CHAMPLAIN HUDSON POWER EXPRESS PROJECT

PROJECT DESCRIPTION AND PURPOSE

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PREFACE

In December of 2010, Champlain Hudson Power Express Inc. and CHPE Properties Inc. (collectively the "Applicants") submitted an application to the United States Army Corps of Engineers ("USACE") to obtain construction permits pursuant to Section 404 of the Clean Water Act ("Section 404") and Section 10 of the Rivers and Harbors Act ("Section 10") ("USACE Application") for the Champlain Hudson Power Express Project ("CHPE" or "Project"). The Project route was based on the routing provided to the New York State Public Service Commission ("Commission") in an application for a Certificate of Compatibility and Public Need pursuant to Article VII of the New York Public Service Law (Case No. 10-T-0139) submitted in March of 2010 and supplemented in July of 2010.

In November of 2010, the Applicants and other stakeholders including New York State agencies and non-governmental agencies ("NGOs"), initiated confidential settlement negotiations in the context of the Article VII process. On February 24, 2012, the settlement negotiations concluded when an agreement was reached on terms and conditions related to a wide range of issues including Project routing, construction windows, collocated infrastructure, and agency consultations ("Joint Proposal"). As a result, the Applicants are submitting this Supplemental Application with revised portions of the previously submitted (December 2010) USACE Application to reflect the Joint Proposal developed as part of the Article VII settlement process.

1.0 PROJECT PURPOSE

The Project consists of a 1,000-megawatt ("MW") underwater/underground high voltage direct current ("HVDC") electric transmission system extending from the international border between Canada and the United States to Queens, New York City, New York. The Applicants propose to develop the Project to deliver clean sources of power to New York City.

The stated purposes of the Project include the following:

- Provide 1,000 MW of primarily carbon-neutral source electricity to New York City without contributing to additional congestion on the electric grid entering the city;

- Provide significant new transmission infrastructure into New York City without the aesthetic impacts associated with traditional overhead transmission projects;
- Place downward pressure on the price of electricity in the Location Marginal Price ("LMP") spot markets operated by New York ISO in the New York City area;
- Reduce air pollution and greenhouse gas ("GHG") emissions within New York City;
- Improve stability of the electric grid serving the New York City area due to the highly reliable and controllable nature of HVDC technology; and
- Reduce the dependency of the New York City region on fossil fuels, such as imported oil.

2.0 PROJECT DESCRIPTION

The Project originates at the international border between the United States and Canada and continues south within Lake Champlain for approximately 101.5 miles in waters of the state of New York. The cables are to be located to the east of Rouses Point, Point au Fer, Chazy Landing, Point Au Roche and Cumberland Head, east of Valcour Island and the Four Brothers islands, and then will continue towards the New York – Vermont border near the middle of the lake. From Split Rock Point south the cables would be located closer to the New York shoreline. Proceeding southward from Crown Point, the waters of the lake become shallower, and the cable route will be closer to the New York-Vermont border near the middle of the narrow water body.

At milepost ("MP") 101.5, in the town of Dresden, Washington County, New York, the transmission cables will transition from the waters of Lake Champlain to the land on the western shore via a horizontal directional drill ("HDD"). The cable route will then transition from under Lake Champlain to land owned by the Delaware and Hudson Railway ("D&H")[1] and other property owners and then enters the right-of-way ("ROW") of New York State Route 22. The cables will continue south within the Route 22 ROW until MP 111.9, except for a crossing of South Bay at MP 109.7. The cable route will continue within the Route 22 ROW into the Village of Whitehall and then will enter the Canadian-Pacific Railway ("CP") ROW on lands owned by the D&H within the Village of Whitehall. The cables will remain primarily within the

[1] The D&H was acquired some years ago by the Canadian Pacific Railway Company, but it still operates for many purposes under the D&H name.

CP ROW and lands owned by the D&H for approximately 65.1 miles, crossing the Washington County municipalities of Whitehall, Fort Ann, Hartford, Kingsbury, Fort Edward Town and Village; the Saratoga County municipalities of Moreau, Northumberland, Wilton, Greenfield, City of Saratoga Springs, Malta, Milton, Ballston, and Clifton Park; the Schenectady County municipalities of Glenville, Rotterdam and the City of Schenectady. Along this portion of the overland route, the cable route will have relatively minor deviations out of the CP ROW onto private and public lands for various engineering constraints, such as a narrow section of ROW, buildings, railroad developments, and sensitive habitat areas. In Schenectady, the proposed route will leave the CP ROW at MP 173 to be installed within Erie Boulevard so as to bypass a section of railroad bridges. The cables will re-enter the CP ROW around MP 173.6, but will exit again at MP 173.7 to utilize largely vacant land to pass beneath Interstate I-890. The cables re-enter the CP ROW at MP 174.3 and will continue to the Town of Rotterdam.

Around MP 177 in Rotterdam, the cables will transfer from the CP ROW to the CSX Transportation Railroad ("CSX") ROW. The cables will be located within the CSX ROW southeasterly for approximately 22 miles through the Albany County municipalities of Guilderland, New Scotland, Village of Voorheesville, Bethlehem and Coeymans. From MP 199, the cables will continue along a CSX ROW that runs south parallel to the Hudson River within the Town of Coeymans and the Village of Ravena, and the Greene County municipalities of New Baltimore, Town and Village of Coxsackie, Town of Athens, and the Town and Village of Catskill. There are relatively minor deviations from the CSX ROW due to engineering constraints such as bridges, roadway crossings, and areas where the existing ROW is too narrow to permit cable installation while meeting established railroad clearance criteria.

In the Town of Catskill north of the hamlet of Cementon, the cable route will exit the CSX ROW at MP 227.5 and turn easterly to follow Alpha Road, which terminates at a landing area at MP 228.2. At this point the cables will transition into the Hudson River via an HDD. The cables will be located within the Hudson River south from Cementon for approximately 67 miles. The cable route has been sited to avoid known sensitive habitat, potential cultural resources, contamination zones and navigation hazards to the extent achievable.

At MP 295.7, the cables will transition from the Hudson River via an HDD and enter a CSX ROW in the Rockland County Town of Stony Point. The cables subsequently will follow the CSX route and public road ROW for a 7.7-mile overland bypass of Haverstraw Bay, which has been identified as one of the most sensitive significant coastal habitats within the Hudson River. The cable route then will travel through the Town of Haverstraw, Village of West Haverstraw and Village of Haverstraw primarily within the CSX ROW, although there are deviations to avoid engineering constraints such as bridges and roadway crossings. At MP 300.8, the CSX ROW is bordered on the east and then on both sides by Haverstraw Beach State Park; therefore, starting at MP 301.4, an HDD will be established to install the cables under Rockland Lake State Park and Hook Mountain State Park (comprising portions of Palisades Interstate Park) to enter the ROW of NYS Route 9W in the Town of Clarkstown. From MP 301.8 to 302.4, the cables will be located within the Route 9W ROW. At this point, another HDD will install the cables beneath the two parks and transition the cables into Hudson River.

From MP 302.8 southerly of Haverstraw Bay, the cables will be located within the New York State section of the Hudson River for approximately 20.7 miles. As with the other in-water segments, the routing has been set so as to avoid sensitive resources. At MP 324, the cable will turn easterly and enter Spuyten Duyvill Creek and the Harlem River within the borough of Manhattan in New York City. The cable route will be located within the Harlem River for 6.58 miles, and then transition to land via an HDD to enter a CSX ROW in the borough of the Bronx. The cable route along CSX ROW will cross lands owned by the New York State Department of Transportation, cross beneath the Robert F. Kennedy Bridge and the Hell Gate railroad bridge and then transition via an HDD to cross beneath and into the East River. From the East River the cable route will transition to land via another HDD in the borough of Queens in New York City, and will continue easterly to the Luyster Creek converter station site in Astoria, north of 20th Avenue on lands of Consolidated Edison Company of New York, Inc. (“Consolidated Edison”).

The converter station will be a “compact type” with a total footprint (i.e., building and associated equipment and related areas) of approximately five (5) acres. Gas insulated HVAC cables will connect the converter station to NYPA’s Astoria Annex 345 kilovolt (“kV”) substation. If Consolidated Edison proceeds with its recently announced plans to connect a phase angle regulating transformer (“PAR”) to the Astoria Annex substation, the Applicants may need to construct a four-breaker gas-insulated ring bus in a building to be located on the same parcel as the converter station, unless a preferable location for this ring bus can be found closer to the Astoria Annex.

From the Astoria Annex substation, another set of HVAC cables will be located within the streets of New York City for approximately three miles to Consolidated Edison's Rainey Substation ("Astoria-Rainey Cable"). The cable will run north parallel along 20th Avenue before crossing 20th Avenue southwesterly onto 29th Street. The cable route will continue within 29th Street for one city block before turning northwest onto 21st Avenue and continuing within 21st Avenue until 23rd Street. The cable route will turn onto 23rd Street and continue southerly, including crossing under the Triborough Bridge, until 30th Drive. The cable route will then turn westerly on to 30th Drive and then southerly within 14th Street. The cable route would turn to the west onto 31st Drive for one city block before turning to the south onto 12th Street. The cable route would turn west onto 35th Avenue and continue to the Rainey Substation.

3.0 CONSTRUCTION METHODS

Given the length of the route from the Canadian border to New York City (approximately 333.3 miles for the international border to the converter station plus the Astoria-Rainey Cable which is approximately 3.5 miles) and the diversity of landforms and water areas that are crossed by the cable route, a variety of construction methods and equipment will be employed. As part of the Joint Proposal developed during the settlement negotiations with New York State agencies and NGOs under the Article VII process, the Applicants developed a Best Management Practices ("BMP) Manual, which details BMPs to be utilized during Project construction. The BMP Manual is provided in Attachment O of the Supplemental Application.

3.1 Terrestrial Installation Methods

For the overland portions of the cable route, the cables will be buried via excavated trenches or trenchless technology (HDD or Jack and Bore [J&B]) methods. The majority of the overland portion of the cable route is located within or immediately adjacent to the existing CP, CSX, and NYS Route 22 and 9W ROWs. Standard and typical diagrams, which include details representing various methods and equipment to be used during Project construction, are provided in Attachment H of the Supplemental Application.

A minimum separation distance is required from the rails to the cables by each railroad; CP requires a minimum separation of 10 feet from the centerline of the outermost track to the cable trench, and CSX requires a minimum separation of 25 feet from the centerline of the outermost track. The typical and preferred layout is to have the bipole (two cables) installed on one (same) side of the railroad tracks. With this layout, the limits of anticipated construction activity extend 40 feet beyond the required minimum setback of the railroads. This 40-foot area will include the area needed for excavation of the trench (approximately four (4) feet wide), installation of erosion and sediment control measures, and stockpiling of excavated material (Attachment H of the Supplemental Application). There are areas that will require different configuration and pose additional engineering challenges, such as steep slopes, environmentally sensitive areas, and existing structures. These areas will be identified and site-specific engineering solutions will be developed as part of the final design phase of the Project. A minimum construction corridor of 25 feet will be required along the edge of Routes 22 and 9W for installation of the two HVDC cables, although a wider width may be employed to allow for more efficient construction and quicker completion of the work in these areas. Along the Astoria-Rainey corridor, a minimum construction width of approximately 20 feet will be necessary for equipment operation and spoil stockpiling. Additional roadway lane closure will be necessary during excess spoil removal, material delivery, and similar operations (Attachment H of the Supplemental Application).

Each of the two overland cables will require a number of joints and a temporary flat pad will be installed underneath each joint for splicing activities. The number of joints will be kept to a minimum and will be determined either by the maximum length of cable that can be transported in a single piece or by the maximum length of cable that can be pulled, whichever is the least, as well as the number of HDD and J&B locations. For land installation, the expected maximum segment lengths between splices will be approximately one-half mile. The jointing for both cables will be performed in a single jointing pit, with typical pit dimensions being 30 feet long, 12 feet wide, and four (4) feet deep (see “Typical Splice Vault,” Figure 176764-UM-35, in Attachment H of the Supplemental Application). Subsequent to completion of cable jointing, the jointing pit will be backfilled primarily with native soils to the original contours/conditions. As further described in Section 5 and shown in the diagrams included in Attachment H of the Supplemental Application (see “Typical Trench Cross-Section”) thermal resistivity sand and a protective covering may be used around the immediate vicinity of the buried cables.

The following sections identify the general construction sequence for routine cable installation along the overland portion of the cable route:

- Initial clearing operations and storm water and erosion control installation;
- Trench excavation;
- Cable installation;
- Backfilling; and
- Restoration and revegetation.

3.1.1 Initial Clearing Operations & Stormwater and Erosion Controls

Initial clearing operations will include the removal of vegetation within the cable trench area and within any temporary additional construction workspace (e.g., HDD workspace, cable joint pits, access roads and staging areas) either by mechanical or hand cutting. Vegetation will be cut at ground level, leaving existing root systems intact except for the immediate trench area, and the aboveground vegetation removed for chipping or disposal. Tree stumps and rootstock will be left undisturbed in the temporary workspace wherever possible to encourage natural revegetation. Brush and tree limbs will be chipped and spread in approved locations or hauled off-site for disposal. Timber will be removed from the right-of-way for salvage or to approved locations.

The cleared width within the ROW and temporary construction workspace will be kept to the minimum that will allow for spoil storage, staging, assembly of materials, construction vehicle passage, and all other activities required to safely install the cables and associated equipment.

Prior to or closely following initial disturbance of the soil, erosion controls will be properly installed as required. Representational drawings of erosion control methods are included in Attachment H of the Supplemental Application (see “Silt Fence,” Figure 176764-UM-21 and “Straw Bale Dike,” Figure 176764-UM-22). Design of the stormwater and erosion controls will be completed as part of the final engineering phase and will include measures such as silt fences, haybales, temporary mulching, etc.

3.1.2 Trench Excavation

The typical cable trench along the overland portion of the route will be four (4) feet wide at the bottom and approximately four (4) to five (5) feet deep to allow for the proper depth required for the burial of the cables (see "Typical Trench Cross Section," Figure 176764-UM-08, in Attachment H). The cables will generally be installed side-by-side; although in some situations there may be up to three feet of spacing between the cables within the four-foot-wide trench.

In normal terrain where the soil conditions range from organic loam, sand, gravel or other unconsolidated material and sufficient clearances exist, traditional excavation equipment will be used. The mixing of topsoil with subsoil will be minimized by using topsoil segregation construction methods in agricultural lands and wetlands (except when standing water or saturated soils are present). Topsoil will be stripped from the trench and subsoil stockpile area (trench plus spoil side method) and placed on one side of the trench. Subsoil will be placed on the other side of the trench or otherwise segregated. Representational drawings of stockpile placement and management are included in Attachment H of the Supplemental Application (see "ROW Top Soil Segregation Techniques"). Should it become necessary to remove water from the trench, it will be pumped to a stable, vegetated upland area (where practical) or filtered through a filter bag or siltation barrier.

Based on review of soils and geologic maps of the routing area, shallow bedrock has the potential to be encountered along some portions of the overland segment of the Project route. The technique selected to remove bedrock encountered during cable installation activities is dependent on relative hardness, fracture susceptibility, and expected volume of the material. Techniques include the following:

- Conventional excavation with a backhoe,
- Hammering with a pointed backhoe attachment followed by backhoe excavation,
- Rock saw/trencher, or
- Blasting followed by backhoe excavation.

All blasting activity will be performed by licensed professionals according to strict guidelines designed to control energy release. Proper safeguards will be taken to protect personnel and property in the area. Charges will be kept to the minimum required to break up the rock. Where appropriate, mats made of heavy steel mesh or other comparable material or trench spoil will be utilized to prevent the scattering of rock and debris. These activities will strictly adhere to all industry standards applying to controlled blasting and blast vibration limits with regard to structures and underground utilities. Blasting in the vicinity of nearby utilities and railroads will be coordinated with the owner, as necessary. Blasted rock will be hauled off-site and disposed of in an appropriate manner. Details of blasting controls and safety procedures will be specified in the final design phase.

3.1.3 Cable Installation

For the overland sections of the Project route, the two cables will typically be laid side-by-side in a trench approximately four (4) feet wide and four (4) to five (5) feet deep. Once a pre-selected length of trench is excavated to the necessary depth and the base prepared, rollers will be placed in the bottom of the trench (or along the upper rim of the excavation) to facilitate pulling the cable into the trench. A cable attached to a winch at the opposite end of the trench from the cable spool will be attached to the cable and reeled in, pulling the cable down the length of the trench on the rollers. Depending upon the soil conditions on the bottom of the trench, the bottom of the trench may have require padding fill (i.e., clean sand) before pulling the cable into the trench, but this circumstance is expected to be minimal. Once the cable segment is pulled down the length of the trench, it is moved off the rollers.

Given the need to schedule work with the railroads and the overall construction schedule, it is anticipated that cable installation activities will occur twenty fours hour per day/seven days per week in most areas, with nighttime shutdowns occurring in select sensitive receptor areas. This approach will require that nighttime lighting be used. To the extent possible, directed lighting will be employed when in residential areas to minimize lighting of areas outside of the workspace. In addition, the continual construction schedule will result in the operation of heavy machinery and equipment (e.g., generators, excavators, and vehicle engines) during all hours of the day and night. Certain activities (e.g., blasting, pile-driving, etc.) may be limited to daytime periods, depending upon noise sensitivity of nearby areas.

During cable installation along railroad corridors, it is anticipated that the railroads will be used to transport heavy equipment such as cable drums to centralized stockpiling areas. Final transport of the cable spools, construction equipment, and supplies will be transported on roadways and so it will be necessary for vehicles to arrive and depart from work areas via local roadways. Workers may arrive at contractor yards or the right-of-way in pickup trucks, supplies may be delivered directly to the site, and equipment such as dewatering pumps, generators, or excavators may also need to access the site via local roads. Along the NYS Route 22 and 9W corridors, all equipment and supplies will be delivered via the roadways. Within New York City, equipment and supplies will be delivered by roadway, rail, or water transport. Procedures for traffic management will be developed as part of the final design phase and may include items such as detours, police details, and signage.

3.1.4 Backfilling

Subsequent to laying the cables, the trench will be backfilled with a layer of soil exhibiting the required low thermal resistivity properties needed to surround the cables, which may include non-native material if the native materials do not exhibit the required low thermal resistivity properties. Because the operation of the cables results in the generation of heat, and heat reduces the electrical conductivity of the cables, it is important to backfill with soil having a low thermal resistivity. The soil’s ability to conduct heat to the atmosphere will limit the temperature build-up in the soil around the cable and prevent heat from one cable affecting the nearby cable. There will be a protective concrete or HDPE cover plate directly above the low thermal resistive backfill material, which is anticipated to be one to two feet above the bottom of the trench. The whole assembly will have a marker tape placed approximately two (2) feet below the ground surface and directly above the cables. The top of the trench may be slightly crowned to compensate for settling. Excess clean spoil material from trench excavation will be disposed of by spoiling on site where approved, or properly disposed of off site at an approved location. Contaminated spoils will be disposed of as required by federal and/or state regulation.

In areas of wetlands or perched water tables, trench plugs or other methods to prevent draining of wetlands or surface waters along the trench will be used. In areas of wetland soils, the organic surface layer will be backfilled over the subsoil backfill to reestablish an adequate surface soil profile for wetland restoration objectives. During the trench backfilling process, soils will be compacted, as appropriate.

3.1.5 Restoration and Re-vegetation

Cleanup crews will complete the restoration and revegetation of the rights-of-way and temporary construction workspace. In conjunction with backfilling operations, any remnant woody material and construction debris will be removed from the rights-of-way or as allowed by state and federal regulators. The construction area will be seeded with an approved seed mix for the temporary work area and allowed to further revegetate naturally. Paved areas will be restored to match existing conditions in accordance with NYSDOT requirements.

3.1.6 Overland Infrastructure/Waterway Crossings

The Project route will result in multiple river, stream, road, and other crossings by the cables and construction equipment. Cable installation options for the infrastructure and/or waterway crossings include trenching, HDD (see Section 3.2 below), or attachment to existing structures such as bridges or railroad trestles. The specific design for each crossing will address the conditions at the particular location, owner/operator design requirements and the preferences of the Engineering, Procurement and Construction ("EPC") contractor, or the Conditions of the Article VII Certificate of Environmental Compatibility and Public Need ("Certificate") and will be detailed in the final design.

3.2 Horizontal Directional Drilling Installation Methods

HDD is a common technique used to install transmission cable projects to avoid or minimize environmental impacts as well as to address engineering or infrastructure constraints associated with traditional trench installation (e.g., major highway crossings). HDD is a trenchless method for installing pipelines and conduit beneath other facilities or resources of concern, including habitats, archeological sites, waterbodies, or existing infrastructure. HDD is a multi-stage process composed of the four steps listed below:

- Pre-site planning,
- Drilling a pilot hole,
- Expanding the pilot hole by reaming if necessary,
- Pull back of drill string with simultaneous installation of conduit, and
- Cable pull through the conduit.

For each proposed HDD location, two separate drills will be required, one for each cable. Each cable will be installed within a 10-inch-diameter, or larger, high density polyethylene ("HDPE") casing. To maintain appropriate separation between the two cables, a minimum of six (6) feet will be required between each drill path. HDD will be employed in a number of situations during construction, including both overland sections of the Project route and at shoreline land/water transition locations. HDD locations along the Project route will have both the entry and exit holes staged on land. The HDD locations are shown on the Terrestrial Route Plan View Map provided in Attachment E of the Supplemental Application. All HDD locations will be engineered on a site-specific basis during development of the final design.

At the seven (7) locations along the Project route where the cables transition from water to land (and vice versa), installation will be accomplished through the use of HDD methodology in order to avoid or minimize disturbance to the banks and near shore areas. The HDD will be staged at the onshore landfall area and will involve the drilling of the boreholes from land toward the offshore entry/exit point. Two conduits (one for each cable) will then be installed through the length of the boreholes and the transmission cable will be pulled through the conduit from the submarine end toward the land. A transition manhole or transmission cable-splicing vault will be installed using conventional excavation equipment (backhoe) at the onshore transition point where the underwater and overland transmission cables will be connected (see "Typical Terrestrial Transition" Figure 176764-UM-41 and "Typical Splice Vault" Figure 176674-UM-35 in Attachment H of the Supplemental Application).

A drill rig will be set up onshore behind a bentonite pit, where a drill pipe with a pilot-hole drill bit will be set in place to begin the horizontal drilling. Drilling fluid will then be pumped into the hole as the cutting head is advanced into the soil. The HDD construction process will involve the use of drilling fluid in order to transport drill cuttings to the surface for recycling, aid in stabilization of the in situ soil/sediment to keep the hole open, and to provide lubrication for the HDD drill string and down-hole assemblies. This drilling fluid is composed of a carrier fluid and solids. The selected carrier fluid for this drilled crossing will consist of water (approximately 95 percent) and inorganic bentonite clay (approximately 5 percent). The bentonite clay is a naturally occurring hydrated aluminosilicate composed of sodium, calcium, magnesium, and iron that is environmentally benign.

After each section of drilling, an additional length of drill pipe is added until the final drill length is achieved. To avoid or minimize the release of the bentonite drilling fluid into the water, freshwater may be used as a drilling fluid to the extent practicable for the final section of drilling, just prior to the drill bit emerging in the pre-excavated pit. This will be accomplished by pumping the drilling fluid out of the drill stem and replacing it with freshwater as the drill bit nears the pre-excavated pit. When the drill bit emerges in the pre-excavated pit, the bit is replaced with a hole-opening tool called a reamer to widen the borehole. It is anticipated that a single reaming pass will be necessary to allow installation of the conduit. Once the desired hole diameter is achieved, a pulling head is attached to the end of the drill pipe and the drill pipe is used to pull back the HDPE conduit pipe into the bored hole. As with the pilot hole drilling process, freshwater will be utilized, if practicable, as the reaming tool nears the pre-excavated pit. Once the HDPE conduits are in place, the underwater cables will be pulled through the conduit, which will be permanently sealed at each end to complete the installation process.

A temporary cofferdam will be constructed at the offshore entry/exit hole location for HDD cable installation at major land-water transitions. The cofferdam will be rectangular in shape and approximately 16 feet by 30 feet. The cofferdam will generally be constructed using steel sheet piles driven from a barge-mounted crane. The cofferdam is intended to help reduce turbidity associated with the dredging and HDD operations as well as to help maintain the exit pit (see "Typical Terrestrial Transition, Figure 176764-UM-41, in Attachment H of the Supplemental Application). The area inside the cofferdam will be dredged to create an entry/exit pit typically six (6) feet deep. The dredged material will be temporarily placed on a barge for storage and ultimate disposal at an upland permitted facility. Upon completion, the exit pit will be backfilled with clean sand to restore the bottom to preconstruction grade.

After the HDD conduit is installed, the ends of the conduit will be sealed with plastic caps until the subsequent installation of the HVDC transmission cables. After the cables have been installed, it is anticipated that the excess annular space with the HDD installed conduit and the installed cable will be backfilled with a thermal grout to help dissipate excess heat generated by the cable. The requirements for the backfill material will be determined in the final design.

The drilling fluid system will recycle drilling fluids (made up of a combination of water, bentonite, and the material being excavated) and contain and process drilling returns for offsite disposal. Although considered environmentally benign, the discharge or release of drilling fluids to the water will be minimized by implementing appropriate techniques and controls to be specified in a drilling fluid overburden breakout monitoring and response plan. It is likely that some residual volume of drilling fluid will be released into the pre-excavated exit pit when the pilot hole and reaming cutting heads come to the surface. The depth of the pit and the temporary cofferdam are expected to contain much of the drilling fluid that may be released into the exit pit.

It is expected that the HDD conduit systems will be drilled through sediment overburden at the landfall location. However, it is anticipated that drilling depths in the overburden will be sufficiently deep to avoid pressure-induced breakout of drilling fluid through the sediments along most of the length of the drill path. Nevertheless, a visual and operational monitoring program will be implemented during the HDD operation to detect a fluid loss. This monitoring includes:

- Visual monitoring of surface waters along the drill path and in the vicinity of the exit hole on a daily basis to observe potential drilling fluid breakout points.
- Drilling fluid volume monitoring by technicians throughout the drilling and reaming operations for each HDD conduit system.
- Implementation of a fluid loss response plan and protocol by the drill operator in the event that a fluid loss occurs. The response plan could include injection of loss

circulation additives such as Benseal that can be mixed in with drilling fluids at the mud tanks, and other mitigation measures as appropriate.

3.3 Underwater Installation Methods

The two HVDC underwater cables associated with the Project will be bundled and laid together within the same trench. The cables will be initially placed in a vertical position (one on top of the other) in the trench, although sediment conditions may allow for slumping into a horizontal position (side-by-side) relative to each other. Generally, the underwater transmission cables will be manufactured with armoring and buried primarily at a six foot depth in the Hudson, Harlem, and East Rivers, from zero to four feet within Lake Champlain north of Crown Point**,** and three to four feet deep within Lake Champlain south of Crown Point. Cable burial will generally be performed at the same time the cable is laid or at a later date, as deemed appropriate or necessary due to subsurface conditions. The cables will be laid by specialized cable-laying vessels or a specially outfitted laybarge, depending on navigation constraints along the Project route. The cable may be installed on the bottom of Lake Champlain in deep waters without protection (0' depth) only if this approach is found to be acceptable after further analysis (See Section 5.1.1 for further discussion).

The cables will be transported from the manufacturer by a special cable transport vessel and transferred onto the cable installation vessel. The linear cable machines onboard the installation vessel will pull the cables from coils on the transport vessel onto the installation vessel and into prefabricated tubs. After the cable has been transferred, the installation vessel will travel to the construction commencement location. This process will be repeated as necessary to deliver and install the cable along the length of the various waterways.

Given the need for certain installation activities to occur uninterrupted (e.g., cable installation involving water jetting or HDDs at the shoreline), it is anticipated that cable installation activities will occur twenty four hours per day/seven days per week in most areas, with nighttime shutdowns occurring only in select sensitive receptor areas. This will require that nighttime lighting be used. Directed lighting will be employed to avoid and/or minimize lighting of areas outside of the workspace. In addition, the continual construction schedule will result in the operation of heavy machinery and equipment (e.g., generators, water pumps, and vessel engines) during all hours of the day and night. Certain activities may be limited to daytime periods depending upon noise sensitivity of nearby areas.

Based on the sediment data collected during the spring 2010 Marine Route Survey[2], it is not anticipated that a backfill plow will be needed. As the cables will be simultaneously laid and buried, the majority of sediments will refill the trench. In addition, due to the natural dynamic processes in the lakes, rivers and estuaries, sediments will be naturally deposited within the trench. Post-installation bathymetric and sediment surveys will be conducted to monitor benthic habitats and sediment conditions.

3.3.1 Jet Plow/Water Jetting

The proposed method for laying and burial of the majority of the underwater cable is the jet plow/water jetting embedment process. These methods involve the use of a positioned cable vessel and a hydraulically powered water jetting device that simultaneously lays and embeds the cables in one continuous trench. At this time, the primary proposed installation vessel will be dynamically positioned, using thrusters and the vessel propulsion system. Deeper draft vessels equipped with dynamic positioning thrusters are proposed for deeper water locations. Dynamically positioned cable installation vessels do not contact or impact the bottom. However, there may be limited circumstances such as in relatively shallow water depths (typically less than 15 feet) where shallow draft vessels/barges using anchors for positioning may be used for installation. An anchor-positioned vessel will propel itself along the Project route with forward winches while letting out on aft winches with other lateral anchors holding the side-to-side alignment during the installation. In the event that an anchor-positioned vessel is needed, it is assumed that a 4-to-8 point anchor mooring system will be used in this process and require an anchor-handling tug to move anchors while the installation and burial proceeds uninterrupted on a 24-hour basis.

[2] Please refer to Attachment E of the USACE Application submitted in December 2010 for the Spring 2010 Marine Route Survey Report. No revisions have been made to the Report since that time; therefore, it is not included in this Supplemental Application.

The jet plow/water jetting embedment methods for underwater cable installations are considered to be the most effective and least environmentally damaging when compared to traditional mechanical dredging and trenching operations. This method of laying and burying the cables simultaneously ensures the placement of the underwater cable system at the target burial depth with minimum bottom disturbance, with much of the fluidized sediment settling back into the trench. For these reasons, it is the installation methodology that appears to be preferred by state and federal regulatory agencies based on review of past underwater cable projects.

Jet Plow/water jetting equipment uses pressurized water (taken from existing waterbodies) from water pump systems onboard the cable vessel to fluidize sediment. The water jetting device is typically fitted with hydraulic pressure nozzles located down the length of "swords" that are inserted into the sediment on either side of the cable and which create a direct downward and backward "swept flow" force inside the trench. This provides a down and back flow of re-suspended sediments within the trench, thereby "fluidizing" the *in situ* sediment column as the equipment progresses along the cable route such that the underwater cable settles into the trench under its own weight to the planned depth of burial. The water jetting device's hydrodynamic forces do not work to produce an upward movement of sediment into the water column, since the objective of this method is to maximize settling of re-suspended sediments within the trench to bury or "embed" the cable system. The pre-determined deployment depth of the jetting swords controls the cable burial depth using adjustable hydraulics on the water jetting device.

The cable system location and burial depth will be recorded during installation for use in the preparation of as-built location plans. The water jetting device is equipped with horizontal and vertical positioning equipment that records the laying and burial conditions, position, and burial depth. This information is monitored continually on the installation vessel. This information will be forwarded to appropriate agencies and organizations as required for inclusion on future navigation charts.

Burial can be performed by either a towed or self-propelled burial machine. In this instance, the self-propelled water jetting device moves forward by the reaction of the backward thrust of the hydraulic jetting power that is fluidizing the soil and keeping the created trench open for the cable to sink into. The forward rate of progress is regulated by the varying types of soil and the water pressure applied through the jets.

A skid/pontoon-mounted jet plow/water jetting device or wheeled, frame-mounted water jetting device, deployed and operated in conjunction with the cable-laying vessel, is proposed for the underwater installation operations. For burial, the cable vessel is used as the platform to operate the water burial device at a safe distance as the laying/burial operation progresses. The cable system is deployed from the vessel to the funnel of the water jetting device. The water jetting swords are lowered onto the bottom, pump systems are initiated, and the jet trencher progresses along the cable route with the simultaneous lay and burial operation. It is anticipated that, to install the cables to the target depth of six (6) feet of sediment cover as is required for portions of the route, the jetting device will fluidize a pathway approximately two (2) feet wide and approximately seven (7) feet deep into which the cable settles through its own weight. The pontoons can be made buoyant to serve different installation needs.

Temporarily re-suspended in-situ sediments are largely contained within the limits of the trench wall, although a small percentage of the re-suspended sediments are transported outside of the trench. Any re-suspended sediments that leave the trench generally tend to settle out quickly in areas immediately flanking the trench. However, the amount of sediment transported out of the trench, the residence time of sediment suspension, and the distance suspended sediments are transported are dependent upon multiple factors, including sediment grain-size, composition, hydrodynamic forces, trench depth, and the hydraulic jetting pressures imposed on the sediment column necessary to achieve desired burial depths. Water quality modeling specific to the conditions in Lake Champlain and the Hudson, Harlem, and East Rivers is provided in Attachment M of the Supplemental Application.

As the jetting device progresses along the route, the water pressure at the device nozzles will be adjusted as sediment types or densities change to achieve the required water quality standards. A test trench may be preformed to ensure proper depth of burial. In the unlikely event that the minimum burial depth is not met during water jetting embedment, additional passes with the water jetting device or the use of diver-assisted water jet probes will be utilized to achieve the required installation target depth.

Jet water pressure varies with different bottom sediment materials, with typical pressures including:

Material	Estimated Jet Water Pressure
Sand and Silt	400-600 psi
Soft Clay	600-800 psi
Hard Clay	800-1,000 psi

Some types of water jetting devices also employ an ejector system to assist in the trenching operation in certain sediment types that do not fluidize well. The ejector system employs an airlift system to create a suction force within the ejector pipes that entrains sediment and releases it at the end of the ejector pipes to either side of the water jetting device. This addition to the water jetting methodology will only be employed to assist in burial if monitoring of the installation reveals difficulty in obtaining the required burial depth due to lack of adequate fluidization of sediments.

In addition to continuous closed circuit video monitoring, divers will make regularly scheduled dives in order to monitor the cable installation operation and inspect the condition of the cable trench and jet sled. Occasionally, the jet sled may require maintenance during cable burial operations due to nozzle wear or loss. During these maintenance periods, the jet leg roller load cells, suction piping, and hose connections are checked, and hydraulic fluid is replenished as required. As necessary, a Spill Prevention, Countermeasure, and Control (“SPCC”) Plan or its equivalent will be developed pursuant to federal and/or state regulations and will be followed during construction equipment maintenance and repair activities.

In certain small areas, typically transition areas between shoreline HDDs and underwater cable trenches, a diver-operated hand jet or Remotely-Operated Vehicle (“ROV”) may be used to bury the cable. In this process, a support vessel provides pressurized water through a hose with a nozzle that is maneuvered by a diver or ROV. The jet of water works the sediment under the cable to create a trench into which the cable settles. This method will be employed for short distances only, typically less than 100 feet.

3.3.2 Plowing

For the plowing technique, a trench is made for the cables by towing a plow, and the cables are simultaneously fed into the trench as it is created by the plow. The plow is not self-propelled, but is instead tethered to a surface support vessel, which supplies the pulling power. Usually, the bottom sediment is allowed to naturally backfill the trench over the cable by slumping of the trench walls, wave action, or bed load transport of sediments.

Shear plows can potentially reduce sediment disturbance as they do not fluidize the sediment and generally require less force to create a narrower trench in the riverbed or lakebed to bury underwater cables than other types of cable installation equipment. Some issues that affect the suitability of shear plows for underwater cable installation and burial are sediment cohesiveness and burial depth. Use of the shear plow is typically limited to sediments that have shear strengths less than 20 Kilopascals (“kPa”). Also, shear plows are typically used with shallower burial depths (less than four (4) feet), which generally reduces the overall amount (i.e., volume) of sediment disturbed during installation.

3.3.3 Conventional Dredging

While it is intended that the use of conventional underwater trench excavation methods will be avoided or minimized, there will be some locations where conventional dredging will be used to meet required installation depths, or to install cofferdams associated with shoreline HDD installations. These circumstances may include instances where the cable route crosses an existing Federal navigation channel. In these locations, either a clam-shell dredge or a barge-mounted excavator will be used to pre-dredge a trench into which the cable will be laid. Dredge material will be brought to the surface to be placed on barges for approved disposal and will not be used for backfill. This work will most likely occur from spud barges, although anchor-moored or jack-up barges may also be employed, depending upon equipment availability and site conditions. A typical spud dredge barge will be equipped with two or more legs, with one spud being a walk-away spud. The barge will have a crane, typically outfitted with a 6 to 9 cubic yard clamshell bucket. Alternatively, the barge may have a track hoe excavator working off the deck of the barge, possibly with an extended boom for areas of deeper water. Once a segment of trench is excavated, cable will be laid, and the clam-shell dredge or excavator will place clean backfill sediment back into the trench.

3.3.4 Non-Burial Protection

In locations along the underwater route within Lake Champlain where the water depth is 150 feet or greater (i.e., portions of Lake Champlain), the cables may be buried at depths less than four (4) feet or laid on the lake bed. This situation would only occur in circumstances in which a report by a recognized authoritative technical consultant demonstrates and concludes that public health and safety can be appropriately protected without such burial. This report would then need to be accepted by the New York State Public Service Commission and the USACE.

In limited areas along the Project route, surficial geology may not permit adequate cable burial depths within the lakebed or riverbed to ensure adequate cable protection. In these areas, the HVDC cables will be laid on the lake or riverbed with protective coverings, such as articulated concrete mats. Areas where this method may occur are at pipeline or cable crossings, unavoidable bedrock areas, and potentially in areas of contaminated sediments. In these locations, the plow or water jetting device will be lifted off the bottom, moved forward past the obstacle and then re-deployed to the bottom once safely across. In a separate activity, the cable laying on the sediment surface will be covered with articulated concrete mats, grout mattresses, or pillows. Drawings representing non-burial cable protection methods are included as Attachment H of the Supplemental Application (see “Grout Filled Mattress Utility Crossing Surface Laid” Figure 176764-SM-10).

Articulated concrete mats are made of small pre-formed blocks of concrete that are interconnected by cables or synthetic ropes in a two dimensional grid. The size of the protective covering area would be dictated by the extent of the obstacle to burial, but the mats typically range in size from six (6) feet by six (6) feet to eight (8) feet by twenty-five (25) feet. The concrete mats are lifted off barges and lowered into the water over the cable using a crane. Positioning is monitored by divers. This type of cable installation and protection is similar to methods potentially used for certain infrastructure crossings, as further described below.

3.3.4.1 Infrastructure Crossing

A preliminary review of the underwater cable route identified numerous areas where construction activities will occur in the vicinity of or cross existing infrastructure (e.g., electric cables, gas pipelines, ferry cables, etc.). Based on a review of New York State Office of General Services ("NYOGS") records and other sources, Table 5.1.3 below provides a list of all submarine infrastructure crossings known to the Applicants.

There are several different installation techniques that can be utilized when crossing existing infrastructure based on the type, burial depth, and existing protective coverings of the infrastructure. In almost all cases, it is anticipated that the underwater cables will be laid over the existing infrastructure with protective coverings. The design of utility crossings will follow industry standards.

When crossing utilities that are owned by a third party, the design of the protection at existing cables and pipelines will require formal consultations with the owners and/or operators of this collocated infrastructure. Detailed discussions on coordination, design and installation methodologies and safety issues will be conducted with the owners of these infrastructures, as specified in the recommended Article VII Certificate Conditions. The detailed designs for each crossing will be provided as part of the final design stage.

Crossing of Fiber Optic and Telecommunication Cables

Wherever possible, the HVDC cables will cross existing fiber optic and telecommunication cables at right angles, extending approximately 150 to 300 feet in length. The method of embedding and protection will be determined by the burial depth of the existing cables. See Section 5.1.2 for the assumptions used in quantifying the impact areas for non-burial.

A minimum separation between the new transmission cables and existing cables will be provided by various methods such as Uraduct® covering on one or both sets of cables and protection of the existing cable with grout pillows, split duct or flexible concrete mattresses. The exact crossing method will be custom designed for each location. The details of these crossings will be coordinated with the owners and/or operators of the existing facilities.

In some cases, existing telecommunication cables are buried less than three (3) feet; therefore, special measures may be utilized at the crossing site, such as the use of protective sleeves on the HVDC cables. The details of these crossings will be coordinated with the owners and/or operators of the existing facilities.

Crossing of Gas or Oil Pipelines and Power Cables

Where the cables cross existing pipelines or power cables, the cables will cross the existing infrastructure as close as possible to right-angles, extending up to 300 feet on each side of the crossing point. The method of cable embedding and protection will be determined by the burial depth of the existing infrastructure.

For deep-buried pipelines or cables, potential protection measures include applying a protective sleeve to the cables at each crossing to provide a minimum separation between the cables and the existing infrastructure. The sleeve would be installed for a reasonable distance on either side of the crossing location to ensure that it will cover the crossing point. For shallow buried cables or pipelines, a minimum separation between the Project cables and the other cable or pipeline will typically be provided by pre-installing a 150 millimeters-thick grout-filled mattress on top of the infrastructure at each crossing. The Project cable and pipeline will be post-lay protected by further placement of grout-filled mats or articulated concrete mats. The cables will be buried using the water jetting device to the target depth, as close as possible to the grout-filled mats.

Crossings of Other Infrastructure Types

A “chain-ferry” operates across the proposed underwater cable route within Lake Champlain. The chain ferry utilizes ferry cables laid on the bottom of Lake Champlain. The normal penetration of the ferry cables into the lakebed will be assessed, and if deemed necessary, additional protection in the form of deeper cable burial at the crossing point or the use of an outer protection sleeve against abrasion will be installed. The ferry cables will be temporarily removed to facilitate the installation of the underwater cables. The ferry cables will then be replaced over the top of the transmission cables. The ferry operator reports that its cables are replaced every four years; therefore, there may be an opportunity to coordinate the HVDC cable installation schedule with the ferry cable replacement schedule. Detailed coordination and discussions will be required with the ferry operator on methodologies and scheduling.

The underwater HVDC cables will also be routed beneath overhead infrastructures, including road bridges and electrical transmission lines. These will not be of concern for the cable systems once in operation, but the superstructure on the cable-laying vessels will be designed to take account of any height restrictions.

4.0 ROUTE SPECIFIC DESCRIPTION AND EFFECTS

The Project route is approximately 336.8 miles long and covers varying landforms and water areas, and numerous existing utility crossings that require a variety of cable installation and construction methods and equipment.

In order to assess the effects from the different construction methodologies, the route has been separated into eight physiographic route segments for discussion below: Lake Champlain (submarine), lower Lake Champlain (submarine), Dresden to Catskill (overland), Hudson River North (submarine), Stony Point to Haverstraw (overland), Hudson River South (submarine), Harlem River (submarine) / Bronx (overland), and East River (submarine) / Queens (Overland). In addition to the information provided below, the Environmental Impact Report (prepared as part of the Article VII process) includes a more comprehensive discussion of the existing conditions and anticipated effects of the construction and operation of the Project. The Environmental Impact Report is included in Attachment N of the Supplemental Application.

4.1 Lake Champlain North (Submarine)

The northernmost segment of the Project route is located within Lake Champlain stretching from the international border between the United States and Canada and continues south within Lake Champlain for approximately 73 miles to Crown Point, New York (MP 0 to 73). This segment of Lake Champlain is composed of two basins, North Basin and South Basin. The HVDC cables will be installed underwater for this entire segment. The existing conditions, construction methods, and project effects of this segment are discussed in the following sections. This physiographic route segment is represented in Sheets 1 through 20 of the Submarine Route Plan View Maps provided in Attachment D of the Supplemental Application

4.1.1 Existing Conditions

Lake Champlain is a large freshwater lake at the northeast corner of New York State. Most of the lake length is within the United States and hosts the border between New York and Vermont, but the northernmost end extends into Canada. The waters of Lake Champlain reach their greatest depth, over 400 feet, in the area between Charlotte, Vermont and Essex, New York. The average depth of the Lake is only 64 feet and some parts of the Lake are very shallow. However, water depths along the Project route vary from 10 feet to nearly 400 feet. Throughout Lake Champlain there are basins, troughs, and plateaus. The cable route was sited to avoid steep changes in slope, to the extent possible.

The North Basin section of the Lake Champlain segment of the proposed route extends from the international border south to the southern end of Grand Isle at MP 29. Water depths through this portion of the route vary widely, ranging from approximately 16 feet deep near the Canadian border to almost 240 feet deep near the southern end of Grand Isle. Surficial sediments along this portion of the North Basin section appear to be fine grained with rocky areas and obstructions occurring in several locations. Sub-bottom profile surveys revealed a layer of soft sediments as there was deep sub-bottom penetration along the majority of the proposed route. In some localized areas sub-bottom penetration indicated bedrock or compacted sediments (Source: Marine Route Survey Summary Report, Attachment E of USACE Application of December 2010).

The South Basin segment of Lake Champlain is 45 miles long. The proposed route is situated between the southern end of Grand Isle (MP 29) and Crown Point (MP 74), just south of Port Henry, NY. This section contains some of the deepest areas along the entire Project route, with water depths increasing to as much as nearly 400 feet. Overall, the surficial features between Grand Isle and Crown Point are relatively smooth, although there were many large bathymetric features observed, causing abrupt changes in water depths over relatively short distances. The sub-bottom profiles showed deep penetration throughout the South Basin section, indicating a soft bottom. Some possible rock outcrops restricted penetration in isolated areas (Source: Marine Route Survey Summary Report, Attachment E of USACE Application of December 2010).

4.1.2 Construction Methods

Within the Lake Champlain segment from MP 0 to 73 the Project cables are anticipated to be buried by jet plow/water jetting. As described in Section 3.3.1, the use of the jet plow/water jetting in this segment would result in the fluidization of the sediment sufficient to allow the cables to be buried at a target depth of between three (3) and four (4) feet or the maximum reasonably attainable depth, whichever is shallower. Representational drawings of water jetting are included in Attachment H of the Supplemental Application. In locations where the water depths of Lake Champlain are 150 feet or deeper, the cable may buried at depths shallower than three feet or be laid on the lake bottom without burial, but only if a recognized authoritative technical consultant concludes that public health and safety can be appropriately protected without burial of the cable, and such conclusion is accepted by the New York State Public Service Commission and the USACE.

Submarine cables (some of which are decommissioned) have been identified within Lake Champlain and will require special techniques for cable crossings. In areas where the HVDC underwater cables cross existing submerged infrastructure, the cables will utilize the aforementioned methodologies for infrastructure crossings, as appropriate. In addition to numerous submarine cables, a ferry cable system is located across Lake Champlain. It is anticipated that coordination with the cable ferry service will be required in order to temporarily remove the ferry cables to facilitate burial of the underwater transmission cables underneath the ferry cables.

4.1.3 Project Effects

Where the cables are installed with the jet plow, installation activities will temporarily re-suspend in-situ sediments with the majority of the sediments refilling the trench. Water quality modeling developed in support of this Project indicated that dispersion of the sediments would be of short duration and that total suspended solid (“TSS”) values would be below 200 mg/l.

The Lake Champlain Water Quality Monitoring Report is provided in Attachment M of the Supplemental Application. Under the Joint Proposal, the Applicants have agreed to perform test trials of the jet plow or shear plow and to take steps, as necessary, to meet agreed upon TSS standards. Once the cables are buried, it is anticipated that the bathymetry will return to pre-installation conditions through re-deposition of the disturbed material into the trench. Even in cases where less than 100 percent of the disturbed sediment settles in the trench, the hydrodynamic regime at any given location along the underwater cable route will not be changed, so it can be expected that in time natural sedimentation will complete the refilling of the trench.

In general, potential impacts to water quality along the underwater cable route will be closely associated with sediment type and sediment contaminants. Re-suspension may cause contaminants adsorbed to sediment particles to disassociate, thereby becoming more readily available in the water column and to aquatic organisms. Water quality modeling completed for the conditions in Lake Champlain indicates there would be no violation of New York or Vermont water quality standards (see Attachment M of the Supplemental Application).

Where bottom conditions or deep water do not permit burial in the substrate, the cable will be laid on the bottom and protected by laying concrete mats or rip-rap over the cables for protection. The mats will alter local hydraulic conditions such that some sediment deposition or scouring may occur around the irregularity in the bottom formed by the mats. However, the overall change in bottom topography will be insignificant because the mats will extend only a short height above the bottom and functional benthic habitat will develop. The volume of the cable is extremely small relative to the sediment layer and bottom hydrography of the water bodies involved, and the effect of the cable on bathymetry will be insignificant relative to natural levels of fluctuation due to currents, storms, navigational traffic, and other pre-existing factors.

4.2 Lower Lake Champlain (Submarine)

The lower Lake Champlain segment begins at Crown Point, at MP 73.6, and continues south within Lake Champlain until the Town of Dresden, located at MP 101.3. The HVDC cables will be installed underwater for this entire segment. This physiographic route segment is represented in Sheets 20 through 27 of the Submarine Route Plan View Maps provided in Attachment D.

4.2.1 Existing Conditions

The southern section of Lake Champlain is similar to a river in terms of its configuration and composition. Water depths along this segment of the cable route are generally less than 20 feet and south of MP 97 the Federal navigation channel occupies the deeper waters. Surficial sediments along this portion of the route are relatively fine grained, with some areas containing course grain surficial sediments and larger materials, specifically in the southern half of this stretch (Source: 2010 Marine Route Survey Summary Report).

4.2.2 Construction Methods

In an effort to minimize the level of total suspended sediments in lower Lake Champlain, where the water body is narrow and water depths are shallow, cables will be installed via shear plow to a burial depth of approximately three to four feet. The Applicant completed water quality modeling for lower Lake Champlain, which provides additional details on shear plow installation specifications. The report entitled “Water Quality Modeling of Shear Plow Cable Installation in Southern Part of Lake Champlain” is provided in Attachment M of the Supplemental Application.

Due to the narrow widths of the water body and the presence of the Federal navigation channel, the cables are sited at or near the top of the side slope in the narrows of Lake Champlain between MP 98 and 101 (see detailed plan and cross section diagrams in Attachment J of the Supplemental Application). A summary of distances from the cable to the edge of the side slope of the Federal navigation channel in the narrows of Lake Champlain is included in Attachment P. The Applicants propose to bury the cables via shear plow to a depth of three to four feet where the cables are located outside of the maintained channel.

4.2.3 Project Effects

When compared to jet plow operations, the shear plow results in a relatively narrower estimated trench and a smaller estimated percentage of re-suspended sediments (2%), as sediment cohesive strengths and burial depths suitable for shear plow use generally require less force. The TSS loading is the rate of sediment mass re-suspended into the water column above, which is a function of the trench cross-sectional area, the plow speed, the force required to overcome sediment shear strength, the percentage of re-suspended sediment, sediment porosity, and density. The shear plow would reduce the cross-sectional area of the trench and require less force than that normally achieved through jet plow operations, thus reducing the likely percentage of re-suspended sediment.

The proposed shear plow installation of cable in the south portion of Lake Champlain was modeled to assess the effects of an alternative installation technology on water quality. The model projections show that shear plowing under the assumed operating scenario would effectively reduce TSS and contaminant concentrations in the southern part of the lake so that New York and Vermont's acute toxicity-based water quality standards would be attained (see "Water Quality Modeling of Shear Plow Cable Installation in Southern Part of Lake Champlain" provided in Attachment M of the Supplemental Application). Impacts in terms of non-burial installation would be expected to be the same as in the northern section of Lake Champlain.

4.3 Dresden to Catskill (Overland)

In the town of Dresden, at MP101.3, the transmission cables will transition from the waters of Lake Champlain to the land along the western shore via an HDD. The cables transition from under Lake Champlain and submerged private lands to land within private property and land owned by the D&H and then enter the New York State Route 22 ROW. The cables will continue south within the Route 22 ROW until MP 111.9, except for a crossing of South Bay at MP 109.7. The cable route continues within the Route 22 ROW into the Village of Whitehall and then enters the CP ROW within the Village of Whitehall. The transmission system has relatively minor deviations out of the CP ROW onto private and public lands for various engineering constraints. In the City of Schenectady, the proposed route leaves the CP ROW at MP 173 to be buried within Erie Boulevard to bypass railroad bridges. The cables re-enter the CP ROW around MP 173.6, but exit again at MP 173.7 to utilize largely vacant land to pass beneath Interstate I-890. The cables re-enter the CP ROW at MP 174.3 and continue to the Town of Rotterdam.

At MP 177 in Rotterdam, the cables transfer from the CP ROW to the CSX ROW for approximately 22 miles. The transmission system will be located within the CSX ROW southeasterly for approximately 22 miles through the Albany County municipalities of Town of Guilderland, Town of New Scotland, Village of Voorheesville, Town of Bethlehem and Town of Coeymans. At MP 199, the cables continue within a CSX ROW that runs south parallel to the Hudson River and the cables will be located within the Town of Coeymans and the Village of Ravena, and the Greene County municipalities of Town of New Baltimore, Town and Village of Coxsackie, Town of Athens, and the Town and Village of Catskill. There are relatively minor deviations from the CSX ROW to accommodate engineering constraints.

In the Town of Catskill, the cable route exits the CSX ROW at MP 227.5 and turns easterly to follow Alpha Road, which terminates at a landing area at MP 228.2. At this point, the cables will transition from land to water within the Hudson River via a HDD. This overland portion of the cable route is reflected in Sheets 1 through 333 in the Terrestrial Route Plan View Map provided in Attachment E of the Supplemental Application.

4.3.1 Existing Conditions

The majority of the underground portion of the Project route from Dresden to Catskill (MP 101-228) is proposed to be constructed within existing CP and CSX railroad ROWs, with the lower Lake Champlain bypass being located in the NYS Route 22 ROW. The cables will be outside of these ROWs only when it is necessary to cross municipal-owned roadways, to avoid sensitive habitat, or when it is necessary to avoid engineering constraints such as bridge abutments or existing structures. As such, the dominant land use for this segment is “transportation” although a wide variety of land uses may be found on the adjacent parcels.

Between 2009 and 2011, wetland delineation surveys were completed along the 118-mile overland route. Table 4-1 of the Wetland Delineation Report (Attachment F of the Supplemental

Application) lists wetlands that are directly crossed by the underground transmission cable corridor as well as wetlands that are adjacent to the Project route that were included during delineation field surveys. The sections entitled Route 22, CP, and CSX correspond to this segment of the Project route. Table 4-2 of the Wetland Delineation Report lists the water bodies crossed by the route for this segment.

4.3.2 Construction Methods

South of the Lake Champlain-Dresden landfall, the cables will utilize an HDD to transition from the waters of Lake Champlain, across private lands to NYS Route 22 ROW. The two cables will be primarily buried within excavated trenches from the landfall in Dresden to the Village of Whitehall. HDD installation methods will also be used, as necessary, at existing infrastructure crossings and other obstacles including shoreline crossings (such as the crossings at South Bay, wetland areas, and major roads). Where the cables cross the Hudson River at Fort Edward, the Mohawk River at Glenville-Schenectady, and Catskill Creek at the Village of Catskill, the cables will be installed in conduits to be attached to existing railway bridge structures or installed beneath the water body via HDD. Within the City of Schenectady, the cable will be buried within Erie Boulevard, as the city is currently planning to renovate the road in 2012 to replace all services. However, in the event that the cables cannot be installed within the timeframe that the city will be conducting construction along Erie Boulevard, the city agreed to work to identify another acceptable route through the city.

Waterbody crossings along the railroad ROWs will typically be constructed by trenching across the waterbody, followed by the restoration of the bed and banks. Intermittent and ephemeral streams may be dry or may have very low flow at the time of crossing. For these crossings, the Applicants will excavate an open cut through the stream without any isolation of the stream flow. Where perennial or other significant stream flows are present, the Applicants may use a dry-ditch method to isolate the work area from the flow of water. These dry-ditch crossings will typically be completed by installing cofferdams upstream of the work area, and either pumping water around the construction area, or diverting the stream flow into one or more flume pipes. Representational drawings for steam crossings are included in Attachment H of the Supplemental Application. In some cases, large waterbodies may be crossed by the HDD method, which allows installation without trenching or other surface disturbance. Alternately, where a large water body is crossed by a railroad bridge, the cables may be placed aboveground along the railroad trestle.

4.3.3 Project Effects

Construction and operation of the Project is expected to result in primarily temporary impacts to wetlands and waterbodies along overland segments of the cable route, including within the CP and CSX railroad ROW. These impacts may include both direct impacts, where the edge of the cleared construction corridor traverses a wetland or riparian area, and indirect impacts from vegetation clearing and ground disturbance in adjacent areas.

During construction, short-term effects on water quality may be caused by localized increases in turbidity and downstream sedimentation resulting from trenching and disturbance within the waterbody. Water quality impacts would be minimized by limiting the duration of construction activities within the waterbody to the extent possible, and by immediately restoring and stabilizing the streambed and banks once construction is completed. At crossings with significant stream flows, the use of dry-ditch crossing methods instead of open cut methods would reduce potential impacts from turbidity and sedimentation, because disturbed sediments within the construction area would not become re-suspended.

Some clearing of riparian vegetation adjacent to waterbodies within the construction corridor may be required to conduct trenching and cable installation activities. Clearing of vegetation along stream banks has the potential to reduce the bank stability and increase erosion. Adverse impacts will be avoided and/or minimized through the use of temporary and permanent erosion control measures, and by restoring, stabilizing, and seeding stream banks as soon as possible once construction is completed.

4.4 Hudson River North (Submarine)

The Project route is sited in two separate areas of the Hudson River, the north segment (between Catskill and Stony Point) and the south segment (between Haverstraw and the Harlem River). The HVDC cables will be buried in the riverbed in both of these segments. The north segment of the physiographic route is represented in Sheets 28 through 45 of the Submarine Route Plan View Maps provided in Attachment D.

4.4.1 Existing Conditions

Hudson River water depths along the cable route vary with median water depths of approximately 50 feet. In general, water depths range from approximately seven (7) feet near shore to 116 feet throughout this portion of the underwater transmission cable route. The upper-estuary from Poughkeepsie north to the Troy Dam constitutes the majority of the tidal freshwater river. In general, the natural depths are greatest in the southern portion of this area, with depths decreasing towards the northern end of the estuary. The mid-estuary begins north of the Haverstraw and Tappan Zee Bays at the Town of Stony Point (river mile 40). North of the City of Peekskill at river mile 44, the river passes into the Hudson Highlands where it narrows to an average width of about 1,800 feet. The Hudson Highlands area of the river is a deep (49 to 197 feet) and turbulent mixing zone with little shoal area and steep rocky shorelines. Moving upstream beyond the Hudson Highlands into the Town of Cornwall at river mile 56, the Hudson River widens to an average width of 5,800 feet in an area called Newburgh Bay. The average mid-channel depth of Newburgh Bay is about 40 feet. There are wider shoal areas along the shoreline, especially on the eastern shore, supporting growth of submerged aquatic vegetation ("SAV"). North of the Village of Wappingers Falls (river mile 67), the river narrows again and increases in depth to as much as 125 feet (USFWS 1997).

In general, the Hudson River is composed of five major surficial sediment types:

- Mud (clay, silt, fine sands);
- Sands with a smooth to mottled bottom;
- Coarse gravel and sand mixtures with irregular bottom composed of compact gravel and cobble deposits intermixed with sand;
- Mix of mud, sand, and gravel; and
- Bedrock, cobbles, and boulders that are often overlain by a variable thickness of unconsolidated sediments.

Within the Hudson River, a minimum 32-foot deep shipping channel is maintained from Albany to New York City. The channel is 600 feet wide from New York City to Kingston and 400 feet wide from Kingston upstream to Albany. The cables have been sited outside of the maintained Federal navigation channel within the Hudson River, although there is one location (MP 238.6-239.6) where the route is near or at the top (within 60-170 feet) of the side slope to avoid sensitive resources identified by New York State resource agencies.

4.4.2 Construction Methods

In the town of Catskill, the cables transition from the overland route to the waters of the Hudson River via an HDD. Upon entering the Hudson River, the HVDC underwater cables will extend along the Hudson River for approximately 67 miles to Stony Point, Rockland County, utilizing jet plow installation methods to achieve a burial depth of six (6) feet.

There are also a number of locations within the Hudson River where the cables cross existing submerged infrastructure, such as submarine cables and pipelines. Existing infrastructure has been identified within the Hudson River at locations including Kingston, Marlboro, Clinton Point, Poughkeepsie, Palisades, Roseton, Highland Falls, Buchanan, and Stony Point. Table 5.1.3 provides a listing of all infrastructure crossings known to the Applicants. Where the cables cross existing infrastructure, the cables will be installed according to the aforementioned methodology for infrastructure crossings, as appropriate.

4.4.3 Project Effects

Project effects are expected to be similar to those reported for the northern portion of Lake Champlain. Installation of the underwater cables with the jet plow would likely result in sediment disturbance and re-suspension of short duration and within applicable standards. The jet plow would result in fluidization of the sediment, allowing both cables to be buried side-by-side in a single trench. Depressions in lake bottoms or river-beds are anticipated after installation but it is expected that the topography would return to pre-installation conditions through natural redeposition of the disturbed material into the trench. The use of HDD technology avoids the need for shoreline trenching and disturbance to the shallow water interface between land and water.

In areas where the cables cannot be buried, primarily areas of rocky substrate, exposed bedrock, or at utility crossings, the cables would be laid on the bottom and protected by laying articulated concrete mats or other appropriate materials over the cables for protection. The mats will alter local hydraulic conditions such that some sediment deposition or scouring may occur around the irregularity in the bottom formed by the mats. However, the overall change in bottom topography would be small because the mats will extend only a short height above the bottom. The mats are not expected to have a significant effect on near-bottom hydrodynamics, which may be similar to the conditions found in rocky bottom areas.

4.5 Stony Point to Haverstraw (Overland)

At MP 295.7, the cables transition from the waters of the Hudson River to a CSX ROW in the Rockland County Town of Stony Point. The cables follows the CSX ROW and public road ROW for a 7.7-mile-long bypass of Haverstraw Bay, which has been identified as one of the most sensitive significant coastal habitats within the Hudson River. The route is located primarily within the CSX ROW, although there are deviations to avoid infrastructure such as bridges and roadways. Around MP 300.8, the CSX ROW is bordered on the east and then on both sides by Haverstraw Beach State Park. At MP 301.4, the cables will be installed under Rockland Lake State Park and Hook Mountain State Park (comprising portions of Palisades Interstate Park) to enter the NYS Route 9W ROW in the Town of Clarkstown. From MP 301.8 to 302.4, the cables will be located within the Route 9W ROW and then extend beneath the two parks and transition into Hudson River. This overland cable segment is reflected in Sheets 334 through 354 in the Terrestrial Route Plan View Maps provided in Attachment E of the Supplemental Application.

4.5.1 Existing Conditions

Most of this segment is along CSX ROW except for a small segment in the Village of Haverstraw where the cables are installed via HDD under Rockland Lake State Park and Hook Mountain State Park to emerge in the Route 9W ROW in Clarkstown. The cables extend within the Route 9W ROW before another HDD is installed beneath the state parks into the waters of the Hudson River. For the entire segment, land use is predominantly "transportation" as the railroad ROW is in use, although the southern portion does cross under two state parks.

Table 4-1 of the Wetland Delineation Report (Attachment F of the Supplemental Application) lists wetlands that are directly crossed by the underground transmission cable corridor as well as wetlands that are adjacent to the Project route that were included during delineation field surveys. The sections entitled CSX Haverstraw Bay Bypass corresponds to this segment of the Project route. Table 4-2 of the Wetland Delineation Report lists the water bodies crossed by the route for this segment.

Table 4.3-3 shows the wetlands that are directly crossed by the underground transmission cable corridor as well as wetlands that are adjacent to the Project route that were delineated during field surveys. Table 4.3-4 shows the water bodies crossed by the route for this segment.

4.5.2 Construction Methods

The cables will utilize an HDD to exit the waters of the Hudson River to the CSX ROW at Stony Point, Rockland County. The cables will also cross the Stony Point State Historic Site via HDD, to minimize intrusion into this state-owned property which is an important destination and scenic site associated with the Revolutionary War. South of the State Historic Site, the cables will be buried in trenches generally within or along CSX ROW, with some minor deviations to accommodate infrastructure and other constraints. At the border of Haverstraw and Clarkstown, an HDD will be established to install the cables under Rockland Lake State Park and Hook Mountain State Park. The cables will be located in the Route 9W ROW for a short distance before another HDD is used to install the cables under the state parks and transition the cables into the waters of the Hudson River. The total distance of this overland bypass is 7.7 miles.

4.5.3 Project Effects

Project effects are expected to be similar to those reported for the Dresden to Catskill segment. Construction and operation of the Project is expected to result in temporary impacts to wetlands and waterbodies along overland segments of the cable route, including within the CP and CSX ROW. These impacts may include both direct impacts, where the edge of the cleared construction corridor traverses a wetland or riparian area, and indirect impacts from vegetation clearing and ground disturbance in adjacent areas. During construction, short-term effects on water quality may be caused by localized increases in turbidity and downstream sedimentation resulting from trenching and disturbance within the water body. Water quality impacts would be minimized by limiting the duration of construction activities within the water body to the extent possible, and by immediately restoring and stabilizing the streambed and banks once construction is completed. At crossings with significant stream flows, the use of dry-ditch crossing methods instead of open cut methods would reduce potential impacts from turbidity and sedimentation, because disturbed sediments within the construction area would not become resuspended.

4.6 Hudson River South (Submarine)

From MP 302.8 south of Haverstraw Bay, for approximately 20.7 miles the cables will be located within the New York State portion of the lower Hudson River. As with the Hudson River North segment, the cable has been sited to avoid sensitive resources. At MP 324, the cables will then turn easterly to enter Spuyten Duyvill Creek, which leads to the Harlem River. This physiographic route segment is represented in Sheets 46 through 52 of the Submarine Route Plan View Maps provided in Attachment D of the Supplemental Application.

4.6.1 Existing Conditions

The conditions within this segment of the Hudson River are similar to those described in the above in Hudson River North (Section 4.4.1) in terms of water depths, sediment conditions, and existing infrastructure.

4.6.2 Construction Methods

Based on an evaluation of the environmental conditions within this segment it is anticipated that cable installation will utilize jet plow technology to achieve burial depths of six (6) feet. For areas where the cables cannot be buried due to exposed bedrock or existing infrastructure crossings, and the cables will be covered with concrete mattresses or other cable protection alternatives.

4.6.3 Project Effects

Project effects are expected to be similar to those reported for the northern portion of Hudson River segment (see Section 4.4.3).

4.7 Harlem River (Submarine) to Bronx (Overland)

The cables extend within the Harlem River for approximately 6.6 miles, then transition to land via an HDD to enter a CSX ROW in the borough of the Bronx. The cables will be laid within an existing railway corridor in the borough of Bronx in New York and extending for approximately 1.1 miles across the South Bronx railyard, and beneath the Robert F. Kennedy Bridge. This physiographic route segment is represented in Sheets 52 and 53 of the Submarine Route Plan View Maps provided in Attachment D of the Supplemental Application and Sheets 355 through 357 of the Terrestrial Route Plan View Map (Attachment E of the Supplemental Application).

4.7.1 Existing Conditions

The Federal navigation channel in the Harlem River occupies most of the width of the channel, but there are small marginal areas outside of the designated channel. Water depths range from approximately 14 to 27 feet along the portion of the proposed transmission cable route within the Harlem River extending from the Hudson River confluence to the Hell Gate Bypass. The Harlem River is scoured daily by tidal action, and sediments tend to be a mixture of sand, gravel, and cobble. The authorized depth of the Federal navigation channel is 15 feet deep and 400 feet wide from the East River to the Hudson River, except in the vicinity of the Washington Bridge where it is 354 feet wide, and at the rock cut west of Broadway Bridge where it is eighteen feet deep and 350 feet wide.

For the overland portion, the dominant land use for the location of the cables is “transportation” and the adjacent parcels are typically zoned as industrial.

4.7.2 Construction Methods

The Applicants propose to site the cables along the outer edge of the Harlem River (Sheets 52 and 53 of the Submarine Route Plan View Maps), which in some instances is located within the

Federal navigation channel and have proposed eleven (11) perpendicular crossings of the Federal navigation channel in order to minimize the total distance where the cables are located within the channel. Detailed plan and cross-section diagrams for the Project route located in the Harlem River are included as Attachment J of the Supplemental Application.

Based on an evaluation of the environmental conditions within the Harlem River, it is anticipated that the cables will be installed using the jet plow technology to achieve burial depths of six (6) feet outside of the navigation channel and between seven (7) and fifteen (15) feet (depending on existing conditions) within the maintained Federal navigation channel. Information obtained from the 2010 marine route survey indicate that the Harlem River has areas of exposed bedrock and existing infrastructure that would prohibit the cables from being buried. Where the cables cannot be buried, the cables will be covered with concrete mattresses or other cable protection alternatives.

The cables will be installed via an HDD from the Harlem River into the Bronx, and then buried in trenches generally within or along CSX ROW with some minor deviations to accommodate engineering constraints.

4.7.3 Project Effects

In-water Project effects are expected to be similar to those reported for the northern portion of Hudson River segment (see Section 4.4.3). Overland project effects are expected to be similar to those reported for the Dresden to Catskill segment (see Section 4.3).

4.8 East River (Submarine) to Queens (Overland)

The cables will be installed via an HDD into the East River from the Bronx, and buried in the riverbed for less than one mile to another HDD landfall, where the cables will transition to land in the borough of Queens in New York City, and proceed easterly to the Luyster Creek converter station site in Astoria, north of 20th Avenue on lands of Consolidated Edison. The converter station will be a “compact type” with a total footprint (i.e., building, associated equipment and other areas) of approximately five (5) acres. Gas-insulated HVAC cables will connect the converter station to NYPA’s Astoria Annex 345 kV substation. From the Astoria Annex substation, another set of HVAC cables will be located within the streets of New York City for approximately three miles to the Rainey Substation. This physiographic route segment is represented in Sheet 54 of the Submarine Route Plan View Maps provided in Attachment D of the Supplemental Application and Sheets 357 through 370 of the Terrestrial Route Plan View Map provided in Attachment E of the Supplemental Application.

4.8.1 Existing Conditions

The proposed cable route in the East River is located in water depths ranging from 10 to 70 feet. Due to swift currents and blasting to create the navigation channel, many areas within the East River have exposed bedrock and coarser substrates. The Luyster Creek Converter station site is zoned as industrial and has a long history of use by Consolidated Edison. The Astoria-to-Rainey cables will be installed within the streets of the borough of Queens and the adjacent land use is primarily residential, industrial, commercial, and open space (parks and recreation).

4.8.2 Construction Methods

The cables will be installed via an HDD into the East River from the Bronx, and buried in the riverbed for less than one mile. For the short portion of the route located within the East River, it is anticipated that the cables will be buried using the jet plow technology. Another HDD will be used to transition the cables from the East River to the landfall in Queens, where the cables will continue along an overland route towards the Luyster Creek converter station in Astoria. For the overland portions, the cables will be installed within trenches primarily buried within roadways.

Construction activities at the converter station site will overlap and include grading and site preparation, foundation construction, erection of major equipment and structures, and installation of electrical and control systems. Construction of the converter station will commence following site clearing and rough grading of the site. The site will be leveled and portions built up to the design grade, above the 100-year storm level. The building foundation slab will be cast on the prepared subgrade and the building structure constructed on that surface.

4.8.3 Project Effects

In-water Project effects are expected to be similar to those reported for the northern portion of Hudson River segment (see Section 4.4.3). Overland project effects are expected to be similar to those reported for the Dresden to Catskill segment (see Section 4.3).

5.0 QUANTIFICATION OF EFFECTS

The Project consists of a 1,000 MW underwater/underground HVDC electric transmission system extending from the international border between Canada and the United States to Queens, New York City, New York. As previously noted, the length of the Project (approximately 336.8 miles) and the diversity of landforms and water areas that are crossed by the transmission route will require that a variety of construction methods and equipment be employed. The Applicants are providing estimates of the likely impacts of this Project to waters and wetlands using available information, reasonable assumptions, and best professional judgment.

5.1 Impacts to Waters

Impacts to Lake Champlain, and the Hudson, Harlem, and East Rivers along the submarine portion of the cable route are anticipated to be caused by cable burial activities (i.e., trenching), non-burial cable protection activities (i.e., laying cable protection fill over the cable), dredging, and activities requiring the use of anchors.

5.1.1 Cable Burial

In the waters of northern Lake Champlain, the Hudson River, Harlem Rivers, and East River, the cables will be installed by jet plow. The assumed trench width is two (2) feet and the assumed trench depth is four (4) feet in northern Lake Champlain and seven (7) feet in the Hudson, Harlem, and East Rivers. The water jetting device is assumed to have a width of fifteen feet for the purposes of calculating the area of impact.

In southern Lake Champlain (from MP 73-101.3), the shear plow installation method will be utilized. The trench depth is assumed to be four (4) feet with a width of 0.8 feet. The shear plow device is also assumed to have a width of fifteen feet for the purposes of calculating the area of impact.

Based on these assumptions, the impacts from cable burial in Lake Champlain and the Hudson, Harlem, and East Rivers are presented below in Table 5.1-1. The route lengths presented account for the length of the route in each waterbody where there will be non-burial. All of these impacts are considered temporary, as it is expected that the trench will refill and the lake/river bed contours will restore itself due to dynamic equilibrium.

TABLE 5.1-1
IMPACTS FROM IN-WATER CABLE BURIAL

	Length[1] (miles)	Trench Dimensions (feet)	Trench Volume (cubic yards)	Area of Impact [2] (square feet)
Northern Lake Champlain	69.9	2'W x 4'D	109.371	5,536,926
Southern Lake Champlain	27.4	0.8'W x 4'D	17,174	2,173,616
Hudson River	83.8	2'W x 7'D	229,390	6,985,440
Harlem River (outside channel)	2.2	2'W x 7'D	6,023	174,240
Harlem River (within channel)	1.7	2'W x 15'D	4,654	134,640
East River	0.8	2'W x 7'D	2,190	63,360
Total			**368,803**	**14,718,703**

[1] The anticipated length of non-burial locations along the submarine route (see Table 5.1-4) was subtracted from the total submarine route distances to provide the length of cable burial shown above.
[2] The width of the jet plow and shear plow devices, which is assumed to be 15 feet, was used to estimate the area of impact.

For the overland portions, there will be temporary impacts to waterbodies crossed by the cable route. Table 4.-2 from the Wetlands Delineation Report (Attachment F of the Supplemental Application) lists the waterbodies crossed by the overland route segments from Dresden to Catskill and Stony Point to Clarkstown as well as the estimated width of the waterbody. Waterbodies which will be crossed via an HDD, bridge crossing, or some other non-intrusive method were not included in the calculation of cumulative width (i.e., cumulative length of waterbody crossings along the overland route). For the two locations where the waterbody width is unknown, a value of five feet was assumed. For each waterbody, it is assumed that the impact will be limited to the trench, which will be approximately four (4) feet wide by four (4) deep. Table 5.1-2 provides the expected impacts to overland streams and waterbodies based on the aforementioned assumptions.

TABLE 5.1-2
IMPACTS FROM CABLE BURIAL AT WATERBODY CROSSINGS ALONG THE OVERLAND ROUTE

	Number of Waterbodies Crossed	Cumulative Length of Waterbody Crossings* (feet)	Trench Dimensions (feet)	Trench Dimension (cubic yards)	Area of Impact (square feet)
Dresden to Catskill	358	2,291.5	4'W x 4'D	1,358	9,166
Haverstraw Bay Bypass	4	106	4'W x 4'D	63	424
Total	**362**	**2,397.5**		**38,360**	**9,950**

*Corresponds to total width of streams crossed by the cables along the overland route.

5.1.2 Non-burial cable protection

In areas where the cables cannot be buried based on existing geology of lake/river bed (i.e., exposed or near surface bedrock) or presence of existing infrastructure, the cables will be laid on the lake/river bed with protective coverings consisting of material such as grout pillows and/or concrete mattresses. For representative diagrams, please see "Grout Filled Mattress Utility Crossing Surface Laid" (Figure 176764-SM-10) and "Grout Filled Mattress Utility Near Surface Laid" (Figure 176764-SM-11) in Attachment H of the Supplemental Application.

Table 5.1.3 provides a listing of existing utility crossings and areas of exposed or near surface bedrock known to the Applicants. These features were identified through a review of NYSOGS records, NOAA navigational charts, side scan sonar data collected during the 2010 marine route survey (see Attachment E of the December 2010 USACE Application) and other sources identified during the Article VII process. In order to estimate the area of impact and volume of fill associated with each non-burial location, the following assumptions were made for each cable protection location:

- For each crossing, the total width of the cable protection material (fill) is assumed to be 48.9 feet for natural bedrock crossings and 32 feet for utility crossings for each foot of non-burial along the cable route.
- For each crossing, the total volume of the mattress layer would be 50.4 cubic feet per linear foot for natural bedrock crossings and 15 cubic feet for utility crossings for each foot of non-burial along the cable route.

Table 5.1-3 summarizes the expected impacts from non-burial while Table 5.1-4 provides estimates for volumes of permanent fill associated with each existing utility crossings and areas of exposed or near surface bedrock known to the Applicants, The estimates for area and volume of permanent fill associated with utility crossings should be considered conservative as the Applicants do not know the precise location of the utilities within the designated utility area and it is likely that it will not be necessary to install non-burial protections for the entire length of the utility corridor. The Applicants believe that the impacts associated with fill for non-burial protection over natural bedrock should be classified as temporary, because the functional (valuable) habitat that will develop on the mattresses will be similar in composition to pre-existing conditions (i.e., hard surface habitat).

TABLE 5.1-3
IMPACTS FROM NON-CABLE BURIAL AREAS REQUIRING PROTECTIVE COVERINGS ALONG THE SUBMARINE ROUTE

	Number of Crossings	Area of Fill* (square feet)	Volume of Fill* (cubic yards)
Utility Crossings	26	1,286,948	22,343
Exposed/Surface Bedrock Crossings	13	863,255	32,953
Total	**39**	**2,150,203**	**55,296**

* Areas and volumes of permanent fill associated with non-burial cable protection is based on the assumed (conservative) dimensions (LxWxH) shown in Table 5.1.3.

5.1.3 Dredging

Dredging will be required in situations where: 1) cables need to be installed at depths greater than can be completed with the jet plow technology; and 2) where cofferdams are needed at areas where the cables transition from water to land (vice-versa) via HDD installation techniques. Based on a review of existing bathymetry and channel depths of Federal navigation channels crossed by the proposed Project cables, it is anticipated that dredging will not be necessary to achieve the proposed burial depths during cable installation and instead burial depths will likely to be achieved by jet plow cable installation methods. Proposed burial depths in these areas are shown on the cross sectional diagrams provided in Attachment J in the Supplemental Application.

TABLE 5.1-4
LOCATIONS OF NON–BURIAL CABLE INSTALLATION AND ASSOCIATED AREA OF IMPACT AND VOLUME OF PERMANENT FILL

Corresponding Submarine Route Plan View Map	Milepost	Crossing Type	Length (feet)	Footprint Area (feet^2)	Volume (feet^3)
1	0.8	Cable Protection - Utility Crossing	911.81	29,178.04	13,677.21
1	1.2	Cable Protection - Utility Crossing	667.52	21,360.73	10,012.84
3	7.7	Cable Protection - Utility Crossing	961.88	30,780.28	14,428.26
3	9	Cable Protection - Natural Bedrock	938.02	45,869.41	47,276.45
3	10.3	Cable Protection - Natural Bedrock	988.54	48,339.69	49,822.51
3	11.3	Cable Protection - Natural Bedrock	871.78	42,629.93	43,937.60
5	15.6	Cable Protection - Natural Bedrock	1,374.79	67,227.16	69,289.34
6	19.9	Cable Protection - Natural Bedrock	862.86	42,193.63	43,487.91
6	20.9	Cable Protection - Natural Bedrock	789.07	38,585.39	39,768.99
7	23.4	Cable Protection - Utility Crossing	1,083.49	34,671.65	16,252.34
7	23.8	Cable Protection - Utility Crossing	897.01	28,704.25	13,455.12
10	37.1	Cable Protection - Natural Bedrock	3,870.50	189,267.58	195,073.34
11	40.4	Cable Protection - Utility Crossing	990.83	31,706.58	14,862.46
11	41.3	Cable Protection - Natural Bedrock	1,152.41	56,352.80	58,081.41
12	44	Cable Protection - Natural Bedrock	939.90	45,960.88	47,370.72
13	46.3	Cable Protection - Natural Bedrock	988.44	48,334.60	49,817.26
16	59.2	Cable Protection - Natural Bedrock	1,190.72	58,226.44	60,012.53
23	86.9	Cable Protection - Utility Crossing	595.58	19,058.58	8,933.71
24	91.5	Cable Protection - Utility Crossing	752.72	24,087.01	11,290.79
32	244.2	Cable Protection - Utility Crossing	2,216.48	70,927.34	33,247.19
36	260	Cable Protection - Utility Crossing	4,216.90	134,940.77	63,253.48
37	266.2	Cable Protection - Utility Crossing	976.46	31,246.76	14,646.92
38	270	Cable Protection - Utility Crossing	2,214.43	70,861.86	33,216.50
40	274.9	Cable Protection - Utility Crossing	2,474.52	79,184.57	37,117.77
40	275.4	Cable Protection - Utility Crossing	1,930.28	61,768.97	28,954.21
42	283.4	Cable Protection - Natural Bedrock	2,693.87	131,730.38	135,771.19
42	285.1	Cable Protection - Utility Crossing	1,879.43	60,141.71	28,191.42
43	286.7	Cable Protection - Natural Bedrock	992.57	48,536.88	50,025.74
44	294.1	Cable Protection - Utility Crossing	1,214.64	38,868.41	18,219.57
48	309.1	Cable Protection - Utility Crossing	1,600.98	51,231.23	24,014.64
49	314	Cable Protection - Utility Crossing	890.72	28,502.91	13,360.74
52	324.1	Cable Protection - Utility Crossing	874.45	27,982.55	13,116.82
52	325	Cable Protection - Utility Crossing	1,176.48	37,647.29	17,647.17
52	325.3	Cable Protection - Utility Crossing	815.27	26,088.71	12,229.08
52	325.7	Cable Protection - Utility Crossing	1,326.65	42,452.92	19,899.81
52	326.2	Cable Protection - Utility Crossing	869.79	27,833.36	13,046.89
52	326.4	Cable Protection - Utility Crossing	1,405.48	44,975.43	21,082.23
53	328.5	Cable Protection - Utility Crossing	1,127.81	36,089.82	16,917.11
53	329.1	Cable Protection - Utility Crossing			
53	329.4	Cable Protection - Utility Crossing	6,145.50	196,656.10	92,182.55
53	329.9	Cable Protection - Utility Crossing			
Totals			**57,870.59**	**2,150,202.61**	**1,492,991.78**

Temporary cofferdams associated with the offshore entry/exit hole at HDD locations are expected to be rectangular in shape with dimensions of approximately sixteen (16) feet by thirty (30) feet or 480 square feet. The area inside the cofferdam will be dredged to create an entry/exit pit typically six (6) feet deep. Table 5.1-5 shows the expected impacts from dredging associated with cofferdams.

TABLE 5.1-5
IMPACTS OF COFFERDAM INSTALLATION AT HDD LOCATIONS ALONG THE SUBMARINE ROUTE

Corresponding Submarine Route Map	Milepost	Waterbody	Cofferdam Dimensions (square feet)	Volume of Dredged Material[1] (cubic yards)
26-27	101.3	Lake Champlain	480	107
28	228.4	Hudson River	480	107
45	295.5	Hudson River	480	107
46	302.8	Hudson River	480	107
53	330.3	Harlem River	480	107
54	331.6	East River[2]	480	107
54	332.5	East River	480	107
Total			**3,360**	**747**

[1] Volume of fill material at cofferdam locations is expected to be the same as the volume of dredged material at cofferdam locations. Fill will consist of clean sand.
[2] Currently there are 2 HDD locations proposed within the East River; however, 1 of the locations is located in an area characterized by deep, swift water. Therefore, a cofferdam may not be feasible and an alternative method may be utilized for this HDD location.

A marine route survey was conducted in the Spring of 2010 (see Attachment E of the December 2010 USACE Application). Physical and chemical characterization of the sediments at the proposed cofferdam locations indicates that the soils are expected to consist primarily of fine grain silts and clays.

Prior to dredging, the selected EPC contractor will develop a dredging plan which will include additional detailed information for the volume of material to be dredged, method of dredging, dredge locations and approved placement areas. It is anticipated that a closed (i.e., sealed) environmental (clamshell) bucket with seals or flaps positioned at locations of vent openings will be used to minimize sediment suspension for locations that have fine-grained unconsolidated (silty) sediments. The dredged material will be temporarily placed on a barge for storage and ultimate disposal at an appropriately permitted facility. Upon completion, the exit pit (i.e., cofferdam area) will be backfilled with clean sand to restore the bottom to preconstruction grade. The volume of clean fill needed to backfill the dredged cofferdam area is considered a temporary impact because it will be used to return the substrate to the original contours within the HDD area. The sand fill will be covered with natural sediment and return to its former functional state.

5.1.4 Anchor Positioning

Installation vessels will typically be dynamically positioned, using thrusters and the vessel propulsion system. However there are three circumstances where the Applicants believe it is likely that anchored, spud moored, or jack-up vessels would be needed to support work associated with cable installation:

- HDD locations where cables transition from land to water (vice versa),
- Cable splicing locations along the submarine route, and
- Cable protection locations along the submarine route (i.e., installation of grout pillow/mattresses).

In each situation where anchor positioning is necessary, the Applicants have assumed that the anchor utilized would be a 5,000-pound stockless Navy anchor, which has an assumed bottom footprint of 30 square feet. It is also assumed that four-point moors would be utilized in all waters except for the work in the East River where an eight-point system could potentially be employed.

A total of seven (7) land-to-water or water-to-land HDDs have been identified. In addition to the splices at these locations, the Applicants have estimated the number of splices that will be required in each waterbody based on the expected length of the cable spools that will be utilized and other installation factors. Table 5.1-6 lists the areas where impacts from anchors are expected to occur.

**TABLE 5.1-6
IMPACTS ASSOCIATED WITH ANCHOR POSITIONING
ALONG THE SUBMARINE ROUTE**

	HDD Locations	Cable Splicing Locations	Cable Protection Areas	Total Number of Anchor Areas	Total Number of Anchors Per Area	Anchor Impact (square feet)
Lake Champlain	1	8	23	32	4	3840
Hudson River	3	2	13	18	4	2160
Harlem River	1	2	10	13	4	1560
East River	2	0	0	2	8	480
Total	**7**	**12**	**46**	**65**		**8,040**

5.1.5 Cumulative Impacts

Based on the analyses presented above, the expected impacts of the Project due to installation in waterways are summarized in Table 5.1-7 below. Of these, only the impacts associated with non-burial protection over existing utilities (22,343 cubic yards) are expected to be permanent.

**TABLE 5.1-7
EXPECTED IMPACTS TO WATERWAYS
FROM CABLE INSTALLATION ACTIVITIES**

Cable Installation Activity	Area of Impact (square feet)	Volume of Permanent Fill (cubic yards)
Cable Burial (Submarine Route)	14,718,703	
Cable Burial at Waterbody Crossings (Overland Route)	9,950	
Non-burial Cable Protection Locations (Submarine Route)	2,150,203	55,296
Cofferdam Locations (Submarine Route)	3,360	747*
Anchor Placement Locations (Submarine Route)	8,040	
Total	**16,889,895**	**56,043**

* Volume of Dredge Material is equal to the Volume of Permanent Fill (20,160 ft^3) for the cofferdam locations along the submarine route.

5.2 Impacts to Wetlands along the Overland Route

A total of 423 wetland areas were identified in the survey area along the overland Project route. Twenty-six (26) wetlands delineated along the overland Project route correspond with wetlands mapped by the NYSDEC. Descriptions of wetland vegetation, hydrology, and soils observed within the Project survey area are presented in the Wetland Delineation Survey Summary Report provided in Attachment F. The expected impacts associated with the Project are presented below as well as the underlying assumptions. For the purposes of calculating impacts, a wetland was considered a forested wetland if it was assigned a Cowardin classification of PFO or a multiple classification that included PFO (e.g. PFO/PSS).

5.2.1 Description of Fill due to Cable Installation

Table 5.2-1 presents the expected impacts to wetlands due to the use of fill during the cable installation activities. The assumptions utilized in this analysis are provided below.

TABLE 5.2-1
EXPECTED TEMPORARY AND PERMANENT FILL INTO WETLANDS DURING CABLE INSTALLATION ACTIVITIES ALONG THE OVERLAND ROUTE

Overland Route Segment	Temporary Fill (cubic yards)	Permanent Fill (cubic yards)
Route 22	169	243
Whitehall to Rotterdam (CP Railroad)	5,281	3,192
Rotterdam to Selkirk (CSX Railroad)	3,997	3,629
Selkirk to Cementon (CSX Railroad)	10,917	12,160
Haverstraw Bay Bypass (CSX Railroad)	0	3
Total	**20,364**	**19,228**

5.2.1.1 Permanent Fill

To avoid thermal damage, the cables need to be surrounded by material with a low thermal resistivity. In locations where native material is suitable (e.g., fine grained material and material without organics), the excavated material will be replaced into the trench after boulders and large cobbles have been removed. Where the native material is unsuitable (wet clay, silt, organic matter or material having large cobbles), an appropriate backfill such as low thermal resistivity uniformly graded sand or low density concrete will be placed in the trench. In some locations where the risk of dig-in or damage is higher, a protective cover of Stork Board or a similar HDPE plate designed for utility protection and marking will be utilized. Marker tape will be placed one to two feet above the cables where Stork Board or a similar protection is not utilized. A layer of topsoil will be installed in the top six inches of the trench.

To provide a reasonable estimate of permanent fill, overland trenches were assumed to have a width of four (4) feet and a depth of five (5) feet. Information from the National Resource Conservation Service ("NRCS") Soil Series Maps was reviewed for individual wetlands to identify broad soil characteristics typical of soils having unacceptable thermal resistivity. For wetlands with a suitable thermal resistivity (e.g. soils classified as "PSS" types, fine sandy loam), it was assumed that two feet of thermal material would be layered in the trench and the remainder would be native soils and topsoil. For wetlands with other soil types, it was assumed that the trench would be filled with thermal material until the upper six inches, where topsoil would be laid.

5.2.1.2 Temporary Fill

During construction, spoil will be stored within the construction corridor immediately adjacent to the trench or within designated extra work areas. The Applicants will avoid and/or minimize the storage of spoil within wetlands; however, due to the space constraints along the railroad ROW, it is anticipated that some spoil storage in wetland areas may be required. In these areas, soil to be used to backfill the trench will be stockpiled for a short period on construction matting or geo-textile fabric with a layer of gravel, which would represent temporary fill.

For the purposes of this calculation, the Applicants reviewed available data to determine the likely extent of the construction zone, spoil zone, or auxiliary access roadways which would be located within each wetland. The depth of temporary fill, which would include the anticipated geo-technical materials plus gravel, was assumed to be six (6) inches. However, it should be noted that construction will also be occurring during months when the wetlands will be frozen or not saturated.

5.2.2 Description of Impacts due to Construction and Vegetative Maintenance

Appendix 1 presents the expected impacts to individual wetlands due to construction and vegetative maintenance activities, which are summarized in Table 5.2-2. The assumptions utilized in this analysis are provided below.

TABLE 5.2-2
EXPECTED IMPACTS TO WETLANDS DURING CABLE INSTALLATION ACTIVITIES ALONG THE OVERLAND ROUTE

Overland Route Segment	Temporary Impacts		Permanent Impacts	
	Forested Wetland (square feet)	Non-Forested Wetland (square feet)	Forested Wetland (square feet)	Non-Forested Wetland (square feet)
Route 22	3,101	18,318		4,022.50
Whitehall to Rotterdam (CP Railroad)	354,496.80	1,216,169.40	15201.9	119553.6
Rotterdam to Cementon, Haverstraw Bay Bypass (CSX Railroad)	347,699	996,306	72,641	236,866
Total	**705,296 (16.2 acres)**	**2,230,794 (51.2 acres)**	**87,842 (2.0 acres)**	**360,442 (8.3 acres)**

5.2.2.1 Permanent Impacts

Under the terms of the Joint Proposal, the Applicants must establish a Permanent ROW for the Project, which is no closer than: (a) six feet from the outer surface of the nearest installed cables when the ROW is located within lands entirely owned or controlled by a railroad company or a public highway; and (b) eight feet from the outer surface of the nearest installed cables in other areas. Based on the diameter of the cables and their expected configuration within the trench, the Permanent ROW is expected to be 13 to 17 feet wide centered over the cable trench.

Within the Permanent ROW, vegetative management activities will be conducted to prevent the establishment of deep-rooted plants/trees in order to protect the cables. These activities will be consistent with vegetative control measures already in place along the railroad and roadway ROWs. Approximately 2.0 acres of forested wetlands are located within the Permanent ROW and will be converted to scrub-shrub wetlands, resulting in a permanent change to the function and values of these wetlands. The remaining non-forested wetlands within the Permanent ROW (8.3 acres) will be subject to periodic vegetative management activities but are expected to retain their previous wetland functions and values.

5.2.2.2 Temporary Impacts

As described in Section 3.1, a construction zone will be established which will include the area needed for excavation of the trench, installation of erosion and sediment control measures, and stockpiling of excavated material. Typical construction configurations are provided in Attachment H of the Supplemental Application. The construction zone is shown on the aerial photography figures provided in Attachment C of the Supplemental Application. A portion of the construction zone will overlap with the Permanent ROW (which includes the cable width plus an additional six or eight feet on either side). For the purposes of this analysis, the temporary construction zone was assumed to be 31 to 33 feet wide depending on the width of the Permanent ROW.

During construction, it is expected that temporary impacts to wetlands will occur within the construction corridor. However, original surface hydrology in disturbed wetland areas will be re-established by backfilling the trench and grading the surface to original contours, as needed. Trenches in wetlands will be backfilled with native wetland soils to the extent practicable and a layer of native topsoil will be installed. The Applicants will seed the right-of-way to establish temporary cover and stabilize soils, at which point wetlands will then be allowed to revegetate naturally. Emergent wetland vegetation is expected to return quickly following construction and woody species will return more slowly. Forested wetlands, where not maintained, are expected to go through several stages of successional vegetation before returning to the pre-construction vegetation cover type.

6.0 MITIGATION ACTIVITIES PROPOSED FOR RESOURCE IMPACTS

Pursuant to 33 CFR 332, the Applicants are required to develop a mitigation plan. This plan must include an explanation of how temporary and permanent impacts will be mitigated. It must also include sequencing of avoidance, minimization, and compensation for temporary and permanent impacts. The Applicants are requesting that the submission of the mitigation plan be delayed until consultation with the USACE can occur in order to confirm the cumulative temporary and permanent impacts associated with this Project. In the interim, the Applicants are providing the following discussion of avoidance and minimization measures which have been adopted throughout the development of this Project.

The Project has been sited to avoid or minimize impacts to sensitive resources. Most of the overland portions of the Project route consist of previously disturbed railroad or roadway ROWs which have been subjected to routine vegetative maintenance activities. As shown in the Wetland Functions and Values Assessment (Attachment G of the Supplemental Application), wetlands within these areas tend to be of lower value than those in less disturbed or non-disturbed areas. The underwater cable route has been thoroughly reviewed by New York state resource agencies and sited to avoid significant habitat and cultural features. The Project has been designed to avoid and/or minimize impacts to tidal and estuarine wetlands to the extent feasible by siting the underwater portions of the cable route within the deeper subtidal zones and by using HDD construction methods for all landfall locations.

The expected temporary and permanent impacts to wetlands are described above in Section 5. It is anticipated that wetland hydrology, vegetation, and water quality will return to pre-construction conditions in most areas when construction is completed. However, in limited areas, forested wetland cover may be converted to a scrub-shrub community as part of the Applicants' Vegetation Management Plan. During operation of the transmission cable system, activities associated with Vegetation Management Plan will be restricted to vegetation clearing on an as-needed basis to conduct repairs or maintenance along the cable route and/or selective cutting to prevent the establishment of large trees directly over the cables. Any herbicide use will be selected based on site sensitivity, target species composition and density, and treatment methods. Herbicides will not be used in certain areas if site sensitivity, regulations, permit conditions, or target species composition or height recommend otherwise. Herbicides will only be applied under the direct supervision of a Certified Pesticide Applicator who either owns or is employed by a business or agency registered with the State of New York for the purpose of herbicide application. Any vegetation management activities currently conducted by the railroads within the ROW will continue following the construction and operation of the underground transmission cables.

To avoid increases in erosion and sedimentation into waterbodies and wetlands from land disturbance in nearby construction areas, the Applicants will install temporary and permanent erosion control measures along the construction corridor and adjacent to soil stockpiles, as needed, and will manage construction stormwater in accordance with Storm Water Pollution

Prevention Plan ("SWPPP") for the Project. A SWPPP will be prepared prior to construction as part of permitting and compliance.

During construction, spoil will be stored within the construction corridor immediately adjacent to the trench or within designated extra work areas. The Applicants will avoid and/or minimize the storage of spoil within wetlands; however, due to the space constraints along the railroad ROW, it is anticipated that some spoil storage in wetland areas may be required. In these areas, soil will be temporarily stockpiled on construction matting or geo-textile fabric to be used to backfill the trench. Any excess spoil will be removed and disposed of properly offsite. The Applicants will segregate topsoil in wetlands, except when standing water or saturated soils are present, to prevent the mixing of topsoil with subsoil. This facilitates wetland revegetation by maintaining physical and chemical characteristics of the surface soil and preserving the native seed bank.

In general, the Applicants anticipate that construction equipment along the overland route in railroad ROWs will operate primarily from the railroad bed, railroad access roads, embankment, or other upland areas. If any construction equipment needs to operate within saturated wetlands that are likely to be impacted by soil compaction or rutting, based on conditions at the time of construction, the Applicants will use equipment mats or low-ground-pressure tracked vehicles to avoid and/or minimize impacts to wetland soils. If dewatering is required within the excavated trench, water will be discharged to a well-vegetated upland area, a properly constructed dewatering structure, or a filter bag.

Original surface hydrology in disturbed wetland areas will be re-established by backfilling the trench and grading the surface to original contours, as needed. The Applicants will seed the right-of-way to establish temporary cover and stabilize soils. Wetlands will then be allowed to revegetate naturally. Wetlands will be backfilled with native wetland soils that were segregated during construction to speed recruitment of existing native wetland vegetation from the seed bank. Emergent wetland vegetation is expected to return quickly following construction and woody species will return more slowly. Forested wetlands, where not maintained, are expected to go through several stages of successional vegetation before returning to the pre-construction vegetation cover type. To assist in the recovery of woody species, the Applicants will avoid and/or minimize removal of roots and stumps in cleared areas outside of the cable trench, unless required for safety, in order to allow resprouting of woody species.

It is expected that during construction, potential short-term impacts on water quality may be caused by localized increases in turbidity and downstream sedimentation resulting from trenching within the waterbody. Water quality impacts will be avoided and/or minimized by using construction techniques such as HDD in some areas and by immediately restoring and stabilizing the streambed and banks once construction is completed. At crossings with significant stream flows, the use of dry-ditch crossing methods instead of open cut methods avoids and/or minimizes potential impacts from turbidity and sedimentation, because disturbed sediments within the construction area do not become re-suspended. Long-term impacts on water quality or on aquatic organisms are not anticipated. Water quality and other stream attributes should return to pre-construction conditions within a short period after restoration of the bed and banks.

Some clearing of riparian vegetation adjacent to waterbodies within the construction corridor may be required to conduct trenching and cable installation activities. Clearing of vegetation along stream banks has the potential to reduce the bank stability and increase erosion. Adverse impacts will be avoided and/or minimized through the use of temporary and permanent erosion control measures, and by restoring, stabilizing, and seeding stream banks as soon as possible once construction is completed.

To avoid and/or minimize impacts to occupied habitat of threatened and endangered wildlife species under the federal Endangered Species Act and 6 NYCRR Part 193 (“TE species”) and rare, threatened and endangered plant species under 6 NYCRR Part 182 (“RTE plants”), the Applicants have committed under the Joint Proposal to minimize the cutting of mature trees. Unless required for safety, the removal of stumps and roots that are not in the footprint of the excavated trench will be limited. In addition, the following species-specific measures will be taken:

a) Indiana bat – The Certificate Holders will identify and avoid and/or minimize impacts to large specimen trees of shagbark hickory (*Carya ovata*), which could potentially serve as maternity or roost trees.

b) Karner blue butterfly and frosted elfin – Areas of potential and occupied habitat for Karner blue butterfly (*Lycaeides melissa samuelis*) and frosted elfin (*Callophrys irus*) were identified by field investigators. These areas will be identified on plan and profile drawings and marked in the field with signs or high visibility flags prior to construction. To avoid and/or minimize impacts on areas of potential or occupied habitat of the Karner blue butterfly and frosted elfin, clearing and disposal activities within these areas will be performed in accordance with the Karner Blue Butterfly Impact Avoidance and Minimization Report.

c) TE species and RTE plants – If any new or previously undiscovered TE species or RTE plants are observed to be present in the construction areas, consultation will occur with state and federal agencies to determine measures to avoid and/or minimize any impacts to the observed TE species or RTE plants.

To avoid and/or minimize impacts from accidental leaks and spills, construction crews will have appropriate on-site personnel to control the source of the spill, release or leak and contain the spill, release or leak in as small an area as possible. Appropriate equipment, supplies and materials for containment and cleanup of oil and hazardous substances will be kept at the construction site(s) (i.e., construction site work area with ongoing construction activities and construction staging area) in the event of a spill. To reduce the likelihood of a spill, the Applicants will avoid storing hazardous materials, chemicals or lubricating oils, or refueling vehicles and equipment within 100 feet of the edge of a waterbody or wetland, unless no reasonable alternative is available.

7.0 PHASING OF ACTIVITIES

During Project planning, an overall construction schedule will be developed that will optimize efficiency while avoiding and/or minimizing impacts to environmental and natural resources. Objectives will include avoiding significant spawning and breeding seasons for fish and wildlife to the greatest extent possible, given other seasonally dependent construction variables. Resources traversed by the Project that have a seasonal specific sensitivity will be identified along with the preferred construction season to avoid and/or minimize impacts and will be reflected in overall scheduling.

Project sequencing and construction sequencing will proceed in a logical progression based on the availability of construction materials and ROW access. The construction sequencing for the Project will be established early in the Project planning process and incorporate seasonal restrictions and construction windows, material fabrication schedules, and overall timeline requirements to complete each segment of the Project.

The following construction windows for work along the underground portion of the Project are proposed:

a) Work that must occur within any identified NYSDEC-protected streams (Class C/Standard T or higher Class/Standard streams or regulated adjacent area) will be highly restricted to avoid or minimize impacts to stream banks, water quality, and wildlife. More specifically, most designated trout streams are anticipated to be crossed using the HDD method thereby avoiding disturbance of these streams. If a dry crossing is proposed for any of these streams, the Applicants will adhere to the proposed timing restrictions or will discuss and develop, as necessary, mitigation measures with the appropriate agencies.

b) The Applicants will avoid construction within or immediately adjacent to occupied Karner blue butterfly habitat. Because adult flight periods may vary from year to year, the Applicants will contact NYSDEC prior to starting construction within any identified habitat areas to confirm that adults have not emerged.

As part of the development of the Joint Proposal, the Applicants agreed to limiting underwater cable installation activities to certain times of the year to avoid life-cycle or migratory impacts to Atlantic sturgeon, American shad, winter flounder, striped bass, and other anadromous fish populations, as well as resident species such as shortnose sturgeon using the affected areas. The construction windows are as presented in Table 7.0-1.

TABLE 7.0-1
IN-WATER CONSTRUCTION WINDOWS

River Mile	Route Mile	Location	Construction Windows
Lake Champlain			
	0 to 73	US/Canada Border to Crown Point	May 1 to August 31
	73 to 101	Crown Point to Dresden	September 1 to December 31
Hudson, Harlem, and East Rivers			
107-68	229 to 269	Cementon – New Hamburg	Aug 1 - Oct 15
68-41	269 to 296	New Hamburg – Stony Point	Sep 15 - Nov 30
33-14	303 to 324	Rockland Lake State Park – Harlem River	Jul 1 - Oct 31
All	324 to 330	Harlem River – East River	May 15 - Nov 30

8.0 ALTERNATIVES SUMMARY

In accordance with the Clean Water Act Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material ("Guidelines"), the Applicants developed a "least environmentally damaging practicable alternative" ("LEDPA") analysis for the Project, which was submitted in April of 2010. In response to a letter sent by the USACE in July of 2010, the Applications submitted supplemental materials in August of 2010. The Applicants also developed a summary of the alternatives evaluated as part of the New York State review of the Project from March 2010 to December 2010. These documents were provided in Appendix D of the USACE Application submitted in December of 2010.

The Applicants have further updated their LEDPA analysis based on a letter dated July 2, 2011 from the USACE and have provided the updated Alternatives Analysis in Attachment I of the Supplemental Application. This analysis is based on information provided by and discussions conducted with New York State agencies, county governments, utilities and non-governmental agencies as part of the confidential settlement negotiations during the Article VII process. Settlement parties underwent an intensive review of the routing, with a specific focus on locating the cables out of major waterbodies to the extent practical and feasible. In their Joint Proposal, the settlement parties[3] stated that various alternative routes had been considered and rejected so that:

[3] Settlement parties endorsing the Joint Proposal for all purposes include: the Applicants, New York State Department of Public Service; New York State Department of Environmental Conservation; New York State Department of State; Adirondack Park Agency; New York State Office of Parks, Recreation and Historic Preservation, Riverkeeper, Inc.; Scenic Hudson, Inc.; and New York State Council of Trout Unlimited. The New York State Department of Transportation and Vermont Electric Power

> *The preferred route as presented in this Joint Proposal was determined to be the best suited for the Facility, since it provides an appropriate balance among the various state interests, and it represents the minimum adverse environmental impact, considering the state of available technology, the nature and economics of the studied alternatives and other pertinent considerations.*

The signatory parties also noted that they supported the issuance of an Article VII Certificate of Environmental Compatibility and Public Need to the Applicants based on factors that included environmental impact as well as the availability and impact of alternatives.

Company signed the JP for the limited purposes of participating in the sections of importance to them.

APPENDIX A

Wetland Impacts

Wetland Impact Table														
Approx. MP	Index Map Sheet	Town	Field ID	NYSDEC Wetland ID	NYSDEC Wetland Class	Cowardin Classification	HDD Crossing Length (feet)	Direct Bury Crossing Length (feet)	Temporary Impacts a/		Permanent Impacts b/		Total Impacts c/	
									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
Route 22 Right-of-Way														
101.6	1	Dresden	A3611	N/A	N/A	PEM	16.6	-	-	-	-	-	-	-
102.2	3	Dresden	A3511	N/A	N/A	PEM	-	-	-	906.5	-	-	-	906.5
102.3	4	Dresden	A3411	N/A	N/A	PSS/RUB	-	-	-	163.4	-	-	-	163.4
103.0	5	Dresden	A3311	N/A	N/A	PEM	-	-	-	104.3	-	-	-	104.3
103.1	6	Dresden	A3211	N/A	N/A	PEM	-	-	-	935.6	-	-	-	935.6
103.2	6	Dresden	A3111	N/A	N/A	PEM/PSS	-	-	-	266.4	-	-	-	266.4
103.7	7	Dresden	A2911	N/A	N/A	PEM/PFO	-	-	1,233.5	-	-	-	1,233.5	-
103.8	7	Dresden	A2711	N/A	N/A	PEM	-	-	-	877.7	-	-	-	877.7
103.8	8	Dresden	A2811	N/A	N/A	PFO/RUB	-	-	1,435.5	-	-	-	1,435.5	-
103.9	8	Dresden	A2611	N/A	N/A	PEM/POW	-	-	-	1,048.7	-	-	-	1,048.7
104.4	9	Dresden	A2511	N/A	N/A	PFO	-	-	14.5	-	-	-	14.5	-
104.8	10	Dresden	A2411	N/A	N/A	PFO/RUB	-	-	28.7	527.2	-	-	28.7	527.2
104.9	10	Dresden	A2311	N/A	N/A	PEM	-	-	-	109.9	-	-	-	109.9
105.2	11	Dresden	A2211	N/A	N/A	PEM	-	-	-	2.5	-	-	-	2.5
105.7	13	Dresden	A2111	N/A	N/A	PEM	-	-	-	299.2	-	-	-	299.2
107.2	16	Dresden	A1811	N/A	N/A	PEM/PSS	-	-	-	293.2	-	-	-	293.2
107.3	17	Dresden	A1611	N/A	N/A	PEM	-	-	-	322	-	-	-	322
107.4	17	Dresden	A1511	N/A	N/A	PEM	-	-	-	338.2	-	-	-	338.2
108.1	19	Dresden	A1311	N/A	N/A	PEM	-	-	-	1,196.3	-	-	-	1,196.3
108.4	19	Dresden	A1111	N/A	N/A	PFO	-	-	365	-	-	-	365	-

Wetland Impact Table														
Approx. MP	Index Map Sheet	Town	Field ID	NYSDEC Wetland ID	NYSDEC Wetland Class	Cowardin Classification	HDD Crossing Length (feet)	Direct Bury Crossing Length (feet)	Temporary Impacts a/		Permanent Impacts b/		Total Impacts c/	
									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
108.4	20	Dresden	A1211	N/A	N/A	PSS	-	-	-	461	-	-	-	461
108.5	20	Dresden	A1011	N/A	N/A	PSS	-	-	-	1,017.1	-	-	-	1,017.1
109.2	22	Dresden	A0511	N/A	N/A	PEM/PFO	-	-	23.4	-	-	-	23.4	-
109.6	23	Dresden	A0811	N/A	N/A	PEM	-	283.5	-	6,250.1	-	4,006	-	10,256.1
110.4	25	Whitehall	A0411	N/A	N/A	PEM	-	-	-	1,306	-	-	-	1,306
110.8	26	Whitehall	A0311	N/A	N/A	PEM/PSS	-	-	-	313.4	-	-	-	313.4
111.4	27	Whitehall	A0211	WH-2	1	PEM	-	-	-	361.4	-	-	-	361.4
111.7	28	Whitehall	A0111	WH-2	1	PEM/PSS	-	-	-	1,218.3	-	16.5	-	1,234.8
Route 22 Right-of-Way Subtotal:							**16.6**	**283.5**	**3,100.6**	**18,318.4**	**-**	**4,022.5**	**3,100.6**	**22,340.9**
Canadian Pacific (CP) Railroad Right-of-Way														
113.5; 113.9; 116.4	33, 34, 40	Whitehall	B54	N/A	N/A	PEM/PSS/PFO	-	-	33,011.5	175,874	-	1,157.4	33,011.5	177,031.4
115.6	38	Whitehall	B55	N/A	N/A	PEM/PSS	-	-	-	4,396.2	-	960.6	-	5,356.8
117.5	43	Whitehall	B53	N/A	N/A	PEM	-	-	-	40,598.9	-	4	-	40,602.9
117.8	44	Whitehall	B52	N/A	N/A	PEM	-	-	-	5,002.6	-	-	-	5,002.6
118.1	45	Fort Ann	B51	N/A	N/A	PEM	-	-	-	64,340.7	-	0.5	-	64,341.2
118.6	46	Fort Ann	B50	N/A	N/A	PEM	-	-	-	433	-	-	-	433
118.9; 119.1	47/48	Fort Ann	B48	N/A	N/A	PEM/PFO	-	-	2,282.9	16,322.2	-	-	2,282.9	16,322.2
119.0	47	Fort Ann	B49	N/A	N/A	PEM	-	-	-	1,140.3	-	-	-	1,140.3
119.3	48	Fort Ann	F19	N/A	N/A	PFO	-	-	155	-	-	-	155	-
119.8; 120.4	49, 51	Fort Ann	F17	FA-13	1	PFO/POW	-	-	753.4	37,698	-	-	753.4	37,698
121.7	54	Fort Ann	F14	N/A	N/A	PFO	-	-	2,762.5	-	-	-	2,762.5	-

Wetland Impact Table														
Approx. MP	**Index Map Sheet**	**Town**	**Field ID**	**NYSDEC Wetland ID**	**NYSDEC Wetland Class**	**Cowardin Classification**	**HDD Crossing Length (feet)**	**Direct Bury Crossing Length (feet)**	**Temporary Impacts a/**		**Permanent Impacts b/**		**Total Impacts c/**	
									Forested Wetland (square feet) d/	**Non-Forested Wetland (square feet)**	**Forested Wetland (square feet) d/**	**Non-Forested Wetland (square feet)**	**Forested Wetland (square feet) d/**	**Non-Forested Wetland (square feet)**
121.9	55	Fort Ann	F13	N/A	N/A	PFO	-	-	4,763.4	-	-	-	4,763.4	-
122.0; 122.4	55	Fort Ann	F12	N/A	N/A	PSS/PFO	-	-	18,939.9	-	-	-	18,939.9	-
122.8	57	Fort Ann	F11	N/A	N/A	PSS/PFO	-	-	23,480.4	-	-	-	23,480.4	-
123.2	58	Fort Ann	F10	N/A	N/A	PSS/PFO	-	-	3,336.4	-	-	-	3,336.4	-
124.2; 124.3; 124.4; 125.2; 125.3; 125.6	59, 60, 61, 62, 64, 65	Fort Ann	F8	N/A	N/A	PEM/PSS/PFO	-	0.7	64,793	58,489.2	25.8	731.5	64,818.8	59,220.7
127.2; 127.5	69	Kingsbury	F4	N/A	N/A	PEM/PSS	-	-	-	52,923.3	-	-	-	52,923.3
128.4	71	Kingsbury	F2	N/A	N/A	PEM/PSS	-	-	-	46,518.2	-	39.7	-	46,557.9
129.6; 130.2	74, 76	Kingsbury	A54	N/A	N/A	PEM/PSS	-	-	-	177,328.5	-	-	-	177,328.5
131.9; 132.3	81, 82	Kingsbury	A2	N/A	N/A	PEM/PSS	-	-	-	76,512.5	-	-	-	76,512.5
133.3	85	Fort Edward	A5	N/A	N/A	PSS	-	267	-	3,212.8	-	2,895.9	-	6,108.7
133.6	86	Fort Edward	A6	N/A	N/A	PFO	-	-	372.6	-	-	-	372.6	-
135.8	91	Moreau	A14	N/A	N/A	PEM/PSS	-	-	-	1,288.3	-	-	-	1,288.3
135.9	92	Moreau	A15	N/A	N/A	PSS	-	-	-	377.6	-	-	-	377.6
136.0	92	Moreau	A16	N/A	N/A	PFO	-	-	766.2	-	-	-	766.2	-
136.1	92	Moreau	A17	N/A	N/A	PFO	-	-	2,096.8	-	-	-	2,096.8	-
136.7	94	Moreau	A23	N/A	N/A	PEM	-	8.1	-	44.3	-	104.6	-	148.9
136.9	94	Moreau	A24	N/A	N/A	PEM/PSS	-	-	-	1,913.9	-	528.8	-	2,442.7
137.1; 137.2	95	Moreau	A26	F-20	2	PEM/PSS/PFO	-	-	1,056.2	13,007.8	-	-	1,056.2	13,007.8
137.8	96	Moreau	A28	N/A	N/A	PFO	-	-	158	-	-	-	158	-

Wetland Impact Table														
Approx. MP	Index Map Sheet	Town	Field ID	NYSDEC Wetland ID	NYSDEC Wetland Class	Cowardin Classification	HDD Crossing Length (feet)	Direct Bury Crossing Length (feet)	Temporary Impacts a/		Permanent Impacts b/		Total Impacts c/	
									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
137.9	97	Moreau	A30	F-7	2	PSS	-	-	-	1,034.4	-	-	-	1,034.4
138.5	98	Moreau	A36	F-7	2	PSS	-	-	-	406.7	-	-	-	406.7
138.8; 139.0	99, 100	Moreau	A38	F-7	2	PSS/PFO	-	15.4	18,915.7	28,318	272.3	1.2	19,188	28,319.2
139.8	102	Northumberland	A41	N/A	N/A	PSS	-	-	-	5,081.7	-	-	-	5,081.7
141.3	106	Northumberland	A47	N/A	N/A	PFO	-	-	4,567.5	-	-	-	4,567.5	-
141.4	106	Northumberland	A48	N/A	N/A	PFO	-	-	404	-	-	-	404	-
141.7; 141.8; 142.1	106, 107	Northumberland	A49	Q-32	1	PSS/PFO	-	-	21,734.4	1,755.7	32.6	-	21,767.1	1,755.7
142.2	108	Northumberland	A52	N/A	N/A	PFO	-	-	2,018.5	-	-	-	2,018.5	-
142.9	110	Northumberland	D7	GA-20	2	PEM	-	-	-	8,663.4	-	-	-	8,663.4
143.0	110	Northumberland	D6	N/A	N/A	PEM/PFO	-	-	1,254.2	-	-	-	1,254.2	-
143.1	111	Northumberland	D4	N/A	N/A	PFO	-	-	342.7	-	-	-	342.7	-
143.2	111	Northumberland	D3	N/A	N/A	PFO	-	-	17,230.3	-	-	-	17,230.3	-
143.4	111	Wilton	D2	N/A	N/A	PFO	-	-	732	-	-	-	732	-
145.9; 146.0	118	Wilton	B39	N/A	N/A	PEM/PFO	-	-	10,361.2	-	-	-	10,361.2	-
146.4	119	Wilton	B36	Q-11	1	PFO/PSS	10.6	-	-	-	-	-	-	-
149.5	127	Wilton	B1	S-7	2	PEM	-	-	-	124.3	-	-	-	124.3
150.5; 150.6; 150.7	130, 131	Greenfield	B3	S-19	1	PEM/PSS /PFO	-	73.3	565.7	28,510.2	-	3,001.9	565.7	31,512.1
151.4	132	Greenfield	B4	S-19	1	PEM/PSS	-	3.3	-	15,338.7	-	264.6	-	15,603.3
152.3	135	Saratoga Springs	B5	S-19	1	PEM/PSS	-	-	-	190.9	-	-	-	190.9
152.8	136	Saratoga Springs	B6	N/A	N/A	PEM/PSS	-	-	-	9,918.5	-	9.3	-	9,927.8

Wetland Impact Table

Approx. MP	Index Map Sheet	Town	Field ID	NYSDEC Wetland ID	NYSDEC Wetland Class	Cowardin Classification	HDD Crossing Length (feet)	Direct Bury Crossing Length (feet)	Temporary Impacts a/		Permanent Impacts b/		Total Impacts c/	
									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
154.9	141	Saratoga Springs	D9	S-21	3	PEM	-	1,402.3	-	86,021.6	-	19,867.9	-	105,889.5
155.5	143	Saratoga Springs	B47	S-21	3	PEM/PSS/PFO	-	45.6	642.1	-	594.1	-	1,236.2	-
155.9	144	Saratoga Springs	B45	N/A	N/A	PEM	-	1,899.2	-	4,410.6	-	22,780.9	-	27,191.5
157.0	146	Saratoga Springs	B44	N/A	N/A	PEM/PFO	-	313.1	10,031	-	3,594.3	-	13,625.3	-
157.1	147	Saratoga Springs	B41	N/A	N/A	PFO	-	-	11,762.1	-	204.3	-	11,966.4	-
157.5; 158.0	148, 149	Saratoga Springs	B10	N/A	N/A	PFO	252.2	248.8	18,784	-	2,898.6	-	21,682.6	-
158.3	150	Milton	B17	N/A	N/A	PFO	-	53.8	3,739.8	-	699.6	-	4,439.4	-
158.7	151	Milton	B16	N/A	N/A	PFO	-	-	14,919	-	-	-	14,919	-
159.0	152	Ballston	B18	N/A	N/A	PEM/PSS	-	133.9	-	15,675.5	-	3,920.4	-	19,595.8
159.1	152	Ballston	B20	N/A	N/A	PEM/PSS	-	-	-	281.6	-	-	-	281.6
159.3	153	Ballston	B21	R-50	3	PEM	-	-	-	801.6	-	-	-	801.6
159.5	154	Ballston	B23	N/A	N/A	PEM	174.7	-	-	560.3	-	347.8	-	908.2
160.1; 160.4	154, 156	Ballston	B25	R-3	3	PEM/PSS/PFO	-	107.7	12,688	36,707	251.4	6,805.7	12,939.3	43,512.7
160.7	156	Ballston	B28	N/A	N/A	PEM	-	-	-	188.8	-	-	-	188.8
160.9	157	Ballston	B29	N/A	N/A	PEM/PSS	-	-	-	1,877.7	-	56.3	-	1,934
161.2	157	Ballston	B30	N/A	N/A	PEM/PSS	-	605.8	-	10,445.5	-	6,881.1	-	17,326.6
161.6	159	Ballston	B31	R-11	2	PEM	-	-	-	17,974.4	-	1,151.2	-	19,125.6
161.8	159	Ballston	B32	N/A	N/A	PEM	-	-	-	10,108.9	-	1,371.8	-	11,480.6
162.9	162	Ballston	B-C1	N/A	N/A	PEM	-	675.4	-	5,965.6	-	8,427.8	-	14,393.4
162.9; 163.0; 163.1	162, 163	Ballston	C1	N/A	N/A	PEM/PSS	-	528	-	16,485.3	-	6,229.3	-	22,714.7
163.4	163	Ballston	C2	N/A	N/A	PEM	27.4	-	-	-	-	-	-	-

Wetland Impact Table														
Approx. MP	Index Map Sheet	Town	Field ID	NYSDEC Wetland ID	NYSDEC Wetland Class	Cowardin Classification	HDD Crossing Length (feet)	Direct Bury Crossing Length (feet)	Temporary Impacts a/		Permanent Impacts b/		Total Impacts c/	
									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
163.4	164	Ballston	C4	N/A	N/A	PEM	-	350.6	-	4,397.3	-	3,197.6	-	7,594.8
163.7	164	Ballston	C5	N/A	N/A	PEM	-	-	-	991.4	-	123.2	-	1,114.6
164.4	166	Ballston	C8	R-18	2	PEM	8	68.4	-	24,785.7	-	4,230.2	-	29,015.9
164.9	167	Ballston	C15	R-18	2	PFO	-	108.6	18,343.5	-	1,441	-	19,784.5	-
167.1	173	Clifton Park	C29	B-31	2	PEM	-	-	-	2,352.2	-	642	-	2,994.2
167.5	174	Clifton Park	C31	N/A	N/A	PEM	-	-	-	10,504.3	-	-	-	10,504.3
168.2	176	Clifton Park	C35	N/A	N/A	PEM/PSS	-	-	-	8,397.6	-	-	-	8,397.6
170.0; 170.2	181	Glenville	C42	S-107	2	PEM/PSS/PFO	67.5	867.9	10,693.4	53,073.3	1,165.3	11,082.6	11,858.7	64,155.9
170.5	182	Glenville	X01	N/A	N/A	PSS/PFO	-	1,002.2	16,039.5	16,853.2	4,022.6	8,075.2	20,062	24,928.4
171.4	185	Glenville	C44	S-112	2	PEM	-	-	-	282.7	-	-	-	282.7
174.8	193	Schenectady	C46	N/A	N/A	PEM	-	-	-	3,316.9	-	-	-	3,316.9
175.0	193	Schenectady	C48	N/A	N/A	PEM	-	100.4	-	814.4	-	1,302.5	-	2,116.8
175.3	194	Schenectady	C56	N/A	N/A	PEM	-	278.4	-	6,131.2	-	3,360.1	-	9,491.3
CP Railroad Right-of-Way Subtotal:							**540.4**	**9,157.9**	**354,496.8**	**1,216,169.4**	**15,201.9**	**119,553.6**	**369,698.6**	**1,335,722.8**
CSX Railroad Right-of-Way – Rotterdam to Catskill, NY														
178.4	202	Rotterdam	E2	N/A	N/A	PSS	-	-	-	5,568.7	-	-	-	5,568.7
178.8; 178.9	203	Rotterdam	E3	N/A	N/A	PEM/PFO	-	331.6	14,381.2	14,470.3	3,914.4	3,050.3	18,295.6	17,520.6
179.1	204	Rotterdam	E4	N/A	N/A	PEM	-	-	-	25,741.6	-	780.6	-	26,522.3
179.5	205	Rotterdam	E5	N/A	N/A	PEM/PFO	-	66.5	13,960	120.4	132.2	2,995.9	14,092.1	3,116.3
179.7; 179.8	205, 206	Rotterdam	E7	N/A	N/A	PEM/PSS	-	51.2	-	10,797.8	-	1,497.7	-	12,295.5
180.0; 180.1; 180.3	206, 207	Rotterdam	E9	S-117	2	PEM/PSS	-	-	-	61,877.8	-	4,111.6	-	65,989.3

Wetland Impact Table

Approx. MP	Index Map Sheet	Town	Field ID	NYSDEC Wetland ID	NYSDEC Wetland Class	Cowardin Classification	HDD Crossing Length (feet)	Direct Bury Crossing Length (feet)	Temporary Impacts a/		Permanent Impacts b/		Total Impacts c/	
									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
180.6; 180.7	208	Guilderland	E10	N/A	N/A	PEM/PSS	13.1	196.4	-	7,226.5	-	2,253.2	-	9,479.8
180.8	208	Guilderland	E12	N/A	N/A	PEM/PFO	224.2	415.6	15,303.1	-	4,161.1	199.9	19,464.2	199.9
181.2; 181.6; 181.7; 181.8	209, 210	Guilderland	E15	N/A	N/A	PEM/PSS/PFO	589	184	12,258.2	6,090.5	2,038	6,439.9	14,296.1	12,530.4
182.0	212	Guilderland	E95	N/A	N/A	PEM	-	4.9	-	411.1	-	85.6	-	496.6
182.1; 182.2	212	Guilderland	E96	N/A	N/A	PEM/PSS/PFO	-	78.9	208.5	4,141.1	-	962.4	208.5	5,103.5
182.4; 182.5	213	Guilderland	E97	N/A	N/A	PEM/PSS	-	2.3	-	964.6	-	124.9	-	1,089.5
183.3	215	Guilderland	E80	N/A	N/A	PEM/PSS	-	-	-	1,139.8	-	-	-	1,139.8
183.4	215	Guilderland	E79	N/A	N/A	PSS/PFO	-	-	6,124.8	-	-	-	6,124.8	-
183.5	215	Guilderland	E77	N/A	N/A	PSS	-	-	-	5,319.7	-	-	-	5,319.7
183.8	216	Guilderland	E75	N/A	N/A	PFO	-	-	1,079.1	-	-	-	1,079.1	-
184.2; 184.2	217	Guilderland	E17	N/A	N/A	PSS/PFO/POW	-	79.9	721.1	13,056	-	1,180.5	721.1	14,236.5
185.5; 186.2; 186.2; 186.3	221, 222	Guilderland	E21	N/A	N/A	PEM/PSS/PFO	-	20.5	8,817.3	61,995.3	-	1,076.5	8,817.3	63,071.8
186.5; 186.7; 186.9; 186.9	223, 224	Guilderland	E24	N/A	N/A	PEM/PSS/PFO	-	552.6	17,695	25,776.1	4,187.3	3,263.7	21,882.2	29,039.8
187.3	225	Guilderland	E26	N/A	N/A	PEM/PSS	-	-	-	9,838.6	-	696.9	-	10,535.5
187.5; 187.7; 187.8	226	New Scotland	E28	V-52	2	PSS/PFO	-	475.1	3,240.8	15,424.9	1,259.7	5,297	4,500.5	20,722
188.0; 188.0	227	New Scotland	E29	N/A	N/A	PSS/PFO	-	16.2	991.7	6,695.2	0.1	774.2	991.8	7,469.4
189.2	230	New Scotland	E31	N/A	N/A	PSS	-	-		2,013.4	-	-	-	2,013.4

Wetland Impact Table

Approx. MP	Index Map Sheet	Town	Field ID	NYSDEC Wetland ID	NYSDEC Wetland Class	Cowardin Classification	HDD Crossing Length (feet)	Direct Bury Crossing Length (feet)	Temporary Impacts a/		Permanent Impacts b/		Total Impacts c/	
									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
189.8	232	New Scotland	E33	N/A	N/A	PEM/PSS/PFO	-	-	1,791.8	1,309.5	30.3	-	1,822.1	1,309.5
190.4	233	New Scotland	E35	N/A	N/A	PFO	-	-	3,111.6	-	-	-	3,111.6	-
190.7	234	New Scotland	E37	N/A	N/A	PFO	-	-	5,272.2	-	58.5	-	5,330.7	-
191.1	235	New Scotland	E39	N/A	N/A	PEM	-	345.4	-	11,289.7	-	4,377.6	-	15,667.3
191.5; 191.6	236	New Scotland	E43	N/A	N/A	PEM/PFO	-	-	4,450	1,003.1	-	-	4,450	1,003.1
194.0	243	Bethlehem	E51	N/A	N/A	PEM	-	-	-	9.8	-	-	-	9.8
194.1	243	Bethlehem	E52	N/A	N/A	PEM	-	-	-	877.8	-	94.7	-	972.5
194.1	243	Bethlehem	E59	N/A	N/A	PEM	-	17.8	-	1,386.6	-	231.8	-	1,618.4
194.2	243	Bethlehem	E58	N/A	N/A	PEM	18.5	1,962.2	-	15,570.3	-	26,527.1	-	42,097.4
197.2	250	Bethlehem	E104	N/A	N/A	PEM	-	-	-	38,523.1	-	-	-	38,523.1
199.2	253	Bethlehem	M71/ E101	N/A	N/A	PEM/PSS	36.5	161.8	-	57,844.8	-	8,899.7	-	66,744.4
199.3	256	Bethlehem	M70	N/A	N/A	PFO	-	-	1,235.9	-	-	-	1,235.9	-
199.6	257	Coeymans	M69	N/A	N/A	PEM/PFO	-	439.9	16,473.2	-	3,499.1	1,653.3	19,972.3	1,653.3
199.8	257	Coeymans	M67	N/A	N/A	PEM/PSS/PFO	-	1,592.2	67,714.2	-	19,234.4	-	86,948.6	-
200.3	259	Coeymans	M65	N/A	N/A	PEM/PSS/PFO	-	-	5,324.7	939	-	-	5,324.7	939
200.3	259	Coeymans	M66	N/A	N/A	PEM/PFO	-	58.7	1,453.7	-	574.7	-	2,028.4	-
200.8	260	Coeymans	M63	N/A	N/A	PEM/PSS/PFO	-	264.4	6,606.9	1,285	2,979.1	438.1	9,586	1,723.1
201.1	261	Coeymans	M62	N/A	N/A	PEM	-	154.3	-	7,739	-	1,954.4	-	9,693.5
201.1	261	Coeymans	Y36	N/A	N/A	PEM	-	-	-	170.2	-	-	-	170.2
201.2	261	Coeymans	M61	N/A	N/A	PEM/PSS/PFO/P OW	-	3,421	7,458.2	94,038	10.7	31,812.2	7,468.9	125,850.2
202.0	264	Coeymans	Y34	N/A	N/A	PEM/PSS	-	132.6	-	3,486.2	-	688.5	-	4,174.7

Wetland Impact Table

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									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
202.2	264	Coeymans	M60	N/A	N/A	PEM/PFO	-	677.1	32,424.8	-	9,747.5	-	42,172.3	-
202.4	265	Coeymans	M59	N/A	N/A	PEM/PSS/PFO	-	43.9	2,926.9	-	537.3	-	3,464.2	-
202.6	265	Coeymans	Y33	N/A	N/A	PEM	-	32.6	-	19,632.9	-	640.5	-	20,273.4
203.0	266	Coeymans	M58	N/A	N/A	PEM/PSS	-	-	-	3,104.4	-	501.5	-	3,605.9
203.1	266	Coeymans	M57	N/A	N/A	PEM/PFO	-	216.2	1,186.8	-	2,717.8	-	3,904.5	-
203.9	268	Coeymans	M56	N/A	N/A	PEM/PSS/PFO	-	-	368.9	-	-	-	368.9	-
204.4	270	New Baltimore	M53	N/A	N/A	PEM	-	822.4	-	10,101.7	-	6,453.7	-	16,555.4
204.6	270	New Baltimore	M52	N/A	N/A	PEM	130.8	-	-	1,663.5	-	880.3	-	2,543.7
204.9	271	New Baltimore	Y32	N/A	N/A	PEM/PSS	-	-	-	1,219.7	-	-	-	1,219.7
205.1	272	New Baltimore	Y31	N/A	N/A	PEM/PSS	-	-	-	3,409	-	-	-	3,409
205.4	272	New Baltimore	Y30	N/A	N/A	PEM	-	-	-	3,492.1	-	-	-	3,492.1
206.1	274	New Baltimore	M48	N/A	N/A	PSS	-	-	-	710.2	-	50	-	760.2
206.5	275	New Baltimore	M47	N/A	N/A	PEM/PSS	27.9	396.9	-	1,939.2	-	5,152.8	-	7,091.9
208.0	279	New Baltimore	Y27	N/A	N/A	PEM/PSS	-	14.7	-	143.4	-	196.6	-	340
208.4	280	New Baltimore	Y26	N/A	N/A	PEM	155.5	-	-	-	-	93.8	-	93.8
208.8	281	New Baltimore	M42	N/A	N/A	PEM/PSS	-	386.3	-	2,164.2	-	5,074.1	-	7,238.3
208.9	282	New Baltimore	M41	N/A	N/A	PEM/PSS/PFO	-	292.7	7,558.5	-	3,845.6	-	11,404.1	-
209.0	282	New Baltimore	M40	N/A	N/A	PSS	-	50.4	-	2,372.4	-	639.7	-	3,012.1
209.0	282	New Baltimore	Y24	N/A	N/A	PEM/PSS	-	95.9	-	3,323.5	-	1,233.4	-	4,556.9
209.8	284	New Baltimore	Y22	N/A	N/A	PEM	-	269.7	-	359.7	-	2,979.5	-	3,339.2
210.4	286	Coxsackie	M36	N/A	N/A	PFO	-	219	851.5	-	2,950.2	-	3,801.6	-

Wetland Impact Table

Approx. MP	Index Map Sheet	Town	Field ID	NYSDEC Wetland ID	NYSDEC Wetland Class	Cowardin Classification	HDD Crossing Length (feet)	Direct Bury Crossing Length (feet)	Temporary Impacts a/		Permanent Impacts b/		Total Impacts c/	
									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
210.6	286	Coxsackie	M35	N/A	N/A	PSS	-	37.6	-	19.1	-	334	-	353
210.7	287	Coxsackie	M34	HN-101	1	PEM/PFO	-	138	160.7	-	718	1,000	878.8	1,000
210.9	287	Coxsackie	Y21	N/A	N/A	PEM	-	133.4	-	1,026.3	-	1,728.8	-	2,755.1
211.2	288	Coxsackie	Y20	N/A	N/A	PEM	18.5	1,262.5	-	8,738.2	-	16,996.3	-	25,734.5
211.7	289	Coxsackie	M33	N/A	N/A	PEM/PFO	4.4	179.9	11852	34.5	2286.8	187.7	14138.8	222.2
211.8	289	Coxsackie	Y19	N/A	N/A	PEM	12.5	23.8	-	266.7	-	583.7	-	850.4
212.3	290	Coxsackie	Y18	N/A	N/A	PEM	-	2,500.2	-	55,108.8	-	28,350.7	-	83,459.4
213.5	292	Coxsackie	M32	N/A	N/A	PEM/PSS/PFO	-	11.6	56,130.8	-	6,327.6	-	62,458.3	-
214.5; 216.0	296, 299	Coxsackie/ Athens	Y16	HN-108	1	PEM	854.1	1,627.6	-	276,129.4	-	40,961	-	317,090.4
216.8	303	Athens	Y17	HN-108	1	PEM	-	-	-	719.2	-	-	-	719.2
220.2	311	Catskill	Y15	N/A	N/A	PEM	-	-	-	37,575.7	-	-	-	37,575.7
220.4	312	Catskill	Y14	N/A	N/A	PEM	-	-	-	2,055.3	-	-	-	2,055.3
220.8	313	Catskill	Y13	N/A	N/A	PEM	-	-	-	1,562	-	242.5	-	1,804.5
220.9	313	Catskill	M29	N/A	N/A	PEM	-	36.5	-	6,019.5	-	905.8	-	6,925.3
222.0	316	Catskill	M25	N/A	N/A	PEM/PFO	-	17	952.8	-	348.3	-	1,301.2	-
222.5	318	Catskill	M24	N/A	N/A	PEM/PFO	-	1.3	4,844.9	-	100.6	-	4,945.5	-
223.2	319	Catskill	Y11	N/A	N/A	PEM	-	627.8	-	6,158.5	-	4,535.6	-	10,694.2
223.6	321	Catskill	M21	N/A	N/A	PEM	-	-	-	11,045	-	41.6	-	11,086.6
223.8	321	Catskill	M20	N/A	N/A	PFO	-	-	242.8	-	-	-	242.8	-
224.1	322	Catskill	M19	N/A	N/A	PFO	-	-	2,133.3	-	-	-	2,133.3	-
224.3	323	Catskill	Y10	N/A	N/A	PEM	-	-	-	10,013.7	-	93.2	-	10,106.9

Wetland Impact Table

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									Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)	Forested Wetland (square feet) d/	Non-Forested Wetland (square feet)
224.5	323	Catskill	Y9	N/A	N/A	PEM	-	-	-	852.2	-	-	-	852.2
225.0	324	Catskill	M16	N/A	N/A	PEM	-	-	-	928.4	-	-	-	928.4
225.2	325	Catskill	M15	N/A	N/A	PEM	-	-	-	485.7	-	795.3	-	1,281
226.0	327	Catskill	M12	N/A	N/A	PEM	-	67.6	-	3,137.2	-	1,189.5	-	4,326.7
226.2	328	Catskill	M11	N/A	N/A	PEM/PFO	10.9	-	904.5	-	-	-	904.5	-
226.3	328	Catskill	M9	N/A	N/A	PSS/PFO	-	25.1	8,058.4	-	655.8	-	8,714.2	-
226.5	328	Catskill	M8	N/A	N/A	PEM/PFO	-	14.4	1,428	-	325.4	-	1,753.4	-
227.1	330	Catskill	M3	N/A	N/A	PEM/PSS	-	234.3		5,491.3	-	3,493.7	-	8,985
CSX Railroad Right-of-Way – Haverstraw Bay Bypass, NY														
296.1	335	Stony Point	Y1	HS-2	1	PEM	266.6	-	-	-	-	-	-	-
298.5	342	Haverstraw	Y4	N/A	N/A	PEM	-	-	-	1,161.6	-	62.5	-	1,224.2
CSX Railroad Right-of-Way Subtotal:							**2,362.5**	**21,482.4**	**347,698.8**	**996,305.7**	**72,640.5**	**236,866**	**420,339.9**	**1,233,171.6**
Total Impacts									**705,296.2 (16.2 acres)**	**2,230,793.5 (51.2 acres)**	**87,842.4 (2.0 acres)**	**360,442.1 (8.3 acres)**	**793,139.1 (18.2 acres)**	**2,591,235.3 (59.5 acres)**

a/ Temporary Impacts are based on an approximate 31- to 33-foot temporary workspace encompassing activities such as trenching, access, equipment staging, and spoil storage.
b/ Permanent Impacts are based on an approximate 13- to 17- foot permanent vegetation maintenance corridor.
c/ Total Impacts include both temporary and permanent impacts combined.
d/ If multiple Cowardin classifications exist for any given wetland identified as containing PFO (i.e. PFO/PSS), impacts were assigned to forested wetland.