

STATE OF NEW YORK
DEPARTMENT OF PUBLIC SERVICE

CHANGE NOTICE

June 4, 2025

TO: JASON ZEHR
CHIEF, ENVIRONMENTAL CERTIFICATION AND COMPLIANCE
OFFICE OF RENEWABLE ENERGY SITING AND ELECTRIC TRANSMISSION

FROM: Daniel Connor, Utility Analyst 2 (Environmental)
ENVIRONMENTAL CERTIFICATION AND COMPLIANCE
OFFICE OF RENEWABLE ENERGY SITING AND ELECTRIC TRANSMISSION

SUBJECT: CASE 21-T-0366 - Application of Empire Offshore Wind LLC
for a Certificate of Environmental Compatibility and Public
Need for the Construction of 17.5 Miles of Transmission
Lines from the Boundary of New York State Territorial
Waters to a Point of Interconnection in Brooklyn, Kings
County.

RECOMMENDATION: Approval of EM&CP Change Notice 2A-3, as Requested

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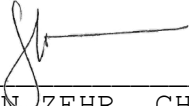
In accordance with Certificate Condition C6 of the Order Adopting Terms of a Joint Proposal and granting Empire Offshore Wind LLC (Empire Wind or Certificate Holder) a Certificate of Environmental Compatibility and Public Need in the above referenced proceeding, Empire Wind has notified Department of Public Service Staff (DPS Staff) of a proposed minor change. This minor change pertains to the Project's Part 2A Environmental Management and Construction Plan (EM&CP) which was approved by an Order of the Commission on June 21, 2024.

Change Notice 2A-3 - This minor change, as proposed by Empire Wind and reviewed by DPS staff, is an update to the approved in-water cable laying procedures, plans, and supporting EM&CP Appendices. The

revised documents are attached to this minor change approval. NYSDEC was consulted during the minor change review and did not have any comments.

DPS staff has reviewed this change and concludes it will not result in a net increase in adverse environmental impacts, nor will it directly relate to any contested issues decided by the Administrative Law Judges or the Commission during the proceeding. No new land rights will need to be acquired. All work will be performed within the approved corridor. It is hereby recommended that this change be approved, and the Certificate Holder be notified.

REVIEWED & APPROVED:



JASON ZEHR, CHIEF
ENVIRONMENTAL CERTIFICATION AND COMPLIANCE
OFFICE OF RENEWABLE ENERGY SITING AND ELECTRIC
TRANSMISSION

cc: Kristen Baker (kbaker@edrdpc)
Dan Connor, DPS (daniel.connor@dps.ny.gov)
21-T-0366 Case File
DPS Central File

NOTICE NUMBER: 2A - 3	NOTICE DATE: 05-21-2025
CHANGE LOCATION: 2A work area – KP 0.6-NYS waters boundary	ASSOCIATED DRAWING NUMBER(S): None
DESCRIPTION OF REQUESTED CHANGE: Minor changes to various EM&CP documents for the cable lay campaign season in 2025. All are compliant with Article VII Certificate Conditions.	
RATIONALE FOR REQUESTED CHANGE: Nexans, the Contractor, has fine-tuned various plans in the EM&CP as cable lay procedures were advanced for the 2025 construction season.	
SUPPORTING DOCUMENTATION PROVIDED AS ATTACHMENTS (Field Sketches, Photographs, Revised Drawings, Other): Appendix I – Pre-Installation Trial Plan; Appendix R.1 - Suspended Sediment and Water Quality Monitoring Plan; Appendix C – Offshore Cable Construction Plan; Appendix O – Anchoring Plan	
Note: Appendix C and Appendix O have confidential versions.	
DOES THE PROPOSED CHANGE RESULT IN A SUBSTANTIAL INCREASE IN ADVERSE ENVIRONMENTAL IMPACT ? YES: _____ (Change to be sent to the Commission for approval) NO: <u> X </u> (Change to be sent to the Director of Facility Certification & Compliance of the Environmental Certification and Compliance (EC&C) Section or their designee for approval)	
PREPARED BY: <u> Kristen Baker, EDR </u> <i>Kristen Baker</i> DATE: <u> 05/21/25 </u>	
APPROVED BY: CERTIFICATE HOLDER: <u> Anna Fusco, Equinor </u> <i>AF</i> DATE: <u> 05/21/25 </u> EC&C DIRECTOR OR DPS STAFF: _____ DATE: _____	
APPROVAL TYPE: VERBAL: _____ WRITTEN: _____	

Empire Wind 1
Case 21-T-0366
Appendix C

Offshore Cable Construction Plan

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1 Introduction

1.1 General Project Description

Empire Offshore Wind LLC (“Empire”) proposes to construct and operate the Empire Wind 1 (EW 1) Project as one of two separate offshore wind projects, both to be located within the Bureau of Ocean Energy Management (BOEM) designated Renewable Energy Lease Area OCS-A 0512 (Lease Area). The proposed transmission system for the EW 1 Project will connect the offshore wind farm to the point of interconnection (POI) and will include 230-kilovolt (kV) export and 345-kV interconnection lines traversing a total of approximately 17.5 miles (mi) (15.2 nautical miles [nm] or 28.2 kilometers [km]) within the State of New York.

The Project will interconnect to the New York State Transmission System operated by the New York Independent System Operator, Inc. (NYISO) at the Gowanus 345-kV Substation (the point of interconnection, or POI). The Gowanus 345-kV Substation is owned by the Consolidated Edison Company of New York, Inc. (Con Edison). The Project’s onshore facilities, including the onshore cable route, onshore substation, and the POI, are located entirely within Brooklyn, Kings County, New York.

The components of the EW 1 Project within the State of New York include:

- Two three-core 230 kV high-voltage alternating-current (HVAC) submarine export cables located within an approximately 15.1 nm (27.9 km) long submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall in Brooklyn, New York.
- A 0.2 mi (0.3 km) long onshore cable route and substation including:
 - Two three-core 230 kV HVAC EW 1 onshore export cables buried underground from the cable landfall transition joint bays to the onshore substation.
 - An onshore substation located at the South Brooklyn Marine Terminal (SBMT), which will increase the voltage to 345 kV for the onshore interconnection cables.
 - Two 345 kV cable circuits, each with three single-core HVAC onshore interconnection cables, buried underground from the onshore substation to the POI.

Nexans Norway AS has been awarded the delivery and installation of two (2) 230kV submarine export cable circuits that are approximately 41 nautical miles (76km) in length each from the offshore substation (OSS) at the lease areas to the onshore substation (ONS) at South Brooklyn Marine Terminal (SBMT), New York. The selected route for the Empire Wind 1 submarine export cables to SBMT is shown in Figure 1-1 below.

1.2 Purpose of the document

The purpose of this document is to provide details regarding the installation of the submarine export cables and the associated pre-installation and post-installation activities from the Transition Joint Bay (TJB) to the New York State (NYS) waters boundary (3 nautical miles offshore).

2 Terms and Abbreviations

Term	Definition
Company	Empire Offshore Wind LLC
Contractor	Nexans Norway AS
Abbreviation	Elaboration
AIS	Automatic Identification System
ATON	Aid TO Navigation
CLB	Cable Lay Barge
CLV	Cable Lay Vessel
ECR	Export Cable Route
EW1	Empire Wind 1
EW2	Empire Wind 2
HV	High Voltage
HVDC	High Voltage Direct Current
IAC	Inter Array Cables
ICPC	International Cable Protection Committee
LNYBL	Lower NY Bay Lateral
MBES	Multi-Beam Echo Sounder
MFE	Mass Flow Excavation
MLLW	Mean Lower Low Water
NAVD88	North American Vertical Datum of 1988
NCBD	Net Conservation Benefit Plan
NYCDEP	New York City Department of Environmental Protection
NYCDOT	New York City Department of Transportation
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O&M	Operations and Maintenance
ONS	Onshore Substation
OOS	Out-Of-Service
OSS	Offshore Substation
PLGR	Pre-Lay Grapple Run
PLJR	Pre-Lay Jetting Run
POI	Point of Interconnection
ROV	Remotely Operated Vehicle
SBMT	South Brooklyn Marine Terminal

Term	Definition
SEC	Submarine Export Cable
SRI	Subsea Rock Installation
TJB	Transition Joint Bay
TSS	Total Suspended Solids
USACE	United States Army Core of Engineers
USBL	Ultra-Short Baseline
USCG	United States Coast Guard
U.V.	Ultra Violet
VI	Vertical Injector
WTG	Wind Turbine Generator

3 Route Preparation

Prior to installation of the Submarine Export Cables (SECs) from the Transition Joint Bay (TJB) at South Brooklyn Marine Terminal (SBMT) to the NYS waters boundary, a number of pre-installation activities will take place:

- Route clearance:
 - Pre-lay grapnel run (PLGR)
 - Debris removal, as necessary
 - Boulder removal/relocation
- Pre-installation surveys
- Pre-sweeping where needed for sandwave levelling
- Third-party infrastructure crossing preparation, as necessary
- Pre-lay jetting run (PLJR) (Pre-trenching) in deep burial portions of the route

In accordance with Certificate Condition I2(a), route preparation activities listed above may take place:

- Between July 1 and September 30;
- Between December 1 and December 15;
- Within waters deeper than 20ft, NAVD88, between December 15 and February 28/29.

In addition, pre-installation trials for the submarine export cables, pre-lay grapnel runs, debris clearance, and boulder removal/relocation may take place in month of June from KP 0.6 to the NYS boundary if conducted in compliance with Appendix X – Atlantic and Shortnose Sturgeon Avoidance, Monitoring, and Impact Minimization Plan and Appendix FF – Net Conservation Benefit Plan (NCBP).

3.1 Pre-lay Grapnel Run (PLGR)

The PLGR will be performed along the cable installation route between the landfall at SBMT to the NYS waters boundary. The PLGR will be carried out to identify and recover debris such as fishing gear, wires, ropes, and out-of-service (OOS) cables located along the cable routes. Several PLGRs may be performed, potentially with offset from the cable routes, if deemed necessary to acquire sufficient route clearance prior to cable installation.

The PLGR will be carried out by towing a grapnel train behind a vessel. The tension in the wire holding the grapnel train will be monitored at all times. A steady rise in tension is normally an indication that the grapnel train has engaged debris. After engaging with debris, the grapnel train will be recovered. Recovered debris will be placed in designated waste receptacles or suitable containers on the support vessel throughout the debris removal operations. One full, the containers will be offloaded, and debris disposed of by a qualified waste management contractor. The waste management contractor will hold all necessary qualifications and ensure that appropriate disposable methods are applied within regulation. The plan will be updated to describe this. For very long debris that extends outside of the cable corridor (such as long wires, ropes or fishing gear), the section of the debris that conflicts with the cable installation will be cut and recovered. PLGR will not be performed over shallowly buried live existing assets. The grapnel train will maintain a setback distance of at least 300 ft (91.4 m) from in-service third-party existing infrastructure before a crossing agreement has been signed. Figure 3-1 shows a typical grapnel train example. The width of the grapnel train to be used for surface and shallowly buried debris clearance is approximately 3.3 feet (1 meter).

Several OOS cables have been identified along the SEC routes. Clearance of OOS cable sections that obstruct works related to the installation of the SECs will be performed according to International Cable Protection Committee (ICPC) recommendations. OOS cable clearance will be carried out as a part of the PLGR operations by using a typical grapnel train or deep de-trenching grapnel. In areas of OOS cables or more deeply buried debris, the width of the grapnel used is approximately 10.5 feet (3.2 meters). When the grapnel train catches an OOS cable, the section of the OOS cable conflicting with the EW1 SEC installation will be cut and recovered. The remaining ends of the OOS cable will be wrapped with either polypropylene rope or steel clamps close to the cutting location so that the OOS cable strands do not unwind after cutting. The OOS cable ends will be laid down with a clump weight attached and position recorded, in accordance with standard industry practice and ICPC recommendations.



Figure 3-1 Typical PLGR grapnel train

3.2 Boulder and Debris Relocation/Removal

In accordance with Certificate Condition J8, boulder relocation will only be performed if micro-routing the cable route to avoid the boulder is not practical or is required to increase the likelihood of achieving the target burial depth. Other debris or obstructions that cannot be avoided through micro-routing that affects the likelihood of achieving the target burial depth may be removed from the seabed and recovered to the vessel or barge for onshore disposal. Any boulders or debris requiring relocation shall be relocated to within 65 ft (19.8m) of the planned centerline of the cable. Any boulders requiring relocation should be placed together where possible to reduce the overall area of obstruction. If a boulder 3.3 ft (1m) or more in diameter is relocated a distance of 6.6 ft (2m) or more from the location where it was initially encountered, then notice shall be provided to the public, mariners, NYCDEP, NYCDOT, United States Coast Guard Waterways Management Office, recreational fishermen, and NYSDEC-Licensed Fishermen, in accordance with Certificate Condition J8, E10, and Appendix AA – Mariner Notification and Public Input Process.

Boulder relocation or debris removal will be performed using a boulder grab, deployed from a vessel or a barge, as illustrated in Figure 3-2. The boulder grab will maintain a setback distance of at least 300 ft (91.4 m) from in-service third-party existing infrastructure before a crossing agreement has been signed.

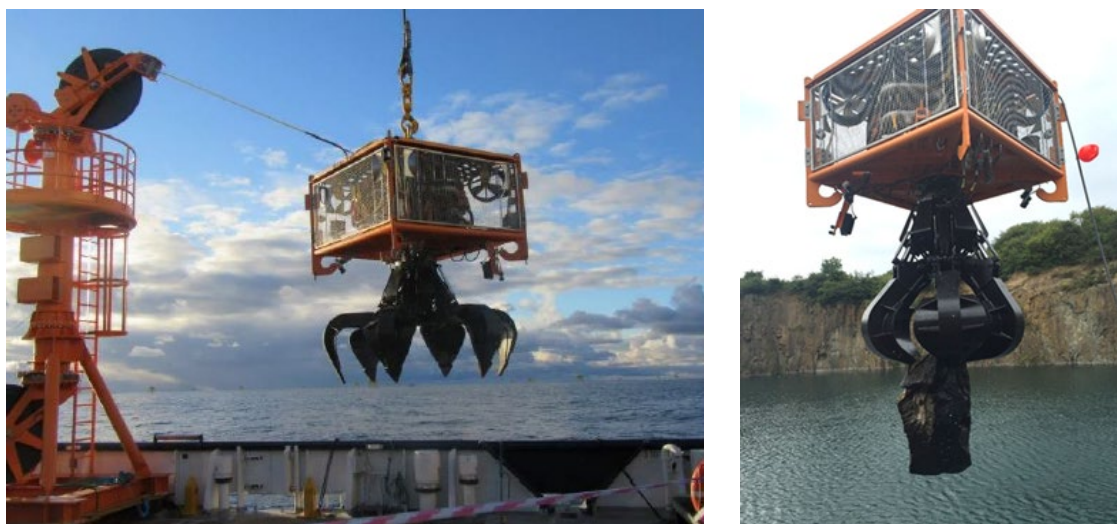


Figure 3-2 UTROV Boulder grab system (www.utrov.com)

3.3 Pre-sweeping

Pre-sweeping in areas of the submarine export cable corridor where underwater megaripples and sandwaves are present will only be performed where micro-routing the cable route to avoid these features within the cable corridor is infeasible and leveling of the seabed is required to increase the likelihood of achieving the target burial depth. Pre-sweeping may also be required to avoid cable free-spans prior to cable burial (cable suspension between two peaks). Based on the available survey data, pre-sweeping will be mainly required from approximately KP 15.5 to KP 20 as described further in the burial assessment in section 6.2.2. Pre-installation surveys may reveal additional areas that require pre-sweeping.

Pre-sweeping operations between KP 15.5 and KP 20 have been analysed in the Sediment transport study performed for the Empire Wind submarine cable installation, see ref. [7]. The study concludes that contamination release is not expected to exceed water quality standards for MFE operations in the planned pre-sweeping area (KP15.5 – KP20). The study also shows it is feasible to operate the MFE and stay within Total Suspended Solids (TSS) limits.

Pre-sweeping for megaripples and sandwave levelling will be performed through the use of a mass flow excavation (MFE) device deployed from a construction vessel or barge, as illustrated in Figure 3-3. The MFE device is suspended by a winch or crane to a certain height above the seabed and produces a jet of seawater that is directed toward the seabed in a controlled manner. The jet of seawater is effective in displacing sediments to level the seabed in a targeted area. The MFE device will be fitted with survey equipment for in-situ monitoring of the seabed. The MFE device may be operated in one or more passes along the targeted area of the cable corridor to achieve the required leveling result and level corridor width. The MFE device will maintain a setback distance of at least 300 ft (91.4 m) from in-service third-party existing infrastructure before a crossing agreement has been signed.

Where pre-sweeping may be required, an in-situ survey of the seabed will be performed to minimize the amount of pre-sweeping by identifying micro-routing opportunities or by avoiding feature levelling if certain features have reduced in dimension below the threshold that requires levelling. During pre-sweeping activities, the results will be evaluated in real time with survey equipment to allow further control and minimization of the scope.

Prior to performing pre-sweeping with MFE, a pre-installation trial will be performed to establish operating conditions that will minimize the suspension of in-situ sediments during MFE activities, consistent with the objectives of the Certificate Conditions, for a description of the pre-installation trials, see ref. [1]. Potential modifications to the operating conditions to further reduce in-situ sediment re-suspension associated with the MFE equipment operations, as determined during the pre-installation trials, may include, but are not limited to; adjusting the rate of advancement of the mass flow excavation equipment (increasing or reducing the progress speed), adjusting the equipment power, adjusting the hydraulic pressure and flow configuration, adjusting the equipment height above seabed, and limiting operations to specific windows in the tidal cycle. Operational controls implemented to minimize exceedances of the TSS limit will not result in the material delay of the progress of work to complete in-water installation during one construction season.

The MFE device will be operated in accordance with the operating conditions determined through the Pre-Installation Trial Plan, ref. [1]. Monitoring of suspended sediments and water quality will be performed during pre-sweeping activities as outlined in the Suspended Sediments and Water Quality Monitoring Plan, ref. [5].



Figure 3-3 Controlled Flow Excavation Systems (www.rotech.co.uk)

3.4 Third-party Infrastructure Crossing Preparation

Details of the proposed crossing designs can be found in ref. [2]. The methods of performing third-party infrastructure crossing pre- and post-installation works is described in this section.

3.4.1 Pre-excavation

If required by the final agreed crossing design, pre-excavation above existing third-party infrastructure may be performed to prepare for installation of concrete mattress above third-party infrastructure prior to cable installation. If required, pre-excavation will be performed using MFE with the same controls and mitigations as described in section 3.3.

3.4.2 Concrete Mattress Installation

If required by the final agreed crossing design, pre-lay and post-lay concrete mattresses will be installed at certain third-party infrastructure crossing locations to both ensure physical separation between the existing third-party infrastructure and the EW1 SECs and also to provide adequate protection of the EW1 SECs where sufficient burial depth is prevented by the existence of the third-party infrastructure. Physical separation between existing third-party infrastructure and the EW1 SECs may also be achieved through the use of a separation sleeve installed on the EW1 SECs. Concrete mattresses will be installed by the use of an installation frame from a vessel or barge as illustrated in Figure 3-4. Depending on the water depth and environmental conditions at the mattress installation location, the installation will be either diver or ROV assisted.

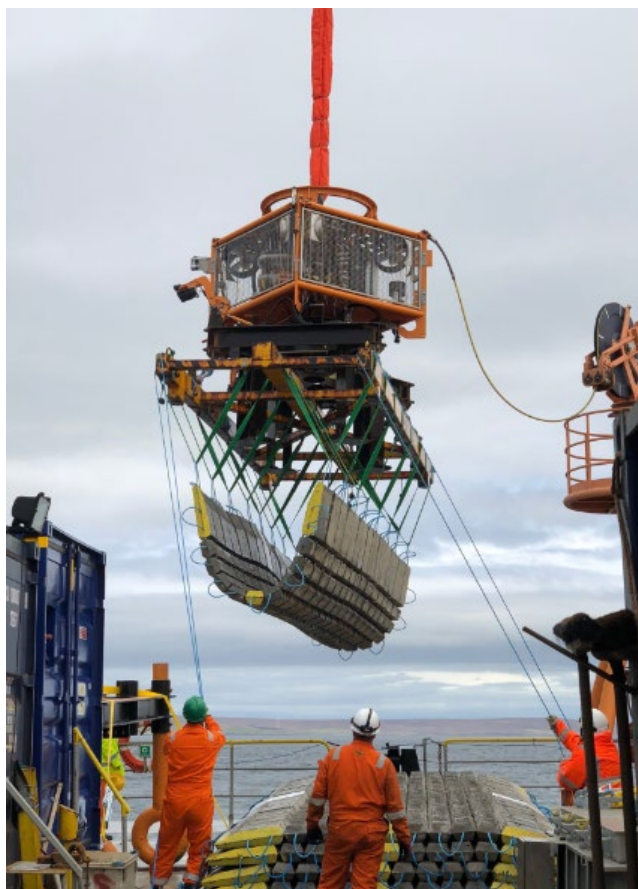


Figure 3-4 Typical mattress installation frame (www.utrov.com)

3.5 Surveys

As a part of the route preparation works, surveys will be performed to confirm the existing site conditions, monitoring the route preparation works, and provide the site conditions after route preparation works are completed and prior to cable installation (pre-lay survey). One or several of the following survey systems will be employed: multi-beam echo sounder (MBES), gradiometer, side scan sonar, real-time sonar, sub-bottom profiler, sub-bottom imager, cable tracking systems, visual surveys, positioning support by ultra-short baseline (USLB) positioning systems. Surveys may be conducted by remotely operated vehicle (ROV), hull mounted systems, or by divers if close inspection is required.

3.6 Pre-trenching (Pre-Lay Jetting Run)

Within portions of the route where deep burial is required or seabed conditions may limit the ability to achieve target burial depth, pre-trenching (also referred to as a Pre-Lay Jetting Run (PLJR)) will be performed. The base-case portions of the route where a PLJR will be performed is within the Bay Ridge Channel and USCG Anchoring Ground #25 where the target burial depth is 15 feet (4.6 m) or greater. The PLJR serves to ensure that target burial depth is achieved by performing a successful PLJR at the target burial depth prior to cable installation. Depending on soil conditions encountered, multiple PLJR passes for each SEC route may be required to achieve a complete run at target burial depth prior to cable installation.

The PLJR will be performed using the Vertical Injector (VI) burial tool operated from a cable lay barge (CLB). The PLJR activities will be similar to simultaneous lay and burial operations described in section 5.1, except there will be no cable loaded into the VI. The PLJR operation will maintain a setback distance of at least 300 ft (91.4 m) from in-service third-party existing infrastructure before a crossing agreement has been signed.

Pre-installation trials for the VI will be conducted as the first part of the PLJR as described in the Pre-Installation Trial Plan, ref. [1], to establish operating conditions that will minimize the suspension of in-situ sediments during VI activities, consistent with the objectives of the Certificate Conditions. The VI will be operated during the remainder of the PLJR activities in accordance with the operating conditions determined through the Pre-Installation Trial Plan. Monitoring of suspended sediments and water quality will be performed during PLJR activities as outlined in the Suspended Sediments and Water Quality Monitoring Plan, ref. [5].<

Pre-trenching may also be performed using Mass Flow Excavation (MFE) where deeper target burial depth requirements may limit the ability to achieve target burial depth. The MFE device will be operated with the relevant controls and mitigations as described in section 3.3.

The MFE device will be operated in accordance with the operating conditions determined through the Pre-Installation Trial Plan, ref. [1]. Monitoring of suspended sediments and water quality will be performed during MFE activities as outlined in the Suspended Sediments and Water Quality Monitoring Plan, ref. [5].

Pre-trenching with MFE is performed by deploying the (MFE) device deployed from a construction vessel or barge. The MFE device is suspended by a winch or crane to a certain height above the seabed and produces a jet of seawater that is directed toward the seabed in a controlled manner. The jet of seawater is effective in displacing sediments to create a fluidized trench where the cable can be laid and subsequently buried further to its target burial depth using post-lay burial equipment. The MFE device will be fitted with survey equipment for in-situ monitoring of the fluidized trench.

4 Submarine Export Cable Pull-In

Pull-in equipment will be mobilized to the SBMT site prior to the pull-in operations. The main onshore equipment and personnel required for the pull-in operations includes the following as illustrated in Figure 4-1:

1. Pull-in winch
2. Winch operator
3. Cable Rollers
4. Cable riggers/handlers
5. Machinery Operators
6. Excavator for cable handling
7. Hydraulic Power Unit & Generators
8. Site facilities
9. Storage containers / workshop

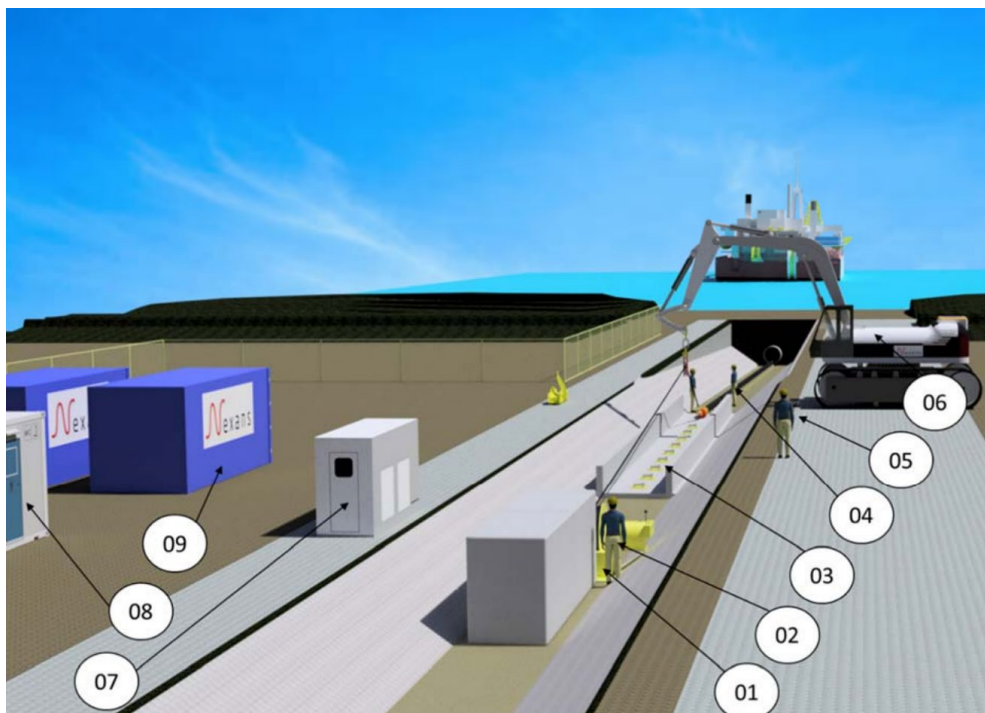


Figure 4-1 Illustration of main equipment for the pull-in operation

After the transition joint bay (TJB) is prepared and the trench is excavated between the TJB and the bulkhead (including steel pipe passage through bulkhead), the pull-in equipment will be setup as illustrated in Figure 4-1, with the pull-in winch setup landward of the transition joint bay (TJB).

The cable lay barge (CLB) will be positioned in proximity of the pier-head line at the mouth of the basin between 35th Street pier at SBMT and materials recovery facility on the 29th Street Pier, as illustrated in Figure 4-2. The barge will be floating and positioned with an anchor spread and/or spuds. The barge will also have positioning assistance with thrusters, see section 5 for a further description of barge manoeuvring.

After the barge is positioned, pull-in operations will commence by paying out the cable toward the landfall. The cable is planned to be supported by cable floats installed at the CLB and the cable position will be controlled using multiple workboats. When the cable end is within proximity to the landfall bulkhead, the pull-in winch wire will be connected to the cable end by means of a cable grip and with workboat and/or diver assistance. The pull-in operation will commence by pulling the cable through the bulkhead (via pre-installed steel pipe) and excavated trench toward the TJB as the CLB continues to pay-out on the cable. Cable floats will be removed as they approach the bulkhead assisted by workboats, divers and/or personnel working at the shoreline. When a sufficient length of cable is pulled onshore (including required overlength beyond the TJB), the operation will come to a controlled stop, and the cable end will be temporarily secured onshore. At this point, the SEC length that is supported by cable floats between the landfall and the CLB will be lowered to the seabed in a controlled manner along the planned SEC route by removing floats by using workboat and/or diver assistance. This section of in-water cable between 35th Street pier at SBMT and materials recovery facility on the 29th Street Pier (from approximately KP 0.14 to KP 0.63) is planned to be lowered into a pre-excavated trench and later back-filled with a granular material to provide cable protection. This cable trench is expected to be ready to be back-filled approximately 1 month after the first cable is installed.

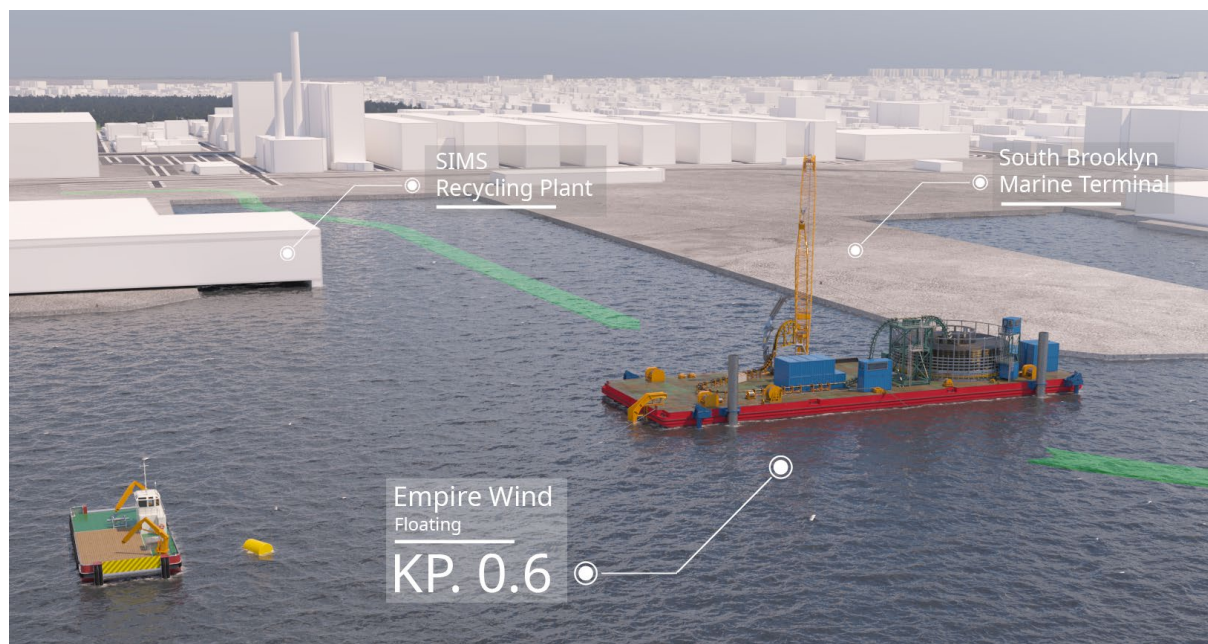


Figure 4-2 Illustration of typical cable lay barge position for cable pull-in

5 Submarine Export Cable Lay and Burial

In accordance with Certificate Condition I2(a), submarine export cable lay and burial activities, and the installation of post-lay secondary protection (mattress or rock protection) may take place:

- Between July 1 and September 30;
- Between December 1 and December 15;
- Within waters deeper than 20ft, NAVD88, between December 15 and February 28/29.

In addition, post-lay mattress and rock protection installation may take place in months of October and November from KP 0.6 to the NYS boundary if conducted in compliance with Appendix X – Atlantic and Shortnose Sturgeon Avoidance, Monitoring, and Impact Minimization Plan and Appendix FF – Net Conservation Benefit Plan (NCBP).

5.1 Simultaneous Cable Lay and Burial

Simultaneous lay and burial of the SECs is planned to be performed using Vertical injector (VI) which uses jet trenching technology to create a narrow trench by using water jetting nozzles to fluidize the soil. The cable is guided internally through the VI and into the bottom of the trench. The VI is supported by crane on cable lay barge (CLB). The CLB is positioned and maneuvered using one or a combination of thrusters, spuds, and anchors that are handled by anchor handing support vessels. Planned anchoring operations and associated impact minimization measures are described in the Anchoring Plan, ref. [4]. Figure 5-1 provides an overview of the VI operated from a CLB.

Prior to performing simultaneous lay and burial, a pre-installation trial will be performed with the VI during the first part of the PLJR to establish operating conditions that will minimize the suspension of in-situ sediments during simultaneous lay and burial activities, consistent with the objectives of the Certificate Conditions. For a description of the pre-installation trials, see the Pre-Installation Trial Plan, ref. [1]. The VI will be operated in accordance with the operating conditions determined through the Pre-Installation Trial Plan, ref. [1]. Monitoring of suspended sediments and water quality will be performed during simultaneous lay and burial of the SECs as outlined in the Suspended Sediments and Water Quality Monitoring Plan, ref. [5].

After the pull-in operations are completed, simultaneous lay and burial will commence by simultaneously lowering the VI into the seabed and moving the barge along the planned cable route to reach the target burial depth prior to entering the Bay Ridge Channel. The CLB will continue along the

planned cable route, adjusting the vertical injector as required to reach the different target burial depths along the route, as presented in the Export Cable Plan and Profile drawings, ref. [3].

Simultaneous lay and burial with VI is planned within the Bay Ridge Channel and USCG Anchoring Ground #25, where the target burial depth is 15 feet (4.6 m) or greater. Between the areas requiring deeper target burial depth (from approximately KP 4.8 to KP 8.9), and after USCG Anchoring Ground #25 (approximately KP 12.5 to KP 28.7), the cables will be laid partially or fully on the seabed surface (either through the VI or removed from the VI). Completing cable burial to the target burial depth for these sections will be performed with a post-lay burial operation as described in section 5.3.

The Vertical Injector will be positioned using several different sensors mounted on the tool and the CLB. The cable exit position from the VI will be calculated, logged and visually displayed continuously during operation. The cable exit point from the VI will document the as-built burial elevation and position of the cable.



Figure 5-1 Illustration of vertical injector deployed from cable lay barge (www.miahtrenchers.com)

5.2 Cable Lay

Laying the SECs on the surface of the seabed is planned to be performed from a cable lay barge (CLB) or cable lay vessel (CLV). The CLB or CLV is positioned and maneuvered using one or a combination of thrusters, spuds, and anchors that are handled by anchor handing support vessels. Planned anchoring operations and associated impact minimization measures are described in the Anchoring Plan, ref. [4]. Figure 5-2 provides an overview of a typical CLV performing cable lay.

Cable lay partially or fully on the seabed surface is planned between approximately KP 4.8 and KP 8.9, and after USCG Anchoring Ground #25 (approximately KP 12.5 to KP 28.7), but may be performed anywhere along the cable route. As required by Contractor to protect of the cable against damage threats, safety vessels will be deployed along the cable route, potentially continuously during the period between cable lay and cable burial.

5.2.1.1 Cable Separation in The Narrows

For the section of the cable route in The Narrows parallel to the Anchorage/Ambrose navigation channel (approximately KP 6.1 to KP 8.5) the following measures will be employed during installation to minimize the lateral separation between the cables and maximize the distance to the channel side-slope while maintaining the minimum cable separation required during operation:

- Any in-situ micro-siting of the cable that deviates from the planned cable route for debris avoidance or other reasons shall seek to maximize the clearance to the channel side-slope to the extent practicable.
- Any in-situ micro-siting of the cable that deviates from the planned cable route for debris avoidance or other reasons shall not result in the cable being installed within the lateral distance from the channel side slope that is equal to or greater than the repair bight (nominally twice the water depth). Any cable deviation from the planned cable route must also remain within the project siting corridor, which is approximately 500 feet wide and up to approximately 900 ft wide in certain locations. The siting corridor is shown in Appendix A – Export Cable Plan and Profile Drawings.

The planned installation route of the western submarine export cable will be adjusted based on the as-installed placement of the eastern submarine export cable (first cable to be installed) to the extent practicable and where it will not inhibit potential future repair bights. This will serve to minimize the lateral spacing by removing installation tolerance considerations for the already installed eastern cable.

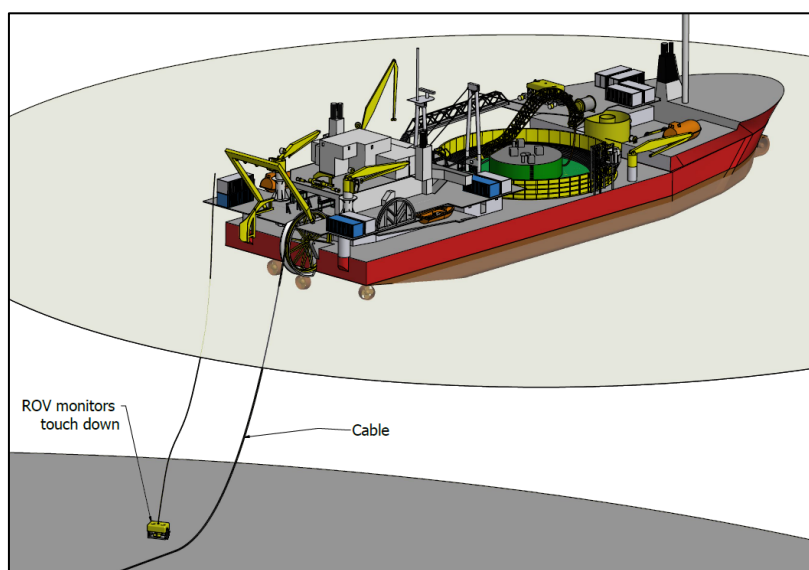


Figure 5-2 Typical cable lay from CLV Nexans Skagerrak with ROV touchdown monitoring

5.3 Post-Lay Cable Burial

Post-lay burial of the SECs is planned to be performed using a remotely operated jet trencher which uses jet trenching technology that creates a narrow trench by using high-pressure water jetting nozzles on two “swords” to fluidize the soil. The cable lowers into the trench under its own weight as the jet trencher progresses under its own power. It is planned that the Capjet jet trencher will be used to perform post-lay cable burial operations, as illustrated in Figure 5-3. The Capjet system is relatively light-weight with a submerged weight of 1100 lbs. - 2200 lbs. (500 kg - 1000 kg). Capjet is propelled by onboard thrusters, can free-fly in the water column and is equipped with high power rotary impeller onboard water pumps. Power is provided via a tether to the support vessel or barge. No vibration equipment is used on Capjet for burial, only high-pressure water jetting. It is also planned that the Capjet 50 jet trencher will be used for post-lay cable burial operations, as described in Figure 5-4. The Capjet 50 system is light-weight with a submerged weight of less than 1700 lbs (800 kg). Capjet 50 is propelled by onboard thrusters. Water pumps for high pressure water jetting are located on the support or barge and jetting water is supplied to the Capjet 50 via a hose. Power is provided via a

tether to the support vessel or barge. No vibration equipment is used on Capjet for burial, only high-pressure water jetting.

Capjet is deployed and operated from either the CLB/CLV or a separate support vessel or barge. The CLB/CLV or support vessel/barge is positioned and maneuvered using one or a combination of thrusters, spuds, and anchors that are handled by anchor handling support vessels. Planned anchoring operations and associated impact minimization measures are described in the Anchoring Plan, ref. [4].

Prior to performing post-lay burial operations, a pre-installation trial will be performed with the jet trencher to establish operating conditions that will minimize the suspension of in-situ sediments during simultaneous lay and burial activities, consistent with the objectives of the Certificate Conditions. For a description of the pre-installation trials, see the Pre-Installation Trial Plan, ref. [1]. The jet trencher will be operated in accordance with the operating conditions determined through the Pre-Installation Trial Plan, ref. [1]. Monitoring of suspended sediments and water quality will be performed during jet trenching operations as outlined in the Suspended Sediments and Water Quality Monitoring Plan, ref. [5].

Post-lay cable burial to the target burial depth is planned to be performed between the areas requiring deeper target burial depth (from approximately KP 4.8 to KP 8.9), and after USCG Anchoring Ground #25 (approximately KP 12.5 – KP 28.7), but may be performed along the full cable route. The tool will be deployed to the seabed and positioned over the cable. The swords are lowered gradually as the tool moves forward to fluidize the soils which allows the cable to lower into the seabed. At the end of the trenching operation, the tool is stopped and the swords are raised before recovering the tool back to the barge or vessel.

The jet trencher will be positioned and controlled using several different sensors mounted on the tool with real time monitoring and control from the support vessel or barge. As-built surveys are planned to be conducted as the post-lay burial operations proceed to determine the actual cable location and burial elevation achieved that employs a cable tracker, and multi-beam echo sounder (MBES) mounted on a remotely operated vehicle (ROV). A tone may be applied to the cable to aid the survey equipment in tracking the cable.

Where post-lay burial with a Jet Trencher is not practicable or successful in achieving the required cable burial depth, Mass Flow Excavation (MFE) may be used to perform post-lay cable burial. The MFE device will be operated with the relevant controls and mitigations as described in section 3.3.

The MFE device will be operated in accordance with the operating conditions determined through the Pre-Installation Trial Plan, ref. [1]. Monitoring of suspended sediments and water quality will be performed during MFE activities as outlined in the Suspended Sediments and Water Quality Monitoring Plan, ref. [5].

Post-lay burial with MFE is performed by deploying the (MFE) device deployed from a construction vessel or barge. The MFE device is suspended by a winch or crane to a certain height above the seabed and produces a jet of seawater that is directed toward the seabed in a controlled manner. The jet of seawater is effective in displacing sediments to create a fluidized trench that the cable lowers into. The MFE device will be fitted with survey equipment for in-situ monitoring of the fluidized trench.

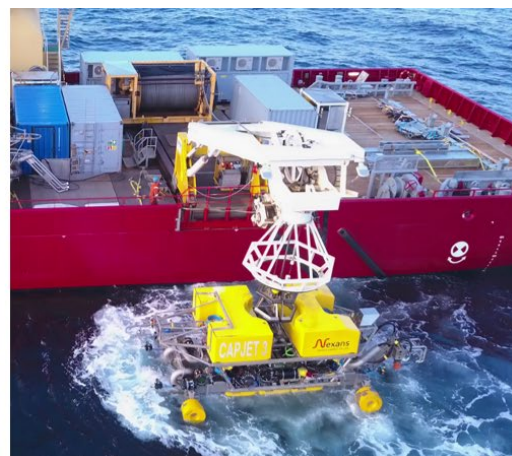
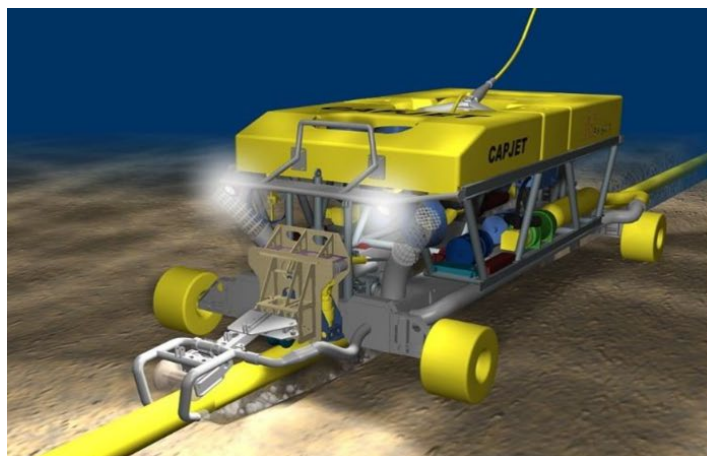
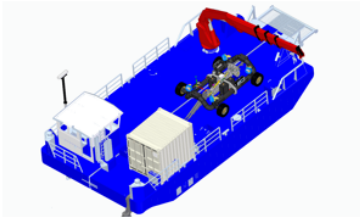


Figure 5-3: Capjet remotely operated jet trencher

NEXANS CAPJET trenchers are developed and built by NEXANS Norway and have been used for jetting of cables, umbilicals and pipelines since mid-80s. The CAPJET machines have been frequently optimized since the first design. The water pumps systems can either be based on low pressure pumps or a combined high/low pressure pump system ensuring an optimized setup for the actual soil conditions on site.


Water supply Capjet 50 – surface supplied
 LP front nozzles
 LP cutting sword and transport water
 2 x 400 HP water pumps, Pressure from 8 to 12 bar- based on system configuration

Hydraulic system- surface supplied
 1 x 120 HP Hydraulic Power Unit
 4 vectorized thruster SA 300
 Tension control front tensioner (free float to 250kg)- cable diameter up to 300 mm

Main structure
 Aluminum main lift structure
 Aluminum tensioner and sword aft
 800 mm vertical linear adjustment of sword arm
 Variable ballast system 0-800 kg
 Adjustable sword 800 mm vertical adjustment
 Fixed width jetting sword max length 2 m

Control system
 All data are collected on a network which gives local control of all sensors and valve packs.
 The latest control system technology distributed data collection, touchscreens and WEB based monitoring and support tools.
 The system can be fully supported through the internet and low speed connections.
 40 m combined control and hydraulic umbilical

Size & weight
 Capjet 50 LXWXH 5m x 3m x 1.2 m, 1200 kg in air / 0-500 kg in water

Topside systems
 Control container 1 x 10' or vessel integrated

Sensors (standard)
 Four PTZ IP camera 4 K
 Octans Fiberoptical gyro
 Valeport Depth sensor
 Position sensors on all hydraulic movements
 Speed sensors on front wheel

Sensors (Optional)
 MAGTRACK Cable tracker
 R2Sonic 2020 MBES
 Gemini sonar

Handling system
 Vessel operated crane 30 tm

Surface vessel- typical
 LXW 15mx7.5 m Draft 1m
 Crane 30 tm
 DP

Figure 5-4: Capjet 50 surface supplied jet trencher

5.4 Cable Temporary Storage and Jointing

Within NYS waters, each submarine cable is planned to be divided into two (2) segments that will be installed in separate installation campaigns and later joined with a field joint at approximately KP 13.2. Prior to the jointing operation, approximately 650 feet to 1000 feet (200m to 300m) of each cable end will be laid in a temporary storage route, as illustrated in the Export Cable Plan and Profile drawings, ref. [3]. To achieve the required routing of the cables in the temporary storage route that is suitable for later jointing, it may be necessary to install temporary turning points as shown in Figure 5-5, or a series of rock nets that form a radius to guide the cable around that will be in place until jointing is completed. As the period between cable installation and jointing/burial is planned to be between approximately 1 day and 80 days (within the same installation season), the cable ends are planned to be laid on the surface, and, as required by Contractor, safety vessels deployed at the location to guard the cable ends and temporary turning points (if installed) against damage threats if the jointing and burial does not occur immediately after laydown of the cable ends. If the period between cable installation and jointing/burial becomes extended in duration because of unplanned events, additional measures may be employed to provide sufficient protection such as: Notice to Mariners, temporary

shallow burial of the cable ends, and/or temporary Aid to Navigation (ATON). Temporary shallow burial is considered to be approximately 2 feet (0.6m) below seabed, and would be planned to be the means of protecting the cable ends if the temporary storage period was greater than approximately 6 months. The maximum anticipated duration for temporary shallow burial, if required, is 1 year. If required, temporary shallow burial would only be done for short cable lengths (1000 ft / 300 m) at the ends of the cable segments in a specific location for each cable. If the temporarily stored parts of the cables are shallowly buried, a small section of rigging at the end of the cable may remain exposed on the seabed for later recovery.

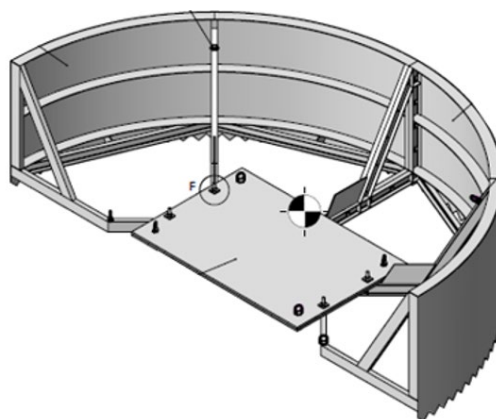
If the cable jointing and joint burial between the Nearshore and Midshore cables is not achieved within the initial installation season (before the start of the October 1 to November 30 restriction window), the following contingencies scenarios would be available:

- If a modification of the seasonal restriction window is not granted, the cable ends would need to be temporarily protected until the end of the seasonal restriction window (November 30) when jointing and burial operations could recommence. For this duration (October 1 to November 30), the cable ends would be planned to be protected through either Temporary Aid to Navigation (Physical or Virtual) or Safety/ Guard vessel stationed near cable ends to monitor and divert other marine traffic. However, if an extreme weather event is forecasted to occur during the temporary storage period, concrete mattresses may be deployed at intervals along the cable ends to provide stability.
- If the cable jointing and joint burial is not planned to be completed within the above mentioned scenario (before the end of the seasonal restriction window on February 28), and a modification of the seasonal window is not granted, the cables ends would need to be temporarily protected until the end of the spring seasonal restriction window (June 30, 2026). In this contingency scenario, where the temporary protection period of the cable ends is long in duration, temporary shallow burial would be performed to provide robust protection of the cable ends.

5.4.1 Jointing

Prior to the joining operation, it may be necessary to install temporary turning points on the seabed that will be used to achieve the required re-routing of the cables for the jointing operation. These temporary turning points would be recovered from the seabed immediately after the jointing operation is completed. Temporary turning points will typically be either a steel structure used to guide the cable route around a tight radius, as shown in Figure 5-5, or a series of rock nets that form a radius to guide the cable around. A further description of the rock nets is provided in section 6.3.3. Both options are installed on the surface of the seabed and have a height above seabed of 3.3 feet to 6.6 feet (1 to 2 m). The approximate footprint of a turning point arrangement is approximately 33 feet x 17 feet (10 meters x 5 meters). The temporary turning points will be installed immediately prior to jointing operations and will be recovered immediately after jointing operations are completed for a total expected duration on the seabed of 1 week to 2 weeks. The temporary turning points are both installed and recovered by a crane on a vessel or barge. The temporary turning points are installed in the vicinity of the cable lay barge or cable lay vessel position during the jointing operation and will be monitoring and guarded as a part of that operation. The jointing operation will be performed by a CLB or CLV. The CLB or CLV is positioned and maneuvered using one or a combination of thrusters, spuds, and anchors that are handled by anchor handling support vessels. Planned anchoring operations and associated impact minimization measures are described in the Anchoring Plan, ref. [4]. The cables will be recovered from the temporary storage route and laid along the final joint configuration routes. If required, jet trenching operations may be needed to de-bury the sections of the cable in the temporary storage routes. If jet-trenching is required, monitoring of suspended sediments and water quality will be performed during de-burial jet trenching of the SECs as outlined in the Suspended Sediments and Water Quality Monitoring Plan, ref. [5].

After re-routing, the cables ends will be recovered to the CLB/CLV and will be joined together. The field joint will be sealed and protected by a steel housing. After the field jointing is completed, the joint will be laid on the seabed in the final configuration. A typical final configuration is illustrated in the Export Cable Plan and Profile drawings, ref. [3]. The cables and joint will then be buried to the target burial depth. This will be performed with a remotely operated jet trencher operated from a vessel or barge.



Description	Unit	Value
Mass	kg	6060
Apparent mass in water	kg	5200
Height	m	2
Diameter	m	7.4
Coverage	°	180

Figure 5-5: Typical Steel Turning Point

5.5 Third-party Infrastructure Crossings

Details of the proposed crossing designs can be found in ref. [2]. The proposed methods of performing third-party infrastructure crossings during cable installation and burial is described in this section. The crossing methods presented in this document are not necessarily finalized or officially agreed with the third-party infrastructure owners, however the methods have been presented to the third-party infrastructure owners and matured based on the owner engagement and feedback.

The following measures will be in-place to avoid impacts to existing buried third-party infrastructure:

- In accordance with section H of the Certificate Conditions, to the extent possible, crossing agreements or letters of no objection will be established with third-party infrastructure owners before crossing operations begin. This crossing agreement or a letter of no objection from the third-party infrastructure owner will be provided to the Commission.
- Notifications will be made to the third-party infrastructure owners prior to performing the crossing.
- No anchor/spud zones are established for each of the existing in-service third-party infrastructure as described in the Anchoring Plan, ref. [4]. These zones will be distributed to the crews on all vessels and boats involved in the operation and confirmed available prior to performing the crossing.
- Weather assessment
- Pre-crossing meeting to confirm all parties agree to perform the crossing and required measures are established
- Where anchors are utilized during the operation, there will be continuous monitoring for anchor drag.
- Where anchors are utilized during the operation, preparations will be made for emergency cut and release of anchor lines with redundant station keeping means available.
- Emergency notification flowchart available to all parties involved.

The methods of performing third-party infrastructure crossings are detailed further in the sections below for the in-service third-party infrastructure that the EW1 SECs will cross over. In addition, the EW1 SECs siting corridor boundary is within 300 feet (91.4m) of the Bayonne Energy Center submarine cables. The measures listed above will also be employed when working in proximity to the Bayonne Energy Center submarine cables.

5.5.1 New Water Siphon (Brooklyn-SI)

[REDACTED]

5.5.2 North and South Utility Trenches

[REDACTED]

[REDACTED]

5.5.3 Verizon Cable

[REDACTED]

[REDACTED]

5.5.4 Neptune HVDC and Transco 26” LNYBL Gas Pipeline

[REDACTED]

5.6 Survey

As a part of the SEC installation and burial works, surveys will be performed to confirm the existing site conditions (pre-lay survey), monitor the installation and burial works, and determine the as-built position and burial depth of the SECs. One or several of the following survey systems will be employed: multi-beam echo sounder (MBES), gradiometer, side scan sonar, real-time sonar, sub-bottom profiler, sub-bottom imager, cable tracking systems, visual surveys, positioning support by ultra-short baseline (USLB) positioning systems. Surveys may be conducted by remotely operated vehicle (ROV) or hull mounted systems.

5.6.1 As-built Survey

An as-built survey will be performed to determine the actual submarine export cable location and burial elevation that employs a cable tracker, camera (video) and multi-beam echo sounder (MBES) mounted on a remotely operated vehicle (ROV). A tone may be applied to the cable to aid the survey equipment in tracking the cable. The as-built cable position and elevation obtained from as-built surveys (with cable tracking equipment) performed in conjunction with the burial operations may be used to document the as-built elevation and position of the cables.

In deep burial sections of the submarine export cable route, the continuously tracked depth and position of the cable exit point from the burial tool (Vertical Injector) is the most reliable method available for documenting the as-built burial elevation and position of the cable. The vertical injector will be positioned using several different sensors mounted on the tool and the CLB. The cable exit position from the VI will be calculated, logged and visually displayed continuously during operation. An as-built survey of the seabed elevation utilizing MBES will be conducted and used together with the as-built burial elevation data to determine the as-built burial depth of the SECs.

6 Burial Assessment Study

6.1 Cable Route

Within NYS waters, each submarine cable is planned to be divided into two (2) segments that will be joined with an offshore field joints. Cable 2 is divided into segments L1, L3 and Cable 1 is divided into segments L2, L4.

The route sections and approximate locations are defined as follows and illustrated in Figure 6-1.

- Nearshore section – KP 0 – KP 13 (cable segment L1, L2)
- Midshore section – KP 13 – KP 28 (cable segment L3, L4)

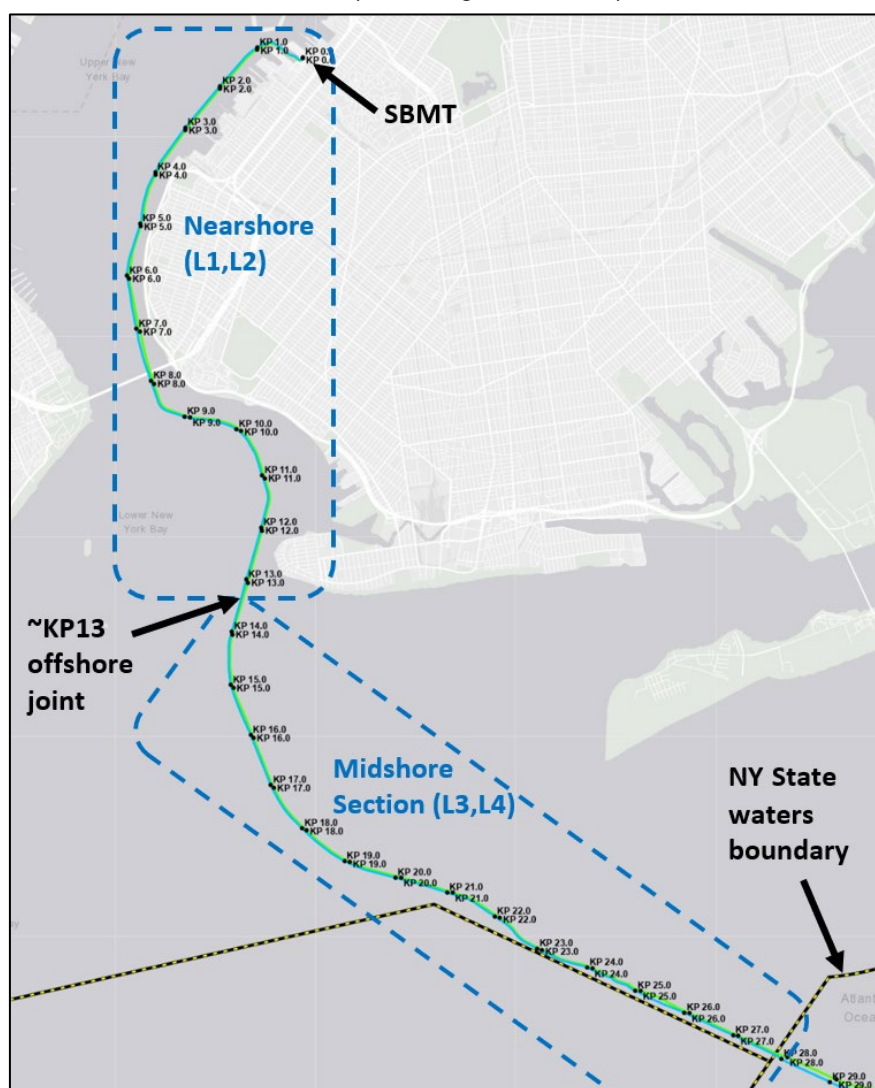


Figure 6-1: Submarine export cable route overview

6.1.1 Nearshore Section

The nearshore section (KP 0 – KP 13) is from the onshore transition joint bay (TJB) at SBMT to the end of Gravesend Bay. See Figure 6-2 for an overview of the nearshore section route.

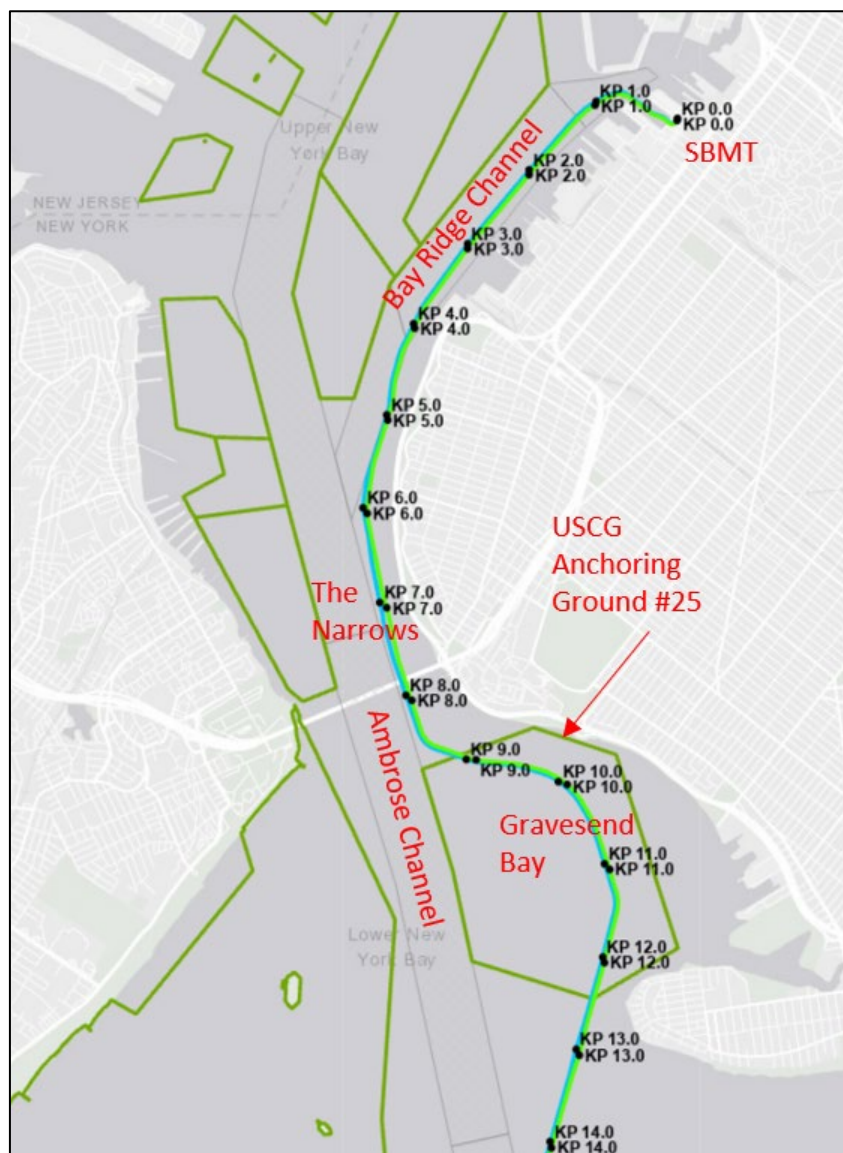


Figure 6-2: Route overview, nearshore section (KP 0 – KP13)

Burial Requirements:

Based on recent bathymetry data, the maximum depth of burial required is expected to be approximately 19.7 feet (6 m) between approximately KP 0.6 and KP 2 within the Bay Ridge Channel. Sedimentation shoaling may occur in this area before project execution, but this is not expected to increase the burial requirement above 23 feet (7 m). The target depth of burial is plotted continuously for the submarine export cable routes in the Export Cable Plan and Profile Drawings, ref. [3]. The target depth of burial requirements are outlined below for the nearshore section.

- Within federal navigation projects (anchorage and shipping channels, incl. theoretical side slope): The USACE requires a minimum target depth of burial of 15 ft (4.6 m) below the authorized depth or existing seabed (whichever is deeper), see Figure 6-3 for illustration.

For the nearshore section route, this requirement is relevant for the cable routing inside the theoretical side slopes of the Bay Ridge Channel where the authorized depth is 40 ft (12.2 m) below Mean Lower Low Water (MLLW). Mean Lower Low Water is 2.9 feet (0.88m) below NAVD88 as determined using NOAA VDATUM. Therefore, the authorized depth of the Bay Ridge Channel is taken as 42.9 feet (13.08m) below NAVD88. This translates to a minimum

required target depth of burial of at least 55 ft (16.8 m) below MLLW or 57.9 ft (17.7 m) below NAVD88.

- Within US Coast Guard (USCG) Anchoring Ground #25: The USCG requires a minimum target depth of burial of 15 feet (4.6 m) below existing seabed with USCG Anchoring Ground #25. For the nearshore section route, this requirement is relevant for most of the cable route within Gravesend Bay.
- Outside of federal navigation projects: Based upon guidance from the USACE and the outcome of the Cable Burial Risk Assessment found in Appendix 1, the target depth of burial is 6 feet (1.8m) outside of federally maintained areas, see Figure 6-4 for illustration. For the nearshore section route, this requirement is relevant for the cable route along the Ambrose channel through the narrows, and at the end of Gravesend Bay (outside of USCG Anchorage #25).

For the section of in-water cable between 35th Street pier at SBMT and the materials recovery facility on the 29th Street Pier (from approximately KP 0.14 to KP 0.63), the cable burial is planned to be achieved with a pre-excavated trench and back-fill above the cable with a granular material. Granular material provides improved resistance to cable threats compared to the existing soft material.

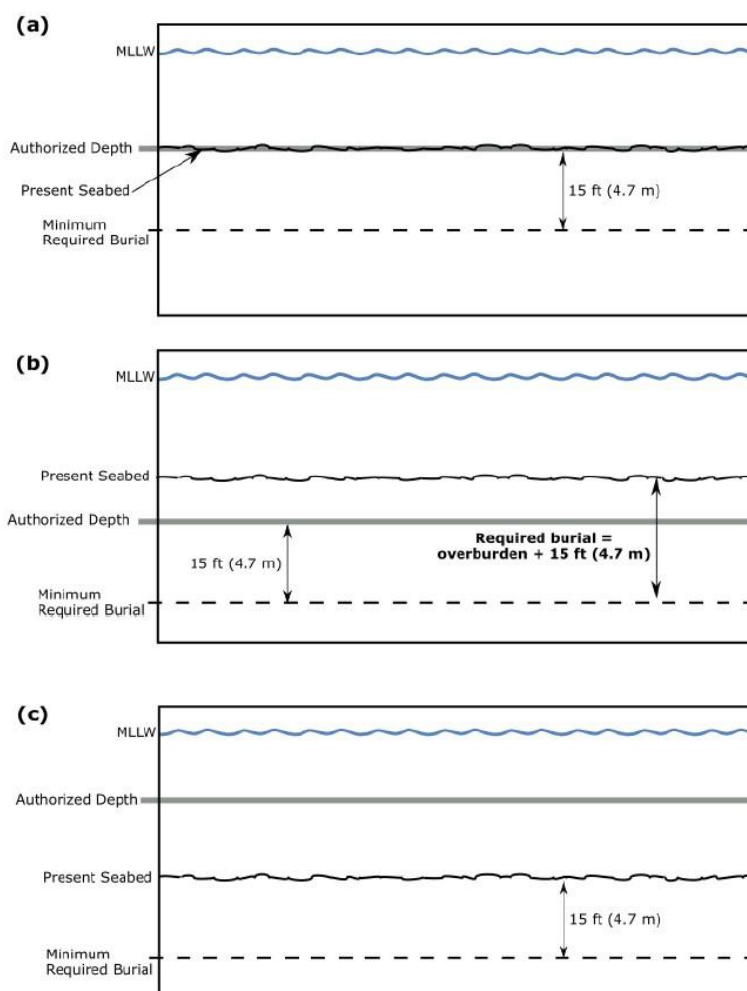


Figure 6-3: Diagrammatic representation of USACE minimum cable burial requirements within federal navigation projects

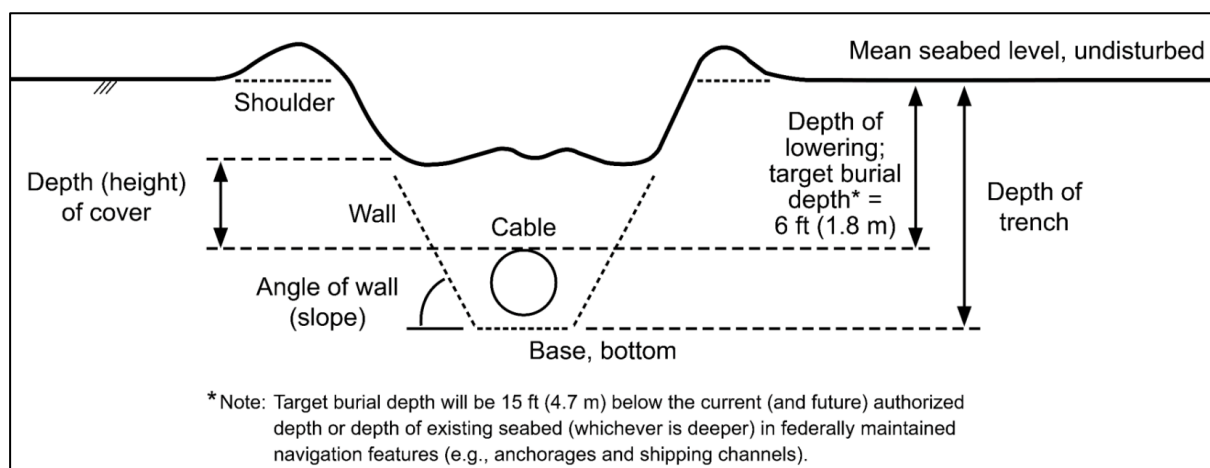


Figure 6-4: Diagrammatic representation of target depth of burial

Water Depth:

- Based on recent bathymetry data, the water depth varies along the nearshore route from 23-102 ft (7-31 m) below NAVD88. The water depth is plotted continuously for the submarine export cable routes in the Export Cable Plan and Profile Drawings, ref. [3].

Seabed Conditions:

Within the Bay Ridge channel route section, the soil is generally characterized as silt/clay which can be extremely low strength, sometimes overlaying sand and clay. Marine sand sections and extremely low to medium strength clay/silt are found in The Narrows section of the route. The first part of Gravesend bay route section is characterized by very low strength to medium strength clay/silt followed by predominantly marine sand at the end of the Gravesend bay section.

According to Geotechnical Design Basis for the Export Cable Route, ref. [6], the main stratigraphic units encountered consist in general and in descending order of Holocene marine sand deposits, Holocene estuarine deposits, Holocene transgressive deposits, Pleistocene alluvial deposits, and Pre-Quaternary Coastal Plain deposits. A description and distribution of the soil zones relevant to the target burial depths along the nearshore ECR according to design basis (ref. [6]) are provided below in Table 6-1.

Table 6-1 Description of zones along the EW1 nearshore ECR, ref. [6]

KP From	KP To	Length	Zone	Soil units present					Description of Zonation
				U1 Silty Clayey SAND	U2 SAND	U3 CLAY	U4 SILT	U5 PEAT	
0	3.5	3.5	X2	x	x	x	x	x	Extremely low strength to medium strength clay/silt overlaying medium strength to high strength clay/silt and loose to medium dense sand
3.5	4.7	1.2	X1	x		x	x	x	Extremely low strength to low strength clay/silt
4.7	7	2.3	B1	x	x	x	x		Very low strength to high strength clay/silt interbedded with sand overlaying very loose to dense sand
7	9	2	E	x	x	x	x	x	Valley with water depths ranging from approximately 25 m to 30 m. Soil primarily consists of interbedded extremely low strength to medium strength clay/silt and loose to medium dense sand
9	11.2	2.2	X1	x	x	x	x	x	Extremely low strength to low strength clay/silt
11.2	13	1.8	A1	x	x	x			Primarily medium dense to very dense sand

6.1.2 Midshore Section

The midshore section (KP 13 – KP 28) is from the end of Gravesend Bay (after USCG Anchorage #25) to the New York State waters boundary (3 nautical miles offshore). Much of the route is adjacent to the Ambrose channel and encounters a relic dredged area between the Ambrose channel and East Bank with mobile bedforms encountered from approximately KP 15.5 to KP 20. The relic dredged area and Ambrose channel are divided for most of the stretch by a shallow and narrow ridge. The route then encounters the shallower Rockaway sandbanks (approximately KP 20 to KP 24.5). See Figure 6-5 for an overview of the midshore section route.

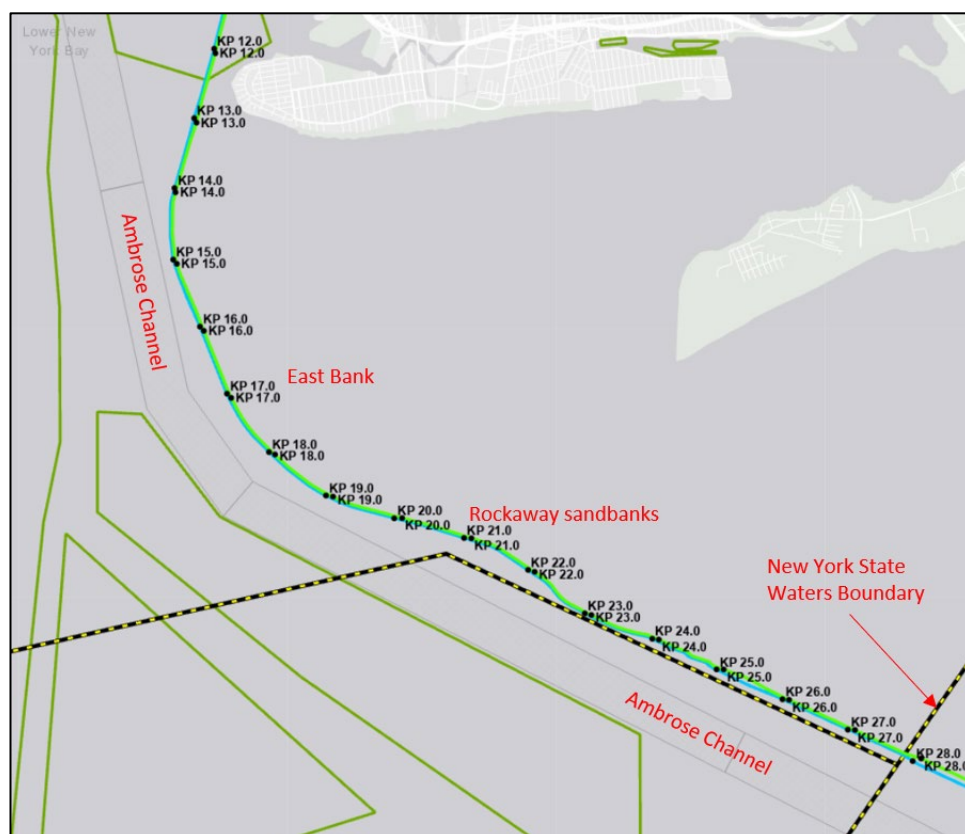


Figure 6-5: Route overview, midshore section (KP 13 – KP 28)

Burial Requirements:

The maximum depth of burial required is 6 feet (1.8m). The target depth of burial is plotted continuously for the submarine export cable routes in the Export Cable Plan and Profile Drawings, ref. [3]. The target depth of burial requirements are outlined below for the midshore section.

- Outside of federal navigation projects: Based upon guidance from the USACE and the outcome of the Cable Burial Risk Assessment found in Appendix 1, the target depth of burial is 6 feet (1.8m) outside of federally maintained areas, see Figure 6-4 for illustration. For the nearshore section route, this requirement is relevant for the cable route along the Ambrose channel through the narrows, and at the end of Gravesend Bay (outside of USCG Anchorage #25).
- Relic dredged area between Ambrose channel and East Bank: From approximately KP 15.5 – KP 20 the cable route charts an area of deeper water between the Ambrose channel and East Bank where there is evidence of small scale mobile bedforms, referred to as megaripples. To achieve cable burial beneath the zone of influence of these features, pre-sweeping is required, as described in section 3.3. Pre-sweeping will be minimized as described in section 3.3. The average seabed level in the relic dredged area is shown to increase over time and therefore the presence of the megaripples will not affect the burial depth achieved below the zone of influence of these features over the lifetime of the project.

Water Depth:

- Based on recent bathymetry data, the water depth varies along the route from 20 to 75 feet (6 m to 23 m) below NAVD88. The water depth is plotted continuously for the submarine export cable routes in the Export Cable Plan and Profile Drawings, ref. [3].
 - New York Lower Bay Entrance (KP 13 – KP 15.5):
 - 23 feet to 36 feet (7 m to 11 m) below NAVD88
 - Relic dredged area between Ambrose & East Bank (KP 15.5 – KP 20):
 - 33 feet to 75 feet (10 m to 23 m) below NAVD88
 - Rockaway Sandbanks to NYS waters boundary (KP 19.7 to KP 28)
 - 20 feet to 40 ft (6 m to 12 m) below NAVD88

Seabed Conditions:

The midshore section soil is generally characterized as predominantly medium dense to very dense sand.

According to Geotechnical Design Basis for the Export Cable Route, ref. [6], the main stratigraphic units encountered consist in general and in descending order of Holocene marine sand deposits, Holocene estuarine deposits, Holocene transgressive deposits, Pleistocene alluvial deposits, and Pre-Quaternary Coastal Plain deposits. A description and distribution of the soil zones relevant to the target burial depths along the midshore ECR according to design basis (ref. [6]) are provided below in Table 6-2.

Table 6-2 Description of zones along the EW1 midshore ECR, ref. [6]

KP From	KP To	Length	Zone	Soil units present					Description of Zonation
				U1 Silty Clayey SAND	U2 SAND	U3 CLAY	U4 SILT	U5 PEAT	
13	28	15	A1	x	x	x			Primarily medium dense to very dense sand

6.2 Burial Tool Selection & Performance

6.2.1 Within Navigation Channels or Anchorages

The burial tool selection for the nearshore section with navigation channels or anchorages is largely dictated by the deep burial requirements within the Navigation Channels and Anchorages where overburden may generate a minimum target burial depth of up to 20 feet (6m) or more in certain sections depending on re-siltation rates prior to project execution. In addition, the extremely soft seabed sediments encountered offer limited support for burial tools that bear on the seabed. Vertical Injector is well suited to handle these seabed conditions as the tool elevation is supported and controlled from a floating barge. Vertical Injector performs well in very soft to stiff clay and sand, which is predominantly what shallow geology is encountered within the Navigation Channels and Anchorages. The base case burial solution within the Nearshore Navigation Channels or Anchorages is Vertical Injector, which is displayed in Figure 6-6.

While the seabed conditions based on the survey data are considered favorable for achieving the required cable burial with vertical injector, the risk of reduced burial depth generated by un-foreseen soil conditions or obstructions is mitigated by performing pre-lay jetting runs (PLJR) prior to cable installation.



Figure 6-6 Illustration of vertical injector deployed from cable lay barge (www.miahtrenchers.com)

6.2.2 Outside Channels and Anchorages

Jet trenching is the base case burial solution within the nearshore & midshore section outside of navigation channels or anchorages, where the target burial depth is 6 feet (1.8 m). Jet trenchers are suitable for use in granular sediments and low to medium strength clays, which is predominantly what shallow geology is encountered in the nearshore & midshore section outside of navigation channels or anchorages. It is planned that the Capjet jet trenching system will be utilized, which is displayed in Figure 6-7. While the seabed conditions based on the survey data are considered favorable for achieving the required cable burial with jet trenching, the risk of reduced burial depth generated by unforeseen soil conditions or obstructions is mitigated by the ability to perform additional passes with the jet trencher.

From approximately KP 15.5 to KP 20 there is evidence of small scale mobile bedforms, referred to as megaripples, which have cross-route slopes that will likely exceed the slope limits of jet trenching equipment. The height of the peaks of the megaripples may also prevent sufficient cable burial below the zone of influence of these features, risking cable exposure during the lifetime of the project. Therefore, levelling of megaripples will be required by pre-sweeping prior to performing cable burial, as described in section 3.3. Pre-installation surveys may reveal additional areas that require pre-sweeping. However, pre-sweeping will be minimized to the extent practicable as described in section 3.3.

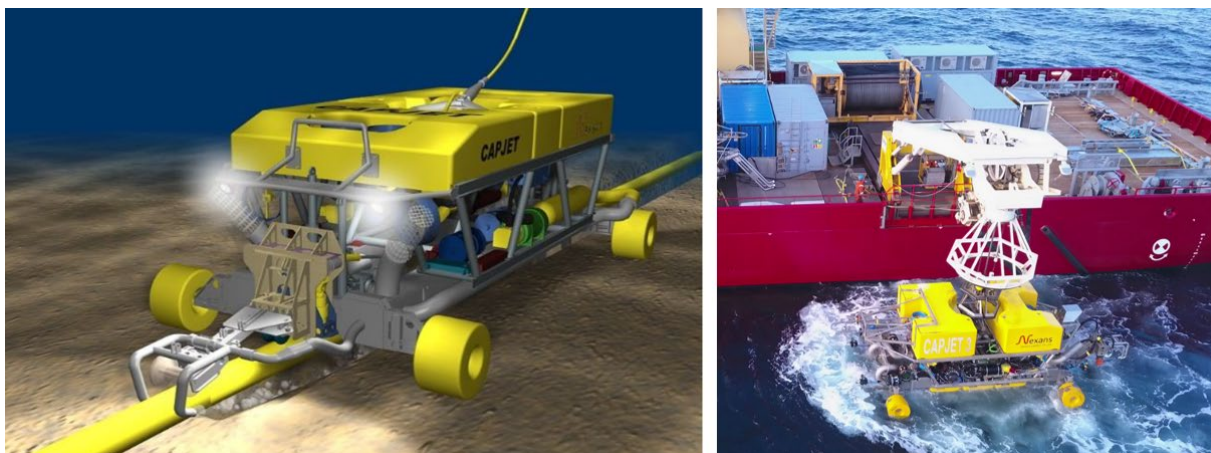


Figure 6-7: Capjet remotely operated jet trencher

6.2.2.1 Landfall Approach Between Piers

The section of the ECR between 35th Street pier at SBMT and the materials recovery facility on the 29th Street Pier (from approximately KP 0.14 to KP 0.63) presents a locally higher risk of relic subsurface debris in this once industrial dock in addition to the highest concentration of contaminated sediments found along the ECR.

In this section, cable burial is planned to be achieved with a pre-dredged trench to a depth of -34.5ft MLLW, which is 8 feet below the planned maintenance dredge depth of the area during the operational phase (-26.5ft MLLW), and a granular back-fill material installed above the cable after it is installed in the trench. While the shallow geology encountered in this section is likely suitable for jet trenching, pre-dredging with backfill is considered a more suitable burial method for mitigating and handling the debris and contamination risks presented in this localized area than jet trenching.

6.3 Alternative Cable Protection Measures

The primary protection means for the EW1 SEC is burial to the target burial depths as described in section 6.2. Although the seabed conditions for the EW1 SEC are considered favorable for jet trenching, if the actual burial depth achieved does not provide adequate protection (due to seabed conditions or geologic or topographic features) then alternative protection measures may be used to achieve required protection. Some Third-Party Infrastructure crossings will prevent cable burial and, at these locations, alternative protection measure are planned to be utilized for cable protection. See ref. [2] for further details of the proposed alternative protection measures the crossing locations. The three widely used industry-standard alternative cable protection measures that have been identified for viable use on the EW1 submarine export cables are tapered edge concrete mattresses, subsea rock installation (SRI), and rock bags as described in the sections below. Empire Wind will use best efforts to avoid the use of cable protection if the actual burial depth achieved provides adequate protection.

6.3.1 Tapered Edge Concrete Mattresses

Tapered edge concrete mattresses consist of a lattice of molded concrete blocks connected by U.V. stabilized polypropylene ropes, where the blocks can articulate and allow the mattress to conform to the cable and seabed. Typical dimensions of concrete mattresses are nominally 10 ft x 20 ft x 1 ft (6 m x 3m x 0.3m). Figure 6-8 illustrates a typical tapered edge concrete mattress. Multiple mattresses are typically installed along a cable by a vessel crane to provide the required length of continuous cable protection.

On an erosional seabed, such as the seabed encountered along the entire EW1 SEC cable route, the tapered edge of the concrete mattresses are likely to embed into the seabed. This generates good on-bottom stability over time against wave and current forces, a limited discernable berm, and a smooth transition from the seabed to the mattress providing good overtrawlability. The relatively short length of the individual mattresses generates an upper bound to the continuous length of mattress protection that is reasonably practicable to install. This makes mattresses most viable for use in localized areas

such as third-party infrastructure crossings or where local seabed conditions prevent required cable burial.

Because of good stability, a low seabed profile, good overtrawlability, and suitability for localized areas, tapered edge concrete mattresses are the preferred alternative protection measure for the EW1 SECs at third-party infrastructure crossings where required burial is not achieved and for local areas where required burial is not achieved.



Figure 6-8 Typical tapered edge concrete mattress (www.subseaprotectionsystems.co.uk)

6.3.2 Rock Berm

Subsea rock installation (SRI) can be performed to create protective berms of graded crushed rock on top of the cable. Protective rock berms are typically 3 ft (1m) high with a top width of approximately 3 ft (1m) and a 1:3 side slope gradient. The final dimensions of the rock berm and grading of the rock are determined based on site-specific seabed and weather conditions to ensure seabed stability. Rock berms are typically installed by a fall pipe vessel using onshore sourced rock, but if local conditions include shallow waters or proximity to an offshore structure, then SRI is more likely to be from a pipe over the side of the vessel or a side stone dumping vessel. Figure 6-9 shows an illustration of rock installation from a fall pipe vessel. Rock berm installation is viable for more extended lengths of cable protection compared to mattress installation due to the nature of the installation method. Tapered edge concrete mattresses can be installed over extended lengths, however there is a threshold where it is no longer economically viable to use tapered edge concrete mattresses compared to rock berm installation. The main differentiating factors are the capacities of the typical available vessels that are used for each method, and progress rate of installation difference between the methods.

In the scenario where the cable has been lowered into the seabed sufficiently but the depth of cover is not sufficient (insufficient natural backfill), then the installation of crushed rock may or may not protrude above the seabed depending on if the height of rock needed for sufficient protection is greater than the trench depth or not.

The gentle side-slopes of rock berms provide good overtrawlability that can offer less potential for snagging than concrete mattresses depending on mattress embedment into the seabed. Rock berms are engineered to site specific conditions to be stable over time against wave and current loads. Rock berms have a larger footprint and discernible berm height than concrete mattresses. Therefore, rock berms are the preferred alternative protection measure for the EW1 SECs for long cable lengths of insufficiently buried cable where mattress installation would not be reasonably practicable.



Figure 6-9 Typical subsea rock berm installation with a fall pipe vessel (www.vanoord.com)

6.3.3 Rock Bags

Rock bags are pre-filled bags containing loose crushed rock that are placed on top of the cable. Rock bags are typically available in 2 tonne, 4 tonne, and 8 tonne sizes, where the 8 tonne size will have a diameter of approximately 10 feet (3 m) and a height of approximately 2 feet (0.7 m). Figure 6-10 illustrates typical rock bag installation. Multiple rock bags are typically installed along a cable by a vessel crane to provide the required length of continuous cable protection.

Rock bags present a snagging risk to fishing gear. Rock berms can be engineered to site specific conditions to be stable over time against wave and current loads. Rock bags can be installed with a similar footprint as that of mattresses, but will generate a higher discernible berm height. Rock bags also offer the benefit of being able to perform limited rock installation with increased precision and a more controlled load impact. A wider range of vessels can install the rock bags than rock berms and the bags prevent dispersion of the individual rocks thus providing increased stability of the protection. The relatively short length of the individual rock bags generates an upper bound to the continuous length of rock bag protection that is reasonably practicable to install. This makes rock bags most viable for use in localized areas. Rock bags may be considered for use in localized areas with low trawling risk where mattresses are not a viable option. Mattresses may not be a viable option where seabed unevenness requires the secondary protection method to conform to the seabed to a degree that is beyond the capability of a concrete mattress. As an example, if secondary protection is needed where there is an unexpected cable free-span (cable suspension between two peaks), the conforming nature of rock nets allows them to both support and protect a cable free-span. In general, concrete mattresses are planned to be used over rock bags, and rock bags are planned to be avoided to the maximum extent possible.

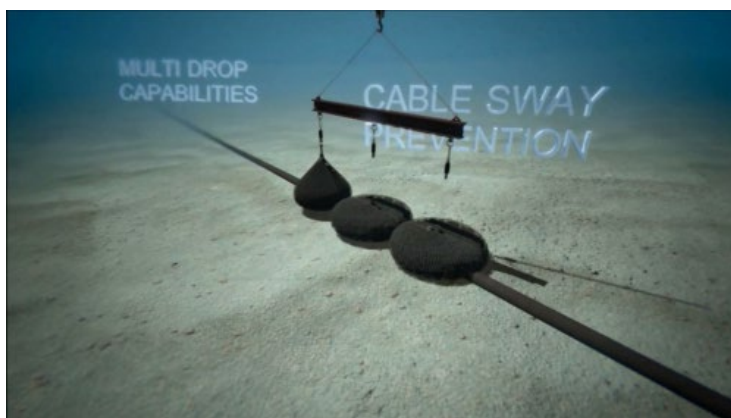


Figure 6-10 Typical rock bag installation

7 References

7.1 Project References

Ref.	Document title	Doc. no.	Company doc. no.
1	Pre-Installation Trial Plan – EM&CP	00795707	C218-NX-A-MA-00011
2	Submarine Asset Crossing Details – EM&CP	00795703	C218-NX-A-MA-00017
3	Export Cable Plan and Profile Drawings – EM&CP	00795702	C218-NX-A-XE-00001-01
4	Anchoring Plan – EM&CP	00795710	C218-NX-A-MA-00014
5	Suspended Sediment and Water Quality Monitoring Plan	00795711	C218-NX-A-MA-00015
6	Empire Wind Phase 1: Geotechnical Design Basis for Export Cable Route	N/A	C218-EQ-G-IB-00005-03
7	Empire Wind 1 Sediment Transport Study	N/A	11207423-002-HYE-0004

8 List of Appendices

Appendix	Title	Number of pages
1	Cable Burial Risk Assessment	1 + 6
2	Equipment Specification Sheets	1 + 4

Appendix 1 Cable Burial Risk Assessment

Appendix 2 Equipment Specification Sheets

Empire Wind 1
Case 21-T-0366
Appendix I
Pre-Installation Trial Plan

REV1

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1 Introduction

1.1 General Project Description

Empire Offshore Wind LLC (“Empire”) proposes to construct and operate the Empire Wind 1 (EW 1) Project as one of two separate offshore wind projects, both to be located within the Bureau of Ocean Energy Management (BOEM) designated Renewable Energy Lease Area OCS-A 0512 (Lease Area). The proposed transmission system for the EW 1 Project will connect the offshore wind farm to the point of interconnection (POI) and will include 230-kilovolt (kV) export and 345-kV interconnection lines traversing a total of approximately 17.5 miles (mi) (15.2 nautical miles [nm] or 28.2 kilometers [km]) within the State of New York.

The Project will interconnect to the New York State Transmission System operated by the New York Independent System Operator, Inc. (NYISO) at the Gowanus 345-kV Substation (the point of interconnection, or POI). The Gowanus 345-kV Substation is owned by the Consolidated Edison Company of New York, Inc. (Con Edison). The Project’s onshore facilities, including the onshore cable route, onshore substation, and the POI, are located entirely within Brooklyn, Kings County, New York.

The components of the EW 1 Project within the State of New York include:

- Two three-core 230 kV high-voltage alternating-current (HVAC) submarine export cables located within an approximately 15.1 nm (27.9 km) long submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall in Brooklyn, New York.
- A 0.2 mi (0.3 km) long onshore cable route and substation including:
 - Two three-core 230 kV HVAC EW 1 onshore export cables buried underground from the cable landfall transition joint bays to the onshore substation.
 - An onshore substation located at the South Brooklyn Marine Terminal (SBMT), which will increase the voltage to 345 kV for the onshore interconnection cables.
 - Two 345 kV cable circuits, each with three single-core HVAC onshore interconnection cables, buried underground from the onshore substation to the POI.

Nexans Norway AS has been awarded the delivery and installation of two (2) 230kV submarine export cable circuits that are approximately 41 nautical miles (76km) in length each from the offshore substation (OSS) at the lease areas to the onshore substation (ONS) at South Brooklyn Marine Terminal (SBMT), New York. The selected route for the Empire Wind 1 submarine export cables to SBMT is shown in Figure 1-1 below.

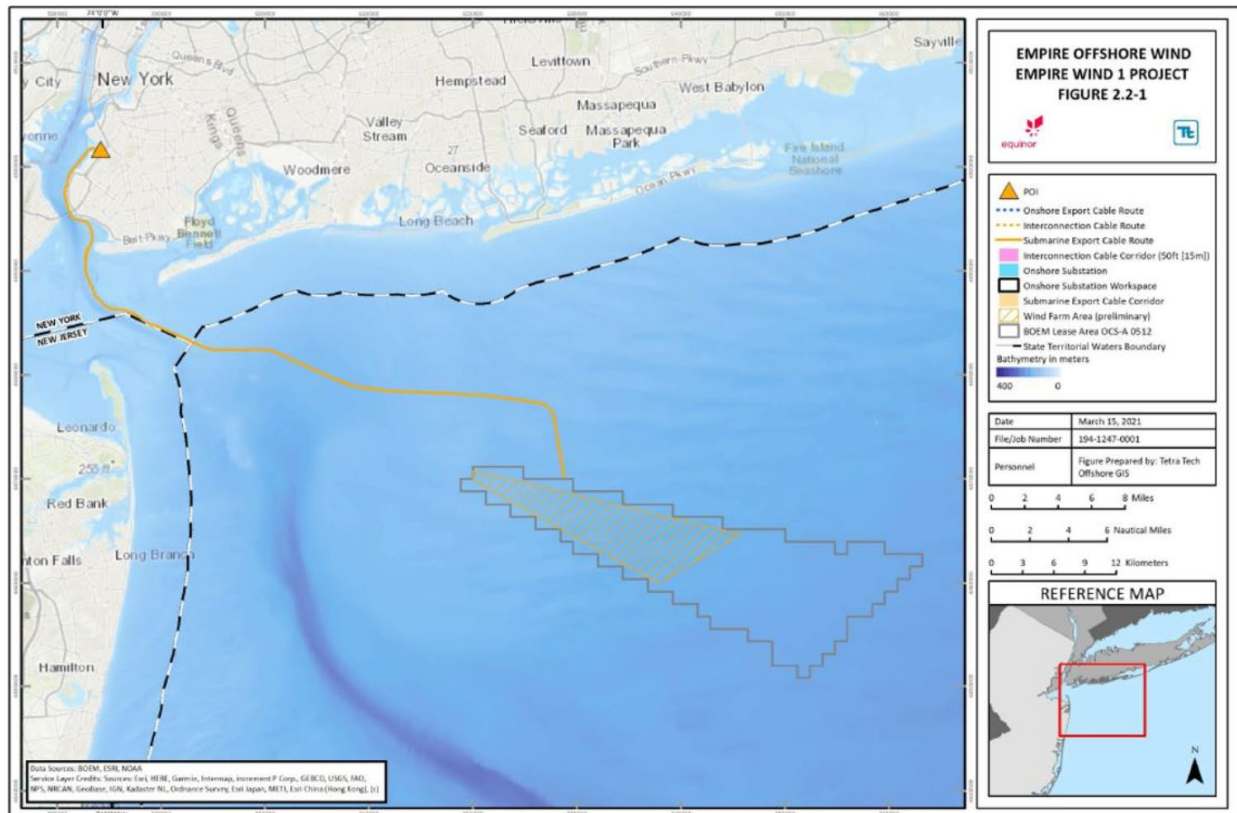


Figure 1-1: Empire Wind 1 project with selected Submarine Export Cable route to SBMT

1.2 Purpose of the document

The purpose of this document is to outline the scope of pre-installation trials for jetting tools and mass flow excavation tools that will be used during the installation and burial of the Empire Wind 1 (EW1) Submarine Export Cable (SEC) within NYS waters (within 3 nautical miles offshore). The goal of the pre-installation trial is to establish operating conditions that will minimize the suspension of in-situ sediments and contaminants during jetting and mass flow excavation activities, consistent with the objectives of the Certificate Conditions. This Pre-Installation Trial Plan should be read in conjunction with Appendix R – Suspended Sediments and Water Quality Monitoring Plan included in the Environmental Management & Construction Plan (EM&CP).

This Pre-Installation Trial Plan has been developed to fulfil the requirements of Certificate Condition J14 which states that:

“A pre-installation trial will be conducted for any proposed jetting tools (jet sled, jet trencher, vertical injector) and mass flow excavation tools. If alternative jetting tools are proposed in the EM&CP, pre-installation trials for those tools will be included in the Pre-Installation Trial Plan. Pre-installation trials in accordance with the Pre-Installation Trial Plan must be conducted within representative sections or areas proximate to the proposed underwater cable route in NYS waters or during pre-installation activities prior to cable installation to evaluate compliance with Total Suspended Solids (“TSS”) threshold limit, turbidity, and water quality standards as defined in Condition U6 and U8. The goal of the pre-installation trial is to establish operating conditions that will minimize the suspension of in-situ sediments and contaminants during the jetting and mass flow excavation activities, consistent with the objectives of Conditions U6 and U8. The trial will include approximately one thousand (1,000) ft of operations within an area to be specified in the Pre-Installation Trial Plan that will be submitted as part of the EM&CP for the applicable Segment. The following conditions apply to pre-installation trials:

- a) *Appropriate instruments will be specified in the EM&CP and used to measure water column TSS and turbidity on selected transects in the field. Companion water samples will be collected and analyzed by a NYSDOH Environmental Laboratory Approval Program ("ELAP") certified laboratory for TSS;*
- b) *Samples of TSS and constituents listed in Condition U8 will be collected up-current (for baseline) and at the edge of the mixing zone down-current of the pre-installation trial, at three-interval depths (near surface, mid-depth, and near bottom); the mixing zone shall be as defined in Condition U2 and the Suspended Sediment and Water Quality Monitoring Plan;*
- c) *The Certificate Holder must work cooperatively with the Aquatic Environmental Monitor, DPS Staff and NYSDEC, to review the results of the TSS field measurements during the pre-installation trials to evaluate whether the operating conditions result in TSS concentrations that exceed the TSS threshold limit;*
- d) *If the pre-installation trials demonstrate that the operating conditions result in TSS concentrations that exceed the TSS limit (100 mg/L above background concentration) established in this Certificate, the Certificate Holder must work with the Aquatic Environmental Monitor, DPS Staff and NYSDEC to evaluate and implement practicable operational modifications to the jetting or mass flow excavation tools to further reduce in-situ sediment re-suspension associated with the equipment operations. Operational controls implemented to minimize exceedances of the TSS limit will not result in the material delay of the progress of work to complete in-water installation during one construction season; and*
- e) *Jetting and mass flow excavation operations may proceed after the pre-installation trial field results of the applicable equipment are submitted by the Certificate Holder to DPS Staff and NYSDEC and reviewed in real-time. Review of this information by DPS Staff and NYSDEC shall not unreasonably delay the commencement of installation of the underwater cable system. Laboratory results from the pre-installation trial shall be submitted electronically to DPS Staff and NYSDEC as soon as possible, but no later than the 48 hours following receipt from the laboratory."*

2 Terms and Abbreviations

Term	Definition
Certificate	Certificate of Environmental Compatibility and Public Need
Company	Empire Offshore Wind LLC
Contractor	Nexans Norway AS
Project	Empire Wind 1 Submarine Export Cables EPCI
Abbreviation	Elaboration
BOEM	Bureau of Ocean Energy Management
EM&CP	Environmental Management & Construction Plan
EW1	Empire Wind 1
HVAC	High Voltage Alternating Current
IAC	Inter Array Cables
KP	Kilometer Point
NYISO	New York Independent System Operator, Inc.
NYS	New York State
O&M	Operations and Maintenance
ONS	Onshore Substation
OSS	Offshore Substation
PLJR	Pre-Lay Jetting Run
POI	Point of Interconnection
SEC	Submarine Export Cable
SBMT	South Brooklyn Marine Terminal
TSS	Total Suspended Solids
WTG	Wind Turbine Generator

3 Pre-Installation Trials

3.1 Trial Locations

The pre-installation trials will be conducted along representative sections or areas proximate to the proposed EW1 SEC cable route within sediment types identified to have the potential to result in the highest Total Suspended Solids (TSS) concentrations while considering other factors such as minimizing the impact to other waterway users.

3.1.1 Vertical Injector Trial Location

The trial will include approximately 1,000 feet (305 meters) of jetting operations. The trial will be carried out along the planned cable route within an area between KP1.5 and KP3.5, as illustrated in Figure 3-1. The trial will take place prior to or during the pre-lay jetting run (PLJR) pre-cable installation cable activity and on or after June 1. The selection of the approximately 1,000 feet (305 meters) trial location within the area between KP1 and KP3.5 will occur immediately prior to the operation through coordination with other users of the waterway and confirmation of suitability (for example, free from obstacles) based on a pre-construction survey.

Based on the geotechnical site investigation of the soil and sediment composition derived from the sediment samples undertaken by Company (ref. [1]), the seabed in this area has fine silt and clay content that is representative of the highest fine silt and clay contents found along the cable route where Vertical Injector will be used. Higher fractions of fine silt and clay are likely to result in higher TSS concentrations during jetting operations.



Figure 3-1: Pre-Installation Trial Area for Vertical Injector

3.1.2 Jet Trencher Trial Location for Trenching Within KP0.6 – KP28

The trial will include approximately 1,000 feet (305 meters) of jetting operations. The trial will be carried out prior to or during post-lay cable burial operations and on or after July 1. During post-lay cable burial jetting operations, it is possible to perform operational modifications or suspend cable burial operations if required. The trial will be carried out along the planned cable route within an area between KP4.8 and KP5.5, as illustrated in Figure 3-2. The selection of the approximately 1,000 feet (305 meters) trial location within the area between KP4.8 and KP5.5 will occur immediately prior to the operation through coordination with other users of the waterway and confirmation of suitability (for example, free from obstacles) based on a pre-construction survey.

Based on the geotechnical site investigation of the soil and sediment composition derived from the sediment samples undertaken by Company (ref. [1]), the seabed in this area has fine silt and clay content that is representative of the highest fine silt and clay contents found along the cable route where Jet Trencher will be used between KP0.6 and KP28. Higher fractions of fine silt and clay are likely to result in higher TSS concentrations during jetting operations.

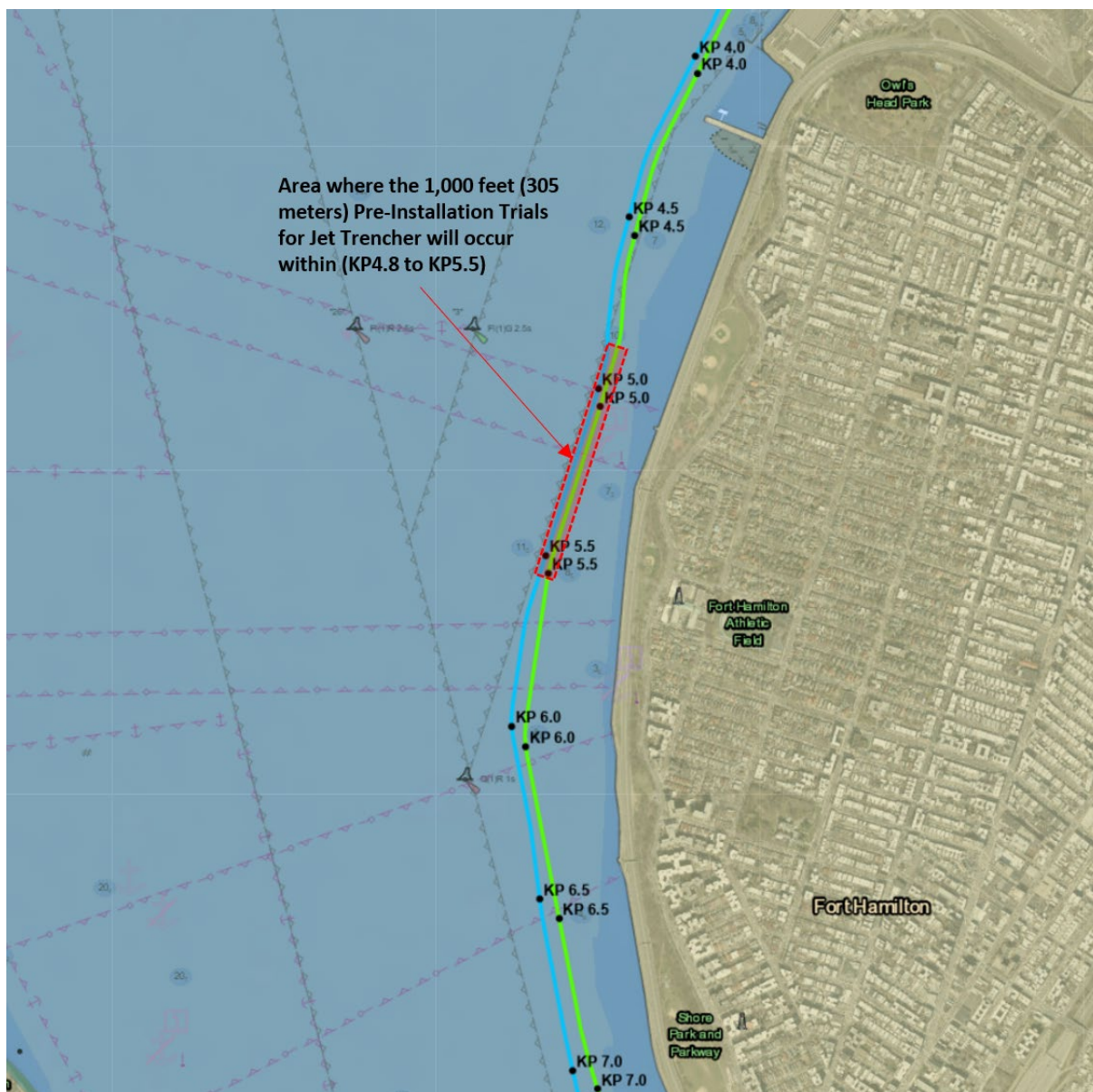


Figure 3-2: Pre-Installation Trial Area for Jet Trencher

3.1.3 Jet Trencher Trial Location for Trenching Within KP13 – KP28

In the event that the trenching work within KP13 – KP28 becomes available before the work within KP 0.6 to KP13, Jet Trencher trials may be conducted within KP13-KP28 that are applicable for trenching activities within KP13-KP28. This will allow trenching works be completed as early in the seasonal window as possible and reduce the risk of not completing the work within the season.

The trial will include approximately 1,000 feet (305 meters) of jetting operations. The trial will be carried out prior-to or during post-lay cable burial operations and on or after July 1. During post-lay cable burial jetting operations, it is possible to perform operational modifications or suspend cable burial operations if required. The trial will be carried out along the planned cable route within an area between KP13 and KP28. The selection of the approximately 1,000 feet (305 meters) trial location within the area between KP13 and KP28 will occur immediately prior to the operation through coordination with other users of the waterway and confirmation of suitability (for example, free from obstacles) based on a pre-construction survey.

Based on the geotechnical site investigation of the soil and sediment composition derived from the sediment samples undertaken by Company (ref. [1]), the seabed in this area between KP13 and KP28 has a uniform and low amount of fine silt and clay content, making trials performed anywhere in this section representative of trenching throughout the section (KP13-KP28). Higher fractions of fine silt and clay are likely to result in higher TSS concentrations during jetting operations.

3.1.4 Mass Flow Excavation Trial Location – Pre-Sweeping Operations

The trial will include approximately 1,000 feet (305 meters) of mass flow excavation operations. The trial will be carried out during pre-sweeping (seabed levelling) operations on or after July 1. During pre-sweeping (seabed levelling) operations, it is possible to perform operational modifications or suspend operations if required. The trial will be carried out along the planned cable route within an area between KP17 and KP19, as illustrated in Figure 3-3. The selection of the approximately 1,000 feet (305 meters) trial location within the area between KP17 and KP19 will occur immediately prior to the operation through coordination with other users of the waterway and confirmation of suitability (for example, free from obstacles) based on a pre-construction survey.

Based on the geotechnical site investigation of the soil and sediment composition derived from the sediment samples undertaken by Company (ref. [1]), the seabed in this area has fine silt and clay content that is representative of the highest fine silt and clay contents found along the cable route where Mass Flow Excavation will be used. Higher fractions of fine silt and clay are likely to result in higher TSS concentrations during Mass Flow Excavation operations.

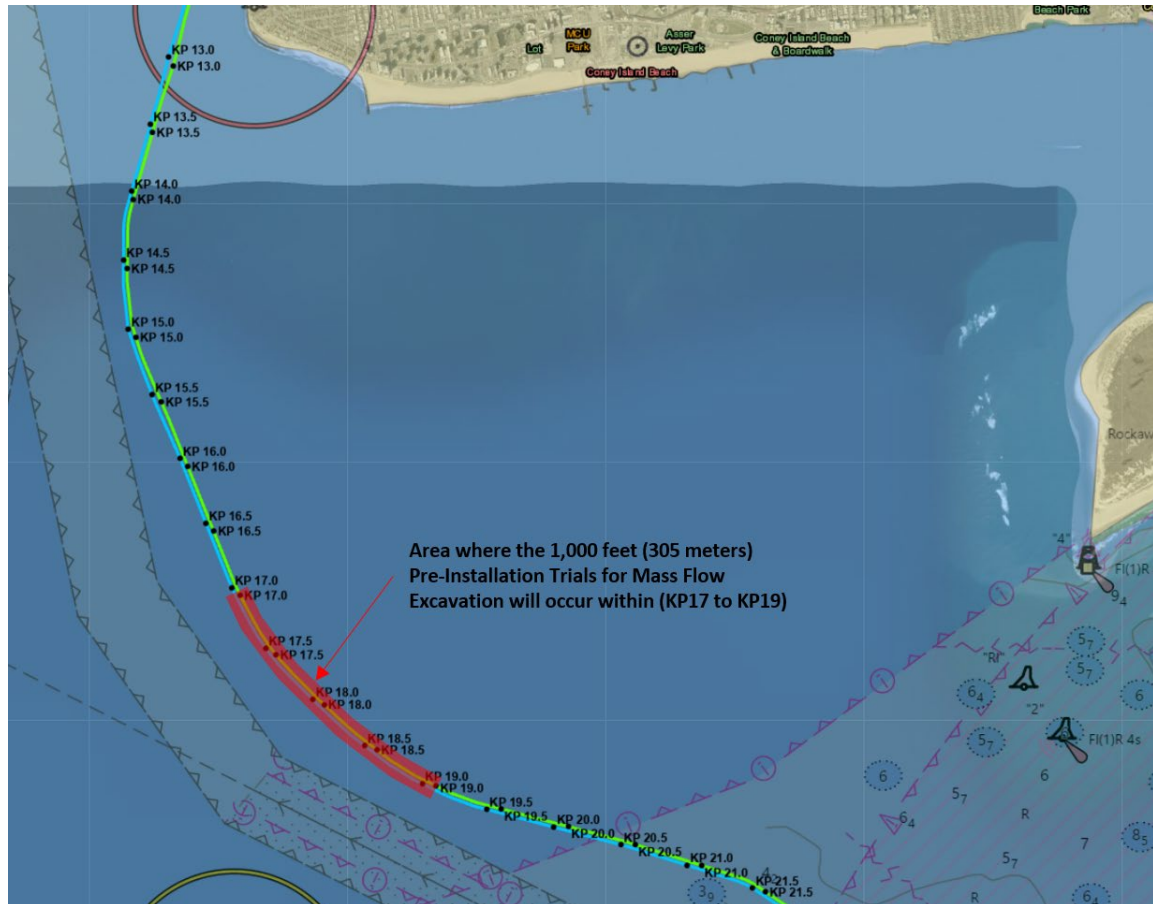


Figure 3-3: Pre-Installation Trial Area for Mass Flow Excavation

3.1.5 Mass Flow Excavation Trial Location – Pre-trenching & Post-burial Operations

Where post-lay burial with a Jet Trencher is not successful or viable in achieving the required cable burial depth, Mass Flow Excavation may be used to perform post-lay cable burial. In addition, pre-trenching may also be performed using Mass Flow Excavation (MFE) where deeper burial depths may limit the ability to achieve target burial depth. Pre-installation trials will be performed prior to this operation to establish acceptable operating conditions.

The trial will include approximately 1,000 feet (305 meters) of mass flow excavation operations. The trial will be carried out immediately before or during post-lay burial operations and on or after July 1. During post-lay burial operations, it is possible to perform operational modifications or suspend operations if required. The trial will be carried out along the planned cable route within an area between KP0.6 and KP28. The selection of the approximately 1,000 feet (305 meters) trial location between KP0.6 and KP28 will occur immediately prior to the operation through coordination with other users of the waterway and confirmation of suitability (for example, free from obstacles) based on a pre-construction survey.

Based on the geotechnical site investigation of the soil and sediment composition derived from the sediment samples undertaken by Company (ref. [1]), the seabed in the area between KP13 and KP28 has a uniform and low amount of fine silt and clay content. In addition, environmental conditions throughout this area are considered uniform. This makes trials performed anywhere in this section representative of Mass Flow Excavation throughout the section (KP13-KP28). For KP0.6 to KP13, the trials would occur in the location as specified for the jet trenching trials (see section 3.1.2)

3.2 Schedule of Pre-Installation Trials

- **Vertical Injector:** Vertical Injector trials will be conducted as the initial part of the pre-lay jetting run (PLJR) pre-cable installation cable activity. The trials will be short in duration.
- **Jet Trencher:** Jet Trencher trials will be conducted as the initial part of post-lay cable burial operations. The trials will be short in duration.
- **Mass Flow Excavation:** Mass Flow Excavation trials will be conducted as the initial part of the pre-sweeping (seabed levelling) or post-lay burial operations. The trials will be short in duration.

3.3 Equipment

The vertical injector trials will be carried out from a cable lay barge. The jet trencher and mass flow excavation trials will be carried out from either a cable lay barge or separate trenching support vessel.

During the trials, TSS monitoring and water sampling will be performed from a separate vessel at locations up-current (for baseline) and down-current of the pre-installation trial as defined in Appendix R – Suspended Sediments and Water Quality Monitoring Plan included in the EM&CP. Monitoring activities will feature the use of equipment to take TSS field measurements and water sampling with subsequent laboratory analysis. Further description of the equipment associated with TSS monitoring for the trials is described in Appendix R – Suspended Sediments and Water Quality Monitoring Plan included in the EM&CP.

3.4 Objectives of Pre-Installation Trials

Pre-installation trials will be conducted to establish operating conditions for any jetting and mass flow excavation tools to be used during installation activities, in accordance with Condition J14 and Y12. The objectives of the pre-installation trials are to:

- Evaluate compliance of the cable burial and mass flow excavation equipment with TSS threshold limits and water quality standards defined within the Certificate Conditions;
- Provide an opportunity to refine monitoring procedures including data collection, communication, and safety protocols between the monitoring and the cable lay barge or trenching support vessel; and
- If required, evaluate and implement practicable operational modifications to the jetting or mass flow excavation tools to further reduce in-situ sediment re-suspension associated with the equipment operation, consistent with the objectives of the Certificate Conditions.

3.5 Scope of Pre-Installation Trials for Jetting

If the pre-installation trials are performed in the month of June, the trials will be conducted in compliance with Appendix X – Atlantic and Shortnose Sturgeon Avoidance, Monitoring, and Impact Minimization Plan and Net Conservation Benefit Plan.

The scope of the pre-installation trials for jetting will consist of:

1. Positioning of the barge/vessel and jetting tool.
2. General testing of all systems of the jetting tool.
3. Grade-in of the jetting tool (gradual forward movement and lowering of the trenching tool until the target burial depth is achieved.
4. Jetting at target burial depth at the trial location (with preferred operating conditions and opportunity to evaluate and implement practicable operational modifications).

5. Collection of TSS field measurements and water samples as specified in Appendix R – Suspended Sediments and Water Quality Monitoring Plan included in the EM&CP, in accordance with Condition J14 (a) and J14 (b).
6. Real-time submittal and review of the TSS field results with the Aquatic Environmental Monitor, DPS Staff and NYSDEC to evaluate if TSS concentrations are within threshold limits as specified in Appendix R – Suspended Sediments and Water Quality Monitoring Plan included in the EM&CP, in accordance with Condition J14 (c).
7. If required, together with Aquatic Environmental Monitor, DPS Staff and NYSDEC, real-time feasibility evaluation and implementation of practicable modifications to the operating conditions to minimize exceedances of TSS limits associated with the equipment operations, in accordance with Condition J14 (d).
8. After the above steps are complete (the pre-installation trial), jetting operations may proceed, in accordance with Condition J14 (e).

Potential modifications to the operating conditions to further reduce in-situ sediment re-suspension associated with the jetting equipment operations may include, but are not limited to the list below. In accordance with Condition J15 (b), hydraulic jetting pressures shall not be required to be reduced to levels which would not allow burial to the Target Burial Depth specified in the EM&CP or other permits. In addition, in accordance with Condition J14 (d), operational controls implemented to minimize exceedances of the TSS limit will not result in the material delay of the progress of work to complete in-water installation during one construction season.

- Adjusting the rate of advancement of the jetting equipment (increasing or reducing the trenching speed).
- Adjusting the hydraulic pressure and flow configuration in the jetting blade / swords
- Adjusting the nozzle configuration (e.g., blanking nozzles, if possible)
- Other reasonable operational controls or modifications as agreed with DPS Staff and NYSDEC.

During the trial, Condition U7 will be adhered to which states:

Visual observations of turbidity caused by Monitored Construction Activities must be conducted to ensure compliance with the narrative water quality standard in 6 NYCRR § 703.2, which states, "No increase that will cause a substantial visible contrast to natural conditions."

3.6 Scope of Pre-Installation Trials for Mass Flow Excavation

The scope of the pre-installation trials for mass flow excavation will consist of:

1. Positioning of the barge/vessel and mass flow excavation tool.
2. General testing of all systems of the mass flow excavation tool.
3. Pre-sweeping (seabed levelling) / post-lay burial operations at the trial location (with preferred operating conditions and opportunity to evaluate and implement practicable operational modifications).
4. Collection of TSS field measurements and water samples as specified in Appendix R – Suspended Sediments and Water Quality Monitoring Plan included in the EM&CP, in accordance with Condition J14 (a) and J14 (b).

5. Real-time submittal and review of the TSS field results with the Aquatic Environmental Monitor, DPS Staff and NYSDEC to evaluate if TSS concentrations are within threshold limits as specified in Appendix R – Suspended Sediments and Water Quality Monitoring Plan included in the EM&CP, in accordance with Condition J14 (c).
6. If required, together with Aquatic Environmental Monitor, DPS Staff and NYSDEC, real-time feasibility evaluation and implementation of practicable modifications to the operating conditions to minimize exceedances of TSS limits associated with the equipment operations, in accordance with Condition J14 (d).
7. After the above steps are complete (the pre-installation trial), mass flow excavation operations may proceed, in accordance with Condition J14 (e).

Potential modifications to the operating conditions to further reduce in-situ sediment re-suspension associated with the mass flow excavation equipment operations may include, but are not limited to the list below. In accordance with Condition J15 (b), hydraulic jetting pressures shall not be required to be reduced to levels which would not allow burial to the Target Burial Depth specified in the EM&CP or other permits. In addition, in accordance with Condition J14 (d), operational controls implemented to minimize exceedances of the TSS limit will not result in the material delay of the progress of work to complete in-water installation during one construction season.

- Adjusting the rate of advancement of the mass flow excavation equipment (increasing or reducing the trenching speed)
- Adjusting the equipment power
- Adjusting the hydraulic pressure and flow configuration
- Adjusting the equipment height above seabed
- Other reasonable operational controls or modifications as agreed with DPS Staff and NYSDEC

During the trial, Condition U7 will be adhered to which states:

Visual observations of turbidity caused by Monitored Construction Activities must be conducted to ensure compliance with the narrative water quality standard in 6 NYCRR § 703.2, which states, "No increase that will cause a substantial visible contrast to natural conditions."

4 References

4.1 References

Ref.	Document title	Doc. no.
1	Empire Wind 1 Sediment Transport Study	11207423-002-HYE-0004



Empire Wind 1

Pre-Installation Trial Plan - EM&CP

Document no.: 00795707

Company doc. no.: C218-NX-A-MA-00011

Date: 2025-04-11

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5 List of Appendices

N/A

Empire Wind 1
Case 21-T-0366
Appendix O
Anchoring Plan

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REV2

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1 Introduction

1.1 General Project Description

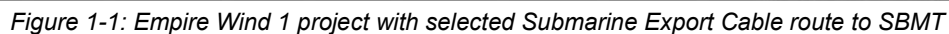
Empire Offshore Wind LLC (“Empire”) proposes to construct and operate the Empire Wind 1 (EW 1) Project as one of two separate offshore wind projects, both to be located within the Bureau of Ocean Energy Management (BOEM) designated Renewable Energy Lease Area OCS-A 0512 (Lease Area). The proposed transmission system for the EW 1 Project will connect the offshore wind farm to the point of interconnection (POI) and will include 230-kilovolt (kV) export and 345-kV interconnection lines traversing a total of approximately 17.5 miles (mi) (15.2 nautical miles [nm] or 28.2 kilometers [km]) within the State of New York.

The Project will interconnect to the New York State Transmission System operated by the New York Independent System Operator, Inc. (NYISO) at the Gowanus 345-kV Substation (the point of interconnection, or POI). The Gowanus 345-kV Substation is owned by the Consolidated Edison Company of New York, Inc. (Con Edison). The Project’s onshore facilities, including the onshore cable route, onshore substation, and the POI, are located entirely within Brooklyn, Kings County, New York.

The components of the EW 1 Project within the State of New York include:

- Two three-core 230 kV high-voltage alternating-current (HVAC) submarine export cables located within an approximately 15.1 nm (27.9 km) long submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall in Brooklyn, New York.
- A 0.2 mi (0.3 km) long onshore cable route and substation including:
 - Two three-core 230 kV HVAC EW 1 onshore export cables buried underground from the cable landfall transition joint bays to the onshore substation.
 - An onshore substation located at the South Brooklyn Marine Terminal (SBMT), which will increase the voltage to 345 kV for the onshore interconnection cables.
 - Two 345 kV cable circuits, each with three single-core HVAC onshore interconnection cables, buried underground from the onshore substation to the POI.

Nexans Norway AS has been awarded the delivery and installation of two (2) 230kV submarine export cable circuits that are approximately 41 nautical miles (76km) in length each from the offshore substation (OSS) at the lease areas to the onshore substation (ONS) at South Brooklyn Marine Terminal (SBMT), New York. The selected route for the Empire Wind 1 submarine export cables to SBMT is shown in Figure 1-1 below.



"The Certificate Holder will develop an Anchoring Plan to be provided in the EM&CP that will discuss how the use of anchoring, if any, during construction and maintenance activities will avoid and/or minimize impacts to sensitive benthic habitats (Condition J12), Recognized Ecological Complexes (Condition Y17), historic and archeological resources, and impacts to existing buried assets (e.g., telecommunications cables, pipelines, water siphons). The Anchoring Plan will outline the parameters for the use of anchors and spuds, the limits of the anchoring corridor, and identify discrete "No Anchor" areas in the event anchoring is ultimately required. The Anchoring Plan will describe the measures that will be employed to minimize sediment disturbance caused by the anchoring during construction of the submarine export cables (e.g., use of floating mooring ropes). The Certificate Holder shall provide the Anchoring Plan at least forty-five (45) days prior to filing the EM&CP to DPS Staff, NYSDOS, and NYSDEC for review and comment."

2 Terms and Abbreviations

Term	Definition
Certificate	Certificate of Environmental Compatibility and Public Need
Company	Empire Offshore Wind LLC
Contractor	Nexans Norway AS
Project	Empire Wind 1 Submarine Export Cables EPCI
Abbreviation	Elaboration
AHV	Anchor Handling Vessel
BOEM	Bureau of Ocean Energy Management
CLB	Cable Lay Barge
CLV	Cable Lay Vessel
CTV	Crew Transfer Vessel
DP	Dynamically Positioned / Dynamic Positioning
EM&CP	Environmental Management and Construction Plan
EW1	Empire Wind 1
HVAC	High Voltage Alternating Current
IAC	Inter Array Cable
LCV	Light Construction Vessel
MARA	Marine Archaeological Resources Assessment
NYISO	New York Independent System Operator, Inc.
ONS	Onshore Substation
OSS	Offshore Substation
POI	Point of Interconnection
REC	Recognized Ecological Complexes
SBMT	South Brooklyn Marine Terminal
SEC	Submarine Export Cable
USCG	United States Coast Guard
WTG	Wind Turbine Generator

3 Anchoring Plan

This section comprises the Anchoring Plan for the EW1 SEC installation and burial, pre-installation works, and/or post-installation works within NYS waters (within 3 nautical miles offshore) in addition to approximately the first nautical mile into federal waters (up to approximately KP29.5).

3.1 Applicability

This anchoring plan is applicable to all vessels involved in the installation of the SECs within NYS waters for Empire Wind 1. This includes, but is not limited to: cable lay vessel (CLV), cable lay barge (CLB), tug boats, anchor handling vessels, crew transfer vessel(s) (CTV), survey vessels, guard vessels, and construction vessels.

3.2 Vessel Navigation Responsibility

The authority and responsibility for the safe navigation of all vessels involved in the SEC installation resides ultimately with the Master of the vessel. The Master shall ensure at all times the safe navigation of the vessel, which may include deployment of mooring anchors in the event of an unplanned loss of propulsion.

All vessels associated with the project shall comply with United States Coast Guard (USGC) rules and regulations, and in accordance with ref. [2], "Navigation Safety Plan for Submarine Export Cable Installation - EM&CP", found in Appendix L.1 – Navigation Safety Plan.

3.3 Description of Vessels and Anchoring Activity and Operations

3.3.1 General

Anchoring activities during the installation campaigns will be conducted in accordance with the criteria established by Anchoring Plan No Anchor Areas map, ref./1/ and this Anchoring Plan. Anchors or spuds shall only be placed within the Corridor for Anchoring and adhere to all of the *NO ANCHOR AREA* restrictions described in the legend of the No Anchor Areas map ref./1/, except as required under 3.2 - Vessel Navigation Responsibility.

The identified *NO ANCHOR AREAS* includes Marine Archaeological Resources Assessment (MARA) Identified Targets, Rocky Till with Boulders, and existing submarine assets. By limiting the deployment of anchors to the area within the anchoring corridor and outside of any *NO ANCHOR AREAS*, impact to sensitive benthic habitats, Recognized Ecological Complexes (REC), historic and archeological resources, and existing buried assets will be minimized.

Additionally, anchor deployment during the construction activities will be limited to the specific vessel types and operation for which anchoring and/or spud deployment is critical.

3.3.2 Cable Lay Barges

3.3.2.1 CLBs Overview

Cable Lay Barges (CLBs) are marine assets (barge / pontoon) that are equipped with cable handling and laying equipment, power generation equipment, and a form of position keeping equipment such as thrusters, mooring winches, anchors, spuds, and/or tug assistance. Cable lay barges may use any or a combination of the above position keeping methods to ensure position keeping and movement during the cable installation activities. The CLB will move slowly along the lay route facilitated by these position keeping methods.

Cable lay barges may utilize a vertical injector, which is a simultaneous lay and burial tool capable of achieving deep burial depths, during cable laying activities along the route. During the use of the vertical injector, an additional pulling anchor is required to achieve the required reaction force.

Certain activities such as anchor re-positioning, cable pull-in and jointing activities will require the CLB to remain in position for a period of time. In shallow water, if available for use, spuds will be favored to hold the CLB in position to minimize the impact to other waterways users along the cable route and to reduce emissions and fuel consumption.

3.3.2.2 CLB Anchoring Details

CLBs will typically be equipped with four (4) to eight (8) mooring anchors. Anchors will typically be bruce or flipper-delta type anchors, and sized appropriately for the required loads.

Anchor lines will feature floating mooring lines where practicable to minimize the seabed disturbance caused by anchor sweeps. Anchor sweeps will be further minimized through use of multipoint anchoring.

3.3.2.3 CLB Anchoring Operations

Anchor shifting will be facilitated by (an) Anchor Handling Vessel(s) (AHV), and will consist of the following primary operations. Barge station keeping during anchor handling will be accomplished by using thrusters, spuds, and/or assisting tug boat.

- Transfer of anchor to AHV
 - AHV to come alongside CLB to receive pennant wire and spool it onto winch drum.
 - CLB pays-out on mooring winch as AHV hauls-in for transfer of anchor.
 - Anchor recovered to AHV deck or secured alongside AHV.
- Anchor Deployment
 - CLB identifies planned anchor position
 - CLB deploys spuds to hold position, or fixes position with thrusters.
 - AHV transits to planned anchor position with coordinated pay out of mooring line by CLB, and confirms anchor position does not conflict with any NO ANCHOR AREAS
 - AHV deploys anchor and informs CLB when at seabed.
 - CLB confirms correct position and AHV deploys pennant wire and buoys. CLB slowly increases tension to verify if anchor holds position. In case of dragging over seabed, CLB to reduce tension and AHV to recover, rerun, redeploy and CLB to retest anchor holding position.
- Anchor recovery
 - AHV relocates to instructed anchor position.
 - Buoy and rope recovered to deck by boat hook or similar
 - Pennant wire is connected to tugger winch. Pennant buoy is disconnected and secured on deck in a safe position
 - AHV to inform CLB pennant wire connected to mooring winch and AHV ready to break out and recover anchor from seabed.
 - CLB pays out on anchor wire and informs AHV when to proceed with operations
 - AHV retrieves anchor

3.3.2.4 CLB Anchor Mitigations

The following mitigations will be employed to reduce the impact on anchoring on the seabed.

- Limitation of Deployment Area:
 - By limiting the deployment of anchors to the area within the anchoring corridor and outside of any *NO ANCHOR AREAS*, impact to sensitive benthic habitats, Recognized Ecological Complexes (REC), historic and archeological resources, and existing buried assets will be minimized.
- Multipoint Anchoring:
 - Multipoint anchoring will be used on the CLB, which in turn reduces the possible swept path of an anchor line compared to a single point mooring. By employing multipoint the impact of anchor sweeps will be reduced.
- Where practicable, anchor lines can be outfitted with buoys and/or buoyant ropes to minimize the seabed disturbance caused by anchor sweeps and during anchor handling operations.

3.3.3 Cable Lay Vessel

The Cable Lay Vessel (CLV) is a dynamically positioned seagoing vessel equipped with specific cable lay equipment. The CLV is equipped with mooring anchors as required for the safe navigation of the vessel.

The CLV is not expected to conduct anchoring activity during the majority of CLV cable laying operations. For cable lay or jointing operations from the CLV in shallow waters, the CLV may be equipped with a multi-point anchoring system for position keeping where thrusters cannot be utilized. In the event that such anchoring activities are required, the CLV would obey the same anchoring restrictions and anchor handling procedures as the CLB, detailed above in 3.3.2 Cable Lay Barge.

A Trenching Support Vessel (TSV) may act as CLV for some operations, such as jointing, where a multi-point anchoring system may be used for position keeping.

Outside of cable laying activities, anchoring will be typically be limited to normal vessel navigation within established USCG anchorages.

3.3.4 Tug boats

Tug boats are ocean going or coastwise towing vessels that can conduct multiple operations including barge towing, barge support, and harbor assist operations. Tug boats will be used to facilitate transporting CLB to and from lay site.

Tug boats are not expected to conduct any anchoring activity during project operations. Anchoring will be limited to normal vessel navigation within established USCG anchorages.

3.3.5 Light Construction Vessels

Light Construction Vessels (LCVs) are seagoing vessels that are typically dynamically positioned to conduct pre-lay and post-lay installation activities such as mattress installation and asset crossing preparations.

The LCVs are not expected to conduct any anchoring activity during pre and post lay installation activities. Anchoring will be limited to normal vessel navigation within established USCG anchorages.

3.3.6 Survey Vessels

Survey vessels consist of both small coastwise boats and larger oceangoing vessels, depending on the area of operations. Survey vessels are used to conduct acoustic survey campaigns without physical contact with the seabed.

Survey Vessels are not expected to conduct any anchoring activity during project operations. Anchoring will be limited to normal vessel navigation within established USCG anchorages.

3.3.7 Anchor Handling Vessel(s)

Anchor handling vessels (AHV) are similar to tug boats, and equipped with stern rollers, winches, and cranes. They are capable of retrieving, positioning, and deploying mooring anchors for the CLB. The AHVs will conduct anchor operations for the CLB as described in section 3.3.2 - Cable Lay Barge.

Other than facilitating anchor movements for the CLB as noted above, the AHV is not expected to conduct anchoring activity.

3.3.8 Crew Transfer Vessels

Crew Transfer Vessels (CTVs) are coastwise vessels that typically operate in daily transits for the purpose of transporting crew to and from work platforms and/or vessels. CTVs will be used on the SEC installation to bring personnel to and from the CLB during laying activities.

CTVs are not expected to conduct any anchoring activity during project operations. Anchoring will be limited to normal vessel navigation within established USCG anchorages.

3.3.9 Work boats

Workboats are versatile vessels that can perform and assist construction activities in shallow water. Workboats may use anchoring to maintain position to support certain construction activities, such as mass flow excavation (MFE) operations.

This position keeping method for MFE operations involves mooring the vessel to a single approximately 25-ton stern clump weight, which is positioned in the direction of the vessel's intended working route. The vessel aligns itself with the clump weight using the stern roller. As it pays out winch

wire, the vessel tows against the clump weight until it reaches the designated working area. Throughout the operation, the vessel's Master continues to tow ahead against the clump weight, ensuring precise vessel positioning. Longitudinal control is achieved through winch movements, while the bow thruster assists with transverse control. The clump weight can typically be a clumped length of chain connected to the vessel winch via a steel wire rope.

Workboats may also be used to temporarily connect survey equipment to cable ends, where standard anchoring may be used to maintain position. Anchors will be sized appropriately for the required loads.

3.3.10 Liftboats

Liftboats are self-propelled, self-elevating vessels used to support construction activities. Liftboats have the capability of raising its hull clear of the water on its own legs that make contact with the seabed as to provide a stable platform from which construction work may be conducted. Liftboats may be used for a variety of activities such as a diving support vessel.

4 References

4.1 Project References

Ref.	Document title	Doc. no.	Company doc. no.
1	Anchoring Plan No Anchor Areas - EM&CP	00729686	C218-NX-A-XE-00004-01
2	Navigation Safety Plan for Submarine Export Cable Installation - EM&CP	00795708	C218-NX-A-MA-00012



5 List of Appendices

N/A

Attachment 1

No Anchor Areas

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**This document contains Confidential
Critical Infrastructure Information
and it is exempted from disclosure
under POL § 87(2).**

**An unredacted/confidential version of
this document has been submitted with
the Records Access Officer under 16
NYCRR Section 6-1.4.**

Attachment 2

Gravesend Bay REC Anchoring Plan Figure

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**This document contains Confidential
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NYCRR Section 6-1.4.**

Empire Wind 1
Case 21-T-0366
Appendix R.1
Suspended Sediment and Water Quality
Monitoring Plan

REV2

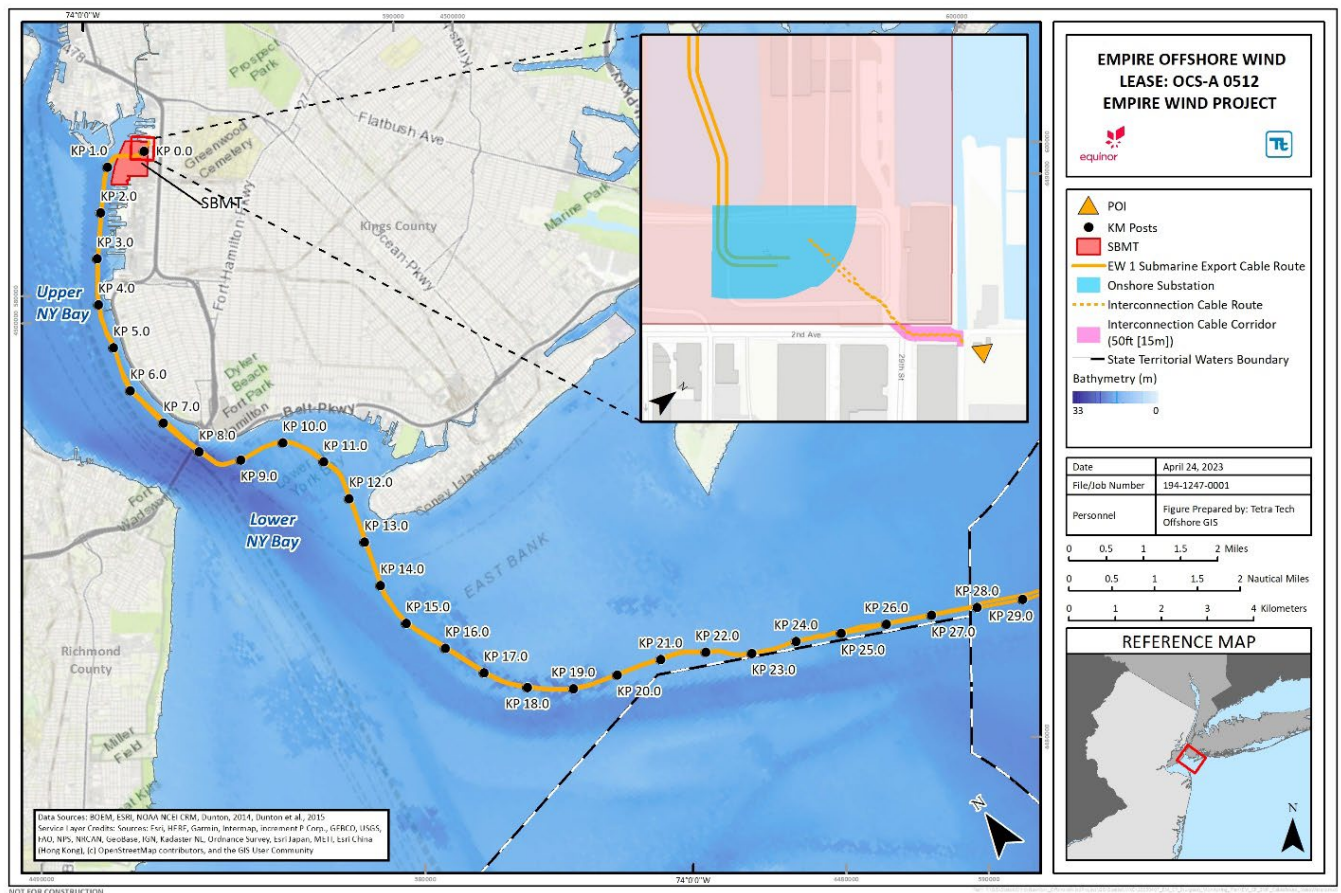


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1 Introduction

1.1 General Project Description

Empire Offshore Wind LLC (“Empire”) proposes to construct and operate the Empire Wind 1 (EW 1) Project as one of two separate offshore wind projects, both to be located within the Bureau of Ocean Energy Management (BOEM) designated Renewable Energy Lease Area OCS-A 0512 (Lease Area). The proposed transmission system for the EW 1 Project will connect the offshore wind farm to the point of interconnection (POI) and will include 230-kilovolt (kV) export and 345-kV interconnection lines traversing a total of approximately 17.5 miles (mi) (15.2 nautical miles [nm] or 28.2 kilometers [km]) within the State of New York.

The Project will interconnect to the New York State Transmission System operated by the New York Independent System Operator, Inc. (NYISO) at the Gowanus 345-kV Substation (the point of interconnection, or POI). The Gowanus 345-kV Substation is owned by the Consolidated Edison Company of New York, Inc. (Con Edison). The Project’s onshore facilities, including the onshore cable route, onshore substation, and the POI, are located entirely within Brooklyn, Kings County, New York.

The components of the EW 1 Project within the State of New York include:

- Two three-core 230 kV high-voltage alternating-current (HVAC) submarine export cables located within an approximately 15.1 nm (27.9 km) long submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall in Brooklyn, New York.
- A 0.2 mi (0.3 km) long onshore cable route and substation including:
 - Two three-core 230 kV HVAC EW 1 onshore export cables buried underground from the cable landfall transition joint bays to the onshore substation.
 - An onshore substation located at the South Brooklyn Marine Terminal (SBMT), which will increase the voltage to 345 kV for the onshore interconnection cables.
 - Two 345 kV cable circuits, each with three single-core HVAC onshore interconnection cables, buried underground from the onshore substation to the POI.

Nexans Norway AS has been awarded the delivery and installation of two (2) 230kV submarine export cable circuits that are approximately 41 nautical miles (76km) in length each from the offshore substation (OSS) at the lease areas to the onshore substation (ONS) at South Brooklyn Marine Terminal (SBMT), New York. The selected route for the Empire Wind 1 submarine export cables to SBMT is shown in Figure 1-1 below.

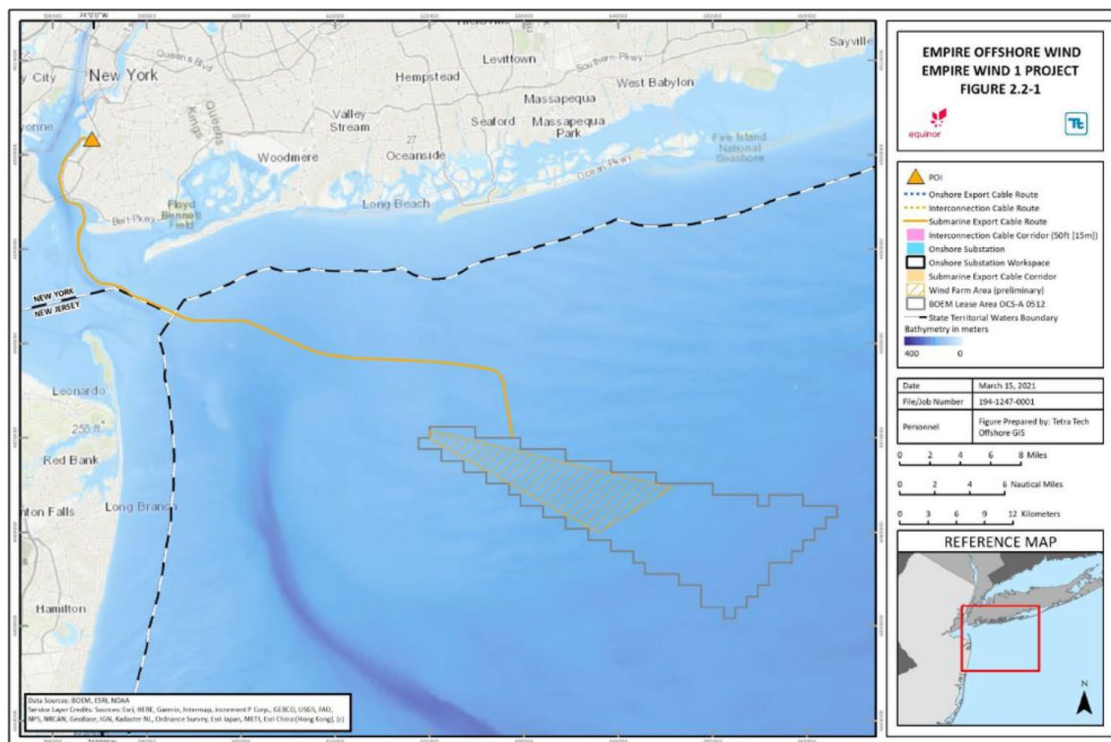


Figure 1-1: Empire Wind 1 project with selected Submarine Export Cable route to SBMT

1.2 Purpose of the document

The purpose of this document is to describe the Suspended Sediment and Water Quality Plan for the installation of the submarine export cables and the associated pre-installation and post-installation activities within NYS waters (within 3 nautical miles offshore) as required by section U of the Certificate Condition. Reference is made to the Offshore Cable Construction Plan – EM&CP, [1], for further descriptions of the installation activities. Certificate Condition U3 specifically states that:

“Water quality monitoring shall be conducted during dredging, dewatering of dredged material, barge decanting, pre-sweeping, pre-trenching, jet trenching activities, cable installation and maintenance and decommissioning activities (together, “Monitored Construction Activities”) that involve disturbance of sediments in accordance with the Suspended Sediment and Water Quality Monitoring Plan. Monitoring shall also be conducted during pre-installation trials in accordance with Condition J12. Cable installation, maintenance and decommissioning activities that result in only minor disturbance of sediments, including: (i) anchor sweep; (ii) anchoring; (iii) placement of jack-up barge; (iv) hand jetting; (v) temporary cable lay without simultaneous burial; (vi) other activities as determined by DPS Staff, in consultation with NYSDEC, shall not require water quality monitoring.”

NOTE: This water quality monitoring plan does not cover the following “Monitored Construction Activities” as these activities are addressed in Appendix R.2:

- Dredging
- Dewatering of dredged material
- Barge decanting

This water quality monitoring plan also does not cover submarine export cable maintenance and decommissioning activities as prior to commencing maintenance and decommissioning activities, the Certificate Holder will submit for NYSDEC review a water quality monitoring plan for activities that may require monitoring, in accordance with Certificate Condition U4(g).

2 Terms and Abbreviations

Term	Definition
Certificate	Certificate of Environmental Compatibility and Public Need
Company	Empire Offshore Wind LLC
Contractor	Nexans Norway AS
Project	Empire Wind 1 Submarine Export Cables EPCI
Abbreviation	Elaboration
BOEM	Bureau of Ocean Energy Management
EW1	Empire Wind 1
HVAC	High Voltage Alternating Current
IAC	Inter Array Cables
NYISO	New York Independent System Operator, Inc.
O&M	Operations and Maintenance
ONS	Onshore Substation
OSS	Offshore Substation
POI	Point of Interconnection
SEC	Submarine Export Cable
SBMT	South Brooklyn Marine Terminal
WTG	Wind Turbine Generator



Empire Wind 1

Suspended Sediment and Water Quality Monitoring Plan - EM&CP

Document no.: 00795711

Company doc. no.: C218-NX-A-MA-00015

Date: 2025-04-14

Page: 8 of 10

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Comp. rev.: 07

3 Suspended Sediment and Water Quality Plan

The Suspended Sediment and Water Quality Plan is included in this documents as Appendix 1.

4 References

4.1 Project References

Ref.	Document title	Doc. no.	Company doc. no.
1	Offshore Cable Construction Plan – EM&CP	00795709	C218-NX-A-XE-00002-01

5 List of Appendices

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1	Suspended Sediment and Water Quality Monitoring Plan	1 + 19



Empire Wind 1

Suspended Sediment and Water Quality Monitoring Plan - EM&CP

Document no.: 00795711

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Date: 2025-04-14

Page: Appendices

Revision: H

Comp. rev.: 07

Appendix 1 Suspended Sediment and Water Quality Monitoring Plan

Suspended Sediment and Water Quality Monitoring Plan – Empire Wind 1 Submarine Export Cable Installation

April 14, 2025

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ACRONYM LIST

ADCP	Acoustic Doppler Current Profiler
CTD-OBS	Conductivity Temperature Depth Optical Backscatter (Water Quality Sonde)
DDD	Dichlorodiphenyldichloroethane
DDT	Dichlorodiphenyltrichloroethane
ECR	Export Cable Route
EM&CP	Environmental Management and Construction Plan
KP	Kilometer Point
L	Liter
MFE	Mass Flow Excavator
NYSDEC	New York State Department of Environmental Conservation
NYSDOH ELAP	New York State Department of Health Environmental Laboratory
NYSDPS	New York State Department of Public Service
OSS	Offshore Substation
PAH	Polycyclic Aromatic Hydrocarbons
SBMT	South Brooklyn Marine Terminal
TOGS	New York Technical and Operational Guidance Series
TSS	Total Suspended Solids
VI	Vertical Injector

1 Introduction

This document presents the suspended sediment and water quality monitoring plan for the Empire Wind 1 Project export cable installation. This project involves the installation of two 230 kV submarine export cables, connecting the Empire Wind 1 offshore substation (OSS) located in the OCS-A 0512 Lease Area to a landfall at the South Brooklyn Marine Terminal (SBMT) in Brooklyn NY (Figure 1). The export cable route (ECR) is approximately 41 nautical miles in length (76 km).

Kilometer points (KPs) have been defined to identify locations along the ECR. The cable landfall is located at KP 0 and the OSS is located at KP 76. Installation of the submarine export cables has been divided into three segments. The nearshore segment begins at KP 0 at SBMT and continues south to KP 13. The midshore segment extends from KP 13 to the New York State (NYS) waters boundary (KP 28). The offshore segment is located in US federal waters (KP 28 - KP 76) and is not considered in this plan. All KP values used in this document are approximate.

This Suspended Sediment and Water Quality Monitoring Plan (the Plan) describes the procedures, sampling criteria, and reporting requirements necessary for the monitoring of seabed disturbances to ensure the appropriate protection of water quality in NYS waters during installation of the midshore and nearshore segments of the Empire Wind 1 export cables (i.e., those segments within New York State waters).

The Monitored Construction Activities, as defined by the Article VII Certification Conditions, that will be performed during submarine export cable installation within NYS waters and monitored as described in this plan are pre-sweeping, pre-trenching, jet trenching, and cable installation with simultaneous burial. Sediment disturbance created by jetting operations will be characterized along a transect located down-current perpendicular to the current flow at the edge of the mixing zone using a three-tiered approach:

- 1) Documenting the three-dimensional current velocity and suspended sediment cross section of the water column using a vessel-mounted Acoustic Doppler Current Profiler (ADCP) along transects both up-current and down-current of the monitored activities as described in Section 2.2.
- 2) Collecting in situ vertical profiles of the water column using a Conductivity-Temperature-Depth (CTD) profiler and Optical Backscatter Sensor (OBS)
- 3) Collecting water samples at various depths for laboratory analysis of total suspended solids (TSS). In addition, water quality monitoring for additional constituents (dissolved arsenic, dissolved cadmium, dissolved copper, dissolved lead, total mercury, total PCBs, p,p'-DDD, p,p'-DDE, and p,p'-DDT) will be conducted during Monitored Construction Activities between KP0 and KP15 as per Certificate Condition U4(h)(i).

Monitoring activities will be conducted down-current of jetting operations and at background stations up-current and out of the influence of the monitored construction activities as detailed in the following sections.

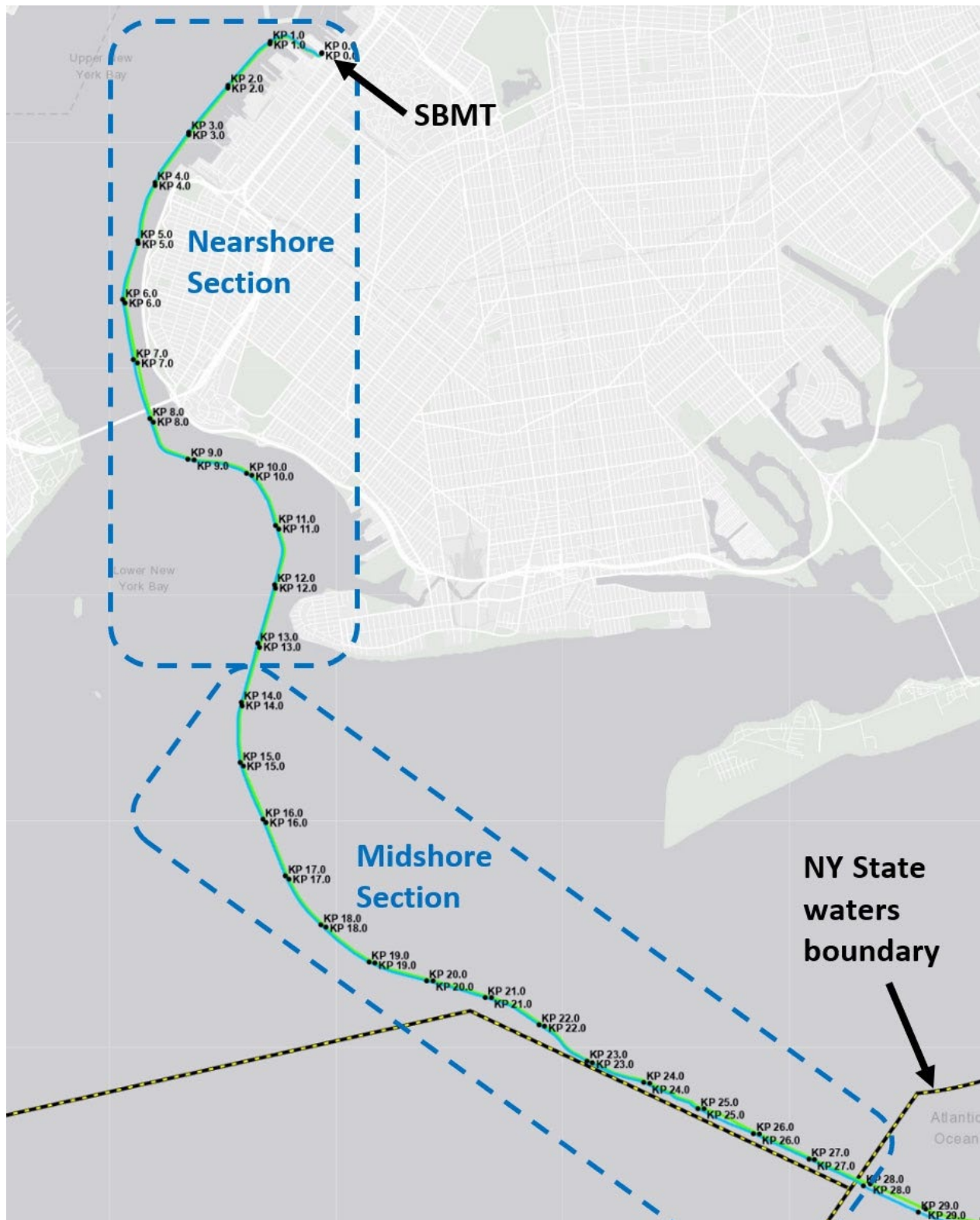


Figure 1: Empire Wind 1 Submarine Export Cable Route Overview

1.1 Monitored Construction Activities

As required by conditions in the Article VII Certificate, suspended sediment and water quality monitoring described in this Plan will occur during pre-sweeping, pre-trenching, jet trenching, and cable installation with simultaneous burial activities that occur in New York State waters during the submarine export cable installation. Other activities that will require suspended sediment and water quality monitoring including dredging, dewatering of dredged material, barge decanting and cable maintenance and decommissioning activities are not being conducted as part of the submarine cable installation, and those activities will be covered under plans that will be developed and submitted separately. Monitored Construction Activity methods anticipated to be used as part of the Empire Wind 1 Submarine Export Cable Installation project, that will require suspended sediment and water quality monitoring, are described below. TSS during sediment disturbing activities will not be from sewage, industrial waste, or other wastes that will cause deposition or impair the waters for their best usages.

1.1.1 Vertical Injector Burial Tool

The vertical injector (VI) is a hydraulic jetting trencher that uses high-pressure water to jet a narrow trench by fluidizing sediments (Figure 2). During installation, the cable is guided internally through the VI into the bottom of the trench where it becomes buried as suspended sediments resettle. Cable burial depths of up to 33 ft (10m) below the seabed can be obtained through use of a VI. The VI will be deployed and operated by a crane on a cable lay barge. Additional details on barge maneuvering can be found in the Cable Construction Plan. The VI will be the primary method for cable burial in the nearshore cable segment.



Figure 2: Cable Lay Barge with Vertical Injector (VI)

1.1.2 Capjet Burial Tool

The Capjet burial tool is a remotely operated jet trencher that uses high-pressure water jetting nozzles on two “swords” to fluidize the sediment and create a narrow trench in which to bury a cable (Figure 3). The trench is backfilled, burying the cable at depth, as fluidized sediments resettle following Capjet passage. The system is able to free fly in the water column using onboard thrusters and remains tethered to the support vessel by an umbilical during operations. The Capjet system will be used for post-lay cable burial in nearshore and midshore cable segments.

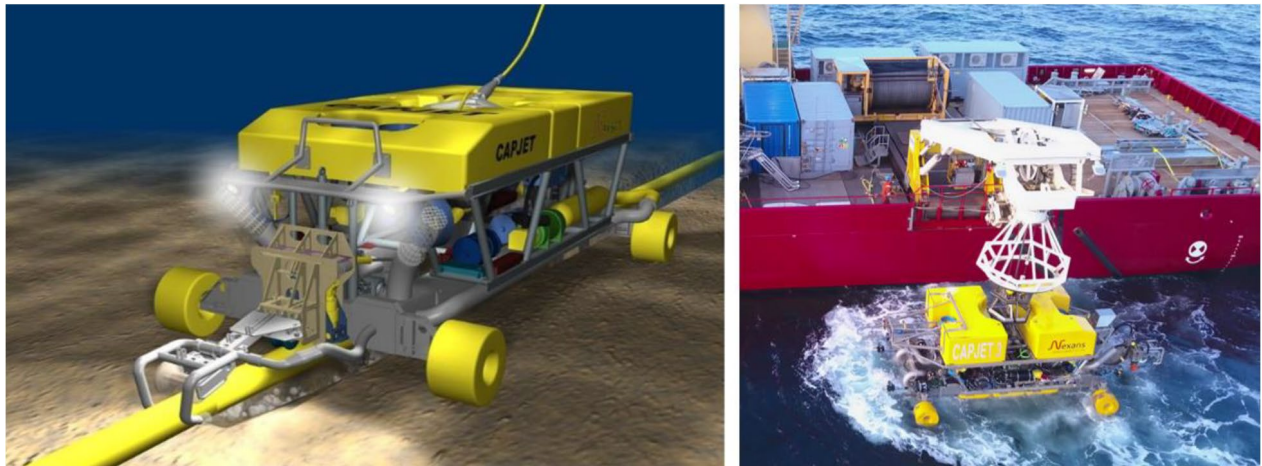


Figure 3: Capjet Remotely Operated Jet Trencher

1.1.3 Mass Flow Excavation

Mass flow excavation is performed with a high-velocity water jet that fluidizes and disperses sediments (Figure 4). The jet is deployed by a crane mounted to a vessel or barge. It is anticipated that the use of mass flow excavation for pre-sweeping (seabed leveling) of megaripples/sandwaves will be required.



Figure 4: Typical Mass Flow Excavator (MFE)

2 General Monitoring Protocols

Water quality and suspended sediment monitoring activities (described in detail in Section 6) will 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 will be sent for analysis at a laboratory certified by the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP).

To allow for real-time monitoring of TSS concentrations during Monitored Construction Activities, a correlation will be established between acoustic backscatter intensity (as measured by an ADCP), optical backscatter (turbidity as measured by a water quality sonde), and laboratory determined TSS concentration via standard method 2540D. This relationship (calibration curve) will be established in a pre-activity benchtop study using site sediment and water (Section 4) and then refined during pre-installation trials (Section 5). Data collected during cable installation and seabed leveling activities, as described in Section 6, will be used to continually assess the system stability and calibration throughout the monitoring period as the work moves into different regions of the cable route.

The characteristics of the dispersing plume of sediment placed in suspension during Monitored Construction Activities will be documented in real time using an ADCP. An onsite survey vessel will collect acoustic backscatter intensity data along 1 transect located up-current of the monitored activity out of the influence of the monitored activity to establish the background conditions. A second transect will be collected at the down-current edge of the applicable mixing zone as described in Section 2.2 during daylight hours. The ADCP will 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) will 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. Using the OBS readings and the relationship between turbidity and TSS developed in the benchtop study, the TSS at the measurement location will be calculated and this data will be used to assess if the requirements for TSS levels are being met as described in Section 2.1.1. Grab samples for laboratory analysis of TSS will also be collected at three depths at the location of maximum acoustic backscatter intensity (see Section 2.2), and these results will be used to assess and refine the relationship between turbidity and TSS over the course of the project.

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 Monitored Construction Activities. The proposed methodology will allow real-time monitoring of project-related suspended sediment characteristics. The collection of water samples for laboratory measurement of TSS concentrations will provide an additional data correlation needed for calibration and will provide validation of the real-time monitoring results.

In conjunction with the turbidity measurements methods described above, visual observations of turbidity caused by Monitored Construction Activities will be conducted to ensure compliance with the narrative water quality standard in 6 NYCRR §703.2, which states, "No increase that will cause a substantial visible contrast to natural conditions." Any turbidity plumes that are observed in the measurement area associated with a monitored activity will be documented in the daily monitoring

log and reported to NYSDEC and NYSDPS along with the daily updates and practical operational modifications will be implemented to reduce in-situ sediment re-suspension according to the process described in section 6.1 and CCU11.

In addition to monitoring of TSS and turbidity, water quality sampling will also be conducted during Monitored Construction Activities to measure the relative aqueous concentrations of constituents of concern specified in the Article VII Certificate Conditions (Section 2.1.2). Grab samples for the water quality analysis will be collected at the location of maximum acoustic backscatter intensity at three depths (Section 2.2) at the same time the water samples for TSS analysis are collected.

Sample collection and monitoring will be conducted from a smaller vessel (or vessels) than will 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. When necessary to avoid risk of damage to the cables, Empire Wind may continue installation activities when monitoring operations are suspended during periods of such adverse weather. Sampling and monitoring operations will be resumed promptly once weather conditions allow. The decision to suspend monitoring operations because of unsafe weather conditions will be made by the captain of water quality monitoring vessel. This decision will be guided by weather forecasts and National Weather Service Small Craft Advisory thresholds. The decision to continue installation activities without monitoring operations in order avoid material delay or potential damage to the cable will be made by the cable installation manager, vessel or barge master in consultation with NYSDPS Staff and NYSDEC. The authority and responsibility for the safe navigation of the cable installation vessel or barge ultimately lies with the vessel or barge master and shall not be impaired by monitoring operations.

2.1 Exceedance Thresholds

2.1.1 Turbidity and TSS

Per Article VII Certificate Condition No. U6b, TSS levels are not to exceed 100 mg/L above ambient conditions at the down-current edge of the applicable mixing zone (Section 2.2) during Monitored Construction Activities. Ambient conditions will be established by sampling at an up-current background station. Down-current measurements will be compared to up current background station measurements collected on the same day, during the same tidal stage, and at the same depth. Standard Method SM 2540D will be used to measure TSS in the laboratory.

2.1.2 Additional Water Quality Constituents

The water quality constituents listed in Table 1 will be sampled and analyzed from approximately KP 15 north to the cable landfall (per Article VII Certificate Condition U8). Concentrations of these constituents must remain below the greater of the water quality standards presented in Table 1, or 1.3 times the highest ambient background level measured at the up-current background station during the same sampling day, tidal period, and depth.

Table 1: Additional Water Quality Constituent Standards Specified in the §401 WATER QUALITY CERTIFICATION

Parameter	Water Quality Standard	Type	Units	Method	Detection Limit*
Dissolved Arsenic	63	A(C)	ug/L	EPA 200.8	25
Dissolved Cadmium	7.7	A(C)	ug/L	EPA 200.8	5
Dissolved Copper	5.6	A(C)	ug/L	EPA 200.8	2
Dissolved Lead	8	A(C)	ug/L	EPA 200.8	2
Total Mercury	7×10^{-4} (0.05**)	H(FC)	ug/L	EPA 1631E	0.0005
Total PCBs	1×10^{-6}	H(FC)	ug/L	EPA 608.3	0.095
p,p'-DDD	8×10^{-5}	H(FC)	ug/L	EPA 608.3	0.033
p,p'-DDE	7×10^{-6}	H(FC)	ug/L	EPA 608.3	0.012
p,p'-DDT	1×10^{-5}	H(FC)	ug/L	EPA 608.3	0.036
Benzo(a)pyrene	6×10^{-4} ***	H(FC)	ug/L	EPA 625.1	0.1
Analytical methods must be sufficiently sensitive to measure the required limit or be able to measure a sufficiently sensitive method detection or reporting limit. Methods must also be approved in 40 CFR 136 and performed by a laboratory with NYS ELAP certification for that method. Certificate Holder may use a different method if the method is proposed to, and approved by, DPS Staff, in consultation with NYSDEC, in writing.					
* The detection limits listed in the table above represent the Minimum Level (ML) for the specified analytical methodology.					
** Limit based on General Level Currently Achievable described in TOGS 1.3.10.					
*** Benzo(a) pyrene will be used as an indicator for the total concentration of Polycyclic Aromatic Hydrocarbons (PAHs)					

- a. When a detection limit listed above is greater than the water quality standard, the water quality standard will be presumed to be met when analytical results demonstrate compliance with the detection limit.

2.2 Mixing Zones and Sample Depths

Data collection activities will occur down-current of Monitored Construction Activities at the edge of the applicable mixing zone distance from the operating VI, Capjet, or MFE (Table 2), and at up-current background stations located outside the effects of Monitored Construction Activities. Water column profile data (collected using a CTD-OBS) and samples for laboratory analysis and will be collected at the location of maximum acoustic backscatter intensity along down current and up current transects oriented perpendicular to the direction of current flow. Figure 5 illustrates the up current and down current transect and sampling locations for the section of the channel where the mixing zone distance is 500 ft.

Table 2: Mixing Zone Distances Specified in Certificate Condition U2

Cable Portion	Parameter	Mixing Zone Distance
KP 15 south to the limits of NY State waters	TSS and turbidity	1,500 ft
KP 15 north to the cable landfall	TSS and turbidity	500 ft
	Dissolved arsenic, dissolved lead, dissolved copper, dissolved cadmium, total mercury, benzo(a)pyrene, DDT, DDE, DDD, total PCBs*	
*Only monitored from KP 15 north to cable landfall		

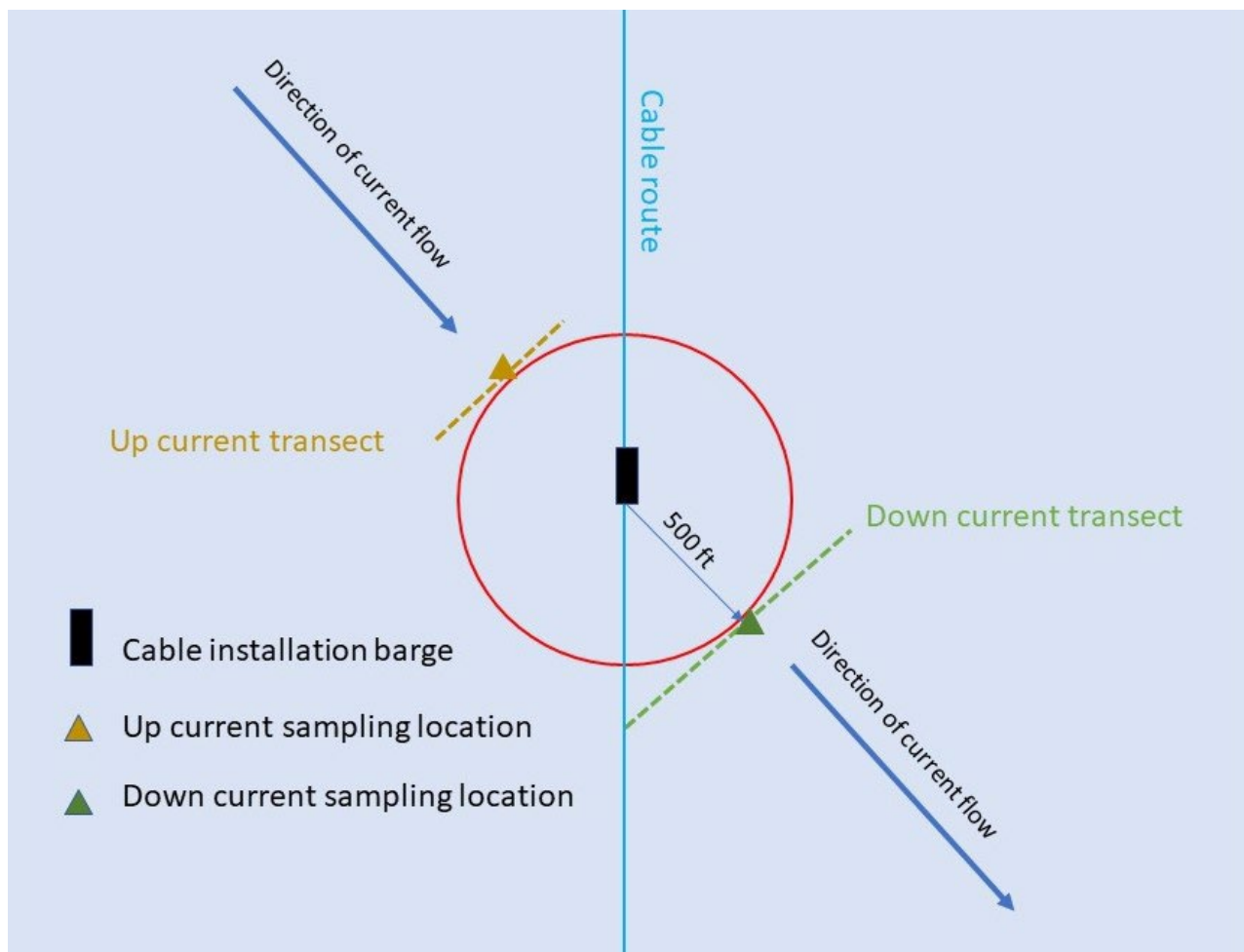


Figure 5: Example of up current and down current transects and sampling locations for section of cable route where mixing zone is 500ft

Grab water samples for laboratory analysis of relevant parameters will be collected from near surface (~18 in [0.46 m] below the water surface), mid-depth, and near-bottom (3 ft [0.91 m] above the sediment surface) depths.

2.3 Sampling Equipment and Protocols

Sampling will be conducted using the equipment outlined below or equivalent.

- Currents and acoustic backscatter: A 600 kHz Teledyne RDI ADCP configured with bottom tracking will be used to collect the current profiles and acoustic backscatter data. HYPACK software will be used for navigation and sample positioning.
- Turbidity data: The CTD-OBS used to collect turbidity profiles will be a YSI EXO system equipped with a turbidity probe and salinity sensor. The unit will be calibrated prior to the start of the sampling program and a calibration check will be performed each day prior to the start of sampling using turbidity and salinity standards.
- Position Data: Position information will be collected using a GPS integrated into HYPACK navigation system. The locations of the transect lines will be recorded in HYPACK along with the locations of the turbidity samples and the water samples.
- Water samples: A peristaltic pump equipped with Teflon hoses will be used to collect the water samples. The hose with a weight will be lowered such that the depth of the end of the hose is at the desired sample depth. Markings on the hose will be used to determine the sample depth. Once the end of the hose is at the desired water depth, the pump will be started. At each sample depth, a volume of water equivalent to at least 10 times the volume of the water in the hose will be pumped through prior to the collection of the water samples. To collect the water samples, the water will be placed directly into the bottles from the pump's discharge hose. Care will be taken to avoid touching the discharge hose to the lip of the bottle while filling.
- While the primary method for the collection of the water samples will be the peristaltic pump and tubing, a contingency method will be the use of Niskin bottles for sample collection using a Teflon coated Niskin style water sampler that will be lowered to the appropriate sample depth and triggered using a messenger. An alternative sampling method may be implemented in which the Niskin bottle will be installed on a small rosette equipped with three bottles that will be triggered electronically at the appropriate water depth rather than using a messenger. The water sampler will be decontaminated between each water sample using the following procedure:
 1. Wash sampler with a non-phosphoric, laboratory grade detergent and water,
 2. Rinse with tap water,
 3. Rinse with distilled or deionized water,
 4. Rinse with 10% nitric acid,
 5. Rinse with distilled or deionized water,
 6. Rinse with reagent grade acetone
 7. Rinse with distilled or deionized water
 8. Allow to air dry in an area not adjacent to decontamination area,
 9. Wrap sampling equipment with aluminum foil after decontamination, to remain wrapped until next sample collection.

If the water sampling requirements are changed at any point during the sampling program, the decontamination procedures will be adjusted to match the sampling requirements.

- Sample containers: Samples will be placed in certified cleaned sample bottles provided by the laboratory and labeled with the appropriate station information, preservatives used,

analysis requirements and sample date/time and placed in a Ziploc bag. Each sample will be documented on a Chain of Custody form and placed on ice in a container. New, clean nitrile gloves will be worn during the sample collection and changed between each location.

- Sample naming conventions: The samples will be named in as follows:
 - MMDDYY-L-TT-D where:
 - MM is the month
 - DD is the day
 - YY is the year
 - L is the location (i.e. U for up-current or D for down-current)
 - T is the tide (i.e. HS for high slack, PE for peak ebb, LS for low slack and PF for peak flood)
 - D is the depth (i.e. S for surface, M for mid-depth and B for near bottom)
 - The sample name will be recorded in the chain of custody and the sample log along with the date, time (local and UTM), water depth at sample station and depth at which sample was collected

2.4 Field and Laboratory QAQC Procedures

QAQC protocols will be implemented for the collection water samples for all analysis and will include the following:

- Equipment Blank – An equipment blank will be collected at a frequency of once per day. An equipment blank is intended to assess the contamination caused by sampling and processing equipment and is collected by passing distilled water through the decontaminated water sampling equipment and the into a sample bottle. The sample will be submitted to the laboratory along with the other samples on a daily basis for analysis of the same constituents as the field samples.
- Temperature Blank – This is a small sample bottle filled with water and will be provided by the laboratory and placed in the sample cooler when the sample bottles are placed in the cooler and stored in each cooler to confirm that the sample temperature upon receipt at the lab is $4 \pm 2^{\circ}\text{C}$.

Field blanks will not be conducted for this project as they are typically only performed in situations where volatiles analysis is being performed.

The laboratory that will be conducting the analysis is planned to be Eurofins located in Edison, NJ, which is NYSDOH ELAP certified and uses state-of-the-art laboratory equipment and procedures. Eurofins has a fully documented QAQC program and will perform matrix spike and matrix spike duplicate analysis as part of their QAQC process for each batch of samples submitted.

3 Anticipated Schedule

The anticipated Monitored Construction Activities included as part of the Empire Wind 1 Submarine Cable Installation project in nearshore (~KP 0 - KP 13) and midshore (~KP 13 – KP 28) cable segments is presented in Table 3. Activities will include pre-installation trials with VI, Capjet, and MFE, pre-lay jetting run and cable installation with VI, cable burial with Capjet, and pre-sweeping with MFE. Scheduling information is presented in section 1.4 of the EM&CP Part 2 narrative.

Table 3: Monitored Construction Activities

Cable Segment*	Monitored Construction Activity
Nearshore	Pre-installation trials with VI
	Pre-lay Jetting run with VI
	Cable installation with VI
	Pre-installation trials with Capjet
	Cable burial with Capjet
Midshore	Pre-installation trials with MFE
	Pre-sweeping with MFE
	Cable burial with Capjet

Monitoring of TSS, turbidity, and the additional water quality constituents described above will be conducted daily (during daylight hours only) at the following tidal stages: max flood, high slack, max ebb, and low slack where they intersect with the planned daylight operating hours of the onsite survey vessel performing the monitoring during Monitored Construction Activities.

If construction activities detailed in Table 3 above occur simultaneously, each activity would be monitored separately.

Empire Wind shall use commercially reasonable efforts to request the most expedited turnaround time available for laboratory sample analysis. Once samples are received at the laboratory, the total turnaround time, including laboratory analysis, data entry, and data processing will typically take four (4) to six (6) days.

Water samples collected for analysis of TSS will be transferred to a laboratory certified by NYSDOH ELAP within 24 to 48 hours after collection via a courier that will meet the sampling team at the dock to pick up the samples and delivered additional sampling supplies. To allow for quicker turnaround of laboratory data, TSS samples will not be batched, as the results will be used during Monitored Construction Activities to update the calibration curve.

Water samples collected for analysis of additional water quality constituents (selected metals, PCBs, selected pesticides, benzo(a)pyrene) will be transferred to a NYSDOH ELAP certified laboratory at the end of each sampling day following collection. Once samples are received by the laboratory, the total turnaround time for analysis of these constituents is typically 14 days.

Initial results will be forwarded to the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Public Service (NYSDPS) Staff within two business days of receipt from the laboratory to allow initial quality assurance checks to be performed prior to submittal to NYSDEC. Original laboratory data shall be submitted to DEC with accompanying discussion regarding quality assurance checks. Quality assurance review of the results will be completed three months after installation has been completed.

Failure to collect samples as specified in this Plan and the Certificate Conditions over the course of the installation will be considered a violation of certificate conditions.

4 Benchtup Studies to Develop Initial TSS-Turbidity Correlation

Prior to the initiation of any field measurements, a benchtop study will be conducted to establish an initial correlation between turbidity measured with a OBS and TSS. To develop this relationship, seawater will be collected from the project area along with sediments from a representative section of the cable route. The water and sediments will be used to create a series of up to 35 water samples with sediment concentrations ranging from 0 to approximately 250 mg/l. The turbidity level of each sample across the full range will be measured with the OBS, and then an aliquot of the sample will be put into a container and sent to a laboratory for TSS analysis.

The results of the laboratory TSS analysis of the prepared samples and the OBS readings taken of the samples will be used to develop the initial correlation relationship between TSS and turbidity. The calibration process will utilize a statistical regression type analysis. Once calibration procedures have been completed, a working calibration curve will be generated and provided to NYSDEC Staff and NYSDPS Staff for their review prior to the commencement of the pre-installation trials. Data collected during the pre-installation trials will be used to verify and refine the relationship.

5 Pre-Installation Trials

Pre-installation trials will be performed in the nearshore portion of the ECR for the VI and Capjet, and in the midshore portion of the ECR for the MFE (see Table 3 above). Pre-installation trials will simulate expected operating conditions and allow for possible adjustments to these conditions to assess TSS and Water Quality compliance criteria. Data will also be collected during the trials to assess and refine the calibration curve relating TSS concentration to acoustic and optical backscatter developed in the benchtop study. A reliable and robust relationship between TSS and turbidity will be necessary to allow for real-time monitoring of TSS during Monitored Construction Activities.

These trials will be conducted within representative sections or areas proximate to the ECR. The locations of each pre-installation trial are specified in the Pre-Installation Trial Plan. Each trial (for the VI, Capjet, and MFE) is expected to be conducted over a period of approximately two (2) days.

This trial will include jetting over a distance of approximately 1,000 feet. Suspended sediment associated with the pre-installation trial activity will be monitored using the ADCP, CTD-OBS vertical profiles, and water samples as described in Section 6.

During the trials, the installation contractor will be able to test operational settings of the installation spread to minimize associated sediment resuspension while still achieving the design burial depth. In addition, the trials will provide an opportunity to refine suspended sediment monitoring procedures including the calibration of acoustic and optical backscatter intensity measurements and field testing of water sampling equipment. The trials will include the following elements based on the equipment to be used for the installation of the cable (see the Pre-Installation Trial Plan for additional details).

- VI: Jetting to a depth of 15 feet (4.6 m) below present bottom over a distance of approximately 1,000 feet.

- Capjet: Jetting to a depth of 6 feet (1.8 m) feet below present bottom over a distance of approximately 1,000 feet.
- MFE: Seabed leveling of mega-ripples/sandwaves over a distance of approximately 1,000 feet.

TSS and water quality sampling methods and means implemented in the pre-installation trials may be modified for the cable installation events based on the results of the trial methods. During implementation of operational modifications, DPS Staff and NYSDEC may specify additional monitoring until compliance with the TSS limit and water quality standards is demonstrated. Changes to the monitoring requirements may include adjustment of transect locations and spacing, increasing the number of water samples, altering the methods for deploying equipment, and modifying the procedures for calibrating real-time monitoring equipment to laboratory measurements of TSS. Changes in the monitoring requirements will remain in place until resumption of routine monitoring is authorized by DPS Staff in consultation with NYSDEC. Modification to the procedures specifically described in this Plan that are made as a result of the pre-installation trials will be subject to NYSDEC and NYSDPS review.

Water samples will be collected at multiple times and locations within a given tidal cycle during the VI pre-installation trial to generate data necessary to evaluate the calibration curve relating TSS and turbidity developed in the benchtop study. The calibration curve will be continuously updated based on data collected during the pre-installation trials, and during Monitored Construction Activities. Collection of water samples for monitoring of additional water quality constituents (Table 1) during pre-installation trials will follow general sampling procedures (Section 2.0).

As noted above, extensive TSS and turbidity sampling will be conducted during the VI sampling to provide as broad a range as possible of TSS values. Once the Capjet and MFE trials start, sampling will occur at specified tidal periods (max flood, high slack, max ebb, and low slack) during daylight hours and will follow general sampling procedures to be employed during Monitored Construction Activities (Section 2.0).

Empire Wind will provide in-water field results from the installation trial to DPS and DEC in real time. DPS and DEC will review the field results in a reasonable length of time not exceeding the time frame it takes for Empire Wind to provide the lab results. Empire Wind agrees to obtain and pay for expedited lab results from the installation trials and will provide the lab result report to DPS and DEC as soon as possible, expected to be within 2-5 days from the time the samples were collected. Assuming there are no exceedances of Water Quality standards identified in the lab results by Empire Wind, Empire Wind will start installation as soon as we provide the lab report(s) to DPS and DEC. In the unlikely event that there are exceedances of Water Quality standards identified, Empire Wind will expeditiously provide this information to DEC and DPS and will cooperate with the agencies to identify the best path forward in terms of operational controls etc. prior to proceeding with installation (per the Certificate Conditions).

Operational controls implemented to minimize exceedances of the TSS limit will not be implemented in such a manner that it would result in a material delay of progress of work to complete the in-water installation during one construction season.

Review of the results of the pre-installation trials for the Capjet and MFE will follow procedures outlined above for the VI pre-installation trial. The certificate Holder must operate the jetting and mass flow excavation tools in accordance with the operating conditions determined through pre-installation Trial plan.

6 Cable Installation and Seabed Leveling

6.1 Suspended Sediment Monitoring

Sediment resuspension during mass flow excavation activities and jet trenching of each of the two export cables will be monitored along transects oriented perpendicular to the direction of current flow. The characteristics of the suspended sediment plume created by Monitored Construction Activities will be monitored in real-time using an ADCP and a CTD-OBS vertical profiler.

The ADCP and CTD-OBS instruments will be calibrated to measure suspended sediment concentrations during Monitored Construction Activities through quantitative relationships between the ADCP, CTD-OBS, and TSS established during the pre-installation trials and updated and refined throughout the project. Water samples for laboratory analysis of TSS will also be collected from the location of maximum acoustic backscatter intensity at each transect. Monitoring of the suspended sediment plume will be conducted daily during monitored construction activities, on each of the two cable installations. Monitoring will occur during daylight hours only during max flood, high slack, max ebb, and low slack tidal conditions, as described below. If sampling results indicate consistent compliance with the TSS standards, the Empire Wind can submit a request in writing to DPS Staff and NYSDEC Staff to reduce the sampling frequency.

- Real-time monitoring will consist of ADCP measurements and CTD-OBS profile measurements taken along generally current-perpendicular transects located at the edge of the relevant mixing zone (Table 2). During each tidal period, an up-current transect outside the influence of Monitored Construction Activities will be collected first at the edge of the mixing zone (or at a reasonably safe survey distance up-current of the cable lay vessel and jet trencher or MFE) to measure ambient or background TSS conditions. Following collection of up-current data, measurements will be collected along a down-current transect located at the relevant mixing zone distance from VI, Capjet, or MFE operation, and oriented generally perpendicular to the current flow. The length of these transects will depend on plume spatial characteristics and distances required to maintain a safe survey distance interval from the cable vessel and other objects at the time of survey.
- The ADCP will provide horizontal and vertical profiles of current velocities and acoustic backscatter intensity along each transect. Once acoustic backscatter data has been obtained for a transect, the suspended sediment and water quality monitoring vessel will return to the transect location where observed acoustic backscatter intensity was highest. A CTD-OBS vertical profiler system will be deployed at this location and grab samples will also be collected for laboratory measurement of TSS from near-surface, mid-depth, and near-bottom waters. Water samples will be transferred to a NYSDOH ELAP certified laboratory for measurement of TSS using by-weight concentration methods.
- If, during Monitored Construction Activities, the near-surface, mid-depth, or near-bottom, TSS concentrations measured at the relevant mixing zone distance exceed the TSS concentrations at the corresponding up-current background station by more than 100 mg/L or any water quality standards are exceeded, the Certificate Holder will notify DPS Staff and NYSDEC. The Certificate Holder will implement practicable operational modifications to reduce in-situ sediment re-suspension as needed. These measures may include changing the rate of advancement of the jet trencher or MFE, modifying hydraulic jetting pressures, or implementing other reasonable operational controls that may reduce suspension of in-situ sediments. If modifications do not restore compliance with the TSS

limit and/or any water quality standard, the Certificate Holder shall consult with DPS staff and NYSDEC staff regarding an acceptable solution. Mitigation measures implemented to minimize exceedances of the TSS limit will not be implemented in such a manner that will result in the material delay of the progress of work to complete the in-water installation during one construction season. Nothing in this Plan is intended to require that operational adjustments to the jet trencher or MFE be made that would prevent burial of the cable to the depths specified in the permit conditions through a single installation pass.

6.2 Water Quality Monitoring

Water quality sampling will be conducted to monitor the aqueous concentrations of identified constituents specified in the Certificate Conditions and listed above (Section 2.1.2). If water quality sampling results indicate consistent compliance with the monitoring standards, the Empire Wind can submit a request in writing to DPS Staff and NYSDEC to reduce the sampling frequency. If sampling results for the first export cable indicate consistent compliance with the monitoring standards, Empire Wind will request in writing to DPS Staff and NYSDEC Staff that sampling frequency be reduced such that water sampling would only be conducted during installation of the second export cable in areas where compliance thresholds were exceeded during installation of the first cable. Because the two cables that will comprise the Empire Wind 1 export cable will be separated by a short distance, significant variations in the concentrations of the constituents are not expected between cable installation locations.

- Water samples will be collected to monitor levels of relevant constituents (Table 1) at the up-current and down-current transects from KP 15 north to the cable landfall. Grab samples for analysis of these constituents will be collected at the same locations where TSS samples are taken (location along transect where the highest acoustic backscatter intensity was observed). Water quality samples will be collected at three depth intervals (near-surface, mid-depth, and near bottom).
- NYSDPS Staff, NYSDEC Staff and the Aquatic Environmental Monitor shall be notified if, during Monitored Construction Activities, concentrations of a constituent exceed the greater of the water quality standards presented in Table 1, or 1.3 times the highest ambient background level measured at the up-current background station during the same sampling day, tidal period, and depth. Practicable operational controls will be implemented after consultation with these representatives as needed (see Section 6.1).

7 Reporting

Results of the pre-installation trial will be analyzed along with any findings or recommendations for procedural modifications at that time. Laboratory results from the pre-installation trials shall be submitted electronically to DPS Staff and NYSDEC as soon as possible, but no later than the 48 hours following receipt from the laboratory. The results will then be summarized in a brief letter report and provided to the NYSDEC and NYSDPS within three weeks of receiving the TSS water sample results from the laboratory. Submission of this report is not a prerequisite to starting jet trencher or MFE operations.

Once cable installation activities begin, available real-time data results can be reported verbally on a daily basis to a designated contact at NYSDPS and NYSDEC, if desired. In the event of consistent compliance with monitoring standards, Empire Wind will submit a request, in writing, to NYSDPS and NYSDEC to reduce the frequency of sampling.

Within four months of completion of cable installation activities, a “Dredging and Water Quality Monitoring Report” will be submitted to the NYSDEC and NYSDPS as required by Certificate Condition U13. This report will include a description of procedures followed during the monitoring description of the results. The final report will include the correlations between real-time optical and acoustical backscatter equipment and corresponding TSS results from water samples. The report will include a comparison of TSS and water quality results to project-required thresholds.

Within four months of completion of the submarine cable installation, an analysis comparing the actual water quality monitoring results obtained during installation to the previous model predictions described in the report, “Empire Wind 1 Sediment Transport Study” (July 2022, Deltares, Inc.) will be filed with the Secretary as required by Certificate Condition U12.