Empire Offshore Wind LLC

and

EW Offshore Wind Transport Corporation

Empire Wind 2 Project

Article VII Application

Exhibit E-3

Underground Construction

August 2023

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ACRONYMS AND ABBREVIATIONS

ac	Acre
BOEM	Bureau of Ocean Energy Management
EM&CP	Environmental Management & Construction Plan
Empire or the Applicant	Empire Offshore Wind LLC and EW Offshore Wind Transport Corporation
EW 2	Empire Wind 2
ft	foot
ft/min	feet per minute
HDD	horizontal directional drilling
HVAC	high-voltage alternating current
in	inch
in^2	square-inch
km	kilometer
kV	kilovolt
Lease Area	Bureau of Ocean Energy Management-designated Renewable Energy Lease Area OCS-A 0512
LIPA	Long Island Power Authority
m	meter
m/min	meters per minute
mi	mile
mm	millimeter
mm^2	square millimeter
MTBM	microtunnel boring machine
nm	nautical mile
NY Project	EW 2 Project transmission facilities in New York
NYISO	New York Independent System Operator, Inc.
NYSPSC or Commission	New York State Public Service Commission
O&M	operations and maintenance
OCS	Outer Continental Shelf
POI	Point of interconnection at the Hampton Road substation
PSEG-LI	PSEG Long Island
PSL	New York Public Service Law
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
XLPE	cross-linked polyethylene

EXHIBIT E-3: UNDERGROUND CONSTRUCTION

E-3.1 Introduction

Empire Offshore Wind LLC and EW Offshore Wind Transport Corporation (collectively, Empire or the Applicant) proposes to construct and operate the Empire Wind 2 (EW 2) Project as one of two separate offshore wind projects to be located within the Bureau of Ocean Energy Management (BOEM) designated Renewable Energy Lease Area OCS-A 0512 (Lease Area). The EW 2 Project will require an electric transmission system to connect the offshore wind farm to the point of interconnection (POI) to the New York State Transmission System. An electric transmission line with a design capacity of 125-kilovolt (kV) or more, extending a distance of one mile or more, is subject to review and approval by the New York State Public Service Commission (Commission or NYSPSC) as a major electric transmission facility pursuant to Article VII of the New York Public Service Law (PSL). The EW 2 Project transmission system will extend a total of approximately 12.2 miles (mi) (19.6 kilometers [km]) within the State of New York and includes two 345-kV cable circuits.

The POI will be located on a parcel located along Hampton Road in Oceanside, within the Town of Hempstead, New York. The POI facilities (referred to herein collectively as the Hampton Road substation) will include both 345-kV and 138-kV substation facilities. The Applicant is proposing to permit all of these facilities, as well as the 138-kV "loop-in / loop-out" lines that will connect the substation facilities to two existing 138-kV cable circuits located under Lawson Boulevard owned by the Long Island Power Authority (LIPA) and operated by PSEG Long Island (PSEG-LI). LIPA will own and PSEG-LI will operate these loop-in / loop-out lines and the 138-kV facilities at the Hampton Road substation site. The ownership and/or operation of the 345-kV facilities at the Hampton Road substation will be determined through a mutually acceptable Interconnection Agreement between the Applicant and LIPA, as developed through the New York Independent System Operator, Inc. (NYISO) interconnection process.

This application is being submitted to the Commission pursuant to Article VII of the PSL for the portions of the EW 2 Project transmission system that are located within the State of New York (the NY Project). The onshore portion of the NY Project will be located entirely within Nassau County, New York.

The NY Project includes:

- Two three-core 345-kV high-voltage alternating-current (HVAC) submarine export cables located within an approximately 7.7-nautical mile (nm, 14.2-km)-long submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall;
- A cable landfall in the City of Long Beach, New York;
- Two 345-kV onshore export cable circuits, each with three single-core HVAC onshore export cables within an approximately 1.6-mi (2.5-km)-long onshore export cable corridor from the cable landfall to the onshore substation;
- An onshore substation in the Village of Island Park, within the Town of Hempstead, New York, which will house major control components for the electrical system and perform functions such as voltage regulation, reactive power compensation, and harmonic filtering;

- Two 345-kV interconnection cable circuits, each with three single-core HVAC interconnection cables within an approximately 1.7-mi (2.8-km)-long interconnection cable corridor from the onshore substation to the Hampton Road substation;

- The new Hampton Road substation in Oceanside in the Town in Hempstead, New York, which will include substation facilities that will provide the necessary breaker arrays and 345-kV/138-kV transformers; and

- Four 138-kV loop-in / loop-out line cable circuits, located within an approximately 0.1-mi (0.2-km) long cable corridor from the Hampton Road substation to existing LIPA transmission lines located under Lawson Boulevard in Oceanside, New York.

This Exhibit addresses the requirements of 16 New York Codes, Rules and Regulations § 88.3 for the NY Project facilities, including a description of the cable system to be used, applicable design standards, and the number and size of conductors. The cable profile, including the cable depth and locations of vaults, is provided in **Exhibit 5: Design Drawings**.

E-3.2 Cable System Design

The submarine export cable corridor for the NY Project begins where the cable route crosses the state boundary 3 nm (3.5 mi, 5.6 km) offshore, which occurs approximately 3 nm (3.5 mi, 6.2 km) directly south of Jones Beach in western Long Island. After crossing the New York State boundary, the submarine cable route continues northwest to the barrier island of Long Beach, New York on the south side of Long Island, where it makes landfall in the City of Long Beach. The length of the submarine export cable route in New York State waters is approximately 7.7 nm (8.8 miles, 14.2 km).

At the cable landfall, the submarine export cables will transition to the onshore export cables at jointing locations, and the onshore export cables will extend north for approximately 1.6 mi (2.5 km) to the proposed onshore substation on the north side of Reynolds Channel, in the Village of Island Park, New York. The onshore interconnection cables will traverse north from the onshore substation to the Oceanside POI at the Hampton Road substation. From the onshore substation to the Hampton Road substation, the onshore interconnection cable route is approximately 1.7 mi (2.8 km) long. The loop-in / loop-out lines will traverse east from the northeaster portion of the Hampton Road substation for approximately 0.1 mi (0.2 km) to connect to LIPA's existing 138-kV transmission lines under Lawson Boulevard.

All of the NY Project's transmission facilities are located underground or underwater, with the exception of the crossing of Barnums Channel along the interconnection cable route between the Village of Island Park and Oceanside, New York, which will utilize an aboveground cable bridge (Section E-3.3.3.5). The NY Project's transmission system, including the submarine export cables, onshore substation, onshore export cables, interconnection cables, Hampton Road substation, and loop-in / loop-out lines will be designed and installed to meet or exceed applicable industry standards and electrical codes, including but not limited to applicable standards of the:

- International Electrotechnical Commission;
- Insulated Cable Engineers Association;
- National Electric Safety Code;
- American National Standards Institute/Institute of Electrical and Electronics Engineers;
- International Council on Large Electric Systems (CIGRE);

- North America Electric Reliability Corporation;
- Northeast Power Coordinating Council;
- Reliability Rules of the New York State Reliability Council;
- Underwriters Laboratories;
- National Electrical Manufacturers Association; and
- National Fire Protection Association.

E-3.2.1 Submarine Export Cables

The submarine export cables will be HVAC. Each of the two HVAC submarine export cables will consist of a three-core 345-kV solid dielectric cable with up to two integrated fiber optic cables. Each three-core 345-kV submarine export cable will measure a maximum of approximately 11.4 inches (in) (290 millimeters [mm]) in outer diameter. **Figure E-3.2-1** provides a typical cross-section of a submarine export cable. Installation methods for the submarine export cables are described in Section E.3.3-1.

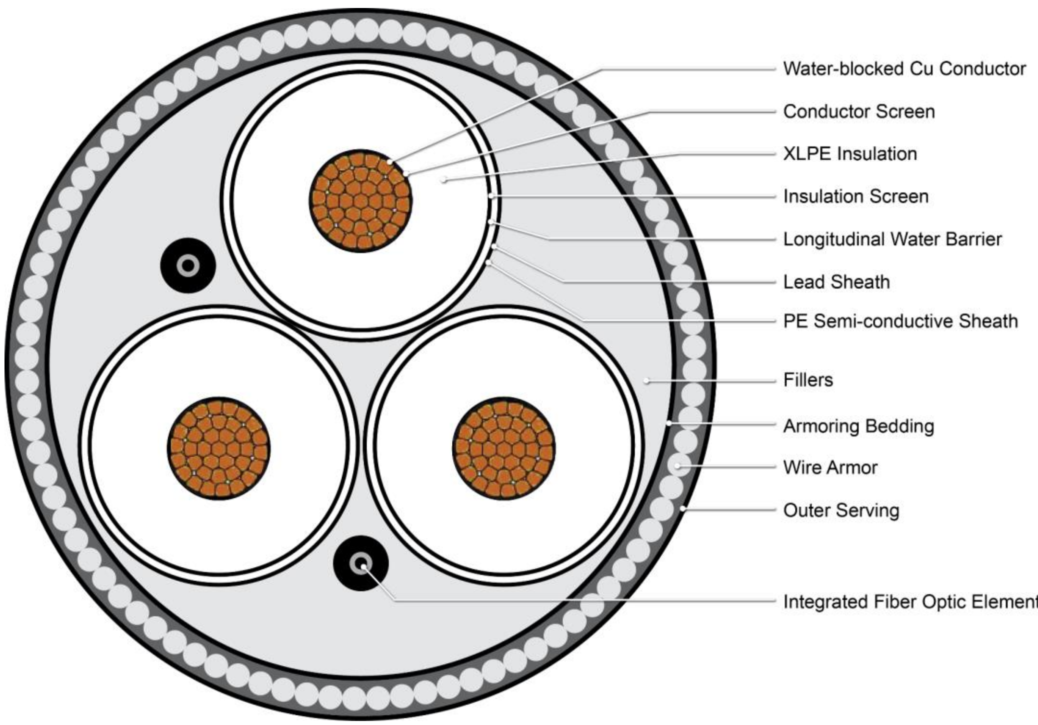

Figure E-3.2-1 Representative Cross-Section of Submarine Export Cable

E-3.2.1.1 Conductor Design

Each of the 3.1-square inch (in²) (2,000 square millimeter [mm²]) bundled copper power conductors will be within insulated power cores. The conductors will be made of stranded copper wires and will be protected against longitudinal water ingress by means of a water-blocking compound, yarns, and/or tapes.

E-3.2.1.2 Insulation System

Copper conductors will be enclosed in cross-linked polyethylene (XLPE) insulation. The insulation system will be rated for 362-kV. The Applicant does not anticipate any oils or insulating fluid as part of the cable insulation system.

E-3.2.1.3 Longitudinal Water Barrier

The longitudinal water barrier will consist of water-blocking tapes to prevent longitudinal water ingress under the lead sheath.

E-3.2.1.4 Metal Sheath

The power cores will incorporate a lead sheath extruded over the longitudinal water barrier. The lead sheath will prevent radial water ingress into the power cores.

E-3.2.1.5 Semi-conductive Sheath

A semi-conductive polymeric sheath will be extruded over the lead sheath to act as a mechanical reinforcement and a corrosion protection for the metal sheath.

E-3.2.1.6 Fillers

The three insulated power cores will be helically laid in a trefoil formation, together with the fiber optic elements for communications and monitoring. Extruded polymeric fillers will be applied in the interstices to give a round shape to the bundle.

E-3.2.1.7 Armoring

An armoring package, made of an armoring bedding and a layer of either steel or a combination of steel and polymeric armor wires flushed with bitumen, will be applied over the bundle.

E-3.2.1.8 Outer Serving

An outer serving, which protects the sheath/armoring from corrosion and is made of black polypropylene yarns, will be applied over the armoring package. Colored polypropylene yarns will be applied helically over the outer serving; the cable will be marked at specified lengths every 0.62 mi (1 km), as well as every 328 feet (ft) (100 meters [m]) of the first and last kilometer.

E-3.2.2 Onshore Export Cables

The onshore export cables between the cable landfall and the onshore substation will consist of two 345-kV circuits. Each circuit will comprise three single-core XLPE solid dielectric cables. Each dielectric cable will be approximately 5.26 in (134 mm) in outer diameter. **Figure E-3.2-** provides a cross-section of the single-core onshore export cable. At a minimum, two separate fiber optic cables will be used for communication and monitoring and will be installed alongside the onshore export cables.

The onshore export cables will be housed in either one common duct bank or two separate concrete duct banks, which will be buried to a minimum target depth of 3 ft (0.9 m). The configuration of the six export cables and up to two fiber optic cables within the duct banks may vary along the installation corridor. Each of the concrete duct banks will be approximately 3 feet (0.9 m) high by 5 ft (1.5 m) wide. In certain areas, there may be a separation between duct banks due to site conditions and spacing constraints. Joint pits (manholes)/temporary pull-in pits will be located approximately every 800 to 5,000 ft (244 to 1,524 m) along the onshore export cable corridor to provide access to the cables. The actual length between joint pits will vary due to site-specific and cable installation constraints. Final jointing pit locations will be provided in the Environmental Management and Construction Plan (EM&CP).

Joint pits will generally be in-situ or pre-cast concrete boxes with approximate dimensions of 50 ft by 15 ft (15.2 m by 4.6 m) to a depth of approximately 10 ft (3.3 m). A cast iron cover may be present at ground level for access by maintenance personnel. Direct buried installation may also be used instead of an accessible chamber, with access only to the link boxes, depending on the final evaluation.

Anticipated locations of manholes, as well as cross sections of duct bank configurations and joint pits, are provided in **Exhibit 5**. Since the proposed onshore export cables will be solid dielectric, no dielectric fluid or insulating oil is needed and no oil pumping stations are proposed.

E-3.2.2.1 Conductor Design

The copper power conductors within each of the three insulated conductor cables will be made of round stranded or segmented copper wires with a cross-sectional area of up to 3.9 in^2 (2,500 mm^2).

E-3.2.2.2 Insulation System

Copper conductors will be enclosed in an XLPE insulation system, rated for 362-kV. The Applicant does not anticipate any oils or insulating fluid as part of the cable insulation system.

E-3.2.2.3 Longitudinal Water Barrier

Semi-conductive swelling tape will be applied over the insulation screen.

E-3.2.2.4 Metal Sheath

The conductor cables will incorporate copper wires and a metallic laminated or lead sheath over the longitudinal water barrier.

E-3.2.2.5 Outer Sheath

An insulating polymeric sheath will be extruded over the metal sheath to act as mechanical reinforcement and corrosion protection for the metal sheath. A semiconductive skin will be extruded over the sheath for testing purposes.

E-3.2.2.6 Bending Radius

The onshore export cables will not be installed with less than the manufacturer’s minimum recommended bending radii. Typical minimum bending radii for the onshore export cables are 20 times the outer diameter during installation and 15 times the outer diameter during operations.

E-3.2.2.7 Bonding

Bonding at regular intervals limits the induced voltage. Pending final onshore interconnection design, bonding points will be located at joint pit (manhole locations) with a typical distance of every 800 to 5,500 ft (244 to 1,524 m) and will be contained within link boxes. Final detail on the bonding and grounding will provided in the EM&CP.

E-3.2.2.8 Link Boxes

Pending final onshore interconnection design, link boxes are anticipated to be up to approximately 4 ft by 3 ft (1.2 m by 0.9 m) and 1.5 ft (0.5 m) high and located at joint pit (manhole) locations. A typical link box is provided in the conceptual onshore drawings in **Exhibit 5**.

E-3.2.2.9 Fiber Optic Cable

At least two fiber optic cables with an approximate diameter of 1.1 in (30 mm) will be installed.

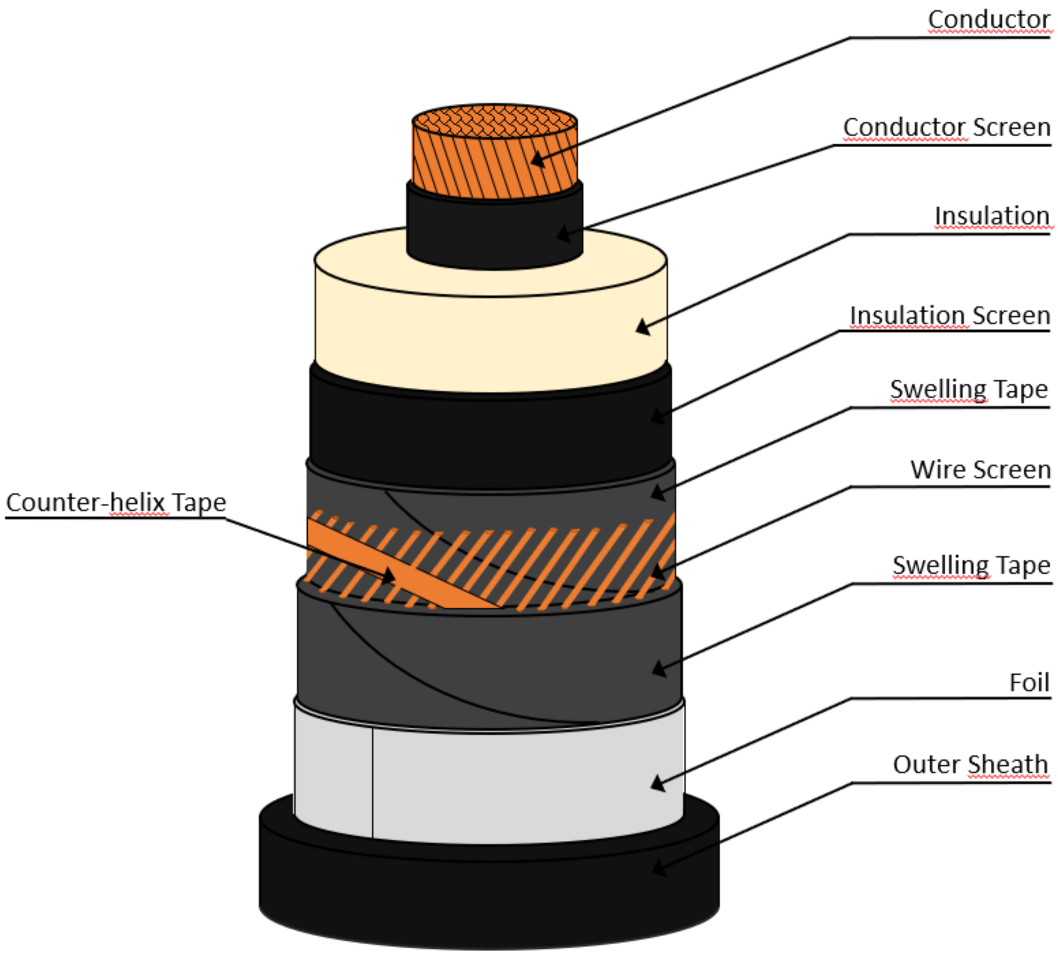

Figure E-3.2-2 Representative Cross-Section of Onshore Export Cable

E-3.2.3 Interconnection Cables

The interconnection cables between the onshore substation and the Hampton Road substation will consist of two 345-kV cable circuits. Each cable circuit will comprise three single-core XLPE solid dielectric cables. Each dielectric cable will be approximately 5.26 in (134 mm) in outer diameter. **Figure E-3.2-3** provides a cross-section of the single-core interconnection cable. At a minimum, two separate fiber optic cables will be used for communication and monitoring and will be installed alongside the interconnection cables.

The interconnection cables will be housed in either one common or two separate concrete duct banks, which will be buried to a minimum target depth of 3 ft (0.9 m). The configuration of the six interconnection cables and at least two fiber optic cables within the duct banks may vary along the installation corridor. Duct bank configurations will be similar to those for the onshore export cables, depicted in **Exhibit 5: Design Drawings**). Each of the concrete duct banks will be approximately 3 feet (0.9 m) high by 5 ft (1.5 m). In certain areas, there may be a separation between duct banks due to site conditions and spacing constraints. Joint pits (manholes)/temporary pull-in pits will be located approximately every 1,250 to 5,000 ft (381 to 1,524 m) along the interconnection cable corridor to provide access to the cables. The actual length between joint pits will vary due to site-specific and cable installation constraints. Final jointing pit locations will be provided in the EM&CP.

Joint pits will generally be in-situ or pre-cast concrete boxes with approximate dimensions of 50 ft by 15 ft (15.2 m by 4.6 m) to a depth of approximately 10 ft (3.3 m). A cast iron cover may be present at ground level for access by maintenance personnel. Direct buried installation may also be used instead of an accessible chamber, with access only to the link boxes, depending on the final evaluation.

Anticipated location of manholes, as well as cross sections of duct bank configurations and joint pits, are provided in **Exhibit 5**. Since the proposed interconnection cables will be solid dielectric, no dielectric fluid or insulating oil is needed and no oil pumping stations are proposed.

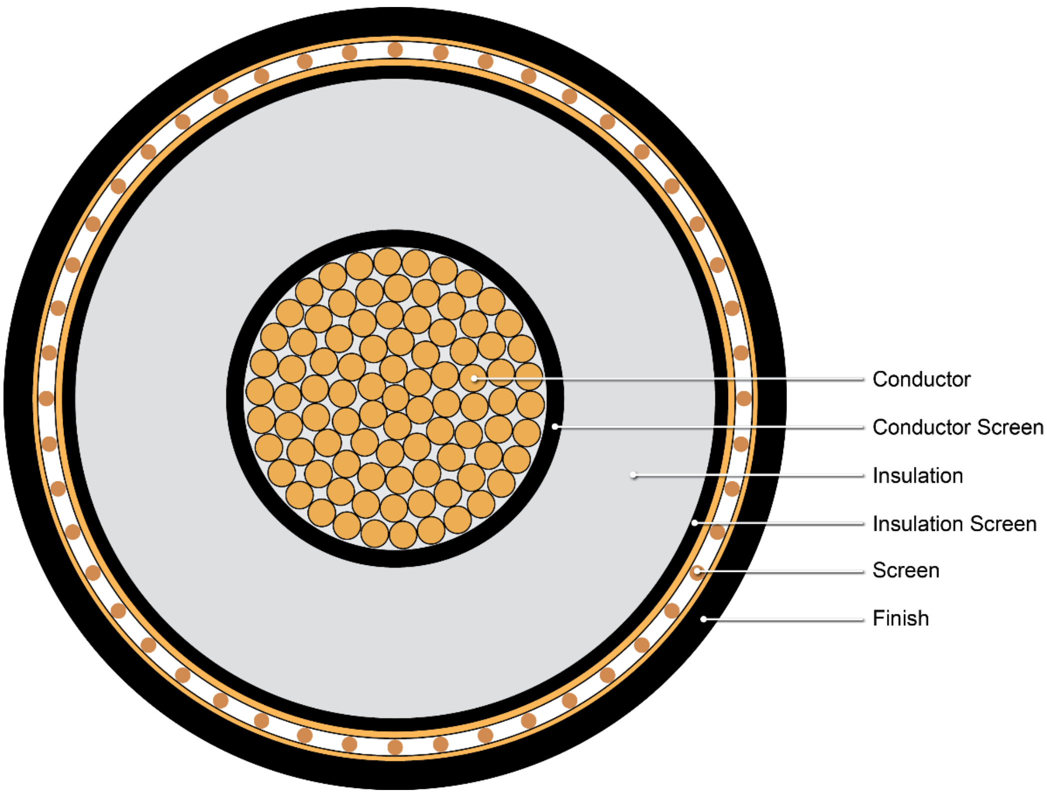

Figure E-3.2-3 Representative Cross-Section of Interconnection Cable

E-3.2.3.1 Conductor Design

The copper power conductors within each of the three insulated conductor cables will be made of round stranded or segmented copper or aluminum wires with a cross-sectional area of up to 3.9 in^2 (2,500 mm^2).

E-3.2.3.2 Insulation System

Copper conductors will be enclosed in an XLPE insulation system, rated for 362 kV. The Applicant does not anticipate any oils or insulating fluid as part of the cable insulation system.

E-3.2.3.3 Longitudinal Water Barrier

Semi-conductive swelling tape will be applied over the insulation screen.

E-3.2.3.4 Metal Sheath

The conductor cables will incorporate copper wires and a metallic laminated or lead sheath over the longitudinal water barrier.

E-3.2.3.5 Outer Sheath

An insulating polymeric sheath will be extruded over the metal sheath to act as mechanical reinforcement and corrosion protection for the metal sheath. A semiconductive skin will be extruded over the sheath for testing purposes.

E-3.2.3.6 Bending Radius

The onshore interconnection cables will not be installed with less than the manufacturer's minimum recommended bending radii. Typical minimum bending radii for the onshore interconnection cable are 20 times the outer diameter during installation and 15 times the outer diameter during operations.

E-3.2.3.7 Bonding

Bonding at regular intervals limits the induced voltage. Pending final onshore interconnection design, bonding points will be located at joint pit (manhole) locations with a typical distance of every 1,250 to 5,500 ft (381 to 1,524 m) and will be contained within link boxes. Final detail on the bonding and grounding will provided in the EM&CP.

E-3.2.3.8 Link Boxes

Pending final onshore interconnection design, link boxes are anticipated to be approximately 4 ft by 3 ft (1.2 m by 0.9 m) and 1.5 ft (0.5 m) high and located at joint pit (manhole) locations. A typical link box is provided in the conceptual onshore drawings in **Exhibit 5**.

E-3.2.3.9 Fiber Optic Cable

At least two fiber optic cables with an approximate diameter of 1.1 in (30 mm) will be installed.

E-3.2.4 Loop-In / Loop-out Lines

The loop-in / loop out line cables between the Hampton Road substation and the existing LIPA 138-kV lines under Lawson Boulevard in Oceanside, New York, will consist of four 138-kV cable circuits. Each cable circuit will comprise three single-core XLPE solid dielectric or oil-filled cables for a total of 12 cables. Each cable will be approximately 4.0 in (102 mm) in outer diameter.

The loop-in / loop-out lines will be housed in either common or separate duct banks, which will consist of thermal concrete or thermal fill,. The loop-in / loop out lines will be buried to a minimum target depth of 4 ft (0.9 m). The configuration of the cables within the duct banks may vary along the installation corridor. Duct bank configurations will be similar to those for the onshore export and interconnection cables and are depicted in **Exhibit 5: Design Drawings**. Each of the single-circuit concrete duct banks will be up to approximately 3 ft (0.9 m) wide by 2 ft (6 m) high and will consist of thermal concrete or thermal fill. Including spacing, the 2-circuit duct banks are expected to be approximately 6 ft (1.8 m) wide. The four circuits may be combined in a single duct bank up to 32 ft (10 m) wide.

Joint pits (manholes)/temporary pull-in pits are not anticipated to be needed for the loop-in / loop-out lines, as it is assumed that existing vaults along the existing LIPA 138-kV transmission cables will be used.

E-3.2.4.1 Conductor Design

The copper power conductors within each of the three insulated conductor cables will be made of round stranded or segmented copper wires with a cross-sectional area of up to 1.4 in^2 (887 mm^2).

E-3.2.4.2 Insulation System

Copper conductors will be enclosed in an XLPE insulation system, rated for 145 kV. In the event that insulating oil is needed for the design of the loop-in / loop-out lines, the oil pumping station would be located within the Hampton Road substation facilities.

E-3.2.4.3 Longitudinal Water Barrier

Semi-conductive swelling tape will be applied over the insulation screen.

E-3.2.4.4 Metal Sheath

The conductor cables will incorporate copper wires and a metallic laminated or lead sheath over the longitudinal water barrier.

E-3.2.4.5 Outer Sheath

An insulating polymeric sheath will be extruded over the metal sheath to act as mechanical reinforcement and corrosion protection for the metal sheath. A semiconductive skin will be extruded over the sheath for testing purposes.

E-3.2.4.6 Bending Radius

The onshore interconnection cables will not be installed with less than the manufacturer's minimum recommended bending radii. The minimum bending radius for the loop-in / loop-out lines should be 35 times the outer diameter during installation and 20 times the outer diameter during operations.

E-3.2.4.7 Bonding

Bonding at regular intervals limits the induced voltage. Bonding type is pending for the loop-in / loop-out lines. Final detail on the bonding and grounding will be provided in the EM&CP.

E-3.2.4.8 Communications

The use of fiber optic cables or radio communication needs for the loop-in / loop out lines is pending further design information.

E-3.3 Cable System Installation

This section describes the underground cable installation methods for the submarine export cables, cable landfall, onshore export cables, onshore interconnection cables and loop-in / loop-out lines.

E-3.3.1 Submarine Export Cable Installation

Offshore infrastructure within New York State waters will consist of submarine export cables and cable protection. The submarine export cables will be installed from a specialized vessel that will install the cables from a turntable on the lay vessel. One or several vessels might be used for the installation of the cables depending on a number of factors, such as seabed depth, depth of cable protection, distance to shore, installation methodology, and the type of cable protection method to be used. The submarine export cable installation methodology selected will also depend upon a variety of factors, including seabed characteristics and target burial depth. Installation methods that may be used along different portions of the submarine export cable route are described in Section E-3.3.1.2.

The submarine export cables will be buried to a minimum target depth of 6 ft (1.8 m), or in federally maintained channels and anchorages, to a minimum of 15 ft (4.6 m) below authorized depths or depth of existing seabed (whichever is deeper), if feasible. The Applicant does not anticipate that any federally maintained channels or anchorages will be crossed within New York State waters. The burial depth may vary from the target depth due to a variety of factors including seafloor conditions, previously installed utilities, other existing uses, and planned and future uses.

Other factors that will influence minimum target burial depth will be determined through cable burial risk assessment and could include activities such as non-regulated anchoring and seabed-impacting fishing (e.g., hydraulic clam dredging). For example, in areas of hydraulic clam dredging, a target burial depth of at least 6 ft (1.8 m) may be appropriate. A conceptual submarine export cable plan and profile is provided in **Exhibit 5**. A complete cable burial risk assessment will be conducted to inform the final design. Additional information on target burial depths will be provided with the EM&CP.

In areas where the target burial depth cannot be achieved due to existing seabed conditions or the presence of existing utilities (cables and/or pipeline), it is anticipated that protection measures will be required (see Section E-3.3.1.5 for additional information on cable protection).

The typical key stages of submarine export cable installation have been defined as:

1. Notification to the maritime community,
2. Unexploded ordnance (UXO) clearance and pre-installation activities[1],
3. Pre-sweeping (if needed),
4. Pre-trenching activities,
5. Cable lay and burial,
6. Cable and pipeline crossings,
7. Post-installation survey,
8. Post-crossing cable protection, and
9. Post-crossing or remedial cable protection (if needed).

The installation of the submarine export cables, including pre-installation activities, is expected to take up to approximately 2 months per cable for the submarine export cable route in New York. Pre-installation activities are expected to be conducted prior to the start of the cable lay. The actual installation schedule will be subject to seabed characteristics, installation vessel availability, other vessel traffic and weather.

E-3.3.1.1 UXO Clearance and Pre-Installation Activities

Prior to the installation of cables, survey campaigns including debris clearance, UXO clearance, pre-lay grapnel run, and pre-installation surveys may be completed. This is to ensure that the submarine export cable and burial equipment will not be impacted by any debris or hazards, either natural or artificial, during the cable lay and burial process and avoid the potential for equipment damage and/or delays. This work also serves to ensure sufficient cable burial depth.

[1] A separate pre-survey and route clearance might be performed prior to the pre-installation grapnel run and survey if there are expected to be large quantities of debris along the route.

It is anticipated that portions of the submarine export cable route will be surveyed for UXO and may, if required, be cleared. The submarine export cable will be micro-sited within the surveyed cable corridor to avoid potentially hazardous features; where re-routing is deemed unfeasible, these features will be managed in accordance with applicable regulations. A pre-lay grapnel run may be completed to remove seabed debris (abandoned fishing gear, wires, etc.) from the cable corridor, where feasible.

In some areas, existing, out-of-service cables and pipelines may be cut away and removed in order to install the submarine export cables. This removal will only be completed as part of pre-installation activities for pre-determined cables and pipelines for which written agreement is received from the owners and/or appropriate agencies (see Section E-3.3.1.6 for additional information on submarine cable and pipeline crossings).

E-3.3.1.2 Pre-Sweeping

In certain limited areas of the submarine export cable corridor, where underwater megaripples and sandwaves are present on the seafloor, pre-sweeping activities may be necessary prior to cable lay activities in order to achieve cable burial to the target depth. Pre-sweeping involves smoothing the seafloor by removing ridges and edges where present. The primary pre-sweeping method will involve using a mass flow excavator from a construction vessel to remove the excess sediment on the seafloor along the footprint of the cable lay; however, suction hopper dredge or other types of dredging equipment may be used depending on environmental conditions and equipment availability.

Where required, pre-sweeping activities will occur in an area of up to 164 ft (50 m) width along the length of the megaripples and sandwaves; the length of clearance will vary along the submarine export cable route. Megaripple and sandwave height vary depending on localized seabed and current characteristics. Pre-sweeping activities are also anticipated to be required along the nearshore portions of the submarine export cable route.

Should a suction hopper dredge vessel or similar equipment be used to complete these activities, the Applicant anticipates that dredged material will either be sidecast near the site of installation or removed for reuse or proper disposal. The actual method of dredged material management will be based on sediment sampling and consultation with regulatory agencies. Additional information on dredged material management and/or disposal will be provided as part of the EM&CP.

Mass flow excavation equipment, if used for pre-sweeping, will not generate dredge material requiring disposal; rather, the material will be sidecast. Within areas subject to pre-sweeping by either dredging or mass flow excavation, the submarine export cables will be subsequently installed to the target depth via jetting or other cable burial techniques (e.g., jetting, plowing, etc.).

E-3.3.1.3 Pre-trenching

Pre-trenching activities may be required in select locations along the submarine export cable route in areas where deeper burial depths may be required and/or seabed conditions would not be suitable for traditional cable burial methods without prior seabed preparation. Pre-trenching involves running the cable burial equipment over portions of the route in order to soften the seabed prior to cable burial and/or the use of a suction hopper dredge to excavate additional sediment. This activity helps facilitate an easier burial process in areas of greater depth. The impacts associated with this pre-trenching method are anticipated to be the same as those for cable lay and burial. Pre-trenching would be conducted as a separate activity prior to cable lay, such that sediments suspended during pre-trenching would be expected to settle out of the water column prior to the start of cable installation.

E-3.3.1.4 Dredging

Dredging is used to excavate, remove, and/or relocate sediment from the seabed in order to increase water depth and alter existing conditions; this can be completed through clamshell dredging, suction dredging, and/or hydraulic dredging. The dredging of sediment allows for deep draft vessels to safely navigate over shallow areas, as well as allowing for adequate burial of the submarine export cables in areas where deeper burial is required.

Dredging will be conducted as part of excavation of an exit pit for trenchless installation of the cable landfall segment of the submarine export cables, as described in Section E-3.3.2. At locations where the submarine export cable crosses other assets, localized dredging may also be needed in order to reduce the shoaling of the crossing design. This method is described in Section E-3.3.1.6.

E-3.3.1.5 Cable Lay and Burial

Following pre-burial activities, the submarine export cables will be brought to the appropriate section of the cable corridor and laid on the seabed. The main method of cable lay will use a dedicated cable lay vessel to place the submarine export cables and ensure the correct position on the seabed. Cable burial will be conducted via jetting, plowing, or trenching methods. Cable burial may be performed as separate campaigns, or cable lay and burial may be performed in one campaign. The submarine export cables will be laid onto the seabed and either buried directly and simultaneously via jet plow or mechanical plow, or a second vessel will follow the cable lay vessel to bury the submarine export cables via jetting. Mechanical plowing and trenching also may be used if required by site-specific seabed conditions and burial requirements. The final cable burial method selection will be made prior to the Applicant's filing of the EM&CP.

In shallow areas, such as in the vicinity of the cable landfall, the submarine export cable may need to be floated into place for burial, because water depths along this stretch are inadequate for the cable lay vessel. Should this floating installation method be implemented, the cable lay vessel will be located in deeper waters up to approximately 1,312 ft (400 m) from the burial location. The cable will be spooled out on floats, and the cable end will be floated by workboats to a dedicated vessel for accurate lowering and positioning of cable. The cable burial machine will then assist in burying the submarine export cable in place as it moves along the route in these shallower areas. The burial machine may also be run out of a separate construction vessel or barge.

Throughout the submarine export cable corridor, the two 345-kV submarine export cables are anticipated to be spaced variably, with separation distances ranging from 33 ft (10 m) to 300 ft (91 m) in New York State waters. Direct disturbance for installation will be up to approximately 33 ft (10 m) wide per cable, including approximately 5 ft (1.5 m) for the width of the burial tool penetrating the seafloor (bottom with of the trench), plus the additional width of seafloor contact and sediment sidecast. This will be located within the typically 500-ft (274-m) submarine cable siting corridor. The submarine export cable installation rate is dependent on seabed characteristics, installation vessel availability and weather.

The submarine export cables will be buried via jetting, plowing, or trenching methods as described below.

Jetting

Jetting will be the primary method for cable installation. Jetting may be conducted via a device that travels along the seafloor surface. Jetting may also be conducted with a vertical injector fixed to the side of a vessel or barge. These methods inject high pressure water into the sediment through a blade that is inserted into the seafloor to create a trench. Post-lay burial with a jetting tool means that the cable would first be laid along the seafloor, and then the post-lay jetting tool would follow and may attempt multiple passes of the area for burial.

Alternately, the cable may be fed from the cable vessel down through the device and simultaneously laid into the trench.

The high-pressure water from the jetting tool sufficiently softens the sediment such that the cable can be pushed down through the sediment to the desired burial depth. The adjacent sediment and displaced sediment then resettles into the trench. Jetting with simultaneous cable lay, using either a jet plow or vertical injector, is considered the most efficient method of submarine cable installation in many soil types, since it minimizes the extent and duration of bottom disturbance.

Cable installation production rates for any method will vary based on depth requirements, sediment types, installation vessel type, and conditions at the time of construction, so that the expected range of production rates for jetting methods may range from 3 to 52 feet per minute (ft/min) (1 to 16 meters per minute [m/min]). However, average rates expected for jetting methods are from approximately 20 to 26 ft/min (6 to 8 m/min).

Plowing or Mechanical Plowing

Plowing is conducted with a "mechanical" (i.e., non-jetting) cable plow that is pulled along the seabed, creating a narrow trench. The cable may be simultaneously fed from the cable vessel down to the plow, with the cable laid into the trench by the plow device. Gravity causes the displaced sediment to return to the trench, covering the cable. In general, material backfills naturally under wave action and tidal currents, but if necessary, additional sediment is mechanically returned to the trench using a backfill plow. Plowing is generally less efficient than jetting methods but may be used in limited site-specific conditions. Mechanical plowing may be used for harder soils, where jetting is determined to be problematic. These impacts are discussed in more detail in Section 4.2 of **Exhibit 4: Environmental Impact**. As described above, cable installation production rates are variable for different target depths, sediment types, installation vessel type, and conditions at the time of construction; rates for mechanical plowing are expected to range from 3 to 33 ft/min (1 to 10 m/min), with average rates of approximately 20 ft/min (6 m/min).

Trenching (Cutting)

Trenching is used on seabed containing hard materials not suitable for jetting or plowing. For those areas containing hard materials, the trenching machine mechanically cuts through the hard materials using a chain or wheel cutter fitted with picks or teeth. The cutter creates a trench that the submarine export cable is laid into and backfill is mechanically returned to the trench using a backfill plow. Trenching produces direct seafloor disturbance similar to jetting and plowing, with the potential to impact benthic infauna and epifauna from the action of the trenching machine, and to impact water quality from suspended sediment. As described above, cable installation production rates are variable for different target depths, sediment types, installation vessel type, and conditions at the time of construction; installation rates expected for trenching are up to 16 ft/min (5 m/min), with an average of approximately 7 ft/min (2 m/min).

E-3.3.1.6 Cable Protection Installation

Cable burial is the preferred protection technique, and the submarine export cables will be buried to the target burial depth wherever it is technically and commercially feasible to do so. Additional or alternative protection measures will only be used if determined to be necessary after an assessment of cable burial risk. In areas where burial of the cable is not feasible or where sufficient burial depth is not achieved, remedial cable protection will be installed to protect the cables. The locations requiring protection, the type of protection selected, and the amount placed around each submarine export cable will be based on a variety of factors, including water flow and substrate type (hydrodynamic scour modeling) and potential other uses (e.g., commercial fishing or other maritime activities). Alternative measures to burial may include:

- Rock: the installation of crushed rock or boulders over a cable;
- Rock Bags: the placement of pre-filled bags containing crushed rock over a cable;
- Concrete Mattress: the placement of concrete blocks, or mats, made of connected segments over a cable; and/or
- Geotextile Mattress: filled with rock or similar material.

In addition, at certain cable and pipeline crossings, tubular sections may be installed on the submarine export cable as a protection layer prior to the placement of the cable protection measures. With the exception of certain asset crossings discussed below, surficial use of concrete mattresses is not a favored method of cable protection, based on feedback during the consultation process. However, this approach may be the preferred solution at certain asset crossings in order to reduce shoaling in areas where cable burial is not feasible or target burial depth cannot be achieved.

Cable protection may be placed around appropriate sections of exposed or at risk cables, where the amount and type is dependent on the cable type and position, residual burial depth (if partially buried) and subject to the results of the geophysical and geotechnical surveys, hydrodynamic modelling and the cable burial risk assessment. It is estimated that up to 10 percent of the length of the submarine export cable route will require cable protection.

Table E-3.3-1 details the parameters for the proposed cable protection measures.

Table E-3.3-1 Summary of Cable Protection Maximum Parameters

Cable Protection Parameters	Maximum Representative Protection Measures a/
Submarine Export Cables	
Width at Base	36 ft (11 m)
Width at Top	5 ft (1.5 m)
Depth	5 ft (1.5 m)
Cable and Pipeline Crossings	
Width at Base	53 ft (16 m)
Width at Top	6.6 ft (2 m)
Depth	6.6 ft (2 m)

Note:
a/ Provided per cable within each installation corridor.

E-3.3.1.7 Cable and Pipeline Crossings

A number of existing cables and pipelines, both in-service and out-of-service (see **Exhibit E-6: Effect on Transportation** for detailed information on asset crossings), will be crossed by the submarine export cable route. Where the submarine export cable route requires the crossing of such assets, specific crossing designs will be developed and engineered. Cable crossing methodologies will be based on a variety of factors, including the type of asset to be crossed (i.e., material), the depth of the existing buried cable or pipeline, and whether the assets are in-service or out-of-service. These crossing methods will be detailed further in the EM&CP. Additional detail for cable and pipeline crossings and cable protection measures are provided in **Exhibit 5**.

A typical sequence for submarine export cables crossing other cable and pipeline assets is as follows:

- Once the precise location of the infrastructure to be crossed is determined, usually by survey, a layer of protection is installed on the seabed (if needed). Localized dredging may be required in order to minimize potential shoaling on the seabed before cable protection is installed.
- Cable burial will terminate before cable protection, at a predetermined distance documented in the crossing agreements and based on cable route, water depth and seabed conditions.
- The submarine export cable may have a casing installed prior to placement, as an additional layer of protection.
- The submarine export cable is laid over the first layer of protection.
- A second layer of protection is installed over the submarine export cable.
- Subject to burial depth, a final layer of protection may be installed over the crossing for further stabilization and additional scour protection; any remaining voids in the seabed at the installation site will be allowed to backfill naturally.

The Applicant has evaluated a variety of submarine export cable crossing methods for cable and pipeline assets. In evaluating potential asset crossing methods, the Applicant considered technical feasibility and potential to reduce impacts to marine navigation from shoaling. Based on challenges associated with other methods, traditional trenched crossings (**Figure E-3.3-1**), with either rock or mattress protection, are the proposed asset crossing methods.

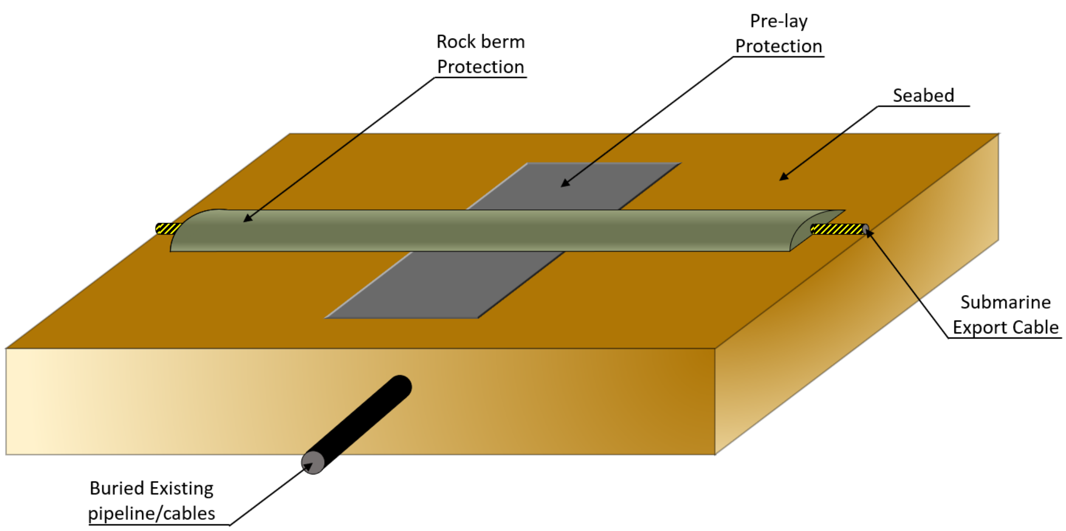

Figure E-3.3-1 Typical Cable Crossing Design

A traditional trenched asset crossing with crushed rock installation or a rock berm (**Figure E-3.3-2**) would consist of installation of rock at the base, cable lay, followed by another layer of rock protection over the top. Rock installation provides protection for the cable against anchor drags or other external impacts.

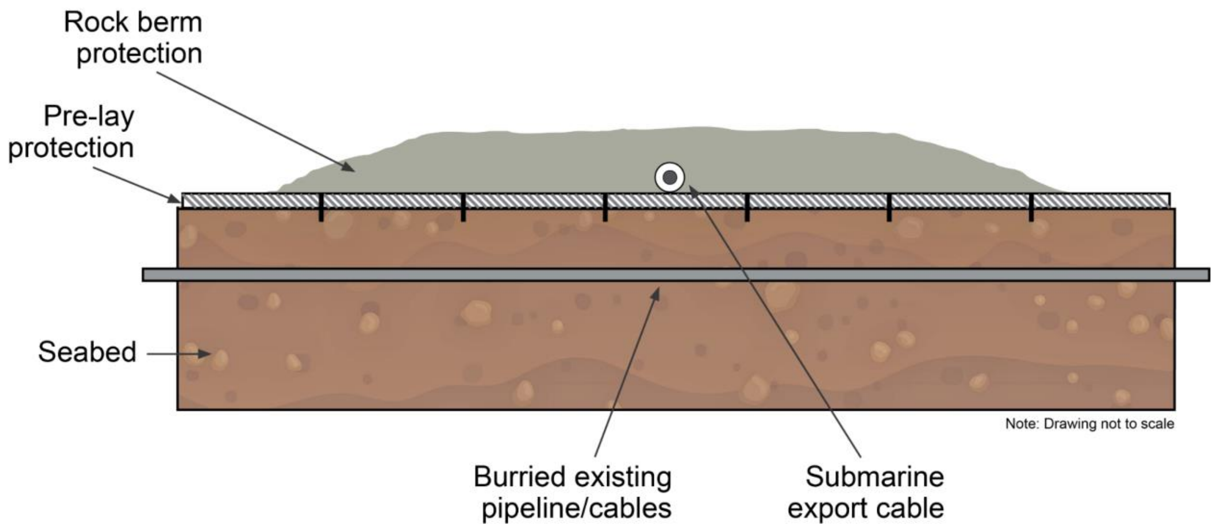

Figure E-3.3-2 Traditional Asset Crossing Installation with Rock Berm

For certain crossings, the Applicant is also evaluating the use of traditional trenched asset crossing measures protected with mattresses filled with either rock or concrete (**Figure E-3.3-3**). Potential methods include either laying the cable directly on the seafloor with a protective mattress on top or laying the cable on top of a layer of protective mattress on the seafloor, and then adding a second protective mattress over the top of the cable.

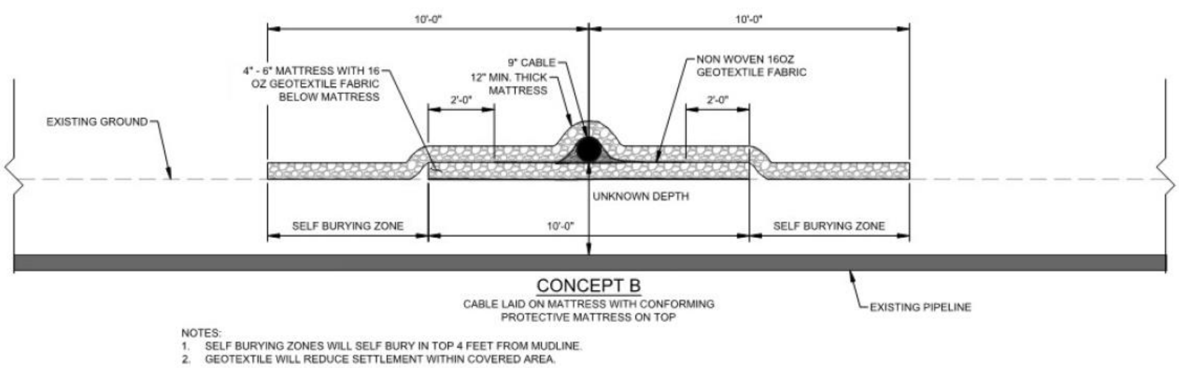

Figure E-3.3-3 Conceptual Diagram of Traditional Asset Crossing Installation with Mattresses

Excavation of material at crossings of identified assets to facilitate installation may be conducted before the crossing installation (**Figure E-3.3-4**) to allow for sufficient burial of the submarine export cables and reduce the need for supplemental cable protection material or shoaling on the seabed. This method may not be feasible at every location due to likely prohibitions or limitations on dredging in the vicinity of existing assets. However, if used, this crossing design could include the removal of approximately the top 8 ft (2.4 m) of seabed within a 33-ft by 52.5-ft (10-m by 16-m) area at each crossing; utilizing a 3:1 side slope, the upper bounds of this area will be approximately 59 ft by 79 ft (18 m by 24 m). Approximately 735 cubic yards (562 cubic meters) of material is anticipated to be removed by suction hopper dredge and/or MFE at each crossing. The final depth of the dredged area will be governed by the vertical distance between the natural seabed and the assets to be crossed.

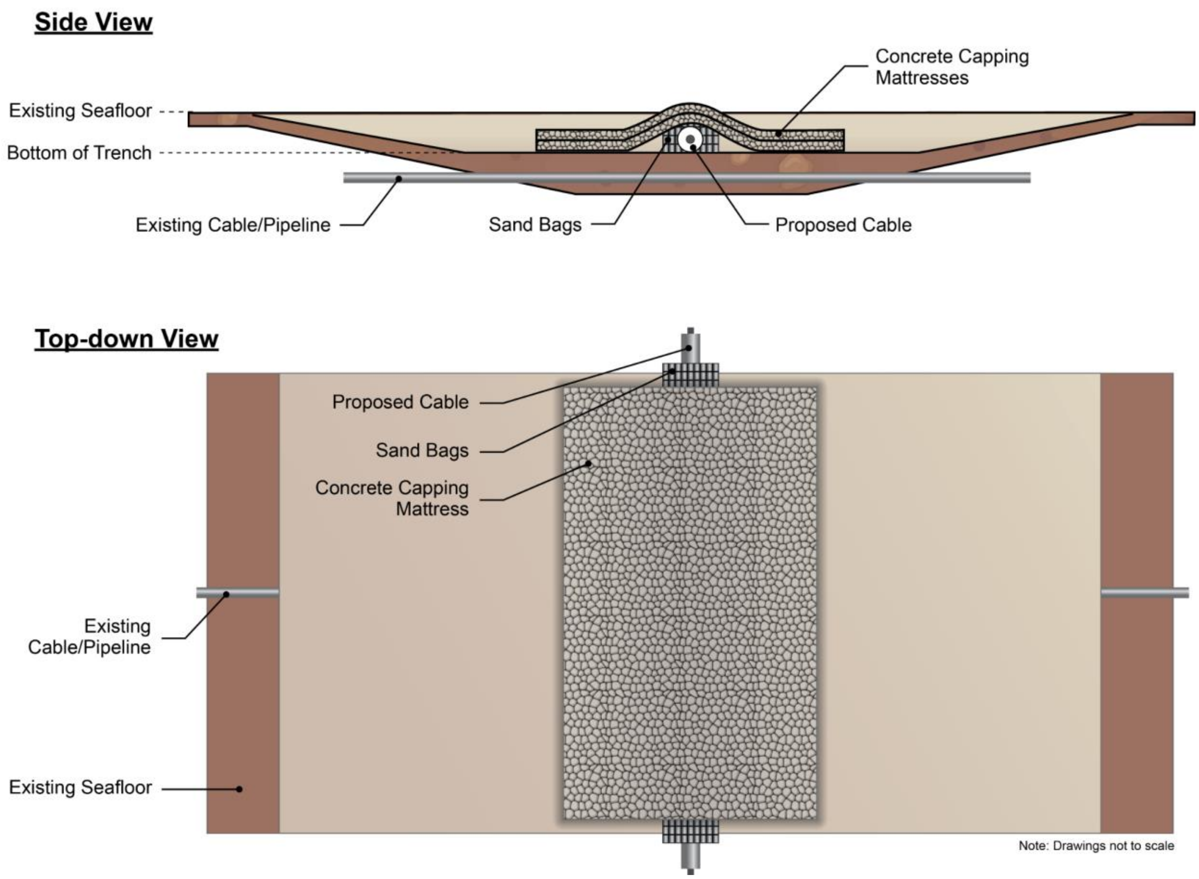

Figure E-3.3-4 Representative Option for Locally Dredged Asset Crossing Methodology

E-3.3.1.8 Post-installation Survey

After cable burial, a post-installation survey will be completed to determine the as-built conditions of the submarine export cables and the levels of burial achieved. At this time, areas requiring remedial cable protection will be identified.

E-3.3.2 Cable Landfall Installation

Trenchless installation of the cable landfall consists of installation of the cables through ducts between two points without surface disturbance, for example by a horizontal directional drill (HDD) installation. Trenchless methods allow for installing conduits or ducts beneath sensitive coastal and nearshore habitats, such as dunes, beaches, waterways, submerged aquatic vegetation, and other critical crossings. Trenchless installations can also be used to cross under major infrastructure, including railroads and highways.

Typically, trenchless installation operations for an export cable landfall originate from an onshore landfall location and exit a certain distance offshore, determined by the water depth contour and total cable landfall length considerations. To support this installation, both onshore and offshore work areas are required.

The Applicant is proposing HDD installations of the export cable landfall to minimize impacts to the marine and shoreline environments. The cable landfall will require two HDD installations, one for each circuit. The HDD method is described briefly below.

A joint pit/temporary pull-in pit on the onshore side of the cable landfall will transition the submarine export cables to the onshore export cables. The joint location is expected to be backfilled or installed in a concrete chamber, and may require a manhole; however, final design is ongoing. A link box chamber may be required at the surface level. All components will be buried underground. Representative example drawings of export cable transition components are provided in **Exhibit 5**.

The onshore work area for the HDD installations is located within the upland cable landfall workspace at the HDD entry point, supporting a drilling rig containment pit for drilling mud, a drill control cab, and staging of the drill stem and drilling mud production/recycling. Since the proposed cable landfall parcel is within an existing roadway and adjacent vacant lot, no impacts to vegetation, natural habitats, wetlands or waterways will result from use of this area for the HDDs. Once the onshore work area is set up, each HDD commences using a rig that drills a borehole underneath the surface. Prior to commencing drilling, casings may be installed for each entry point by hammering from a rig into the subsurface.

The drill begins with a pilot bore that advances a steerable, rotary drill bit along the design alignment from the drill rig entry location to the exit location. Once the pilot bore is completed, the pilot drilling assembly is removed and replaced with a reaming assembly. Reaming involves enlarging the pilot bore to a larger diameter to accommodate the conduits. Depending on the required diameter, multiple passes with reamers of increasing diameter may be required to incrementally enlarge the pilot bore to its final diameter.

Upon completion of the reaming pass(es), the condition of the HDD bore is assessed by completing a swab pass through the bore. This pass consists of pushing or pulling a slightly smaller diameter barrel or ball reamer through the fully reamed bore from start to finish. The cable landfall will typically consist of pre-installed conduits (steel or high-density polyethylene) ready for the submarine export cables to be pulled through. Once the drill for each HDD exits onto the seafloor, the duct for the submarine export cable will be floated to the exit point and pulled back onshore within the drilled borehole from the exit side.

The offshore exit location requires some seafloor preparation in order to collect any drilling fluids that localize during HDD completion. Preparation for each HDD may include installation of a cofferdam or excavation (wet or dry). A temporary steel casing and/or offshore goal posts may be installed on the offshore exit side from a jack-up barge to below the mudline. This jack-up barge will also house a drill rig. A pit will be excavated at the offshore exit point or material within the cofferdam will be dredged prior to installation of the conductor casing. Up to two cofferdams may be required (one for each landfall HDD). The offshore work area for the HDD installation requires approximately 10,000 square feet (930 square meters).

Onshore, the entry side of the HDD installation requires an approximate workspace of at least approximately 246 by 246 ft (75 by 75 m). The entry side staging area is required to locate equipment necessary for the installation, which includes the drill rig, stacks of drill pipe, operator control cabin, tooling trailers, crane or excavator, separation plant, mud tanks, mud pumps, water storage tanks, office trailer, and support trailers. In total, the proposed cable landfall parcel is 4.1 acres (1.6 ha).

In addition to the entry and exit staging areas, a staging area is also required for fabricating sections of the pipe or conduit string. The conduit or pipe string is fully fabricated into a single pipe with a length equivalent to the approximately length of the HDD installation (additional length may be necessary to account for geometry). This results in a pipe stringing area requirement for a single conduit pipe string that is typically 20 to 25 ft (6.1 to 8.2 m) wide by the length of the pipe string (2,460 ft [750 m]). The pipe or conduit string is floated out to the offshore HDD exit point, where it will be installed by using the drill string to pull it back through the drill hole. The Applicant is evaluating potential offsite upland staging areas for the pipe string fabrication.

Target depths of landfall HDD paths vary by the length of the HDD. Longer HDD installations typically require greater depths of cover to allow for sufficient overlying strength to resist the drilling fluid pressures. Inadvertent returns occur when drilling fluid pressures exceed the strength of the overlying geotechnical material, and pressure causes the drilling fluids to follow a path that flows upwards and outwards until the pressure is relieved. Drilling fluids reaching the sediment surface may pond on the ground surface in uplands or be released on the seabed as inadvertent returns. All HDD installations carry some risk of an inadvertent drilling fluid return, especially during the exit curve and exit tangent, as the drill bit is steered upwards toward the ground surface. Inadvertent return risks can be reduced along the majority of an HDD alignment by selecting an appropriate depth of cover that provides sufficient overlying strength to resist the required fluid pressures. The Applicant will develop and implement an Inadvertent Return Plan to avoid, minimize, and/or mitigate potential impacts from potential inadvertent returns of drilling fluids.

E-3.3.3 Onshore Export and Interconnection Cable Installation

Based on the existing conditions along the onshore export and interconnection cable routes, both trenchless (e.g., HDD and jack and bore) and trenched (open cut trench) methods are proposed for installation of onshore export and interconnection cables.

The Applicant anticipates that ground-disturbing activities for onshore export and interconnection cable installation will take approximately 2 years. However, installation activities will not be continuous during this period and will move along the length of cable corridor, such that the duration of disturbance in any given location will be less. Work within the public roadway will be coordinated with the Nassau County Planning Department's Transportation Division, the City of Long Beach, the Town of Hempstead, and the Village of Island Park.

E-3.3.3.1 Open Cut Cable Installation

The onshore export and interconnection cables will be installed utilizing open-cut trench as the primary installation method, except where trenchless methodologies are necessary. Open-cut installation will typically include the following main activities:

1. Preparing the construction corridor, including safety and traffic management as necessary;
2. Excavating a trench;
3. Installing ducting;
4. Establishing jointing bays;
5. Pulling onshore cables through the ducts;
6. Joining the cables; and
7. Restoring the construction corridor.

The preparation of the construction corridor typically includes survey and corridor marking, clearing, and grading. However, clearing and grading activities are anticipated to be minimal or unnecessary because of the highly developed nature of the onshore cable corridor, which is located primarily in an existing road right-of-way and existing paved areas in an urban environment. Activities will move progressively along the construction corridor so that construction sequence activities may be in different stages in different areas of the corridor.

To install the ducting using the open-cut method, a trench will be excavated along the onshore cable route. The trench will be up to 10 ft (3 m) deep and 30 ft (9 m) wide, within up to a 150-ft (46-m)-wide construction corridor, including duct banks for both circuits. The duct bank will be installed with a minimum of 3 ft (0.9 m) of cover.

Existing utility and infrastructure crossings may require deeper trenching or trenchless installation segments (see Section E-3.3.3.2). Identification of the existing utility crossings and infrastructure information along the onshore export and interconnection cable routes is ongoing. Trench shoring will be installed as needed in accordance with applicable health and safety regulations and policies.

During excavation activities, the excavated materials will be stockpiled and/or removed and replaced with new material. Cut pavement and other materials may be placed immediately in a container or truck for off-site disposal. Erosion and stormwater controls will be installed adjacent to work areas and around stockpiled material when left within the cable corridor, as needed; additional details will be provided as part of the EM&CP.

If groundwater is encountered during trenching, dewatering may be needed prior to installation. Dewatering discharges for the NY Project may be to an existing sewer or to a surface waterbody, and as necessary, will be conducted in accordance with the appropriate State Pollution Discharge Elimination System (SPDES) permit. The Applicant will test groundwater in areas of known contamination where excavation will occur to determine if treatment may be necessary prior to discharge in order to comply with the applicable authorization (e.g., SPDES or discharge to sewer).

Pre-fabricated ducts or conduits will be lowered into the trench, spacers installed, and duct banks formed with poured concrete/cable sand or similar. Once the duct bank installation is complete, the trench will be backfilled, typically using the excavated soil, if it is suitable and approved for reuse by permitting authorities. Unsuitable or contaminated soils will be disposed of offsite in an approved manner and location, and suitable soil will be brought in and used as backfill. The area then will be restored to pre-construction conditions by stabilizing with a seeding mix or re-paving as applicable.

A mandrel will be pulled through the conduit for cleaning and the conduit will be tested. Finally, the cables will be pulled through the conduits from joint bay locations and spliced. Once fully installed, the cables will be tested prior to being brought into service.

E-3.3.3.2 Open Cut Waterbody Crossings

In the case that the Applicant determines a trenchless or bridge crossing solution for waterway crossings (Reynolds Channel and Barnums Channel) along the onshore export and interconnection cable routes are not feasible, an open cut crossing may be used as a back-up solution. For a waterway crossing, an open cut is typically constructed using excavators working from both banks and/or within the channel, as necessary. Excavated material is collected in an appropriate manner for either re-use or disposal (depending on the nature of the material) and in accordance with applicable regulations. Installation via an open cut requires an approximately 120 ft (37 m) construction corridor across the channel.

If further feasibility evaluation reveals that an open cut crossing method is required, the Applicant would evaluate installation of the onshore export or interconnection cables via an open cut with a dry crossing method. A dry crossing method involves isolating the work area from the flow of water (with sandbags, bladderdam, cofferdam, or other measures) prior to trenching, and using a dam-and-pump, flume, or similar design to transport water from one side of the work area to the other. Dry crossings minimize the transport of sediment during an open cut by preventing water from flowing across the disturbance area until the bed and backs have been restored. In the case that a dry crossing is also not feasible, a wet crossing would be used, and the Applicant would consider the potential efficacy of alternative best management practices to minimize sediment transport (e.g., silt curtains).

E-3.3.3.3 Jack and Bore Cable Installation

The Applicant may use trenchless construction along the onshore export and interconnection cable routes in order to cross the existing roads, railroad tracks, buried utilities and infrastructure. The jack and bore method is completed by installing a steel pipe or casing under existing roads, railways, or other infrastructure. This is done by excavating a bore (entry) pit and a receiving (exit) pit on either side of the crossing. An auger boring machine is then placed in the entry pit, to jack a casing pipe through the earth while at the same time removing earth spoil from the casing by means of a rotating auger inside the casing. The cables are then pulled through the casing.

The jack and bore crossing installation typically requires an extra work area of approximately 60 ft by 60 ft (18 m by 18 m) alongside the onshore cable corridor. Within the cable corridor, the crossing requires a 60-ft by 60-ft (18-m by 18-m) bore pit to be excavated on one side and a 40-ft by 40-ft (12-m by 12-m) receiving pit on the other side.

Excavated soil will be stockpiled next to the pits or in some cases may be placed immediately in a container or truck for disposal. Depending on groundwater levels, it is also possible that the bore and/or receiving pits will need dewatering. The rate of dewatering and the quality of the water will determine whether the water may be placed into frac tanks for off-site disposal, or if permissible, into the storm drain system. Impacts on water quality will be minor and short-term from dewatering, assuming dewatering best management practices are employed. Erosion and stormwater controls will be installed around stockpiled material when left within the cable corridor. Additional details for sediment and erosion control, soil stockpiling, and dewatering will be provided as part of the EM&CP. Once the installation is complete, the bore and receiving pits will be returned to pre-construction conditions.

E-3.3.3.4 HDD

Onshore or waterway HDD crossings utilize a drilling rig that drills a borehole underneath the ground’s surface, with two onshore workspaces on either side of the crossing. HDD is frequently used to install cables in ducts under sensitive coastal and nearshore habitats, such as dunes, beaches, waterways, and submerged aquatic vegetation, as well as under existing infrastructure and highways. Similar to the cable landfall HDD described in Section E-3.3.2, a bentonite and water-based drilling fluid is used to lubricate the drill bit, return the cuttings to the bore pit, and maintain the borehole during drilling. Depending on the size of the borehole required, a pilot hole is advanced, followed by one or more reaming passes in order to enlarge the hole. Once the desired size borehole is achieved, a duct is pulled back within the drilled borehole and the onshore cables are pulled through the installed duct. Onshore crossings require two onshore work areas (approximately 246 ft by 246 ft [75 m by 75 m] on each side) to support the activities.

The Applicant is proposing to install an HDD along the onshore export cable route to cross Reynolds Channel. This crossing will involve installation of the two land-to-land HDDs, one for each of the onshore export cables, for approximately 1,014 ft (309 m) across the waterbody. For the Reynolds Channel crossing, both workspaces are located on previously developed commercial/industrial lands adjacent to the waterbody; on the north side of the Reynolds Channel crossing, workspace will be located within the onshore substation site. Conceptual drawings for the Reynolds Channel crossing are provided in **Exhibit 5**.

E-3.3.3.5 Cable Bridge

The interconnection cable route includes an inland waterway crossing between the Village of Island Park and Oceanside, New York, which may be crossed by an above-water cable bridge. This crossing will consist of two cable tray transition areas to elevate the cables to the height of the proposed bridge superstructure. The total structure, inclusive of the two transition areas and the bridge superstructure, will be supported by approximately thirty-one piles at seven locations (e.g., pile caps). The proposed piles to support the transition areas and bridge superstructure consist of steel H-piles installed within 2-ft (0.61-m) diameter steel pipe piles. Multiple piles will be required at each pile cap location along the bridge.

Within the crossed waterway there are planned to be up to five bent caps consisting of approximately twenty-three piles. These supports may be installed by hammer or other installation methods, up to 100 ft (30 m) below the seabed, with final design subject to geotechnical investigation. The cable bridge superstructure will be constructed from a prefabricated steel truss system assembled offsite and set in place. The superstructure will measure up to 25 ft (7.6 m) wide and 10 ft (3.0 m) tall and span a length of approximately 200 ft (64 m). The crossing will be located adjacent to the existing Long Island Rail Road railway bridge. The bridge superstructure is anticipated to have low chord elevation up to 16.0 ft NAVD8, with a maximum total height of 30 ft (9.1 m) NAVD88. Conceptual drawings of the cable bridge are included in **Exhibit 5**.

E-3.3.4 Loop-in / Loop-out Line Installation

The loop-in / loop-out lines will be installed underground, using methods similar to those described in Section E-3.3.3 for the onshore export and interconnection cables. Immediately to the east of the Hampton Road substation, the loop-in / loop-out lines will cross the existing LIRR railroad tracks. The loop-in / loop-out lines are anticipated to be installed across the railroad using the trenchless jack and bore method further described in Section E-3.3.3.3. The jack and bore method is completed by installing a steel pipe or casing under existing roads, railways, or other infrastructure. This is done by excavating a bore (entry) pit and a receiving (exit) pit on either side of the crossing. An auger boring machine is then placed in the entry pit, to jack a casing pipe through the earth while at the same time removing earth spoil from the casing by means of a rotating auger inside the casing. The cables are then pulled through the casing.

The remainder of installation of the loop-in / loop-out lines is anticipated to be completed using typical open cut installation methods that described in Section E.3.3.3.1. There are no waterbody crossings along the loop-in / loop-out line route.

Construction and installation of the loop-in / loop-out lines will be determined through a mutually acceptable Interconnection Agreement between the Applicant and LIPA, as developed through the NYISO interconnection process.

E-3.3.5 Cable System Maintenance

The NY Project will be designed to operate with minimal day-to-day supervisory input, with key systems monitored remotely 24 hours a day. During operations, the NY Project will require both planned and unplanned inspections and maintenance, which will be carried out by qualified engineers, technical specialists, and associated support staff. For the facilities that the Applicant will own and operate, the Applicant will ensure that all components are maintained and operated in a safe and reliable manner, compliant with regulatory conditions, and in accordance with commercial objectives. Operations and maintenance of the loop-in / loop-out lines are anticipated to be conducted by LIPA and PSEG-LI.

The Applicant's Operations and Maintenance (O&M) Plan will be developed and finalized prior to the commencement of construction. An Oil Spill Response Plan (for offshore facilities); Spill Prevention, Control and Countermeasures Plan (for onshore facilities); and Safety Management System will also be developed and implemented during O&M activities.

The submarine export, onshore export, and interconnection cables will be monitored through Distributed Temperature Sensing equipment. The Distributed Temperature Sensing system will be able to provide real time monitoring of temperature, alerting the Applicant should the temperature change, which often is the result of a change in cable burial depth, for example caused by scouring of cable covering material. The Applicant will also conduct surveys of the submarine export cables to confirm the cables have not become exposed or that the cable protection measures have not worn away. A Distributed Vibration Sensing system will be integrated within the submarine export cables to provide real-time vibration monitoring close to the cables, which may indicate potential dredging activities or anchor drag occurring close to the cables. Upon receiving any such alert, the Applicant will warn vessels in the area (for the submarine export cable route), assess the cable condition, and identify any needed corrective actions.

Should one of the submarine export cables fault, the portion of the cable will be spliced and replaced with a new, working segment. If the submarine export cables or cable protection measures require repair, the submarine export cables require reburial, or new cable protection is required, impacts associated with repair activities will be similar to those described for construction activities, but with a much shorter duration and a more limited area of the cable corridor.

The onshore export and interconnection cables should not require regular maintenance, but occasional repair activities may be required should there be a fault or damage caused by a third party.

Monitoring and maintenance of the loop-in / loop-out lines are anticipated to be conducted by LIPA and PSEG-LI and are assumed to be consistent with procedures and protocols employed along LIPA's existing 138-kV transmission system.