permits would specify monitoring for analytes (e.g., TSS, turbidity, metals, PAHs, etc.), exceedance thresholds, monitoring distances, frequency/timing of the required sampling and depth at which samples would be taken.

Monitoring of TSS, turbidity, and the additional water quality constituents described above would be conducted daily (during daylight hours only) at the following tidal stages: max flood, high slack, max ebb, and low slack during Project activities. Monitoring would involve measurement of in-situ acoustic and optical data and collection of water samples from an onsite survey vessel during daylight hours. Collected water samples would be sent for laboratory analysis.

To allow for real-time monitoring of TSS concentrations during Project activities, a correlation would be established between acoustic backscatter intensity (as measured by an Acoustic Doppler Current Profiler [ADCP]), optical backscatter (turbidity as measured by a water quality sonde), and laboratory determined TSS concentration. This relationship (calibration curve) would be established during preinstallation trials and refined based on data collected during cable installation. Comparisons between the optical and acoustic backscatter intensity measurements would provide a continuing check on system stability and calibration throughout the monitoring period.

The characteristics of the dispersing plume of sediment placed in suspension during Project activities would be documented in real time using an ADCP. An onsite survey vessel would collect acoustic backscatter intensity data along transects located at the edge of the applicable mixing zone during daylight hours. The ADCP would provide measurements of acoustic backscatter intensity and current velocity at 1-meter vertical bins throughout the water column.

A water quality sonde capable of measuring conductivity, temperature, depth, and optical backscatter (CTD-OBS) would be deployed to collect a vertical profile of backscatter intensity, water temperature, and salinity at a selected location along each survey transect that corresponds to the highest observed acoustic backscatter intensity. Measured OBS readings would then be related to TSS levels using the established correlation. Grab samples for laboratory analysis of TSS would also be collected at three depths at the location of maximum acoustic backscatter intensity.

The combination of these techniques is considered a relatively comprehensive, accurate, and cost-effective means to define background TSS conditions based on project design and past experience performing similar monitoring where these techniques have been able to adequately define the character and extent (both space and time) of suspended sediment distribution associated with Project activities. The proposed methodology would allow real-time monitoring of project–related suspended sediment characteristics. The collection of water samples for laboratory measurement of TSS concentrations would provide an additional data correlation needed for calibration and would provide validation of the real-time monitoring results.

Monitoring would be conducted from a smaller vessel (or vessels) than would be used for cable installation. Therefore, weather conditions may prevent the safe collection of suspended sediment and water quality data during time periods when conditions remain acceptable for cable installation. To avoid material delay of installation activities and minimize risk of damage to the cable, US Wind may suspend monitoring operations, but continue installation activities, during such periods of adverse weather. Monitoring operations would be resumed promptly once weather conditions allow.