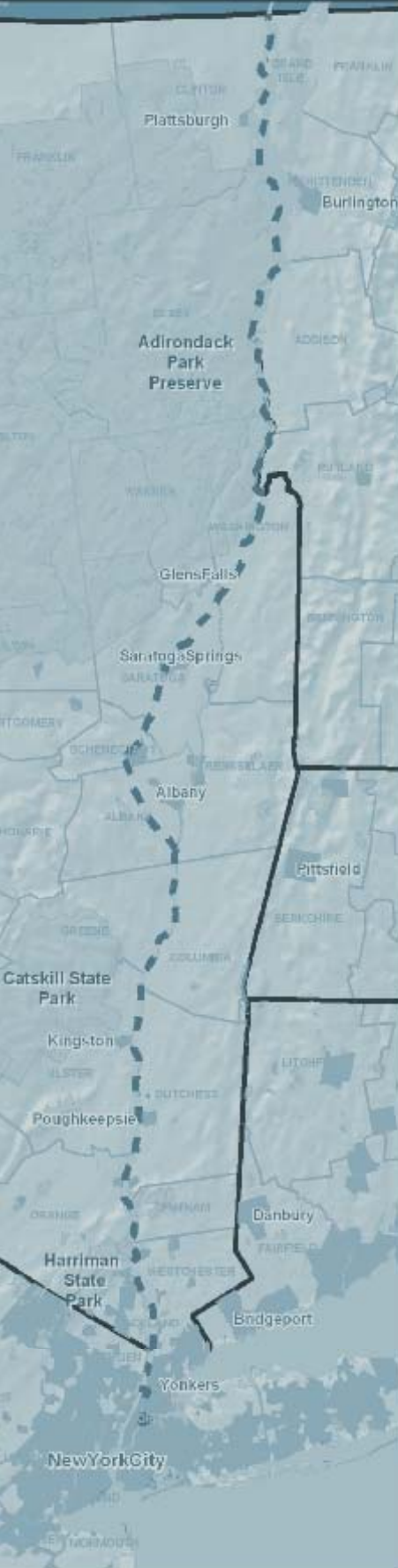




Revised

BIOLOGICAL ASSESSMENT

Addressing the Proposed Champlain Hudson Power Express Transmission Line Project



**U.S. DEPARTMENT OF ENERGY
OFFICE OF ELECTRICITY DELIVERY AND ENERGY RELIABILITY
WASHINGTON, DC**

July 2014

ACRONYMS AND ABBREVIATIONS

° C	degrees Celsius	MP	Milepost
° F	degrees Fahrenheit	mV/cm	millivolts per centimeter
AC	alternating current	MW	megawatt
BA	Biological Assessment	NMFS	National Marine Fisheries Service
BMP	best management practice	NPDES	National Pollutant Discharge Elimination System
CCC	Criterion Continuous Concentration	NYNHP	New York Natural Heritage Program
CFR	Code of Federal Regulations	NYISO	New York Independent System Operator
CHPE	Champlain Hudson Power Express	NYSDEC	New York State Department of Environmental Conservation
CHPEI	Champlain Hudson Power Express, Inc.	NYSDPS	New York State Department of Public Service
cm	centimeters	NYSDOS	New York State Department of State
CMP	Coastal Management Program	NYSDOT	New York State Department of Transportation
ConEd	Consolidated Edison	NYSPSC	New York State Public Service Commission
CP	Canadian Pacific	NYPA	New York Power Authority
cSEL	cumulative sound exposure level	PAS	population analysis site
CSX	CSX Transportation	PCB	polychlorinated biphenyl
DC	direct current	POI	point of interconnection
DOE	U.S. Department of Energy	PRD	Protected Resources Division
DPS	distinct population segment	psi	pounds per square inch
EIS	Environmental Impact Statement	rms	root-mean-square
EM&CP	Environmental Management and Construction Plan	ROI	region of influence
EMF	electromagnetic field	ROV	remotely operated vehicle
EO	Executive Order	ROW	right-of-way
ERRP	Emergency Repair and Response Plan	SCFWH	Significant Coastal Fish and Wildlife Habitat
ESA	Endangered Species Act	SF6	sulfur hexafluoride
G	Gauss	SPCC	Spill Prevention, Control, and Countermeasures
GIS	geographic information systems	SPL	sound pressure level
GPS	global positioning system	TDI	Transmission Developers, Inc.
HDD	horizontal directional drill	TSS	total suspended solids
HDPE	high-density polyethylene	U.S.C.	United States Code
HVAC	high-voltage alternating current	USACE	U.S. Army Corps of Engineers
HVDC	high-voltage direct current	USEPA	U.S. Environmental Protection Agency
Hz	Hertz	USFWS	U.S. Fish and Wildlife Service
I	Interstate	V/m	volts per meter
kg/m	kilograms per meter	WNS	White-nose Syndrome
kV	kilovolt	XLPE	cross-linked polyethylene
kV/m	kilovolt(s) per meter	YOY	young-of-year
lb/ft	pound(s) per foot		
µg/L	micrograms per liter		
µPa	micropascal		
µT	microTesla		
mG	milliGauss		
mg/L	milligrams per liter		

REVISED

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PROPOSED CHAMPLAIN HUDSON POWER EXPRESS
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JULY 2014

**REVISED BIOLOGICAL ASSESSMENT
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PROPOSED CHAMPLAIN HUDSON POWER EXPRESS TRANSMISSION LINE PROJECT**

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Executive Summary

1

2 Champlain Hudson Power Express, Inc. (CHPEI), as the Applicant for a Presidential permit, proposes to
3 develop the proposed Champlain Hudson Power Express (CHPE) Project as a merchant transmission
4 facility to connect renewable sources of power generation in Canada with load centers in the New York
5 City metropolitan area. According to the Applicant, the estimated total capital cost for the proposed
6 CHPE Project would be approximately \$2.2 billion and is projected to be in service by 2017. It is
7 estimated by the Applicant that the proposed CHPE Project would create more than 300 direct
8 construction jobs during its estimated 4-year construction period.

9 The proposed CHPE Project would include construction, operation, and maintenance of an approximately
10 | 336-mile (541-kilometer [km])-long, 1,000-megawatt (MW), electric-power transmission system. This
11 system includes a high-voltage direct current (HVDC) transmission line that would run from the
12 U.S./Canada border to Astoria, Queens, New York, and associated equipment, such as cooling stations, a
13 proposed converter station, improvements to the Astoria Annex Substation, and high-voltage alternating
14 current (HVAC) interconnection from this substation to Consolidated Edison's (ConEd) Rainey
15 Substation in Queens. The proposed CHPE Project transmission line would be installed using both
16 aquatic (underwater) and terrestrial (underground) portions of the route. The underwater portions of the
17 proposed transmission line would be buried in the beds of Lake Champlain and the Hudson, Harlem, and
18 East rivers, and the terrestrial portions of the transmission line would be buried principally in railroad
19 right-of-ways (ROWs) and to a lesser extent roadway ROWs. The proposed CHPE Project would be
20 owned and operated in the United States by the Applicant.

21 This Biological Assessment (BA) has been prepared in accordance with the legal requirements set forth
22 under regulations implementing Section 7 of the Federal Endangered Species Act (50 CFR 402;
23 16 U.S.C. 1536(c)). The purpose of this BA is to review the proposed project in sufficient detail to
24 determine if the proposed action may affect any federally threatened or endangered species and critical
25 habitat.

26 Based on the description of the proposed CHPE Project in **Section 2** of this BA and further described in
27 the associated CHPE Environmental Impact Statement (EIS) (DOE 2013), the status of potentially
28 affected protected species and environmental baseline conditions described in **Sections 3** and **4** and the
29 analysis of potential impacts in **Section 5** of this BA, DOE concludes determinations of effect for the
30 species that occur in the project area as identified in **Table ES-1**. Similarly, DOE concludes that this
31 project would have no effect on the species identified in **Table ES-2**.

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Table ES-1. Determinations of Effect for Protected Species Potentially Affected by the Proposed CHPE Project

Common Name	Scientific Name	ESA Status	Determination of Effect
Fish			
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	T	May affect, but not likely to adversely affect
Atlantic sturgeon	<i>Acipenser oxyrinchus oxyrinchus</i>	T ¹ , E ^{2,3,4,5}	May affect, but not likely to adversely affect
Mammals			
Indiana bat	<i>Myotis sodalis</i>	E	May affect, but not likely to adversely affect
Northern long-eared bat	<i>Myotis septentrionalis</i>	PE	May affect, but not likely to adversely affect
Invertebrates			
Karner blue butterfly	<i>Lycaeides melissa samuelis</i>	E	May affect, but not likely to adversely affect

Table Key: E = Federally listed as endangered; T = Federally listed as threatened; PE = Proposed species for listing as endangered.

1. Gulf of Maine DPS.
2. New York Bight DPS.
3. Chesapeake Bay DPS.
4. Carolina DPS.
5. South Atlantic DPS.

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Table ES-2. Nearby Listed Species Not Affected by the Proposed CHPE Project

Common Name	Scientific Name	ESA Status
Marine Mammals		
Fin whale	<i>Balaenoptera physalus</i>	E
Humpback whale	<i>Megaptera novaeangliae</i>	E
North Atlantic right whale	<i>Eubalaena glacialis</i>	E
Sei whale	<i>Balaenoptera borealis</i>	E
Sperm whale	<i>Physeter macrocephalus</i>	E
West Indian manatee	<i>Trichechus manatus</i>	E
Sea Turtles		
Green sea turtle	<i>Chelonia mydas</i>	T ¹
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	E
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E
Loggerhead sea turtle	<i>Caretta caretta</i>	T ²
Aquatic Invertebrates		
Dwarf wedgemussel	<i>Alasmidonta heterodon</i>	E
Piping plover	<i>Charadrius melodus</i>	T
Roseate tern	<i>Sterna dougallii dougallii</i>	E
Red knot	<i>Calidris canutus rufa</i>	PT
Terrestrial Reptiles		
Bog turtle	<i>Clemmys muhlenbergii</i>	T
Plants		
Northern wild monkshood	<i>Aconitum noveboracense</i>	T
Small whorled pogonia	<i>Isotria medeoloides</i>	T

Table Key: E = Federally listed as endangered; T = Federally listed as threatened; PT = Proposed species for listing as threatened

1. Since the nesting areas for turtles encountered at sea often cannot be determined, a conservative approach to management requires the assumption that all greens in the Gulf of Mexico are endangered.
2. There are nine DPSs for this species; the Northwest Atlantic DPS is the most likely to occur in waters in the vicinity of the proposed CHPE Project.

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1. Introduction

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The purpose of this Biological Assessment (BA) is to evaluate the potential impacts of the proposed Champlain Hudson Power Express (CHPE) Transmission Line Project (proposed CHPE Project) on federally listed threatened or endangered species, and to comply with the requirements of the Endangered Species Act (ESA) of 1973 (16 United States Code [U.S.C.] 1531–1534). The Proposed Federal Action by the U.S. Department of Energy (DOE) is the issuance of a Presidential permit that would authorize Champlain Hudson Power Express, Inc. (CHPEI) (the Applicant) to construct, operate, and maintain the proposed CHPE Project crossing of the U.S./Canada border. DOE has prepared an Environmental Impact Statement (EIS) for the proposed CHPE Project (DOE 2013) to comply with the requirements of the National Environmental Policy Act. Therefore, DOE is preparing this BA as the lead Federal Action Agency for the proposed CHPE Project. That EIS contains additional details about the project and potential effects on the natural and human environment, and is incorporated into this BA by reference. The U.S. Army Corps of Engineers (USACE) has a Federal action related to the implementation of the proposed CHPE Project regarding issuance of a Clean Water Act Section 404 permit for the project. Other cooperating agencies involved with the EIS process include the U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (USEPA), U.S. Coast Guard, New York State Department of Public Service (NYSDPS), and New York State Department of Environmental Conservation (NYSDEC).

CHPEI, as the Applicant for a Presidential permit, proposes to develop the proposed CHPE Project as a merchant transmission facility to connect renewable sources of power generation in Canada with load centers in the New York City metropolitan area (TDI 2010). According to the Applicant, the estimated total capital cost for the proposed CHPE Project would be approximately \$2.2 billion and is projected to be in service by 2017 (CHPEI 2012a). It is estimated by the Applicant that the proposed CHPE Project would create more than 300 direct construction jobs during its estimated 4-year construction period (TDI 2010).

The proposed CHPE Project would include construction, operation, and maintenance of an approximately 336-mile (541-km)-long, 1,000-megawatt (MW), electric-power transmission system. This system includes a high-voltage direct current (HVDC) transmission line that would run from the U.S./Canada border to Astoria, Queens, New York, and associated equipment, such as cooling stations, a proposed converter station, improvements to the Astoria Annex Substation, and high-voltage alternating current (HVAC) interconnection from this substation to Consolidated Edison’s (ConEd) Rainey Substation in Queens. The proposed CHPE Project transmission line would be installed using both aquatic (underwater) and terrestrial (underground) portions of the route. The underwater portions of the proposed transmission line would be buried in the beds of Lake Champlain and the Hudson, Harlem, and East rivers, and the terrestrial portions of the transmission line would be buried principally in railroad right-of-ways (ROWs) and to a lesser extent roadway ROWs. The proposed CHPE Project would be owned and operated in the United States by the Applicant.

On January 25, 2010, the Applicant applied to the DOE for a Presidential permit for the proposed CHPE Project pursuant to Executive Order (EO) 10485, as amended by EO 12038, and the regulations codified at 10 Code of Federal Regulations (CFR) Part 205.320 *et seq.* (2000), “Application for Presidential Permit Authorizing the Construction, Connection, Operation, and Maintenance of Facilities for Transmission of Electric Energy at International Boundaries.” Subsequently, Transmission Developers, Inc. (TDI), on behalf of the Applicant, submitted amendments to the Presidential permit application on August 5, 2010; July 7, 2011; and February 28, 2012. The February 28, 2012, amendment reflected route and project changes that resulted from negotiations, including more than 50 settlement conferences held between November 2010 and February 2012, with state agencies and stakeholder organizations pursuant

1 to the New York State Public Service Commission’s (NYSPSC) Article VII Certificate of Environmental
2 Compatibility and Public Need process review of the project. The NYSPSC issued a Certificate of
3 Environmental Compatibility and Public Need authorizing construction and operation of the proposed
4 CHPE Project to the Applicant on April 18, 2013 (NYSPSC 2013). The State of New York has
5 concurred with the proposed route for and construction and operation of the transmission line as cited in
6 the Certificate, with conditions that the Applicant must meet during construction and operation of the line.
7 Such conditions include pre- and post-installation surveys and sampling as described in **Section 2.5.1** and
8 additional coordination with appropriate agencies should the transmission line require rerouting due to
9 previously unforeseen conditions.

10 1.1 Endangered Species Act Requirements

11 The ESA establishes procedures for the protection and conservation of threatened and endangered species
12 and the ecosystems upon which they depend. The ESA describes several categories of Federal status for
13 plants and animals and their critical habitat, which have been designated by the USFWS or National
14 Marine Fisheries Service (NMFS). In addition to allowing the listing of species and subspecies, the ESA
15 allows listing of “distinct population segments” (DPSs) of vertebrate species. An “endangered” species is
16 defined as any species in danger of extinction throughout all or a large portion of its range. A
17 “threatened” species is defined as any species likely to become an endangered species in the foreseeable
18 future. “Critical habitat” is defined in the ESA as “a specific geographic area that is essential for the
19 conservation of a threatened or endangered species and that could require special management or
20 protection.” Critical habitat can include an area that is not occupied by a species but is needed for the
21 recovery of that species. There are no designated or proposed critical habitat areas in or near the
22 proposed CHPE Project area.

23 NMFS and USFWS share responsibility for implementing the ESA. Generally, the USFWS manages
24 terrestrial and freshwater species, while NMFS manages marine and “anadromous” (i.e., born in fresh
25 water, spends most of its life in the sea, and returns to fresh water to spawn) species. In the case of sea
26 turtles, NMFS has the lead in the marine environment, while USFWS does on the nesting beaches.
27 Federal agencies must consult with NMFS and USFWS, under Section 7(a)(2) of the ESA, on activities
28 that may affect a listed species. These interagency consultations, or Section 7 consultations, are designed
29 to assist Federal agencies in fulfilling their duty to ensure Federal actions do not jeopardize the continued
30 existence of a species or destroy or adversely modify critical habitat.

31 1.2 Consultation History

32 The following interactions between DOE and USFWS or NMFS associated with the proposed CHPE
33 Project have occurred prior to the preparation of this BA and have supported its development:

- 34 • **March 1, 2010** – Letter sent on behalf of CHPEI to NMFS to request information on protected
35 species along the proposed transmission line route.
- 36 • **Undated letter, 2010** – Response letter sent by NMFS providing information on protected
37 species along the proposed transmission line route.
- 38 • **June 7, 2010** – Letter from USFWS recommending surveying for Karner blue butterfly habitat
39 along the entire route in Saratoga County (excluding actively agricultural, non-sandy or poorly
40 drained soil areas, and lawns) rather than only certain portions of the route in Saratoga County.
41 USFWS also requested a coarse analysis of the Schenectady and Albany County portions, for the
42 record, to address, among other things, why there is or is not potential habitat in those areas and
43 what level of surveys were conducted in these areas.

- 1 • **June 18, 2010** – DOE publishes in the *Federal Register* a Notice of Intent to prepare a Draft EIS
2 for the proposed granting of a President Permit to CHPEI to construct and operate the proposed
3 CHPE Project.
- 4 • **August 2, 2010** – Letter sent by USFWS to DOE responding to the June 18, 2010, *Federal*
5 *Register* posting. USFWS offered technical assistance and information, in particular noting that
6 terrestrial species and impacts should be addressed.
- 7 • **August 4, 2010** – Letters sent by DOE to USFWS and NMFS to invite the agencies to participate
8 as Cooperating Agencies.
- 9 • **September 17, 2010** – Letter sent by USFWS to DOE agreeing to participate as a Cooperating
10 Agency.
- 11 • **April 25, 2012** – Meeting with USFWS and NYSDEC to discuss the Karner blue butterfly.
12 Current proposed Project route employs routing and installation techniques that avoid all mapped
13 lupine patches, so the plan was to conduct no surveys. USFWS noted that without any survey, all
14 lupine patches will be considered occupied.
- 15 • **June 21, 2012** – Letters sent by DOE to NMFS and USFWS to initiate informal Section 7
16 consultation for the proposed CHPE Project and request information on protected species along
17 the proposed transmission line route.
- 18 • **June 28, 2012** – Letter sent by NMFS to DOE providing information on protected species along
19 the proposed transmission line route.
- 20 • **July 17, 2012** – Letter sent by USFWS to DOE providing information on how to access Web site
21 for information on protected species along the proposed transmission line route.
- 22 • **February 5, 2013** – Letter sent to DOE by USFWS as a cooperating agency providing comments
23 on an internal working draft of the EIS addressing the action.
- 24 • **February 28, 2013** – Phone conversation between DOE EIS contractor (HDR EOC) and NMFS
25 regarding Essential Fish Habitat considerations. These impacts are also applicable to ESA-listed
26 fish species. Impacts of interest to NMFS included persistent disturbance to sediment,
27 maintenance, heat, impacts on infauna, and impacts from electric and magnetic fields.
- 28 • **March 4, 2013** – Phone conversation between DOE and NMFS to confirm that the Agency was
29 in concurrence that a joint BA would be prepared for the species under both USFWS and NMFS
30 jurisdiction.
- 31 • **April 11, 2013** – Applicant briefed NMFS on the proposed CHPE Project. NMFS asked various
32 questions about cable-laying seasons, construction windows, and the proposed transmission line
33 route.
- 34 • **December 12, 2013** – USFWS provided comments on the biological resources sections of the
35 Draft CHPE EIS.
- 36 • **January 15, 2013** – NMFS provided comments on the aquatic protected and sensitive species
37 sections of the Draft CHPE EIS.
- 38 • **January 23, 2014** – Preliminary phone conversation among DOE and NMFS to discuss NMFS
39 comments on the Draft CHPE EIS.
- 40 • **March 27, 2014** – Phone conversation among DOE, NMFS, and USACE to discuss NMFS
41 comments on the Draft CHPE EIS and approaches and analyses for the BA.
- 42 • **April 7, 2014** – DOE submitted Draft BA to NMFS and USFWS.

- 1 • **May 7, 2014** – USFWS provided comments on the Draft BA and a phone conversation was held
2 among DOE and USFWS.
- 3 • **May 23, 2014** – NMFS provided comments on the Draft BA.
- 4 • **May 28, 2014** – Phone conversation among DOE, NMFS, USACE, and Applicant to discuss
5 NMFS comments on the Draft BA and approaches and analyses.
- 6 • **June 6, 2014** – Phone conversation among DOE and USFWS to further discuss USFWS
7 comments on the Draft BA and approaches and analyses.
- 8 • **July 8, 2014** – Phone conversation among DOE and NMFS to further discuss NMFS comments
9 on the Draft BA and approaches and analyses.

2. Description of the Proposed Action

The following section summarizes the key elements of the proposed CHPE Project, which was drawn from the DOE Draft EIS (DOE 2013). This section defines the Action Area (including the “route segments” referred to in the Draft EIS and used in this BA) and specific engineering details of the transmission system installation: the aquatic direct current (DC) transmission cables, horizontal directional drill (HDD) methods, terrestrial DC transmission cables, cooling stations, the proposed HVDC converter station and substation interconnection in Astoria, and the proposed Astoria Annex to Rainey substation alternating current (AC) interconnection.

The transmission system would consist of one 1,000-MW, HVDC transmission line, one communications cable, and ancillary aboveground facilities, including cooling stations at selected locations where required and a DC-to-AC converter station. The transmission line would be a bipole consisting of two transmission cables, one positively charged and the other negatively charged. The entire length of the transmission system would be buried, with the majority of the route beneath Lake Champlain and the Hudson River, with the exception of bridge attachments and ancillary aboveground facilities, such as at the converter station and cooling stations. A new HVDC converter station would be constructed in Queens, New York, to convert the electrical power from DC to AC and then connect to two points of interconnection (POIs) within the New York City electrical grid. The cooling stations that would be installed along the transmission line route would be for certain locations to disperse accumulated heat in long cable segments installed by HDD techniques.

2.1 Description of the Route Segments Used in the Draft EIS Analyses

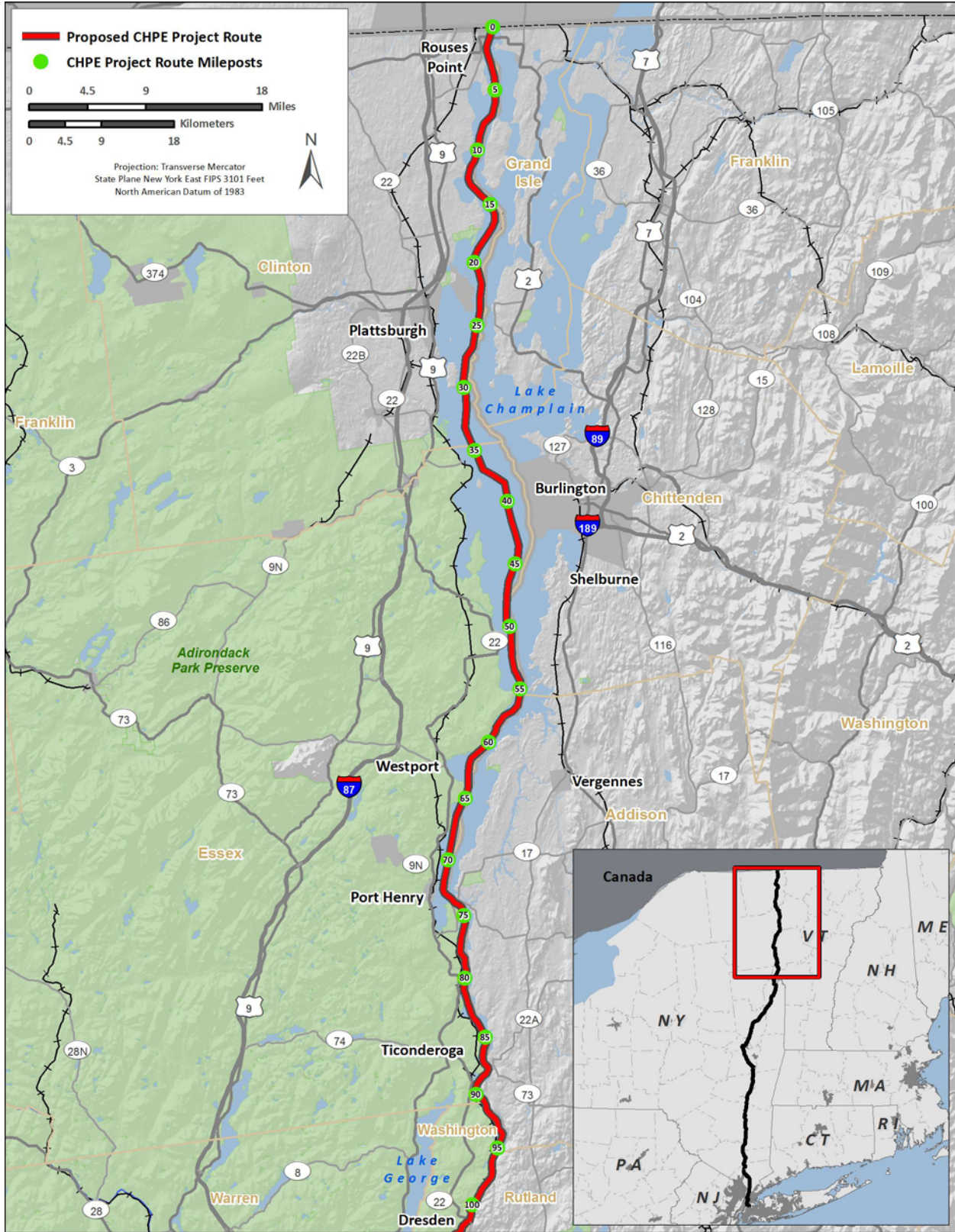
The proposed CHPE Project would include construction, operation, and maintenance of an approximately 336-mile (541-km)-long, 1,000-MW, high-voltage electric power transmission system that would have both aquatic (underwater) and terrestrial (and primarily underground) portions of the transmission line route. The underwater portions of the transmission line would be buried in the beds of Lake Champlain and the Hudson, Harlem, and East rivers, and the terrestrial portions of the transmission line would be buried underground, principally in railroad and roadway ROWs.

For the purposes of understanding the various environmental settings associated with the proposed CHPE Project, and to facilitate the analysis in the DOE Draft EIS, the transmission line route was divided into four geographically logical segments as follows:

- **Lake Champlain Segment**
- **Overland Segment**
- **Hudson River Segment**
- **New York City Metropolitan Area Segment.**

The four segments are shown on **Figures 2-1** through **2-4**, respectively. From the U.S./Canada border, the HVDC transmission line would be located in the bed of Lake Champlain for approximately 101 miles (163 km), from near Champlain, New York, to Dresden, New York. This portion of the route composes the **Lake Champlain Segment** (see **Figure 2-1**).

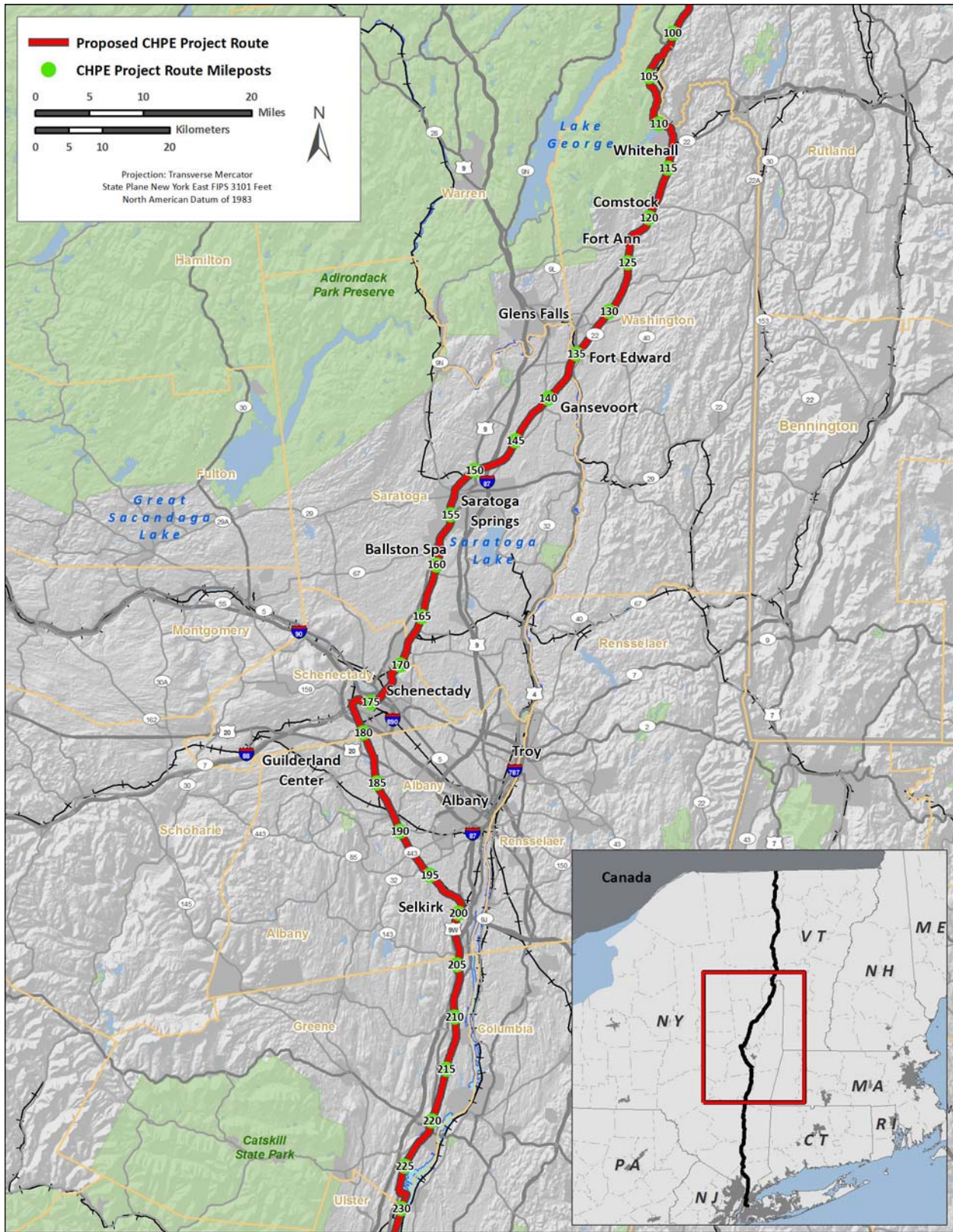
The **Overland Segment** begins at the southern end of Lake Champlain at the Town of Dresden, where the HVDC transmission line would exit the water at milepost (MP) 101 and be installed underground in the New York State Department of Transportation (NYSDOT) ROW, the Canadian Pacific (CP) railroad ROW, and the CSX Transportation (CSX) railroad ROW for 127 miles until the transmission line would enter the Hudson River at the town of Catskill, New York (see **Figure 2-2**).



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Figure 2-1. Lake Champlain Segment



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Figure 2-2. Overland Segment

1 The **Hudson River Segment** begins at MP 228 where the HVDC transmission line would be buried in the
2 bottom of the Hudson River for approximately 67 miles (108 km) to Stony Point, New York, where the
3 transmission line would be routed upland along the CSX railroad ROW and the U.S. Route 9W roadway
4 ROW between MPs 295 and 303 (see **Figure 2-3**). The transmission line would be buried underground
5 through this entire stretch before reentering the Hudson River. The transmission line would reenter the
6 Hudson River at MP 303 for approximately 21 miles (34 km) until it reaches the end of the Hudson River
7 Segment at Spuyten Duyvil Creek and the Harlem River in New York City at MP 324.

8 The **New York City Metropolitan Area Segment** begins at Spuyten Duyvil at MP 324, where the HVDC
9 transmission line would enter the Harlem River and continue south in the river for a distance of
10 approximately 6 miles (10 km) to a point north of the Willis Avenue Bridge in the borough of the Bronx
11 at MP 330 (see **Figure 2-4**). The transmission line would exit the river and proceed east through the
12 NYS DOT railroad corridor and rail yards along the northern side of the Bronx Kill to the East River at
13 MP 331 and proceed to the southeast to the site of the ConEd Charles Poletti Power Plant complex in
14 Astoria, Queens, New York, at MP 332.

15 2.2 Action Area

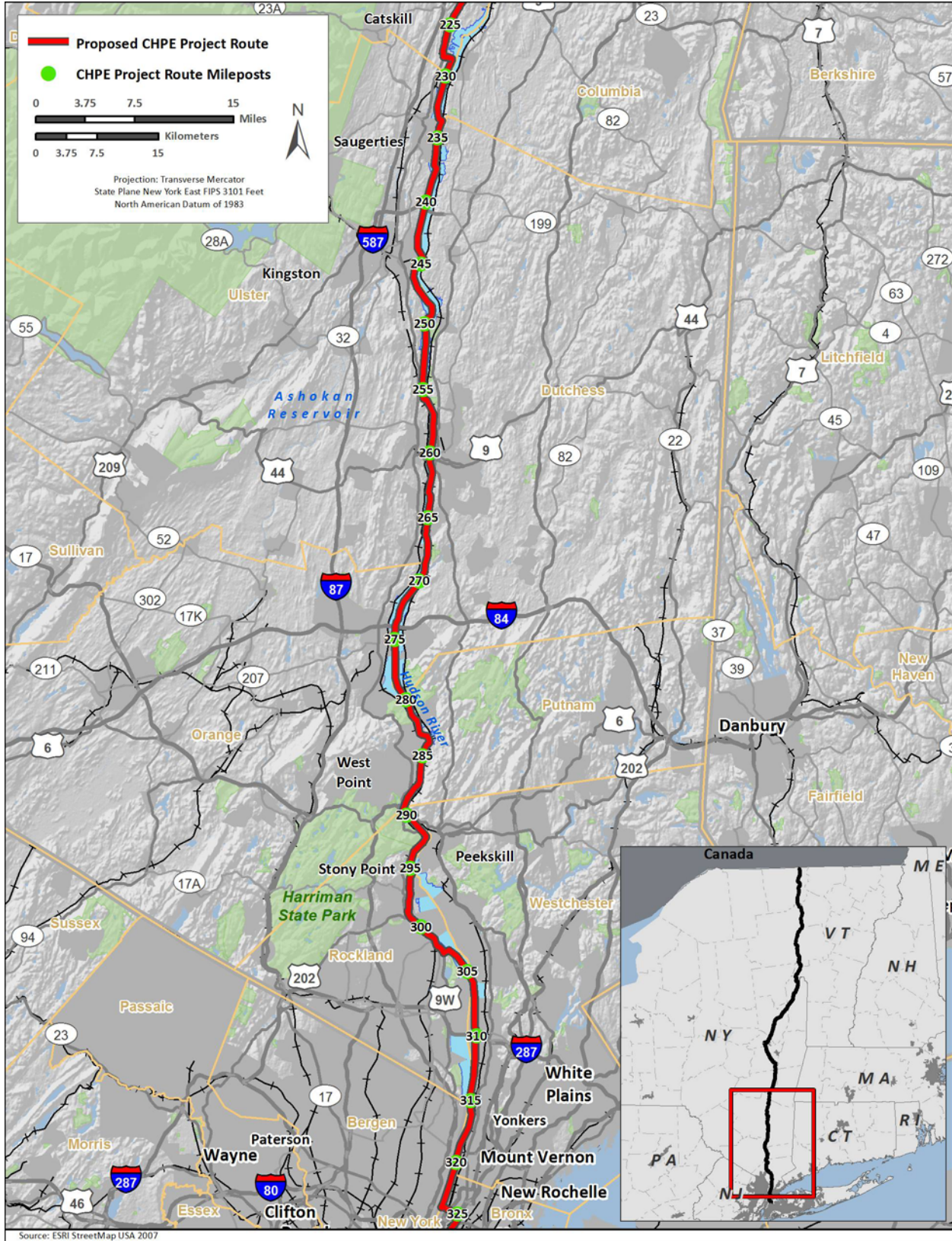
16 The Action Area is defined in 50 CFR Part 402.02 as “all areas to be affected directly or indirectly by the
17 Federal action and not merely the immediate area involved in the action.” The Action Area for aquatic
18 ESA-listed species for the proposed CHPE Project includes the aquatic habitats that occur below the
19 mean high tide line for the route segment affected. This takes into account the footprint of the proposed
20 CHPE Project area, including the distance that sediment plumes can travel in the aquatic portions, and the
21 distance that each fish species can travel through the entire body of water associated with a segment.
22 Aquatic ESA-listed species occur only in the Hudson River and New York City Metropolitan Area
23 segments (see **Section 3.1**). For this BA, the Action Area for the Hudson River Segment is the Hudson
24 River from Catskill, New York south to Spuyten Duyvil, and for the New York City Metropolitan Area
25 Segment, it is the East and Harlem rivers. The Action Area for terrestrial protected and sensitive species
26 along the terrestrial portions of the proposed CHPE Project is 100 feet (30 meters) on either side of the
27 transmission line.

28 2.3 Descriptions of Construction Methods

29 The following subsections describe the specific engineering details of the transmission system as
30 approved by the NYSPSC Certificate for the proposed CHPE Project issued to the Applicant
31 (NYSPSC 2013). The following subsections also discuss how the Applicant proposes to install and
32 operate the transmission line and aboveground facilities of the proposed CHPE Project.

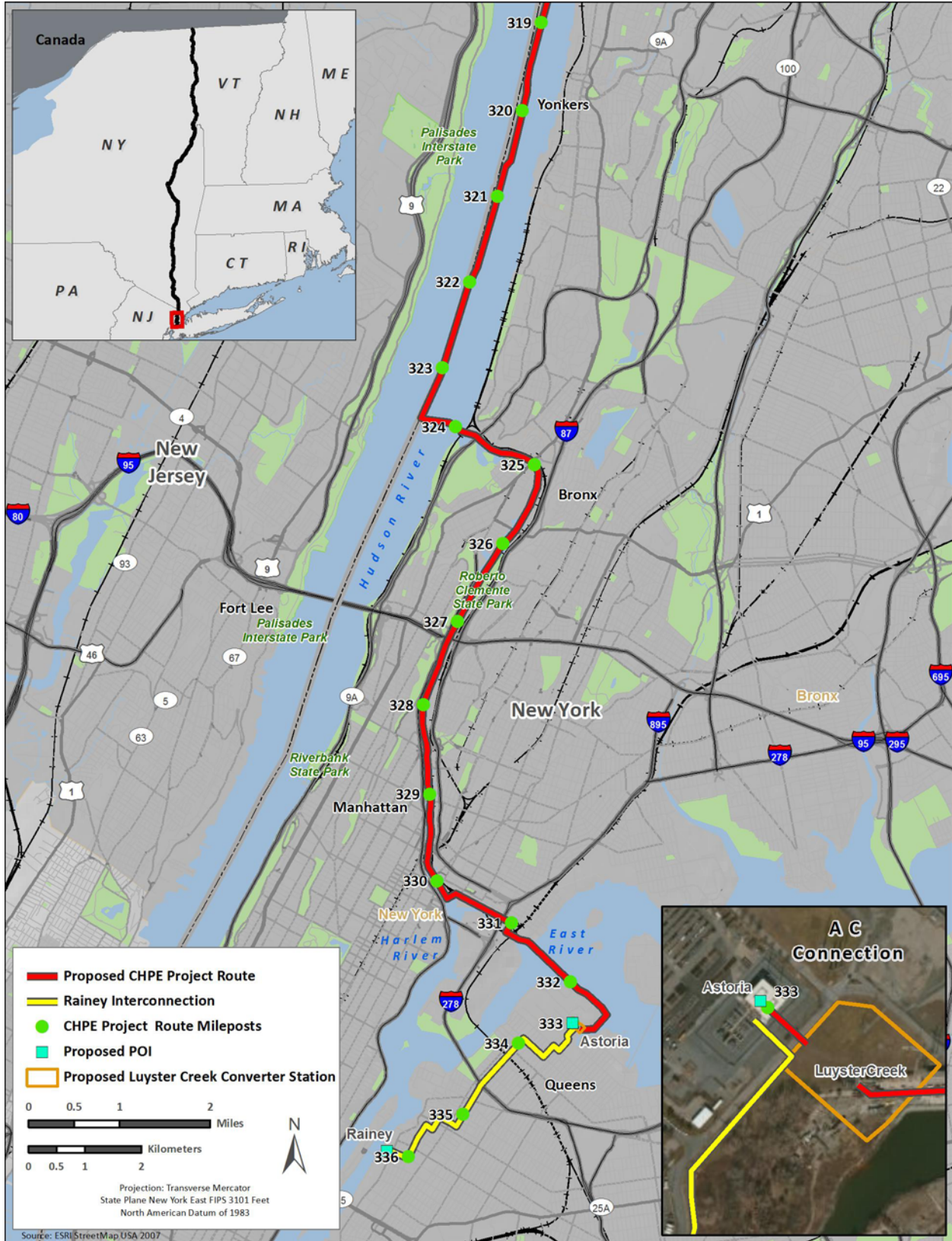
33 2.3.1 Aquatic Direct Current Transmission Cable

34 The transmission cables proposed for installation in the Lake Champlain and Hudson River segments
35 would be cross-linked polyethylene (XLPE) HVDC cables rated at 300 to 320 kV. An armored layer of
36 galvanized steel wires embedded in bitumen provides additional protection for the aquatic transmission
37 cables (see **Figure 2-5**). The first step in the installation of the aquatic transmission cables would involve
38 conducting a pre-installation route clearance operation. During this operation or the pre-lay grapnel run,
39 to occur in the fall preceding installation the following year, the route is cleared of debris, such as logs
40 and out-of-service cables, by dragging a grapnel along the route. Following debris removal, the
41 transmission cables would be buried beneath the beds of Lake Champlain, and the Hudson, Harlem, and
42 East rivers at a depth of at least 4 to 8 feet (1.2 to 2.4 meters) to prevent disturbance to the cables from
43 unrelated marine operations in the waterways. The depth of burial that can be achieved would depend on
44



1
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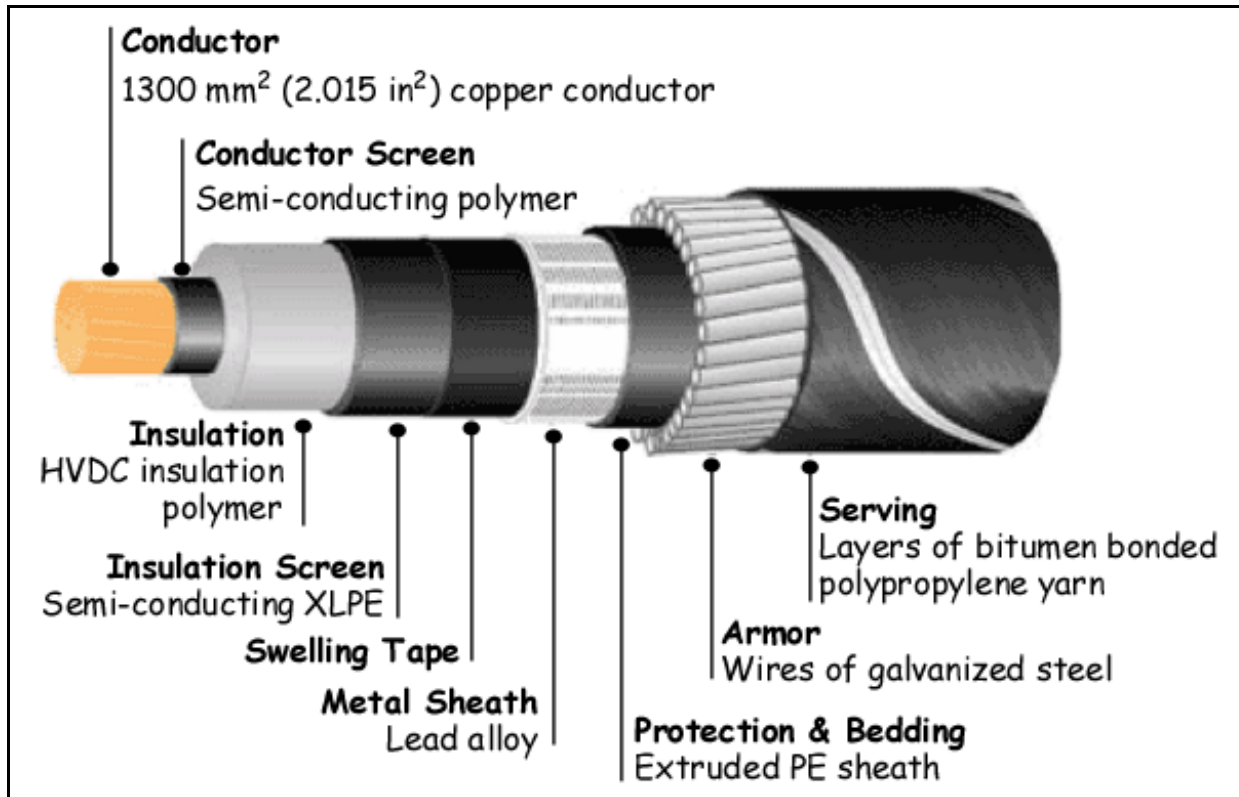
Figure 2-3. Hudson River Segment



1

2

Figure 2-4. New York City Metropolitan Area Segment



Source: Cross-Sound Cable Company 2012

Figure 2-5. Example Aquatic HVDC Transmission Cable Cross-Section

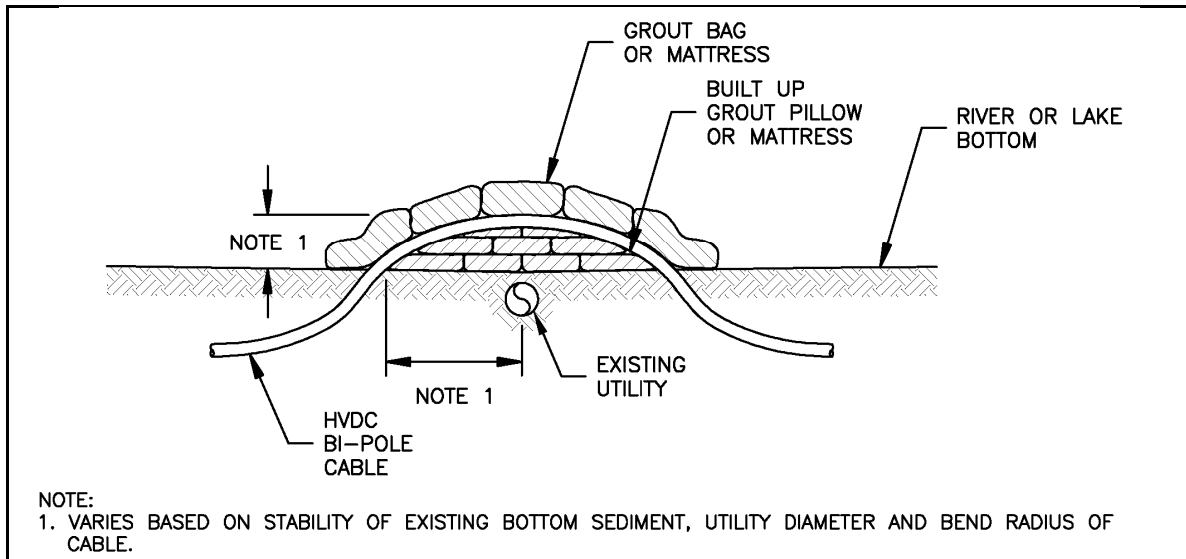
1 available marine construction equipment, soil types and depth to bedrock, existing utilities, and the types
2 of marine activities occurring and their potential threat to cable integrity (TDI 2010).

3 Where the transmission cables cross bedrock (approximately 11 locations in the Hudson River) or an
4 existing utility such as a pipeline or another cable (approximately 66 locations in the Hudson River and
5 26 locations in the Harlem River), it would be laid over the rock or existing utility and a protective
6 covering, such as an articulated concrete mat, would be installed over the cable crossing (CHPEI 2012c)
7 (see **Figure 2-6**). The concrete mats would be 40 feet (12 meters) long, 8 feet wide (2.4 meters), and
8 9 inches (23 cm) thick. An average of three concrete mats would be placed lengthwise end-to-end over
9 each crossing. Physical surveys, including diver surveys of each utility, would be performed prior to
10 cable installation in an attempt to reduce the requirement for concrete mats.

11 2.3.2 Horizontal Directional Drilling

12 HDD would be used to install the transmission cables in transition areas between aquatic and terrestrial
13 portions of the proposed CHPE Project route at the transitions from water to land and land to water (at
14 MPs 101, 228, 295, 303, and 330), at certain environmentally sensitive areas such as wetlands or streams
15 where deemed necessary, under roadway or railway crossings where trenching is not possible, and wild
16 blue lupine (*Lupinus perrenis*) habitat.

17 The HDD operation at a water-to-land transition would include an HDD drilling rig system, a drilling
18 fluid collection and recirculation system, temporary cofferdam installed at the water exit to maintain exit
19 pit stability following dredging of the pit, and associated support equipment (see **Figure 2-7**). For each
20 proposed HDD location, two separate drill holes would be required, one for each cable. During
21



Source: CHPEI 2012c

Figure 2-6. Representative Schematic of Protective Measures for Aquatic Transmission Cables

1 installation, a drill rig would be placed on shore behind a temporary fluid return pit and a 40-foot
 2 (12-meter) drill pipe with a cutting head would be set in place to begin the drilling process. As the initial
 3 pilot borehole is drilled, slurry composed of water and bentonite would then be pumped into the hole to
 4 transport the drill cuttings to the surface, to aid in keeping the borehole stable, and to lubricate the drill.
 5 After the final drill length has been achieved, high-density polyethylene (HDPE) conduits would be
 6 pulled into the drilled hole. Once the HDPE conduits are in place, the transmission cables would be
 7 pulled through these pipes and into a transition splice vault, which would remain in place to protect the
 8 transmission cable.

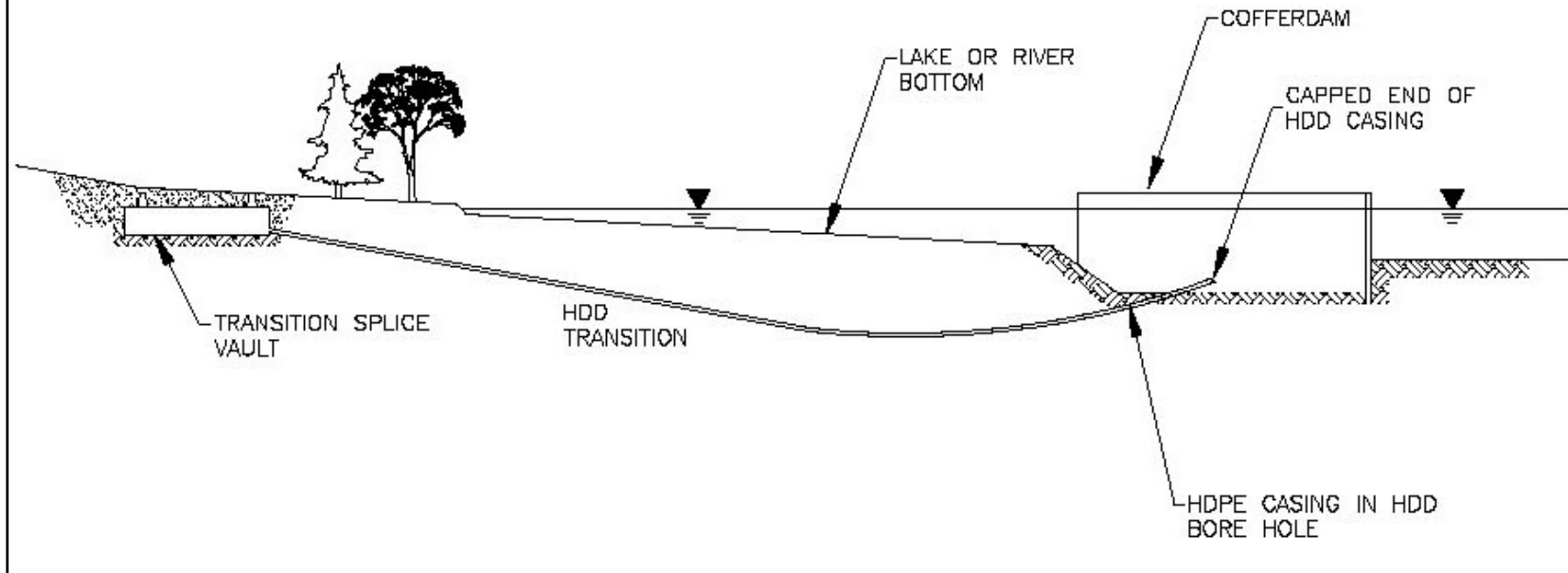
9 Cofferdams would be installed in the Hudson River at approximate MPs 228, 295, and 303 (see
 10 **Attachment 1**). The anticipated dimensions of each cofferdam would be approximately 16 feet
 11 (4.9 meters) by 30 feet (9 meters) or 480 square feet (44 square meters). Dredging activities associated
 12 with the proposed CHPE Project would only be for cofferdam installation, which is expected to last from
 13 5 to 10 days using a single dredge and result in a total dredged area limited to less than 1 acre in the
 14 Hudson River. Dredging and cofferdam installation would occur during the construction windows
 15 established for this project, which are outside of shortnose and Atlantic sturgeon spawning season. The
 16 spawning seasons for these species are approximately April 1 to June 30 for shortnose sturgeon and
 17 approximately April 15 to mid-summer for Atlantic sturgeon depending on where spawning is occurring
 18 on the Hudson River.

19 Material would be dredged using a closed clamshell dredge (also known as an environmental bucket) and
 20 removed by barge to an appropriately permitted processing facility. Dredging would be conducted during
 21 8- to 12-hour shifts daily. The cofferdam would extend 6 feet (1.8 meters) below the mudline.
 22 Approximately 107 cubic yards (82 cubic meters) would be removed from within each cofferdam, for a
 23 total of 321 cubic yards (246 cubic meters) of dredge material removed from all three cofferdam sites on
 24 the Hudson River. A barge or dredge scow could hold up to 2,500 cubic yards (1,923 cubic meters) of
 25 material. Therefore, only one barge trip should be needed to remove all material. Silt curtains would be
 26 used as required around the work area; however, it is not anticipated that any silt would escape from
 27 within the cofferdam.

28

NOTES:

1. COFFERDAM TO BE UTILIZED WHERE NECESSARY TO STABILIZE BOTTOM SEDIMENT AT HDD TERMINUS. OTHER ALTERNATIVES PROVIDING EQUIVALENT ENVIRONMENTAL PROTECTION MAY BE EMPLOYED WHERE BOTTOM CONDITIONS DO NOT PERMIT DRIVEN PILES.
2. PILES SHALL BE REMOVED OR CUT BELOW THE MUD LINE. AT COMPLETION OF CABLE INSTALLATION IN COORDINATION WITH THE BMP REQUIREMENTS.
3. COFFERDAM WILL EXTEND ABOVE THE WATERLINE IN SHALLOW WATER. EXPOSED STRUCTURE WILL BE MARKED BY BUOYS AND OTHER NAVIGATION AIDS. A NOTICE TO MARINERS WILL BE ISSUED WHEN APPROPRIATE.
4. COFFERDAMS IN DEEP WATER NOT BE EXTENDED TO THE WATER SURFACE. EACH INSTALLATION WILL BE MARKED BY BUOYS AND OTHER NAVIGATION AIDS. A NOTICE TO MARINERS WILL BE ISSUED WHERE APPROPRIATE.



Source: CHPEI 2012a. Note: Not to scale.

Figure 2-7. Example HDD Techniques

1
2

1 Sheet pile used to construct cofferdams would be installed with a vibratory hammer, and would be
2 installed in pairs with 8 to 10 pairs of sheets installed per day. Each pair of sheets would provide a wall 4
3 feet (1.3 meters) wide and approximately 50 feet (15 meters) tall. A single pair of sheets can be installed
4 in 30 to 120 minutes depending on the geotechnical conditions. After the vibratory penetration, each
5 sheet would be “seated” into hard strata as required. Approximately 4 to 6 strikes per pair of sheets
6 would be required to “seat” the pile wall. The Applicant has committed to using soft starts for vibratory
7 installation. Each cofferdam would be constructed within 25 to 30 days, for a total duration of sheet pile
8 installation of 75 to 90 days for all three cofferdams. All cofferdams would be inspected for trapped fish
9 following installation. It is anticipated that the cofferdam would be cut at the mudline using divers and
10 underwater cutting or burning equipment such as exothermic rods when installation activities are
11 completed.

12 A visual and operational monitoring program would be developed and conducted during HDD operations
13 to detect any losses of drilling fluid. Visual observations of drilling fluid in the water, or excessive loss of
14 volume or pressure in the borehole would trigger response actions by the HDD operator, including halting
15 drilling activities and initiating cleanup of released bentonite. A barge with a pumping system would be
16 positioned at the cofferdam during drilling to collect any drilling fluid released into the cofferdam
17 enclosure.

18 HDD could also be used to install the transmission cables beneath other sensitive areas such as wetlands,
19 streams, and existing infrastructure along the terrestrial portions of the proposed CHPE Project route, and
20 in special circumstances to avoid obstacles along the CHPE Project route, such as road or railroad
21 crossings where open trenching would not be possible (TDI 2010). It is expected that at least three
22 different sized HDD rigs would be employed on the project, requiring varying staging area sizes
23 depending on the length of the drill at the particular location, proximity to sensitive areas such as
24 wetlands, access limits, and other constraints.

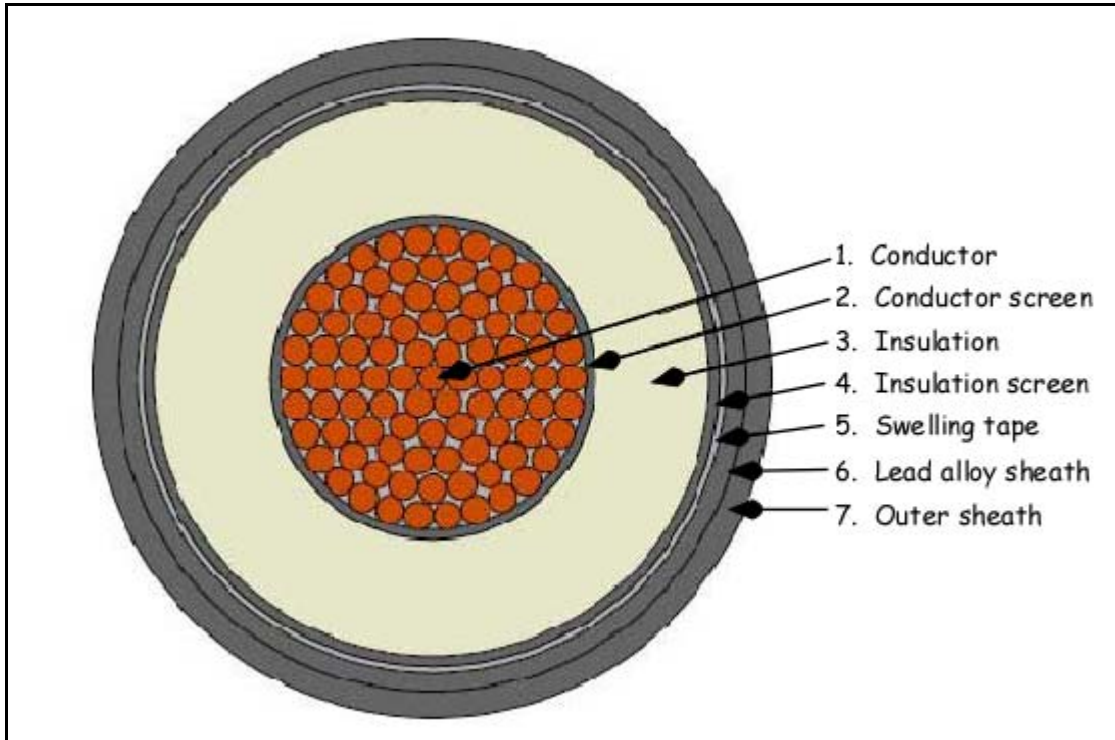
25 2.3.3 Terrestrial Direct Current Transmission Cable

26 Approximately 42 percent of the proposed CHPE Project route would be composed of underground
27 (terrestrial) portions. For the underground portions of the transmission line route, the two cables within
28 the bipole system would typically be laid side-by-side in a trench. After the cables are laid in the trench,
29 the trenches would be backfilled with low thermal resistivity material, such as well-graded sand to fine
30 gravel, stone dust, or crushed stone. For the underground transmission cables, the outer sheathing
31 insulation would be composed of an ultraviolet-stabilized, extruded polyethylene layer (see **Figure 2-8**).
32 The underground transmission cables would have an outside diameter of 4.5 inches (11 centimeters [cm]),
33 and each cable would weigh approximately 20 pounds per foot (lb/ft) (30 kilograms per meter [kg/m])
34 (TDI 2010). A protective cover of HDPE, concrete, or polymer blocks would be placed directly above
35 the low thermal resistive backfill material.

36 A combination of HDD and trenching techniques would be used to install the transmission line
37 underground along upland portions of the route. Trenchless technologies would be used where roadways
38 and railroad beds would be crossed by the transmission line. Trenchless technologies could include
39 HDD, horizontal boring, or pipe jacking. Following completion of the transmission cable installation, the
40 excavated area would be backfilled and regraded, and the disturbed area would be returned to its previous
41 condition as much as possible (CHPEI 2012h).

42 The proposed CHPE Project would be in the existing ROW of both the CP and CSX railway systems
43 between MPs 112 and 228, MPs 295 and 301, and MPs 330 and 331. The Applicant has stated that drafts
44 of Occupancy Agreements for easements along the railroad corridor have been exchanged with both CP

1 and CSX and are currently under negotiation. The final agreements would establish the terms of
2 occupancy of the ROWs and refine required offsets of the transmission cables from the track centerline.



Source: CHPEI 2012b

Figure 2-8. Example Terrestrial HVDC Transmission Cable Cross-Section

3 2.3.4 Cooling Stations

4 In certain situations where there is a long segment of cable installed by HDD, heat can accumulate in the
5 HDPE conduit and reduce the performance of the transmission system. The Applicant has identified
6 16 sections of underground cabling where the potential for heat accumulation could require that cooling
7 equipment stations be installed. Each cooling station would consist of a chiller unit and pumping system
8 within the building and this equipment would circulate chilled water through tubing in a closed-loop
9 system alongside the HVDC cable to cool the cables. The heat emitted from the cables within the buried
10 conduit would then be transferred by the coolant back to the cooling station and then to the outside
11 atmosphere above ground. It is anticipated that the cooling systems would be operated primarily during
12 peak electric load conditions (CHPEI 2012a).

13 2.3.5 Luyster Creek HVDC Converter Station

14 An HVDC converter station would be constructed near Luyster Creek in Astoria, New York, to convert
15 the electrical power from DC to AC. The converter station site would be approximately 4.5 acres
16 (1.8 hectares) in size. The HVDC converter station building would be approximately 165 feet by 325 feet
17 (50 meters by 99 meters) with a building footprint of 1.2 acres (0.5 hectares) and a height of
18 approximately 70 feet (21 meters), with transformers, cooling equipment, and power line carrier filters
19 being installed outside of the building. The converter station would be powered by electricity taken

1 directly from the proposed CHPE Project transmission line and would not require onsite personnel during
2 normal operations.

3 2.3.6 Astoria Annex Substation Interconnection

4 The Luyster Creek Converter Station would deliver its energy by underground cable to the Astoria
5 345-kV, sulfur hexafluoride (SF₆) gas-insulated substation that serves as the primary POI to the grid.
6 The Applicant has proposed to modify the electrical configuration of the Astoria Annex Substation by
7 adding a four-breaker, gas-insulated switch ring bus to connect both the cable from the Luyster Creek
8 Converter Station and the Astoria-Rainey Cable to the one remaining empty bus at the Astoria Annex
9 Substation. This new ring bus could require construction of a new building approximately 72 feet
10 (22 meters) long, 58 feet (18 meters) wide, and 40 feet (12 meters) high. If constructed, the new ring bus
11 building would be 4,176 square feet (388 square meters) in size and would be located on the same parcel
12 of land as the Luyster Creek Converter Station. However, no obstacles have been identified that would
13 prevent the expansion of the existing ring bus at the Astoria Annex Substation to eight breaker positions.
14 Therefore, it is unlikely that it would be necessary to build a new building to house the ring bus. The new
15 ring bus would be connected to both the converter station and the Astoria Annex Substation by
16 gas-insulated switch cables in underground pipes (CHPEI 2012e).

17 2.3.7 Astoria to Rainey Interconnection

18 CHPEI would also construct a 345-kV HVAC cable circuit from the ring bus to ConEd's Rainey
19 Substation in Queens to deliver power reliably into ConEd's 345-kV system. This interconnection would
20 consist of HVAC cables buried beneath city streets for approximately 3 miles (5 km) (see **Figure 2-4**).
21 The XLPE HVAC cables would be buried in a trench to a depth of more than 4 feet (1.2 meters) with a
22 separation distance of 9 inches (23 cm) between the cables in the trench.

23 2.4 Additional Engineering Details

24 **Heat.** Ambient water temperatures in the Hudson, Harlem, and East rivers range from 32 degrees
25 Fahrenheit (°F) (0 degrees Celsius [°C]) in January to a July maximum of 81 °F (27 °C) (Historic Hudson
26 River 2004, Riverkeeper 2013, Blumberg and Pritchard 1997). The proposed CHPE Project's HVDC
27 cables would be designed to operate at normal temperature of 158 °F (70 °C). Under limited durations
28 (i.e., maximum of 2 hours) of emergency overload conditions, the temperature would be limited to 176 °F
29 (80 °C). At these temperatures, heat must be carried away from the conductors for them to operate
30 efficiently, and soils in and around a trench perform this for underground cables. Where required on land,
31 a clean, low thermal resistive backfill material would be used instead of native soil in the trench around
32 the cables to ensure sufficient standard heat transfer to the surrounding soils and groundwater.

33 It is estimated that that for cable burial at 4 and 8 feet (1.2 and 2.4 meters), the maximum expected
34 temperature change would be less than 1 °F (0.0001 °C and 0.0002 °C for 4- and 8-foot [1.2- and
35 2.4-meter) burial, respectively) in the water column above the riverbed, approximately 1.8 °F (1.20 °C
36 and 1.24 °C, respectively) at the riverbed surface, and 9 °F and 4 °F (5 °C and 2.46 °C), respectively, at
37 0.2 meters below the riverbed surface. This is based on modeling that used a flow rate of 1.38 feet
38 (0.4 meters) per second (CHPEI 2012p). This flow rate might be considered conservative inasmuch as
39 Nepf and Geyer (1996) indicated ebb tide velocities can reach approximately 6.6 feet (2 meters) per
40 second in the Hudson River under normal flow conditions. While the temperature change is not directly
41 linear, it is reasonably expected that based on these calculations that the expected water, surface, and
42 subsurface temperatures that would be expected at a burial depth of 7 feet (2.1 meters) would be closer to
43 those identified for the 8-foot (2.4-meter) burial rather than the 4-foot (1.2-meter) burial.

1 Where the transmission cables cannot be buried to their full depth due to utilities or bedrock and must be
 2 covered with concrete mats, the estimated increase in ambient water temperature surrounding the cables
 3 covered by the concrete mats is expected to be negligible (less than 0.25 °F [0.14 °C]). This is expected
 4 to be within the range of daily variation of water temperatures experienced in the Hudson and Harlem
 5 rivers. The highest increase in ambient temperature in the top 2 inches (5 cm) of sediment along the sides
 6 of the concrete mat is expected to be 1.26 °F (0.7 °C) or less (Exponent 2014). This assumes a river
 7 depth of 16 feet (5 meters) and an average water velocity of 1.38 feet (0.4 meters) per second.

8 **Electric and Magnetic Fields.** Operation of the proposed CHPE Project transmission line would produce
 9 electric and magnetic fields. Transmission lines, like all electric devices, produce electric and magnetic
 10 fields, or electromagnetic fields (EMFs). Voltage, the force that drives the current, is the source of the
 11 electric field. Current, the flow of electric charge in a wire, produces the magnetic field. The strength of
 12 the EMF depends on the design of the electrical line and the distance from it. EMF is found around any
 13 electrical wiring, including household wiring, electrical appliances, and equipment.

14 Electric fields are measured in volts per meter (V/m) or kilovolts per meter (kV/m). Electric field
 15 strength is reduced by shielding or by intervening objects such as structures and vegetation. The
 16 proposed CHPE Project transmission line cables would be shielded within a lead-alloy sheath(see
 17 **Figure 2-8**) and buried, which would effectively eliminate any exposure to the electric field (Cross-Sound
 18 Cable Company 2012, WHO 2012). In areas where the cable cannot be buried (e.g., when installed over
 19 existing utility lines or bedrock), protective covering, such as concrete mats, would be installed over
 20 them.

21 Like electric fields, magnetic fields diminish with distance from the source. Unlike electric fields,
 22 however, intervening objects between the source and the receptor, such as structures or soil over a buried
 23 transmission line, do not reduce magnetic field strength. Consequently, while electrical appliances can
 24 produce the highest localized magnetic fields, power lines serving neighborhoods and distribution lines
 25 and transformers serving individual homes or businesses are a common source of longer-term magnetic
 26 field exposure (BPA 2010).

27 Magnetic fields are measured in units of gauss (G) or milligauss (mG). The average magnetic field
 28 strength in most homes (away from electrical appliances and wiring) is typically less than 2 mG. Outdoor
 29 magnetic fields in publicly accessible places can range from less than a few mG to 300 mG or more,
 30 depending on proximity to power lines and the voltage of the power line.

31 **Table 2-1** and **Figure 2-9** provide the magnetic field strengths for the Proposed CHPE Project
 32 transmission lines at an assumed burial depth of 3.3 feet (1.0 meter). The table and figure demonstrate
 33 that magnetic field levels are reduced the closer the cables are to each other. Lake sturgeon exhibited
 34 temporarily altered swimming behaviors in response to AC-generated EMF that ranged from 35,100 mG
 35 to 1,657,800 mG, and EMF responses disappeared below 10,000 to 20,000 mG (Cada et al. 2011,
 36 Bevelhimer et al. 2013). These magnetic fields are much more intense than those that would be produced
 37 by the transmission line, which would be approximately 162 mG at the sediment-water interface.

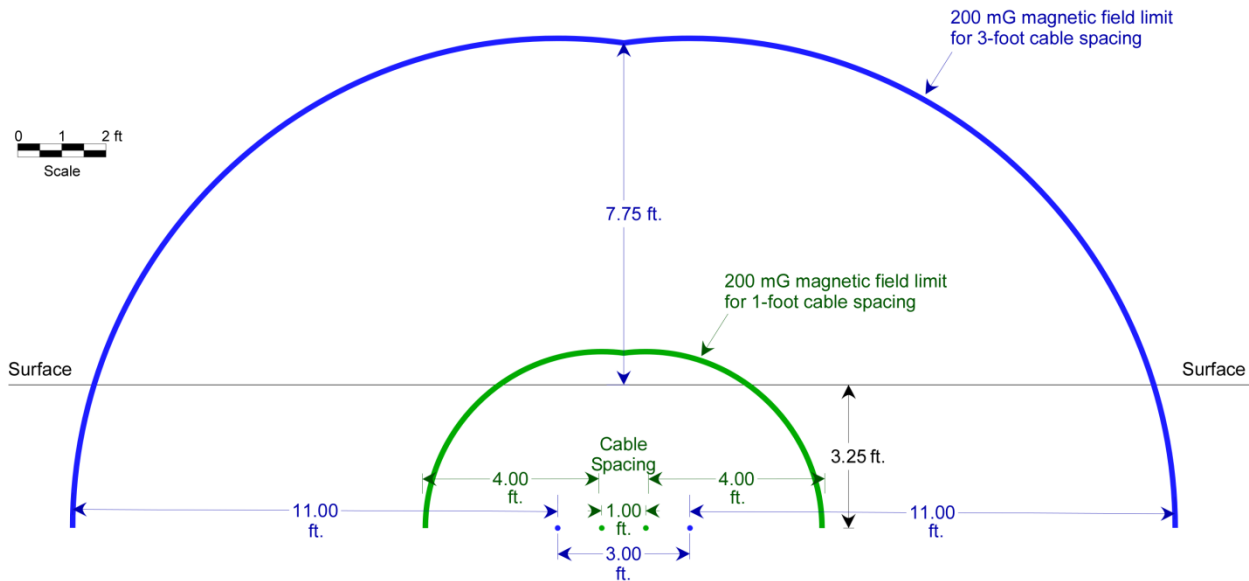
38 2.5 Construction and Schedule

39 The Applicant anticipates that the initial permitting phase of the proposed CHPE Project would continue
 40 through mid-2014, with major construction commencing later in 2014. Installation of the transmission
 41 cables is proposed to be completed in three phases between 2014 and 2017. The Applicant anticipates
 42 that the commercial operation date for the proposed CHPE Project would be 2017 (TDI 2010,
 43 CHPEI 2012o).

1 **Table 2-1. Magnetic Field Levels for the Proposed CHPE Transmission Cables**

Distance From Cables (feet)	Levels at Various Spacing Between Cables (values in mG)			
	1 foot	2 feet	3 feet	6 feet
+5	161.8	322.7	481.6	932.3
+10	76.9	154.1	231.9	472.1
+15	41.0	82.1	123.5	251.3
+20	24.8	49.6	74.6	151.0
+25	16.4	32.9	49.4	99.6
+30	11.6	23.3	34.0	70.4
+50	4.3	8.6	12.9	25.9

Source: CHPEI 2012m



2 **Figure 2-9. 200-mG Magnetic Field Strengths with Cable Spacings of 1 Foot and 3 Feet**

3 **2.5.1 Aquatic Transmission Cable Installation**

4 To the extent practical, the aquatic transmission cables would be buried beneath the beds of existing
 5 waterways at depths ranging between 4 and 8 feet (1.2 and 2.4 meters) beneath the bed surface. In Lake
 6 Champlain, the cables would be buried in the lake bottom to a target depth of 8 feet (2.4 meters) in the
 7 soft sediment within the Federal navigation channel, and at least 4 feet (1.2 meters) in the lakebed outside
 8 of the navigation channel. In the Hudson River, the cables would be buried to a minimum depth of 7 feet
 9 (2.1 meters). Cable installation in the Harlem River would be entirely within the navigation channel at
 10 depths of 8 feet (2.4 meters) in the soft sediment and 6 feet (1.8 meters) in rock. The transmission line
 11 would be installed along the entire East River route using HDD; therefore, trench burial depths would not
 12 apply.
 13

14 In the year preceding transmission line installation, debris would be removed from the route (i.e., route
 15 clearing). Debris removal would occur from September 15 through October 30 in the Hudson River

1 within the appropriate construction windows and would be accomplished in 20 calendar days during
 2 12-hour shifts. Debris removal would occur in the Harlem River during the May 31 to November 30
 3 construction window. Route clearing could require one to three stages based on the site conditions. All
 4 stages of route clearing would use a tug and barge equipped with cutter wheel equipment, or with a
 5 smaller tug if possible. Support vessels would include a crane barge to remove larger debris as required
 6 or a debris barge to transport recovered riverbed debris. The initial stage of route clearing is designed to
 7 find and remove debris lying on and just below the river floor. This stage is performed with large grapnel
 8 equipment (see **Figure 2-10**). In areas of extensive debris or suspect areas, a second stage clearing would
 9 be performed with a de-trenching grapnel. This grapnel provides penetration of up to 3 feet (0.9 meters)
 10 into the riverbed.



Source: Kingbird 2014

11 **Figure 2-10. Example of Grapnel Used for Debris Removal**

12 After completion of the grapnel runs, a third stage of clearing (i.e., plow pre-rip) would be required if the
 13 site conditions indicate the potential for sub-surface debris. The plow pre-rip is designed to clear and
 14 prove the entire route to the full burial depth, and would be performed in the Hudson and Harlem rivers
 15 using a jet plow but without the cables loaded.

16 Transit routes for the route-clearing equipment would vary based on the location of marine-based yards
 17 along the route, but the yards would generally be no more than 50 miles (81 km) from the equipment's
 18 location. Temporary marine yards would be set up and moved as the route-clearing operation progresses.
 19 Transit speeds would be no faster than 8 to 12 knots depending on weather, currents, and barges in tow.
 20 Vessel drafts would vary from 8 feet (2.4 meters) for supply barges to 16 feet (5 meters) for supply tug
 21 boats, with 4-foot (1.3-meter) drafts for local push tugs. Work barges would generally draw 12 feet
 22 (4 meters), depending on the load. This level of activity and associated vessel speeds are consistent with
 23 existing vessel use on the Hudson River. During debris removal, the barge would proceed at a speed of
 24 1.5 knots or less. In areas with significant side-scan and magnetometer targets, the speed would be
 25 reduced to less than 1 knot. The route transected for clearing would follow the path of the proposed
 26 transmission line.

27 Following debris removal, aquatic installation and burial of the transmission line would occur via jet plow
 28 in all locations except where installed by shear plow in southern Lake Champlain (south of MP 74), HDD
 29 at water-to-land transitions, lain on the surface over bedrock or utility line crossings and covered with
 30 concrete mats (total of 3.0 miles [4.8 km]), or blasting of 460 feet of trench at MP 324.5 in the Harlem
 31 River. The jet plow is fitted with hydraulic pressure nozzles that create a downward and backward flow
 32 to fluidize the sediment within a trench approximately 2 feet (0.4-meters) wide and 4 to 8 feet (1.2 to
 33 2.4 meters) deep depending on the burial requirements, allowing the transmission cables to settle to the
 34 bottom of the trench under their own weight before the sediments settle back into the trench. The trench

1 dimensions of the shear plow (mechanical blade proposed to be used in Lake Champlain south of Crown
2 Point [MP 74]) would be approximately 0.8 feet (0.2 meters) wide and 4 to 8 feet (1.2 to 2.4 meters) deep.

3 | The Applicant would employ a fleet of approximately four vessels, including the cable-laying vessel,
4 survey boat, crew boat, and tugboat or tow boat, which would be used to coordinate the laying of cable.
5 The plowing process would be conducted using either a dynamically positioned cable barge and towed
6 plow device that simultaneously lays and embeds the aquatic transmission cables in a trench. The
7 transmission cables composing the bipole would be deployed from the vessel to a funnel device on the
8 plow. The plow is lowered to the lake or river bed, and the plow blade cuts into the lake or riverbed while
9 it is towed along the pre-cleared route to carry out a simultaneous lay-and-burial operation. The plow
10 would bury both cables of the bipole in the same trench at the same time.

11 Burial depths could vary in response to site-specific factors (e.g., presence of existing infrastructure or
12 archaeological resources, environmental concerns, localized geological or topographical obstacles)
13 identified along the proposed CHPE Project route. Where the transmission cables would cross areas that
14 contain surficial bedrock or existing infrastructure (e.g., other cables, pipelines), the transmission cables
15 would generally be laid atop the existing bedrock or infrastructure and protected by material placed over
16 the transmission cables. Protective material could include concrete (e.g., rip-rap, grout mattresses),
17 protective cable ducts, or other low-impact protective armoring (TDI 2010). Aquatic transmission cables
18 would cross under a cable ferry crossing in Lake Champlain. The Ticonderoga–Larrabee Point Ferry,
19 which would be crossed at the proposed CHPE Project route near MP 86, uses two parallel, steel guidance
20 cables that are lifted by steel sheaves to pull the ferry along the cables. The guidance cables rest along the
21 bottom of the lake when they are not in use and typically are replaced every 4 years. The guidance cables
22 would be temporarily removed from the lakebed prior to the installation of the transmission cables, which
23 could put the ferry temporarily out of service. After installation and burial of the transmission cables, the
24 guidance cables would be put back in place over the top of the transmission cables. Installation of the
25 cables would be coordinated with the ferry operator to minimize impacts on ferry operations.

26 The burial depth for the area of rock excavation in the Harlem River is stated in the USACE Public
27 Notice as being 6 feet below waterbody bottom (USACE 2013). The proposed transmission line would
28 cross exposed bedrock for approximately 460 feet. Geologic maps indicate this rock is Fordham gneiss
29 having unconfined compressive strength that is too hard to remove by cutterhead, ripping, hoe-ramming,
30 or non-explosive methods. Blasting trials would be conducted using a pre-packaged chemical demolition
31 agent (e.g., Green Break or RockCracker) that would be inserted into holes drilled into rock. These
32 packaged demolition agents would be loaded into boreholes and when ignited would generate an
33 expansive force to fracture the rock. The rock fragments would then be removed by long-reach hydraulic
34 excavating buckets and deposited in a barge. If the trials are successful, a vertical pattern of holes would
35 be drilled into the rock to form a trench. The broken rock would be dredged sequentially from each end
36 of the trench progressing towards the middle with the rock fragments placed into a barge. Turbidity
37 would be generated as a result of operations. However, impacts are expected to be minimal because of
38 the crystalline nature of the rock and because silt curtains would be used to surround the operations to
39 avoid the spread of a turbidity plume.

40 In the event that trials with the pre-packaged chemical demolition agent are unsuccessful, due to the
41 | rock's hardness or other reasons, it would be necessary to use water gel dynamites to fracture the rock so
42 it can be dredged. The dynamite would produce a shock wave upon detonation. The force of the shock
43 wave could be decreased by stemming the top of the blast holes with pea gravel, which could require an
44 increase in the number of boreholes to be drilled in order to get the powder factor (pounds of dynamite
45 per cubic yard of rock) required to break the rock. Each blast hole would be detonated in a controlled
46 sequence to move the rock towards the open end of the trench and to minimize vibrations that would
47 travel towards the shoreline. Explosives would be detonated during each delay (typically 8 milliseconds)

1 apart). Blasting would occur within the proposed CHPE Project construction window for the Harlem
 2 River (see **Table 2-2**).

3 **Table 2-2. Underwater Construction Windows**

CHPE Milepost	Location	Construction Window	Primary Construction Method	Species Lifestage Protected
Lake Champlain				
0 to 73	U.S./Canada Border to Crown Point	May 1 to August 31	Jet Plow	N/A: No Aquatic Federally Protected Species in Lake Champlain.
73 to 101	Crown Point to Dresden	September 1 to December 31	Shear Plow	N/A: No Aquatic Federally Protected Species in Lake Champlain.
Hudson River				
228 to 245	Cementon (Catskill) to New Hamburg	August 1 to October 15 ^a	Jet Plow	<i>Shortnose sturgeon</i> : spawning adults, eggs, and larvae (spring); adults and juveniles (early summer). <i>Atlantic sturgeon</i> : spawning adults, eggs, and larvae and early juveniles (spring and early summer).
269 to 295	New Hamburg to Stony Point	September 15 to November 30	Jet Plow	<i>Shortnose sturgeon</i> : adults and juveniles (summer). <i>Atlantic sturgeon</i> : adults, eggs, larvae, and juveniles (spring and summer); early juveniles (winter).
303 to 324	Clarkstown to Harlem River	July 1 to October 31	Jet Plow	<i>Shortnose sturgeon</i> : adults and juveniles (winter and early summer). <i>Atlantic sturgeon</i> : early juveniles (winter and spring).
Harlem and East Rivers				
324 to 330	Harlem River	May 31 to November 30	Jet Plow	Proposed blasting would avoid sturgeon spawning migration.
331 to 331	East River	May 15 to November 30	HDD	N/A

Source: Bain 1997, NYSPSC 2013

Notes: a. The transmission line would be installed between MPs 245 and 269 between September 14 and November 30 to avoid impacts on the Kingston-Poughkeepsie Deepwater Significant Coastal Fish and Wildlife Habitat (SCFWH).

b. Blasting would take place between July 1 and November 30.

4 The blasting program in the Harlem River is estimated to take up to 10 weeks, requiring approximately
 5 300 drill holes with each drill taking 30 to 60 minutes to complete. Nominal noise, vibration, and
 6 turbidity are expected from the drilling process, which would employ small diameter drill holes
 7 (~1.5 inches) that generate a small amount of suspended sediment. The sediment would be contained by
 8 means of floating silt curtains as appropriate. Air compressors mounted on the barge would generate
 9 additional construction noise. Drilling is anticipated to be conducted from a barge on spuds. Prior to
 10 blasting, the barge would be moved off the drilled holes for each blast with clearance of the vicinity as
 11 required by the local fire marshal and harbormaster.

1 The blast events are anticipated to have duration of only a few seconds, but they would be preceded by
2 warnings and clearings of the area prior to and after the blast for inspections, all of which may last
3 approximately two hours. The exact production schedules would be developed by the blasting
4 construction contractor. Preliminary construction sequencing studies indicate that 15 to 20 separate blasts
5 could be required. Peak ground vibrations are predicted to range from 0.25 inches per second at a
6 distance of 200 feet from the trench, 1 inch per second at a distance of 75 feet, 2 inches per second at
7 50 feet, and 4 inches per second at 30 feet. Peak water pressures are predicted to be 10 pounds per square
8 inch (psi) at 200 feet, 30 psi at 75 feet, 50 psi at 50 feet, and 85 psi at 30 feet from the trench.

9 Following clearance by the blaster, mucking of blasted trench materials would be done with long-reach
10 backhoes to lift muck out of the trench and, if the fragmentation is good, put it to the side. Large rocks
11 would require removal to shore and disposal. An estimated 1,200 tons of rock material is anticipated to
12 be removed from the trench and temporarily stored on the river bottom adjacent to the trench. The cables
13 would be laid over a sand backfill and covered with sand layer. Thereafter, the remainder of the trench
14 would be backfilled with the blasted aggregate materials.

15 The NYSPSC Certificate issued for the proposed CHPE Project established construction work schedule
16 windows identifying times of the year when work associated with the underwater portion of the
17 transmission line may take place (NYSPSC 2013). These work windows were subsequently
18 supplemented through consultation with NMFS. These established work windows and time of year
19 restrictions (see **Table 2-2**) were developed in part to avoid impacts on overwintering, spawning
20 migrations, spawning activity, and larval stages of ESA-listed fish species. Spawning seasons for
21 ESA-listed fish species in the Hudson River Segment are April through May for shortnose sturgeon and
22 May through June for Atlantic sturgeon. The New York State Department of State (NYSDOS) has
23 conditionally concurred with these construction windows as part of its Coastal Management Program
24 (CMP) consistency certification for the proposed CHPE Project. Restriction of construction activities to
25 specific windows of time would protect ESA-listed fish species during spawning migrations, which are
26 vital and sensitive stages of their lifecycle.

27 2.5.2 Terrestrial Direct Current Transmission Cable Installation

28 The general sequence for installing the terrestrial DC transmission cables along the road and railroad
29 ROWs would be conducted in steps as follows (CHPEI 2010b):

- 30 • Initial clearing operations (where necessary) and storm water- and erosion-control installation
- 31 • Trench excavation
- 32 • Cable installation
- 33 • Backfilling
- 34 • Restoration and revegetation.

35 The typical trench would be up to 9 feet (2.7 meters) wide at the top and approximately 3 feet (0.9 meters)
36 deep to allow for proper depth and a 1-foot (0.3-meter) separation required between the two transmission
37 cables to allow for heat dissipation. If shallow bedrock is encountered, the rock would be removed by the
38 most suitable technique given the relative hardness, fracture susceptibility, and expected volume of
39 material. The operation of the transmission cables would result in the generation of heat, which would
40 reduce the electrical conductivity of the cables; therefore, prior to laying the cables, the trenches would be
41 backfilled with low thermal resistivity material such as sand to prevent heat from one cable affecting a
42 nearby cable. There would be a protective concrete cover consisting of a layer of weak concrete directly
43 above the low thermal resistive backfill material. The whole assembly would have a marker tape placed
44 1 to 2 feet (0.3 to 0.6 meters) above the cables (CHPEI 2010b).

1 | For crossings of waterbodies, the following five dry-ditch crossing methods would be used for installation
2 | of the transmission line:

3 | • *Attachment to a Bridge.* Where available and feasible, the transmission line would be affixed
4 | directly to an existing railroad bridge as it spans the waterbody.

5 | • *Flume Crossing Method.* This method involves installing a flume pipe to carry the stream around
6 | the work area in an enclosed pipe, allowing the trenching to be done in a dry condition, limiting
7 | the amount of sediment that can enter the waterbody.

8 | • *Dam and Pump Crossing Method.* For this method, the stream is dammed upstream of the work
9 | area and a pump and hose are used to transport the stream flow to bypass the trenching area to a
10 | point downstream where it would be discharged back to the stream bed.

11 | • *HDD.* Under this method, cable conduits would be installed under the streambed using HDD and
12 | avoiding any disturbance to the streambed, and the cables would then be pulled through the
13 | conduits.

14 | • *Open Cut.* The open cut method of construction involves digging an open trench across the
15 | streambed, laying the cable, and backfilling the trenched area without diverting the stream around
16 | the work area.

17 | The waterbody crossing methods would be determined based on the NYSDPS stream width classification,
18 | NYSDEC stream type classification, and conditions present during the time of construction; and would be
19 | in accordance with NYSDPS's *Environmental Management and Construction Standards and Practices*
20 | *for Underground Transmission and Distribution Facilities in New York State* (NYSDPS 2003).

21 | In wetland areas, the cables would generally be installed by trenching. The typical sequence of activities
22 | would include vegetation clearing, installation of erosion controls, trenching, cable installation,
23 | backfilling, and ground surface restoration. Equipment mats or low-ground-pressure tracked vehicles
24 | would be used to minimize compaction and rutting impacts on wetland soils. To expedite revegetation of
25 | wetlands, the top 1 foot (0.3 meters) of wetland soil would be stripped from over the trench, retained, and
26 | subsequently spread back over and across the backfilled trench area to facilitate wetland regrowth by
27 | maintaining physical and chemical characteristics of the surface soil and preserving the native seed bank.
28 | Trench plugs or other methods would be used to prevent draining of wetlands or surface waters down into
29 | the trench.

30 | The permanent ROW required for maintenance and operation of the transmission line along the terrestrial
31 | portions of the proposed CHPE Project route would be up to 20 feet (6.1 meters) for both railroad and
32 | roadway ROWs. The permanent ROW would provide protection of the transmission cables against
33 | third-party damage and would facilitate any required maintenance or repairs (TDI 2010).

34 | 2.5.3 Staging Areas

35 | ***Aquatic Transmission Cable Support Facilities.*** For the portions of the proposed CHPE Project route
36 | where aquatic transmission cables would be installed, it is anticipated that minimal land-based support
37 | would be required. Transport of the aquatic transmission cables would occur via the cable-laying vessel,
38 | supported by resupply barges operated from a temporary storage area on land. This land-based support
39 | facility is expected to be no greater than 200 by 300 feet (61 by 91 meters), and would be at an existing
40 | port with heavy lift facilities, likely the Port of Albany or the Port of New York and New Jersey
41 | (CHPEI 2010a).

1 **Terrestrial Transmission Cable Support Facilities.** For the terrestrial portions of the proposed CHPE
2 Project route where underground transmission cables would be installed, additional nearby temporary
3 aboveground support facilities would be established. Support facilities could include contractor yards,
4 storage areas, access roads, and additional workspace. Additional workspace might be required at HDD
5 locations, cable jointing locations, and areas with steep slopes. The support facilities would be sited
6 within the existing road and railroad ROWs (CHPEI 2010a).

7 2.5.4 Operations and Maintenance

8 The proposed CHPE Project has an expected life span of 40 years or more (CHPEI 2012a). During this
9 period, it is expected that the transmission system would maintain an energy availability factor of
10 95 percent, meaning that the transmission system would be delivering electricity 95 percent of the time,
11 with the remaining 5 percent allocated for scheduled and unscheduled maintenance.

12 The HVDC and HVAC transmission cables would be designed to be relatively maintenance-free and
13 operate within the specified working conditions. However, selected portions or aspects of the
14 transmission system would be inspected to ensure equipment integrity is maintained (CHPEI 2010a).

15 **ROW Maintenance.** During operation of the proposed CHPE Project, vegetation clearing in the
16 transmission line ROW would be performed on an as-needed basis. Vegetation management would
17 include mowing, selective cutting to prevent the establishment of large trees (i.e., greater than 20 feet
18 [6 meters] tall) directly over the transmission line, and vegetation clearing on an as-needed basis to
19 conduct repairs.

20 **Transmission Cable Repairs.** While not anticipated, it is possible that over the lifespan of the proposed
21 CHPE Project, the transmission cables could be damaged, either by human activity or natural
22 processes. Before operation of the proposed CHPE Project begins, an Emergency Repair and Response
23 Plan (ERRP) would be prepared to identify procedures and contractors necessary to perform maintenance
24 and emergency repairs. The typical procedure for repair of a failure within the aquatic and terrestrial
25 portions of the proposed CHPE Project route is described as follows:

- 26 • **Aquatic Transmission Cable Repair.** In the event of aquatic cable repair, the location of the
27 problem would be identified and crews of qualified repair personnel would be dispatched to the
28 work location. A portion of the transmission cable would be raised to the surface, the damaged
29 portion of the cable cut, and a new cable section would be spliced in place by specialized jointing
30 personnel. Once repairs were completed, the transmission cable would be reburied using a
31 remotely operated vehicle (ROV) jetting device (CHPEI 2010a).
- 32 • **Terrestrial Transmission Cable Repair.** In the event of terrestrial transmission cable repair,
33 contractors would excavate around the location of the problem and along the transmission cable
34 for the extent of cable to be repaired or replaced. Specialized jointing personnel would remove
35 the damaged cable and install new cable. Once complete, the transmission cable trench would be
36 backfilled and the work area restored using the same methods described for the original
37 installation (CHPEI 2010a).

38 **Transmission Service.** The maximum electrical power delivery capability for the proposed CHPE
39 Project under normal conditions would be 1,000 MW. The ultimate maximum capacity would be
40 determined during final design of the proposed CHPE Project. The estimated short-time (i.e., 2-hour)
41 emergency overload capability would be approximately 1,150 MW for the transmission system
42 (TDI 2010).

1 The New York Independent System Operator (NYISO) would be the controlling authority for the
2 proposed CHPE Project and the operator of the system where the energy would originate, Hydro-Québec,
3 would coordinate with the NYISO.

4 **Decommissioning.** The Applicant proposes to de-energize and abandon the proposed CHPE Project
5 transmission line in place following expiration of its useful life. This proposed approach or any changes
6 to the plan for decommissioning plan would be subject to applicable Federal and state regulations in place
7 at that time.

8 2.6 Impact Minimization and Conservation Measures

9 As part of its application development process, the Applicant detailed a number of industry-accepted best
10 management practices (BMPs) that it would undertake to avoid or reduce environmental impacts during
11 construction and operation of the proposed CHPE Project. The Applicant would develop a
12 Environmental Management and Construction Plan (EM&CP), which documents environmental and
13 construction management procedures and plans to be implemented during the proposed CHPE Project
14 construction activities and during facility operation. In addition, the Applicant has proposed to employ a
15 number of specific measures to minimize environmental impacts as part of its filings with the NYSPSC
16 and the USACE. These impact reduction measures, collectively referred to as BMPs, have been proposed
17 by the Applicant for use during construction and operations to protect environmental, agricultural,
18 cultural, and other potentially sensitive resources along the proposed CHPE Project route. These BMPs
19 have been incorporated into the Certificate and will be incorporated into the final EM&CP (NYSPSC
20 2013). The Applicant-proposed measures have been taken into account in the environmental analyses
21 conducted for the DOE Draft EIS and this BA. These measures include development of a Spill
22 Prevention, Control, and Countermeasures (SPCC) Plan; time of year work restrictions; water quality
23 monitoring; biological studies; work site restoration; and inspection and reporting. A listing of specific
24 BMPs proposed by the Applicant as part of the proposed CHPE Project and considered in the EIS
25 evaluation is provided in Appendix G of the Draft EIS (DOE 2013). The Certificate includes
26 165 attached conditions, some of which require measures to reduce, avoid, or measure environmental
27 impacts. Specific measures that apply to ESA-listed species are presented as follows. A final EM&CP
28 | would be developed in consultation with NYSDPS, NYSDEC, and NMFS as the project design is
29 advanced prior to construction.

30 2.6.1 Applicant-Proposed Measures and BMPs for Aquatic ESA-listed Species

31 The Applicant has proposed measures to avoid or minimize impacts on aquatic ESA-listed species and
32 | their occupied habitats in the Hudson River and New York City Metropolitan Area segments.
33 Additionally, the NYSPSC Certificate requires the Applicant to undertake a series of pre- and
34 post-installation compliance monitoring studies: benthic and sediment monitoring; bathymetry, sediment,
35 temperature, and magnetic field; and Atlantic sturgeon pre-installation and post-energizing hydrophone.
36 The Atlantic sturgeon study would document the species' movements in relation to cable operation. The
37 post-energizing benthic surveys would be conducted at the following milestones: (a) 3 years after
38 installation assuming cable energizing, and (b) when the transmission system is operating at 500 to
39 1,000 MW if it is not doing so 3 years after installation. Sediment post-energizing sampling would be
40 conducted 3 years after installation during the same season as the first benthic sampling event. All studies
41 | would be developed in consultation with appropriate natural resources agencies.

42 The overall objective of the surveys would be to obtain the highest quality hydrographic data using
43 commercially available equipment and techniques. Equipment that would be used includes a
44 high-resolution side-scan sonar system with a dual frequency (100 and 500 kiloHertz) towfish, a vessel
45 | motion sensor (heave, pitch, and roll) and heading sensor, real time kinematic GPS, and a shore-based

1 GPS receiver. The entire cable route would be surveyed in the first year to compare with the bottom
2 elevations of the pre-installation survey. Segments where the substrate has returned to the pre-installation
3 configuration would not be resurveyed. Segments that have not returned to pre-installation condition
4 after 3 years would be resurveyed after 5 years and 8 years after cable installation. Each survey would
5 take about 35 days and would likely be conducted in the late summer and early fall. The speed of the
6 vessel conducting the survey would depend on the water current speed and the weather. It is expected
7 that the average speed of the vessel while surveying would be about 3 to 4 knots. Transit speeds would
8 be 8 to 10 knots. The side-scan sonar system would be operated with a towfish height above the bottom
9 that provides adequate coverage.

10 The following measures have been proposed by the Applicant to avoid or minimize impacts on aquatic
11 ESA-listed species:

- 12 • The Applicant would continue to work closely with Federal and state agencies to establish
13 measures prior to construction starting to avoid or minimize impacts on aquatic threatened and
14 endangered species along the proposed CHPE Project route.
- 15 • All in-water work would be conducted within applicable time windows as agreed to by the
16 NYSDEC, NYSDOS, NYSDPS, and NMFS Habitat Conservation Division, including
17 location-specific dredging windows in the Hudson River Estuary intended for the protection of
18 aquatic threatened and endangered species. As a conservation measure, the Applicant worked
19 with the NYSDEC to establish periods when sensitive species would be using different segments
20 of the Hudson River. The Applicant has proposed construction windows to avoid impacts on
21 spawning migrations, spawning activity, and larval stages of ESA-listed fish species (see **Table**
22 **2-2**). NYSDOS has conditionally concurred with these construction windows as part of its CMP
23 consistency certification for the proposed CHPE Project. Restricting construction activities to
24 timing windows protects ESA-listed fish species from construction activities during spawning
25 migrations, which are the most vital and sensitive portions of their lifecycle.
- 26 • Reduced in-water pressure and jetting speeds (e.g., less than 4 knots) would be used to reduce
27 turbidity when crossing sensitive areas such as Significant Coastal Fish and Wildlife Habitats
28 (SCFWHs), which contain important breeding habitat for protected and sensitive species (see
29 Attachment A). The most appropriate speeds would be coordinated with the construction
30 contractor, who would consider existing sediment conditions, cable weight, and multiple other
31 factors to arrive at an installation speed that allows for a reduction in impacts and safe and
32 efficient cable installation. Reductions in total suspended solids (TSS) would be calculated after
33 the installation specifications have been set as part of the construction design phase. Proposed
34 areas where construction modifications could occur would be identified in Plan and Profile
35 drawings included in the EM&CP.
- 36 • HDD would be used where the cables enter and exit bodies of water to avoid or minimize effects
37 on shoreline and shallow water habitats.
- 38 • A closed environmental (clamshell) bucket dredge would be used to minimize sediment
39 suspension at mechanical dredging sites for fine-grained (silty) sediments.
- 40 • A sheet pile cofferdam installed using a vibratory hammer would be positioned to enclose the
41 HDD exit point work site before commencing mechanical dredging to create the exit pit. The
42 cofferdam would remain in place and functional during all phases of the dredging operations and
43 would be removed upon completion of dredging activities.
- 44 • During nighttime construction activities, vessels would be outfitted with identification lights and
45 working decks would be illuminated for safety. Lights would not be directed into surrounding
46 waters, thereby reducing the potential for effects on benthic communities and fish.

- 1 • Commencement of in-river work north and south of the Haverstraw Bay SCFWH would occur
2 between high tide and ebb tide to avoid or minimize impacts of resuspended sediments on
3 Haverstraw Bay, which contains important habitat for protected and sensitive species.
- 4 • The Environmental Inspector would have the authority to modify or suspend construction if any
5 aquatic threatened and endangered species would be impacted in any way by construction
6 activities.
- 7 • Most designated trout streams are anticipated to be crossed using the HDD method, thereby
8 avoiding disturbance to these streams.
- 9 • In the event that the Applicant unexpectedly encounters any rare, threatened, or endangered
10 species during the preconstruction, construction, or operation and maintenance phases of the
11 CHPE Project, the following measures would be implemented:
 - 12 ○ The Applicant would temporarily halt construction activities, excepting any activity
13 required for immediate stabilization of the area, to avoid or minimize the impacts on the
14 species or habitat.
 - 15 ○ The Environmental Inspector would identify the area of the sighting or encounter and
16 record GPS locations of the likely habitat boundary or the sighting location of any aquatic
17 threatened and endangered species.
 - 18 ○ Any unanticipated sightings of threatened and endangered species or observation of rare,
19 threatened, and endangered plants would be reported as soon as possible to NYSDPS
20 staff, NYSDEC, USFWS, or NMFS (as appropriate). Reporting of all takes of listed
21 species of sturgeon should be directed to incidental.take@noaa.gov and the NMFS
22 Protected Resources Division (PRD) should be contacted (Bill Barnhill,
23 william.barnhill@noaa.gov; 978-282-8460). The Applicant would consult with
24 applicable resource agencies for measures to avoid or minimize impacts on aquatic
25 threatened and endangered species and their occupied habitat. Construction activities in
26 the area would resume once protective measures, developed in consultation with
27 NYSDPS staff, NYSDEC, or USFWS, are implemented.
- 28 • Any sightings of sturgeon would be reported to the New York Natural Heritage Program
29 (NYNHP), USFWS, and NMFS as soon as possible. Reporting of all takes of listed species of
30 sturgeon should be directed to NMFS PRD. A Standard Operating Procedures Manual would be
31 prepared to outline the monitoring and reporting methods to be implemented during proposed
32 CHPE Project construction. This manual would be coordinated with and reviewed by NMFS
33 PRD.
- 34 • If new aquatic threatened and endangered species-occupied habitat is identified, the EM&CP
35 would be updated to show the new occupied habitat(s), and consultation with appropriate Federal
36 or state agencies would commence.
- 37 • All personnel associated with the project would be advised of the potential presence of aquatic
38 threatened and endangered species and the need to avoid collisions. All construction personnel
39 would also be updated on the locations of any new aquatic threatened and endangered species or
40 occupied habitats that are identified. These areas would be reported to the applicable resource
41 agencies.
- 42 • All vessel crew members and contractors would participate in a fisheries training for aquatic
43 protected species presence and emergency procedures in the unlikely event an animal is struck by
44 a vessel. The emergency procedure would be provided as part of the EM&CP. Both the training

1 program and applicable parts of the EM&CP would be coordinated with and reviewed by NMFS
2 PRD.

- 3 • All construction personnel would be responsible for observing water-related activities for the
4 presence of these species.
- 5 • The Applicant would train and educate transmission system contractors and subcontractors to
6 identify aquatic invasive species and site-specific prescriptions for preventing or controlling their
7 transport throughout or off of the proposed CHPE Project site.
 - 8 ○ Require that vessels, equipment, and materials be inspected for, and cleaned of, any
9 visible vegetation, algae, organisms, and debris before bringing them to the proposed
10 CHPE Project area.
 - 11 ○ Train transmission system contractors and subcontractors on the various cleaning or
12 decontamination methods to be used on a site-by-site basis for the proposed CHPE
13 Project.
 - 14 ○ Require that vessels, equipment, and materials be inspected for, and cleaned of, any
15 visible vegetation, algae, organisms, and debris before leaving the waterbody for another.
- 16 • All construction personnel would be advised that there are civil and criminal penalties for
17 harming, harassing, or killing aquatic species that are protected under the ESA.
- 18 • All vessels associated with the construction project would operate at “no wake/idle” speeds
19 (i.e., less than 4 knots) at all times while in the construction area and while in water depths where
20 the draft of the vessel provides less than a 4-foot (1.2-meter) clearance from the bottom. In areas
21 with substantial objects recorded in side-scan sonar and magnetometer surveys, the speed would
22 be reduced to less than one knot. All vessels would preferentially follow deepwater routes
23 (e.g., marked channels) whenever possible.
- 24 • Blasting would occur between July 1 and November 30. Measures to startle fish or keep fish
25 away immediately prior to underwater blasting activities, such as use of sparkler guns or bubble
26 curtains, would be used as conditions dictate.
- 27 • Any collision with or injury to a protected species would be reported immediately to the NMFS
28 Protected Resources Division.

29 2.6.2 Applicant-Proposed Measures and BMPs for Terrestrial ESA-listed Species

30 The Applicant has proposed mitigation measures and BMPs applicable to all threatened and endangered
31 species and their occupied habitats. Additionally, measures developed through consultation with agencies
32 including the NYSDEC, NYNHP, and USFWS would be included, if applicable. Specific measures
33 meant to avoid impacts on threatened and endangered species and their occupied habitats include the
34 following:

- 35 • All known threatened and endangered species, occupied habitats, and locations where rare,
36 threatened, and endangered plants have been observed, based on the field surveys and available
37 data, would be clearly marked on the construction drawings. The construction drawings would be
38 provided to the NYSDEC, NYNHP, NYSDPS, and USFWS for review of mapped occupied
39 habitat areas and locations where rare, threatened, and endangered plants have been observed.
- 40 • Locations of threatened and endangered species or their habitat and rare, threatened, and
41 endangered plants would be treated as confidential. All documents or plans containing specific

1 location information would be marked as such. Appropriate training would be provided to
2 employees and contractors regarding the confidential nature of this information.

- 3 • Construction personnel would be trained to identify known and potential threatened and
4 endangered species; rare, threatened, and endangered plants; and significant natural communities
5 that could be encountered, when possible, and the identification and protection measures that are
6 included in the construction plan.
- 7 • The Environmental Inspector would be responsible for ensuring that prescribed protection
8 measures are appropriately used during construction.

9 Federally listed species that have the potential to be affected by construction of the terrestrial portions of
10 the transmission cable include the Karner blue butterfly (*Lycaeides melissa samuelis*) and Indiana bat
11 (*Myotis sodalis*). Measures designed specifically to avoid impacts on the Karner blue butterfly and
12 Indiana bat are as follows:

13 **Karner blue butterfly.** The following measures would be implemented to protect the Karner blue
14 butterfly and its habitat, per the Applicant's *Karner Blue Butterfly Impact Avoidance and Minimization*
15 *Report* (CHPEI 2012k). These measures have also been written to address the state-listed frosted elfin
16 butterfly (*Callophrys irus*), which has habitat similar to the Karner blue butterfly.

17 Prior to construction, a qualified biologist would conduct surveys for the presence of Karner blue and
18 frosted elfin butterflies, in accordance with the USFWS and NYSDEC guidance document *Karner Blue*
19 *Butterfly* (*Lycaeides melissa samuelis*) *Survey Protocols Within the State of New York* (USFWS and
20 NYSDEC 2008). These protocols include guidance on the following:

- 21 • Prior to construction, the boundaries of all wild blue lupine (*Lupinus perennis*) patches within or
22 immediately adjacent to construction workspaces or access routes would be clearly flagged in the
23 field, and the Applicant would conduct a walk-through to discuss and review measures to avoid
24 impacts.
- 25 • Disturbance or access through all flagged lupine patches would be prohibited.
- 26 • Contractors and construction crews would be trained on the locations and identification of the
27 host plant, wild blue lupine, for the Karner blue butterfly and frosted elfin. Construction
28 personnel would be trained and instructed to avoid trampling or destruction of wild blue lupine
29 plants.
- 30 • Wild blue lupine is an early successional species that could regenerate following a variety of
31 different environmental disturbances. If any previously unknown (i.e., unflagged) areas
32 containing wild blue lupine are encountered during preconstruction environmental inspection,
33 construction, or restoration, the Environmental Inspector would delineate the boundary of the
34 habitat with flagging in the field, and would collect Global Positioning System (GPS) data
35 mapping its location.
- 36 • The Applicant would notify NYSDPS, NYSDEC, and USFWS as soon as possible (within
37 48 hours) if any previously unidentified habitats containing wild blue lupine are discovered
38 during pre-construction environmental inspection, construction, or restoration. If additional
39 protective measures are necessary to protect the Karner blue butterfly, frosted elfin butterfly, or
40 occupied habitat (i.e., grasses and nectar within approximately 650 feet [200 meters] of lupine
41 patches within or immediately adjacent to construction workspaces and access routes) for these
42 species, the Applicant would temporarily cease any vegetation clearing, construction,
43 ground-disturbing, or vegetation management activities in the area, excepting any activities that
44 could be necessary for immediate stabilization of the work site, until protective measures can be

1 implemented. Work would only resume once NYSDEC and USFWS have been notified and
2 recommended protective measures to avoid or minimize impacts on threatened and endangered
3 species and occupied habitat have been implemented.

4 During operation of the transmission line, any vegetation management, emergency repairs, or other
5 operational maintenance activities required within Karner blue butterfly and frosted elfin lupine habitats
6 would be implemented in accordance with ongoing consultations between the Applicant and USFWS and
7 NYSDEC, and the results of those consultations will be included in the EM&CP. At a minimum, the
8 EM&CP would include the following measures to avoid and minimize impacts on Karner blue butterfly
9 and its habitat.

- 10 • No herbicides or pesticides would be used within occupied Karner blue butterfly and frosted elfin
11 nectar habitat, except as approved by the USFWS and NYSDEC. To minimize the impact of
12 herbicides on Karner blue butterfly and its food plants, applications would be limited to spot
13 application with hand-operated equipment, using personnel certified or experienced in pesticide
14 applications and trained to identify the butterfly and lupine.
- 15 • For emergency repairs in areas where the cable was installed by HDD under Karner blue butterfly
16 habitat, the cable would be pulled from the entry or exit locations and repaired to avoid impacts
17 on the butterfly and its habitat. In areas where the cables are installed in trenches adjacent to
18 nectar patches, repair crews would employ the same protocols adhered to during installation to
19 avoid impacts (e.g., training of personnel to identify and flag habitat boundaries to be avoided).

20 **Indiana Bat and Northern Long-eared Bat.** During the preconstruction survey, the contractors would
21 identify and avoid large live or dead trees with peeling bark, including large specimens of shagbark
22 hickory (*Carya ovata*), with the potential to serve as maternity or roost trees and these would be marked.
23 Potential roost trees identified within the construction limits would be avoided where possible during
24 construction activities. Tree removal would occur between October and March.

25 **Unexpected Encounters.** In the event that the Applicant unexpectedly encounters any rare, threatened, or
26 endangered species during the preconstruction, construction, or operation and maintenance phases of the
27 proposed CHPE Project, the following measures would be implemented:

- 28 • Areas of threatened and endangered species occupied habitat and locations of rare, threatened,
29 and endangered plants along the terrestrial portions of the proposed CHPE Project route would be
30 flagged in the field.
- 31 • The Environmental Inspector would identify the area of the sighting or encounter; flag the
32 boundaries of the newly identified occupied habitat or locations where the threatened or
33 endangered species or rare, threatened, or endangered plant were observed; and record GPS
34 locations of the likely habitat boundary or the sighting.
- 35 • Any unanticipated sightings of threatened or endangered species or observations of rare,
36 threatened, or endangered plants would be reported as soon as possible to NYSDPS, NYSDEC,
37 or USFWS. The Applicant would consult with applicable resource agencies for measures to
38 avoid or minimize impacts on plants or animals.
- 39 • If threatened or endangered species or threatened or endangered plants are discovered during
40 construction activities, the Applicant would temporarily halt construction activities in the vicinity
41 of the discovery, excepting any activity required for immediate stabilization of the area, to avoid
42 or minimize the impacts on the species or habitat. Construction activities in the area would
43 resume once protective measures, developed in consultation with NYSDPS, NYSDEC, and
44 USFWS, are implemented.

- 1 • If new threatened or endangered species and occupied habitat are identified or threatened or
2 endangered plants are observed and verified, construction plans would be updated to show the
3 new threatened or endangered species, occupied habitat, or threatened or endangered plant
4 species. These newly occupied areas would also be flagged in the field.
- 5 • Construction personnel would be updated on the locations of any new threatened and endangered
6 species or occupied habitats or locations of threatened or endangered plants that are identified.
7 These areas would be reported to the applicable natural resource agencies.

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3. Federally Listed Species and Designated Critical Habitat

DOE obtained a list from the USFWS of threatened, endangered, proposed, and candidate species that could occur within or near the proposed CHPE Project area by querying the Information, Planning, and Conservation System part of the Environmental Conservation Online System run by USFWS (USFWS 2013a). NMFS provided similar information for species managed by their agency in the form of a letter to DOE. No federally listed species were identified as being present in Lake Champlain; therefore, aquatic species in Lake Champlain are not addressed further in this document.

The 13 aquatic and 7 terrestrial ESA-listed species identified by the USFWS and NMFS as potentially occurring within or near the proposed CHPE Project area and 2 terrestrial species proposed for listing under the ESA in October 2013 that potentially occur in the project area were assessed for this BA (see **Sections 3.1** and **3.2**). Of these, the shortnose sturgeon (*Acipenser brevirostrum*), five distinct population segments (DPSs) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), and Karner blue butterfly (*Lycaeides melissa samuelis*) occur in the proposed CHPE Project area, and the status of those species and potential effects of the proposed CHPE Project on them are analyzed in detail in **Section 5**. The proposed CHPE Project would have no effects on other listed species for a variety of reasons as discussed below, including lack of an established record within the proposed CHPE Project area, and those species are not considered further in **Sections 4** and **5**. Neither the NMFS nor the USFWS have designated or proposed designated critical habitat in the Action Area for any species potentially affected by the proposed CHPE Project as discussed in each following subsections; therefore, DOE concludes that the proposed CHPE Project would have no effect on designated or proposed to be designated critical habitat.

3.1 Aquatic Species

The USFWS has jurisdiction over the West Indian manatee (*Trichechus manatus*), dwarf wedgemussel (*Alasmidonta heterodon*), and sea turtles on nesting beaches, while NMFS has jurisdiction over the large whale species and sea turtles in the water. The federally listed aquatic species that could occur in the proposed CHPE Project area are identified in **Table 3-1**. Marine mammals are discussed in **Section 3.1.1**, marine reptiles in **Section 3.1.2**, fish in **Section 3.1.3**, and aquatic invertebrates in **Section 3.1.4**. There is no designated or proposed designated critical habitat within the proposed CHPE Project area for any of the aquatic species.

3.1.1 Marine Mammals

Six marine mammal species listed under the ESA have made rare appearances in the Hudson River or New York City Metropolitan Area segments: five large whale species: the North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*); and one sirenian, the West Indian manatee (*Trichechus manatus*) (see **Table 3-1**). Under the ESA, all whale species fall under the jurisdiction of NMFS, while the West Indian manatee is managed by USFWS.

Historic unconfirmed, records of large whales up the Hudson River have been reported as far north as Troy (Kiviat and Hartwig 1994). However, large whales are uncommon in the Hudson River; individual large whales could be found occasionally at the river mouth. Typically, large whales, which include ESA-listed species, occur in offshore waters of the New York Bight. Wide-ranging movements have been documented for some individual manatees. One manatee was sighted in various waters of the northeastern United States during July and August 2006. This individual traveled up the Hudson River to

1
2

Table 3-1. Likelihood of Occurrence of Aquatic ESA-Listed Species within the Segments of the Proposed CHPE Project Area

Common Name	Scientific Name	ESA Status	Critical Habitat		Possible Occurrence in Each Segment			
			Designated for Species?	Located Within or Adjacent to Proposed Action Area?	Lake Champlain	Overland	Hudson River	New York City Metropolitan Area
Marine Mammals								
Fin whale	<i>Balaenoptera physalus</i>	E	N	N	N	N/A	N	N
Humpback whale	<i>Megaptera novaeangliae</i>	E	N	N	N	N/A	N	N
North Atlantic right whale	<i>Eubalaena glacialis</i>	E	Y	N	N	N/A	N	N
Sei whale	<i>Balaenoptera borealis</i>	E	N	N	N	N/A	N	N
Sperm whale	<i>Physeter macrocephalus</i>	E	N	N	N	N/A	N	N
West Indian manatee	<i>Trichechus manatus</i>	E	Y	N	N	N/A	N	N
Marine Reptiles								
Green sea turtle	<i>Chelonia mydas</i>	T ¹	Y	N	N	N/A	N	Y ³
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	E	N	N	N	N/A	N	Y ³
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E	Y	N	N	N/A	N	Y ³
Loggerhead sea turtle	<i>Caretta caretta</i>	T ²	N	N	N	N/A	N	Y ³
Fishes								
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	E	N	N	not expected	N/A	Y	Y ³
Atlantic sturgeon	<i>Acipenser oxyrinchus oxyrinchus</i>	T ⁴ E ^{5,6,7,8}	N	N	not expected	N/A	Y	Y
Aquatic Invertebrates								
Dwarf wedgemussel	<i>Alasmidonta heterodon</i>	E	N	N	not expected	N	N	N

Table Key: E = Federally listed as endangered; T = Federally listed as threatened, Y = Yes, N = No; N/A = Not Applicable
Notes:

1. Since the nesting areas for turtles encountered at sea often cannot be determined, a conservative approach to management requires the assumption that all greens in the Gulf of Mexico are endangered.
2. There are nine DPSs for this species; the Northwest Atlantic DPS is the most likely to occur in waters offshore of Action Area.
3. Not likely, but conservatively assumed to be present in the Action Area.
4. Gulf of Maine DPS.
5. New York Bight DPS.
6. Chesapeake Bay DPS.
7. Carolina DPS.
8. South Atlantic DPS.

1 the Harlem River and was also sighted off Cape Cod, Massachusetts, and in Bristol Harbor, Rhode Island
2 (Hamilton and Puckett 2006). **Based on available occurrence records, it is unlikely that ESA-listed**
3 **marine mammal species would occur in either the Hudson River or New York City Metropolitan**
4 **Area segments; therefore, DOE concludes that the proposed CHPE Project would have no effect on**
5 **the North Atlantic right whale, humpback whale, fin whale, sei whale, sperm whale, and the West**
6 **Indian manatee, and those species are not discussed further in this BA.**

7 3.1.2 Marine Reptiles

8 Four sea turtle species occur seasonally during warmer months (June through mid-November) in the
9 offshore waters of New York Bight (i.e., the bend in the shoreline from the New Jersey coast to Long
10 Island). These are the leatherback (*Dermochelys coriacea*) (endangered), loggerhead (*Caretta caretta*)
11 (threatened), Kemp's ridley (*Lepidochelys kempii*) (endangered), and green (*Chelonia mydas*)
12 (threatened) (see **Table 3-1**). NMFS and the USFWS share jurisdiction for sea turtles, with NMFS
13 having lead responsibility for the conservation and recovery of sea turtles in the marine environment and
14 USFWS for turtles on nesting beaches. These four sea turtle species are less frequently documented in
15 the bays and harbors of the western portion of Long Island Sound when compared to the eastern portion
16 (CHPEI 2012j). Due to known sea turtle presence in western Long Island Sound, which access the East
17 River water passage between Upper New York Harbor/Manhattan and Long Island Sound, transient sea
18 turtles could occasionally occur in the East River from June through October (Kurkal 2009). However,
19 they are generally considered extralimital in the East River, and would likely occur only as occasional
20 transients (NMFS 2014). Based on the limited upriver sightings of listed sea turtles (NMFS 2011a), these
21 species are unlikely to occur in the Hudson River Segment or the Harlem River. In 2010, a deceased,
22 propeller-cut Kemp's ridley sea turtle was recovered from the beach at Verplanck, New York. This is the
23 only the second reported sea turtle recovered in the lower Hudson River (NMFS 2011a); a propeller-cut
24 Kemp's ridley was also recovered near Yonkers in 1995 (NYSDEC 2007, NYSDEC 2010). **Based on**
25 **the lack of upriver sighting records, it is unlikely that any sea turtles would occur in either the**
26 **Hudson River or New York City Metropolitan Area segments; additionally, the transmission line**
27 **would be installed under the East River via HDD, thereby not affecting aquatic species in the East**
28 **River. DOE therefore concludes that the proposed CHPE Project would have no effect on the**
29 **leatherback, loggerhead, Kemp's ridley, and green sea turtles, and those species are not discussed**
30 **further in this BA.**

31 3.1.3 Fishes

32 Under the authority of the ESA, USFWS and NMFS are responsible for the protection and recovery of
33 endangered and threatened fish species. NMFS has jurisdiction over most marine fish and anadromous
34 fish (i.e., fish that are born in fresh water, migrate to the ocean to grow into adults, and then return to
35 fresh water to spawn) listed under the ESA, while USFWS has jurisdiction over freshwater fish species.
36 The only ESA-listed species that have the potential to occur in the proposed CHPE Project area are the
37 shortnose sturgeon and the Atlantic sturgeon. These fish species could be encountered in the Hudson
38 River and New York City Metropolitan Area segments. NMFS has jurisdiction over all the listed fish
39 species that could be affected by the proposed CHPE Project. Details on the life history and occurrence
40 patterns of these species are discussed in the following sections.

41 Shortnose Sturgeon

42 The following description of the shortnose sturgeon comes primarily from the following sources, which
43 are incorporated by reference.

- 44 • *Recovery Plan for the Shortnose Sturgeon (NMFS 1998)*

- 1 • *A Biological Assessment of Shortnose Sturgeon (Acipenser brevirostrum) (SSSRT 2010)*
- 2 • *Biological Assessment for the Tappan Zee Hudson River Crossing Project (FHWA 2012)*
- 3 • *Biological Opinion for the Tappan Zee Bridge Replacement Project (NMFS 2013a)*
- 4 • *Biological Opinion for Continued Operations of Indian Point Nuclear Generating Unit Nos. 2*
- 5 *and 3 (NMFS 2013b).*

6 **Status.** The shortnose sturgeon was listed as endangered in 1967 under the Endangered Species
7 Preservation Act that pre-dated the ESA (32 *Federal Register* 4001). NMFS manages the species and
8 recognizes 19 separate populations of shortnose sturgeon. Individuals occurring in the proposed CHPE
9 Project area belong to the endangered Hudson River population, which is the largest population of
10 shortnose sturgeon, with an estimated 65,000 individuals (USFWS 2009). There is no designated or
11 proposed designated critical habitat for the shortnose sturgeon, so the DOE concludes that the proposed
12 CHPE Project would have no effect on critical habitat (NOAA 2013, USFWS 2014).

13 **Behavior and Life History.** The shortnose sturgeon primarily occurs in freshwater rivers and coastal
14 estuaries. The species is considered freshwater amphidromous, meaning its use of marine waters is
15 limited to the estuaries of its home rivers (Bain 1997). Spawning occurs in upper freshwater areas, while
16 feeding and overwintering activities could occur in both freshwater and saline habitats (NMFS 1998,
17 SSSRT 2010). While the shortnose sturgeon does not undertake the significant marine migrations seen in
18 the Atlantic sturgeon, telemetry data indicate that shortnose sturgeons do make localized coastal
19 migrations. For example, one individual tagged in the Hudson River was recaptured in the Connecticut
20 River (Welsh et al. 2002).

21 The shortnose sturgeon is a long-lived species (30 to 40 years) that matures at late ages (males attain
22 sexual maturity at 6 to 10 years of age, while females do so between 7 and 13 years) (NMFS 1998).
23 Males spawn approximately every 2 years, while females spawn every 3 to 5 years. Generally, shortnose
24 sturgeons spawn in sand- to boulder-sized substrate in April to May. Studies indicate that the spawning
25 period lasts from a few days to several weeks and begins when freshwater temperatures increase from
26 46 to 48 °F (8 to 9 °C), early April through May (NYSDEC 2013a, Dovel et al. 1992). Larvae tend to
27 drift downstream and are generally found between Albany and Poughkeepsie, New York (NatureServe
28 2013, NYNHP 2010a). Larvae can be found upstream of the saltwater wedge (i.e., a wedge-shaped
29 intrusion of salty ocean water into a tidal river; it slopes downward in the upstream direction, and salinity
30 increases with depth) in the Hudson River estuary and are most commonly found in deep waters with
31 strong currents, typically in the channel (Dovel et al. 1992, Bain 1997). Most activity of larvae, juveniles,
32 and adults appears to occur at night (NatureServe 2013). Juvenile shortnose sturgeons in the Hudson
33 River typically use the same deep channel habitats throughout the tidal reach as adults (Bain 1997).

34 In northern rivers (e.g., the Hudson River), the shortnose sturgeon feeds in fresh water during summer and
35 over sand-mud bottoms in the lower estuary during fall, winter, and spring (NMFS 1998). Shortnose
36 sturgeons are bottom feeders; their mouths are designed to suck up prey from the river bottom. Juveniles
37 eat available benthic crustaceans and insects. Adults in fresh water feed on mollusks, crustaceans, and
38 insect larvae depending on availability, and, in estuaries, their primary foods are polychaete worms,
39 crustaceans, and mollusks (NatureServe 2013).

40 **Distribution and Habitat.** In New York State, the shortnose sturgeon is found in the Hudson River from
41 the Federal Dam at Troy downriver to the southern tip of Manhattan, over a large portion of the fresh and
42 brackish reaches in deep channel habitats (Bain 1997, Bain et al. 2000). All life stages occur in the lower
43 Hudson River. Non-spawners use overwintering habitat concentrated in brackish waters of the lower
44 Hudson River while spawners (in the upcoming spring) overwinter in a single concentration in deep

1 channel habitats further upstream (Bain 1997). Adults migrate upriver from their middle Hudson River
2 overwintering areas to freshwater spawning sites north of Coxsackie, New York when water temperatures
3 reach 46 to 48 °F (8 to 9 °C) (NYSDEC 2013a, Dovel et al. 1992).

4 Shortnose sturgeon have been found in waters with temperatures as low as 36 to 37 °F (2 to 3 °C) and as
5 high as 93 °F (34 °C) (Dadswell et al. 1984). Water temperatures above 82 °F (28 °C) are thought to
6 adversely affect shortnose sturgeon. Shortnose sturgeon are known to occur at depths of up to 98 feet
7 (30 meters) but are generally found in waters less than 66 feet (20 meters) (Dadswell et al. 1984). Adults
8 occur in both freshwater and upper tidal saline areas all year. Juveniles (age of 3 to 10 years) generally
9 occur at the saltwater/freshwater interface (i.e., salt front) (Dovel et al. 1992).

10 Spawning grounds extend from below the Federal Dam at Troy downriver to around Coeymans, New
11 York (Dovel et al. 1992). Spawning typically occurs at water temperatures between 50 and 64 °F (10 and
12 18 °C) (generally early April through May). Shortnose sturgeon eggs are expected to hatch in 8 to
13 13 days and embryos gradually disperse downstream over much of the Hudson River estuary. Shortnose
14 sturgeon larvae captured in the Hudson River were associated with deep waters and strong currents (Hoff
15 et al. 1988 as cited in Bain 1997). Juvenile shortnose sturgeon are predominantly found in deep channels
16 in mid-river region in the mid-summer (Hoff et al. 1998 and Pekovitch 1979 as cited in Bain 1997). After
17 spawning, adults disperse quickly down river into their summer range. The broad summer range
18 occupied by adult shortnose sturgeon extends from just south of Catskill, New York, downriver to the
19 Palisades area near the border of New York and New Jersey. Similar to non-spawning adults, most
20 juveniles occupy the broad region of Haverstraw Bay by late fall and early winter (Dovel et al. 1992).
21 Migrations from the summer foraging areas to the overwintering grounds are triggered when water
22 temperatures fall below approximately 46 °F (8 °C), which typically occurs in late November (NMFS
23 1998). Juveniles are distributed throughout the mid-river region during the summer and move back into
24 the Haverstraw Bay region during the late fall.

25 From late fall to early spring, adult shortnose sturgeon concentrate in a few overwintering areas.
26 Reproductive activity the following spring determines overwintering behavior. The largest overwintering
27 area is just south of Kingston, New York, near Esopus Meadows (Dovel et al. 1992). The fish
28 overwintering at Esopus Meadows are mainly spawning adults. Captures of shortnose sturgeon during
29 the fall and winter from Saugerties to Hyde Park (greater Kingston reach), indicate that additional smaller
30 overwintering areas may be present (Geoghegan et al. 1992). An overwintering site in the
31 Croton-Haverstraw Bay area has also been confirmed (Geoghegan et al. 1992, Dovel et al. 1992). Fish
32 overwintering in areas below Esopus Meadows are mainly thought to be pre-spawning adults. Typically,
33 movements during overwintering periods are localized and fairly sedentary. The shortnose sturgeon
34 prefers deep channel habitats during the winter season.

35 There have been no documented captures of shortnose sturgeon in the East River; however, shortnose
36 sturgeon have been captured near the confluence of the East River and New York Harbor. As there have
37 been no documented captures of shortnose sturgeon in the area where the East River converges with Long
38 Island Sound, it is unknown whether these fish traveled through the East River and through Long Island
39 Sound (the most direct route) or exited New York Harbor into the Atlantic Ocean and swam around
40 southern Long Island and back into Long Island Sound. Based on this information, although the East
41 River is not expected to be a high use area for shortnose sturgeon, occasional transient shortnose sturgeon
42 could be present in the East River (NMFS 2014).

43 Shortnose sturgeon eggs and larvae are limited to the low salinity waters near spawning grounds, and
44 young of the year are also restricted to areas of low salinity. The shortnose sturgeon spawning grounds in
45 the Hudson River are greater than 125 miles [48 km] upstream from the Harlem and East rivers. In

1 | addition, given higher salinity of the Harlem and East rivers, eggs, larvae, and young-of-year (YOY) is
2 not present in these waterbodies (NMFS 2014).

3 **Threats.** Throughout the shortnose sturgeon's range, habitat degradation or loss (resulting, for example,
4 from dams, bridge construction, channel dredging, and pollutant discharges) and mortality (resulting, for
5 example, from impingement on cooling water intake screens, dredging and incidental capture in other
6 fisheries) are the principal threats to survival (NMFS 1998).

7 Atlantic Sturgeon

8 The following description of the Atlantic sturgeon comes primarily from the following sources, which are
9 incorporated by reference.

- 10 • *Status Review of Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus) (ASSRT 2007)*
- 11 • *Biological Assessment for the Tappan Zee Hudson River Crossing Project (FHWA 2012)*
- 12 • *Biological Opinion for the Tappan Zee Bridge Replacement Project (NMFS 2013a)*
- 13 • *Biological Opinion for Continued Operations of Indian Point Nuclear Generating Unit Nos. 2*
14 *and 3 (NMFS 2013b).*

15 **Status.** Although as a species the Atlantic sturgeon is not listed as threatened or endangered, there are
16 five DPSs that are listed: threatened Gulf of Maine DPS, endangered New York Bight DPS, endangered
17 Chesapeake Bay DPS, endangered Carolina DPS, and South Atlantic DPS. Individuals from any of these
18 five DPSs could occur in the proposed CHPE Project area (Colligan 2012). Based on genetic sampling of
19 Atlantic sturgeon captured within the Hudson River, three DPSs are most likely to occur in the Hudson
20 River (ranked largest to smallest): New York Bight DPS, Gulf of Maine DPS, and Chesapeake Bay DPS
21 | (NMFS 2013b, 77 *Federal Register* 5880). Based on the previously mentioned genetic sampling, the
22 majority of Atlantic sturgeon in the Hudson River are likely to be of the New York Bight DPS. In the
23 New York Bight DPS, there are two known spawning populations: those in the Hudson and Delaware
24 rivers. Currently, the existing spawning population in the Hudson River is estimated to have 870 adults
25 spawning each year (600 males and 270 females), and there is no indication that the population is
26 increasing (77 *Federal Register* 5880). There is no designated or proposed designated critical habitat for
27 any of the five DPSs that could occur in the proposed CHPE Project area, so the DOE concludes that
28 there is no effect of the proposed CHPE Project on critical habitat. Herein, referral to Atlantic sturgeon
29 refers to multiple DPSs.

30 **Behavior and Life History.** Atlantic sturgeon are long-lived (approximately 60 years), late-maturing,
31 estuarine-dependent, anadromous fish (i.e., adults spawn in fresh water in the spring and early summer
32 and migrate into estuarine and marine waters where they spend most of their lives). In the Hudson River,
33 the Atlantic sturgeon matures at 11 to 21 years (ASSRT 2007). Males spawn approximately every 1 to
34 5 years and females every 2 to 5 years.

35 Eggs are deposited on hard-bottom substrate (e.g., cobble, coarse sand, and bedrock) (Greene et al. 2009).
36 After hatching, larval fish move downstream at night and seek refuge during the day. As larval fish make
37 their way downstream, they grow and become more tolerant of brackish and saline waters, and eventually
38 reside entirely in estuarine waters (for 2 to 6 years) until they reach sub-adulthood and move into the open
39 ocean (Bain 1997). Locations of sonic-tagged juvenile sturgeons revealed that individuals are found most
40 often in dynamic mud habitat (ASMFC 2008). When juveniles begin to emigrate they travel widely along
41 the Atlantic Coast and its estuaries.

1 Atlantic sturgeons are bottom-feeders that suck food into their mouths. Diets of adult and migrant
2 sub-adult Atlantic sturgeon include mollusks, gastropods, amphipods, annelids, decapods, isopods, and
3 fish (e.g., sand lance). Juvenile Atlantic sturgeon feed on aquatic insects, insect larvae, and small
4 invertebrates (ASSRT 2007). Adults feed primarily on benthic worms (e.g., polychaetes), crustaceans,
5 and mollusks (NOAA 2013).

6 ***Distribution and Habitat.*** Spawning generally occurs between May and July in the Hudson River (Bain
7 1997, Bain et al. 2000). Male sturgeons begin upstream spawning migrations when waters reach
8 approximately 43 °F (6 °C), and remain on the spawning grounds throughout the spawning season.
9 Females begin spawning migrations when temperatures are warmer at 54 to 55 °F (12 to 13 °C), make
10 rapid spawning migrations upstream, and quickly depart following spawning (Greene et al. 2009).
11 Spawning likely occurs in multiple sites within the Hudson River in the vicinity of the proposed CHPE
12 Project from MPs 254 to 269 (Dovel and Berggren 1983, Van Eenennaam et al. 1996, Kahnle et al. 1998,
13 Bain et al. 2000). Spawning sites in a given year can be influenced by the position of the salt wedge
14 (where the salt water from the estuary meets the fresh water of the river) (Dovel and Berggren, 1983, Van
15 Eenennaam et al. 1996, Kahnle et al. 1998). The area around Hyde Park (MP 254) has consistently been
16 identified as a spawning area through scientific studies and historical records of the Hudson River
17 sturgeon fishery. Habitat conditions near Hyde Park site are fresh water year-round with bedrock, silt,
18 and clay substrates and water depths of 40 to 80 feet (12 to 24 meters) (Dovel and Berggren 1983, Van
19 Eenennaam et al. 1996, Kahnle et al. 1998, Bain et al. 2000). A spawning site near New Hamburg near
20 MP 266 has also been identified based on tracking data; has clay, silt, and sand substrates; and is
21 approximately 70 to 90 feet (21 to 27 meters) deep (Bain et al. 2000, NMFS 2014). Larvae are expected
22 to occur from June through August in the vicinity of the spawning area (Bain et al. 2000).

23 Juvenile Atlantic sturgeon have been recorded in the Hudson River between approximate MPs 245 (near
24 Kingston, New York) and 295 (north of Haverstraw Bay), which includes some brackish waters;
25 however, larvae must remain upstream of the salt wedge because of their low salinity tolerance (Dovel
26 and Berggren 1983, Kahnle et al. 1998, Bain et al. 2000). Catches of immature sturgeon (age 1 and older)
27 suggest that juveniles use the estuary from Kingston to the Tappan Zee Bridge (MPs 245 to 310).
28 Seasonal movements are apparent with juveniles occupying waters from MPs 270 to 295 during summer
29 months and then moving downstream as water temperatures decline in the fall, primarily occupying
30 waters in the vicinity of the proposed CHPE Project from MPs 290 to 324 (Dovel and Berggren 1983,
31 Bain et al. 2000). Based on river-bottom sediment maps (Coch 1986), most juvenile sturgeon habitats in
32 the Hudson River have clay, sand, and silt substrates (Bain et al. 2000). Newburgh and Haverstraw Bays
33 in the Hudson River are areas of known juvenile sturgeon concentrations. Sampling in spring and fall
34 revealed that highest catches of juvenile Atlantic sturgeon occurred during the spring in soft-deep areas of
35 Haverstraw Bay, even though this habitat type composed only 2 percent of the available habitat in the
36 bay. Overall, 90 percent of the total 562 individual juvenile Atlantic sturgeon captured during the course
37 of this study came from Haverstraw Bay (Sweka et al. 2007). At around 3 years of age, Hudson River
38 juveniles exceeding 28 inches (70 cm) in length begin to migrate to marine waters (Bain et al. 2000,
39 NMFS 2014). It has also been reported that older juveniles and post-spawn adult sturgeon congregate in
40 deepwater habitat during the summer in the Hudson River (Bain et al. 2000). Sonic-tagged spawning
41 adults were detected in the river as early as April and as late as October (ASMFC 2008).

42 Atlantic sturgeon are known to occur in the East River (NMFS 2014). After emigration from the natal
43 estuary, sub-adults and adults travel within the marine environment, typically in waters less than 164 feet
44 (50 meters) in depth, using coastal bays, sounds, and ocean waters. Satellite-tagged adult sturgeon from
45 the Hudson River concentrate in the southern part of the Mid-Atlantic Bight at depths greater than 66 feet
46 (20 meters) during winter and spring, and in the northern portion of the Mid-Atlantic Bight at depths less
47 than 66 feet (20 meters) in summer and fall (Erickson et al. 2011). Atlantic sturgeon adults and

1 sub-adults that are not spawning live in coastal and estuarine conditions, generally in shallow water (33 to
2 164 feet [10 to 50 meters]) in nearshore areas dominated by gravel and sand (Greene et al. 2009).

3 **Threats.** Unintended catches of Atlantic sturgeon in fisheries, vessel strikes, poor water quality, water
4 availability, dams, lack of regulatory mechanisms for protecting the fish, and dredging are the most
5 significant threats to Atlantic sturgeon (77 *Federal Register* 5880, 77 *Federal Register* 5914).

6 3.1.4 Aquatic Invertebrates

7 The dwarf wedgemussel (*Alasmidonta heterodon*) is an endangered freshwater mollusk species that
8 occurs in New York State. Its extent is limited to a small area within the upper Delaware River watershed
9 in Sullivan and Delaware counties, and in one of its major downstream tributaries, the lower Neversink
10 River in Orange County (NatureServe 2013, NYSDEC 2013b). **Since the dwarf wedgemussel does not**
11 **occur in the proposed CHPE Project area, DOE has concluded that the proposed CHPE Project**
12 **would have no effect on this species.**

13 3.2 Terrestrial Species

14 Under the authority of the ESA, USFWS is responsible for the protection and recovery of endangered and
15 threatened terrestrial species. The terrestrial species that are federally listed, or are proposed for Federal
16 listing, that have previously been identified in the vicinity of the proposed CHPE Project area are
17 identified in **Table 3-2**. There is no designated or proposed designated critical habitat for any of these
18 species within the proposed CHPE Project area.

19 3.2.1 Indiana Bat

20 **Status.** The Indiana bat was officially listed as an endangered species on March 11, 1967 (32 *Federal*
21 *Register* 4001). Critical habitat was designated for the species on September 24, 1976 (41 *Federal*
22 *Register* 14914). Thirteen hibernacula, including eleven caves and two mines in six states, were listed as
23 critical habitat; however, there is no designated or proposed designated critical habitat for this species in
24 New York State. The following description of the Indiana bat comes primarily from the following
25 sources, which are incorporated by reference.

- 26 • *Indiana Bat Recovery Plan (USFWS 1983)*
- 27 • *Revised Draft Recovery Plan for the Indiana Bat (USFWS 2007)*
- 28 • *Indiana Bat Five-Year Review (USFWS 2009)*
- 29 • *Biological Opinion on the Effect of Proposed Activities on the Fort Drum Military Installation*
30 *(2012-2014) in the Towns of Antwerp, Champion, Leray, Philadelphia, and Wilna, Jefferson*
31 *County and the Town of Diane, Lewis County, New York on the Federally-Endangered Indiana*
32 *Bat (Myotis sodalis) (USFWS 2012a)*
- 33 • *Biological Assessment, Indiana Bat (Myotis sodalis), St. Lawrence Windpower Project, Jefferson*
34 *County, New York (Young et al. 2010).*

35 **Behavior and Life History.** The Indiana bat is a temperate, insectivorous, migratory bat that hibernates in
36 caves and mines in the winter (typically October through April) and summers in wooded areas. It is a
37 medium-sized bat 1.5 to 2 inches long, having a wingspan of 9 to 11 inches (23 to 28 cm), and weighing
38 approximately only one-quarter of an ounce. It has brown to dark-brown fur and the facial area often has
39

Table 3-2. Likelihood of Occurrence of Terrestrial ESA-Listed Species within the Segments of the Proposed CHPE Project

Common Name	Scientific Name	Federal Status, State Status	Possible Occurrence in Each Segment			
			Lake Champlain	Overland	Hudson River	New York City Metropolitan Area
Mammals						
Indiana bat	<i>Myotis sodalis</i>	E	Y	Y	Y	N
Northern long-eared bat	<i>Myotis septentrionalis</i>	PE	Y	Y	Y	Y
Birds						
Piping plover	<i>Charadrius melodus</i>	T	N	N	N	Y
Roseate tern	<i>Sterna dougallii dougallii</i>	E	N	N	N	Y
Red knot	<i>Calidris canutus rufa</i>	PT	N	N	N	Y
Reptiles						
Bog turtle	<i>Clemmys mühlenbergii</i>	T	N	Y	Y	Y
Invertebrates						
Karner blue butterfly	<i>Lycaeides melissa samuelis</i>	E	N	Y	N	N
Plants						
Northern wild monkshood	<i>Aconitum noveboracense</i>	T	N	N	N	N
Small whorled pogonia	<i>Isotria medeoloides</i>	T	N	N	N	N

Table Key: E = Federally listed as endangered; PE = Proposed species for listing as endangered; T = Federally listed as threatened; PT = Proposed species for listing as threatened; Y = Yes; N = No

3 a pinkish appearance. The Indiana bat feeds primarily on aquatic and terrestrial insects. Diet varies
 4 seasonally and variations exist amongst different ages, sex, and reproductive status (USFWS 1999).
 5 Indiana bats forage in closed to semi-open forested habitats and forest edges located in floodplains,
 6 riparian areas, lowlands, and uplands.

7 In Illinois, Gardner et al. (1991) found that forested stream corridors, and impounded bodies of water,
 8 were preferred foraging habitats for pregnant and lactating Indiana bats, which flew up to 1.5 miles
 9 (2.4 km) from upland roosts to forage. They forage between dusk and dawn and feed exclusively on
 10 flying insects, primarily moths, beetles, and aquatic insects. Riparian habitat is occupied by Indiana bats
 11 from mid-April to mid-September. Romme et al. (1995) cite several studies which document that Indiana
 12 bats also forage in upland forests.

1 **Distribution and Habitat.** During winter, Indiana bats are restricted to suitable underground habitats
2 known as hibernacula. The majority of hibernacula consist of limestone caves, but abandoned
3 underground mines, railroad tunnels, and even hydroelectric dams can provide winter habitat throughout
4 the species' range (USFWS 2007). Hibernacula with stable or growing populations of Indiana bats have
5 stable low temperatures that allow the bats to maintain a low rate of metabolism and conserve fat reserves
6 through the winter. Hibernacula in the vicinity of the project include those in Ulster County
7 (Priority 1: site that is essential to long term conservation of the species and containing a population of
8 10,000 bats), Essex County (Priority 2: site of geographic or regional importance to the species that has
9 between 1,000 and fewer than 10,000 bats), Warren County (Priority 3: site with between 50 and fewer
10 than 1,000 bats), and Columbia County (Priority 4: site with a population of fewer than 50 bats)
11 (USFWS 2007).

12 Spring emergence occurs when outside temperatures have increased and insects (forage) are more
13 abundant (Richter et al. 1993). Female Indiana bats emerge from hibernation in late March or early April,
14 followed by the males. The period after hibernation but prior to migration is typically referred to as
15 staging. Spring staging occurs when some bats remain close to the cave for a few days before migrating
16 to summer habitats. Others head directly to summer habitat. Most populations leave their hibernacula by
17 late April.

18 Potential summer habitat occurs throughout much of New York State. At least 39 documented maternity
19 colonies have been identified in Cayuga, Columbia, Dutchess, Essex, Jefferson, Onondaga, Orange,
20 Oswego, and Ulster counties. Male bats disperse throughout the range and roost individually or in small
21 groups. In contrast, reproductive females form larger groups, referred to as maternity colonies, in which
22 they raise their offspring. Non-reproductive females roost individually or in small groups and
23 occasionally are found roosting with reproductive females.

24 Summering Indiana bats (males and females) roost in trees in riparian, bottomland, and upland forests.
25 Roost trees generally have exfoliating bark which allows the bat to roost between the bark and bole of the
26 tree. Cavities and crevices in trees also may be used for roosting. A variety of tree species are used for
27 roosts including, but not limited to, silver maple (*Acer saccharinum*), sugar maple (*Acer saccharum*),
28 shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya*
29 *cordiformis*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), eastern cottonwood
30 (*Populus deltoides*), northern red oak (*Quercus rubra*), post oak (*Quercus stellata*), white oak (*Quercus*
31 *alba*), shingle oak (*Quercus imbricaria*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*),
32 and sassafras (*Sassafras albidum*) (Rommé et al. 1995). Structure is probably more important than the
33 species in determining if a tree is a suitable roost site. Tree species which develop loose, exfoliating bark
34 as they age and die are likely to provide roost sites. Exposure of trees to sunlight and location relative to
35 other trees are important to suitability (USFWS 1999).

36 During the fall breeding season, female bats can number from 50 to 100 individuals in a single tree
37 (NYSDEC 2012b). Maternity colonies use a minimum of 8 to 25 trees per season (Callahan et al. 1997,
38 Kurta et al. 2002). On the average, Indiana bats typically switch roosts every 2 to 3 days with
39 reproductive condition of the female, roost type, weather conditions, and time of year affecting switching
40 behavior (Kurta et al. 2002, Kurta 2005).

41 Very little research has focused on the use of travel corridors by Indiana bats. Most information
42 pertaining to bat movements and travel corridors is incidental to other portions of a study and general
43 observations. However, Murray and Kurta (2004) showed that Indiana bats increased commuting
44 distance by 55 percent to follow tree-lined paths rather than flying over large agricultural fields, some of
45 which were at least 0.6 miles (1 km) wide. Apparently, suitable forest patches might not be available to
46 Indiana bats unless they are connected by a wooded corridor; however, we do not know the maximum

1 size of an opening Indiana bats can cross. There are numerous observations of Indiana bats crossing
2 interstate highways and open fields. In New York State, Indiana bats tracked from hibernacula to spring
3 and summer roosts have crossed I-81, the Hudson River, I-87, and other highways. These crossings
4 primarily occurred during the initial migration from hibernacula to spring and summer habitats, rather
5 than during nightly foraging bouts.

6 While little is known about behavior during dispersal, evidence from radio-tracking studies in New York
7 and Pennsylvania indicate that Indiana bats are capable of dispersing at least 30 to 40 miles (48 to 64 km)
8 in one night (Young et al. 2010). It appears as if Indiana bat dispersal from hibernacula to summer
9 habitat is fairly linear and short-term but in the fall is more dispersed and varied. Some studies have
10 shown that Indiana bats travel between 9 and 17 miles (15 and 27 km) from a roost site to a hibernaculum
11 cave where swarming is occurring. In addition, males and females display different dispersal behavior.
12 Females appear to move quickly between the hibernacula and maternal colonies, while males will
13 commonly remain near the hibernacula. While it is unknown, it is likely that Indiana bats dispersing to
14 and from hibernacula follow more meandering routes that may be habitat-related and do not fly at high
15 altitudes, in highly linear paths, or long distances (more than 50 miles [80 km]) non-stop (USFWS 2007).

16 **Threats.** The primary threats to Indiana bats in New York State at this time are White-nose Syndrome
17 (WNS), energy development (e.g., wind power), and residential and commercial development that fail to
18 incorporate measures to maintain suitable Indiana bat habitat, and avoid and minimize impacts on
19 maternity colonies and swarming bat populations. Over the long term, from 1965 to 2001, there has been
20 an overall decline in Indiana bat populations and winter habitat modifications have been linked to changes
21 in populations at some of the most important hibernacula. Summer habitat modification is also suspected
22 to have contributed to the decline of bat populations; however, it is difficult to generalize how forest
23 management or disturbance may affect Indiana bats. The *Indiana Bat Draft Recovery Plan* (USFWS
24 2007) provides a comprehensive summary of Indiana bat life history, which is incorporated by reference.

25 Lake Champlain Segment

26 In the Lake Champlain Segment, the Indiana bat could potentially occur in Essex and Clinton counties.
27 The Indiana bat is likely to occur in Essex County during both the summer and winter due to the presence
28 of the one known hibernaculum (location chosen for hibernation) in Essex County (USFWS 2007). The
29 Indiana bat could occur in Clinton County during the summer, due to the presence of the nearby Essex
30 County hibernaculum.

31 Indiana bats can travel hundreds of miles after dispersing from hibernacula in the spring, which could
32 bring this species into the range of the Lake Champlain Segment. Groups of female bats form maternity
33 colonies in the crevices of trees or under the loose bark of dead trees. During the fall breeding season,
34 female bats can number from 50 to 100 individuals in a single tree (NYSDEC 2012b). Maternity colonies
35 typically roost during the day, but little is known about the foraging or roosting behavior of Indiana bats
36 at night (Murray and Kurta 2004).

37 Bat roost and maternity colonies could be associated with a variety of forested community types adjacent
38 to the Lake Champlain construction corridor, including Appalachian oak-hickory, beech-maple mesic,
39 floodplain, and hemlock-northern hardwood forests. Large live and dead trees with peeling bark,
40 including shagbark hickory, with the potential to serve as maternity or roost trees were identified along
41 the project route (CHPEI 2012b). Bats forage on flying insects along river and lake shorelines, in the
42 crowns of trees in floodplains, and in upland forests. Indiana bats prefer to forage and travel along the
43 forest-air interface of the forest canopy or along forest edges/hedgerows (USFWS 2007). Roosting and

1 foraging habitat for Indiana bats could occur adjacent to the transmission line route in the Lake
2 Champlain Segment.

3 Overland Segment

4 According to the USFWS, Indiana bats are present in such low numbers that it is unlikely that they would
5 be present in Saratoga, Albany, and Schenectady counties (USFWS 2012b). In the Overland Segment,
6 the Indiana bat could occur in Washington County during the summer due to the presence of known
7 hibernacula in nearby Warren and Essex counties (CHPEI 2012j). The summer range of this species
8 extends well beyond the wintering locations since the animals disperse to breeding areas and other
9 habitats to feed and raise their young. In the immediate vicinity of the road and railroad ROWs, much of
10 the habitat consists of disturbed open lands and secondary forest lacking suitable habitat for bat roosts;
11 however, a few areas do have large shagbark hickories or other large trees that could support summer bat
12 colonies (NYNHP 2010b).

13 Hudson River Segment

14 In the Hudson River Segment, the Indiana bat could occur in Ulster County during both the summer and
15 winter due to the presence of the known hibernaculum in Ulster County. The Indiana bat could occur in
16 Greene, Dutchess, Orange, Putnam, Rockland, and Westchester counties during the summer due to the
17 presence of the nearby Ulster County hibernaculum (CHPEI 2012j). In the immediate vicinity of the
18 roadway and railroad ROWs in Rockland County, much of the habitat consists of disturbed open lands
19 and secondary forest lacking suitable habitat for bat roosts; however, a few areas do have large shagbark
20 hickories or other large trees that could support summer bat colonies (NYNHP 2010b, CHPEI 2012e).

21 3.2.2 Northern Long-Eared Bat

22 | **Status.** On October 2, 2013, the USFWS announced its proposal to list the northern long-eared bat
23 (*Myotis septentrionalis*) as endangered under the ESA and the initiation of a 12-month finding toward a
24 final status determination. The USFWS reported that no critical habitat for the species was determinable.
25 There are limited data on population trends for the northern long-eared bat; however, all reported
26 occurrences of the species are marked by small populations that are in decline (Schmidt 2003, 78 *Federal*
27 *Register* 61046).

28 | Pursuant to Section 7(a)(4) of the ESA, Federal action agencies are required to confer with the USFWS if
29 their proposed action is likely to jeopardize the continued existence of the northern long-eared bat
30 (50 CFR 402.10[a]). Action agencies may also voluntarily confer with the USFWS if a proposed action
31 may affect a proposed species. Species proposed for listing are not afforded protection under the ESA;
32 however, as soon as a listing becomes effective, the prohibition against jeopardizing its continued
33 existence and “take” applies regardless of an action’s stage of completion. DOE is addressing potential
34 effects on the northern long-eared bat at this time to avoid unnecessary delays in the proposed CHPE
35 Project should the species be listed in the future.

36 | **Behavior and Life History.** The northern long-eared bat is medium-sized, averaging between 3 and
37 3.7 inches (7.62 and 9.4 cm) in length with a wingspan that measures between 9 and 10 inches (23 and
38 26 cm) (Caceres and Barclay 2000). Females of this species are generally larger and heavier than the
39 males (Caceres and Pybus 1997). As its name suggests, this bat is distinguishable from other *Myotis*
40 species by long ears that extend beyond the tip of its nose when laid forward, a long, narrow, and sharp-
41 pointed tragus, and a calcar (cartilage spur at ankle) that lacks a keel (Caceres and Barclay 2000, USFWS
42 2013b). This species has medium to dark brown fur on its back, dark brown ears and wing membranes.

1 The diet for the northern long-eared bat is diverse and varied according to season and geographical
2 occurrence. Generally, the diet will consist of moths, flies, leafhoppers, beetles and caddisflies, and
3 spiders. Bats will catch insects by hawking (catching in flight) and gleaning (emitting a high-frequency
4 echolocation call) to find prey (Henderson and Broders 2008). The gleaning call of the northern
5 long-eared bat is the highest frequency of any bat species, and is higher than the hearing frequency of
6 many moth species, thereby giving it a foraging advantage within its feeding habitat.

7 Breeding for this species begins in late summer or early fall when males begin swarming near
8 hibernacula. Following fertilization, pregnant females migrate to summer areas where they roost in small
9 colonies of between 30 and 60 bats, although larger maternity colonies have been observed. Like the
10 Indiana bat, the female northern long-eared bat will nest under the loose dead bark of trees such as
11 shagbark hickory, which is found in the CHPE Project area. There is also documentation of this species
12 roosting in manmade structures such as buildings and barns. Females in a maternity colony generally
13 give birth to one pup, and will all give birth at around the same time of year, from late May to late July,
14 depending on where the colony is located within its home range. Young bats begin to fly and explore
15 approximately 4 weeks following birth. Adult northern long-eared bats live up to 19 years
16 (USFWS 2013b).

17 **Distribution and Habitat.** The range of this species includes much of the eastern and north central
18 United States, and all Canadian provinces for the Atlantic Ocean west to the southern Yukon Territory
19 and eastern British Columbia (USFWS 2013b). This species has been observed year-round throughout
20 New York State (USFWS 2013f).

21 Habitat use changes over the course of the year and varies based on sex and reproductive status.
22 Reproductive females often use different summer habitat than males and non-reproductive females.
23 Generally, summer and winter ranges for this species will be identical, but the habitat types used within
24 those ranges will differ. Potential summer habitat occurs throughout much of New York State. Maternity
25 colonies are formed in roost trees and are more widely distributed and numerous than are major
26 hibernacula. Northern long-eared bats overwinter in multi-species hibernacula that are typically caves or
27 abandoned underground mine shafts with deep crevices (Caceres and Pybus 1997, Caceres and Barclay
28 2000). In these hibernacula, this species will usually comprise less than 25 percent of the total number of
29 individuals (Caceres and Pybus 1997). Northern long-eared bats have been observed in 58 hibernacula in
30 mines, caves, and tunnels in New York.

31 Edge habitat is important for northern long-eared bats as they migrate and forage (WDNR 2013). Bats
32 will migrate from hibernacula to summer roosts, or fly from their roosts to feeding grounds following the
33 habitat edges to maintain protection from wind and predation. Additional to the protection that edge
34 habitat provides, this behavior may also allow bats more feeding opportunities because food is more
35 abundant around edge habitat. Commuting along edge habitat may assist the bats with navigation and
36 orientation through use of linear edges as landmarks.

37 **Threats.** Most mortalities in this species occur during the juvenile stage (Cyceres and Pybus 1997). The
38 predominant threat affecting population declines of this species is WNS, an emerging infectious fungal
39 disease that depletes fat stores, reduces responsiveness to human disturbance, and results in a lack of
40 immune response during hibernation and uncharacteristic dispersing from hibernacula during the day in
41 mid-winter (WNS Session 2008). As indicated for the Indiana bat, northern long-eared bat populations
42 are declining with the destruction and modification of their summer and winter habitats. Access to
43 hibernacula may be restricted by doors or gates intended to exclude humans. Also, the thermal regime
44 typical of these habitats may be adversely altered by mining activities, or hibernacula in mines may be
45 destroyed altogether with mine passage collapses. Additionally, habitats are subject to adverse impacts

1 from development activities (industrial, commercial, and residential) on overwintering, roosting, and
2 feeding bats.

3 **Occurrence in the Proposed CHPE Project Area.** The northern long-eared bat occurs in every county in
4 New York State. Based upon this species' habitat preferences during winter and summer, it may be
5 assumed that these bats would occur in similar or the same areas indicated for the Indiana bat (and more)
6 along the proposed CHPE Project route.

7 3.2.3 Piping Plover

8 **Status.** Recent surveys have estimated the Atlantic Coast population at approximately 800 breeding
9 pairs, about 200 of which nest in New York State. The piping plover (*Charadrius melodus*) was federally
10 listed as threatened in the Northeast Region on December 11, 1985 (50 *Federal Register* 50726). There is
11 no critical habitat designated for the Northeast population.

12 **Behavior and Life History.** This pale shorebird with orange legs is the color of dry beach sand. The
13 species weighs 1.5 to 2.25 ounces (43 to 64 grams) and is 5.5 inches (14 cm) long. Piping plovers are
14 seen singly or in small flocks.

15 The piping plover is one of the first shorebirds to arrive in the New York Bight area for breeding, starting
16 from early to mid-March; piping plovers have been observed as early as March 11 in New York State
17 (USFWS 1996). Nests are placed on open, generally grassless sand beaches or dredged spoil areas, well
18 above the high tide mark. Piping plover and least tern nest in the same areas. Piping plovers forage on
19 beaches and dunes where they feed on marine worms, insect larvae, beetles, crustaceans, mollusks, and
20 other small marine animals and their eggs (62 *Federal Register* 59605). By early September, all but a few
21 stragglers have departed for their wintering areas.

22 **Distribution and Habitat.** Piping plovers breed on dry, sandy beaches or in areas that have been filled
23 with dredged sand, often near dunes in areas with little or no beach grass. They occur along the Atlantic
24 Coast from southwestern Newfoundland and southeastern Quebec south to North Carolina, and on inland
25 beaches from eastern Alberta and Nebraska to Lake Ontario.

26 The sand spits extending into Lower New York Bay from Long Island (Breezy Point) and New Jersey
27 (Sandy Hook) have supported some of the highest nesting concentrations for piping plover in the region.
28 Other important nesting beaches for piping plover include Jones Beach Island West (Hempstead Bay),
29 Jones Beach Island East (Great South Bay), and Westhampton Beach (Moriches Bay) on Long Island; and
30 Holgate (Barnegat Bay), Little Beach Island (Brigantine Bay and Marsh Complex), and Cape May
31 Meadows (Cape May) in New Jersey (62 *Federal Register* 59605).

32 **Threats.** Coastal development, recreational activities, and disturbance by off-road vehicles have reduced
33 the available suitable breeding habitat for these birds.

34 **Occurrence in the Proposed CHPE Project Area.** Piping plovers are present in the Lower New York
35 Bay during March through September, where they breed on Long Island's sandy beaches in Queens and
36 in the harbors of northern Suffolk County (NYSDEC 2012b). However, no potential breeding habitat has
37 been identified along the proposed CHPE Project route. The tidal area at the landfall for cables
38 connecting to the Luyster Creek converter station is also unlikely to support foraging piping plovers.
39 Although some mud and wrack may be exposed during low tide below the rip-rap slope at this location,
40 which could be used by feeding shorebirds, the habitat is marginal and within a largely urban landscape;
41 therefore, it is unlikely that this particular area would be used for foraging. **Since the piping plover does**

1 **not occur in the proposed CHPE Project area, DOE has concluded that the proposed CHPE Project**
2 **would have no effect on this species.**

3 3.2.4 Red Knot

4 **Status.** On September 30, 2013, USFWS announced its proposal to list the red knot (*Calidris canutus*
5 *rufa*) as threatened under the ESA. Currently, no critical habitat has been designated for the species.
6 Recent survey data indicate that populations have declined by approximately 75 percent since the 1980s,
7 with the steepest declines in the 2000s (USFWS 2013c, 78 *Federal Register* 60024).

8 **Behavior and Life History.** Red knots are birds that have an average body length of between 10 and
9 11 inches (25 and 28 cm) and a wingspan of up to 20 inches (51 cm) (USFWS 2013d). The plumage
10 (i.e., feathers) of this species varies in between sexes in the spring and varies between spring and winter
11 (Harrington 2009). During spring, feathers from the crown to the rump are ashy gray mottled and barred
12 with black. The sides, throat and chest feathers are cinnamon, and the undertail is white barred with
13 black. Although similar to the color pattern of the male, female spring plumage is lighter in color.
14 Winter plumage becomes more uniformly pale and gray, and is similar for both sexes.

15 Red knots form monogamous breeding pairs. Females usually lay 4-egg clutches in nests built on dry,
16 rocky arctic tundra at high elevations. Nests are built around clumps of lichens and scant vegetation, and
17 among rocky outcroppings on hills and ridges. Eggs are laid in June and July and both parents incubate
18 the eggs for a period of about 21-22 days until they hatch. The young take flight approximately 18 days
19 after hatching (SMS 2010).

20 During its migrations, this species feeds along the sand and muddy shorelines where intertidal
21 invertebrates may easily be found and consumed (Harrington 2009). The primary food items for red knot
22 in non-breeding habitats include blue mussel, spat (mussel juveniles), clams, snails, polychaete worms,
23 insect larvae and crustaceans (USFWS 2013e). During the spring breeding season, red knots primarily
24 feed on the eggs of horseshoe crabs, mussels, and spat.

25 **Distribution and Habitat.** The red knot is the longest-distance migratory bird in the animal kingdom,
26 flying up to 9,300 miles during its northern migration to its breeding grounds in the Canadian Arctic in
27 the spring and again during its southern migration to Tierra del Fuego in the fall (USFWS 2013e).
28 Because their flights can extend for thousands of miles between stopovers, these birds are dependent upon
29 seasonally abundant resources at the various habitats located along their migratory routes to build up and
30 maintain fat reserves that will be used for the next long-distance flight (USFWS 2013c). The red knot
31 migrates and winters in large flocks of hundreds of birds and uses spring and summer stopover areas
32 along the Atlantic and Gulf coasts (USFWS 2013e). In New York State, the species is known to occur in
33 Queens, Kings, Nassau, and Suffolk counties (USFWS 2013d).

34 **Threats.** This species is considered to be especially sensitive to climate change impacts that cause habitat
35 loss from sea level rise; loss of nesting habitat from warmer arctic temperatures that alter the condition of
36 vegetation; and asynchronies between the timing of their annual breeding, migration, and wintering cycles
37 with the windows of peak food availability (USFWS 2013e). Additionally, since this species flocks in
38 such large numbers, its population is subject to decline from singular catastrophic events such as storms
39 or oil spills (USFWS 2013e).

40 **Occurrence in the Proposed CHPE Project Area.** The New York City Metropolitan Area Segment of
41 the proposed CHPE Project route transverses northern Queens County in New York. Although specific
42 data on occurrences of the red knot in Queens County New York are unavailable, no impacts on beach or
43 shoreline habitat where this species may stop over to feed are anticipated from the construction and

1 | operation of the transmission line or converter station. **Since the typical stopover and feeding habitat**
2 **of the red knot does not occur in the proposed CHPE Project Area, DOE has concluded that the**
3 **proposed CHPE Project would have no effect on this species.**

4 3.2.5 Roseate Tern

5 **Status.** The roseate tern population is estimated to have fallen by 75 percent since the 1930s. Recent
6 survey data indicate that 87 percent of the birds in New York nest in only one colony at Great Gull Island.
7 Recent occurrences of roseate terns have been documented in Queens and Nassau counties
8 (CHPEI 2012j). The roseate tern (*Sterna dougalli dougalli*) was federally listed as endangered on
9 November 2, 1987 (52 *Federal Register* 42064).

10 **Behavior and Life History.** The roseate tern is a graceful bird, 14 to 17 inches (36 to 43 cm) long, with a
11 wingspan of about 30 inches (76 cm). It resembles the common tern. Its back and upper wings are a light
12 pearly-gray, while its underparts are white.

13 Roseate terns arrive to breed in New York in late April or early May and are always found nesting with
14 common terns. Nests are built in sand, shell, or gravel, within dense grass clumps or under boulders or
15 riprap. Both adults incubate the eggs for about 23 days, and the young fledge in 22 to 29 days. One
16 brood per season is typical, although two broods are sometimes produced. Migration begins in late
17 summer.

18 Roseate terns in the northeastern United States breed in only a few scattered colonies on sandy beaches
19 along the Atlantic coast, and winter primarily in northern South America. Birds arrive at the breeding
20 grounds in late April or early May and remain until late July, when they begin staging for migration to the
21 wintering grounds in late summer (Spendelov 1995). Roseate terns feed offshore on small schooling
22 fish, such as sand lance.

23 **Distribution and Habitat.** In the New York City area, this species breeds primarily in a few colonies on
24 Long Island, with additional nesting sites at Breezy Point in Queens (USFWS 1997). Recent survey data
25 indicate that 87 percent (more than 1,000 nesting pairs) of roseate terns in New York nest in only one
26 colony at Great Gull Island (NYSDEC 2013c).

27 **Threats.** Threats to roseate tern populations include vegetational changes within the breeding areas,
28 competition with gulls for suitable nesting areas, and predation. The increased presence of humans has
29 contributed to higher predation rates. Predators, such as raccoons (*Procyon lotor*), find tern nests when
30 they are attracted to the garbage left behind by careless beach users.

31 **Occurrence in the Proposed CHPE Project Area.** Recent occurrences of roseate terns have been
32 documented in Queens County (CHPEI 2012j). No impacts on sand beach habitat are expected from
33 construction of the transmission line or converter station and no breeding colonies for roseate tern have
34 been identified in the immediate vicinity of the transmission line route. **Since the roseate tern does not**
35 **occur in the proposed CHPE Project area, DOE has concluded that the proposed CHPE Project**
36 **would have no effect on this species.**

37 3.2.6 Bog Turtle

38 **Status.** The bog turtle (*Clemmys muhlenbergii*) was federally listed as threatened on November 4, 1997
39 (62 *Federal Register* 59605). Based upon documented losses of bog turtles and their habitat, the northern
40 population has declined by at least 50 percent, with most of the documented decline occurring over the
41 past 30 years. Significant declines are likely to have occurred prior to this due to the filling and draining
42 of wetlands. As of 2007, bog turtles have been documented at approximately 608 individual sites

1 (element occurrences) (see **Table 3-3**), ranging in quality from good to poor, within the northern range.
 2 These represent individual wetlands, or in some cases road crossing sightings, where the species has been
 3 confirmed. These sites or occurrences are not equivalent to the “population analysis sites” (PAS) or sub-
 4 populations referred to in the *Bog Turtle Recovery Plan, Northern Population*.

5 **Table 3-3. Bog Turtle Occurrences in Its Northern Range**

State	Counties of Occurrence	Number of Extant Occurrences
Connecticut	1	19
Delaware	1	15
Maryland	4	82
Massachusetts	1	4
New Jersey	11	212
New York	11	62
Pennsylvania	15	214
TOTAL	44	608

Source: USFWS 2010a

6 **Behavior and Life History.** Bog turtles are small, semi-aquatic turtles that primarily inhabit open wet
 7 meadows and calcareous bogs, which can be isolated or part of a larger wetland complex. The northern
 8 population of the bog turtle occurs in seven states ranging from Massachusetts to Maryland. Critical
 9 habitat has not been designated for this species. The current environment, impacts of human activities,
 10 and current status of the bog turtle have been described in detail in the following reports, which are
 11 incorporated here by reference.

- 12 • *Bog Turtle (Clemmys muhlenbergii) Northern Population 5-year Review Summary and*
 13 *Evaluation (USFWS 2008a)*
- 14 • *Biological Opinion. Effects of the Implementation of Habitat Restoration Practices by the*
 15 *Natural Resources Conservation Service on the Northern Population of the Bog Turtle (USFWS*
 16 *2010a)*
- 17 • *Bog Turtle (Clemmys muhlenbergii) Recovery Plan, Northern Population (USFWS 2001).*

18 The bog turtle is the smallest member of the genus *Clemmys*, with the upper shell of adults measuring 3 to
 19 4.5 inches (7.5 to 11.4 cm). The large, conspicuous bright orange, yellow, or red blotch on each side of
 20 the head is a distinguishing characteristic of the species. Bog turtles are semi-aquatic and only active
 21 from April to mid-October in the northern part of their range and hibernate from October to April, often
 22 just below the upper surface of frozen mud or ice. Their varied diet consists of slugs, beetles,
 23 lepidopteran larvae, caddisfly larvae, snails, nematodes, millipedes, fleshy pondweed seeds, sedge seeds,
 24 and carrion.

25 **Distribution and Habitat.** Bog turtles typically inhabit shallow spring-fed fens, sphagnum bogs, swamps,
 26 marshy meadows, and pastures with soft muddy areas. These emergent wetlands are usually a mosaic of
 27 shallow water, soft muddy bottoms, low grasses and sedges, and interspersed wet and dry pockets.
 28 Spring-seeps often form a network of small rivulets in the wetland. The open canopy of these wetlands
 29 provides sunlight for basking and nesting, and is essential for continued use by bog turtles. The shallow
 30 water and deep mucky soils are crucial bog turtle habitat components.

1 Bog turtle habitats are sustained primarily by groundwater, although surface water also contributes to
2 wetland maintenance. Bog turtles depend upon relatively stable, year-round supplies of clean
3 groundwater to support their food base, brumation (hibernation) and aestivation areas, and their nesting
4 habitat. Soft substrates and slow-moving water both above and below the surface protect the bog turtles
5 against freezing and overheating. Bog turtles inhabit sub-climax seral wetland stages and are dependent
6 on riparian systems that are unfragmented and sufficiently dynamic to allow the natural creation of
7 meadows and open habitat to compensate for the closing over of habitats caused by ecological succession.
8 Succession of many wetlands from open-canopy fens to closed-canopy red maple (*Acer rubrum*) swamps
9 contributes to the loss of bog turtle habitat.

10 Bog turtles are known to use streams as travel corridors and avenues for dispersal into new unoccupied
11 wetlands. Movement of bog turtles between wetlands usually occurs along interconnecting water courses,
12 but turtles have also been observed traveling overland through cornfields and pine plantations, across
13 roads (especially those adjacent to or within wetlands), and through other terrestrial habitats.

14 **Threats.** Primary threats to the bog turtle are loss, fragmentation, and degradation of its fragile, early
15 successional wet meadow habitat, and collection for the wildlife trade (USFWS 2008a). Direct habitat
16 loss or degradation has occurred from the draining, ditching, dredging, or filling of suitable sites for
17 agricultural use, development, and pond or reservoir construction. The proximity of many remaining bog
18 turtles to roadways and population centers exposes these populations to increased predation, road kills,
19 pollution, and establishment of invasive native or exotic plant species that pose a significant indirect
20 threat to the species. Spread of exotic invasive vegetation, including common reed (*Phragmites*
21 *australis*), purple loosestrife (*Lythrum salicaria*), multiflora rose (*Rosa multiflora*), and reed canary grass
22 (*Phalaris arundinacea*), degrades bog turtle habitat in many locations. The eggs and young of bog turtles
23 are particularly vulnerable to predators such as raccoon, opossum, skunk, fox, snapping turtle, water
24 snake, and larger birds. Populations of many of these predators are elevated in areas of high human
25 activity.

26 Overland Segment

27 Freshwater wetland and upland habitats have the potential to be impacted along the underground
28 transmission line corridor in Washington, Saratoga, Schenectady, and Albany counties. Historic records
29 of bog turtles occur in Albany County; however, according to data from the NYNHP, no historic records
30 of bog turtles in their database occurred within 0.25 miles (0.4 km) of the proposed CHPE Project route
31 (CHPEI 2012j). Although suitable bog turtle habitat associated with open-canopy red-maple hardwood
32 swamps, sedge meadows, and fens could be present along the proposed transmission line corridor in this
33 county, no recent records suggest that bog turtles are likely to occur. Additionally, because the
34 construction corridor consists primarily of previously disturbed brush and edge habitat associated with the
35 railroad, the likelihood of bog turtle occurring in the proposed CHPE Project area is extremely low.

36 Hudson River Segment

37 In the Hudson River Segment, the bog turtle could occur in Rockland County. However, according to
38 data from the NYNHP, no historic records of bog turtles in their database occur within 0.25 miles
39 (0.4 km) of the proposed transmission line route in the Hudson River Segment. This species is also listed
40 in Dutchess, Orange, Putnam, Ulster, and Westchester counties; however, this portion of the segment is
41 entirely aquatic and does not contain suitable habitat for the bog turtle.

42 **Since the bog turtle does not occur in the proposed CHPE Project area, DOE has concluded that**
43 **the proposed CHPE Project would have no effect on this species.**

1 3.2.7 Karner Blue Butterfly

2 **Status.** The Karner blue butterfly was federally listed as endangered December 14, 1992 (USFWS
3 2012c). No critical habitat has been designated for the Karner blue butterfly. The current environment,
4 impacts of human activities, and current status of the Karner blue butterfly have been described in detail
5 in the following reports, which are incorporated here by reference.

- 6 • *Karner Blue Butterfly (Lycaeides melissa samuelis) Recovery Plan (USFWS 2003)*
- 7 • *Karner Blue Butterfly (Lycaeides melissa samuelis). 5-year Review: Summary and Evaluation*
8 *(USFWS 2012c).*

9 **Behavior and Life History.** The Karner blue butterfly is a small butterfly having a wingspan of 0.9 to
10 1.3 inches (22 to 32 millimeters). The female's wings are dark-blue or grayish-brown dorsally, with an
11 irregular band of orange inside a narrow black border on the upper wings. The dorsal side of the male's
12 wings has a narrow black margin and is light blue or silvery-blue in color. The Karner blue butterfly is a
13 bivoltine species, meaning that two generations are produced per year. Eggs that have overwintered hatch
14 in mid- to late-April. The larvae feed on wild lupine for approximately 3 weeks prior to pupating. Adult
15 butterflies begin emerging in late-May or early-June in most years.

16 The Karner blue butterfly is highly specialized on the larval host plant, wild blue lupine (*Lupinus*
17 *perrenis*). Two generations occur per year. One generation hatches from overwintering eggs and
18 emerges from May to June. These adults lay eggs to produce the second generation, which emerges from
19 mid-July to mid-August (NYSDEC 2013d). Natural habitat for Karner blue butterflies includes pine
20 barrens, oak savannahs, and openings in oak woodlands (NYNHP 2010b).

21 **Distribution and Habitat.** Lupine tends to grow in sandy soils. These plants historically occurred in
22 savanna and barrens habitats typified by dry, sandy soils, and now occur in remnants of these habitats,
23 and in other locations such as roadsides, military bases, and some forest lands. Though wild lupine is
24 essential for the larvae, adult Karner blue butterflies also use many nectar plants. Ideal habitat contains
25 numerous nectar species that bloom at various times throughout the summer, thus ensuring an ample
26 supply of nectar during both flights.

27 The Karner blue butterfly was once found in a narrow north-to-south band stretching from eastern
28 Minnesota to Maine. Karner blue butterflies are currently found in Minnesota, Wisconsin, Indiana,
29 Michigan, New York, New Hampshire, and Ohio, and are considered extirpated from Iowa, Illinois,
30 Pennsylvania, Massachusetts, Maine, and the Canadian province of Ontario. Within their restricted range,
31 Karner blue butterflies now also occur in man-made openings along ROWs, at airports and in sandy old
32 fields wherever wild blue lupine is present. Karner blue butterflies are found in the Hudson Valley sand
33 belt extending from near Albany to Glens Falls (NYSDEC 2013d).

34 The NYSDEC has identified 70 Karner blue butterfly localities and 56 subpopulations in the Glacial Lake
35 Albany Recovery Unit. Of those, 43 subpopulations are within the three recovery areas: 7 in the Albany
36 Pine Bush, 27 in Saratoga Sandplains, and 9 in Saratoga West. Of these 43 subpopulations, only 15 are
37 anticipated to have more than 10 butterflies in the annual index counts (USFWS 2003). Distribution of
38 the Karner blue butterfly has not changed significantly in New York although it has contracted somewhat
39 within the counties that are occupied as small outlying populations mapped in 1989 disappeared. This is
40 especially true in Warren County where the NYSDEC is attempting to restore the Queensbury Sandplains
41 Karner blue butterfly metapopulation, a state recovery site. There is one less county (Schenectady
42 County) with Karner blue butterflies in 2011 compared to 1992; however, this resulted in the loss of only
43 one small site (USFWS 2012c).

1 **Threats.** The primary limiting factors are loss of habitat through development, and canopy closure
2 (succession) without a concomitant restoration of habitat. A shifting geographic mosaic that provides a
3 balance between closed and open-canopy habitats is essential for the maintenance of large viable
4 populations of the Karner blue butterfly.

5 Overland Segment

6 Portions of the Overland Segment in Albany, Schenectady, and Saratoga counties are within an area
7 containing suitable habitat and known to be inhabited by the Karner blue butterfly. The NYNHP has
8 records of Karner blue butterflies within 0.25 miles (0.4 km) of the proposed CHPE Project in Wilton and
9 Saratoga Springs in Saratoga County (CHPEI 2012j). Lupine and nectar patches were identified and
10 mapped along the CP Railroad ROW portion of the segment (MPs 112 to 177). During follow-up
11 presence/absence surveys, two Karner blue butterflies were observed in lupine patches in the segment
12 crossing through the Town of Wilton in Saratoga County (CHPEI 2012k).

13 3.2.8 Small Whorled Pogonia

14 **Status.** The small whorled pogonia (*Isotria medeoloides*) was federally listed as threatened in October 6,
15 1994 (59 *Federal Register* 50852).

16 **Distribution and Habitat.** Small whorled pogonia inhabits semi-open second-growth deciduous forests
17 or older hardwood stands of beech, birch, maple, oak, and hickory that have an open understory.
18 Occasionally it occurs in pine or hemlock woods. Typically it prefers acidic and mesic soils, often on
19 slopes near small streams (NatureServe 2013, USFWS 2008b). Small whorled pogonia was rediscovered
20 in Schunnemunk Mountain State Park in Orange County, New York in 2010 by a NYNHP botanist.
21 Botanists have spent decades looking for small whorled pogonia throughout New York, where it had been
22 collected only five times, from 1887 to 1923, in five different counties: Washington, Ulster, Rockland,
23 Nassau and Suffolk. Orange County is now added to the list of counties where it grows (NYSOPRHP
24 2010).

25 Hudson River Segment

26 In the Hudson River Segment, the small whorled pogonia could occur in Orange County. However, there
27 is no information to suggest that the species occurs within the proposed Project area in the Hudson River
28 Segment. The Schunnemunk Mountain State Park is located over 3 miles from the proposed CHPE
29 Project region of influence (ROI) (the Hudson River in the Hudson River Segment) in Orange County,
30 and this portion of the ROI is entirely aquatic and does not contain suitable habitat for the small whorled
31 pogonia.

32 **Since the small whorled pogonia does not occur in the proposed CHPE Project area, DOE has**
33 **concluded that the proposed CHPE Project would have no effect on this species.**

34 3.2.9 Northern Wild Monkshood

35 **Status.** The northern wild monkshood (*Aconitum noveboracense*) was federally listed as threatened on
36 April 26, 1978 (43 *Federal Register* 17910).

37 **Distribution and Habitat.** Northern wild monkshood is an herbaceous perennial that inhabits cool sites
38 such as stream sides or shaded cliff sides. The northern wild monkshood is federally listed in Ulster
39 County. This portion of the Hudson River Segment in Ulster County is entirely aquatic. As such,
40 suitable habitat for this species does not exist in the proposed CHPE Project area.

1 **Since the northern wild monkshood does not occur in the proposed CHPE Project area, DOE has**
2 **concluded that the proposed CHPE Project would have no effect on this species.**

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4. Environmental Baseline Conditions

4.1 Aquatic Environment

The current environment and impacts of human activities in the Action Area, specifically the Hudson River and its estuary, and current status of the ESA-listed species in the area (see also **Section 3.1**), have been described in detail in the following reports, which are incorporated here by reference.

- *Recovery Plan for the Shortnose Sturgeon (NMFS 1998)*
- *A Biological Assessment of Shortnose Sturgeon (Acipenser brevirostrum) (SSSRT 2010)*
- *Biological Opinion on the Issuance of a Permit to Evaluate Shortnose Sturgeon Populations in the Hudson River (Number 16439) (NMFS 2011b).*
- *Biological Assessment for the Tappan Zee Hudson River Crossing Project (FHWA 2012)*
- *Biological Opinion for the Tappan Zee Bridge Replacement Project (NMFS 2013a)*
- *Biological Opinion for Continued Operations of Indian Point Nuclear Generating Unit Nos. 2 and 3 (NMFS 2013b)*

4.1.1 Hudson River Segment and Estuary – Current Environment

The Hudson River is 315 miles (507 km) long from its source at Lake Tear of the Clouds in the Adirondacks to the mouth at the Battery in New York City. The Hudson River is tidal for 153 miles (246 km) from the mouth to the Federal Dam at Troy. Salt water travels about 60 miles (97 km) up the river to Newburgh, New York. Habitat features within the Hudson River Segment include the channel (deep open water portion of the river), flats (expanses of mud or sand in river shallows), bays (coves along the shoreline), and wetlands (plant communities that develop in shallow water habitat (Stanne et al. 1996). The aquatic portions of the New York City Metropolitan Area Segment occur in the New York-New Jersey Harbor Estuary and extend in the Harlem and East rivers from the Hudson River to Astoria. Both the Harlem and East rivers have undergone significant modifications, such as channelization, bulk heading, upland filling, and urbanization.

Benthic community structure and population density are dependent on factors including water quality, sediment type, the presence or absence of SAV, and human alterations. Benthic communities vary in distribution in the Hudson River depending on bottom type (i.e., hard or soft substrate), salinity, SAV, and location along the river.

Current conditions along the aquatic portions of the Project's transmission cable route were evaluated during a marine route survey in the spring of 2010 that collected route-specific bathymetric, side-scan sonar and geotechnical data for a 300-foot (91-meter)-wide corridor along the proposed CHPE Project route. The marine route survey included geophysical, sediment, and benthic surveys (CHPEI 2012g) as described in the following:

- Geophysical surveys were conducted to investigate existing bottom features in the lakes, rivers, and canals along the proposed route. Surveys were conducted using multi-beam bathymetry, side-scan sonar, magnetometer, and sub-bottom profile.
- The sediment survey was conducted to collect information on the existing sediment type and quality along the proposed route.

- The benthic survey was conducted to augment existing benthic community data. These data sets are being used to assess potential impacts associated with the installation of the proposed underwater transmission cable.

Broadscale sediment type data from the NYSDEC Hudson River Estuary Program indicate that the sediments along the transmission line route primarily consist of sand, sandy mud, muddy sand, and mud. The transmission line occasionally crosses or travels near areas of sandy gravel, gravelly sand, or gravelly mud. There are a few locations where the transmission line crosses gravel or travels near gravel. These areas are near MP 269 (Hudson River mile 67) and MP 310 (Hudson River mile 27). The sediment type interpretation is based on the grain size analysis of the cores and grabs with some guidance from the backscatter data. The sediment profile imagery data have also been used to supplement these interpretations. These data represent general trends and are not meant for finescale interpretation (Bell et al. 2006).

Sediment cores were collected approximately every 2 to 3 miles throughout the aquatic portion of the transmission line route. The Coxsackie Landing to Kingston section of the Hudson River (north of where the transmission line enters the Hudson River to MP 245) contained the largest variety of sediment types found along the Hudson River. The surficial sediments ranged from well-mixed sand and gravel with cobbles to soft silt/clay. Sediments below the river bottom ranged from soft silt/clay to dense glacial till. One core at approximate MP 234 consisted of medium to coarse sand and fine to coarse gravel with pebble-cobble in surficial sediments. In the Kingston to Peekskill Bay portion (MP 245 to MP 292), the surficial sediments consisted of very soft unconsolidated silts except at MP 284 (taken north of Garrison), where the upper 4 inches of sediment consisted of gravel and pebbles in a silt matrix. Sediments below the river bottom here in all cases consisted of soft silt/clay. In general in the Peekskill Bay to Spuytin Duyvil portion (MP 292 to MP 324), the surficial sediments consisted of very soft silts and clays, with occasional lenses of fine shell hash. Surface sediments in the Harlem River portion of the CHPE Project route are a mixture of sand, gravel, and cobble. Sediments are coarse and several rock outcrops exist in the northern portion of the Harlem River traversed by the CHPE Project route, while finer sediments dominate downstream (CHPEI 2012g). Surface sediments in the East River are coarser, with occurrences of exposed bedrock due to swift currents removing sediments and blasting to create the navigation channel (CHPEI 2012f). Contaminant loads of sediments are detailed in CHPEI (2012i).

The benthic macroinvertebrates in the Hudson River Segment form a diverse community that includes approximately 300 species of annelids, mollusks, crustaceans, and insects. However, the benthic community has been subject to pollution and human alterations over the past 200 years (Levinton and Waldman 2012). Shellfish data are not available for the entire proposed CHPE Project route in the Hudson River, but limited data are available for three discrete areas. Available shellfish information indicates that zebra mussel beds occur sporadically between approximate MP 232 to MP 246. No shellfish beds have been recorded between approximate MP 261 and MP 281 (NYSDEC 2014a). Oyster beds occur from near Ossining at MP 305 to south of the Tappan Zee Bridge near MP 310 (NYSDEC 2014a, AECOM 2011). Section 3.3.4 of the EIS provides additional detail on the shellfish and benthic communities within the Hudson River Segment.

The majority of benthic invertebrate species found in the disturbed habitats of the Harlem and East rivers in the New York City Metropolitan Area Segment are tolerant of highly variable conditions. Biological surveys of these areas have found the benthic community to be composed of both suspension and deposit feeders, including polychaetes, crustaceans, and bivalves (Levinton and Waldman 2012). Section 3.4.4 of the EIS provides additional detail on the shellfish and benthic communities within the ROI in the New York Metropolitan Area Segment.

1 The proposed CHPE Project transmission line would intersect one SCFWH within the Overland Segment
2 (Catskill Creek) and four SCFWHs within the Hudson River and New York City Metropolitan segments.
3 From north to south, the proposed route would cross the following SCFWHs in the Hudson and Harlem
4 rivers (see **Attachment 1** for mapped SCFWH along the project route):

- 5 • Esopus Estuary (MPs 234 to 235)
- 6 • Kingston-Poughkeepsie Deepwater Habitat (MPs 245 to 267 and MPs 268 to 270)
- 7 • Hudson Highlands (MPs 276 to 295)
- 8 • Lower Hudson Reach (MPs 317 to MP 325).

9 The Kingston-Poughkeepsie Deepwater Habitat SCFWH provides spawning habitat for Atlantic sturgeon
10 which could occur through July, meaning that Atlantic sturgeon larvae could occur in this SCFWH
11 through August. It also provides wintering habitat for shortnose sturgeon and Atlantic sturgeon. Both
12 Atlantic and shortnose sturgeon could occur in the Esopus Estuary SCFWH in the waters north and south
13 of the Esopus Creek mouth. The adjacent deepwater area of the Hudson River serves as post-spawning
14 and wintering habitat for shortnose sturgeon. The deep areas of the Hudson Highlands SCFWH are used
15 as migrational routes by Atlantic sturgeon and shortnose sturgeon and are important nursery areas and
16 summering areas for juvenile Atlantic sturgeon and summering areas for post-spawn adults. It might also
17 be an overwintering ground for Atlantic sturgeon. Adult Atlantic sturgeon and shortnose sturgeon
18 migrate through the Lower Hudson Reach SCFWH (NYS DOS 2014).

19 The benthic macroinvertebrates of the Hudson River form a well-documented and diverse community that
20 includes approximately 300 species of annelids, mollusks, crustaceans, and insects. Benthic communities
21 vary in distribution in the Hudson River depending on bottom type (i.e., hard or soft substrate), salinity,
22 submerged aquatic vegetation (SAV), and location along the river. Freshwater snails, clams,
23 chironomids, and insects are present north of Kingston, whereas there is a mixture of freshwater and
24 marine organisms between Stony Point and Poughkeepsie. South of Poughkeepsie, the benthos are
25 dominated by estuarine worms and crustaceans. In the middle Hudson River, the benthic
26 macroinvertebrate community underwent substantial decline in recent years due to the invasion of the
27 nonnative zebra mussel (*Dreissena polymorpha*) in the early 1990s (Strayer 2006); however, with the
28 observed long-term decline in invasive zebra mussels in the Hudson River watershed, parts of the
29 ecosystem appear to be recovering toward pre-invasion levels, including benthic animals such as native
30 mussels and clams (Strayer et al. 2011). The predominant crustaceans in the lower Hudson River estuary
31 include grass shrimp (*Palaemonetes*), sand shrimp (*Crangon septemspinosa*), and blue crab (*Callinectes*
32 *sapidus*) (Levinton and Waldman 2011). Historically, the Hudson River estuary also supported a
33 commercial-scale oyster fishery. Benthic mapping and sampling efforts have revealed several historic
34 oyster reefs near the Tappan Zee reach and live oysters in this area and Haverstraw Bay (Bell et al. 2006).
35 Restoration efforts for oysters are also currently ongoing.

36 The benthic macroinvertebrate community collected during the spring 2010 marine route survey
37 (CHPEI 2012g) of the Harlem and East rivers was typical of the existing benthic communities in an
38 urbanized estuary. In sum, 29 taxa were found in the East River compared to 16 in the Harlem River.
39 Annelids and arthropods composed the majority of the East River samples, with pollution-tolerant taxa
40 dominating the samples obtained near the Polletti landfall. The Harlem River was dominated by the
41 polychaetes, *Scolecopides viridis*, Capitellidae, and *Streblospio benedictii*. Many of the benthic species
42 identified in the two rivers are important food sources for shortnose and Atlantic sturgeon
43 (see **Section 3.1.3**).

44 The USEPA has designated SAV as "special aquatic sites" under Section 404(b)(1) of the Federal Clean
45 Water Act due to its important role in the marine ecosystem for spawning, nursery cover and forage areas
46 for fish and wildlife. More than 20 species of aquatic plants, both native and invasive, occur in the

1 Hudson River, with native water celery (*Vallisneria americana*) and the exotic water chestnut (*Trapa*
2 *natans*) as the predominant SAV species. Other native species of SAV in the Hudson River include the
3 clasping leaved pondweed (*Potamogeton perfoliatus*) and slender naiad (*Najas flexilis*). In addition to the
4 water chestnut, other nonnative species include curly pondweed (*Potamogeton crispus*) and Eurasian
5 watermilfoil (*Myriophyllum spicatum*) (Findlay et al. 2006, NYSDEC 2013). Due to light penetration
6 limits, plants are generally found in water shallower than 10 feet (3 meters), although beds can be deeper
7 in upriver sections. SAV occurs in the tidal Hudson River on shallow shoals in depths less than 10 feet
8 (3 meters) and covers approximately 6 percent of the river with the greatest coverage occurring in the
9 mid-Hudson, from Kingston to Hudson and lower coverage south of Hyde Park (Findlay et al.2006).
10 SAV provides valuable nursery, forage and refuge habitat for a variety of fish including summer flounder,
11 striped bass, bluefish, American shad, alewife, and blueback herring. SAV in the Hudson River has been
12 shown to contribute to primary production and habitat for benthic and fish species in the river (Findlay et
13 al. 2006, Strayer 2006). SAV is generally found in water depths of less than 10 feet (3 meters) and adult
14 shortnose sturgeon have been observed feeding in heavily vegetated, muddy backwater areas that contain
15 SAV (Gilbert 1989); however, the proposed CHPE Project transmission line would generally be installed
16 in deeper waters, minimizing the potential for impact on SAV. SAV is not common in the Hudson River
17 from the Newburgh area south to Haverstraw Bay, perhaps due to higher turbidity (Findlay et al. 2006).
18 Additionally, the transmission line would not traverse any existing mapped SAV beds (NYSDEC 2014).
19 Mapped *Vallisneria* sp. and *Trapa* sp. are presented in Attachment 1.

20 The aquatic vegetation in the Harlem and East rivers in the New York City Metropolitan Area Segment is
21 tolerant of highly variable and harsh conditions. Freshwater and marine phytoplankton are the dominant
22 primary producers in these waterbodies. Diatoms are generally the dominant group of phytoplankton.
23 Residence times of phytoplankton species within New York Harbor are short and individuals move
24 quickly through the system. While SAV is not typically found in these waterbodies, macroalgae do occur
25 on hard surfaces and sandy or muddy bottoms (MTA 2004).

26 4.1.2 Hudson River Segment and Estuary – Anthropogenic Activities

27 The Hudson River Estuary has undergone numerous environmental changes. These changes have
28 included channel maintenance by dredging; wholesale dumping of industrial and domestic wastes;
29 scattered in-basin urbanization and shoreline development; deforestation of the watershed and an increase
30 in agriculture; and water removal for commercial, industrial, and agricultural needs. In addition, the biota
31 of the river has supported commercial and recreational harvesting, exotic species have become
32 established, and habitats have become fragmented, replaced, undergone changes in extent, or isolated.
33 NMFS (2012) has acknowledged that it is difficult to quantify the number of shortnose sturgeon that may
34 be killed in the Hudson River each year due to anthropogenic sources; however, as noted in **Section 3.1**,
35 the Hudson River population is the largest of the shortnose sturgeon populations. The numbers of
36 shortnose and Atlantic sturgeon taken incidentally in commercial and recreational fisheries is not known.
37 Dams, dredging, land use activities, and shipping are habitat-altering activities for sturgeon species.
38 Hydroelectric dams may alter shortnose and Atlantic sturgeon habitat by varying river flows or
39 temperatures necessary for successful spawning or migration and causing mortalities to fish that become
40 entrained in turbines. Sturgeon species also are susceptible to impingement (adult fish) or entrainment
41 (larval fish) on cooling water intake screens of power plants in these species' ranges (e.g., Dadswell et al.
42 1984, NMFS 1998). Due to the importance of benthic habitat to shortnose and Atlantic sturgeon,
43 dredging modifies shortnose feeding areas, disrupts spawning migrations, and fills spawning habitat with
44 resuspended fine sediments. Dredges also can cause mortality of sturgeon. Land use activities also have
45 the capacity to fill spawning habitat with sediments if those activities release sand and silt into the river.
46 In-water or nearshore construction projects can interfere with normal shortnose sturgeon migratory
47 movements and disturb sturgeon concentration areas. For example, the NMFS noted that is likely that the
48 construction of the existing Tappan Zee Bridge (built prior to the ESA) resulted in some disturbance to

1 aquatic communities and may have affected individual shortnose and Atlantic sturgeon. NMFS
2 acknowledged, however, that given the extremely small benthic footprint of the bridge compared with the
3 size of the Hudson River estuary, it is unlikely that this loss of habitat has had significant impacts on
4 shortnose or Atlantic sturgeon (NMFS 2013b).

5 Sources of contamination in the Action Area include atmospheric loading of pollutants, storm water
6 runoff from coastal development, groundwater discharges, and industrial development. Point source
7 discharges and compounds associated with discharges (e.g., contaminants, including toxic metals,
8 polychlorinated aromatic hydrocarbons, pesticides, and polychlorinated biphenyls [PCBs]) contribute to
9 poor water quality and may also impact the health of sturgeon populations. In 1983, the USEPA listed
10 the Hudson River on its Superfund National Priority List. The possible effects of contaminants on
11 ESA-listed fish species is discussed in **Section 5.1**. Water quality within the Hudson River varies based
12 on land use. The most notable water quality problem in the Hudson River is reflected in the
13 PCB-contaminated sediments, which primarily resulted from historic PCB discharges from the Fort
14 Edward area associated with General Electric manufacturing facilities.

15 4.2 Terrestrial Environment

16 4.2.1 Overland Segment

17 The Overland Segment occurs partially in the Champlain Valley, which is between boreal forest and
18 broadleaf deciduous climatic zones in North America. Forests in the Overland Segment are characterized
19 by conifers such as hemlock (*Tsuga canadensis*) and pine (*Pinus* spp.); and deciduous species such as
20 birch (*Betula* spp.), American beech (*Fagus grandifolia*), maple (*Acer* spp.), and, to a lesser extent, oak
21 (*Quercus* [*Q.*] spp.). The Champlain Valley represents the northern extent of the range of tree species
22 such as shagbark hickory (*Carya ovata*), red and white oak (*Q. rubra* and *Q. alba*), and hop hornbeam
23 (*Ostrya virginiana*). Conifer or pine-dominated forests tend to be in less favorable habitats with poorer
24 soils, whereas deciduous forest stands are found in locations with good soils. Coniferous habitats include
25 transitional areas between the mountains of the Adirondacks and the Champlain Valley. Important
26 grassland habitat in agricultural areas includes old fields, upland meadows, hayfields, and
27 shrub-dominated fields (NYSDEC 2012c).

28 Forested habitat in the Adirondacks includes beech-maple forests, hemlock-northern hardwood forest, and
29 spruce-fir (composed of red spruce [*Picea rubens*] and balsam fir [*Abies balsamea*]). Other forested
30 habitats of the Hudson River Valley in Albany County potentially within and along the Overland Segment
31 include red maple- (*Acer rubrum*) black gum (*Nyssa sylvatica*) swamp, chestnut-oak forest (chestnut oak
32 [*Q. montana*] and red oak [*Q. rubra*]), Appalachian oak-hickory forest, and pitch pine-oak-heath rocky
33 summit. Important grassland habitat in agricultural areas includes old fields, upland meadows, hayfields,
34 and shrub-dominated fields (NYSDEC 2012c).

35 Because the transmission cables would be installed underground along the existing ROWs for New York
36 State Route 22, city streets in Schenectady, Alpha Road in Catskill, and the CP and CSX railroads,
37 forested habitat along the ROI most commonly exists as successional or shrubby forest edge or urban
38 areas. The proposed CHPE Project route would cross several streams and rivers via dry crossing
39 methods, HDD or attachment to bridges; however, some riparian habitat is expected to occur within the
40 ROI.

41 The Saratoga Sand Plains Wildlife Management Area is present along the Overland Segment in the Town
42 of Wilton. This area includes deepwater wetlands, rare pine barren vernal ponds, ephemeral wetlands in
43 open areas, and oak-pine savannah, which provide habitat for a wide variety of species, including the
44 Karner blue butterfly (*Lycaeides melissa samuelis*).

1 In spring 2010, surveys of the Overland Segment were completed to identify areas with suitable habitat
2 for the Karner blue butterfly. Lupine and nectar patches were identified and mapped along the CP
3 Railroad ROW portion of the segment (MPs 112 to 177). No lupine patches were found within surveyed
4 areas further south in the CHPE Project corridor along the CSX Railroad portion of the route in
5 Schenectady County, and, because the species' lifecycle depends on the lupine flower, it was determined
6 that this area is unlikely to support nectaring adult Karner blue butterfly. The Applicant has coordinated
7 with NYSDEC regarding the delineation of lupine/nectar areas along the CP Railroad ROW
8 (CHPEI 2012k).

9 During follow-up presence/absence surveys, two Karner blue butterflies were observed in lupine patches
10 in the segment crossing through the Town of Wilton in Saratoga County. The NYSDEC and USFWS
11 indicated that lupine patches where Karner blue butterflies have been observed, and any patches within
12 656 feet (200 meters) of these patches, should be considered occupied. The Applicant has elected to
13 consider all mapped lupine patches to be occupied (CHPEI 2012k).

14 4.2.2 Hudson River Segment

15 Upland habitat types within and along the terrestrial section of the proposed CHPE Project within the
16 Hudson River Segment, from Stony Point through Clarkstown, New York, contain urban areas,
17 successional northern hardwoods, old fields, shrublands, and reverting farmland. It could also include red
18 maple-black gum swamp, chestnut-oak forest, Appalachian oak hickory forest, and pitch pine-oak heath
19 rocky summit (NYSDEC 2012c). The majority of the terrestrial habitat is disturbed.

20 4.2.3 New York City Metropolitan Area Segment

21 The terrestrial portion of the proposed CHPE Project in the New York City Metropolitan Area Segment
22 traverses through the Boroughs of the Bronx and Queens. The habitat along the ROI within these
23 boroughs is primarily disturbed. The disturbed habitat that occurs within the ROI includes urban areas,
24 successional old fields or shrublands, mowed lawns, or vacant lots (USFWS 1997, Edinger et al. 2002).
25 The terrestrial Action Area is primarily developed, consisting of commercial, industrial, transportation,
26 utility, and residential land uses. The proposed Luyster Creek HVDC Converter Station would be
27 constructed on an undeveloped parcel within the Charles Poletti Power Plant complex. The proposed site
28 consists of open space and forested land adjacent to existing power-generating facilities and electrical
29 substations.

30

5. Potential Effects on Federally Listed Species

As discussed in **Section 1**, the DOE has the responsibility under the ESA to determine whether or not the proposed CHPE Project would adversely affect federally listed endangered and threatened species and species proposed for listing and their designated or proposed designated critical habitat.

Potential impacts on ESA-listed species could occur during proposed CHPE Project installation and operation for aquatic and terrestrial species (**Sections 5.1** and **5.2**, respectively). As noted in **Section 3**, there is no designated or proposed designated critical habitat in the proposed CHPE Project area. The Applicant has proposed measures to reduce potentially adverse impacts on ESA-listed species during construction and operations; these are described in **Section 2.5**. DOE’s determinations of effects are discussed throughout **Section 5** and summarized in **Section 7**. **Section 6** presents a cumulative effects analysis of the proposed CHPE Project combined with other reasonably foreseeable actions on protected species.

Table 5-1 presents a summary of the impacts on aquatic and terrestrial protected species, which are discussed in detail in the rest of this section.

Table 5-1. Summary of Impacts on Federally Listed Species by Resource Area

Resource Area	Description of Impacts
Aquatic Resources	
Sediment	Localized temporary disturbance to approximately 569 acres (230 hectares) of river bottom in the Hudson and Harlem rivers, resulting in habitat degradation, avoidance, or loss. The jet plow would create a trench 2 feet (0.4 meters) wide and 7 to 8 feet (2.1 to 2.4 meters) deep. Suspended sediment and resettlement of such would result in negligible additional sediment disturbance compared to the available surrounding habitat.
Turbidity	Water jetting would result in a temporary increase in suspended sediment levels of less than 200 milligrams per liter (mg/L) in the Hudson and Harlem rivers.
Benthic communities and shellfish	Negligible reductions in benthic shellfish and infaunal organisms that serve as prey for shortnose and Atlantic sturgeon would occur in habitat adjacent to the transmission line from jet plow and concrete mat installation. Concrete mats would cover approximately 2.5 percent of the total aquatic portion of the transmission line in the Hudson and Harlem rivers. Benthic recovery and recolonization of impacted areas along the installation route would be expected to begin to occur within months after construction activities have ceased. The fleet of four vessels would maintain idle speeds (less than 4 knots) during installation, and have a draft less than 12 feet (4 meters), which would provide sufficient clearance from the waterbody bottoms and for the lower benthos layers in the Hudson and Harlem rivers.
SAV	No impacts as the transmission line would be buried in deeper waters and would not cross any NYSDEC-mapped SAV beds.
SCFWH	Transmission line route would avoid 18 of 22 SCFWHs in the Hudson and Harlem rivers in the proposed CHPE Project area. Construction windows would avoid or minimize impacts on sturgeon spawning in SCFWHs. Approximately 1.0 miles (1.6 km) of concrete mats would cover 1.0 acres (0.4 hectares) in SCFWHs, or less than 0.01 percent of the area of the affected SCFWHs.

Resource Area	Description of Impacts
Aquatic Resources (continued)	
Noise	Expected underwater noise levels from construction activities would be above the NMFS threshold of 150 dB re 1 μ Pa rms for behavioral impacts on fish, but impacts would be expected to be localized. No injury or physiological impacts would be expected.
Blasting	Sturgeon eggs and larvae are not expected to occur in the Harlem River and the presence of adults is expected to be rare. As such, the potential for blasting in the Harlem River to adversely affect sturgeon is so low, it is discountable.
Vessel strikes	Construction vessels proposed for use during transmission line installation would have relatively shallow drafts, and sturgeon are generally found within 3.3 feet (1.0 meter) of the bottom in the deepest available water. Therefore, the chance of vessel-related mortalities to fish is expected to be low.
Magnetic and electric fields	The estimated magnetic field levels at the riverbed surface directly over the transmission line centerline were calculated to be less than 162 mG at a burial depth of 3.25 feet (1.0 meter). This is substantially less than the greater than 10,000 mG magnetic fields that resulted in behavioral impacts on sturgeon in laboratory tests.
Temperature	The predicted increase in temperature change in the water column would be less than 0.01°F (0.004 °C) for burial in sediment, with temperatures subject to a 9 °F (5 °C) increase at distance of 0.6 feet (0.2 meters) below the sediment surface. Temperature increases of less than 0.3 °F (0.2 °C) would be expected in the water column over concrete mats. Temperatures are expected to be within the range of tolerance for sturgeon eggs and larvae. While temperature tolerances for adult and juvenile sturgeon are not fully known, these life stages are mobile and could avoid the area. The area that would be affected would be negligible compared to the available surrounding habitat.
Decommissioning	The transmission line would be de-energized and abandoned in place, which would not result in any impacts on listed species.
Terrestrial Resources	
Habitat	In total, approximately 236 acres (96 hectares) of existing fringe forest cover could be temporarily disturbed and 48 acres (19 hectares) permanently converted to managed grasses or shrub habitat along the entire CHPE Project route to accommodate proposed construction corridors and any necessary additional workspace. In general, there is limited availability of suitable summer roost trees within and adjacent to the impact area for Indiana bats.
Disturbance (noise, vibrations, and dust)	Increased noise, vibrations, and dust created by construction equipment within the proposed CHPE Project area could disturb protected species in nearby forests. However, the areas impacted are railroad and road ROWs subject to disturbances from trains and industrial activities. The wildlife that occurs in the area is generally habituated to noise and regular disturbance.
Magnetic fields and heat	Some protected species would detect the magnetic field and heat generated by the transmission line during operations; however, there is no evidence to suggest that such projected for the proposed CHPE Project transmission line would result in any effects, or that these effects would be adverse. Buried cables, such as those proposed for the CHPE Project, would have no electric fields at the ground surface and the constant magnetic field (less than 162 mG at the surface above the transmission line) would decrease substantially within 50 feet (3 meters) from the transmission line centerline. As such, the predicted magnetic field and heat associated with the transmission line would not result in any adverse effects on the health, behavior, or productivity of animals.

Sources: CHPEI 2012e, NMFS 2013a, WHO 2012

5.1 Shortnose Sturgeon and Atlantic Sturgeon

Based on the analysis in this section, and the discussion of cumulative effects presented in Section 6, DOE has concluded that any effects on the shortnose sturgeon and Atlantic sturgeon would be insignificant or discountable, and that the proposed CHPE Project may affect, but is not likely to adversely affect, those species (see Table 5-2).

Table 5-2. Determination of Effect under the ESA for Federally Listed Aquatic Species in the Proposed CHPE Project Area

Common Name	Scientific Name	ESA Status	Determination of Effect
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	T	May affect, but not likely to adversely affect
Atlantic sturgeon	<i>Acipenser oxyrinchus oxyrinchus</i>	T ¹ , E ^{2,3,4,5}	May affect, but not likely to adversely affect

Table Key: E = Federally listed as endangered; T = Federally listed as threatened.

Notes:

1. Gulf of Maine DPS.
2. New York Bight DPS.
3. Chesapeake Bay DPS.
4. Carolina DPS.
5. South Atlantic DPS.

Construction Impacts

As described below, sediment disturbance, temporary increases in turbidity and associated water quality degradation, sediment redeposition, noise and vibration, vessel strikes, and accidental release of hazardous materials would have an insignificant effect on shortnose and Atlantic sturgeon.

The Applicant consulted with NYSDEC, NYSDOS, and NMFS to identify construction windows that avoid periods when sensitive species would use different areas of the Hudson River. Table 2-2 illustrates the life history stages of shortnose and Atlantic sturgeon that would be avoided based on the construction windows.

The construction window is from August 1 to September 14 for the area between Catskill (MP 228) and Kingston Point (MP 245) and from September 14 through October 15 for the area between Kingston Point (MP 245) and New Hamburg (MP 269). Shortnose sturgeon spawning is expected to be complete by the end of May and eggs and larvae are not expected to occur in the area by the end of June. Atlantic sturgeon are expected to spawn in the area from May through July between Kingston Point and New Hamburg. Atlantic sturgeon larvae are expected to be in this area through August. As such, spawning adults, eggs, and larvae of Atlantic sturgeon would be avoided. In the mid-summer the largest numbers of juvenile shortnose sturgeon are expected to occur in the mid-river regions and would be avoided by this construction window. This construction window would avoid most of the time period when early juvenile Atlantic sturgeon are expected to occur from Kingston through Peekskill from July through September.

The construction window is September 15 to November 30 for the area from New Hamburg to Verplanck (MP 295). Shortnose sturgeon spawning is expected to be complete by May and eggs and larvae are expected to be absent by June. Atlantic sturgeon spawning is expected to be finished in this area by the end of July and sturgeon eggs and larvae are expected to be absent by the end of August. By the fall, juvenile shortnose sturgeon are expected to occupy Haverstraw Bay, which is being avoided by

1 construction (Bain 1997). The transmission line avoids Haverstraw Bay, which is an important nursery
2 area and overwintering area for shortnose and Atlantic sturgeon. The construction window is July 1 to
3 October 31 for the area from Clarkstown (MP 303) to the Harlem River (MP 324). Adult shortnose and
4 Atlantic sturgeon could transit through this area during this construction window.

5 Both Atlantic sturgeon and shortnose sturgeon larvae and YOY juveniles must remain upstream of the
6 salt wedge because of their low salinity tolerance. This was the basis for concluding that both shortnose
7 and Atlantic sturgeon larvae (YOY) entrainment was very unlikely to occur at the Indian Point Nuclear
8 Generating Station (units 2 and 3) located near MP 293 because the position of the salt front is upstream
9 of the plant (NMFS 2013b). During the 2011 and 2012 Hudson River Estuary Monitoring Program, the
10 salt front location during September through November was generally in the Tappan Zee to West Point
11 reach, and no YOY sturgeon were captured downstream of MP 286 near West Point (ASA 2012, 2013);
12 therefore jet plow encounters with YOY sturgeon south of approximately MP 286 would be unlikely due
13 to the salt front position during the transmission line construction window.

14 The Applicant has proposed that the transmission line would enter the Hudson River in Catskill, New
15 York, bypassing the Inbocht Bay and Duck Cove SCFWHs. The line would exit the Hudson River north
16 of Haverstraw Bay, in Stony Point, New York, to avoid the high-value Haverstraw Bay SCFWH. These
17 SCFWHs were included in “exclusion zones” of highly sensitive areas identified by NYSDEC and
18 avoided by the proposed CHPE Project transmission line. The route also avoids traversing 18 of the 22
19 SCFWHs in the Hudson River.

20 *Sturgeon Swimming Capabilities.* While avoiding most SCFWHs and restricting construction activities to
21 the specific construction windows provided in **Table 2-2** protects spawning adults, eggs, and larvae from
22 April through August, installation activities could occur where juveniles are expected to occur. However,
23 juveniles are expected to be able to avoid the jet plow.

24 Even though juvenile sturgeon might occur in the construction area during the construction window, the
25 potential for an interaction with the jet plow is expected to be discountable. Juvenile sturgeon are not
26 expected to be entrained by the jet plow because the water intake would be located near the surface of the
27 water column and attached to a construction barge or other vessel. As the early life stages for benthic and
28 demersal fish, such as Atlantic and shortnose sturgeon, are generally near the river bottom, the risks of
29 entrainment of these species is anticipated to be minimal. This is especially true for sturgeon as winter
30 approaches, and they move toward and congregate in deep holes during October and November (ASMFC
31 2012). Given the location of the intake near the water surface and the fact that egg and larval forms of
32 sturgeon have matured into mobile juvenile life stages by the middle of September, jet plow impingement
33 or entrainment is not expected to occur.

34 Furthermore, juvenile sturgeon are expected to have the ability to avoid the jet plow, which is related to
35 their swimming ability. Installation of the transmission line via jet plow will proceed at rate of 1 to
36 3 miles (1.6 to 4.8 km) per day. At this pace, the jet plow is moving at a rate of 0.06 to 0.2 feet/second
37 (less than 6 cm/second). YOY sturgeon would need to be capable of swimming at speeds greater than 0.2
38 feet/second (6 cm/second) to avoid the jet plow. By September, juvenile shortnose and Atlantic sturgeon
39 can range from 3.9 inches (10 cm) in length to as large as 11.7 inches (30 cm). Sturgeon demonstrated
40 their ability to avoid intake speeds of 1.0 foot/second (30 cm/second) at Indian Point intake (5 times the
41 maximum jet plow speed). Based on Deslauriers and Kieffer (2012), sturgeon should be able to attain
42 swimming speeds of 1.5 times their body length per second. A 3.9-inch (10-cm) sturgeon is capable of
43 swimming approximately 0.5 feet/second (15 cm/second). Therefore, during the September through
44 November period, Entergy (2012) concluded from this analysis and other supporting data that sturgeon
45 7.5 inches (19 cm) or larger could out-swim a 1.0 foot/second (30 cm/second) velocity intake, and a
46 sturgeon of 5.9 inches (15 cm) or larger could outswim a 0.6 feet/second (18 cm/second) velocity intake.

1 In its Biological Opinion for Indian Point, NMFS (2013b) reviewed swimming speed analyses by Kynard
2 et al. (2005), Boysen and Hoover (2009), Hoover et al. (2011), Deslauriers and Kiefer (2012), and
3 Entergy (2012) to conclude that yearling sturgeon and older could escape intake velocities of
4 1.0 foot/second (30 cm/second), which is more than 5.0 times the fastest expected jet plow speed. In its
5 analysis, NMFS (2013) noted that even smaller white sturgeon juveniles (3.1 to 3.5 inches [8 to 9 cm])
6 exhibited the ability to swim at speeds in the range of 1.3 to 1.5 feet/second (39 to 45 cm/second), as
7 demonstrated in studies by Boysen and Hoover (2009) to assess the ability of small white sturgeon to
8 avoid hydraulic dredge flow fields. Using more likely scenarios of larger sturgeon and slower jet plow
9 speeds it is clear that sturgeon would avoid jet plow installation in the September through November
10 construction window.

11 *Benthic Surveys.* The Applicant has agreed to a series of pre- and post-installation compliance monitoring
12 studies in the aquatic portions of the transmission line route, including benthic and sediment monitoring,
13 bathymetry and sediment temperature studies, and magnetic field surveys (NYSPSC 2013). The
14 Applicant has also proposed Atlantic sturgeon pre-installation and post-energizing hydrophone surveys in
15 the Hudson River. In addition, transmission line installation and burial in the Hudson and Harlem rivers
16 would temporarily disturb or alter the sediment and bottom substrates. The bulk of the sediment
17 disturbed would resettle in the trench created by the jet plow, and natural processes that control scour and
18 deposition would be expected to re-establish the original bottom contours along the transmission line
19 route. Post-installation bathymetric surveys would be used to monitor recovery of the bottom substrate.
20 The energized transmission cables would also have the potential to impact magnetic fields in the vicinity
21 of the cable and dissipate heat to the surrounding substrate. Monitoring would provide the measurement
22 of the magnetic field and sediment temperature for comparison with modeling predictions and conditions
23 prior to cable operation. Benthic recovery and recolonization of impacted areas along the installation
24 route would be expected to begin to occur within months after construction activities have ceased.
25 Additional details on the pre- and post-installation environmental surveys are provided in **Section 2.5**.

26 Analyses of impacts on sturgeon for each phase or type of construction activity that could result in
27 impacts: sediment disturbance, turbidity, contaminated sediments, concrete mats, noise, blasting, vessel
28 strikes, and accidental spills, are presented below.

29 *Sediment Disturbance*

30 Debris removal would occur in the fall preceding installation activities the next year. During the initial
31 phase of debris removal, the riverbed would be disturbed less than during installation activities. If plow
32 pre-rip is also required and the jet plow is used, impacts would be similar to water jetting, with a similar
33 or smaller impact corridor. Depending on the debris found, it is expected that the total riverbed area
34 disturbed would be a maximum of 15 feet (5 meters) wide along the 94-mile (151-km) portion of the
35 transmission line corridor in the Hudson and Harlem rivers, for a maximum total of 171 acres
36 (69 hectares). Along most of the route, it is likely that little or no large debris would be found and the
37 disturbance would be limited to the 3-foot (0.9-meter) grapnel penetration, which would be much
38 narrower than 15 feet (4.5 meters). Assuming a disturbance width of 5 feet (1.5 meters), this equates to
39 57 acres (23 hectares). This would all occur within the area to be disturbed by actual transmission line
40 installation within the following year.

41 Installation of the proposed aquatic transmission line would result in up to 569 acres (230 hectares) of
42 riverbed disturbance in the Hudson and Harlem rivers, which is approximately 0.9 percent of the total
43 surface area of the Hudson River (533 acres [216 hectares]) and 10 percent of the total surface area of the
44 Harlem River (36 acres [15 hectares]) rivers in the vicinity of the proposed CHPE Project. This
45 represents the acreage within a 50-foot construction corridor along the transmission line route and
46 includes trenching and the adjacent area where a substantial majority of sediment from the trench would

1 settle. For the Hudson River Segment, the depth of the transmission line trench would be approximately
2 7 feet (2.1 meters) with 1 foot (0.3 meters) or less of horizontal separation between the two cables, which
3 would be collocated in the same trench. The transmission line would be buried 8 feet (2.4 meters) in
4 sediment in the Harlem River. The primary installation method in the Hudson River Segment is proposed
5 to be water jetting technology, which has been shown to minimize impacts on marine habitat and
6 excessive dispersion of bottom sediments relative to dredging activities. The bottom area directly
7 disturbed by water jetting or mechanical plowing varies, depending upon sediments and depth of
8 installation, but would range from 12 to 16 feet (3.6 to 4.9 meters) in width. Water jetting for the
9 proposed CHPE Project is anticipated to create sediment plumes that would be short-lived and remain
10 fairly close to their source.

11 Barge positioning, anchoring, anchor cable sweep, and the pontoons on the jet plow could result in
12 additional sediment disturbance. Vessel positioning and anchorage during installation of the transmission
13 line can be used in the event that bottom conditions are encountered that either stop forward progress at
14 reasonable tow tension or result in excessive rolling or pitching of the jet plow. In such a case, the barge
15 would be stopped, anchors deployed to hold the barge in position, and obstructions investigated and
16 remedied. Anchors would also be employed during idle periods due to weather conditions. Open water
17 anchorages are not envisioned as a common event. Areas where anchorage is also anticipated include
18 construction of the four temporary water-to-land transition cofferdams, where cable is spliced, and
19 possibly along the 460-foot length of bedrock trenching in the Harlem River (MP 324.5). The collective
20 length of all work areas where anchors may be deployed and potentially result in impacts on benthic
21 habitat is projected to be less than 1 percent of the approximately 197-mile (317-km) marine portion of
22 the installation route. Once stabilized following deployment, the anchors would have a total impact area
23 of approximately 15 square feet (1.4 square meters) per deployment. Spud anchors would be used during
24 the installation of the cofferdam and cable landing at the water-to-land transition. Each barge would
25 include two spud anchors with 3-foot (0.9-meter) diameters. Anchors also require approximately 200
26 square feet (18 square meters) (20 feet [6 meters] by 10 feet [3 meters]) to dig in and stabilize. For four
27 anchors, that is a total of 800 square feet (72 square meters) or 0.02 acres (0.01 hectare). Midline buoys
28 would be used to prevent anchor chain sweeps that might otherwise affect benthic habitat. Therefore, the
29 total benthic habitat area of Hudson and Harlem rivers affected by anchorage during cable installation
30 would be small, and the impacts would be temporary and non-significant.

31 Riverbed disturbance would also include the redeposition of suspended sediment. The estimated
32 thickness of the sediment as it settles back to the riverbed would not be expected to exceed 0.4 inches
33 (10 millimeters). Over the 94 miles (151 km) of the Hudson and Harlem rivers that would be plowed
34 during installation of the transmission line, approximately 32 acres (13 hectares) would accumulate
35 0.2 inches (5 millimeters) or greater increase in sediment depth. The majority of the sediment
36 redeposition would occur in the 569-acre (230-hectare) area that would be disturbed by the jet plow
37 (CHPEI 2014b). The effects of increased sedimentation on fish could include reduced water quality,
38 reduced ability to locate food, decreased gas exchange, toxicity to aerobic species, reduced light intensity
39 in the water column, physical abrasion, and smothering of benthic and demersal species present at the
40 time of the activity (Wilber et al. 2005). Additionally, some fish species, such as shortnose and Atlantic
41 sturgeon, deposit demersal eggs that remain on the bottom until larval hatching; some of these eggs, if
42 present, could be smothered as well. Redeposition of sediments causes larval mortality by clogging gill
43 tissues and through gill abrasion (Reine et al. 1998). For example, previous experiments have shown that
44 a viable hatch of winter flounder eggs is reduced when the eggs are buried by as little as one half of one
45 egg diameter, approximately 0.02 inches (0.5 millimeters) of sediment (Berry et al. 2003, USFWS 2002).
46 However, in areas where deposition of suspended sediments could impact demersal fish eggs, and larvae,
47 the Applicant has proposed to avoid construction during the early spring via the use of construction
48 windows (see **Table 2-2**), which would avoid or minimize the potential impacts associated with
49 sediments covering these eggs. Additionally, the total area that would be impacted by 0.2 to 0.4 inches

1 (5 to 10 millimeters) of sediment redeposition in the lower Hudson River is approximately 32 acres
2 (13 hectares), representing approximately 6 percent of the total area of disturbance for the transmission
3 line installation in the Hudson River. As such, the impact of redeposition would be insignificant
4 compared to the impact of sediment disturbance from jet plowing.

5 The impacts of sedimentation on benthic invertebrates could include smothering, toxicity from exposure
6 to anaerobic sediments, reduction of filtering rates, toxicity from exposure to anaerobic sediments,
7 reduced light intensity, and physical abrasion (Berry et al. 2003). Redeposition of sediments could also
8 change the bottom composition of the riverbed if existing coarser grains lie on top of finer grains. The
9 layering could be reversed after sediments are disturbed because finer grains take longer to settle out of
10 the water column. Such a change would affect the species composition of the benthic community, and
11 locally would be composed of those that could thrive in this sediment. Mobile species that prefer coarser
12 sediment grains would likely relocate to areas with coarser grains. Sessile (immobile) species would
13 likely die off locally if they could not adapt to the new sediment conditions (Germano and Cary 2005).
14 However, this effect is expected to be localized and the affected area would be minimal relative to the
15 available habitat.

16 The proposed CHPE Project would have temporary localized effects on the following SCFHWs in the
17 Hudson and Harlem rivers (**Attachment 1** provides a mapbook of the SCFHWs and other resources along
18 the transmission line route):

- 19 • Esopus Estuary (MPs 234 to 235)
- 20 • Kingston-Poughkeepsie Deepwater Habitat (MPs 245 to 267 and MPs 268 to 270)
- 21 • Hudson Highlands (MPs 276 to 295)
- 22 • Lower Hudson Reach (MPs 317 to MP 325).

23 The Kingston-Poughkeepsie Deepwater Habitat SCFHW provides wintering habitat for shortnose
24 sturgeon and Atlantic sturgeon. Both Atlantic and shortnose sturgeon are found in the Esopus Estuary
25 SCFHW in the waters north and south of the Esopus Creek mouth. Construction and the temporary
26 impacts would occur August 1 through October 1 and would avoid impacts on sturgeon at these two
27 SCFHWs. The adjacent deepwater area of the Hudson River serves as post-spawning and wintering
28 habitat for shortnose sturgeon. The deep areas of the Hudson Highlands SCFHW are used as migrational
29 routes by Atlantic sturgeon and shortnose sturgeon and are important nursery areas and summering areas
30 for juvenile Atlantic sturgeon and summering areas for post-spawn adults. Construction and the
31 temporary impacts would occur September 15 through November 30 and impacts would largely be
32 avoided on sturgeon at this SCFHW. The Lower Hudson Reach SCFHW is used by adult Atlantic
33 sturgeon and shortnose sturgeon during migration. Transmission line installation activities would avoid
34 the Haverstraw Bay SCFHW, which is a major nursery and overwintering area for Atlantic sturgeon.
35 Shortnose sturgeon also overwinter in the Haverstraw Bay SCFHW. In recognizing the importance of
36 Haverstraw Bay and its SCFHW as important habitat for fish nurseries (including for shortnose and
37 Atlantic sturgeon), the Applicant has proposed an approximately 8-mile (13-km) overland bypass of
38 Haverstraw Bay through the Town of Stony Point, Town and Village of Haverstraw, and the Town of
39 Clarkstown.

40 *Impacts on Sturgeon Spawning Habitat.* Sediment disturbances from jet plowing, anchoring, cofferdam
41 construction, dredging, and sediment redeposition, as described, would primarily disturb soft benthic
42 sediments, including silts, clays, and sands. There could be some areas with mixed sand and gravel or silt
43 and clay with cobbles, or shell hash mixed with silt and clay, although these areas are not expected to be
44 common. During the marine survey conducted by the Applicant in 2010, only two sediment cores in the
45 Hudson River contained cobble or gravel in surficial sediments, located at approximate MP 234 in
46 shortnose sturgeon spawning habitat (CHPEI 2012g). As such, physical impacts on sturgeon habitat from

1 sediment disturbance are expected to be negligible. Because cobble and gravel are not common within
2 the transmission line route and rock outcroppings would be avoided wherever possible, the effects on
3 sturgeon spawning habitat are expected to be negligible. Pre-installation hydrographic surveys would be
4 conducted prior to debris removal would provide additional information on the sediments being disturbed.
5 Upon completion of in-water activities in a given area, estuarine depositional processes would, over time,
6 return the benthic habitat to its pre-construction condition. The temporary disturbance of an area would
7 represent a minor fraction of similar adjacent habitat in the Hudson River, and for these reasons, impacts
8 on sturgeon spawning habitat from sediment disturbance are expected to be insignificant.

9 *Impacts on Sturgeon Prey.* Sediment disturbances from jet plowing, anchoring, cofferdam construction,
10 dredging, and sediment redeposition would result in a short-term loss of benthic organisms and shellfish
11 that serve as forage for Atlantic and shortnose sturgeon. These impacts result from crushing, killing, or
12 displacing benthic organisms. The temporary sediment disturbance in benthic habitat which supports
13 benthic prey items for shortnose and Atlantic sturgeon would remain usable as potential shortnose and
14 Atlantic sturgeon foraging habitat. Temporary and localized reductions in available benthic food sources
15 are anticipated, since some mortality of benthic infaunal organisms that serve as prey for shortnose and
16 Atlantic sturgeon would occur. The majority of these impacts would occur within the 50-foot (15-meter)
17 project corridor as a result of jet plowing. Mortality of invertebrates is expected to be greatest within the
18 2-foot (0.6-meter) wide trench, but could also occur to either side of the trench, particularly near the
19 trench where greater concentrations of sediment are expected to settle. The temporary disturbance of an
20 area would represent a minor fraction of similar adjacent habitat in the Hudson River. Only a small
21 portion (0.9 percent of the Hudson River and 10 percent of the Harlem River in the vicinity of the
22 proposed CHPE Project) of sturgeon feeding habitat would be affected by sediment disturbance
23 associated with the transmission line.

24 Benthic communities in the Hudson River are already adapted to human disturbances and other impacts
25 such as degraded water quality, dredging, shoreline hardening, and invasive species. Upon completion of
26 in-water activities in a given area, estuarine depositional processes would, over time, return the benthic
27 habitat to its pre-construction condition. Functional communities would be expected to recolonize these
28 areas over time. Complete recovery times for the benthic communities vary from several months to
29 several years depending on the community composition and severity and frequency of disturbance
30 (Newell et al. 2004, Carter et al. 2008). Recovery rates of benthic macroinvertebrate communities
31 following dredging range from a few weeks or months to a few years, depending upon the type of bottom
32 material, the physical characteristics of the environment, and the timing of disturbance (Hirsch et al.
33 1978, LaSalle et al. 1991). In a 2-year study in the lower Hudson River, Bain et al. (2006) (as cited in
34 NMFS 2014) reported that within a few months following dredging, the fish and benthic communities at a
35 dredged location were no different from seven nearby sites that had not been dredged, and that there were
36 no indications of a lasting effect at the dredged site.

37 Because the habitat disturbance would affect a relatively small amount of the river, and because of the
38 temporary nature of the disturbance, installation of the transmission line is expected to result in negligible
39 reductions in benthic shellfish and infaunal organisms that serve as prey for shortnose and Atlantic
40 sturgeon. As such, impacts on benthic resources which serve as sturgeon prey from sediment disturbance
41 are expected to be insignificant.

42 ***Turbidity***

43 Impacts from debris removal and transmission line installation, including anchor impacts, in the Hudson
44 River, would include localized increases in turbidity and associated water quality degradation,
45 downstream sediment resuspension during cable installation. However, the Hudson River already
46 typically experiences periods of naturally occurring increases in suspended sediments from storm events.

1 During jet plowing, approximately 70 to 80 percent of the disturbed sediment would be expected to
2 remain within the limits of the trench under limited water movement conditions (depending on particle
3 size), with 20 to 30 percent of suspended sediment traveling outside the footprint of the area directly
4 impacted by the cable plow (HTP 2008). Smaller sediment particles would remain suspended longer, and
5 thus be transported farther from the original site of deposition. The extent of the turbidity plume
6 generated would depend on the amount of sediment disturbed, the grain size, and the mass of the
7 disturbed sediment particles, along with construction methods and ambient riverine conditions. Sediment
8 concentrations in the plume can be initially high, and rapidly decrease with distance.

9 Water quality modeling indicates that, on average, the initial sediment plume would be approximately
10 1 mile (1.6 km) long and 500 feet (152 meters) wide (an area of about 60 acres [24 hectares]). The
11 maximum suspended sediment concentrations would range from 80 to 200 milligrams per liter (mg/L)
12 above background (depending on sediment properties) in the water column immediately above the
13 sediment bed where the jet plow would be operating. The plume concentrations would be highest near
14 the river bottom. At the surface, concentrations would be approximately one-tenth of the bottom values.
15 The discernible plume width at the bottom would be approximately 500 feet (152 meters) wide. Because
16 maximum concentrations are expected to be 200 mg/L, installation is not expected to exceed 200 mg/L
17 above background at the edge of the 500-foot (152-meter) mixing zone, as required by the CWA Section
18 401 Water Quality Certification issued for the proposed CHPE Project (NYSDPS 2013). At
19 approximately 4,500 feet (1,372 meters) downstream, which is near the edge of the discernible plume, the
20 maximum concentration would be 10 mg/L above background condition and by approximately 1 mile
21 (1.6 km) downstream the concentrations would be back to background.

22 TSS levels would be approximately 15 mg/L or less at 9 hours following installation, based on the
23 assumption of 24-hour-per-day installation operations. However, if installation activities cease for longer
24 than 2 hours, the plume would dissipate before operations would be restarted. Plumes would be
25 continually affected by tidal action; over the course of a tidal cycle, they would reverse direction.

26 Reduced jetting speeds (e.g., less than 4 knots) would be used to reduce turbidity when crossing sensitive
27 areas such as SCFWHs. The most appropriate speeds would be coordinated with the construction
28 contractor. The construction contractor would consider existing sediment conditions, cable weight, and
29 multiple other factors to arrive at an installation speed that allows for a reduction in impacts and safe and
30 efficient cable installation. Reductions in TSS would be calculated after the installation specifications
31 have been set as part of the construction design. Furthermore, the transmission line is routed on land to
32 avoid the Haverstraw Bay SCFWH, which provides valuable habitat nursery and overwintering habitat for
33 shortnose and Atlantic sturgeon. The Applicant has proposed that commencement of in-river work
34 immediately outside the Haverstraw Bay SCFWH would occur during the high, or flood, tide condition to
35 avoid or minimize impacts of resuspended sediments in Haverstraw Bay, which contains important
36 habitat for ESA-listed fish species.

37 Transmission line installation would avoid 18 of 22 SCFWHs in the Hudson and Harlem rivers in the
38 proposed CHPE Project area. As described, the maximum concentrations of TSS as a result of jet
39 plowing are expected to reach 200 mg/L and the discernible turbidity plume is expected to have
40 temporary and localized impacts on water quality. The effects would be further minimized within the
41 SCFWHs because the Applicant is proposing measures to reduce turbidity in SCFWHs by reducing
42 jetting speed and jetting pressure. Additionally, turbidity plumes are not expected to extend over long
43 distances and are not expected to result in any type of barriers to fish movement in any area of the river
44 and more specifically in SCFWHs because of these measures. Cable installation could temporarily
45 disturb the substrate within the Hudson River; however, this disturbance is expected to occur over a short
46 time period in any one location given the speed at which water jetting occurs and would be localized to
47 the immediate area of the water jetting device or conventional dredge trenching operations (see the more

1 detailed discussion under *Sediment Disturbance*). With the exception of areas that would require
2 installation of concrete mats or rip-rap to cover portions of the transmission line that cannot be buried
3 (e.g., on bedrock or when crossing over existing utility lines) (see *Use of Concrete Mats to Cover the*
4 *Transmission Line* subsection below), no losses of habitat or permanent impacts are expected from cable
5 installation.

6 Turbidity associated with anchors and the installation of sheet pile is expected to be similar. Turbidity
7 levels during these activities would be expected to be less than 50 mg/L above background, diminishing
8 to 5 to 10 mg/L above background within a few hundred feet (NMFS 2014).

9 An environmental bucket, a variation of the conventional clamshell dredge bucket that has been
10 developed to limit spillage and leakage of dredged material, would be used for the dredging associated
11 with the cofferdams. The enclosed dredge bucket features covers designed to prevent material from
12 spilling out of the bucket while it is raised through the water column. The design also employs rubber
13 gaskets or tongue-in-groove joints that reduce leakage through the bottom of the closed bucket.
14 Environmental buckets were used for the two dredges used for 91 days of dredging associated with the
15 Tappan Zee Bridge construction. None of the TSS samples at the 500-foot (152-meter) mixing zone were
16 more than 200 mg/L over background conditions and more than 90 percent of the TSS samples were less
17 than 100 mg/L over background (TZC 2014). There were also no observations of turbidity resulting in
18 substantial visible contrasts from ambient conditions to the Hudson River outside of the 500-foot
19 (152-meter) mixing zone from dredging. However, sediment properties are site-specific variables that
20 cannot be controlled. In general, fine-grained, less-cohesive sediments have the greatest potential for
21 resuspension and would travel farther before resettling to the bottom. The goal would be to eliminate or
22 minimize to the greatest extent practical sediment resuspension during clamshell dredging. The Applicant
23 proposes to achieve this goal by limiting the amount of dredging to only three small cofferdam locations,
24 dredging only inside the cofferdam, positioning the receiving barge as close to the dredging site as
25 possible to minimize dripping into open water, and using well-trained and experienced dredge operators
26 as smooth and controlled hoisting can limit resuspension during clamshell dredging.

27 The Applicant has developed and would implement a Water Quality Monitoring Plan for the installation
28 of the proposed CHPE Project transmission line. If TSS concentrations exceed 200 mg/L beyond the
29 500-foot (152-meter) mixing zone, the Applicant would employ one or more of the following measures:
30 changing the rate of advancement of the jet plow, modifying hydraulic pressures, or implementing other
31 reasonable operational controls to reduce suspended sediments.

32 *Impacts on Sturgeon.* As described, the sediment plume is expected to be relatively localized given the
33 depth and width of the Hudson River (i.e., it is not expected to consume the entire river). While the
34 plume is 500 feet (152 meters) wide (defined at the edges by TSS concentrations of 15 mg/L above
35 background), maximum concentrations would range from 80 to 200 mg/L above background only in the
36 water column immediately above the sediment bed where the jet plow would be operating. Based on the
37 localized and temporary nature of any sediment suspension (i.e., the plume would persist for 9 hours,
38 given 24-hour per day installation operations), no hindrance of sturgeon movements is expected during
39 underwater cable installation. Turbidity associated with anchors, installation of sheet pile, and dredging,
40 is expected to be less.

41 The sensitivity of fish to suspended sediment is species- and life-stage-specific, and depends on abiotic
42 factors of the sediment, sediment concentration, and duration of exposure. Common impacts on fishes
43 can be classified as biological/physiological or behavioral. Biological/physiological impacts include
44 abrasion of gill membranes resulting in a reduction in the ability to absorb oxygen, decrease in dissolved
45 oxygen concentrations in the surrounding waters, and effects on growth rate. Behavioral responses by
46 fishes to increased suspended sediment concentrations include impairment of feeding, impaired ability to

1 locate predators, and reduced breeding activity. Fish larvae are more sensitive to suspended sediments
2 than eggs, juveniles, or adult fish (Berry et al. 2003). Adult and juvenile fish might leave the area to
3 avoid an increase in turbidity. Fish, however, are mobile and generally avoid unsuitable conditions in
4 water, such as large increases in suspended sediment and noise (Clarke and Wilber 2000). Juvenile and
5 adult shortnose and Atlantic sturgeon are highly mobile and would be able to move into adjacent areas
6 away from construction-related activities (as described under *Sturgeon Swimming Capabilities*).

7 Shortnose and Atlantic sturgeon are found in turbid waters (Dadswell et al. 1984) and feed on benthic
8 invertebrates and are, therefore, tolerant of suspended sediment at the levels that are temporarily
9 generated by marine construction activities (NMFS 2013a). NMFS concluded that the effect of
10 suspended sediment concentrations in the range of 10 to 350 mg/L from construction activities for a
11 marina project in the Haverstraw Bay region would not be significant to shortnose sturgeon. It is
12 anticipated that the impact of suspended sediment would be similarly insignificant for the closely related
13 Atlantic sturgeon. Citing the literature, NMFS indicated that the concentrations of total suspended
14 sediments that would be expected to show adverse impacts on fish would be 580.0 mg/L for the most
15 sensitive species, with 1,000 mg/L being more typical (FHWA 2012). Given that water jetting and other
16 activities associated with installation of the CHPE transmission line would result in suspended sediment
17 levels of less than 200 mg/L, impacts on sturgeon are expected to be negligible.

18 Furthermore, increases in turbidity associated with jet plowing, cofferdam installation, and anchoring
19 would be temporary and would occur outside of spawning season. As such, temporary increases in
20 turbidity are expected to have no effect on sturgeon spawning habitat. Temporary increases in turbidity
21 could occur when juvenile sturgeon occur in the Hudson River from Kingston to Peekskill. As described,
22 juvenile sturgeon are expected to be able to outswim the jet plowing operations. Any effects of behavior
23 modification and habitat avoidance would be insignificant because increased turbidity would be very
24 temporary and because there would be a substantial amount of other, non-affected habitat that could be
25 used by these highly mobile species.

26 *Impacts on Sturgeon Prey.* Increased turbidity could reduce light levels in aquatic habitats and
27 temporarily impact water pH and reduced dissolved oxygen levels. The aquatic habitats directly affected
28 by cable installation would primarily be confined to the footprint of the jet and shear plows. Reductions
29 in benthic infaunal organisms that serve as prey for shortnose and Atlantic sturgeon would occur
30 associated with the turbidity plume. However, the greatest effects on benthic organisms would be from
31 the direct effects of sediment disturbance associated with jet plowing. See *Sediment Disturbance* (above)
32 for a discussion of impacts on benthic organisms associated with disturbance of the riverbed from jet
33 plow operations. The impacts associated with the turbidity plume would be temporary (occurring for up
34 to approximately 9 hours at a given point while the jet plow is in operation). The maximum turbidity
35 concentrations would be limited to the 50-foot (15-meter)-wide active construction corridor where
36 sediment disturbance would be greatest and the area immediately around and approximately 500 feet
37 (152 meters) downstream of the active transmission line installation work zone (where the Applicant is
38 required to monitor TSS levels), depending on currents and tides. The NYSPSC Certificate for the
39 proposed CHPE Project requires that a water quality monitoring plan be carried out as part of pre-
40 installation trials of the jet plows, and that suspended sediment levels be monitored during transmission
41 line installation to ensure that the 200 mg/L suspended sediment guideline is not exceeded within 500 feet
42 (152 meters) of the installation operation (NYSPSC 2013). Because benthic organisms are adapted to the
43 harsh and turbid conditions of the Hudson River and because the persistence of the turbidity plume would
44 be temporary, impacts on sturgeon and their prey associated with turbidity would be negligible.

45

1 ***Contaminated Sediments***

2 Contaminants that occur in the sediments could be mobilized and become bioavailable as a result of
3 sediment disturbance during installation of the transmission line. If contaminated sediments became
4 bioavailable or biotransferred within food chains, impacts might occur, such as behavioral alterations,
5 deformities, reduced growth, reduced fecundity, reduced egg viability, and reduced survival of larval fish
6 (Sindermann 1994). Several characteristics of shortnose and Atlantic sturgeon (e.g., long lifespan,
7 extended residence in estuarine habitats, benthic predation) predispose the species to long-term and
8 repeated exposure to environmental contamination and potential bioaccumulation of heavy metals and
9 other toxicants (Dadswell et al. 1984). However, as discussed below, water quality modeling predicted
10 that no exceedances of Section 401 certificate water quality standards would occur. Water quality
11 sampling and monitoring would be conducted during jet plow and shear plow pre-installation trials and
12 during cable installation. Contaminants modeled in the upper Hudson River were arsenic, cadmium,
13 mercury, benz(a)anthracene, pyrene, 4,4-DDE, copper, lead, phenanthrene, and PCBs. Contaminants
14 modeled in the lower Hudson River were 4,4-DDE, copper, lead, phenanthrene, PCB, naphthalene,
15 fluorine, nickel, dioxin, and acenaphthene.

16 To avoid the area associated with the Upper Hudson River PCB Dredging Project and the sensitive
17 habitats found in the upper portion of the Lower Hudson River, the transmission cables would be buried
18 in railroad ROWs from south of Lake Champlain to Catskill, New York. Bypassing this portion of the
19 Hudson River would avoid resuspending sediments with high levels of PCBs, thereby avoiding or
20 minimizing the potential for bioavailability to fish. Water quality modeling for the proposed transmission
21 cable installation indicates that concentrations of PCBs would not exceed the water quality standards
22 required by the Section 401 Water Quality Certificate of 0.09 micrograms per liter ($\mu\text{g/L}$) from MP 228.5
23 to MP 272.3 and 0.2 $\mu\text{g/L}$ per aroclor from MP 272.3 to MP 330 (NYS DPS 2013). Water quality
24 modeling also indicates that the chronic exposure standards for PCBs (0.5 $\mu\text{g/L}$) established by the
25 USEPA and New York State would not be exceeded (NYS DPS 2013). These standards have been
26 established to account for long-term, chronic exposures of aquatic life to PCBs. Since the proposed
27 CHPE Project involves short-term construction activities, the more relevant guideline for assessing PCB
28 concentrations would be the Engineering Performance Standard set by the USEPA for dredging
29 resuspension at the Hudson River PCBs Superfund Site. Following these guidelines, it is expected that
30 PCB concentration increases from resuspension of sediments would be well below the performance
31 standard. No other state water quality standards would be exceeded as a result of transmission line
32 installation activities (CHPEI 2012e, USEPA 2012a).

33 Impacts from the resuspension of contaminated sediments on sturgeon and sturgeon prey are expected to
34 be insignificant. The Section 401 Water Quality Certification water quality standards are not expected to
35 be exceeded. Water quality sampling and monitoring would be conducted during jet plow pre-installation
36 trials and during cable installation. If water quality certificate standards are exceeded, additional water
37 quality sampling would take place at the location of the exceedance.

38 ***Use of Concrete Mats to Cover the Transmission Line***

39 Installation of transmission lines via jet plowing might not be feasible in areas of exposed bedrock and
40 over existing submerged lines in the Hudson River Segment. In such areas, concrete mats or rip-rap
41 would be installed to help protect the transmission line. Concrete mat coverage would be small relative to
42 the total available habitat for ESA-listed fish species in the Hudson and Harlem rivers. Approximately
43 1.8 miles (2.9 km) and 1.7 acres (0.7 hectares) of concrete mats would be installed in the 88-mile
44 (142-km) aquatic portion of the project route in the Hudson River. Approximately 0.6 miles (1.0 km) and
45 0.6 acres (0.2 hectares) of concrete mats would be installed in the 6-mile (10-km) aquatic portion in the
46 Harlem River. This represents approximately 2.5 percent of the aquatic portion of the entire aquatic

1 | portion of the transmission line route in the Harlem and Hudson rivers and approximately 0.4 percent of
2 | the total area of disturbance for the aquatic portion of the transmission line in the Hudson and Harlem
3 | rivers. Of the total to be installed in the Hudson River, approximately 1.0 mile (1.6 km) and 1.0 acre
4 | (0.4 hectares) of concrete mats would be installed as protective covering for the transmission line in
5 | SCFWHs, or less than 0.01 percent of the total acreage of the affected SCFWHs. SCFWHs that would be
6 | affected are the Kingston-Poughkeepsie Deepwater, Hudson Highlands, and Lower Hudson Reach
7 | SCFWHs. The approximate locations of the concrete mats are presented in **Attachment 1**. Because the
8 | area of concrete mat coverage would be small relative to the total available habitat for ESA-listed fish
9 | species in the Hudson and Harlem rivers, impacts are expected to be insignificant.

10 | The majority of the concrete mats would be associated with existing infrastructure areas. As stated, the
11 | majority of the survey corridor is composed of soft benthic sediments, including silts, clays, and sands.
12 | There could be some areas with mixed sand and gravel or silt and clay with cobbles, or shell hash mixed
13 | with silt and clay, although these areas are not expected to be common (CHPEI 2012g). Only one
14 | sediment core contained cobble gravel in surficial sediments; this was located at approximate MP 234 in
15 | shortnose sturgeon spawning habitat. As such, physical impacts on sturgeon habitat from concrete are
16 | expected to be negligible. Because cobble and gravel are not common within the transmission line route,
17 | the effects on sturgeon spawning habitat are expected to be negligible. Pre-installation hydrographic
18 | surveys would be conducted prior to debris removal and would provide additional information on the
19 | sediments being disturbed.

20 | Other areas not suitable for cable burial are generally associated with rock outcroppings. The Applicant
21 | is committed to burying the cable where possible, as burial provides the greatest protection against
22 | interactions with vessels (e.g., anchor drops or snags). Physical surveys, including diver surveys of each
23 | utility, would be performed and possibly reduce this estimate. Rock outcroppings would be avoided
24 | wherever possible. In the case of the Harlem River, designated cable and pipeline areas extend over
25 | substantial areas or occur frequently along the length of the river, so that the placement of protection over
26 | the exposed transmission line can be continuous over several adjacent infrastructure elements. The
27 | detailed design developed as part of the EM&CP developed for the proposed CHPE Project would
28 | optimize the placement of protection to minimize the area of the bottom covered by concrete mats
29 | (CHPEI 2012p).

30 | Placement of concrete mats would bury the benthic community, including potential prey for Atlantic and
31 | shortnose sturgeon. Although individuals among the existing benthic communities might be impacted,
32 | installation of the concrete mats would not preclude the survival of benthic infaunal species and shellfish.
33 | Shortnose and Atlantic sturgeon would be able to use adjacent areas for foraging and other activities.
34 | Installation of these materials could cause a permanent change in benthic habitat from soft sediments to
35 | the hard substrate of the concrete mats within the footprint of the concrete mats. The concrete mats
36 | would extend up to 9 inches (23 cm) above the river bottom. Concrete mats provide hard substrate
37 | habitat, and gaps in the mats provide velocity refuge and cover for aquatic invertebrates and small fishes
38 | (Fischenich 2003), possibly including benthic prey for shortnose and Atlantic sturgeon. Where concrete
39 | mats would be installed, habitat could be permanently altered, but the area requiring concrete mats is very
40 | small relative to the available habitat for shortnose and Atlantic sturgeon. When the concrete mats are
41 | placed in areas of fine sediment, the spaces between the individual concrete elements would be filled by
42 | suspended sediment and the surficial habitat would be partially restored. It is likely that some sediment
43 | would accumulate on the concrete mats, resulting in some benthic habitat re-colonization. New and
44 | functional communities would be expected to recolonize these areas over time. Recovery times for the
45 | benthic communities vary from several months to several years depending on the community composition
46 | and severity and frequency of disturbance (Newell et al. 2004, Carter et al. 2008). Post-installation
47 | monitoring efforts for the Long Island Replacement Cable in 2010 suggested that concrete mats were not
48 | a major disturbance to benthic communities after 2 years (ESS Group 2011).

1 In addition, the concrete mats would be used on top of bedrock or areas disturbed by previous utility line
2 placement activities and the presence of existing habitat could already be low. For this reason and that
3 the extent of the route where concrete mats would be installed represents only 2.5 percent of the entire
4 aquatic transmission line route, the changes resulting from their use are not expected to be significant.
5 The mats could change the river bottom topography over limited areas and alter local hydraulic conditions
6 so that some sediment deposition or scouring could occur around the mats or rip-rap. However, the
7 overall change in bottom topography would be insignificant because the concrete mats would extend only
8 a short height above the river bottom and functional benthic habitat is expected to develop.

9 Recolonization and community composition is dependent upon numerous factors such as the stability of
10 disturbed areas, the tolerance of organisms to physical changes, and the availability of recruits. Recovery
11 times for the benthic communities vary from several months to several years depending on the
12 community composition and severity and frequency of disturbance (Newell et al. 2004, Carter et al.
13 2008). Further, because impacts from installation of concrete mats are expected to be small and localized,
14 and the materials to be used (concrete blocks and cables or synthetic ropes) would not promote the
15 introduction of invasive species any more than other species, significant changes to the benthic
16 community's species composition would not be expected. The communities recolonizing the new hard
17 bottom created by the mats are expected to be similar to pre-construction conditions. Results of
18 monitoring in 2010 of the Long Island Replacement Cable (completed in fall 2008) suggested that
19 concrete mats were not a major disturbance to benthic communities. That monitoring revealed that
20 benthic macroinvertebrate assemblages did not differ significantly in overall abundance, species richness,
21 or community composition between the control and impacted sites. Furthermore, no major seasonal
22 differences in the macroinvertebrate communities were observed. This report did not indicate any
23 observations of invasive species, with the exception of a naturalized macroalgae that was observed in
24 control and impacted sites. No major seasonal differences in the macroinvertebrate communities were
25 observed (ESS Group 2011). The placement of the concrete mats would be very limited and generally
26 sporadic in the Hudson River, and, therefore, would not appreciably impact sturgeon foraging or
27 migration (Scenic Hudson and Riverkeeper 2013). It is important to note that even in areas where such
28 protective covering may extend some distance, the width of the covering would only extend over a small
29 ROW in the vicinity of the proposed aquatic transmission cable, leaving ample undisturbed foraging
30 habitat available on either side. Because habitat is expected to recover, no impacts on overwintering
31 habitat are expected. Furthermore, the Haverstraw Bay is being avoided, which is important
32 overwintering habitat for both shortnose and Atlantic sturgeon.

33 The use of concrete mats would be expected to have insignificant impacts on sturgeon spawning
34 substrate, foraging habitat, or overwintering area because of the very small area to be affected and the
35 only minor long-term changes expected to occur. A pre- and post-energizing benthic monitoring
36 program would be developed in accordance with Condition 163 of the NYSPSC Certificate for the
37 proposed CHPE Project to evaluate impacts of construction on benthic communities (NYSPSC 2013) see
38 **Section 2.5** for additional details on this program).

39 *Noise*

40 Continuous noise associated with vessels and machinery would result from the installation of the
41 transmission line under all proposed installation methods and the vibratory installation of the sheet piles
42 that compose the cofferdams. Noise could also result from cavitations (i.e., the sudden formation and
43 collapse of low-pressure bubbles in the water from rotation of the vessel propeller) during vessel starts
44 and stops. As with other cable installation projects (Merck and Wasserthal 2009), the primary source of
45 underwater noise during cable installation activities is expected to be the cable-laying vessel. Research
46 indicates that the underwater noise temporarily generated by the construction vessels used for cable laying

would be similar to that of other ships and boats (e.g., pleasure boats, fishing vessels, tug boats, and ferries) already operating in the ROI (JASCO 2006, Popper and Hastings 2009).

Few measured data on hearing in sturgeon species are available; however, initial studies measuring responses of the ear using physiological methods suggest that a species of *Acipenser* might be able to detect sounds from below 100 Hertz (Hz) to as much as 1,000 Hz (Popper 2005). Following are the NMFS criteria for physiological impacts on fish:

- Peak sound pressure level (SPL): 206 decibels relative to 1 micropascal (dB re 1 μ Pa, the measurement unit for underwater noise in decibels).
- Cumulative sound exposure level (cSEL) for fish above 0.07 ounces (2 grams): 187 decibels relative to 1 micropascal-squared second (dB re 1 μ Pa²-s).
- cSEL for fish below 0.07 ounces (2 grams): 183 dB re 1 μ Pa²-s (NMFS 2013a).

NMFS uses a root mean square (rms) SPL of 150 dB re 1 μ Pa as a conservative indicator of the noise level at which there is the potential for behavioral effects (NMFS 2013a). That is not to say that exposure to noise levels of 150 dB re 1 μ Pa rms would always result in behavioral modifications or that any behavioral modifications would rise to the level of “take” (i.e., harm or harassment), but that there is the potential, upon exposure to noise at this level, to experience some behavioral response.

Underwater noise generated by dynamic positioning cable-laying vessels with an assumed source level of 177 dB re 1 μ Pa while thrusters were in use, for the Vancouver Island Transmission Reinforcement Project in British Columbia was similar to that of other ships and boats (e.g., container ships, tug boats, fishing vessels, and recreational boats) already operating in the area (JASCO 2006). See **Table 5-3** for a summary of typical underwater source pressure levels for various vessel types. The report does not note the ship propulsion system that was monitored or the horsepower of the ship engines. Due to the acoustic source levels there would be no potential for the construction vessels to exceed either the peak SPL of 206 dB re 1 μ Pa or the cSEL or 187 dB re 1 μ Pa²-s or 187 dB re 1 μ Pa²-s. Therefore, physiological impacts or injury are expected to occur from the cable-laying barge.

Table 5-3. Underwater Source Pressure Levels for Various Vessels

Vessel Description	Length (feet)	Frequency (Hz)	Total Engine Power (horsepower)	Source Level (dB re 1 μ Pa at 1 meter)
Outboard drive (2 engines, 80 horsepower each)	23	630	80 (two engines)	156
Small Supply Ships	180–279	1,000	N/A	125–135 (at 50 meters)
Mercator TSHD	500	Broadband	29,000	185.7 (dredging)
Semac 1 Pipelay Barge	487	Broadband	N/A	179.2 (pipelaying)
Castoro II Pipelay Barge	426	Broadband	3,350	168.1 (anchor operations)
Setouchi Surveyor Survey Vessel	212	Broadband	2,600 + 2,000 (thruster)	186.0 (using thrusters)
Katun AHTS	222	Broadband	12,240	181.8 (anchor pulling)

Sources: Richardson et al. 1995, LGL and JASCO 2005

Behavioral responses could range from a temporary startle to avoidance of an area affected by noise from a project. Noise modeling of a dynamic positioning cable-laying vessel assumed a source level of 177 dB

1 re 1 μPa while thrusters were in use. This modeling indicates that 95 percent of the noise louder than
2 130 dB re 1 μPa would occur within 1,250 feet (380 meters) of the vessel (JASCO 2006). This is an
3 average, based on a range from 853 to 1,640 feet (260 to 500 meters). Based on this information, back
4 calculating the distance to the 150 dB rms SPL isopleth indicates a radial distance of 100 feet (33 meters)
5 from the cable-laying ship during dynamic positioning. LGL and JASCO (2005) modeled broadband
6 source levels for a dynamically positioned vessel. The source level was 188 dB re 1 μPa at 3.3 feet
7 (1 meter) during dynamic positioning (using 2 bow thrusters and 2 stern thrusters). Based on such and the
8 worst-case scenario distance to the 120 dB re 1 μPa rms isopleth of 3.7 miles (6 km), the backcalculated
9 distance to the 150 dB re 1 μPa isopleth is approximately 450 feet (137 meters). This is considered the
10 worst-case noise scenario for all sources of noise associated with cable installation. Noise from the work
11 boat and from vibratory sheet pile installation would have a smaller distance where behavioral effect can
12 occur. The width of the Hudson River at Magazine Point near West Point is approximately 1,300 feet
13 (396 meters). This is one of the narrowest areas along the transmission line route that a sturgeon would
14 transit. Based on a worst-case scenario zone of behavioral effects of 450 feet (137 meters) on either side
15 of the transmission line, sturgeon would still have corridors of approximately 200 feet (61 meters) on
16 either side of the transmission line to transit. However, these narrow points only occur in several
17 locations. The average width of the lower Hudson River is approximately 4,900 feet (1,494 meters) and
18 the average zone of passage would be more than 2,000 feet (656 meters) on either side of the transmission
19 line. Installation of the line would not be scheduled during sturgeon spawning migration and would avoid
20 behavioral effects on spawning adults and larvae. Additionally, cable installation would progress at a rate
21 of 1 to 3 miles (1.6 to 4.8 km) per day. Therefore, it is not expected to create any choke points at narrow
22 parts of the river for prolonged periods of time. It is assumed that dynamic positioning would be used
23 most of the time during transmission line installation; however, as noted, impacts would be localized (i.e.,
24 very close to the vessel).

25 Noise propagation was also modeled for a single workboat, such as a Yamaha FC-26 with a source level
26 of a 157 dB re 1 μPa at 1 meter (3.3 feet). The 95 percent range from a single workboat to the 110 dB
27 noise level contour was less than 360 feet (110 meters). Based on this information, back calculating the
28 distance to the 150 dB rms SPL isopleth indicates a radial distance of approximately 7 feet from the
29 workboat. Therefore, the area where behavioral effects associated with the workboat is a much smaller
30 area than the area for a cable-laying ship.

31 As described under *Sturgeon Swimming Capabilities*, sturgeon have the ability to leave the area when
32 underwater activities that create noise and sound pressure are occurring and returning when activities
33 cease, thereby further reducing effects. Currently, there are no clear indications that noise impacts related
34 to the installation of transmission cables pose a high risk for harming aquatic fauna (Merck and
35 Wasserthal 2009). Because the anticipated noise levels associated with cable laying are relatively
36 minimal, and because the Hudson River is normally subject to substantial commercial and recreational
37 vessel noise, any incremental increases in sound associated with the cable-laying barge would not cause
38 physical injury from noise and are expected to be negligible (Popper and Hastings 2009). Fish in the
39 action area experience an acoustic environment that is generally highly energetic under “normal”
40 conditions. The ambient sound levels in the lower estuary are produced by the high volume of existing
41 commercial shipping traffic within the tidal Hudson River and New York Harbor, and these do not appear
42 to affect the behavior or migration of sturgeon that bypass this active region each year. As the Hudson
43 River is subject to substantial commercial and recreational vessel noise under these conditions, any
44 incremental sound associated with vessel traffic related to the cable installation is not expected to affect
45 sturgeon. Additionally, the construction windows have been developed to avoid impacts on sensitive life
46 stages of sturgeon.

47 Noise from cofferdam installation and rock drilling is also not expected to result in injury to fish and is
48 only considered to be a behavioral response. Sheet pile cofferdams would be installed with a vibratory

1 | hammer. A pair of sheets would take 30 to 120 minutes for installation. Vibratory installation noise
2 | levels have been measured at 170 to 185 dB re 1 μ Pa peak SPL at 33 feet, which is well below the
3 | threshold expected to cause injury to fish. The maximum 90 percent rms SPL ranged from 158 to 169 dB
4 | re 1 μ Pa at 33 feet and dropped to 106 to 130 dB re 1 μ Pa at 2,500 feet. NMFS (2014) indicates that the
5 | footprint of an area where noise greater than 150 dB re 1 μ Pa rms SPL is experienced is within 33 feet (10
6 | meters) of the sheet pile being installed and it is extremely unlikely that the behavior of any individual
7 | sturgeon would be affected by noise associated with the installation of sheet piles with a vibratory
8 | hammer. Even if a sturgeon was within 33 feet (10 meters) of the pile being installed, the behavioral
9 | response would, at most, be limited to movement outside the area where noise greater than 150 dB re 1
10 | μ Pa rms SPL would be experienced (i.e., moving to an area at least 33 feet (10 meters) from the pile
11 | (NMFS 2014). Cofferdam construction would be limited to the three HDD water-to-land transition
12 | locations in the Hudson River at Catskill, Stony Point, and Clarkstown. The narrowest location is at
13 | Catskill, where the Hudson River is 3,450 feet (1,052 meters) wide. If it is assumed that the area where
14 | behavioral effects occur is 33 feet (10 meters) from the sheet pile installation, the smallest zone of
15 | passage during sheet pile installation would be approximately 3,400 feet (1,037 meters).

16 | Rock drilling, such as that required for blasting, has been measured at 165 dB re 1 μ Pa peak SPL and 151
17 | dB re 1 μ Pa rms SPL at 231 feet (Martin et al. 2012). Therefore, behavioral effects are expected to be
18 | localized. Measures to startle fish or keep fish away immediately prior to blasting activities, such as use
19 | of sparkler guns or bubble curtains, would be used as conditions dictate. Additionally, rock drilling
20 | would only occur in the Harlem River, where the presence of adult sturgeon is expected to be rare.

21 | Generally, construction is being scheduled to avoid impacts on spawning migrations, spawning activity,
22 | and larval stages of shortnose and Atlantic sturgeon. Noise impacts associated with transmission line
23 | installation would be either temporary or intermittent and localized and would have an insignificant effect
24 | on ESA-listed fish species. After installation activities have been completed, any displaced shortnose and
25 | Atlantic sturgeon would likely return to the area. The Applicant's proposed construction windows (see
26 | **Table 2-2**) would avoid noise impacts from proposed construction activities to Atlantic sturgeon and
27 | shortnose sturgeon during their spawning migration, which is the most vital and sensitive portions of their
28 | lifecycle.

29 | Equipment proposed to be used for the bathymetric pre- and post-installation surveys includes a
30 | high-resolution side-scan sonar system with a dual frequency (100 and 500 kiloHertz) towfish. These
31 | frequencies are much higher than the range that sturgeon can detect. Vessel noise or the side-scan sonar
32 | could result in avoidance of the immediate survey area, but this would be a temporary and short-term
33 | effect for only the immediate area between the research vessel and the river bottom. If any behavioral
34 | effects occur, they are expected to be insignificant.

35 | **Blasting**

36 | Fish injury and mortality associated with underwater blasting is related to pressure, energy flux density,
37 | and impulse (large, rapid pressure variations) (Keevin and Hempen 1997). Energy flux density is the rate
38 | of transfer of energy through a surface and determines the intensity of the shock wave (rate of energy
39 | transfer per unit area). The most common injury is swim bladder damage, although other organs, such as
40 | gills, kidney, liver, and spleen, can also be damaged. In fish with less well-developed swim bladders,
41 | neither the kidneys nor air bladder are injured, indicating that the presence of a swim bladder plays an
42 | important role in to injuries to other organs. The thickness, location, and physiological connections of the
43 | swim bladder also play a role in the occurrence of injuries. Fish with swim bladders connected to the
44 | circulatory system appear to be more susceptible to injuries than fish with swim bladders connected to the
45 | esophagus. External injuries related to blasting appear to be species-specific and the magnitude of the
46 | pressure wave. The presence of the swim bladder might also be related to external injuries. Factors such

1 as size, age, general health, water temperature, and reproductive condition may influence fish mortality
2 related to blasting. Underwater explosions can result in structural abnormalities and mortality of fish
3 eggs. Mortality decreased with distance with the explosion (Keevin and Hempen 1997). Impulse was
4 determined to be the critical factor to result in mortality of larval fish, because of the high magnitude over
5 the long distance, although estimates for one project did not predict population level impacts based on the
6 number of larvae potentially killed (Govoni et al. 2008). Sturgeon eggs and larvae are not expected to
7 occur in the Harlem River and the presence of adults is expected to be rare. As such, the potential for
8 blasting in the Harlem River to adversely affect sturgeon is so low, it is discountable.

9 *Vessel Strikes*

10 The Hudson River cable installation vessel would consist of one dynamic positioning 100- by 300-foot
11 (33- by 99-meter)-cable-laying deck barge with a 12-foot (4-meter) draft. The barge would be outfitted
12 with a 3,500 horsepower, Class II dynamic positioning system and three static cable holding tanks – one
13 static tank for fiber and two additional static tanks each capable of holding 34 miles (55 km) of HVDC
14 cable and various equipment for tensioning and handling the cable during installation. Based on
15 anticipated installation conditions, the cable-laying barge would be equipped with 6 azimuthing thrusters.
16 Additional vessels anticipated as part of the proposed cable installation for the Hudson River would
17 include the following:

- 18 • 60-foot (18-meter) support/supply tug: typically, minimum of 1,000 HP (9- to 16-foot [2.7- to
19 4.9-meter] draft)
- 20 • 58-foot (18-meter) crew boat (4-foot [1.2-meter] draft)
- 21 • 26-foot (8-meter) outboard powered work skiff (2-foot [0.6-meter] draft)
- 22 • 40-foot (12-meter) with support systems sufficient for three divers (4-foot [1.2-meter] draft).

23 The type and number of vessels could be subject to change based on vessel availability, personnel
24 availability, installation location, and schedule. Each vessel employed would travel into water depths
25 consistent with their purposes (i.e., crew boats to local servicing yards and installation barge principally
26 along the alignment/approved commercial dockage). All vessels would operate fully in compliance with
27 safe navigational practices.

28 The installation barge would principally reside on the installation route and would make approximately
29 two round trips between the mobilization and demobilization ports. It would also make about six trips to
30 and from the local cable-loading ports and in cases where it is deemed prudent return to shore due to
31 weather conditions. At all other times, the cable lay barge's transit route would typically follow the
32 proposed transmission line alignment within the Hudson River.

33 The Applicant anticipates that crew boats would make multiple daily trips to and from a nearby marina to
34 transport personnel and supplies to the installation barge (approximately three to six round trips per day).
35 Other vessels such as the skiff and the dive boat might also make daily trips between the marina and the
36 installation barge (possibly one round trip per day). The frequency of vessel trips is subject to change.
37 However, the estimates provided are indicative of what is currently anticipated. Support and supply
38 vessels would transit in the navigable channels. Transit routes would vary based on the location of
39 applicable marine-based staging yards (e.g., docking areas, equipment yards) along the route, but the
40 yards would generally be no more than 50 miles (81 km) from the location of the installation barge.

41 Vessel speeds in the construction area would be consistent with “no wake” requirements, and in all cases
42 would be less than 4 knots. During transmission line installation, the cable-laying barge would operate at

1 0.07 knots inside the construction area (i.e., the aquatic construction zone with a nominal 50-foot
2 [15-meter] width centered along the cable alignment). The Applicant anticipates the vessel speeds
3 outside the construction area to be in the following ranges:

- 4 • Lay barge under tow: 5 to 6 knots
- 5 • Support/Supply tug: 6 to 10 knots
- 6 • Crew boat: 12 knots or in conformance with general navigational practices/rules
- 7 • Outboard-powered work skiffs: 12 knots or in conformance with general navigational
8 practices/rules
- 9 • Dive boat: 12 knots, assuming a vessel similar to a crew boat.

10 Specific details on numbers and types of vessels, transit routes, and numbers of trips would be further
11 defined as part of the EM&CP to be submitted by the Applicant.

12 A similar number or fewer vessels would be used during debris removal as would be used during
13 installation. Transit routes for the route-clearing equipment would vary based on the location of
14 marine-based yards along the route, but the yards would generally be no more than 50 miles (81 km) from
15 the equipment's location. Transit speeds would be no faster than 8 to 12 knots depending on weather,
16 currents, and barges in tow. This level of activity and associated vessel speeds are consistent with
17 existing vessel use on the Hudson River. During debris removal, the barge would proceed at a speed of
18 1.5 knots or less. In areas with significant side-scan and magnetometer targets, the speed would be
19 reduced to less than 1 knot. The route transected for clearing would follow the path of the proposed
20 transmission line.

21 Pre-installation surveys would be conducted prior to debris removal and post-installation bathymetric
22 surveys would be conducted 1 and 3 years after installation and, if necessary, 5 and 8 years after
23 transmission line installation. Surveys would be conducted outside of spawning season in the summer
24 and early fall. The speed of the vessel conducting the survey would depend on the water current speed
25 and the weather. It is expected that the average speed of the vessel while surveying would be about 3 to
26 4 knots. Transit speeds would be 8 to 10 knots. The side-scan sonar system would be operated with a
27 towfish height above the bottom that provides adequate coverage, meaning that it would be a height
28 above the riverbed that would allow clearance for sturgeon above the riverbed.

29 Large vessels with deep drafts (up to 40 to 45 feet [12 to 14 meters]) relative to smaller vessels (less than
30 20 feet [5 meters]) have been implicated in vessel collisions with demersal fishes and fishes that prefer to
31 feed along the bottom but also occur in the water column (e.g., sturgeon), even in deep water (Brown and
32 Murphy 2010). However, vessel strikes have only been identified as a significant concern in the
33 Delaware and James rivers in the Northeast and Mid-Atlantic United States where several vessel-struck
34 individuals are found each year, possibly because unique geographic features in these areas
35 (e.g., potentially narrow migration corridors combined with shallow and narrow river channels) that
36 increase the risk of interactions between vessels and Atlantic sturgeon (NMFS 2013a). Vessel strikes are
37 not considered to be a significant threat in the Hudson River (NMFS 2014). Smaller vessels and those
38 with relatively shallow drafts provide more clearance with the river bottom and reduce the probability of
39 vessel strikes. Because the construction vessels used for installation of the proposed CHPE Project
40 transmission line (e.g., tug boats, barge crane, hopper scow) have relatively shallow drafts, and sturgeon
41 are generally found within 3.3 feet (1.0 meter) of the bottom in the deepest available water, the chance of
42 vessel-related mortalities to fish is expected to be low.

1 Although Atlantic and shortnose sturgeon are demersal fishes and spend most of their time at the bottom
2 of the water column, it should be noted that Atlantic sturgeon in the Suwannee River (Florida) have been
3 reported to jump out of the water, and, during jumping episodes, individuals are located at or near the
4 surface of the water, where they are more vulnerable to strikes (Brown and Murphy 2010). The Applicant
5 has proposed measures to minimize impacts from construction vessels on shortnose and Atlantic
6 sturgeon, including that all vessels associated with the proposed construction project would operate at “no
7 wake/idle” speeds (less than 4 knots) at all times in the construction area and in-water depth areas where
8 the draft of the vessel provides less than a 4-foot (1.2-meter) clearance from the bottom (see **Section 2.5**).
9 In areas with substantial objects recorded in side-scan sonar and magnetometer surveys, the speed would
10 be reduced to less than one knot. Decreased vessel speeds in shallow waters would provide shortnose and
11 Atlantic sturgeon an opportunity to move out of the way of moving vessels, thereby making it unlikely
12 that a collision would occur. Construction would not occur during spawning migration (see **Table 2-2**),
13 avoiding this vital and sensitive portions of their lifecycle.

14 Based on the types of vessels to be employed and their relatively shallow draft, there should always be
15 sufficient clearance between vessels and the river bottom. The typical draft of the cable installation barge
16 is approximately 12 feet (4 meters), and the Hudson River has a maintained depth of at least 32 feet (10
17 meters) in its navigation channel. Additionally, reduced vessel speeds would help to avoid vessel strikes
18 for sturgeon near the surface. As such, the possibility of a vessel striking shortnose or Atlantic sturgeon
19 during cable installation or bathymetric surveys is discountable.

20 ***Accidental Spills***

21 Minor releases of hydrocarbons (e.g., diesel fuel and lubricants) could result in impacts on ESA-listed fish
22 species. During installation of the aquatic transmission line, approximately four vessels, such as a cable
23 vessel, survey boat, crew boat, and tugboat with barge, would be employed. Each of these vessels
24 contains fuel, hydraulic fluid, and potentially other hazardous materials and, therefore, has the potential
25 for spills. The impacts of hydrocarbons are caused by either the physical nature of the oil (physical
26 contamination and smothering) or by its chemical components (toxic effects and bioaccumulation). It is
27 anticipated that the immediate response reaction of fish to water contaminated with hydrocarbon would be
28 avoidance. Oil has the potential to impact spawning success because of the physical smothering and the
29 toxic effects on eggs and larvae (USFWS 2010b). Minor releases of hydrocarbons could also affect the
30 food sources of ESA-listed fish. Benthic communities could also be affected by clean-up operations or
31 through physical damage to the habitats in which plants and animals live. This could, in turn, decrease
32 the foraging ability of ESA-listed fish species. A Spill Prevention Plan, which would include Applicant-
33 proposed BMPs such as construction crews having sufficient supplies of absorbent and barrier materials
34 available to contain and clean up hazardous materials in the event of such a spill, would be implemented
35 to prevent or mitigate this impact so that it would be an insignificant effect on shortnose and Atlantic
36 sturgeon.

37 **Operations, Maintenance, and Emergency Repair Impacts**

38 Increased temperature, magnetic fields, and a weak induced electric field generated from the magnetic
39 field would have insignificant effects on shortnose sturgeon and Atlantic sturgeon for the reasons
40 discussed below. Maintenance activities would have no effect on ESA-listed fish species, because the
41 proposed transmission line would be maintenance-free. Emergency repair activities also would have
42 insignificant effects on shortnose sturgeon and Atlantic sturgeon. During emergency repairs of the
43 proposed aquatic transmission line, the cables would be brought to the surface for repair, a new section of
44 line would be spliced in, and the line would be reburied. Sediment disturbance resulting in temporarily
45 increased turbidity, decreased water quality due to disturbance of contaminated sediments, and noise
46 would be insignificant effects on shortnose sturgeon and Atlantic sturgeon. These impacts would be

1 similar to those described for construction and installation activities, but on a smaller scale and over a
2 shorter duration. The Applicant has proposed similar measures to employ during emergency repairs (see
3 **Section 2.5**).

4 The Applicant has conducted discussions with NYNHP, NYSDEC, and NMFS to gather additional
5 information and to develop recommendations for the avoidance and minimization of potential impacts on
6 ESA-listed aquatic species, including federally listed fish species, during operations, inspection, and
7 emergency repairs of the proposed aquatic transmission line. The Applicant has proposed measures to
8 minimize impacts on aquatic species during emergency repairs that are similar to those proposed for
9 construction activities (see **Section 2.5**). As specified in the proposed CHPE Project's Certificate of
10 Environmental Compatibility and Public Need (Condition 163) issued by NYSPSC, the Applicant would
11 conduct a series of post-energizing studies, including benthic macroinvertebrate and sediment sampling;
12 bathymetry, sediment temperature, and magnetic field surveys; and Atlantic sturgeon hydrophone
13 surveys, for use in post-installation compliance monitoring (NYSPSC 2013). The Atlantic sturgeon study
14 would document the species' movements in relation to cable operation. All studies would be developed
15 in consultation with appropriate resources agencies. The Applicant also has proposed to establish the
16 Hudson River and Lake Champlain Habitat Enhancement, Restoration, and Research/Habitat
17 Improvement Project Trust. The purpose of the Trust would be the "protecting, restoring, and improving
18 of aquatic habitats and fisheries resources in the Hudson River Estuary, the Harlem and East Rivers, Lake
19 Champlain, and their tributaries, in order to minimize, mitigate, study, and/or compensate for the
20 short-term adverse aquatic impacts and potential long-term aquatic impacts and risks to these water
21 bodies from Facility construction and operation."

22 ***Magnetic and Electric Fields***

23 | The proposed aquatic transmission cable would emit magnetic fields; however, electric fields are not
24 | anticipated due to cable shielding and burial. In addition, a weak induced electric field would be
25 | generated from that magnetic field and this induced electric field can be detected by certain aquatic
26 | organisms. Information on the effects of magnetic and electric fields on aquatic species, including
27 | shortnose and Atlantic sturgeons is limited (Fisher and Slater 2010, Cada et al. 2011). Available evidence
28 | indicates that the magnetic fields that would be generated during operation of the proposed transmission
29 | line may be detected and avoided by shortnose sturgeon and Atlantic sturgeon, but the implications of
30 | these responses are unknown.

31 | ***Magnetic Fields.*** For the Hudson River Segment, the depth of the trench would be approximately 7 feet
32 | (2.1 meters). For the Harlem River in the New York City Metropolitan Area Segment, the depth of the
33 | trench would be approximately 8 feet (2.4 meters). There would be 1 foot (0.3 meters) or less of
34 | horizontal separation between the two cables, which would be collocated in the same trench, in both
35 | segments. Because the magnetic field is strongest at the transmission line and declines rapidly with
36 | distance, deeper burial would reduce the magnetic field, but not eliminate it entirely (CMACS 2003,
37 | Normandeau et al. 2011). In addition, placing the cables in close proximity to each other allows the
38 | magnetic field of each of the bipoles to cancel each other out, further lowering the magnetic field. The
39 | shielding around the cables would render the electric field produced by the transmission line
40 | inconsequential. In areas where concrete mats would be placed over the cables because target cable
41 | burial depths cannot be achieved, magnetic field levels in the water column would also be reduced
42 | (Normandeau et al. 2011). The estimated magnetic field levels at the riverbed surface directly over the
43 | transmission line centerline were calculated to be less than 162 mG at a burial depth of 3.25 feet
44 | (1.0 meter) and a cable spacing of 1 meter (CHPEI 2012i, CHPEI 2012m). The greater depths proposed
45 | for the transmission line would further reduce magnetic field levels at the sediment surface. The
46 | magnetic field emitted by the proposed aquatic transmission line has the potential to affect the way the

1 natural magnetic field of the Earth is sensed by animal species, and this modified magnetic field could
2 occur continuously within approximately 10 feet (3 meters) of the cable (CHPEI 2012I).

3 Demersal fish, such as sturgeon, are more likely to be exposed to higher magnetic field strengths, which
4 are closer to the lake bottom where the transmission line would be buried, as compared to pelagic species,
5 which are found higher in the water column (Normandeau et al. 2011). Sturgeons are electrosensitive and
6 use electric signals to locate prey. However, information on the impacts of magnetic fields on fish is
7 limited. A number of fish species, including sturgeons, are suspected of being sensitive to such fields
8 because they have magnetosensitive or electrosensitive tissues, have been observed to use electrical
9 signals in seeking prey, or use the Earth's magnetic field for navigation during migration (EPRI 2013).
10 Only limited research has been done, so additional studies are required on the potential effects of
11 magnetic fields on demersal species. The current state of knowledge about the potential impacts on fish
12 from magnetic and electric fields emitted by underwater transmission lines is variable and inconclusive
13 (Fisher and Slater 2010, Cada et al. 2011). However, lake sturgeon exhibited temporarily altered
14 swimming behaviors in response to AC-generated EMF that ranged from 35,100 mG to 1,657,800 mG,
15 and EMF responses disappeared below 10,000–20,000 mG (Cada et al. 2011, Bevelhimer et al. 2013).

16 Experiments were conducted to test the responses of freshwater sturgeon (i.e., sterlet sturgeon [*Acipenser*
17 *ruthenus*] and Russian sturgeon [*Acipenser gueldenstaedtii*]) to AC-generated electromagnetic fields.
18 These freshwater sturgeon species exhibited temporarily altered swimming behaviors in response to
19 AC-generated electromagnetic fields that ranged from 35,100 mG to 1,657,800 mG. Lake sturgeon
20 (*Acipenser fulvescens*) exhibited temporarily altered swimming behaviors in response to AC-generated
21 electromagnetic fields that ranged from 35,100 mG to 1,657,800 mG (Cada et al. 2011). Juvenile lake
22 sturgeon displayed temporarily altered swimming behavior when exposed to variable magnetic fields
23 using an AC electromagnet (maximum value of the field at full power was approximately 1,657,800 mG)
24 suggesting a momentary attraction to the variable magnetic field (Cada et al. 2012). Bottom-dwelling
25 demersal fish (such as the shortnose and Atlantic sturgeon) would be exposed to higher field strengths
26 adjacent to the proposed transmission line along the riverbed surface (Normandeau et al. 2011).
27 However, the electromagnetic fields in those studies were much more intense than the magnetic fields that
28 would be produced by the proposed transmission line, which would be less than 162 mG at the
29 sediment-water interface or 600 mG at the surface of a concrete mat directly above the buried
30 transmission cables, which are orders of magnitude weaker than the fields that triggered a reaction in the
31 before-mentioned freshwater sturgeon species.

32 Laboratory studies that exposed rainbow trout (*Onchorhynchus mykiss*), brown trout (*Salmo trutta*), carp
33 (*Cyprinus carpio*), and Northern pike (*Esox lucius*) fish eggs and larvae to magnetic fields ranging from
34 5,000 mG to 150,000 mG resulted in changes in embryonic development and movement (Formicki and
35 Perkowski 1998, Formicki and Winnicki 1998, Winnicki et al. 2004). However, survivability was not
36 discussed. These species serve as a surrogate for other species expected to occur in the proposed CHPE
37 Project ROI. The increase in magnetic field strength at the sediment surface is approximately 162 mG
38 where the transmission line is buried or 600 mG above concrete mats, and would decrease with an
39 increase in distance from the river bottom (i.e., in the water column).

40 Laboratory experiments that indicate that magnetic fields can affect the behavior of adult fish and the
41 development of eggs and larvae used exposures orders of magnitude higher than the magnetic field
42 strengths of those expected from the proposed CHPE Project transmission line. Therefore, the negligible
43 increase in magnetic field associated with the CHPE transmission line is expected to have no effects
44 (short-term or long-term) on eggs, larvae, or adults.

45 Magnetic fields associated with the operation of the transmission line could impact shellfish and benthic
46 organisms that serve as sturgeon prey. According to studies, the survival and reproduction of benthic

1 organisms are not thought to be affected by long-term exposure to static magnetic fields (Normandeau et
2 al. 2011). Several marine benthic invertebrates, including the blue mussel (*Mytilus edulis*) and North Sea
3 prawn (*Crangon crangon*), survived 37,000 mG with no apparent effects (Bochert and Zettler 2004).
4 However, physiological changes (20 percent decrease in hydration and a 15 percent decrease in amine
5 nitrogen values) were detected in blue mussels exposed to magnetic fields of 58,000, 80,000, and
6 800,000 mG. Experiments that exposed two freshwater mollusks, the Asiatic clam (*Corbicula fluminea*)
7 and the freshwater snail (*Elimia clavaeformis*), to 360,000 mG showed no evidence of changes in activity
8 (Cada et al. 2011). In these cases, experimental exposure values for magnetic fields are much more
9 intense than those expected from the proposed CHPE Project transmission line in the Hudson River,
10 which is calculated at less than 160 mG at the sediment-water interface directly above the buried
11 transmission cables buried at 3.3 feet (1 meter) or 600 mG above concrete mats. This field would be
12 extremely localized. According to studies, the survival and reproduction of benthic organisms are not
13 thought to be affected by long-term exposure to static magnetic fields (Bochert and Zettler 2004,
14 Normandeau et al. 2011). Results from the 30-month post-installation monitoring for the Cross Sound
15 Cable Project in Long Island Sound indicated that the benthos within the transmission line corridor for
16 this project continues to return pre-installation conditions. The presence of amphipod and worm tube
17 mats at a number of stations within the transmission line corridor suggest construction and operation of
18 the transmission line did not have a long-term negative effect on the potential for benthic recruitment to
19 surface sediments (Ocean Surveys 2005). Monitoring surveys conducted for the Long Island
20 Transmission Line Project revealed recolonization of concrete mats to preconstruction conditions within
21 2 years. Therefore, no impacts (short-term or long-term) of magnetic fields on sturgeon prey are
22 expected. A pre- and post-energizing benthic monitoring program would be developed in accordance
23 with Certificate Condition to evaluate operational impacts on benthic communities (NYSPSC 2013).

24 *Induced Electric Current.* The movement of charges in a magnetic field can cause an induced electric
25 current. Induced electric fields can be created by water currents such as waves and tides, or the
26 movement of an organism through the Earth's naturally occurring geomagnetic field. Induced electric
27 fields can be increased with the perpendicular movement of an organism or water current relative to a
28 magnetic field associated with a DC transmission line. Induced electric fields can vary with sediment or
29 substrate type (Normandeau et al. 2011). Increases in the induced electric currents would result from
30 operation of the proposed CHPE Project transmission line.

31 Based on the prevailing geomagnetic field in the area of the proposed CHPE Project, a fish moving east to
32 west perpendicular across the transmission cables at a rate of 4.5 feet (1.4 meters) per second (2.7 knots)
33 would incur a naturally occurring induced electric current of 72×10^{-5} millivolts/cm (mV/cm); a fish
34 moving north to south at the same rate would incur an induced electric current of 67×10^{-5} mV/cm. The
35 maximum induced electric current associated with water or a fish moving parallel to the transmission
36 cables at a rate of 1.38 feet (0.42 meters) per second (0.8 knots) would be a 11.5×10^{-5} mV/cm over that
37 produced by the geomagnetic field at 1 foot (0.3 meters) above riverbed at the centerline of the cables.
38 The induced electric field would decrease to 2.8×10^{-5} mV/cm or less at 10 feet (3 meters) from the cable
39 system and continue to decrease with distance from the centerline. The induced electric field from the
40 transmission cables would therefore contribute, at most, a 17 percent increase in the total induced electric
41 field at all locations compared to the induced electric field due to earth's geomagnetic field in these
42 scenarios (11.5×10^{-5} mV/cm [the maximum induced electric field]/ 67×10^{-5} mV/cm [the ambient
43 induced electric field that results in the maximum percent increase]) (Bailey and Cotts 2012).

44 Evidence indicates that electrosensitive organisms such as sturgeon can detect induced electric fields
45 (CMACS 2003, Normandeau et al. 2011). Fish responses to induced currents have been identified as
46 searching for the source and beginning active foraging, or avoiding the source. The evidence for a similar
47 response of sturgeon to bioelectric or simulated electric fields is much more limited.

1 In experiments based on AC cables, sturgeon (*Acipenser gueldenstaedtii* and *Acipenser ruthenus*)
2 responded to 50-Hz electric fields that ranged from 0.2 to 6.0 mV/cm (Normandeau et al. 2011). At range
3 frequencies of 1.0 to 4.0 Hz and 16 to 18 Hz with field intensities of 0.2 to 3.0 mV/cm, the sturgeon
4 response was to search for the source and begin active foraging. At 50 Hz and field intensities of 0.2 to
5 0.5 mV/cm, the response was to search for the source and to begin active foraging. At 50 Hz with field
6 intensities of 0.6 mV/cm or greater, the response was to avoid the source (Basov 1999).

7 In the context of the environment around the proposed CHPE Project cables, these considerations suggest
8 that sturgeon would likely be able to detect induced electric fields from the ambient geomagnetic field
9 and other existing ambient sources in the environment, and to detect alterations in this field by the cable
10 system. However, the change in the induced electric field calculated from the proposed CHPE Project is
11 a small increase (17 percent) over that produced by the ambient geomagnetic field and quickly diminishes
12 with distance from the transmission cables. The induced electric field from the Earth or the transmission
13 cables is also considerably weaker than the electric field measured over certain marine sediments.
14 Therefore, the increment in the ambient marine electric field even over the buried cable would not be a
15 unique or novel stimulus nor would it be strong enough to produce physiological responses (Bailey and
16 Cotts 2012).

17 Because the induced electric field from water flow in a magnetic field is essentially a static DC electric
18 field, it would not seem to be a powerful stimulus to foster feeding behavior as is reported for the
19 low-frequency AC fields that distinguish the bioelectric fields of prey and other fish. Rather than feeding
20 responses associated with AC electric stimuli, electric fields from static DC sources (DC cable and
21 corrosion potentials) might elicit temporary investigatory behavior as has been seen in anecdotal
22 observations of sharks (Tricas and McCosker 1984). Hence, the induced electric field resulting from
23 water current flow or sturgeon swimming in the static magnetic fields in the Hudson River would be more
24 similar to the galvanic electric fields produced by the corrosion potentials from pilings, ships, gas and
25 petroleum pipelines, and virtually all sunken or constructed metal infrastructure (Bailey and Cotts 2012).
26 Altogether, the data are consistent with the idea that a behavioral response of sturgeon to the induced DC
27 electric field from the proposed CHPE Project in the Hudson River, if any, is more likely be an
28 investigative response (temporary and time-limited because of habituation) than a feeding response
29 associated with the low-frequency AC field such as those produced by the bioelectric electric field
30 produced by fish prey that would be more persistent (Bailey and Cotts 2012). Furthermore, fish
31 responses to induced currents have been identified as searching for the source and beginning active
32 foraging, or avoiding the source. In addition, more recent experiments indicated that sturgeon use both
33 electrosense and olfactory cues to search for prey (Zhang et al. 2012).

34 While there is no known literature on the effects of induced electric currents on shellfish and benthic
35 organisms, effects are expected to be negligible. The increase in induced electric current is negligible and
36 is only 17 percent higher than an induced electric current from the naturally occurring geomagnetic field.
37 Additionally, only the area directly above the transmission line is expected to be affected. Results from
38 the 30-month post-installation monitoring for the Cross Sound Cable Project in Long Island Sound
39 indicated that the benthos within the transmission line corridor for this project continues to return
40 pre-installation conditions. The presence of amphipod and worm tube mats at a number of stations within
41 the transmission line corridor suggest construction and operation of the transmission line did not have a
42 long-term negative effect on the potential for benthic recruitment to surface sediments (Ocean Surveys
43 2005). Monitoring surveys conducted for the Long Island Transmission Line Project revealed
44 recolonization of concrete mats to preconstruction conditions within 2 years. Therefore, no impacts
45 (short-term or long-term) of magnetic fields on sturgeon prey are expected. A pre- and post-energizing
46 benthic monitoring program would be developed in accordance with Certificate Condition 163 to evaluate
47 operational impacts on benthic communities (NYSPSC 2013).

1 ***Thermal Impacts***

2 Increases in temperature associated with the operation of the proposed aquatic transmission line at the
3 sediment-water interface would have an insignificant effect on Atlantic and shortnose sturgeon, which as
4 demersal species, would occur close to the bottom of the river bed. Although there would be some
5 change in temperature in the sediment immediately surrounding a cable, the depth of the cable's burial
6 and insulating factors of the cable would minimize impacts on the benthic habitats in the immediate
7 vicinity. The cables would produce heat during operation, but it would dissipate with depth so in the top
8 6 inches (15 cm) of the sediment, where most benthic infauna occur, there would be a negligible
9 temperature increase (CHPEI 2012a). It is estimated that for cable burial at 4 and 8 feet, the maximum
10 expected temperature change would be less than 0.001 °F (0.0001 °C and 0.0002 °C, respectively) in the
11 water above the riverbed, approximately 1.8 °F (1.20 °C and 1.24 °C, respectively) at the riverbed
12 surface, and 9 °F and 4 °F (5.0 °C and 2.5 °C), respectively, at 8 inches (0.2 meters) below the riverbed
13 surface (CHPEI 2012p). However, these estimated rises in riverbed surface temperature and the increase
14 in the water column are an overestimation of the natural condition because they do not taken into account
15 the cooling effect from the natural flow of the Hudson River. The predicted amount of local heat
16 generation would not pose a physical barrier to fish passage, and would allow benthic organisms to
17 colonize and demersal fish species (including demersal eggs and larvae) to use surface sediments without
18 being affected. Impacts on reproduction or feeding are not anticipated, and therefore, impacts on fish
19 would also be negligible (CHPEI 2012c, CHPEI 2012l). The small increase in riverbed and water column
20 temperature is considered to be within normal ranges of variation and no residual effects are predicted
21 (SSE 2009). The potential increase in temperature associated with operation of the transmission line
22 when buried using jet plowing techniques in at least 7 feet (2.1 meters) of sediment in the Hudson and
23 Harlem rivers would be within the normal temperature range of all life stages of shortnose and Atlantic
24 sturgeon.

25 Where the transmission cables cannot be buried to their full depth due to utilities or bedrock and must be
26 covered with concrete mats, the estimated increase in ambient water temperature surrounding the cables
27 covered by the concrete mats is expected to be negligible (less than 0.25 °F [0.14 °C]). This is expected
28 to be within the range of the seasonal variation of water temperatures experienced in the Hudson and
29 Harlem rivers. The highest increase in ambient temperature in the top 2 inches (5 cm) of sediment along
30 the sides of the concrete mat is expected to be 1.3 °F (0.7 °C) or less (Exponent 2014). Because the area
31 of concrete mats is so small, any effects would be localized and not expected to have significant impacts
32 on sturgeon.

33 Ambient water temperatures in the Hudson and Harlem rivers range from 32 °F (0 °C) in January to a
34 maximum of 81 °F (27 °C) in July. Atlantic sturgeon spawn in in water temperatures of 55 °F to 79 °F
35 (13 °C to 26 °C) (ASMFC 2012, Bain et al. 2000, Van Eenennaam et al. 1996). Adult sturgeon have been
36 found in water temperatures as high as 91 °F (33 °C). While beyond this, temperature tolerances for adult
37 and juvenile sturgeon are not fully known, these life stages are mobile and have the ability to avoid the
38 narrow area directly above the transmission line. Atlantic sturgeon eggs have been found to tolerate
39 temperatures from 59 °F to 75 °F (15 °C to 24°C), and larvae tolerate temperatures from 37 °F to 82 °F
40 (3 °C to 28°C) (ASMFC 2012). The potential increase in water temperature associated with operation of
41 the transmission line when buried with concrete mats and when combined with the ambient temperature
42 ranges of the Hudson and Harlem rivers would be within the normal temperature range of all life stages of
43 shortnose and Atlantic sturgeon (Bain et al. 2000). Therefore, no effects on any life stage of sturgeon are
44 expected as a result of the negligible increase in water temperature directly above the transmission line.

45 Temperature increases associated with operation of the transmission line would not have more than a
46 negligible impact on shellfish and benthic communities. The temperature increase in the top 8 inches
47 (15 cm) of sediment where most benthic infauna (bottom-dwelling aquatic animals) occur would be less

1 | than 9 °F (5.0 °C), diminishing to 1.8 °F (1.0 °C) above ambient conditions at the sediment surface
2 | directly above the cables (CHPEI 2012e, CHPEI 2012l, CHPEI 2012p). The highest increase in ambient
3 | temperature in the top 2 inches (5 cm) of sediment along the sides of the concrete mat is expected to be
4 | 1.3 °F (0.7 °C) or less (Exponent 2014). Under normal conditions, near-surface sediments (0 to 2 inches
5 | [0 to 5 cm]) closely follow the temperature profile of the overflowing water (Lenk and Saenger 1998 and
6 | Clark et al. 1999 as cited in McDonough and Dzombak 2006). As such, any increase in temperature at the
7 | sediment water interface would be expected to be well within the range of variation throughout the year.
8 | Further, this temperature increase would be narrowly focused directly over the cable line and would
9 | dissipate rapidly with distance to either side of the centerline. Any measurable amount of local heat
10 | generation would not pose a physical barrier to fish passage and would allow SAV, macroalgae, and
11 | benthic organisms to colonize and demersal fish species (including demersal eggs and larvae, such as for
12 | winter flounder) to use surface sediments without being affected. Organisms living 2 to 6 inches (5 to
13 | 15 cm) below the riverbed surface might be adversely affected but this would be limited to within a few
14 | feet of the transmission line in sediment. Results from the 30-month post-installation monitoring for the
15 | Cross Sound Cable Project in Long Island Sound indicated that the benthos within the transmission line
16 | corridor for this project continues to return pre-installation conditions. The presence of amphipod and
17 | worm tube mats at a number of stations within the transmission line corridor are indicators that suggest
18 | construction and operation of the transmission line did not have a long-term negative effect on the
19 | potential for benthic recruitment to surface sediments (Ocean Surveys 2005). As mentioned under
20 | construction impacts, monitoring surveys conducted for the Long Island Transmission Line Project
21 | revealed colonization of concrete mats used during the project. It is anticipated that a similar situation
22 | would take place for the proposed CHPE Project. Therefore, the small increase in riverbed temperature in
23 | a localized area immediately over the transmission line is considered to be within normal ranges of
24 | variation and would not significantly result in long-term effects on the forage base for sturgeon
25 | (SSE 2009). A pre- and post-energizing benthic monitoring program would be developed in accordance
26 | with Certificate Condition 163 to evaluate operational impacts from magnetic fields and heat during the
27 | lifespan of the transmission line on benthic communities (NYSPSC 2013).

28 | Any negligible amount of local heat generated by operation of the proposed CHPE Project transmission
29 | line would not pose a physical barrier to ESA-listed fish passage, would only occur directly adjacent to
30 | the transmission line, and would allow benthic organisms to recolonize and demersal fish species
31 | (including demersal eggs and larvae) to utilize surface sediments without being affected. Impacts on
32 | reproduction or feeding are not anticipated, and, therefore, effects on ESA-listed fish would be
33 | insignificant (CHPEI 2012c, CHPEI 2012l).

34 | No impacts on ESA-listed species would be expected from decommissioning of the transmission line.
35 | The line would be de-energized and abandoned in place, which would not result in any sediment
36 | disturbance.

37 | 5.2 Terrestrial Species

38 | The following subsection presents a discussion of potential impacts on terrestrial threatened and
39 | endangered resources includes an analysis of impacts and a determination of impact duration and severity.
40 | Included in the discussion are elements of the project description that would both produce impacts and are
41 | proposed to minimize potential impacts. Impacts on terrestrial species are summarized in **Table 5-1**.
42 | Measures for minimizing potential environmental impacts on terrestrial biological resources are listed in
43 | **Section 2.5**.

44 | Based on the analysis in this section, and the discussion of cumulative effects presented in **Section 6**,
45 | **DOE has concluded that any effects on the Indiana bat and Karner blue butterfly would be**
46 | **insignificant or discountable, and that the proposed CHPE Project my affect, but is not likely to**

1 **adversely affect, those species.** Table 5-4 provides a summary of potential impacts on threatened and
 2 endangered terrestrial species potentially resulting from the proposed CHPE Project.

3 **Table 5-4. Determination of Effect under the ESA for Federally Listed Terrestrial Species**
 4 **in the Proposed CHPE Project Area**

Common Name	Scientific Name	ESA Status	Determination of Effect
Mammals			
Indiana bat	<i>Myotis sodalis</i>	E	May affect, but not likely to adversely affect
Northern long-eared bat	<i>Myotis septentrionalis</i>	PE	May affect, but not likely to adversely affect
Invertebrates			
Karner blue butterfly	<i>Lycaeides melissa samuelis</i>	E	May affect, but not likely to adversely affect

Table Key: E = Federally listed as endangered; PE = Proposed species for listing as endangered.

5 **5.2.1 Indiana Bat and Northern Long-Eared Bat**

6 **Construction Impacts**

7 Suitable roosting and foraging habitats for the Indiana bat and northern long-eared bat occur within and
 8 adjacent to the proposed CHPE Project area. These habitats could support spring staging and migration,
 9 summer roosting, maternity, fall migration, or fall swarming periods of Indiana bats within or near the
 10 project area. However, there are no hibernacula within the project area and no habitat containing roost
 11 trees would be removed within 20 miles (32 km) of Priority 1 or 2 Indiana bat hibernacula. The closest
 12 Priority 1 or 2 hibernacula from the proposed CHPE project route are approximately 5 miles from areas
 13 where the transmission line would be buried in Lake Champlain or the Hudson River. The project route
 14 does not go through any forested areas along these portions of the route; therefore, no trees would be
 15 removed in these areas. The hibernacula in Ulster County are greater than the 20 miles (32 km) from the
 16 terrestrial portion of the proposed transmission line. The closest Priority 1 or 2 hibernacula to terrestrial
 17 portions of the proposed CHPE Project Route, where trees could be removed, would be the Barton Hill
 18 Mine hibernaculum in Essex County, approximately 25 miles (38 km) away from proposed CHPE Project
 19 route MP 101, where the transmission line exits Lake Champlain near Dresden in Washington County.
 20 The Cheever Mine hibernaculum in Essex County (located within 1 mile [1.6 km] of Lake Champlain)
 21 and the Indian Oven hibernaculum in Columbia County are Priority 4 with only 3 and 5 bats observed,
 22 respectively. The hibernaculum in Warren County is Priority 3 with 60 to 135 bats estimated (USFWS
 23 2007). These hibernacula have less than 150 bats recorded in areas where the transmission line generally
 24 would be buried under Lake Champlain or the Hudson River.

25 Potential effects associated with construction could range from disturbance to injury or mortality if bats
 26 are roosting in trees while they are felled, and habitat loss or decreases in the quality of remaining habitat
 27 in the Action Area. Factors that might lead to reduced habitat quality include habitat fragmentation and
 28 increased human disturbance (e.g., noise and dust). However, because of the substantial distance from
 29 Priority 1 and 2 hibernacula, these effects are expected to be insignificant.

30 ***Disturbance and Displacement***

1 | Construction of the proposed CHPE Project could create short-term disturbances that could affect bats in
2 | the area. If roosting bats or individuals flying through their home range are disturbed or displaced due to
3 | construction activities, then the potential exists for harassment or harm to occur. Large-scale construction
4 | projects create noise, dust, and vibration type effects that may result in disturbance to individual animals.
5 | Heavy machinery movement and vehicles have a greater potential for generating noise, dust, and
6 | vibrations. These types of disturbances are variable, transient, and temporary in nature as the construction
7 | changes locations and are influenced by environmental conditions at any given time or location. Adjacent
8 | roost trees could be subject to these temporary disturbances. Applicant-proposed BMPs (see **Section 2.5**)
9 | would be implemented to minimize potential construction impacts, such as dust and erosion, but little can
10 | be done to minimize impacts from noise (apart from use of improved mufflers) and vibrations from the
11 | heavy construction equipment on the Indiana bat. However, given the temporary and variable nature of
12 | construction activities, these impacts and behavioral responses to the disturbances would be insignificant
13 | for the reasons discussed below. In addition, the Proposed CHPE Project would be located along and
14 | within existing active railroad and highway ROW where existing noise levels are elevated compared to
15 | adjacent areas.

16 | In several studies bats have displayed some resilience to disturbance type impacts. In the original Indiana
17 | Bat Recovery Plan (USFWS 1999), the USFWS concluded that the bat may be a more adaptable species
18 | than originally thought when it was listed as an endangered species. Maternity colonies have been found
19 | along the edge of woodlots and active agricultural fields, in heavily logged and grazed open woodlots, in
20 | pastures, and even in an active pig-lot (Brack et al. 2002).

21 | Indiana bats and northern long-eared bats may change foraging areas and seek foraging habitats that are
22 | farther away from the construction area. Indiana bats exhibit strong site fidelity to their summer colony
23 | areas and foraging habitat (Kurta et al. 2002, USFWS 1999). It is not known how long or how far Indiana
24 | bats would search to find new habitat if their traditional habitat is lost or degraded. However, there are
25 | observations in the literature of Indiana bat tolerance to disturbance (USFWS 2008c) and it is unknown
26 | whether Indiana bats would shift or abandon their foraging areas as a result of the proposed construction
27 | actions.

28 | **Construction Noise.** Increased noise created by construction equipment within the proposed CHPE
29 | Project area could disturb bats day-roosting in nearby forests during spring, summer, and autumn. This
30 | potential disturbance would be short-term and noise would not be generated throughout the entirety of the
31 | project area during construction. There are several factors that determine the response from individuals or
32 | colonies of bats. Although noise levels associated with construction would likely continue for more than
33 | a single day, the bats roosting within or close to these areas are not expected to shift their focal roosting
34 | areas farther away given the current level of disturbance from the active railroad ROW being used for the
35 | proposed CHPE Project transmission line. Additionally, there is limited availability of suitable summer
36 | roost trees within and adjacent to the impact area.

37 | Construction activities along the Lake Champlain Segment would generally occur at distances greater
38 | than 500 feet (152 meters) from land. However, in a few places, construction would occur closer to
39 | shore. At this distance, the noise level would be approximately 83 to 89 dBA. With an average
40 | installation rate of 1.5 miles (2.4 km) per day, noise levels would be increased over baseline for only a
41 | few hours at any one location. Gardner et al. (1991) suggested that noise and exhaust emissions from
42 | machinery could disturb colonies of roosting bats, but such disturbances would have to be severe to cause
43 | roost abandonment. Callahan (1993) noted that the likely cause of the bats in his study area abandoning a
44 | primary roost tree was disturbance from a bulldozer clearing brush adjacent to the tree. There are many
45 | examples of Indiana bats tolerating noise. During a previous study, a primary Indiana bat roost tree
46 | containing as many as 45 bats was found along Interstate (I)-81. This maternity colony was apparently
47 | not affected by noise created by vehicles traveling north and south on I-81. Given the current level of

1 disturbance from the actively used railroad ROW and the limited availability of suitable summer roosting
 2 habitat within and adjacent to the impact area, Indiana bats and northern long-eared bats are not likely to
 3 become displaced or abandon roosting areas.

4 **Construction Dust.** The creation of airborne dust by construction equipment is likely to occur with all
 5 projects involving earthmoving. Dust likely would be created during the spring, summer, and fall when
 6 Indiana bats are roosting in adjacent forested habitats and possibly foraging throughout the project
 7 corridor. Any potential effects from dust would be very local within and immediately adjacent to the
 8 corridor. However, contractors would implement dust-control strategies (i.e., watering down disturbed
 9 soil) during construction activities. Given the amount of available foraging and drinking areas versus the
 10 area likely to be impacted by construction dust, and the measures to minimize dust, no impacts on bats are
 11 anticipated.

12 **Habitat Loss.** Vegetation removal could result in loss of habitat. In the immediate vicinity of the road
 13 and railroad ROWs, much of the habitat consists of disturbed open lands and secondary forest lacking
 14 suitable habitat for bat roosts. Forested or open woodland habitats occur alongside the proposed
 15 underground transmission line in Washington County; however, vegetation clearing would be conducted
 16 within the railroad ROW. In total, approximately 236 acres (96 hectares) of existing fringe forest cover
 17 could be temporarily disturbed and 48 acres (19 hectares) permanently converted to managed grasses or
 18 shrub habitat along the entire CHPE Project route to accommodate proposed construction corridors and
 19 any necessary additional workspace (CHPEI 2012e). Acreages of tree removal by county are provided in
 20 Table 5-5. Tree removal would be limited to an October to March timeframe to avoid impacts on the
 21 Indiana and northern long-eared bats. There are few large trees within the construction corridor. In
 22 general, there is limited availability of suitable summer roost trees within and adjacent to the impact area.
 23 However, because of the distance from Priority 1 and 2 hibernacula, these effects are expected to be
 24 insignificant. During the preconstruction survey, the contractors would identify large live or dead trees
 25 with peeling bark, such as shagbark hickory, which could serve as maternity or roost trees. These trees
 26 would be avoided where possible.

27 **Table 5-5. Acreages of Tree Removal from the Proposed CHPE Project**

ROUTE	Route ID	County	Temporary Impacts (Acres)	Permanent Impacts (Acres)
Dresden to Whitehall	Route 22	Washington	26.8	8.1
Whitehall to Schenectady	CP Railroad ROW	Washington	36.7	3.3
Whitehall to Schenectady	CP Railroad ROW	Saratoga	75.7	11.5
Whitehall to Schenectady	CP/CSX Railroad ROW	Schenectady	29.4	6.9
Schenectady to Cementon	CSX Railroad ROW	Albany	45.3	12.7
Schenectady to Cementon	CSX Railroad ROW	Greene	18.8	4.5
Haverstraw Bay Bypass	CSX Railroad ROW	Rockland	3.7	0.9
Total			236.2	47.8

Source: CHPEI 2012e

28

1 **Foraging Habitat.** Indiana bats and northern long-eared bats in the Action Area could be affected by the
2 loss of forest habitat and increase in edge habitats. While Indiana bats would have alternative foraging
3 habitat available within the proposed CHPE Project area, they might have to shift or expand their foraging
4 ranges into areas previously unused by them to make up for the loss of foraging habitat. Northern
5 long-eared bats rely upon and prefer edge habitat for safe foraging and movements to and from their roost
6 trees to feed. Therefore the increase in edge habitat may benefit this species. The impact of shifting
7 flight patterns and foraging areas on individual bats would vary. Recovery from the stress of hibernation
8 and migration might be slower as a result of the added energy demands of searching for new foraging
9 habitat especially in an already fragmented landscape such as this one where forested habitat is limited.

10 **Roosting Habitat.** No habitat containing roost trees is expected to be removed within 20 miles (32 km) of
11 Priority 1 or 2 Indiana bat hibernacula. Most of the vegetation that would be impacted along the overland
12 portions of the transmission line consists of previously disturbed herbaceous or shrubby cover within the
13 existing railroad ROW. The major effect on roosting habitat is expected to be the loss of potential future
14 roost sites, rather than immediate effects of loss of roosting habitat. During the preconstruction survey,
15 the contractors would identify large live or dead trees with peeling bark, such as shagbark hickory, which
16 could serve as maternity or roost trees. These trees would be avoided where possible. BMPs, such as
17 site-specific prescriptions for clearing and selective retention of vegetative buffer zones would further
18 reduce effects (see **Section 2.5** for other Applicant-proposed measures to avoid or minimize impacts).

19 **Travel Corridors.** The use of hedgerows and tree-lined fence rows by bats within the proposed CHPE
20 Project corridor is unknown. These linear features may provide travel corridors for Indiana bats and
21 northern long-eared bats within the proposed CHPE Project area. As a result of loss of forest, Indiana
22 bats and northern long-eared bats may alter current flight paths between roosting and foraging habitat,
23 which may increase their overall flights or they may fly over the corridor and continue to use previous
24 foraging areas. However, the northern long-eared bat prefers to fly along edge habitat to reach foraging
25 habitats; therefore, the increase in forest edge may benefit this species. A study in Michigan found that
26 Indiana bats increased their commuting distance by 55 percent to follow tree-lined paths, rather than
27 flying over large agricultural fields (Murray and Kurta 2004). However, the open habitat crossed along
28 those tree-lined corridors was at least 0.6 miles (1 km) wide. The CHPE Project would widen primarily
29 existing open corridors along railroad and road ROWs by up to 20 feet.

30 **Summary of Construction Impacts**

31 In summary, when considering the combination of all potential impacts (e.g., noise, dust, and habitat
32 loss), the proposed CHPE Project may affect, but is not likely to adversely affect, the Indiana bat and the
33 northern long-eared bat. Temporary and small scale reductions in foraging or roosting opportunities for
34 Indiana bats could occur along the project corridor. Indiana bats might change roosting or foraging areas
35 and seek roosts and foraging habitats that are farther away from the active disturbance area, but these
36 changes in behavior would be very short term. In addition, there are observations of Indiana bat tolerance
37 to disturbance in the literature and it cannot definitively be established that Indiana bats would shift or
38 abandon their roosts or foraging areas as a result of construction activities. In general, there is limited
39 availability of suitable summer roost trees within and adjacent to the impact area. The Applicant would
40 identify and, where possible, avoid impacts on large live or dead trees with peeling bark, including
41 shagbark hickory, which could serve as maternity or roost trees for Indiana bats and northern long-eared
42 bats, and continue to consult with USFWS for recommendations regarding avoidance of any potential
43 impacts on Indiana bats.

44

1 **Operations and Maintenance Impacts**

2 ***Vegetation Control***

3 Most of the vegetation that would be impacted along the overland portions of the transmission line ROW
4 consists of previously disturbed herbaceous or shrubby cover within the existing railroad ROW. During
5 operations, vegetation management in the transmission line ROW would be restricted to vegetation
6 clearing on an as-needed basis to maintain heights of woody vegetation to less than 20 feet (6 meters) and
7 conduct repairs or maintenance along the transmission line. Mowing would be completed during the day
8 when Indiana bats are roosting in adjacent trees. Potential effects from mowing on Indiana bats include
9 noise and dust. Noise created by mowing could affect roosting bats in adjacent forests but, as discussed,
10 several colonies of bats have been found near mowed ROWs of major roads and appear to not be affected
11 by noise created by mowing and traffic. In addition, noise created by mowing would be experienced by
12 roosting or foraging bats for a very short duration because mowers would pass quickly by any area having
13 bats. Dust created by mowing would also be present in areas occupied by Indiana bats for a very short
14 duration.

15 ***Magnetic Fields***

16 There have been a limited number of studies performed to ascertain the effect of magnetic fields on
17 terrestrial and aquatic ecosystems, and little or no evidence exists that suggests significant impacts, except
18 for some effects near very strong sources of EMF. Buried cables would have no electric fields at the
19 ground surface (WHO 2012, Normandeau et al. 2011). There would be a constant magnetic field, which
20 would decrease with distance from the cable centerline. The burial of the transmission line at the
21 anticipated depths also reduces electric and magnetic field exposure compared to an overhead
22 transmission system. The burial of the transmission line at the anticipated depths also reduces the EMF
23 exposure compared to an overhead transmission system.

24 No impacts from magnetic fields would be anticipated from operation of the transmission line. While
25 there is evidence that wildlife can detect electromagnetic fields, research indicates that species behaviors
26 would not likely be affected by relatively small changes in magnetic fields (AUC 2011). Additionally,
27 literature suggests that electromagnetic fields associated with transmission lines do not result in any
28 adverse effects on the health, behavior, or productivity of animals (Exponent 2009). Indiana bats may be
29 able to detect magnetic fields; however, there is no evidence to suggest that the fields result in any effects,
30 or that these effects are adverse. Buried cables, such as those proposed for the CHPE Project, would have
31 no electric fields at the ground surface and the constant magnetic field would decrease with distance from
32 the cable centerline (WHO 2012). The predicted magnetic field level for the proposed CHPE Project
33 would be 77 mG at 7 feet (2.1 meters) above the ground directly over the transmission line. While there
34 is evidence that wildlife can detect electromagnetic fields, species behaviors would not be affected by
35 relatively small changes in magnetic fields (AUC 2011). Additionally, literature suggests that
36 electromagnetic fields associated with transmission lines do not result in any adverse effects on the health,
37 behavior, or productivity of animals (Exponent 2009). Indiana bats might be able to detect magnetic
38 fields; however, there is no evidence to suggest that the magnetic fields could result in any effects on the
39 species. The burial of the transmission line at the anticipated depths also reduces the EMF exposure
40 compared to an overhead transmission system.

41 Most of the vegetation that would be impacted along the overland portions of the ROW consists of
42 previously disturbed herbaceous and shrubby cover within the existing railroad ROW. During operations,
43 vegetation along the ROW would primarily be managed by brush hogging/mowing or hand cutting.
44 Potential effects from mowing on Indiana bats include noise and dust. Noise created by mowing could
45 affect roosting bats in adjacent forests but, as discussed, several colonies of bats have been found near

1 mowed ROWs of major roads and appear to not be affected by noise created by mowing and traffic. In
2 addition, noise created by mowing would be experienced by roosting or foraging bats for a very short
3 duration, because mowers would pass quickly by any area having bats. Dust created by mowing would
4 also be present in areas occupied by Indiana bats for a very short duration.

5 5.2.2 Karner Blue Butterfly

6 Construction Impacts

7 Effects on the Karner blue butterfly could occur from vegetation clearing, trenching, and other
8 construction activities associated with the transmission line. Potential effects from vegetation clearing
9 include habitat degradation via trampling, removal, or other disturbances to wild lupine and other
10 vegetation. However, effects on the Karner blue butterfly would be avoided by using HDD through
11 portions of mapped wild blue lupine habitat. A *Karner Blue Butterfly Impact Avoidance and*
12 *Minimization Report* summarizes the routing and construction activities that would be employed to avoid
13 impacts on occupied and potential habitat containing wild blue lupine and nectar patches (CHPEI 2012k).
14 The Applicant has also developed impact avoidance and minimization measures specifically for Karner
15 blue butterflies and their habitat (see **Section 2.2**). The Applicant would avoid construction within or
16 immediately adjacent to occupied Karner blue butterfly habitat during the adult flight periods
17 (approximately May to August) to avoid mortality of adults. Prior to construction, surveys for the
18 presence of Karner blue butterflies would be conducted in accordance with the USFWS and NYSDEC
19 guidance document, *Karner Blue Butterfly (*Lycaeides melissa samuelis*) Survey Protocols Within the*
20 *State of New York* (USFWS and NYSDEC 2008). This would include flagging the boundaries of all
21 lupine patches within or immediately adjacent to construction workspaces or access routes, and training
22 construction personnel on the locations and identification of wild blue lupine to avoid trampling or
23 destruction of wild blue lupine plants. If any previously unknown (i.e., unflagged) areas containing wild
24 blue lupine are encountered, the Applicant would notify NYSDPS, NYSDEC, and USFWS. If additional
25 protective measures are necessary to protect the Karner blue butterfly or occupied habitat for this species,
26 the Applicant would temporarily cease any vegetation clearing, construction, ground-disturbing, or
27 vegetation management activities in the construction area, excepting any activities that could be necessary
28 for immediate stabilization of the work site, until protective measures can be implemented. These
29 measures would avoid the possibility of adverse impacts on Karner blue butterflies and habitat
30 degradation; therefore, direct disturbance is unlikely to occur.

31 **Habitat Loss**

32 The larval host plant of the Karner blue butterfly, wild blue lupine, occurs along portions of the Overland
33 Segment along the railroad ROW in Saratoga, Schenectady, and Albany counties. As a result, portions of
34 the project route have been recorded as being inhabited by adult Karner blue butterflies. Because of the
35 unique association that the Karner blue butterfly has with wild blue lupine, all mapped wild blue lupine
36 colonies are considered occupied. The transmission line would be installed by HDD in these mapped
37 areas to avoid impacts on habitat.

38 There are approximately 1.0 acre (0.4 hectares) of wild blue lupine habitat and 13.2 acres (5.3 hectares) of
39 nectar habitat within 100 feet (33 meters) of the proposed CHPE Project transmission line route where
40 trenching installation methods would be used (CHPEI 2012q, NYSDEC 2012d). All construction
41 including HDD installation and trenching would avoid direct impacts on all lupine habitat.
42 Approximately 1.8 acres (0.7 hectares) of mapped Karner blue butterfly nectar habitat occurs within the
43 33-foot (10-meter) construction corridor proposed for the transmission line along the CP Railroad ROW.
44 The final work around boundary would be identified in the EM&CP and fenced in the field to keep all

1 construction activities within it. Following construction activities, the impacted nectar habitat would be
2 restored with seeding of species that would provide nectar sources.

3 **Summary of Construction Impacts**

4 Because measures such as use of HDD and working within seasonal construction windows would be
5 implemented to avoid disturbing potential habitat and prohibit working near that habitat during the period
6 when butterfly adults are active, the proposed CHPE Project may affect, but is not likely to adversely
7 affect, the Karner blue butterfly. In addition, forest-clearing activities could create habitable areas for
8 wild blue lupine plants and subsequently result in beneficial impacts for the Karner blue butterfly.

9 **Operations and Maintenance Impacts**

10 Impacts on the Karner blue butterfly could occur from vegetation clearing and other maintenance
11 activities associated with the transmission line. During operation, limited vegetation management would
12 be conducted along the corridor, primarily to ensure that large woody vegetation does not grow over the
13 cables, or in the event that repairs or other maintenance of the cables is required. However, adverse
14 impacts on the Karner blue butterfly are not anticipated due to implementation of Applicant-proposed
15 avoidance and mitigation measures. During operation of the transmission line, although wild blue lupine
16 habitat would generally be avoided, if any emergency repairs or other operational maintenance activities
17 could be required within Karner blue butterfly and frosted elfin blue lupine habitats, they would be
18 implemented in accordance with ongoing consultations between the Applicant and USFWS and
19 NYSDEC, and the results of those consultations will be included in the EM&CP. No operational impacts
20 would occur in wild blue lupine habitat from mowing or vegetation removal under the Applicant's
21 Proposed Action because the transmission line would be installed via HDD methods to a depth of more than
22 10 feet (3 meters) below mapped lupine habitat, which would be well below root depths for wild blue
23 lupine, and mowing and vegetation removal would not take place in lupine habitat. Lupine typically
24 grows 8 to 24 inches (20 to 61 cm) in height with taproots approximately 12 to 20 inches (30 to 51 cm)
25 (USFS 2014, PlanetNatural 2012).

26 No herbicides or pesticides would be used within occupied Karner blue butterfly habitat, except as
27 approved by the USFWS and NYSDEC. To minimize the impact of herbicides on Karner blue butterfly
28 and its food plants, applications would be limited to spot application with hand operated equipment, using
29 personnel certified or experienced in pesticide applications and trained to identify the butterfly and lupine.

30 Heat from the cables in these areas would be dissipated by deep burial and by a cooling system and no
31 effect on vegetation would be anticipated. For emergency repairs in areas where the cables were installed
32 by HDD under Karner blue butterfly habitat, the cables would be pulled from the entry or exit locations
33 and repaired to avoid impacts the butterfly and its habitat. In areas where the cables were installed in
34 trenches adjacent to lupine and nectar patches, repair crews would employ the same protocols adhered to
35 during installation to avoid or minimize impacts (e.g., training of personnel to identify and flag habitat
36 boundaries to be avoided).

37 During operation of the transmission line, any emergency repairs, or other operational maintenance
38 activities required within Karner blue butterfly habitat would be implemented in accordance with the
39 mitigation plan for this species being developed by the Applicant in consultation with USFWS and
40 NYSDEC. Given these Applicant-proposed avoidance and mitigation measures, proposed CHPE Project
41 operations and maintenance activities may affect but are unlikely to adversely affect the Karner blue
42 butterfly.

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6. Cumulative Effects

Reasonably foreseeable future activities that might occur in the proposed CHPE Project area and an assessment of cumulative effects from such when combined with the proposed CHPE Project are described in Chapter 6 of the CHPE EIS (DOE 2013). State, local, and private activities (i.e., non-Federal activities) that are reasonably certain to occur within the Action Area are provided below. The Proposed Action when combined with other reasonably foreseeable actions would not contribute to cumulative adverse effects on ESA-listed species, largely because the conservation measures proposed as part of the proposed CHPE Project would avoid, minimize, and mitigate any impacts on ESA-listed species resulting from project construction and operation (see **Section 2.5**).

Fisheries. Recreational and commercial fishing activities in state waters may take shortnose and Atlantic sturgeon; however, information on such incidents, including numbers of fish affected, in the Action Area is not available (NMFS 2013b).

NPDES Permits. The State of New York has been delegated authority to issue NPDES permits by the USEPA. These permits authorize the discharge of pollutants into waters in the Action Area from facilities including municipalities for sewage treatment plants and other industrial users.

Haverstraw Water Supply Project. United Water proposes to provide a new water source to meet long-term water supply needs in Rockland County, New York. The proposed Haverstraw Water Supply Project would include the following:

- Water intake structure in the Town of Haverstraw that draws water from the Hudson River
- Water treatment plant near the closed Haverstraw Landfill, that uses reverse osmosis or desalination to remove salt, inorganic compounds, radionuclides, and viruses
- Raw intake water transmission lines between the intake structure and the treatment plant
- New connections from the treatment plant to existing water mains.

Construction of Phase 1, which includes the majority of infrastructure investments, is scheduled to begin in 2013 and be completed by 2015. Phase 2, which would include installation and expansion of process equipment within existing structures, would be in service by 2020; and Phase 3, which would involve additional mechanical equipment and expansion of the water treatment facility, could be in service by 2030. A Draft EIS for the Haverstraw Water Supply Project has been prepared (NYSDEC 2012a). The proposed CHPE Project would be adjacent to the Haverstraw Water Supply Project between MPs 297 and 298. Construction and installation activities could overlap, spatially and temporally, and so it is included in this cumulative impacts analysis.

Redevelopment of Stony Point Waterfront. A site at MP 296 along the Hudson River currently occupied by the Willow Cove Marina and Stony Point Bay Marina in Stony Point is being considered for redevelopment into 300 housing units, new marina with 125 boat slips, yacht clubs, and restaurants (Matsuda 2012).

Luyster Creek Converter Station Site. The Luyster Creek Converter Station Site is surrounded by utility and industrial facilities and uses, such as the Astoria Energy I and II plants, Astoria Generating Station plants, former Charles Poletti Power Plant, and Bowery Bay Wastewater Treatment Plant. The New York Power Authority (NYPA) recently constructed a new substation in Astoria (Astoria Annex Substation) to accommodate new interconnections, including the Astoria Energy II plant and, potentially, the proposed CHPE Project. Astoria Generating Company plans to construct the Luyster Creek Energy Project, which

1 would replace one generating unit at the Astoria Generating Station. Past, present, and reasonably
2 foreseeable uses of this parcel and surrounding areas are for utility and industrial purposes.

3 **ConEd Learning Center.** ConEd plans to use a portion of the Luyster Creek parcel for a Learning
4 Center. Currently, ConEd operates a training center in Queens, but a larger facility is needed to meet
5 ConEd's growing needs for training its employees. The Luyster Creek parcel is approximately 21 acres
6 (8 hectares). The Luyster Creek HVDC Converter Station would require approximately 5 acres
7 (2 hectares) in the northeastern portion of the parcel. Through a joint stipulation between ConEd and the
8 Applicant, the Luyster Creek parcel could be developed with both the Luyster Creek HVDC Converter
9 Station and the ConEd Learning Center. Under this stipulation, the HVDC Converter Station and
10 associated facilities would be confined to approximately 5 acres (2 hectares) within a subdivided parcel,
11 and the remainder of the Luyster Creek parcel would be used for the ConEd Learning Center (NYSPSC
12 2012). Existing setbacks and easements within the Luyster Creek parcel would still be applicable under
13 future development scenarios.

14 **Astoria Energy Project.** In 2006, Astoria Energy constructed a natural gas power plant, Astoria Energy I,
15 adjacent to the Charles Poletti Power Plant facility in Astoria, Queens. Astoria Energy I produces
16 500 MW for ConEd into the NYISO Market (AE 2012). In 2011, Astoria Energy II, LLC, completed
17 construction of the Astoria Energy II 550-MW natural gas-fueled generating facility in Astoria, Queens
18 (NYPA 2011). NYPA has a 20-year power supply contract to purchase generating output from the
19 Astoria Energy II plant for government customers (e.g., schools, hospitals, municipal buildings, and
20 subways and commuter trains). Both Astoria Energy plants are in the vicinity of the site for the proposed
21 Luyster Creek HVDC Converter Station for the proposed CHPE Project. The Astoria Energy II project is
22 now part of the existing condition.

23 **Luyster Creek Energy Project.** The Astoria Generating Company, LP, proposes to enhance the existing
24 Astoria Generating Station with a new 440-MW, gas-powered, combined-cycle generating facility in
25 Astoria, Queens. As part of this project, Astoria Generating Company would retire one existing unit and
26 limit emissions from other units at the Astoria Generating Station. It is anticipated that construction could
27 begin in 2013 with operations beginning in 2015, if approvals are granted (USPowerGen 2012). This
28 project is considered in the cumulative impacts analysis because of its proximity to the site for the
29 proposed converter station.

30 **Astoria Rezoning Plan.** Surrounding land uses south of 20th Avenue are mixed-use residential and
31 commercial with some open space and recreational. In 2010, the Queens Office of the New York City
32 Department of City Planning presented a rezoning plan for Astoria between Broadway and 20th Avenue.
33 New recommendations for this area of Astoria include replacing existing zoning with districts to
34 encourage predictable development, guiding new housing opportunities towards major corridors and mass
35 transit, and updating commercial overlays for business opportunities (NYCDCP 2010).

36 **Queens East River and North Shore Greenway Master Plan.** The Queens East River and North Shore
37 Greenway is a proposed 10.6-mile (17.1-km), urban shared-use trail that is intended to provide shoreline
38 access and improve non-motorized commuting options (NYCDCP and NYS OPRHP 2006). The plan
39 considered the waterfront and surrounding areas in the utility and industrial area surrounding the Luyster
40 Creek Converter Station Site for greenway purposes but noted that access was unlikely because of the
41 publicly inaccessible nature of the existing and planned utility development activities. The North Shore
42 section of the proposed greenway would run along 20th Avenue between Shore Boulevard near Ralph
43 DeMarco Park and Hazen Street and include a shared-use path and bike lanes along the roadway.

7. Conclusions

7.1 Effects Determination for Listed Species

Based on the description of the proposed CHPE Project in **Section 2** of this BA and further described in the associated Draft CHPE EIS (DOE 2013), the status of species and environmental baseline described in **Sections 3** and **4**, and the analysis of potential impacts in **Section 5**, the DOE concludes the following:

- The proposed CHPE Project would have no effect on the North Atlantic right whale, humpback whale, fin whale, sei whale, sperm whale, West Indian manatee, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, dwarf wedgemussel, piping plover, roseate tern, and bog turtle.
- The proposed CHPE Project may affect, but is unlikely to adversely affect, the shortnose sturgeon or any DPS of Atlantic sturgeon. Sediment disturbance, temporary increases in turbidity and associated water quality degradation, sediment redeposition, noise and vibration, vessel strikes, and accidental releases of hazardous materials are not expected to have significant effects on shortnose sturgeon and Atlantic sturgeon. Conservation measures such as establishment of construction windows to avoid seasonal periods where sensitive species are using these portions of the rivers would avoid or minimize to insignificant levels adverse effects on federally listed sturgeon species.
- The proposed CHPE Project may affect, but is unlikely to adversely affect, the Indiana bat or the northern long-eared bat. Although Indiana bats and northern long-eared bats may temporarily change roosting or foraging areas and seek roosts and foraging habitats that are farther away from active construction areas, there are observations in the literature of Indiana bat tolerance to disturbance and it cannot definitively be established that Indiana bats or the northern long-eared bats would shift or abandon their roosts or foraging areas. In general, there is limited availability of suitable summer roost trees within and adjacent to the impact area. Potential roost trees identified within the construction limits would be avoided where possible during construction activities. Tree removal would occur between October and March. Avoiding potential maternity or roost trees for Indiana bats and northern long-eared bats and other measures identified through ongoing consultation with USFWS would avoid or minimize to insignificant levels adverse effects on Indiana bats and northern long-eared bats.
- The proposed CHPE Project may affect, but is unlikely to adversely affect, the Karner blue butterfly. Measures would be implemented to avoid disturbing potential habitat and prohibit working near that habitat during the period when adults are active. Therefore, effects on the Karner blue butterfly from vegetation clearing, trenching, and other construction activities associated with the transmission line, such as habitat degradation via trampling, removal, or other disturbances to wild lupine and other vegetation, are unlikely. Direct and indirect adverse effects on the Karner blue butterfly would be discountable or insignificant.

7.2 Effects Determination for Critical Habitat

There is no designated or proposed designated critical habitat for the shortnose sturgeon, any DPS of Atlantic sturgeon, Indiana bat, northern long-eared bat, or Karner blue butterfly in the proposed CHPE Project area. As a consequence, there would be no effect on critical habitat.

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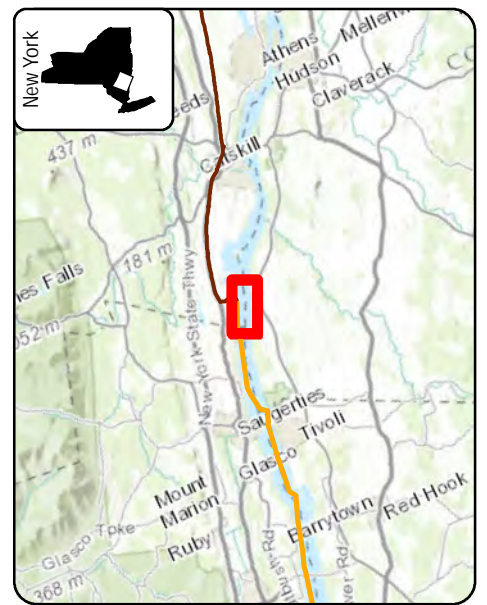
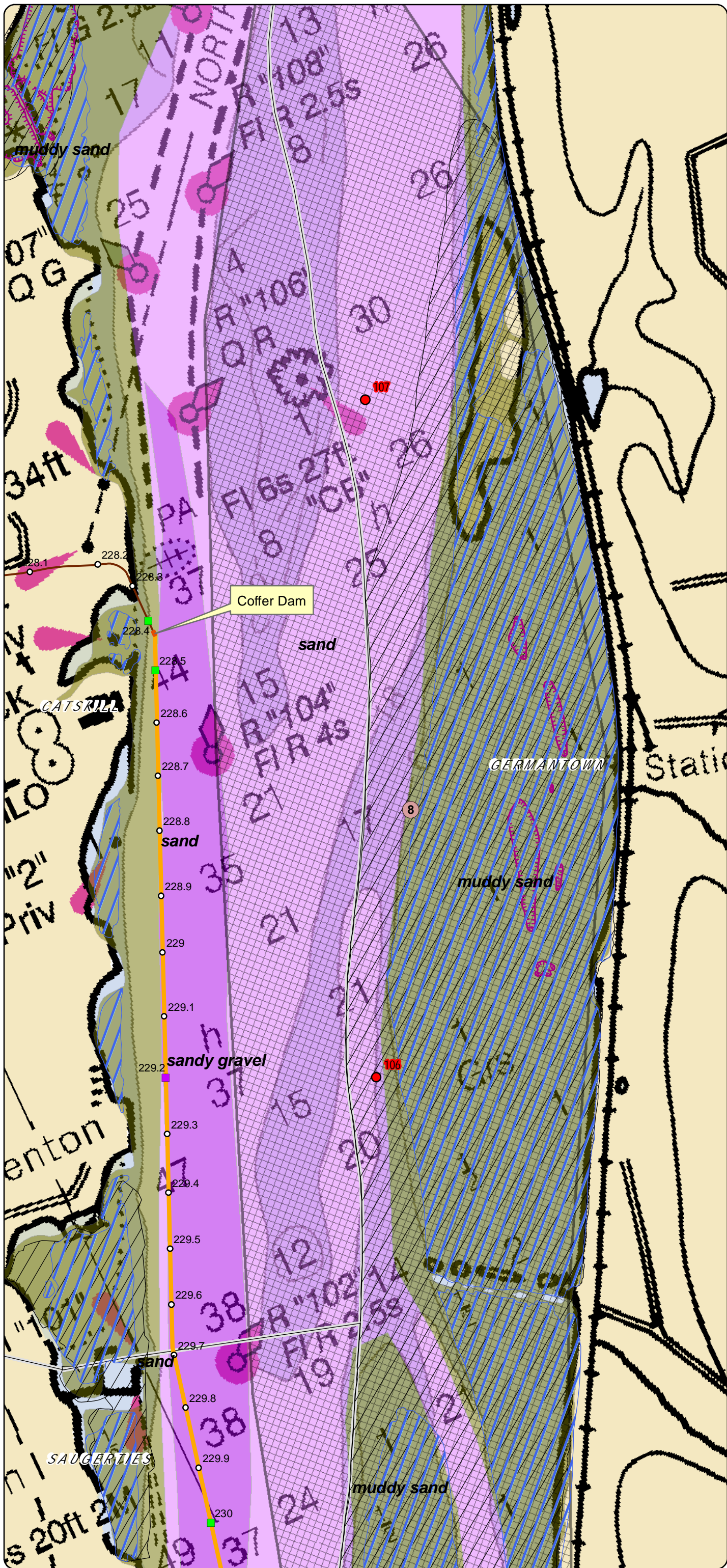
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ATTACHMENT 1

RESOURCES ALONG THE PROPOSED CHPE PROJECT ROUTE IN THE HUDSON RIVER



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud
- State Boundary
- County Boundary
- Town Boundary

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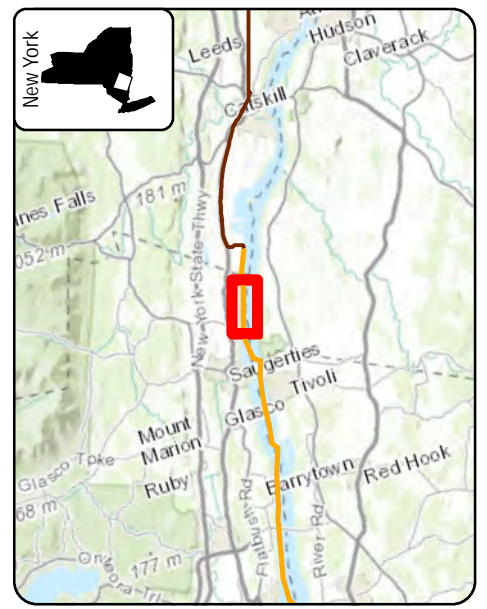
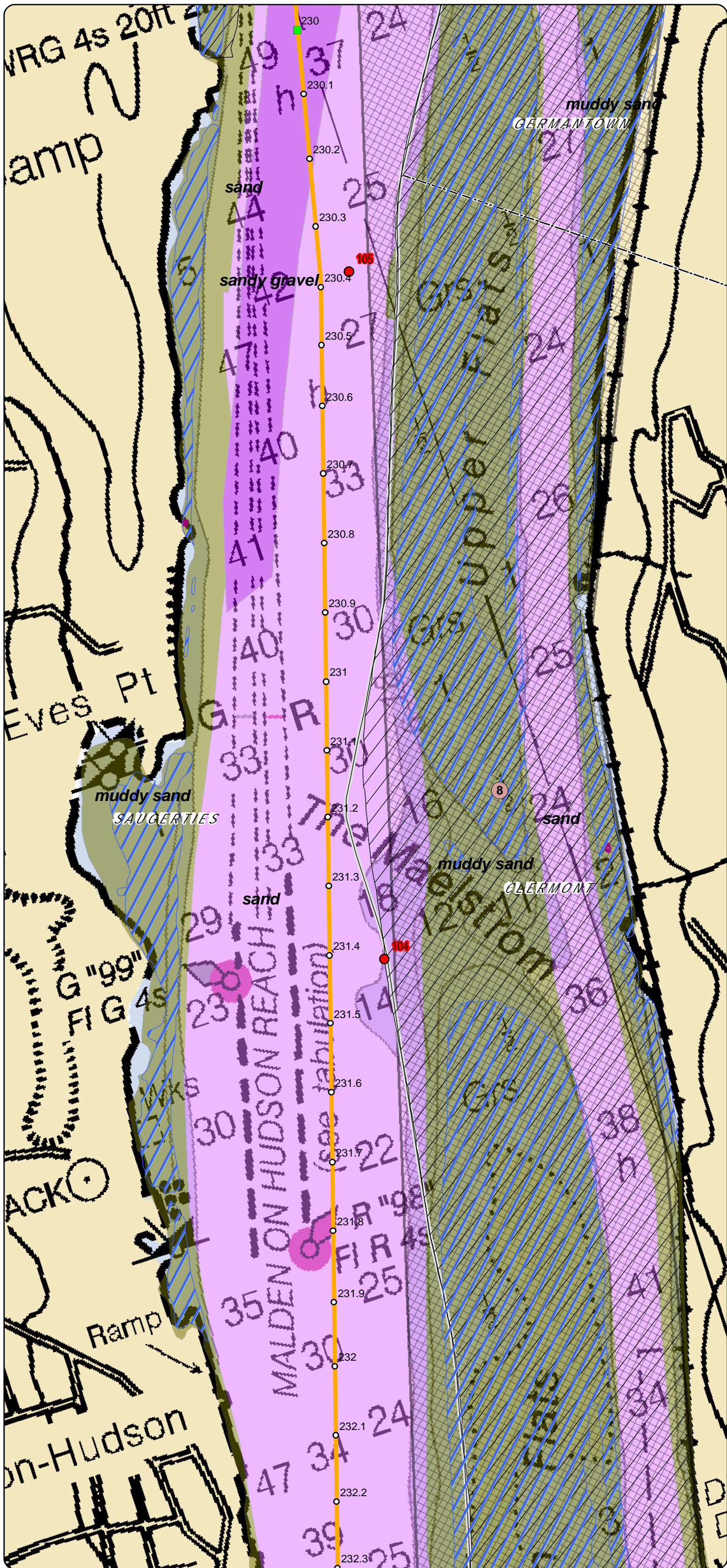
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Hudson River Project Route

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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

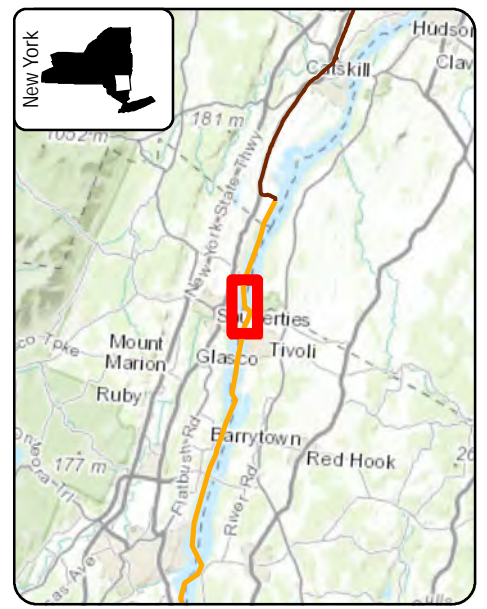
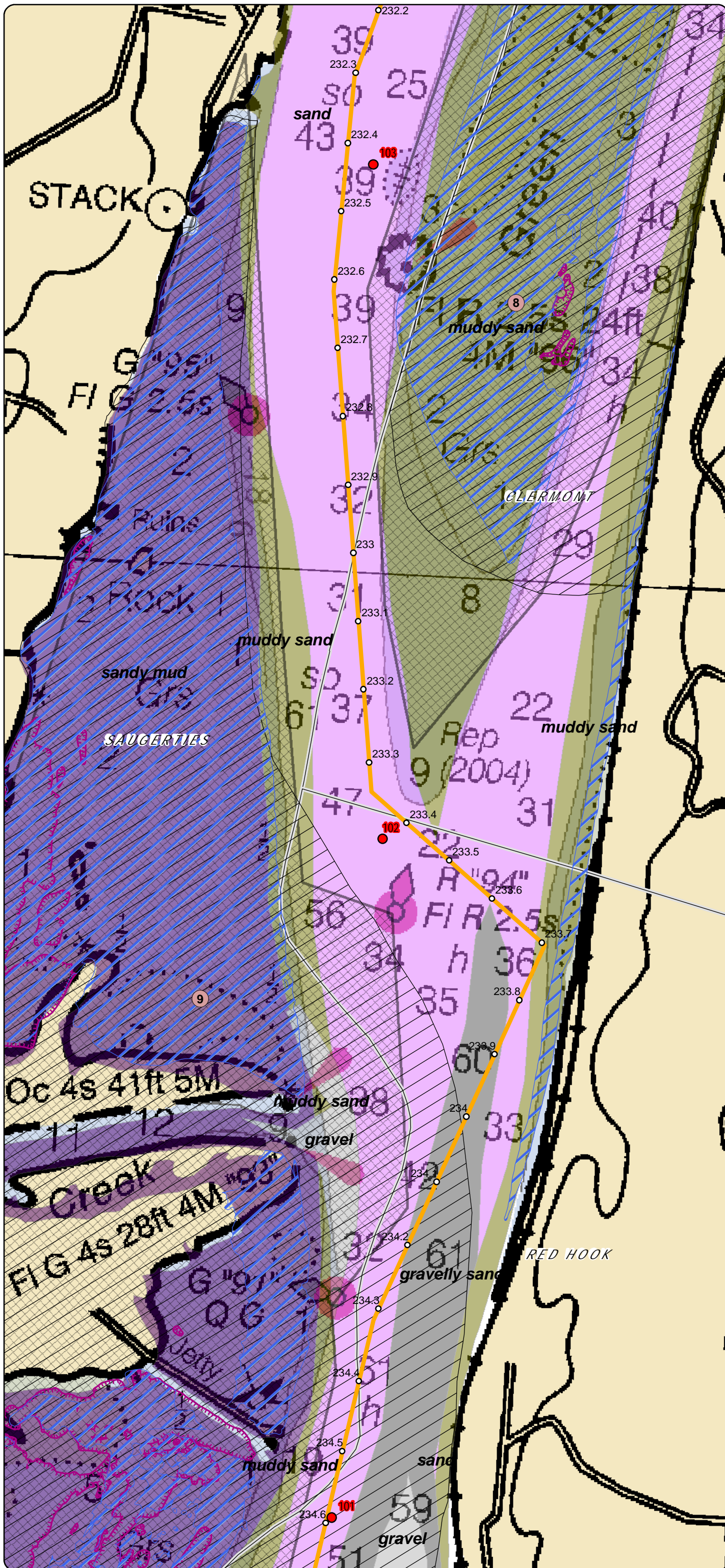
- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud
- State Boundary
- County Boundary
- Town Boundary

0 750
Feet


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Hudson River Project Route
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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud
- State Boundary
- County Boundary
- Town Boundary

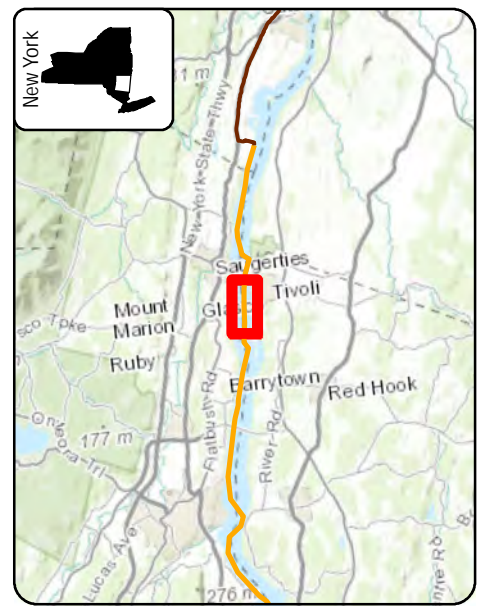
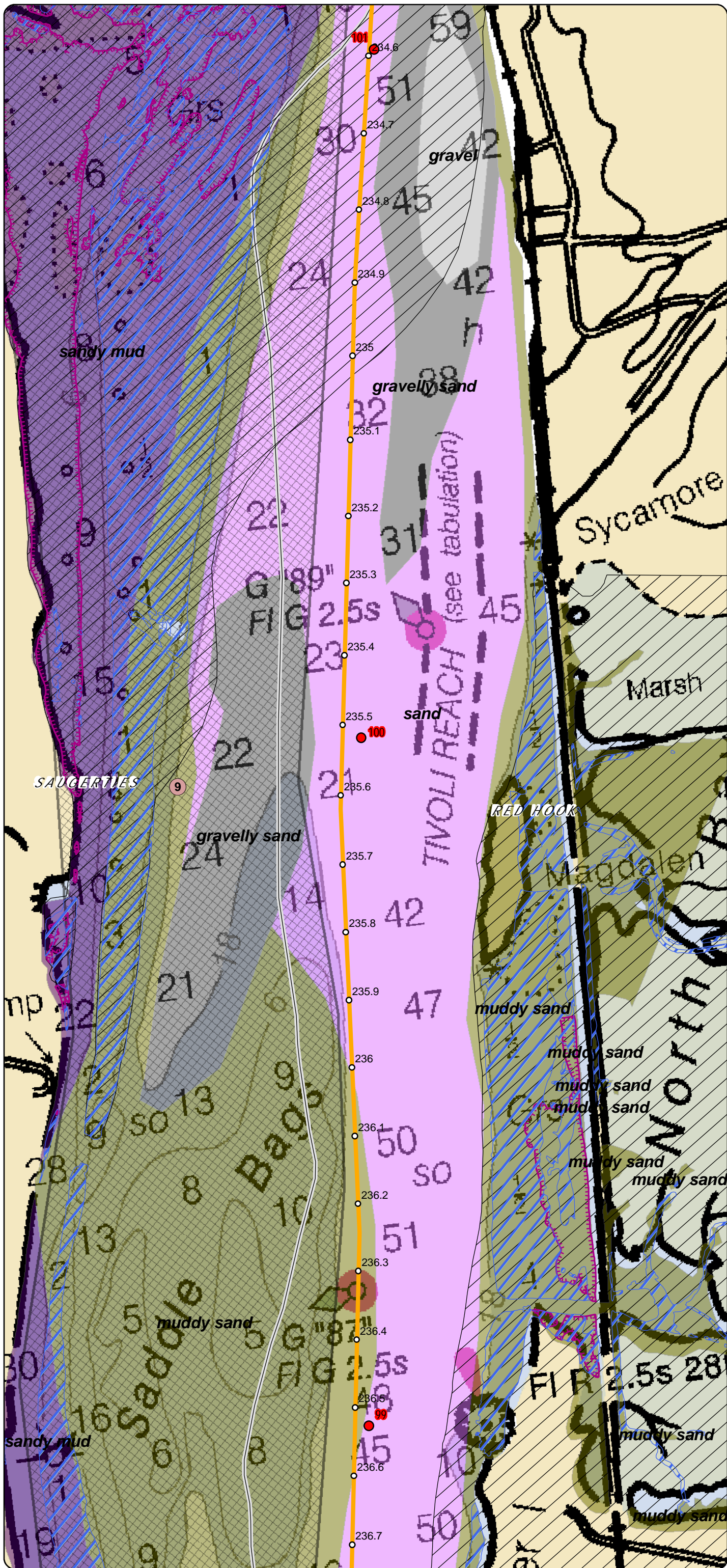
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Hudson River Project Route
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Created: 6/18/2014
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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
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- Submerged Aquatic Veg: Valsineria (NYSDEC)
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

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Feet

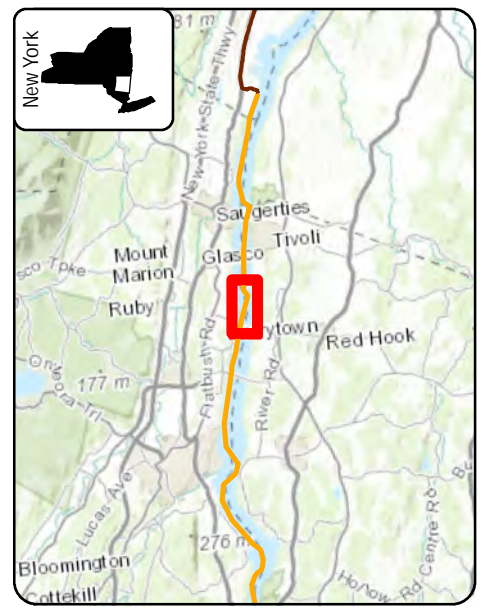
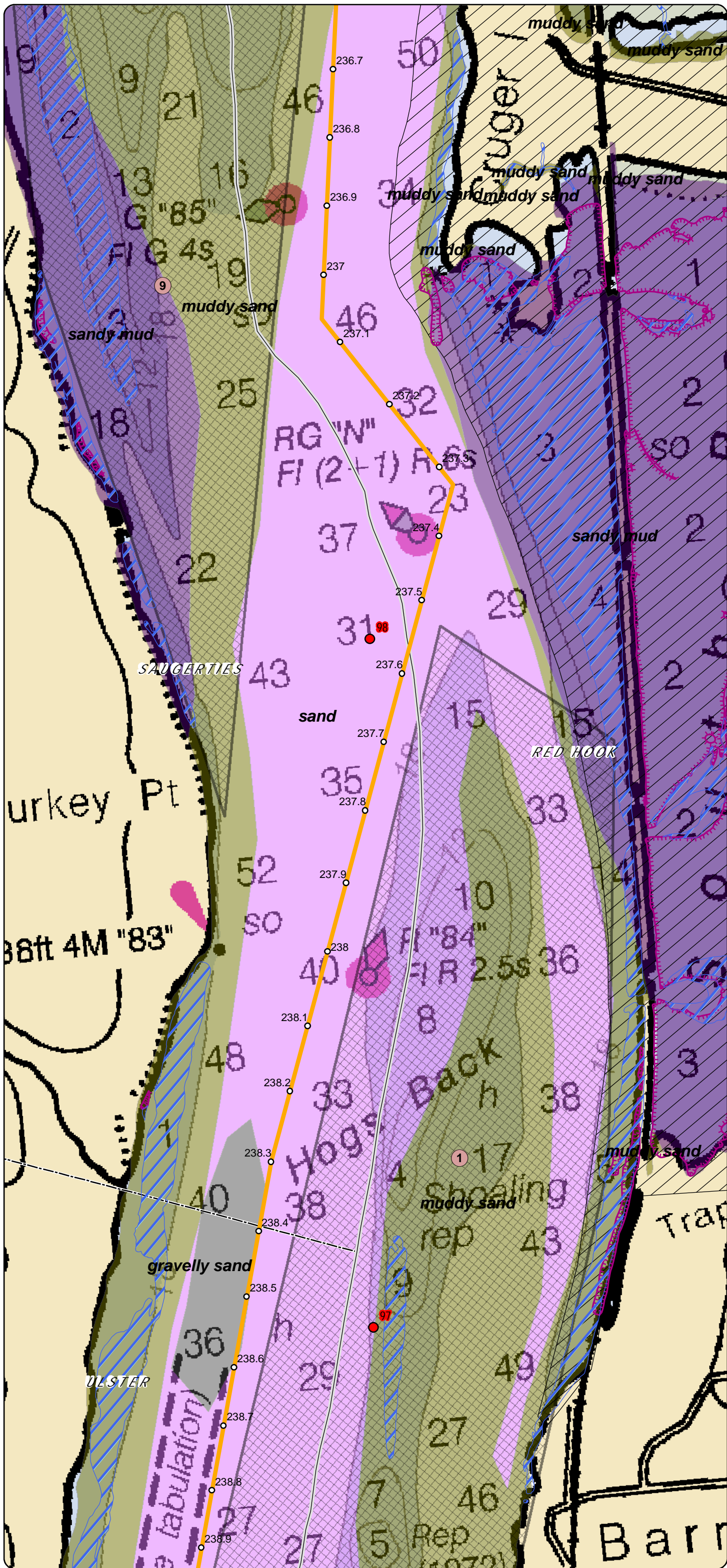
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Hudson River Project Route
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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
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- Contamination Site
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- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

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Feet

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Developers Inc.

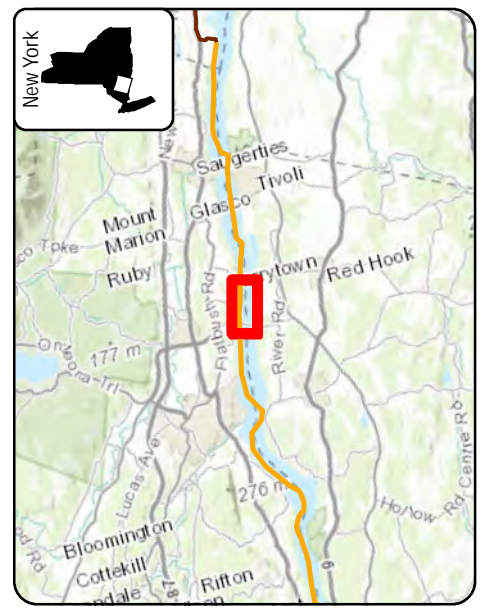
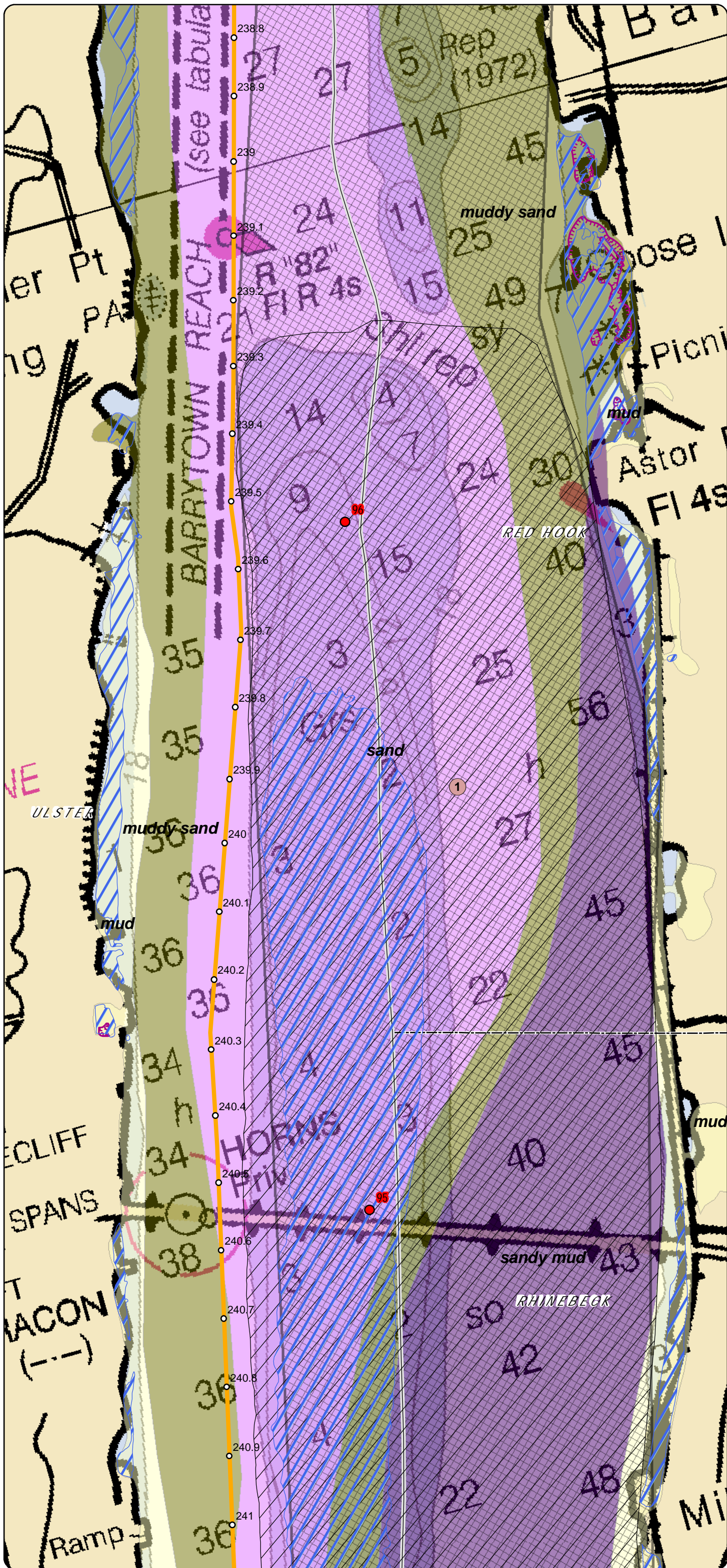
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**Hudson River
Project Route**

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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferd Dam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

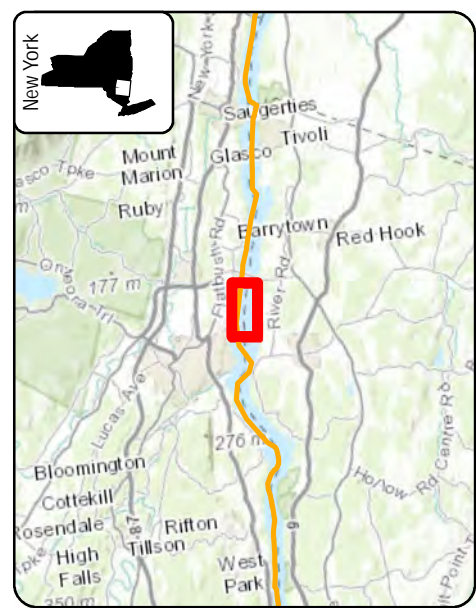
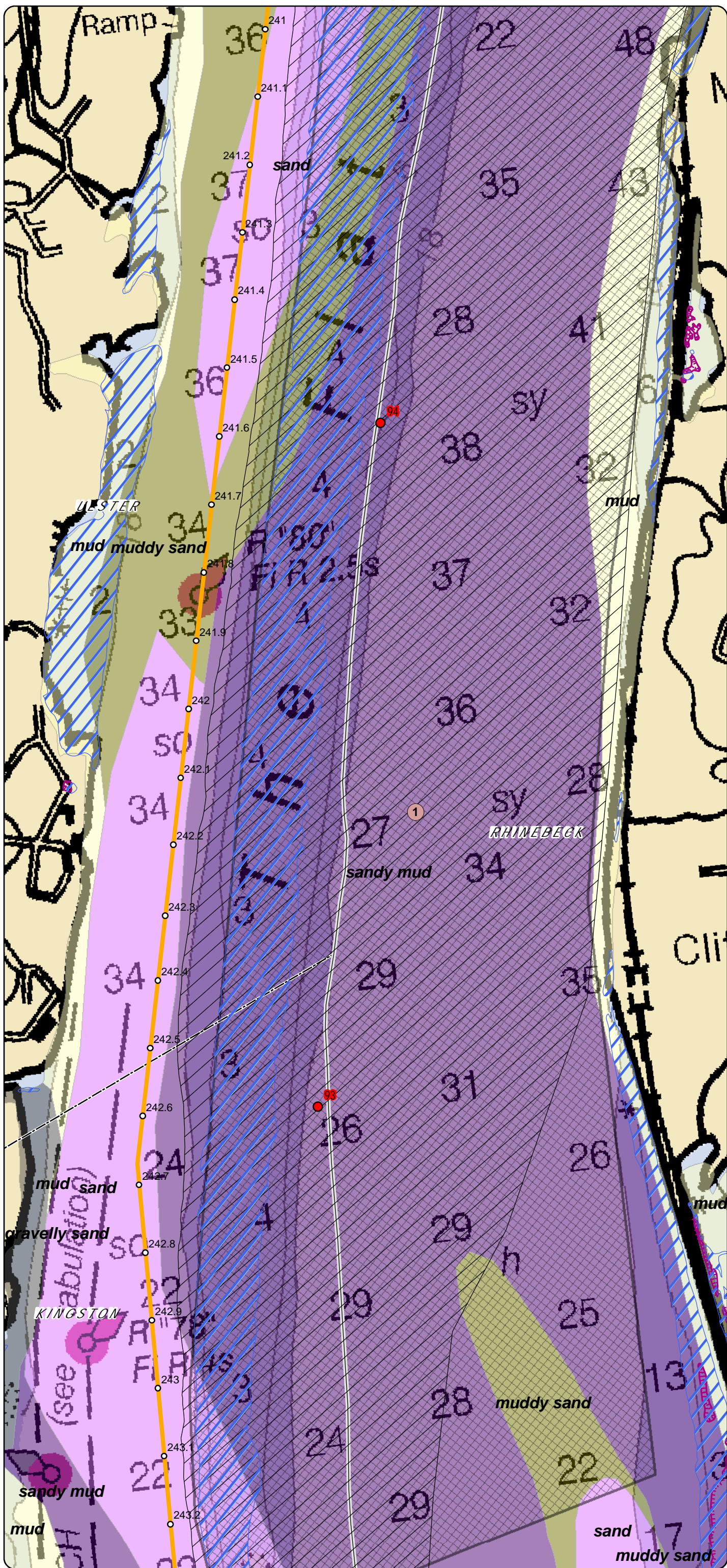
- State Boundary
- County Boundary
- Town Boundary

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Hudson River Project Route
 Sheet 6 of 43

 Created: 6/18/2014
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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
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- sandy mud

- State Boundary
- County Boundary
- Town Boundary



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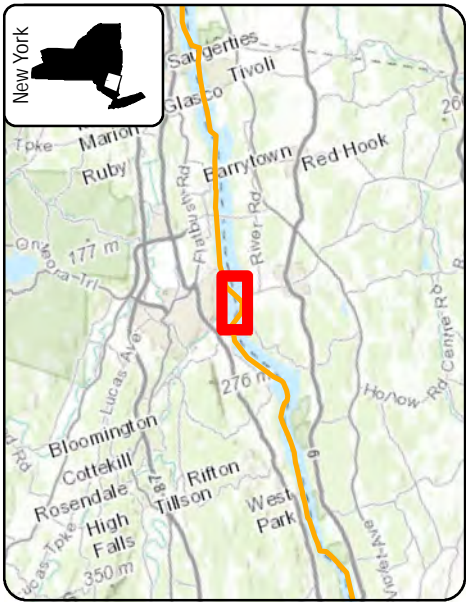
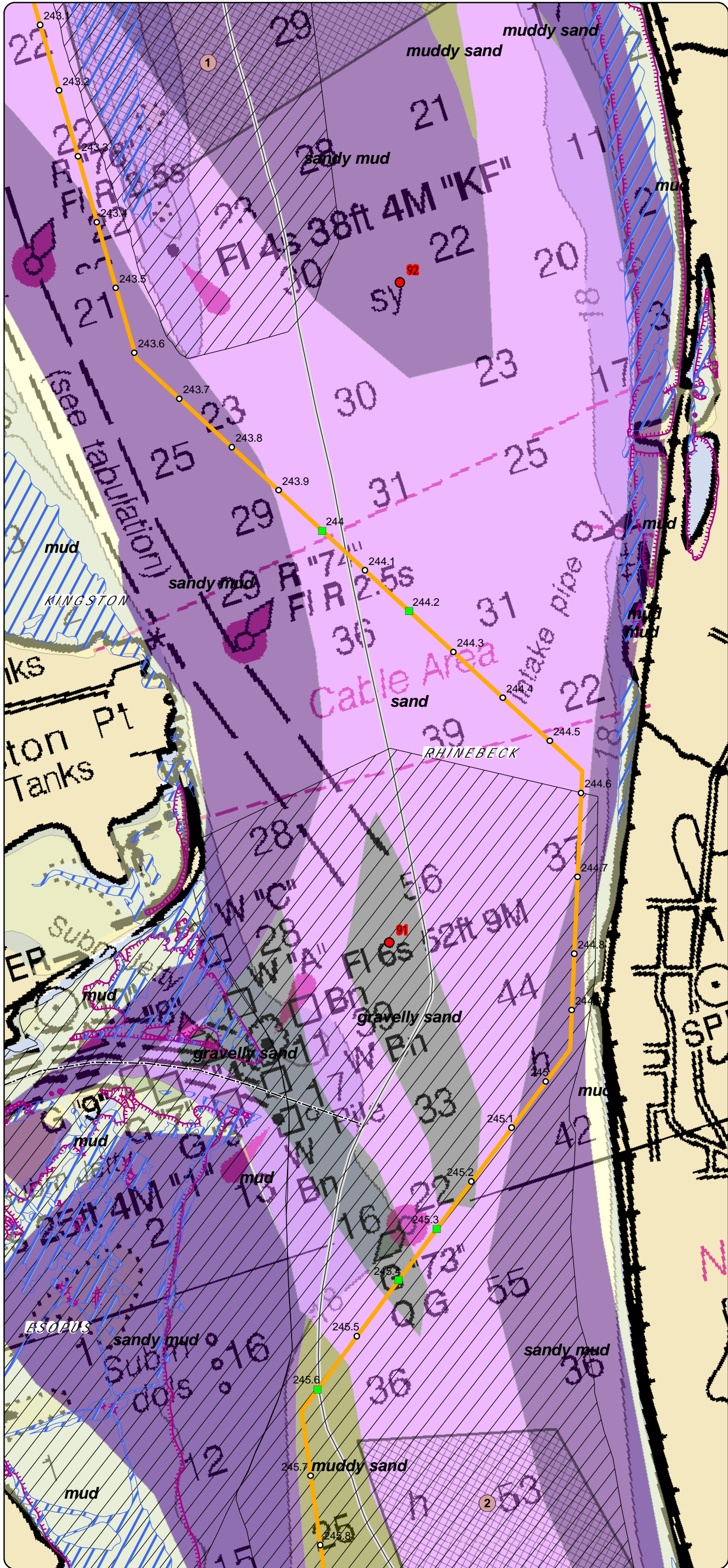


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Hudson River Project Route
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Created: 6/18/2014
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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
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- sandy mud

- State Boundary
- County Boundary
- Town Boundary



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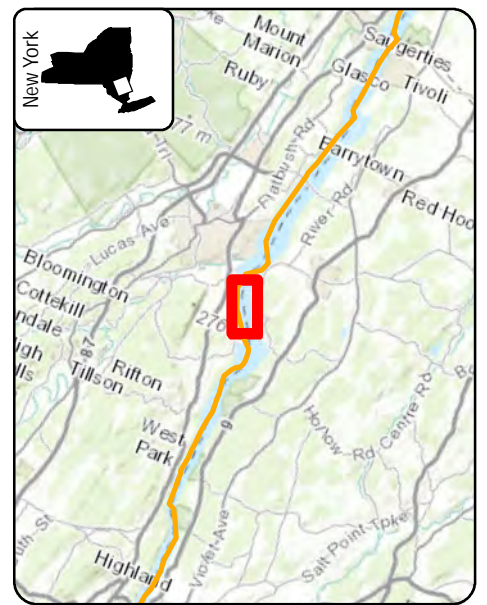
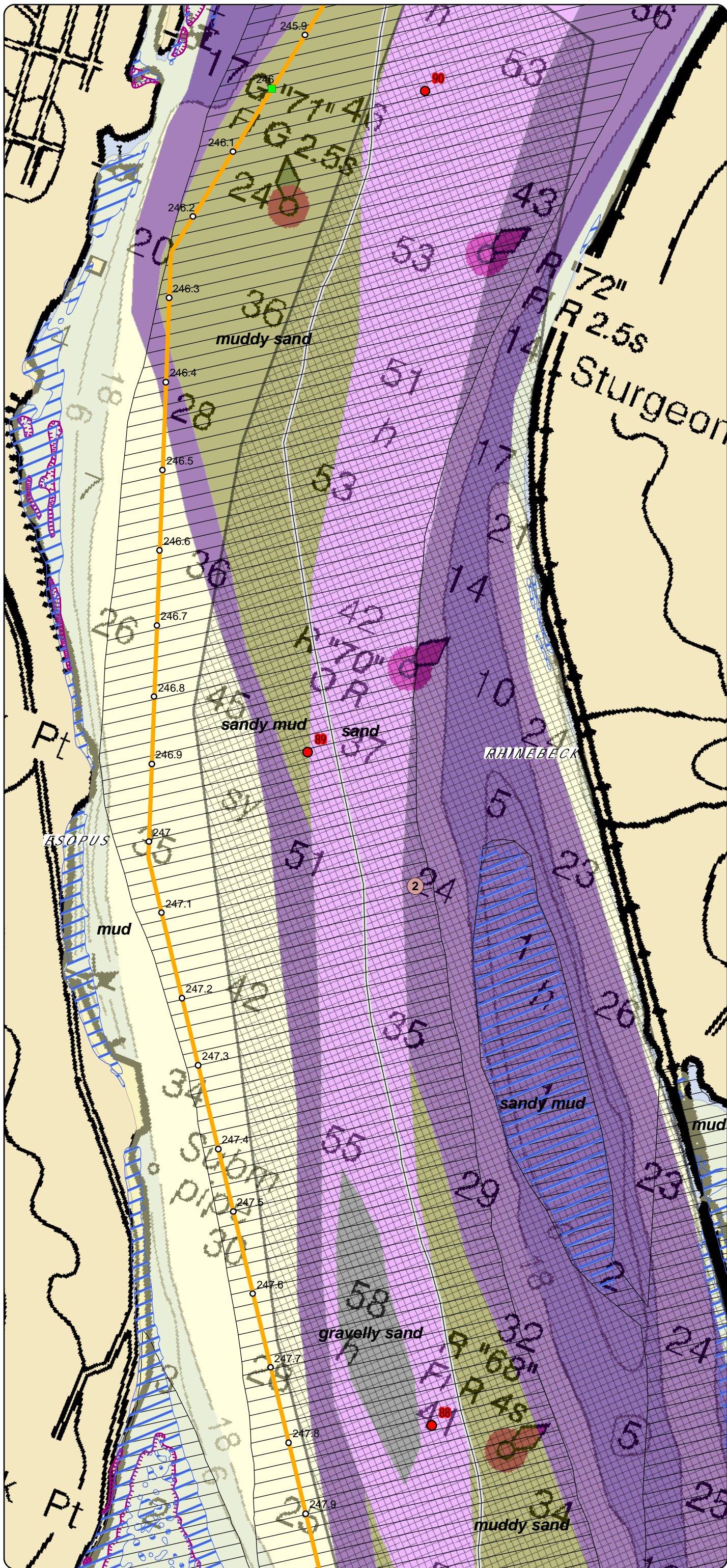
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Hudson River Project Route

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Created: 6/18/2014

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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
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Sediment Type - NYSDEC Hudson River Estuary Program

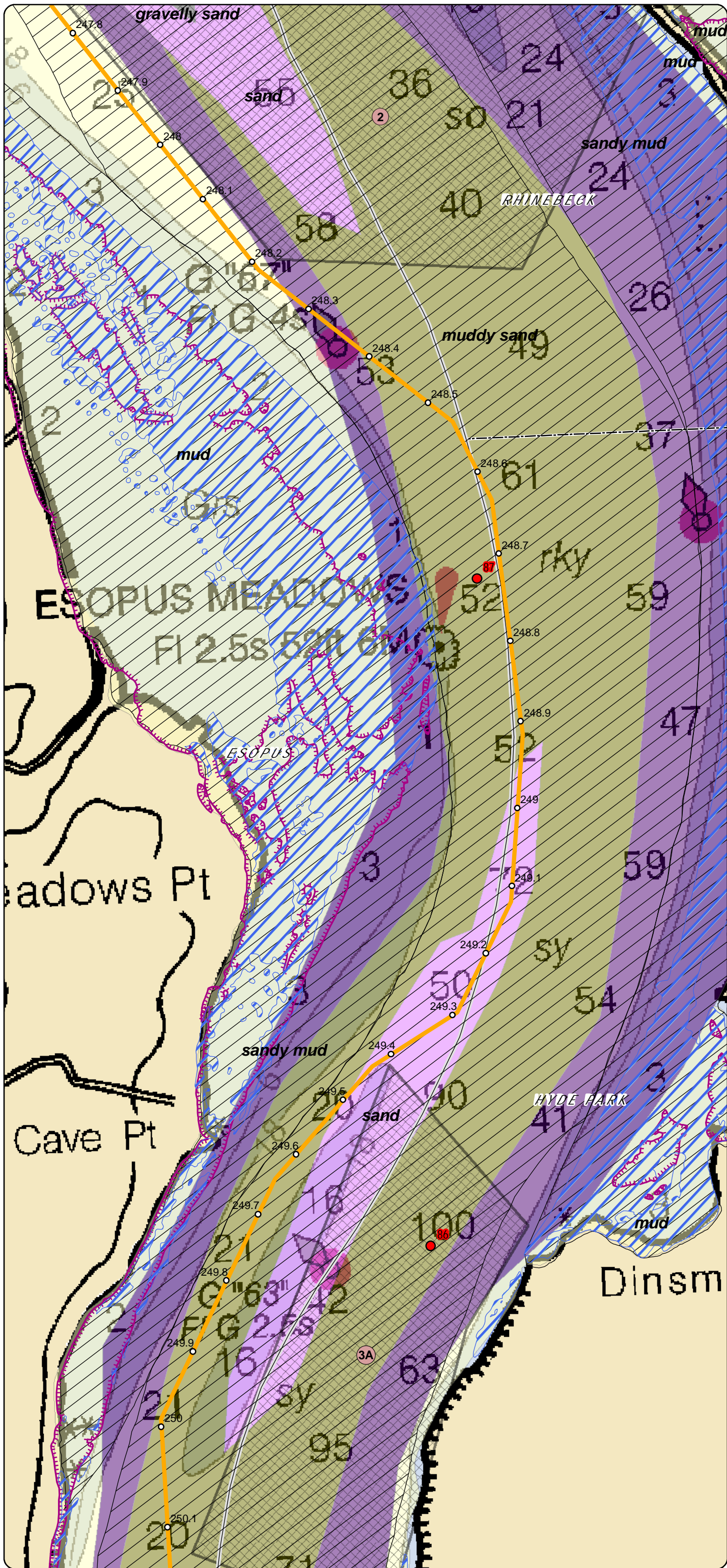
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- State Boundary
- County Boundary
- Town Boundary

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Feet


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 Champlain Hudson Power Express Project
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Hudson River Project Route
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 Created: 6/18/2014
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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
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- State Boundary
- County Boundary
- Town Boundary



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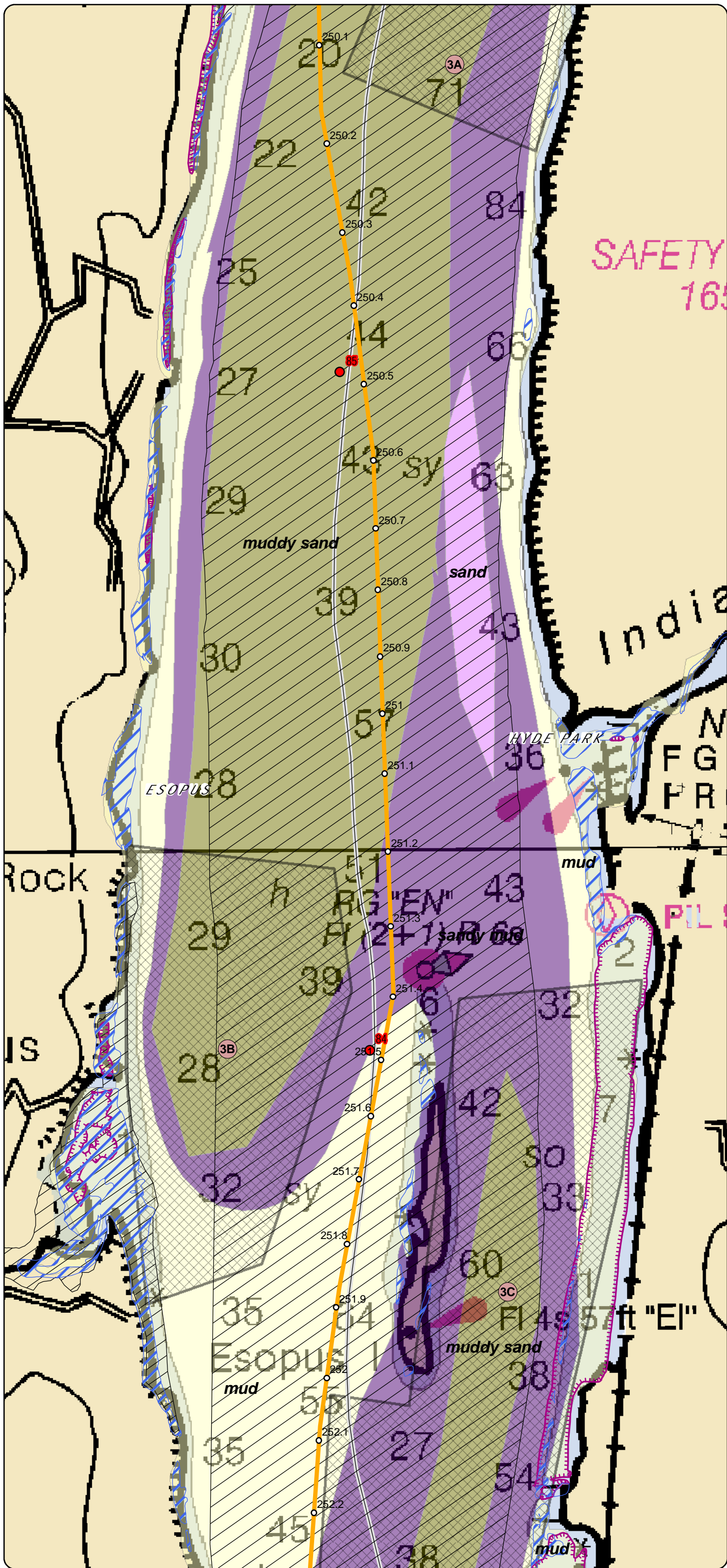
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Hudson River Project Route

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Created: 6/18/2014

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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

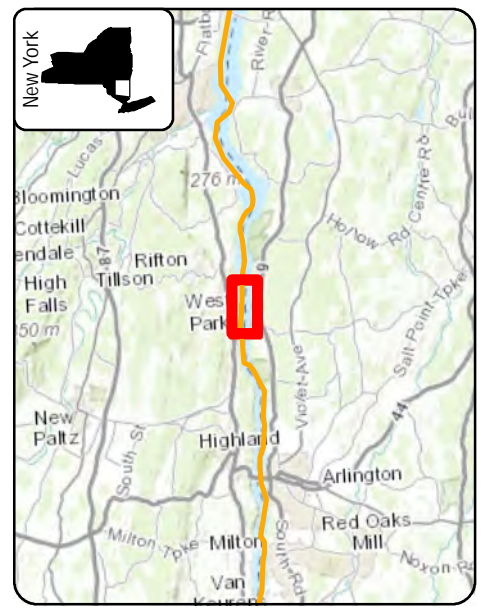
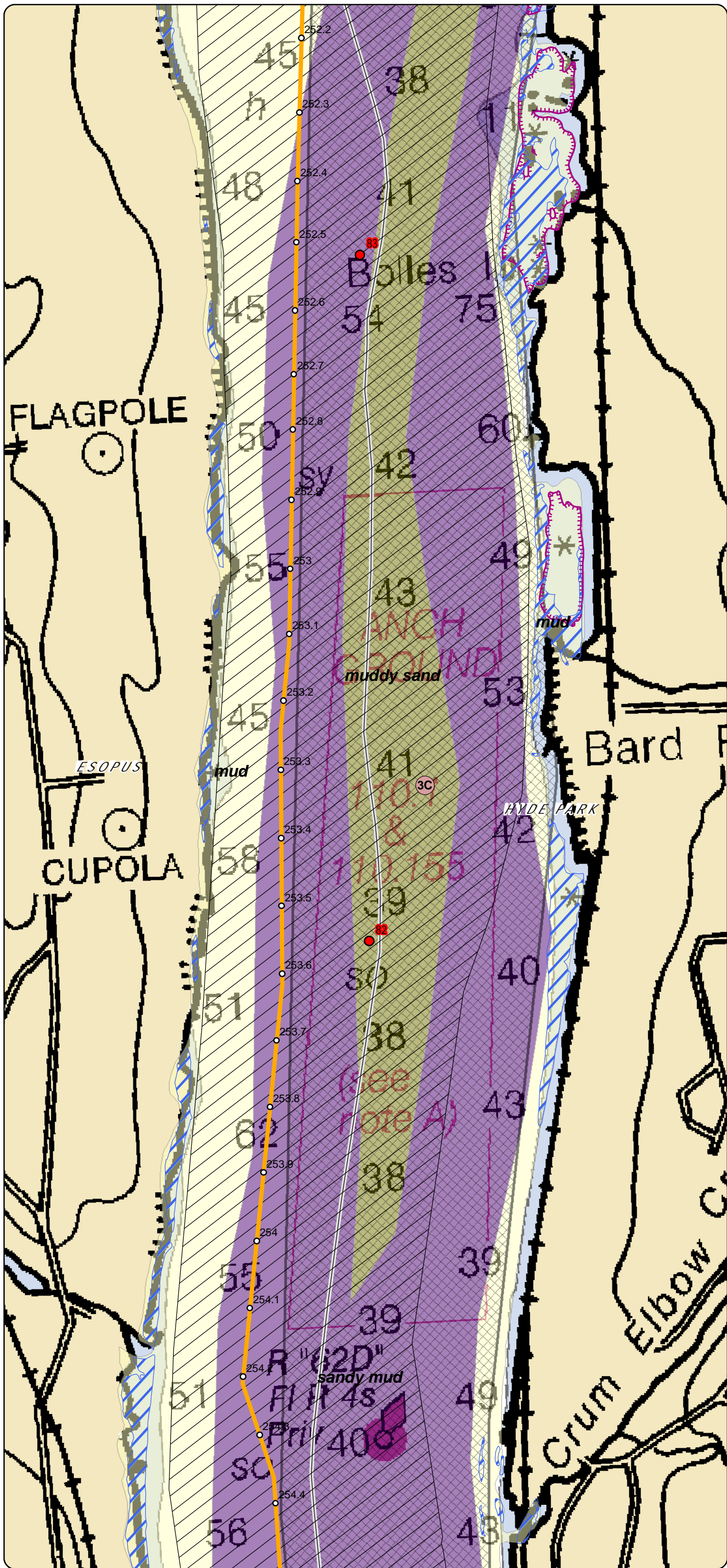
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- State Boundary
- County Boundary
- Town Boundary

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Feet

Transmission Developers Inc.
 Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route
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 Created: 6/18/2014
 by: &



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud
- State Boundary
- County Boundary
- Town Boundary

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Feet

Transmission
Developers Inc.

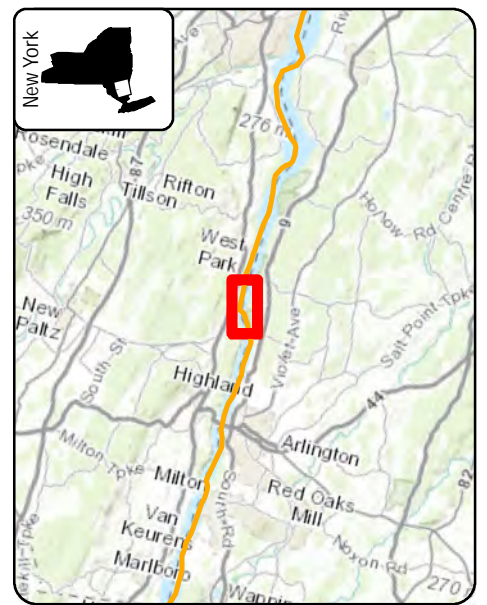
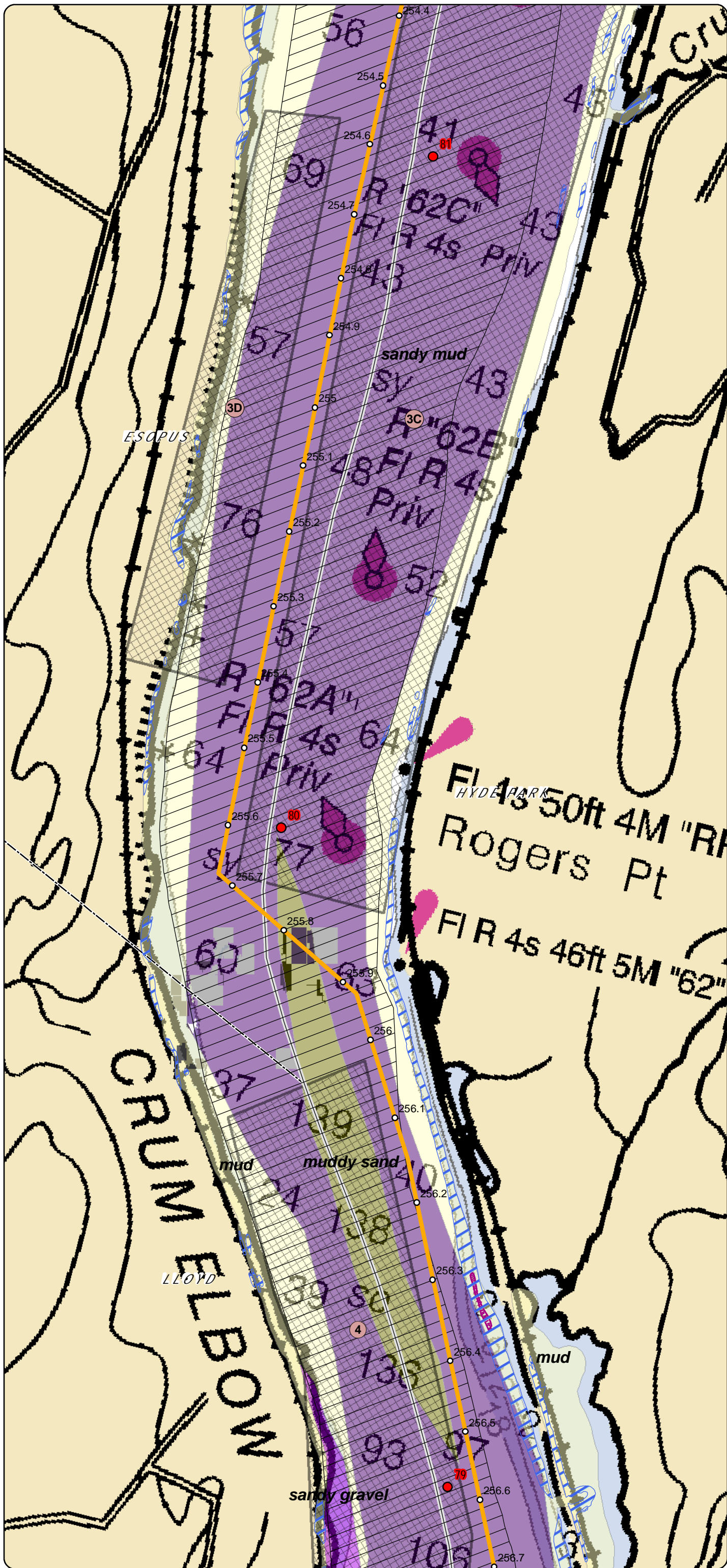
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Champlain Hudson Power Express Inc.

**Hudson River
Project Route**

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Created: 6/18/2014

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LEGEND


- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) Zone Number
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary





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Feet



Transmission
Developers Inc.

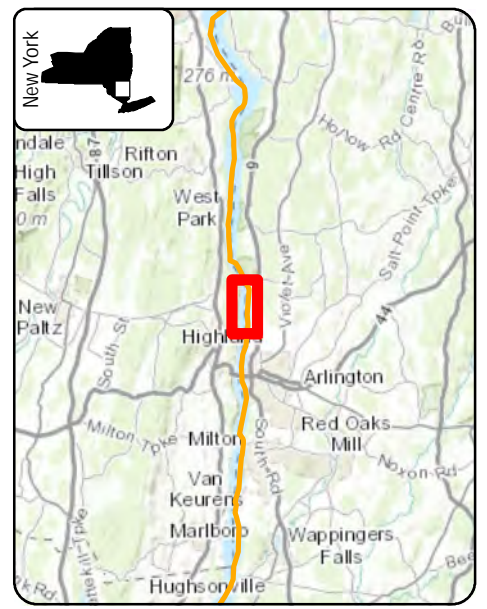
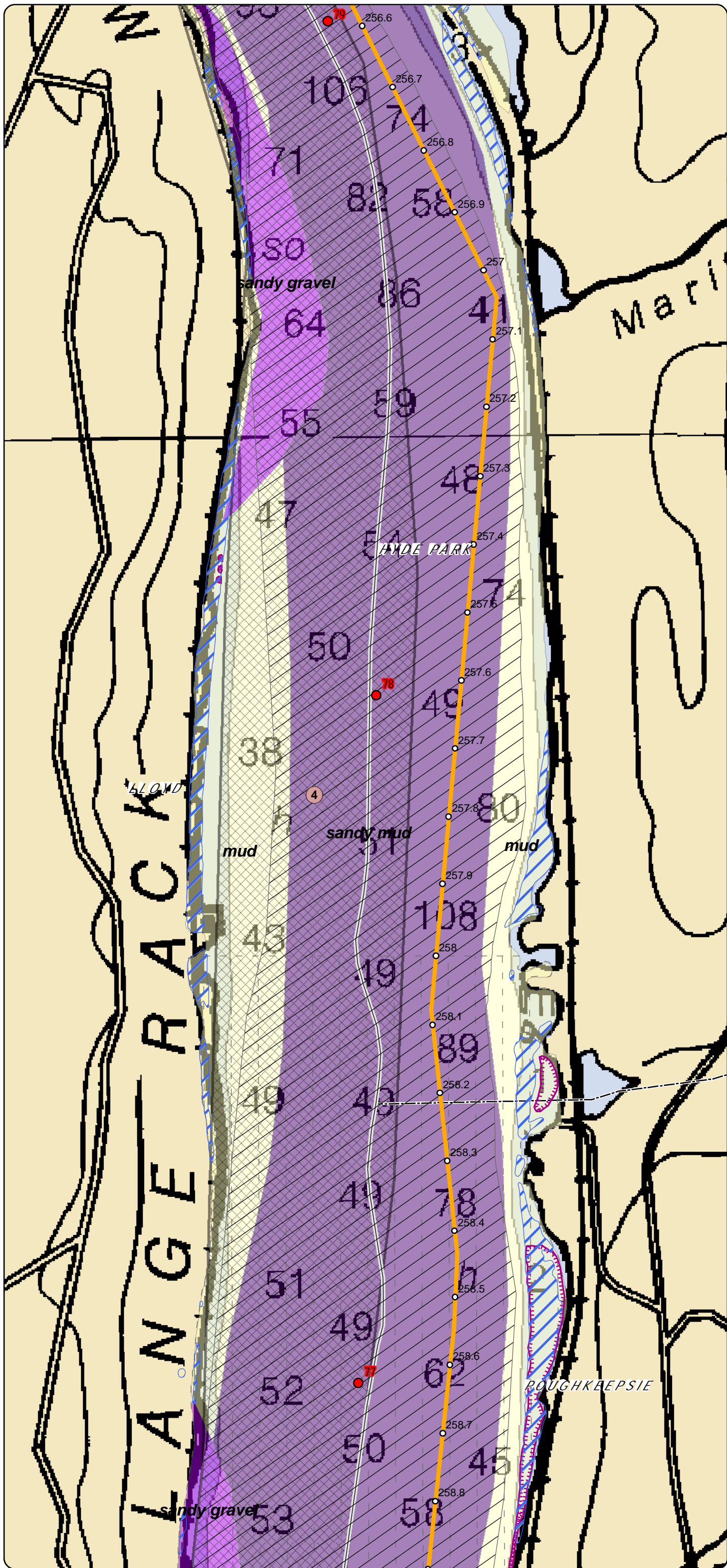
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Champlain Hudson Power Express Inc.

Hudson River Project Route

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Created: 6/18/2014

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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission Developers Inc.

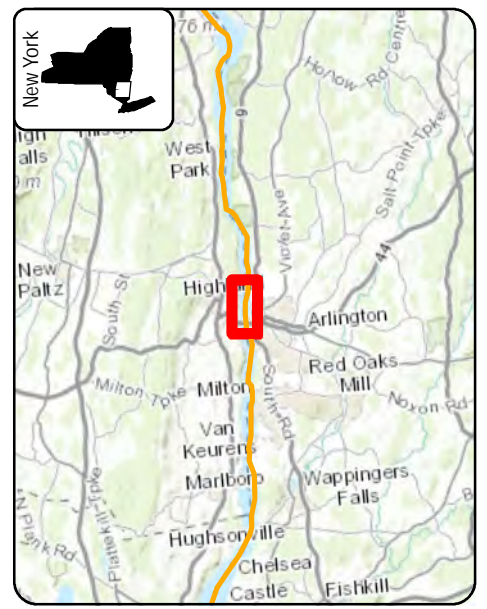
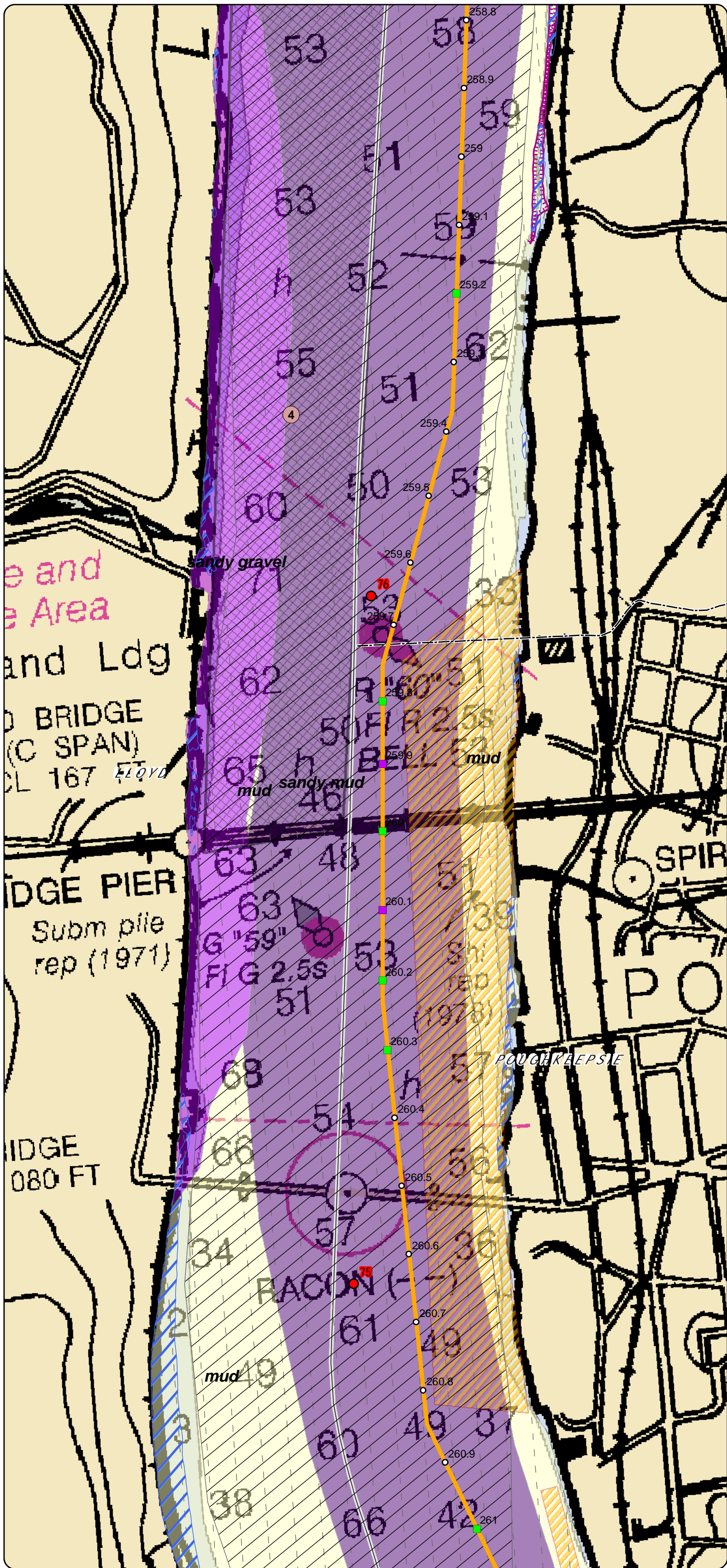
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Champlain Hudson Power Express Inc.

Hudson River Project Route

Sheet 14 of 43

Created: 6/18/2014

by: **HDR** **UTA** & **CTRC**



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission Developers Inc.

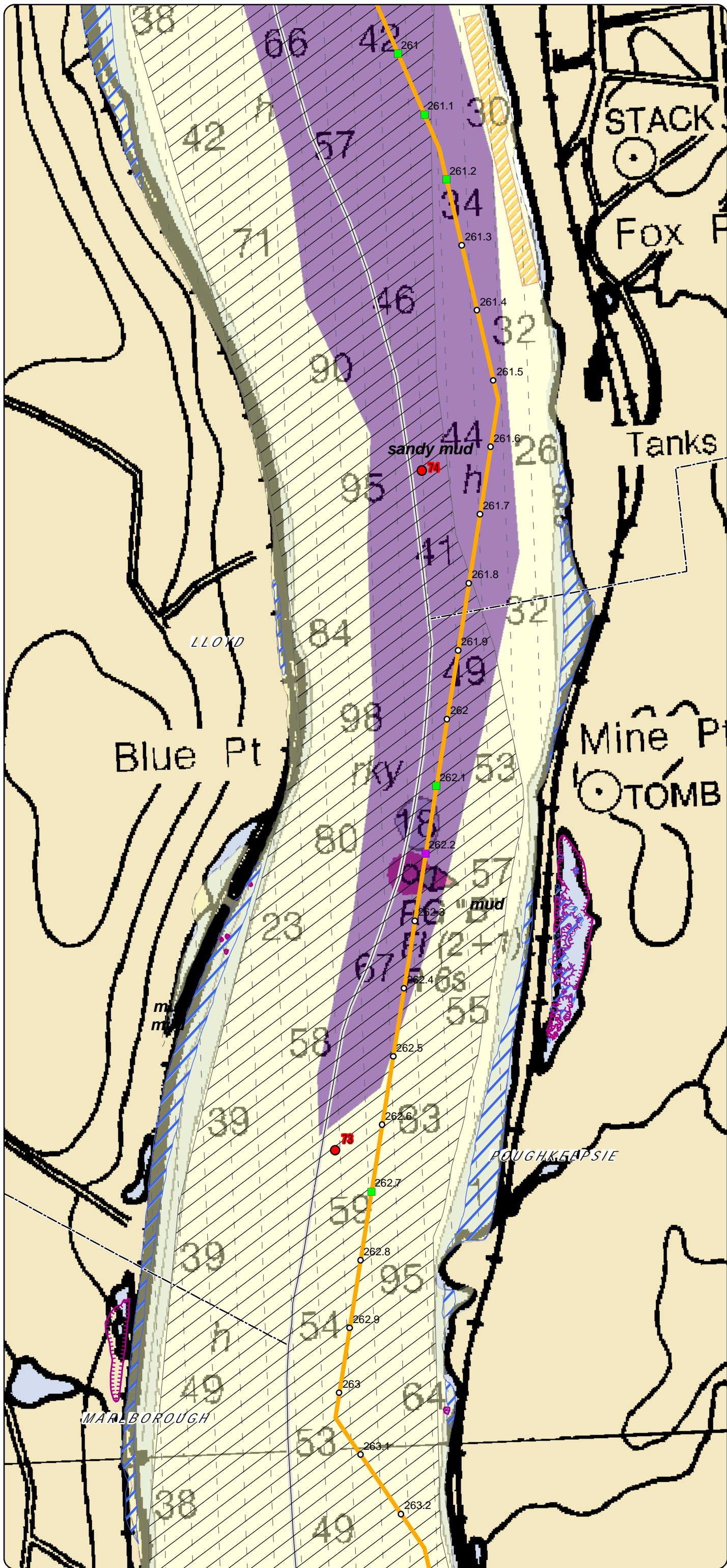
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

Sheet 15 of 43

Created: 6/18/2014

by: **HDR** **UTA** & **CTRC**



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission Developers Inc.

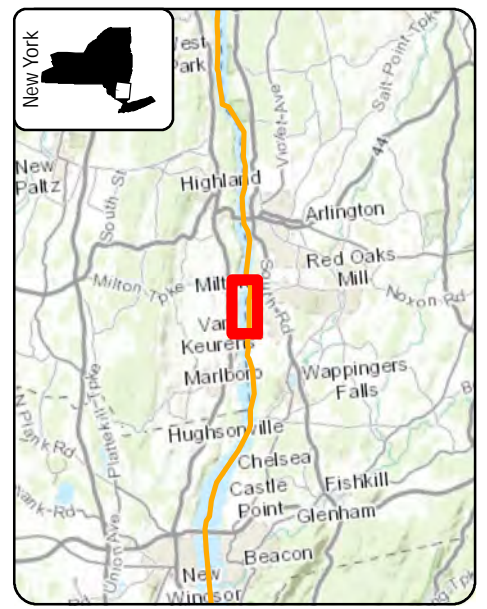
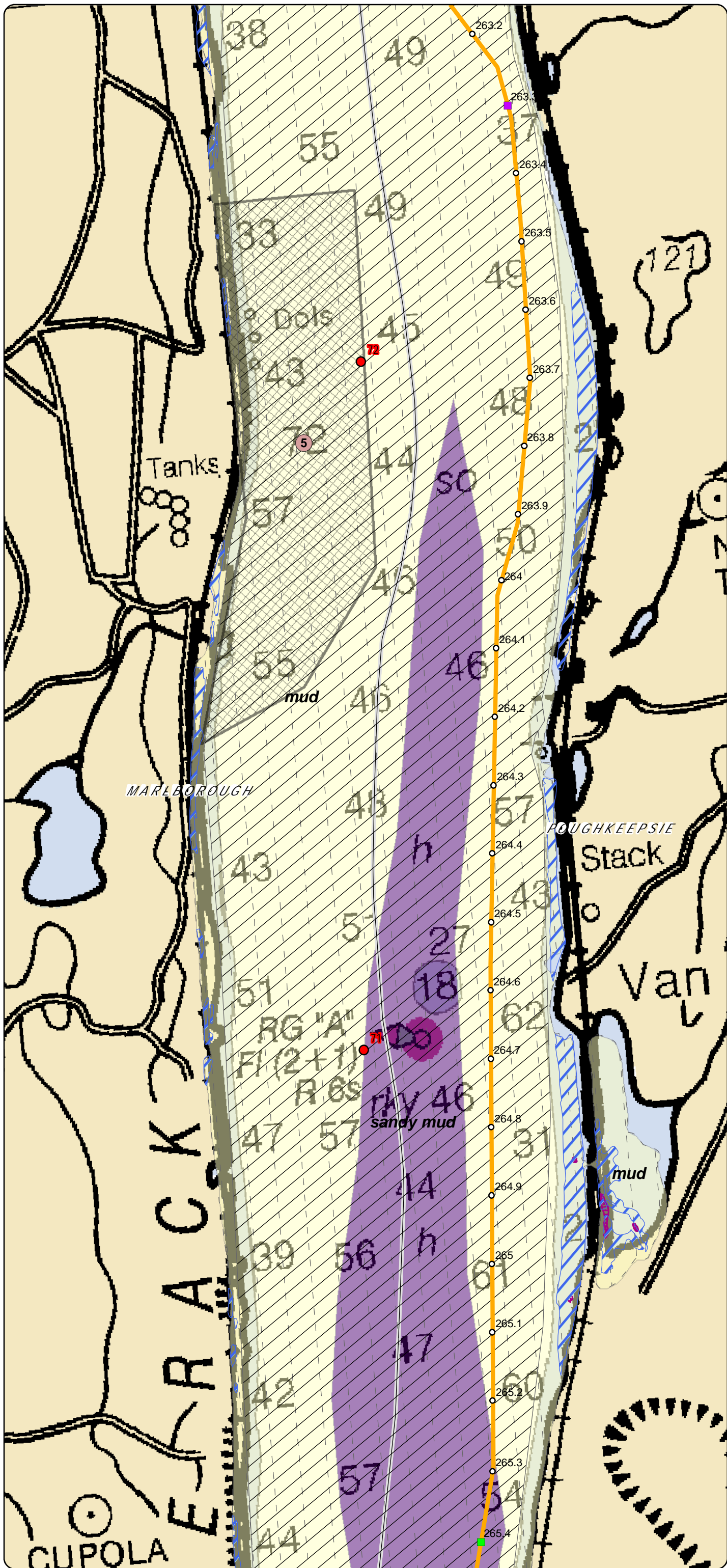
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

Sheet 16 of 43

Created: 6/18/2014

by: **HR** **UTA** & **CTRC**



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission
Developers Inc.

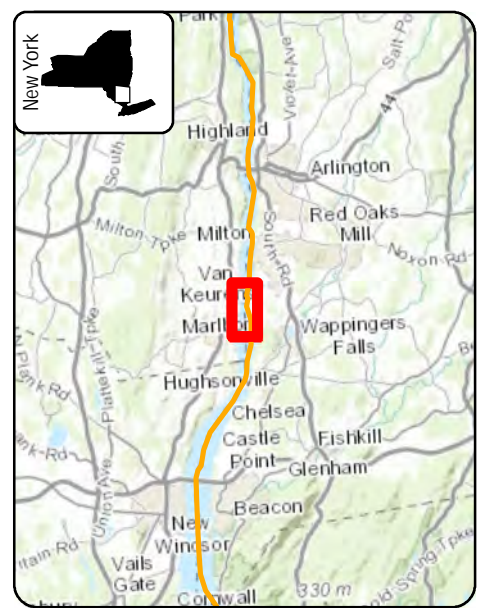
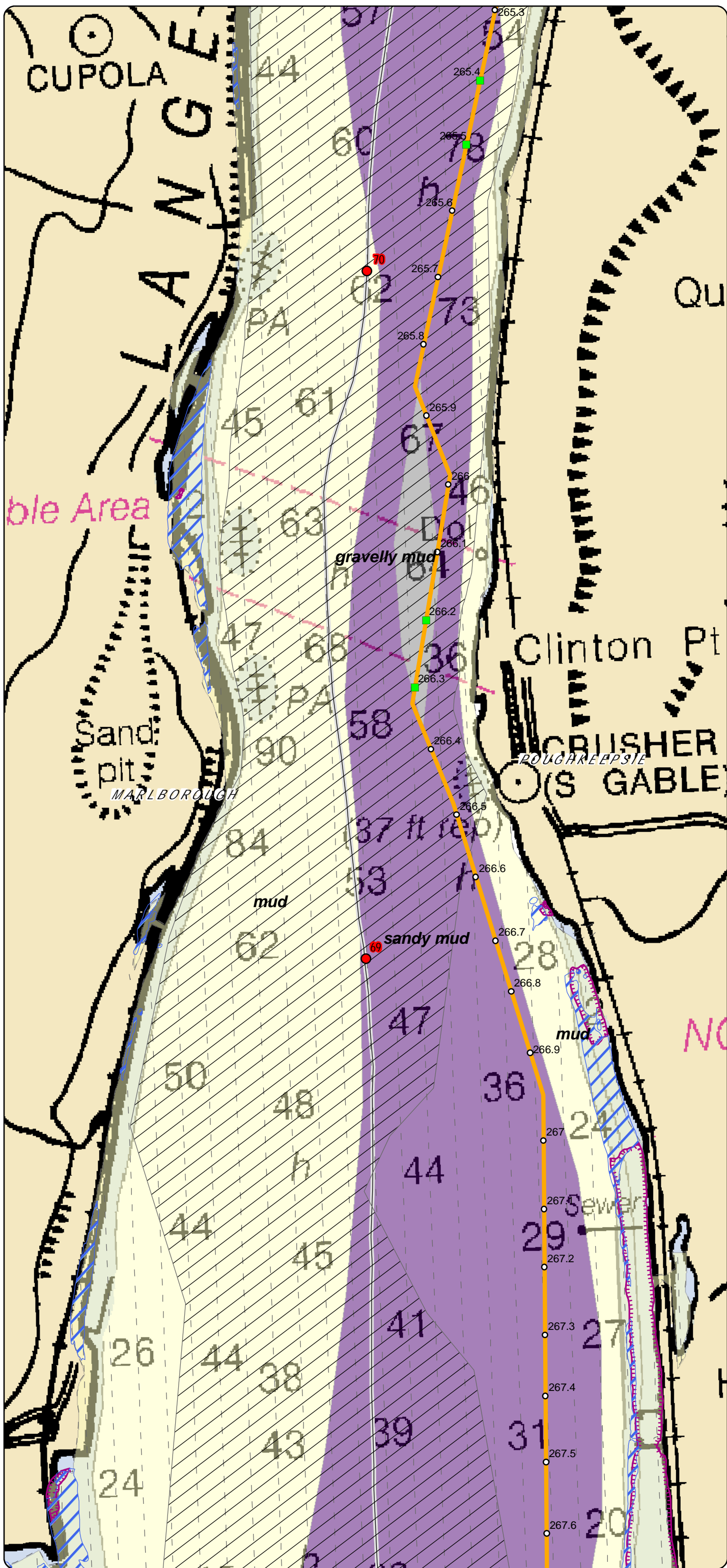
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**Hudson River
Project Route**

Sheet 17 of 43

Created: 6/18/2014

by: &



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission
Developers Inc.

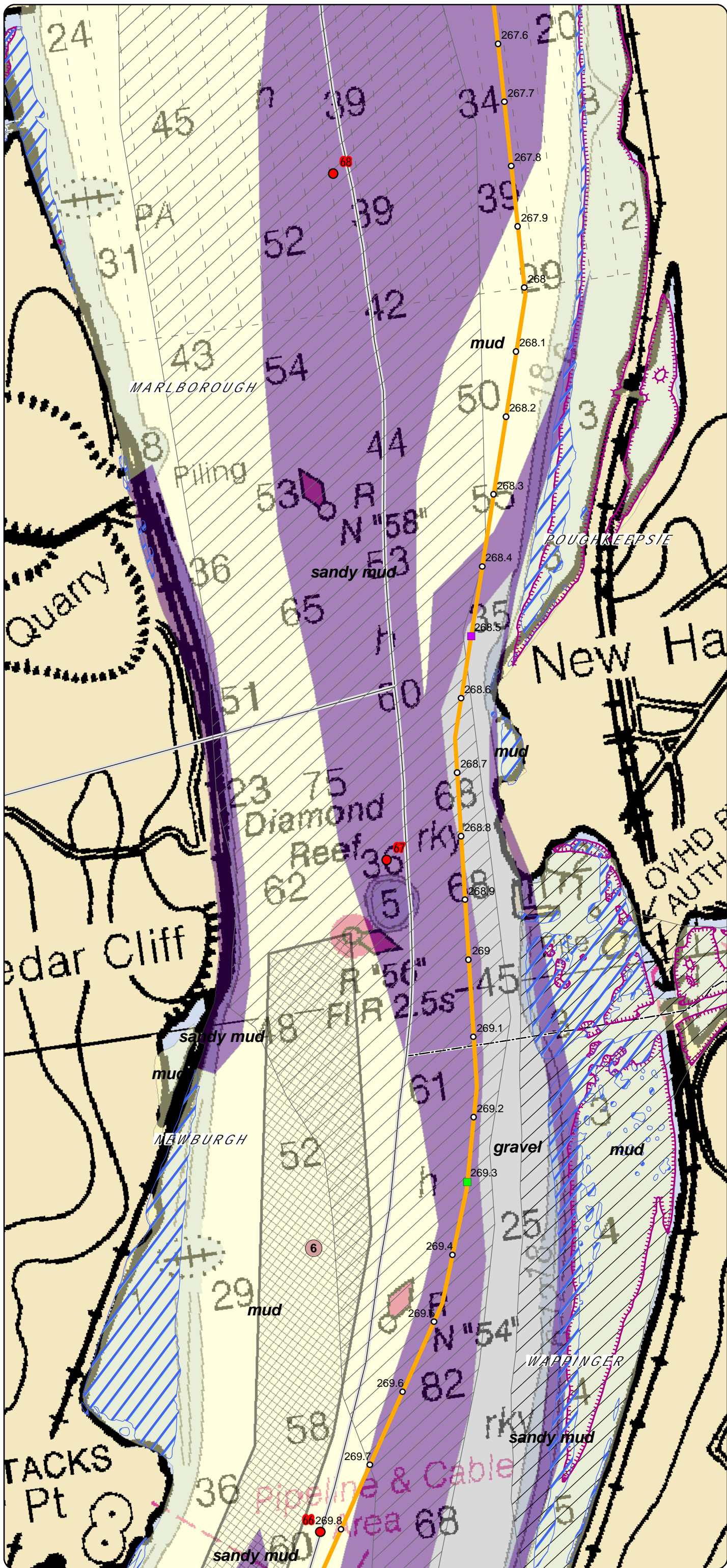
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**Hudson River
Project Route**

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Created: 6/18/2014

by: &




LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud
- State Boundary
- County Boundary
- Town Boundary



0 750
Feet



Transmission Developers Inc.

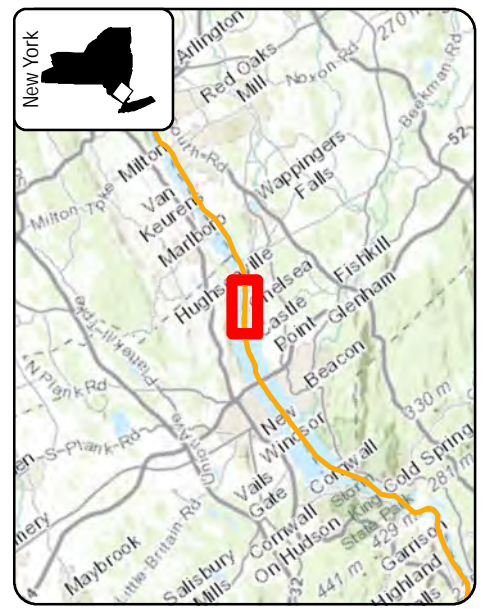
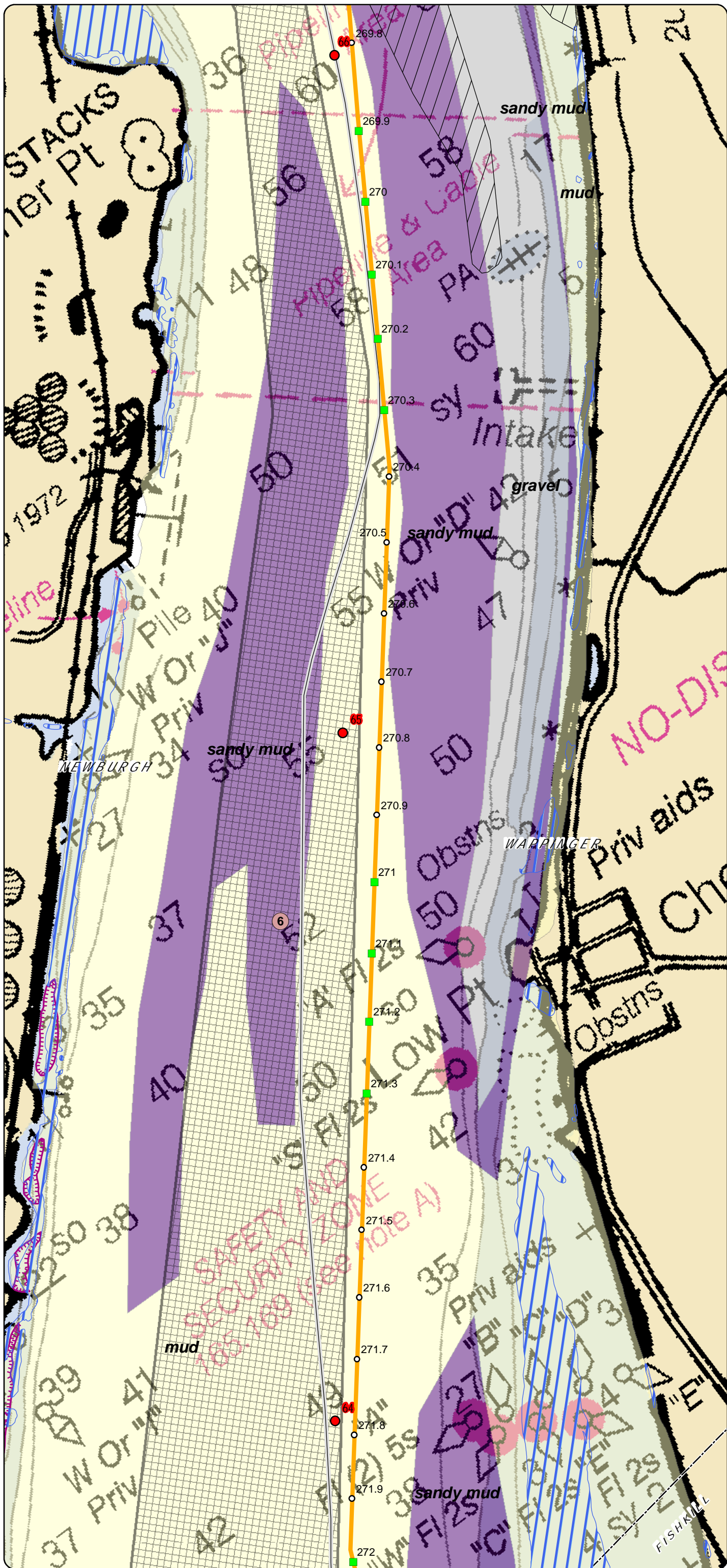
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

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Created: 6/18/2014

by: **HDR** **UTA** & **CTRC**





LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud
- State Boundary
- County Boundary
- Town Boundary







Transmission
Developers Inc.

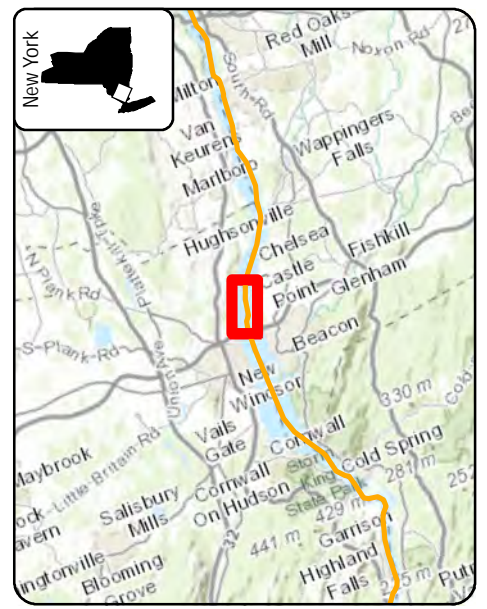
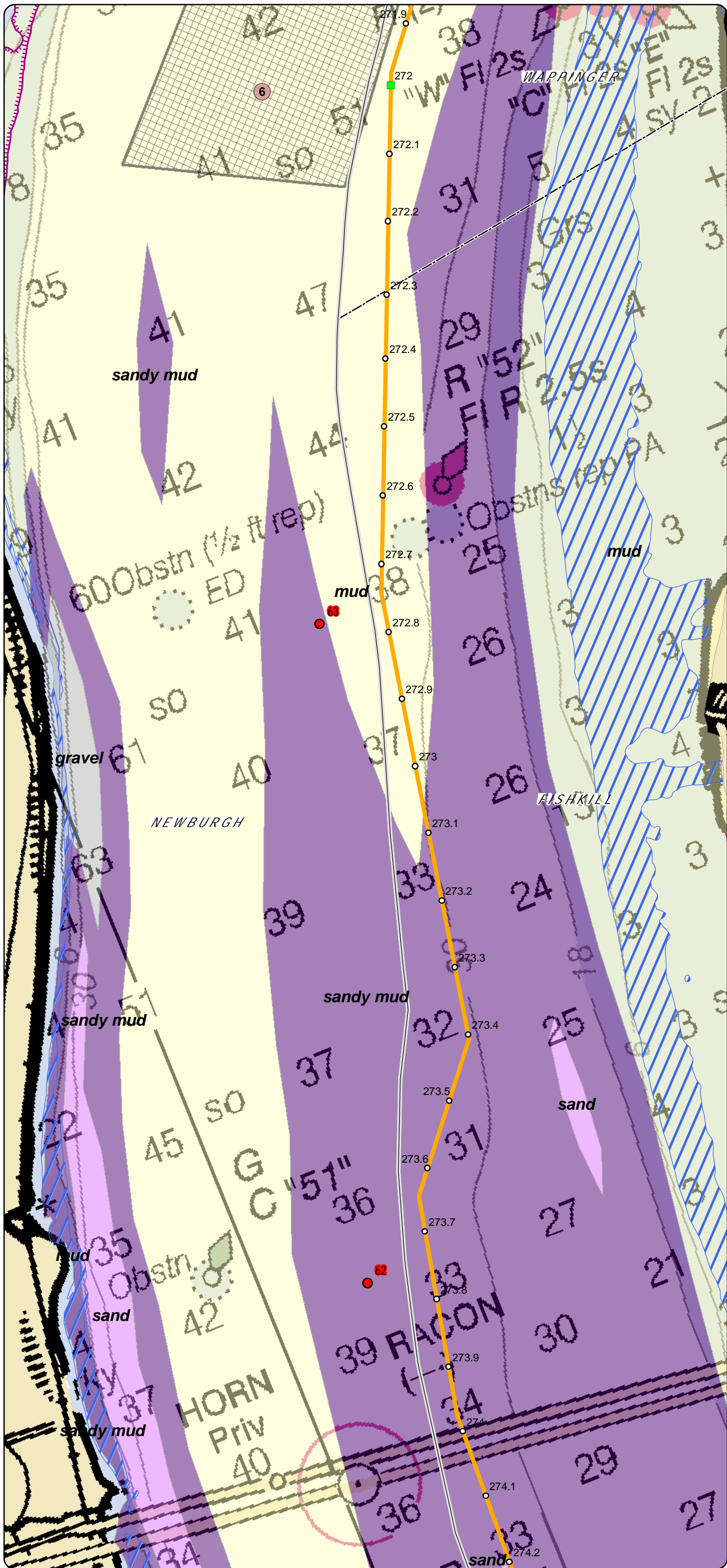
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

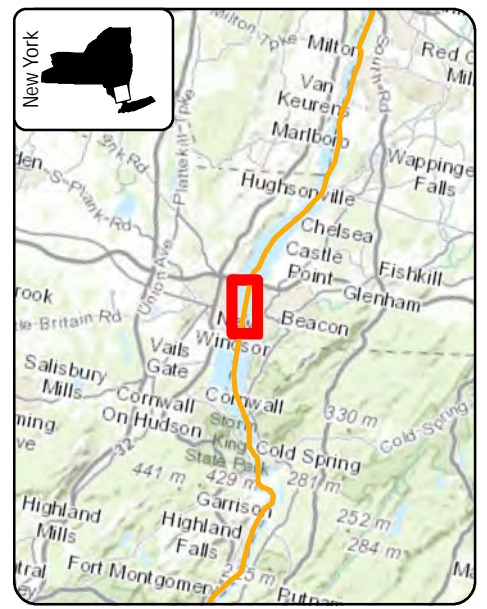
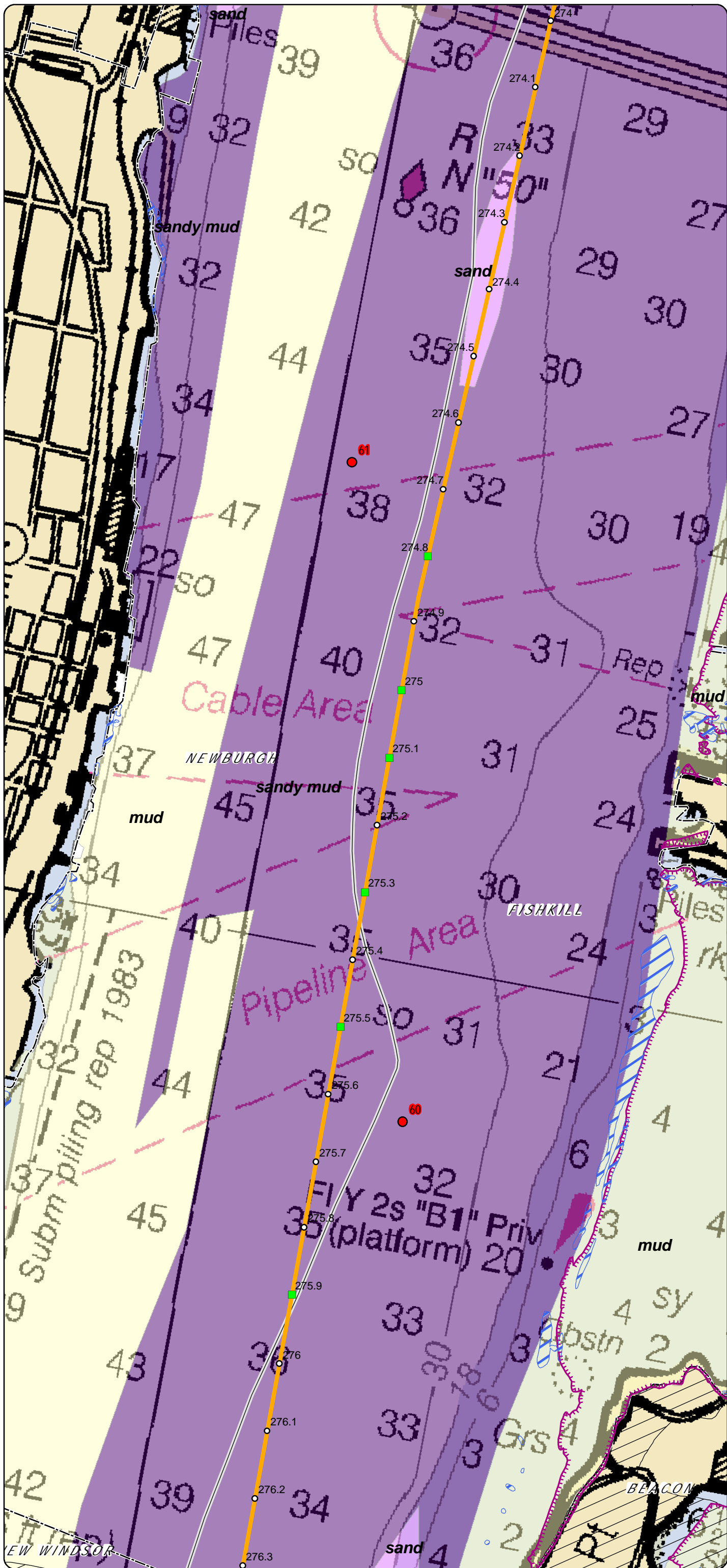
- State Boundary
- County Boundary
- Town Boundary

0 750
Feet


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 Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route
 Sheet 21 of 43

 Created: 6/18/2014
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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud
- State Boundary
- County Boundary
- Town Boundary



0 750
Feet



Transmission Developers Inc.

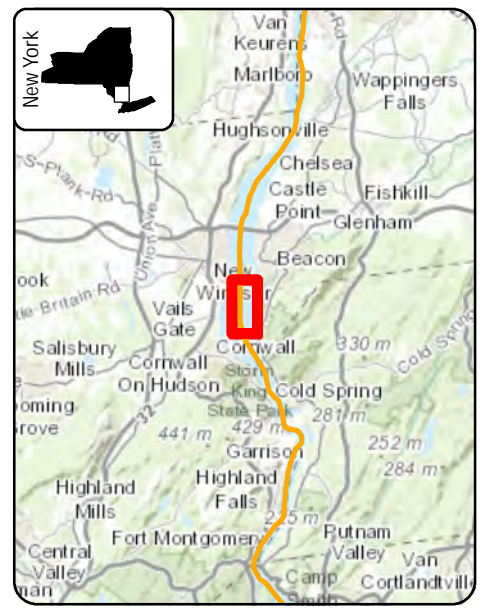
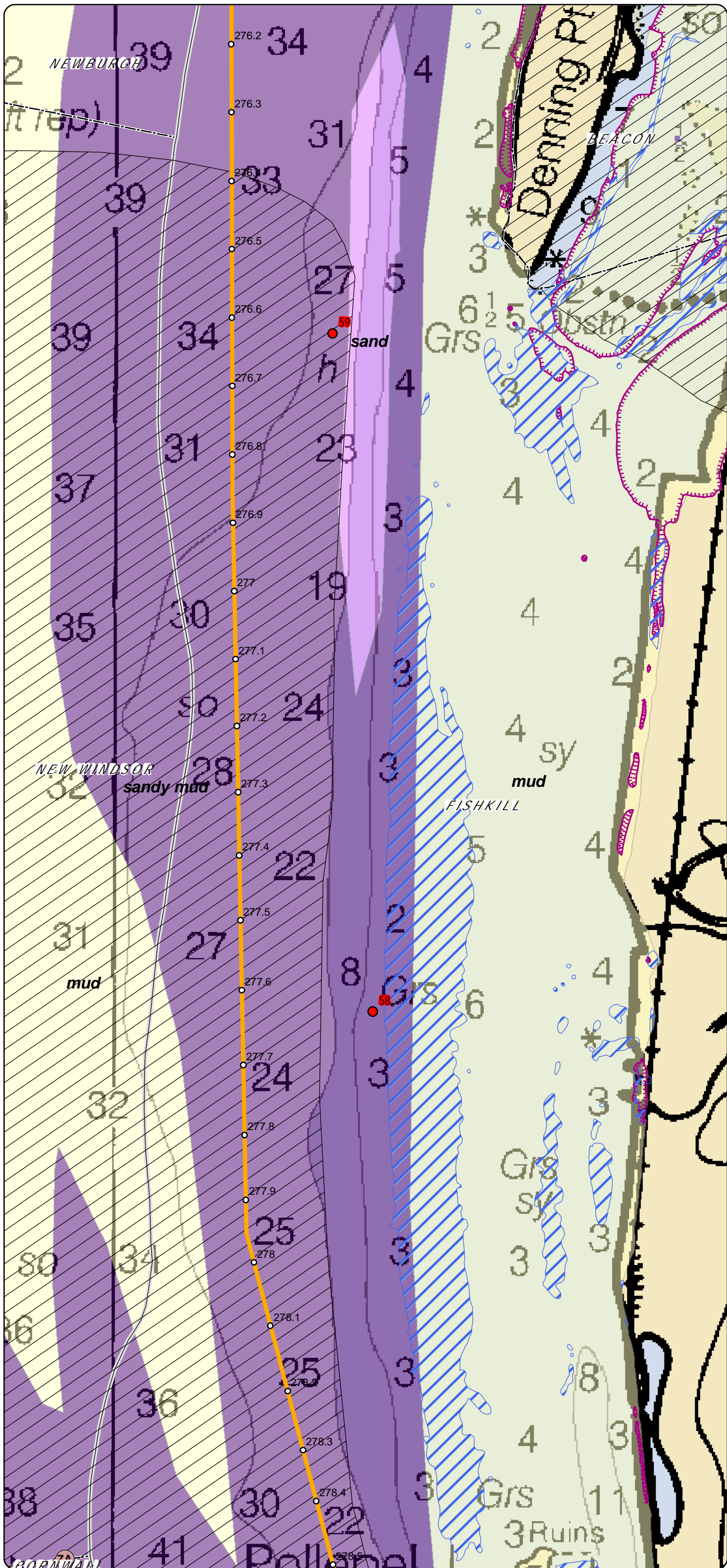
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission Developers Inc.

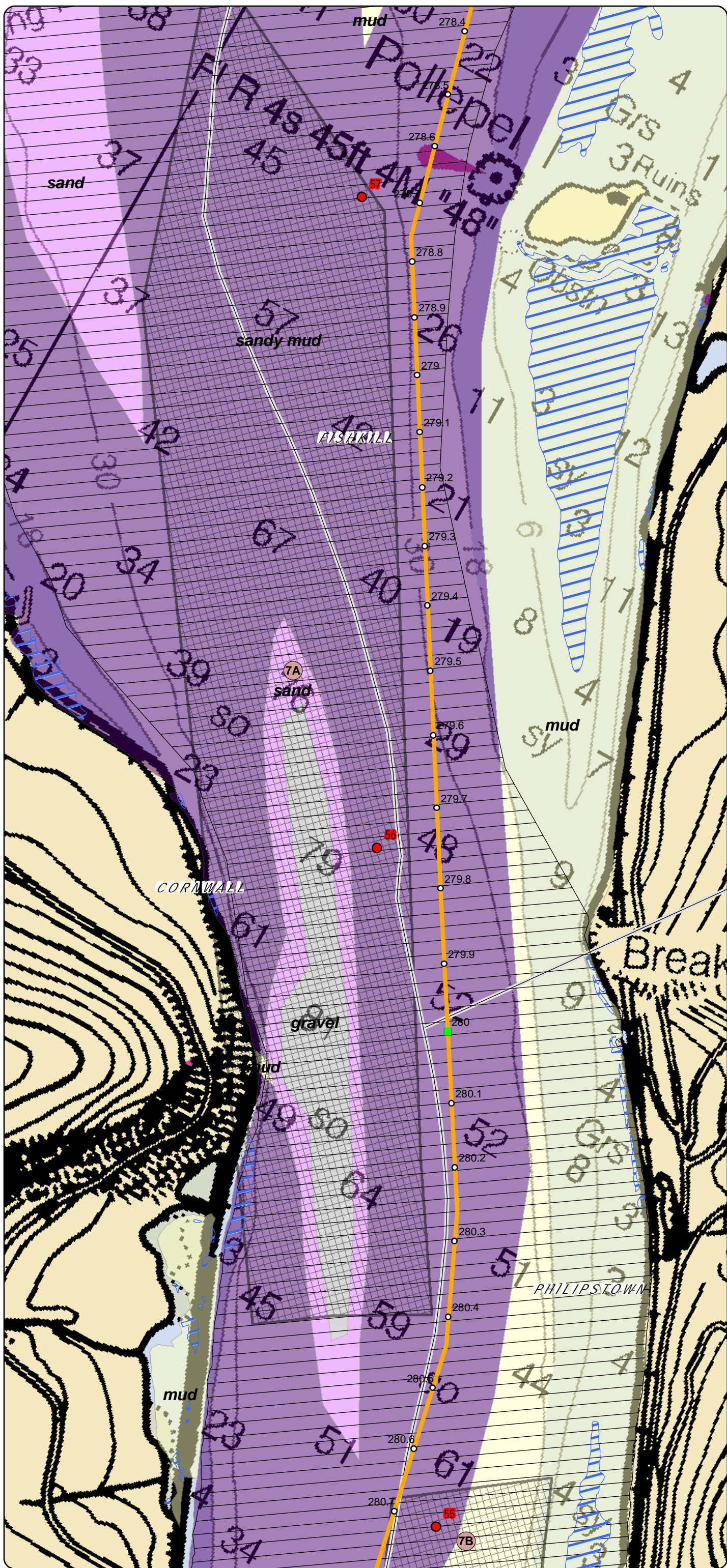
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

Transmission
Developers Inc.

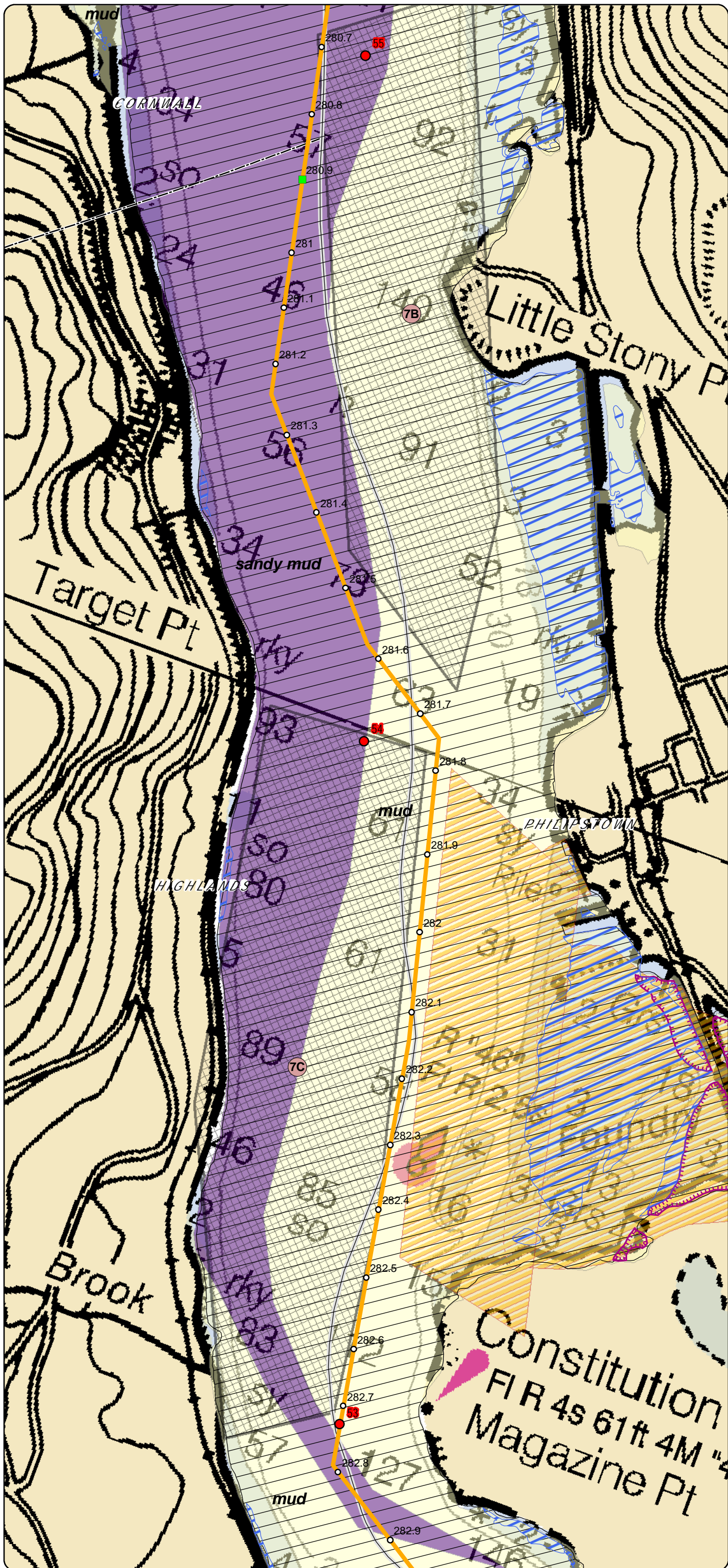
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**Hudson River
Project Route**

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by: &



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

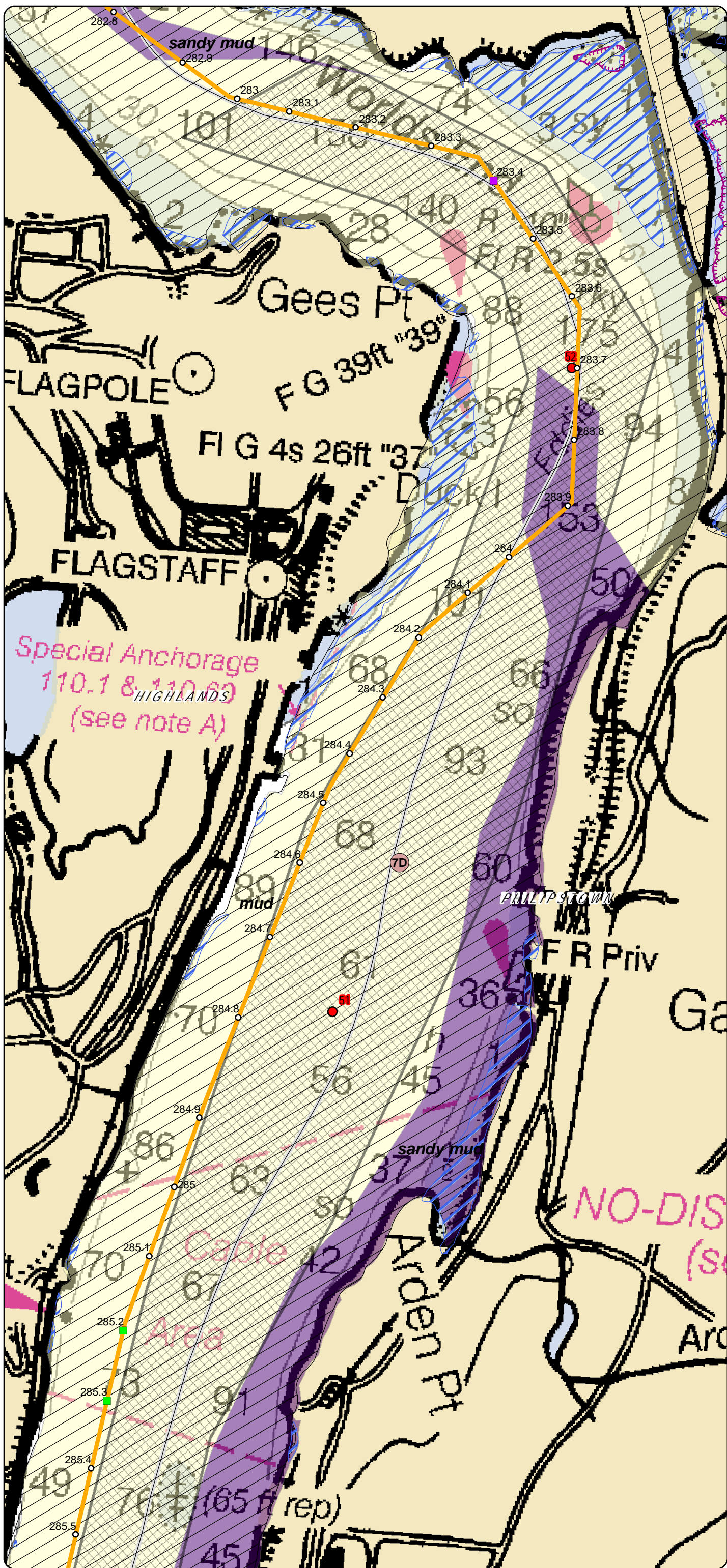
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 Transmission Developers Inc.
 Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route
 Sheet 25 of 43

Created: 6/18/2014

by:   & 



LEGEND

- Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) ⁴ Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud
- State Boundary
- County Boundary
- Town Boundary

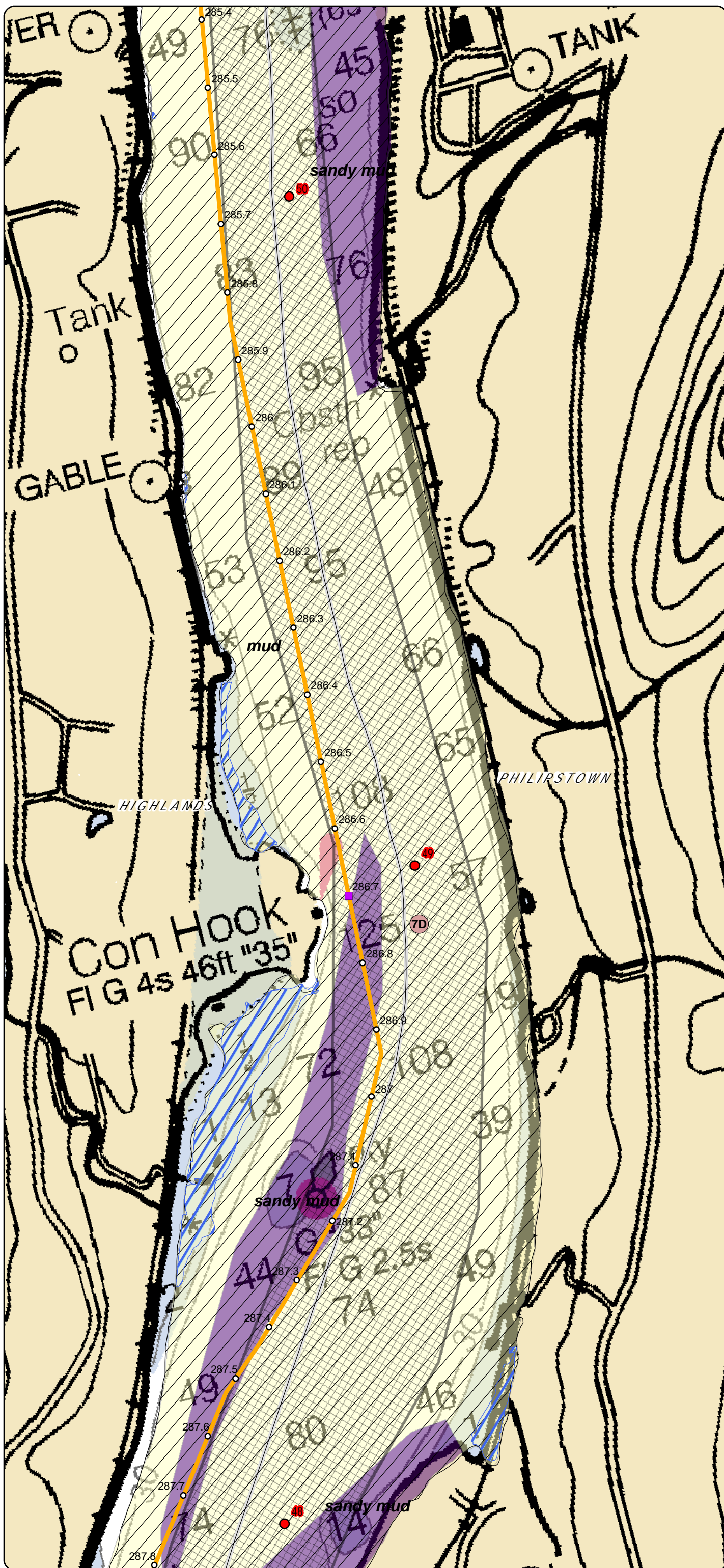
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Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route
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Created: 6/18/2014
by: HDR, UTA & CTRC



LEGEND

- Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) ④ Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

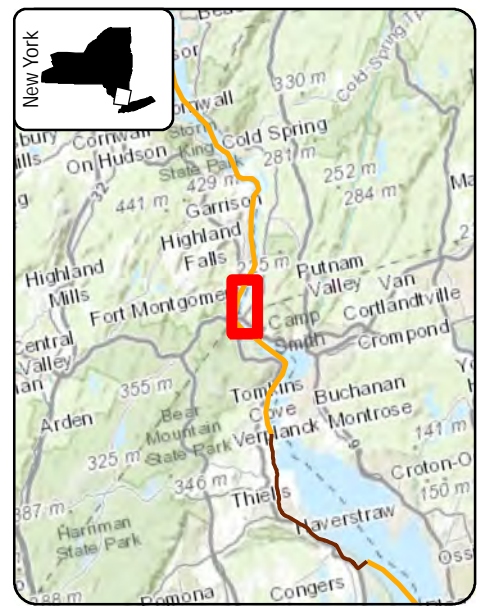
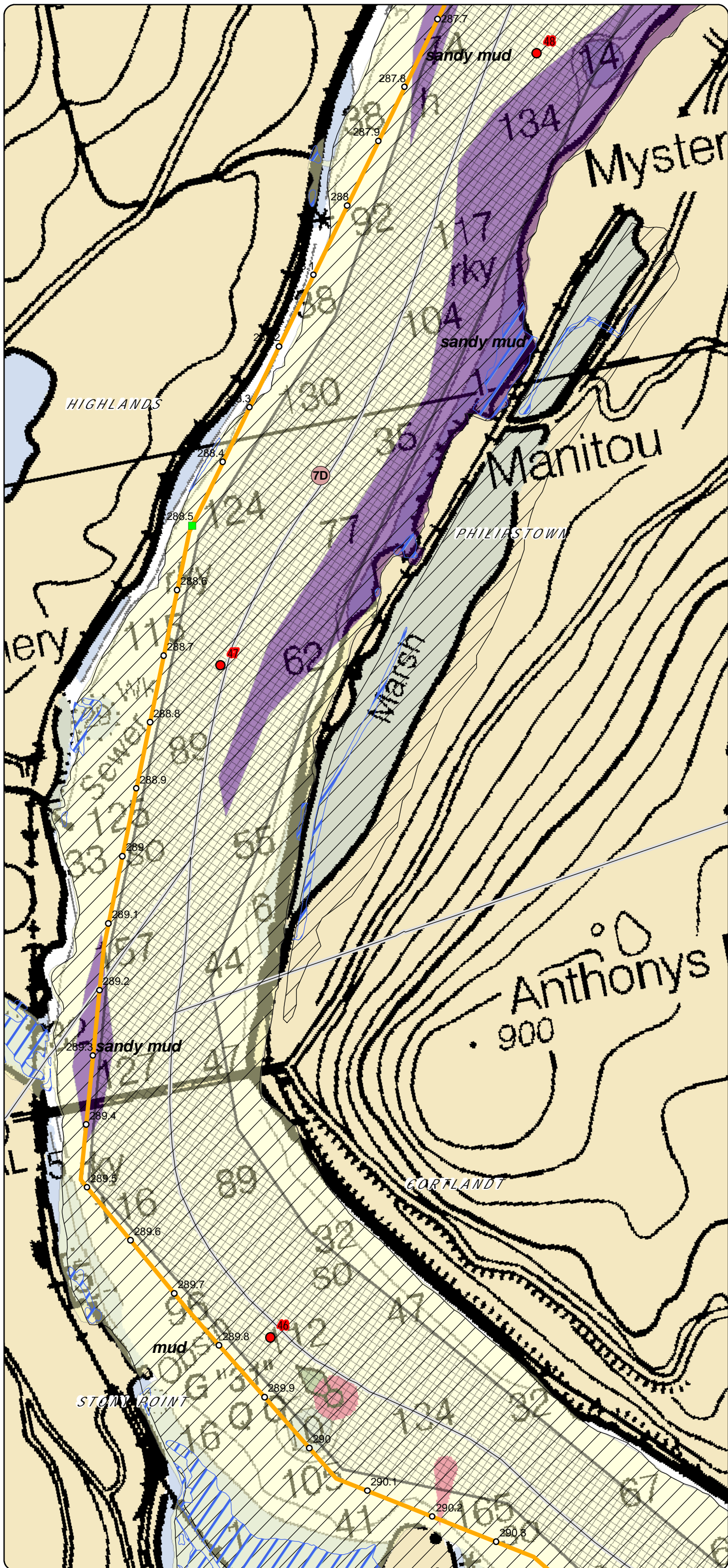
Transmission Developers Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route
Sheet 27 of 43

Created: 6/18/2014

by: &



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

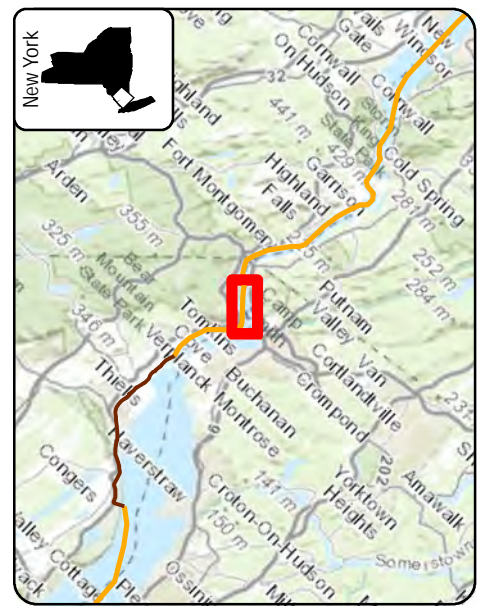
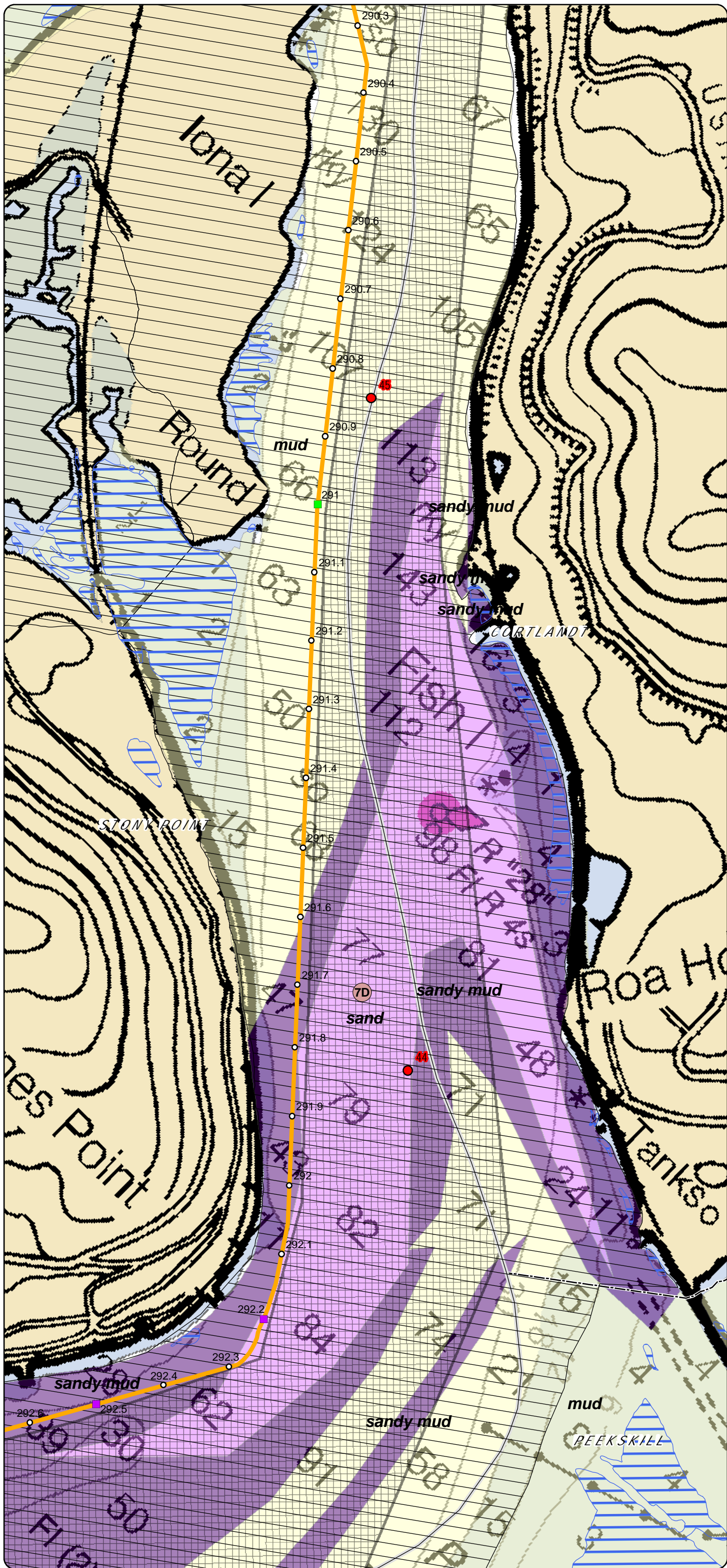
- State Boundary
- County Boundary
- Town Boundary

0 750
 Feet

Transmission Developers Inc.
 Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route
 Sheet 28 of 43

Created: 6/18/2014
 by: &



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 0 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

Transmission
Developers Inc.

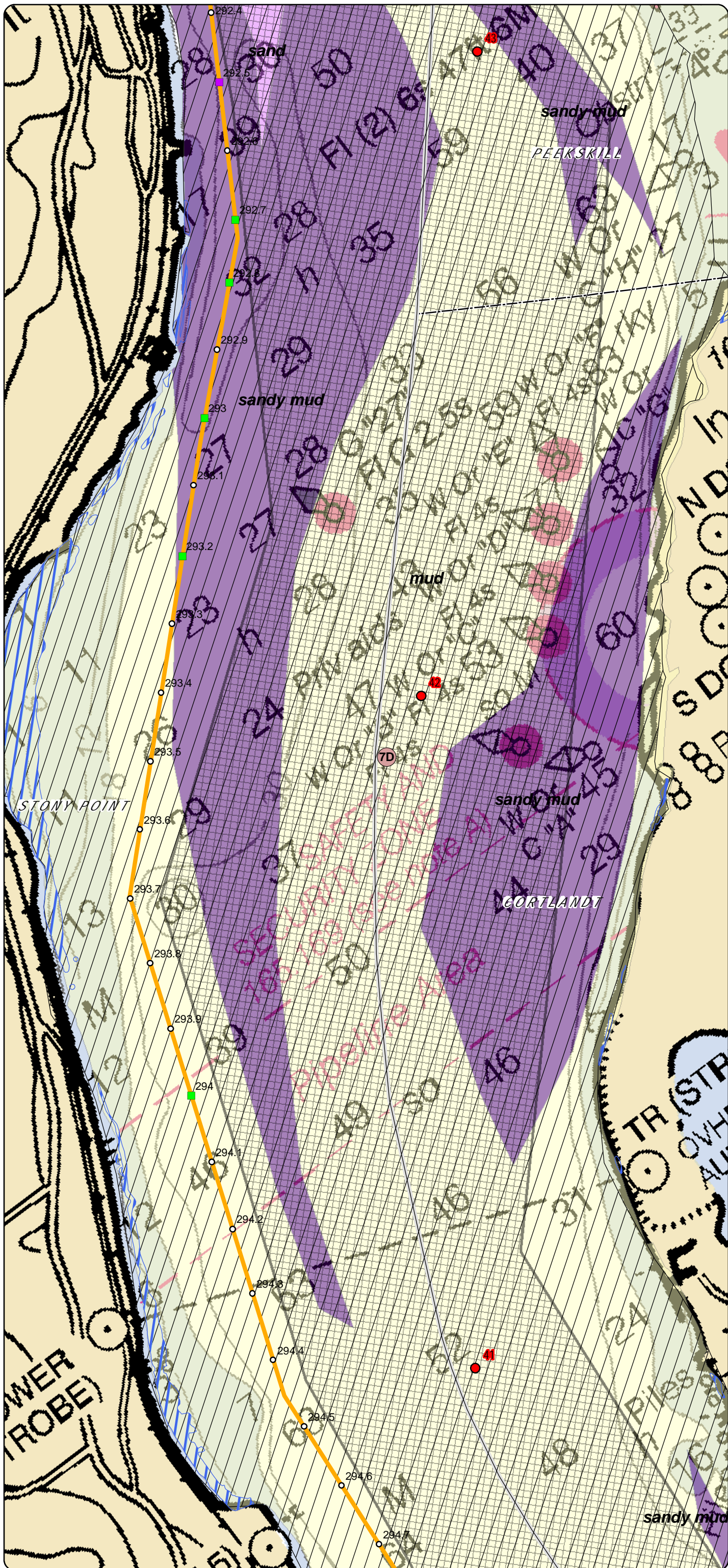
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

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Created: 6/18/2014

by: &





LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud
- State Boundary
- County Boundary
- Town Boundary







Transmission
Developers Inc.

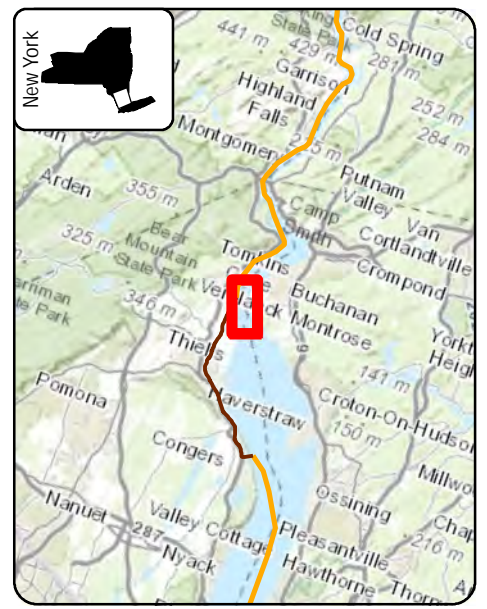
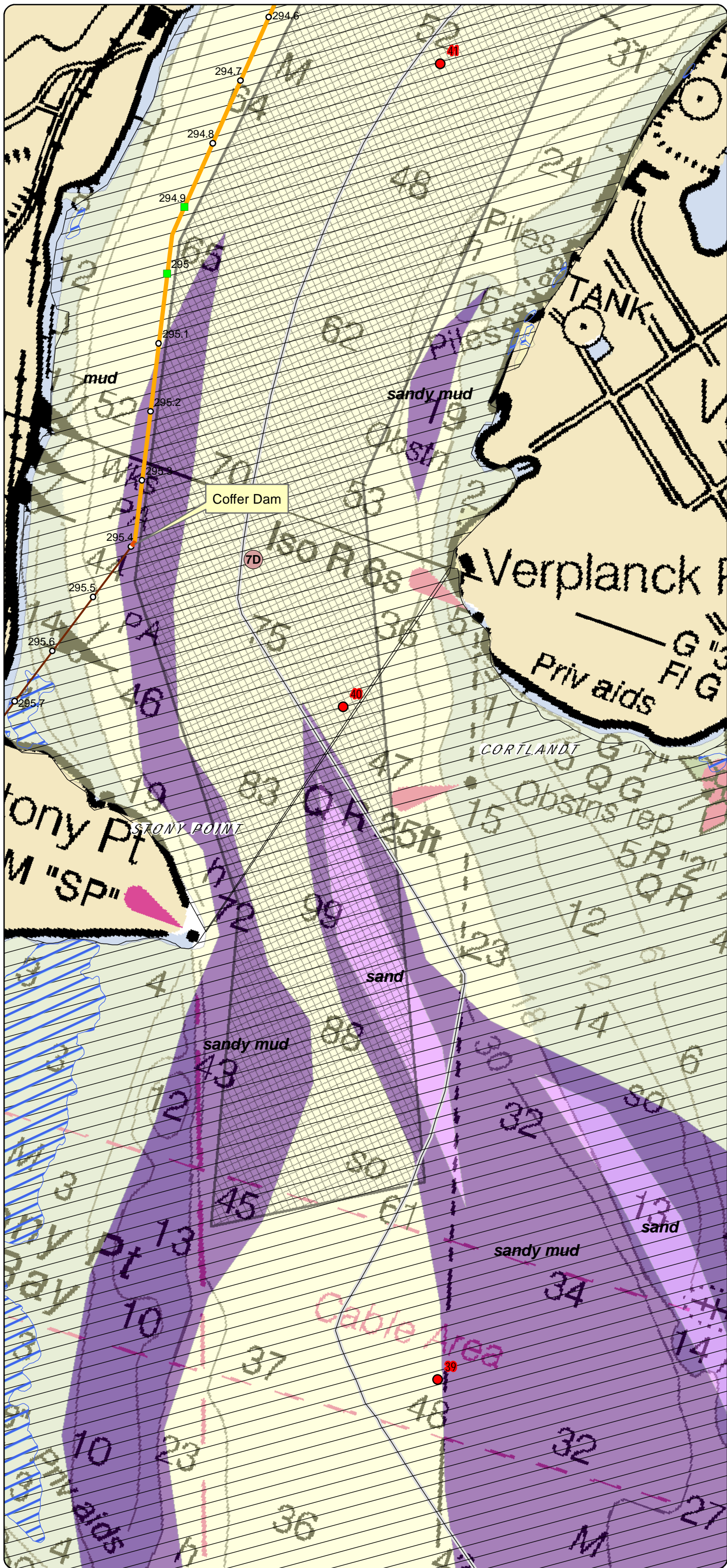
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

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by:   & 



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) 4 Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

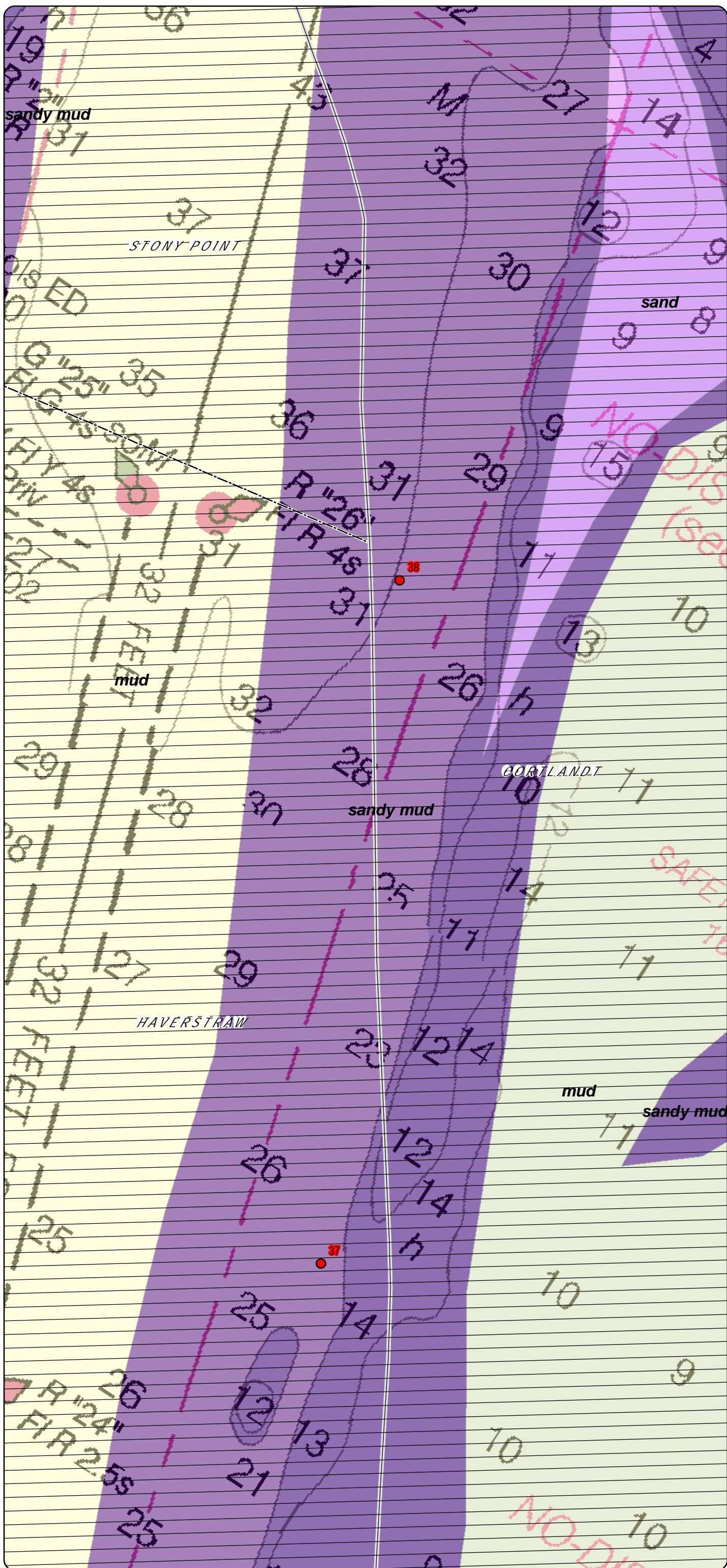
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Feet

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Developers Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River
Project Route
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Created: 6/18/2014
by: **HDR** **PTA** & **CTRC**



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission Developers Inc.

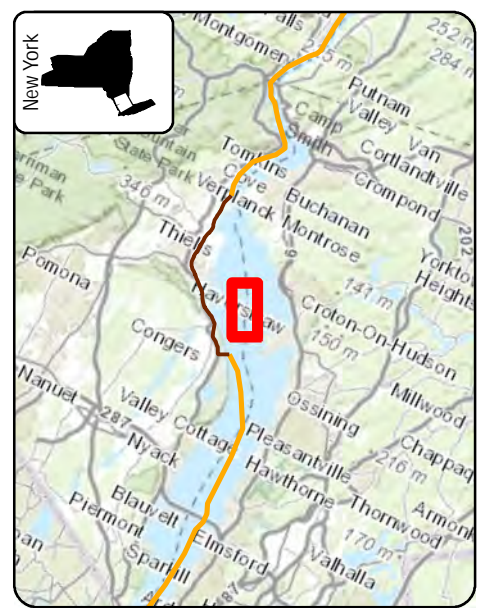
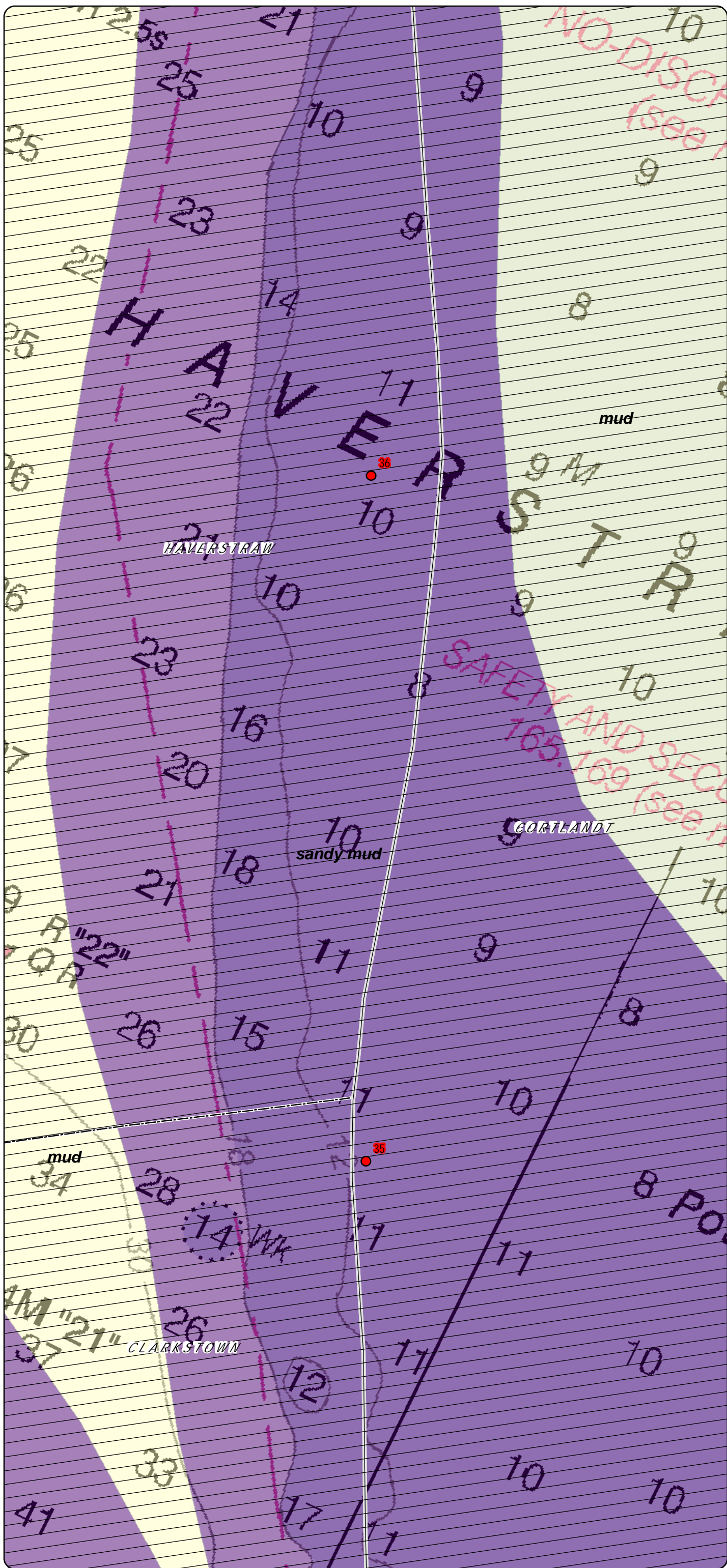
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

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Created: 6/18/2014

by: &



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) ④ Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission
Developers Inc.

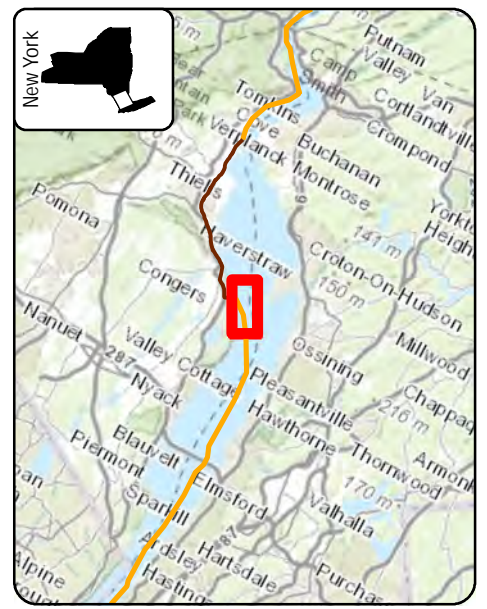
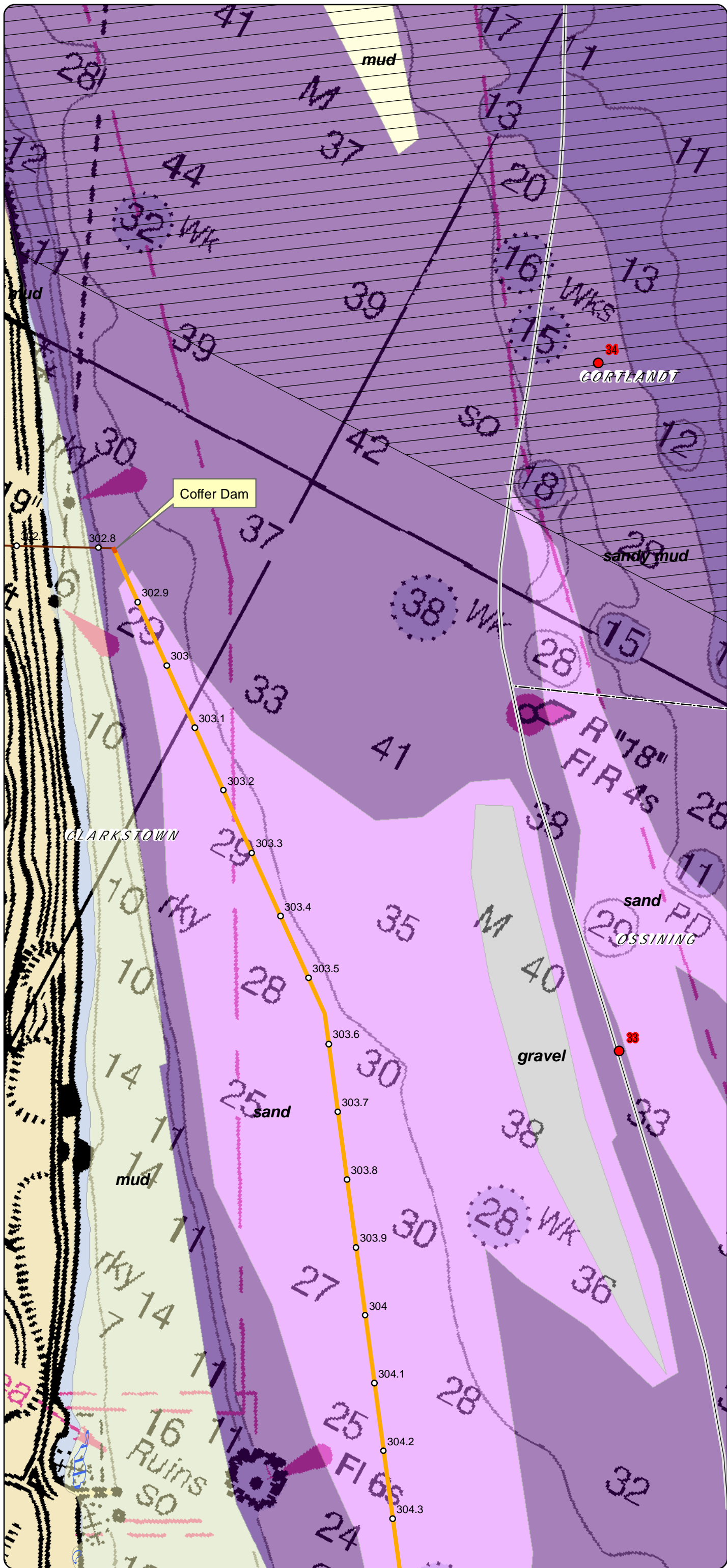
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

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Created: 6/18/2014

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LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Coffer Dam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) Zone Number
- Contamination Site
- NMFS Identified Atlantic Sturgeon Habitat
- Submerged Aquatic Veg: Valsineria (NYSDEC)
- Submerged Aquatic Veg: Trappa (NYSDEC)

Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
- gravelly sand
- mud
- muddy gravel
- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

Transmission
Developers Inc.

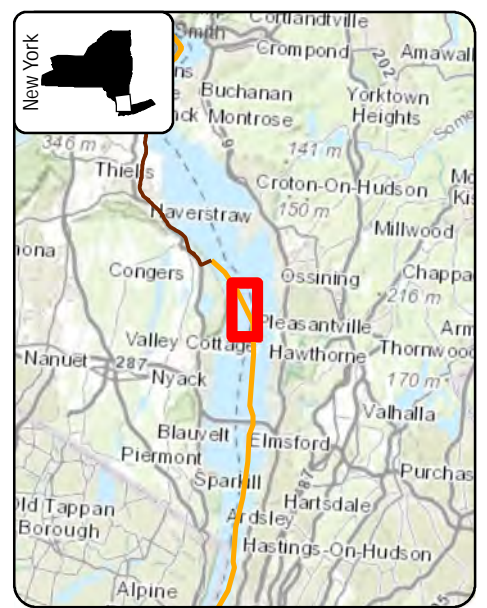
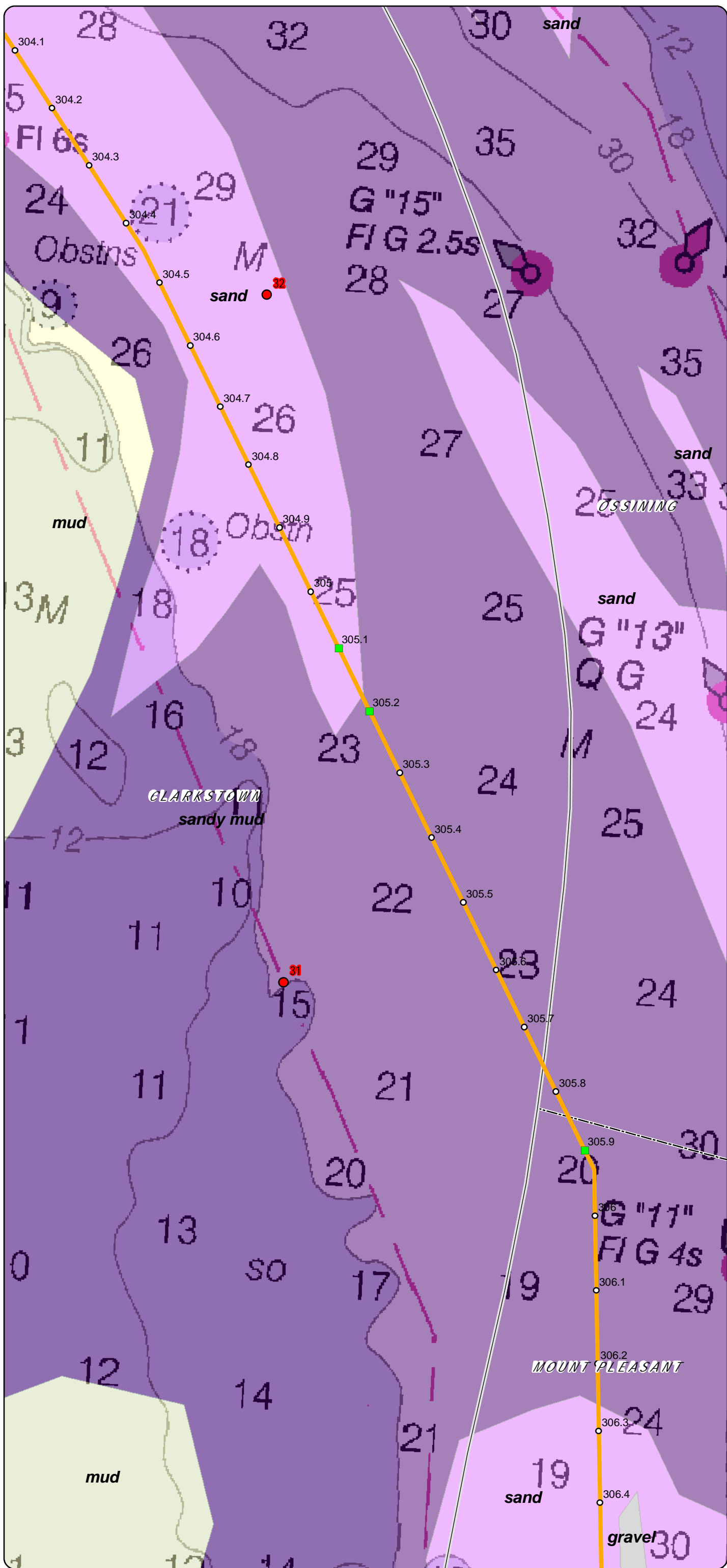
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route

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by: &



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
- Potential Mattress (Utility Crossings)
- 1 CHPE Route Mileposts
- Proposed CHPE Submarine Route HVDC
- Proposed CHPE Terrestrial Route HVDC
- Cofferdam
- Significant Coastal Fish and Wildlife Habitat
- Exclusion Zones (NYSDEC) ④ Zone Number
- Contamination Site
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
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- muddy sand
- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission
Developers Inc.

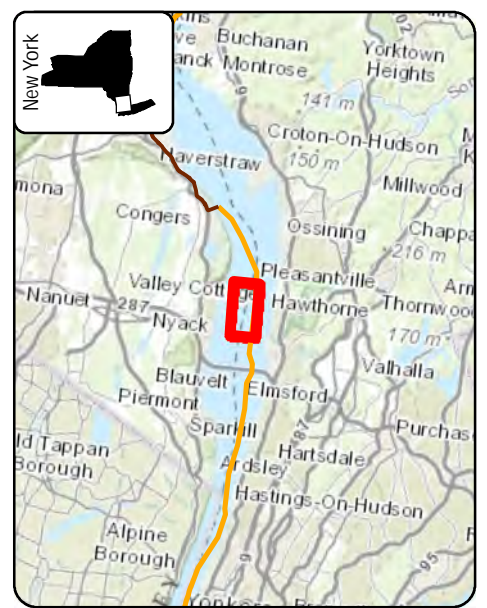
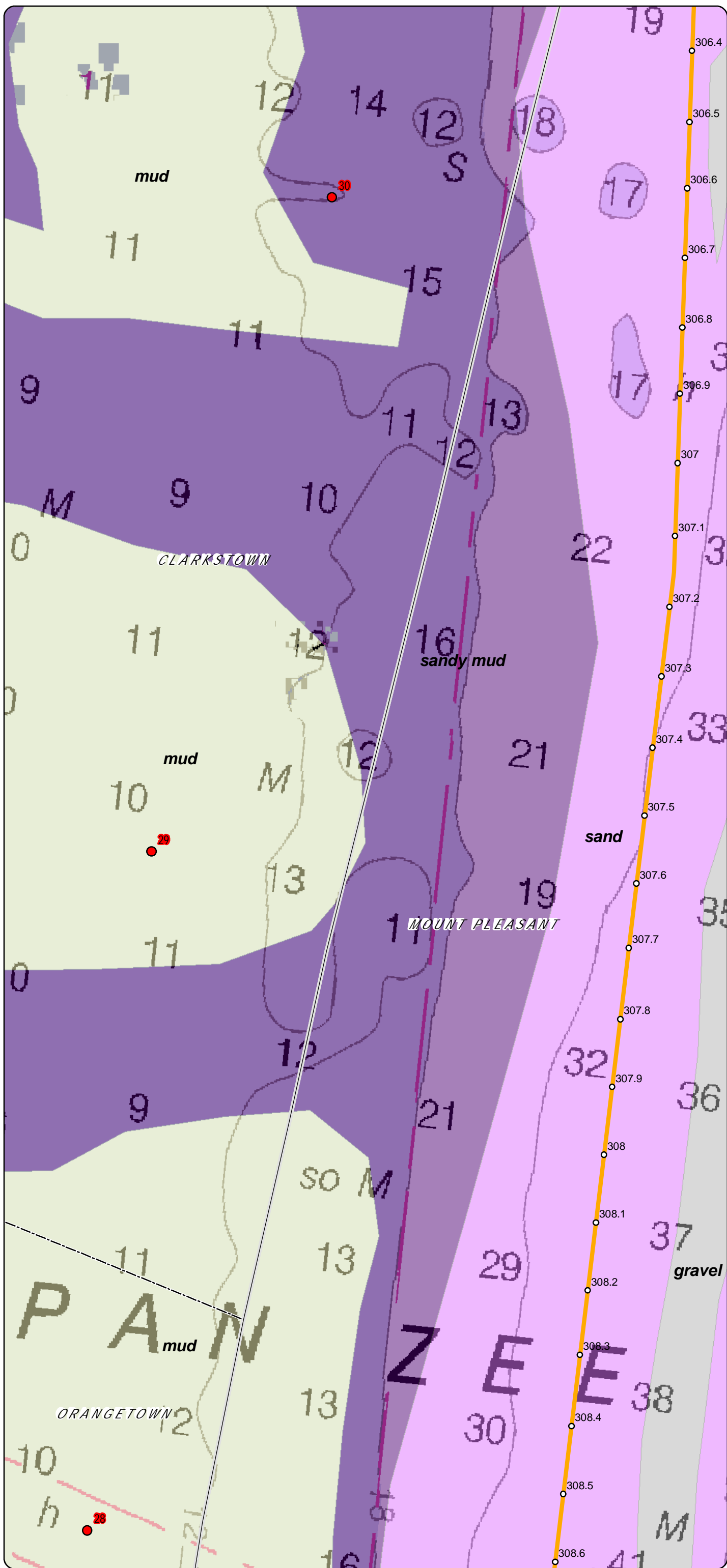
Champlain Hudson Power Express Project
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Hudson River Project Route

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by: &



LEGEND

- 1 Hudson River Miles
- Potential Mattress (Rock or Stiff Soils)
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Sediment Type - NYSDEC Hudson River Estuary Program

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- sand
- sandy gravel
- sandy mud

- State Boundary
- County Boundary
- Town Boundary

0 750
Feet

Transmission Developers Inc.

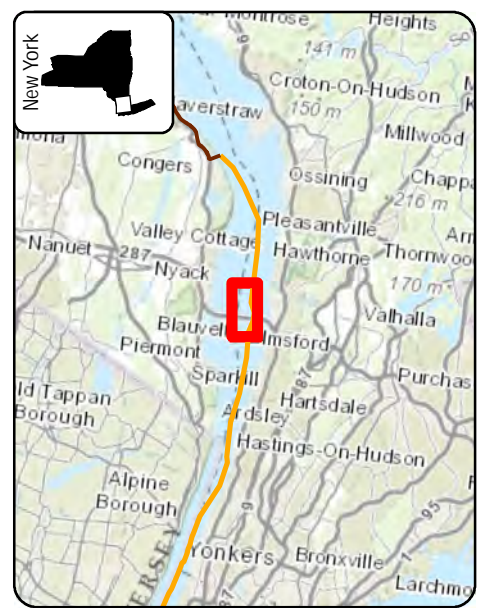
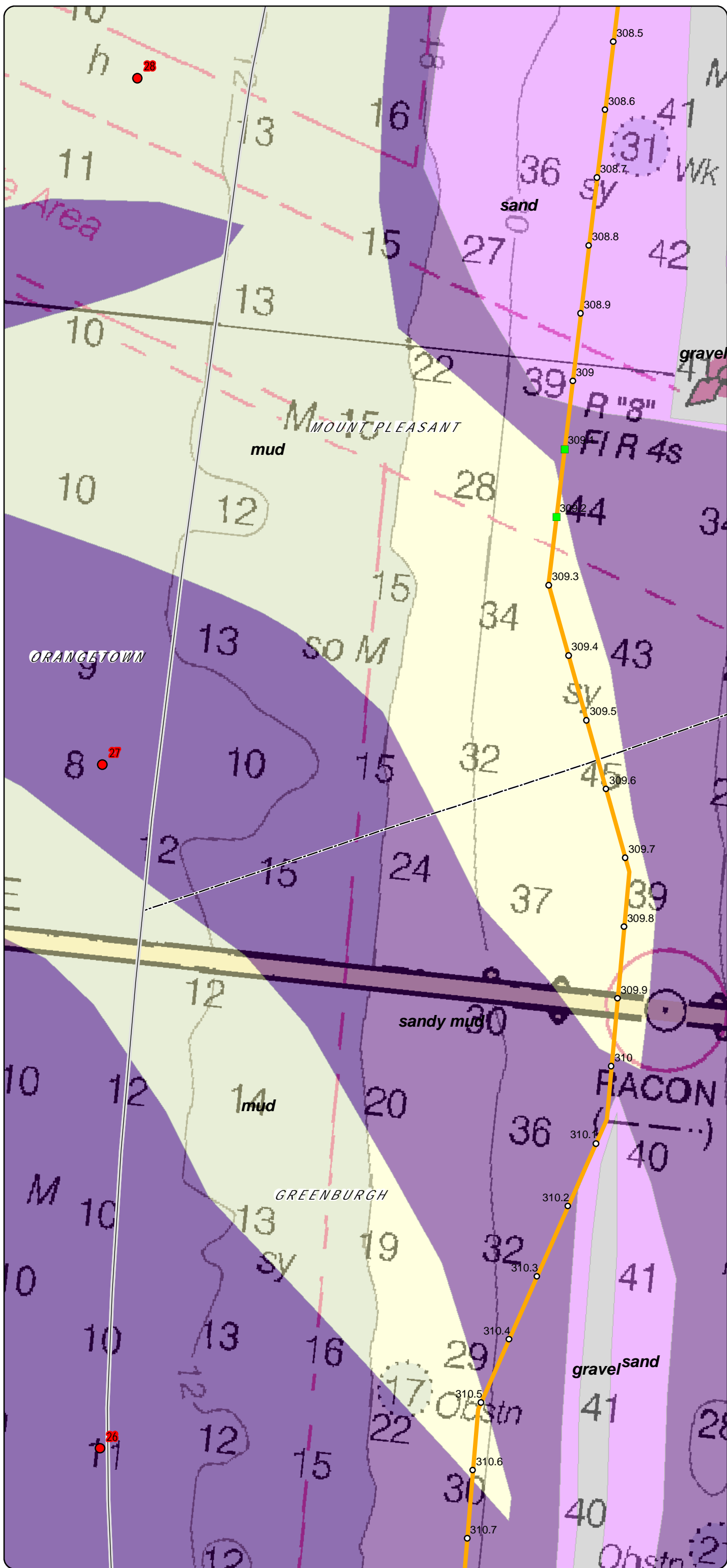
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Champlain Hudson Power Express Inc.

Hudson River Project Route

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LEGEND

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- Potential Mattress (Rock or Stiff Soils)
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Sediment Type - NYSDEC Hudson River Estuary Program

- gravel
- gravelly mud
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- sandy gravel
- sandy mud

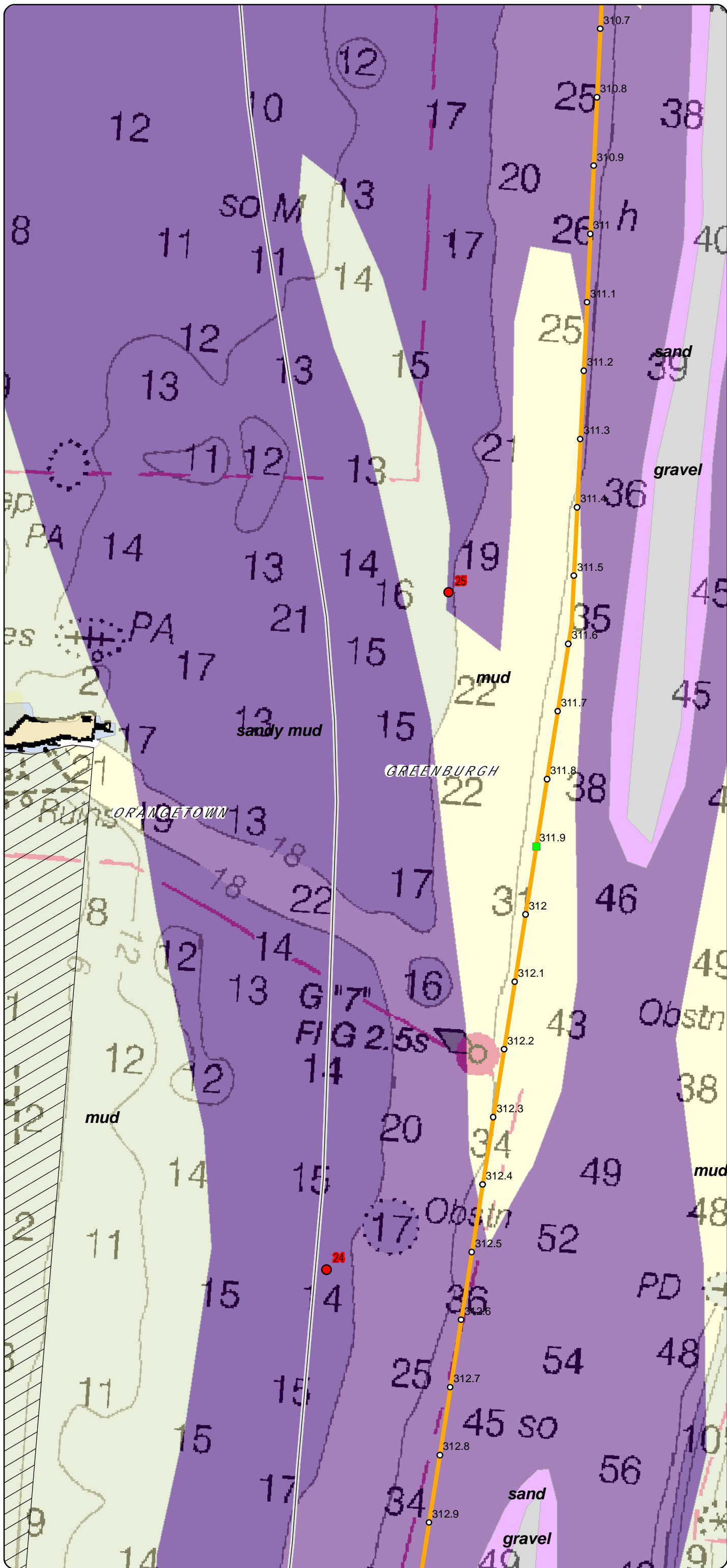
- State Boundary
- County Boundary
- Town Boundary


 0 750
 Feet


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 Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route
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LEGEND

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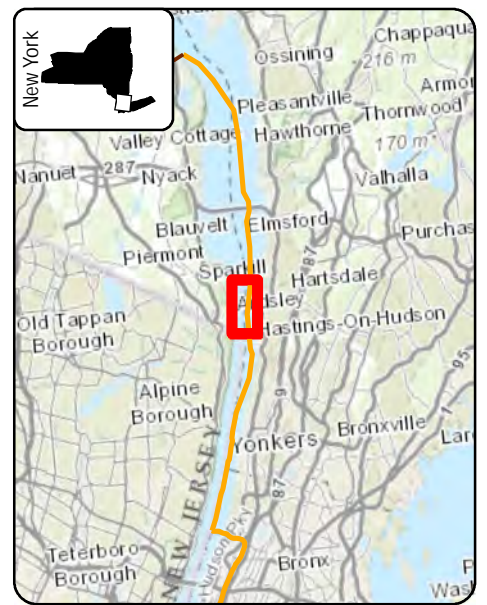
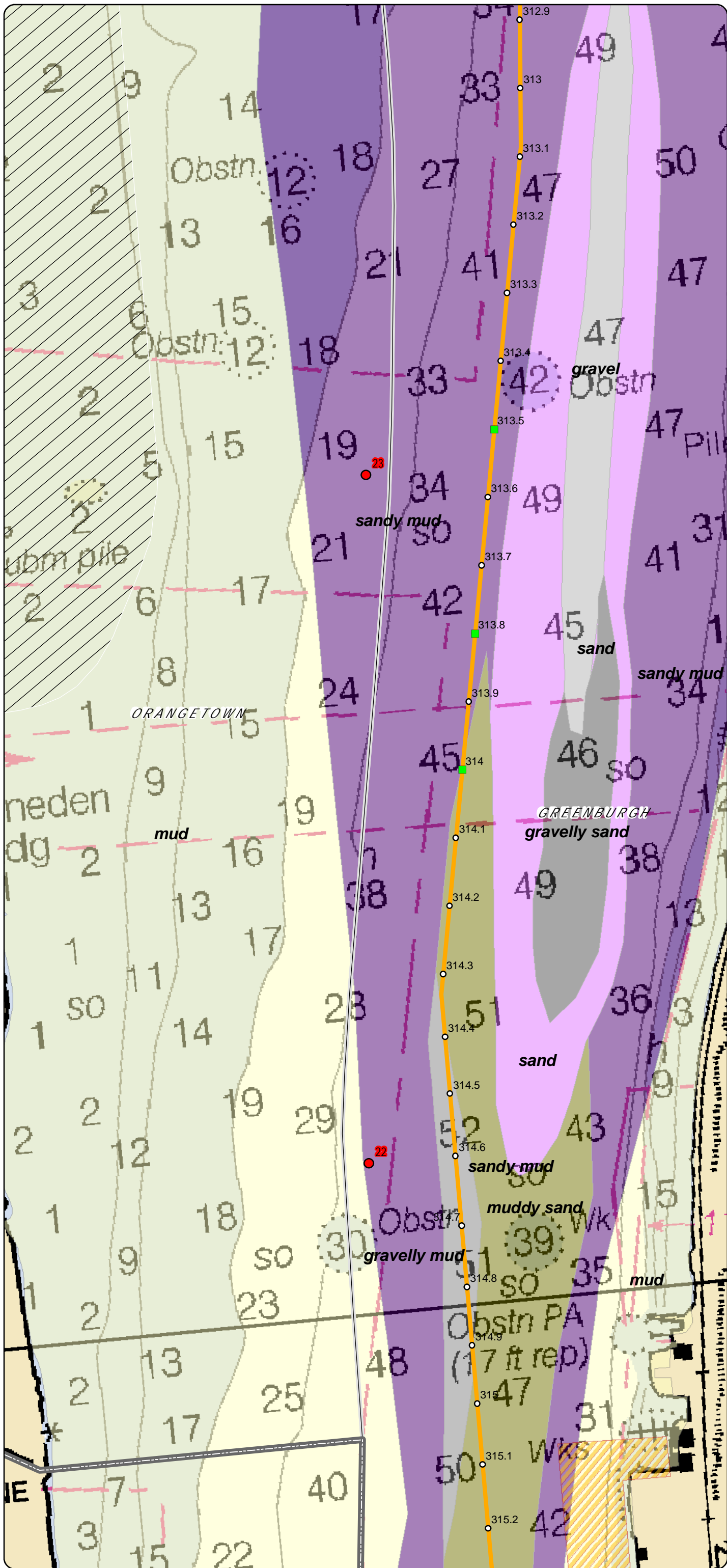
- State Boundary
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- Town Boundary

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 Feet

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0 750
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Transmission Developers Inc.

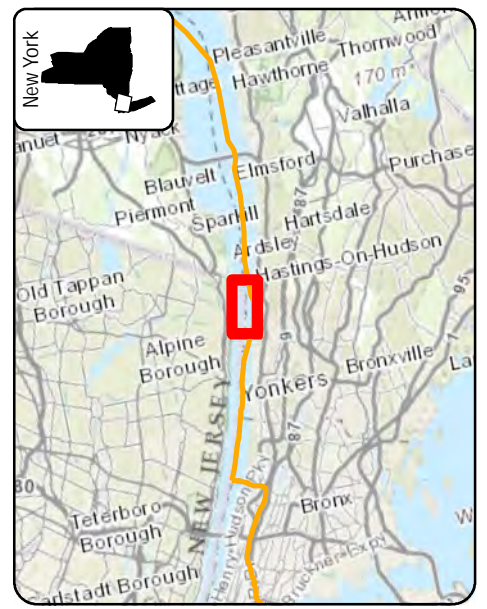
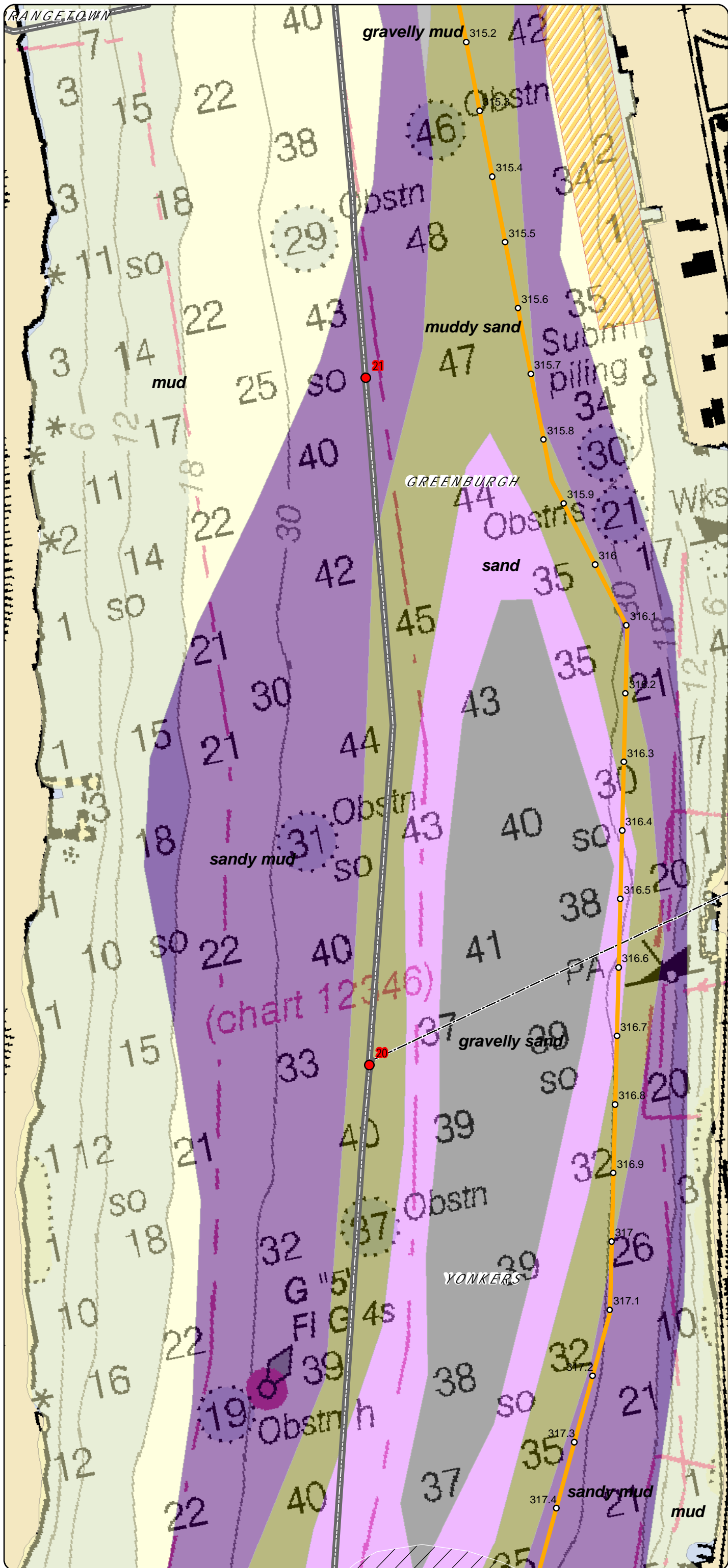
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by: **HDR** **UTA** & **CTRC**



LEGEND


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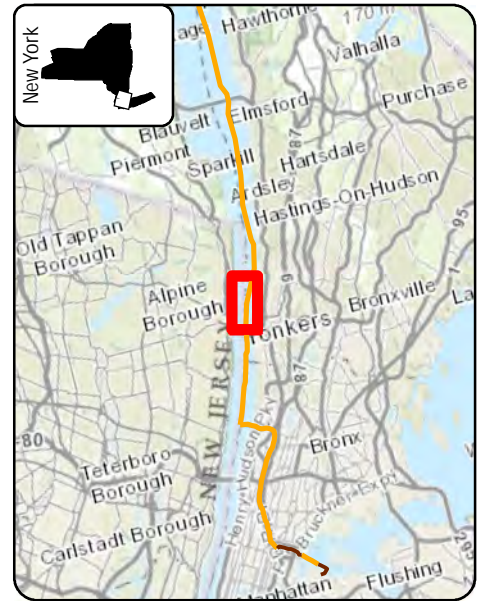
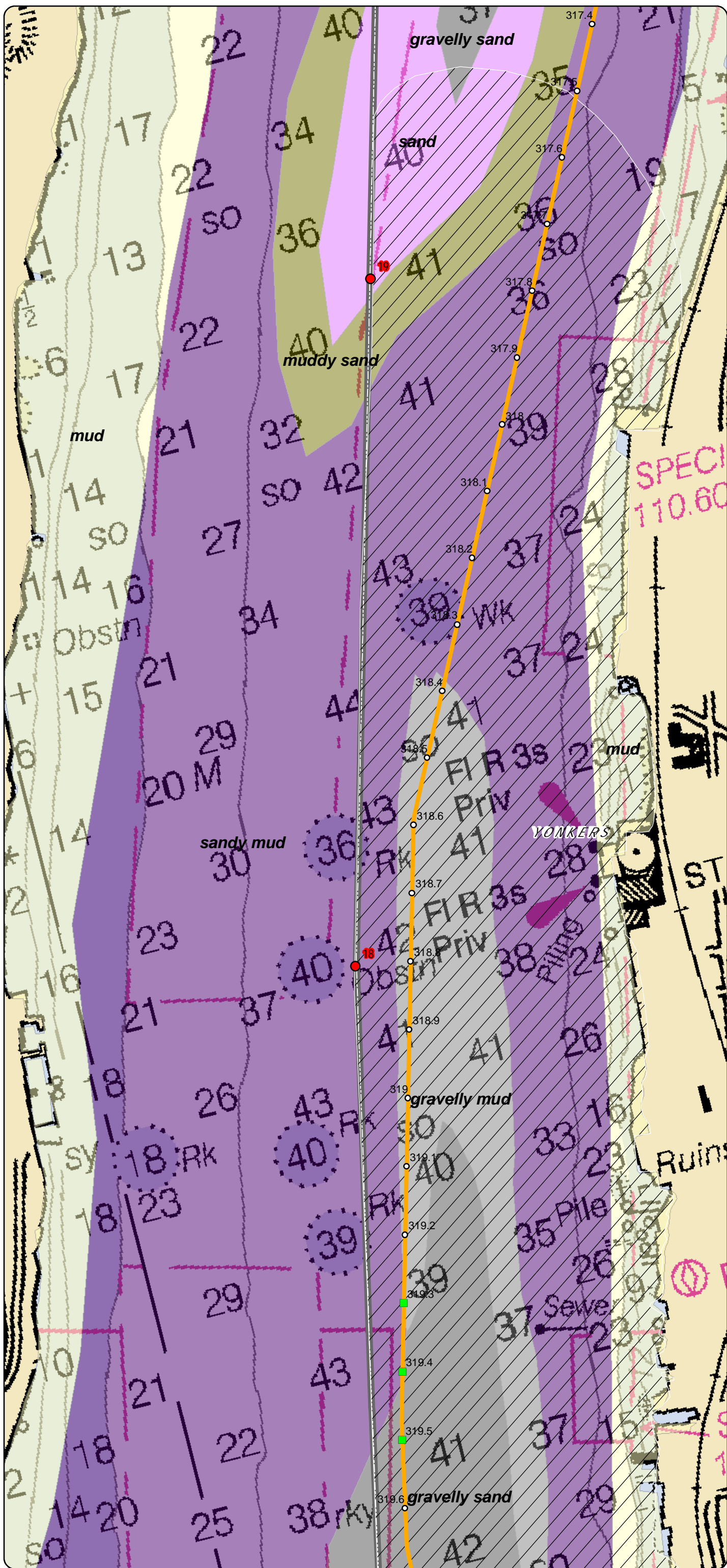
- State Boundary
- County Boundary
- Town Boundary

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Feet


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 Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Hudson River Project Route
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LEGEND


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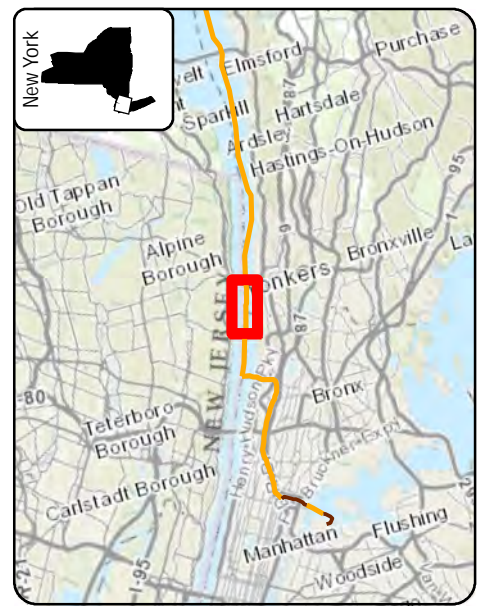
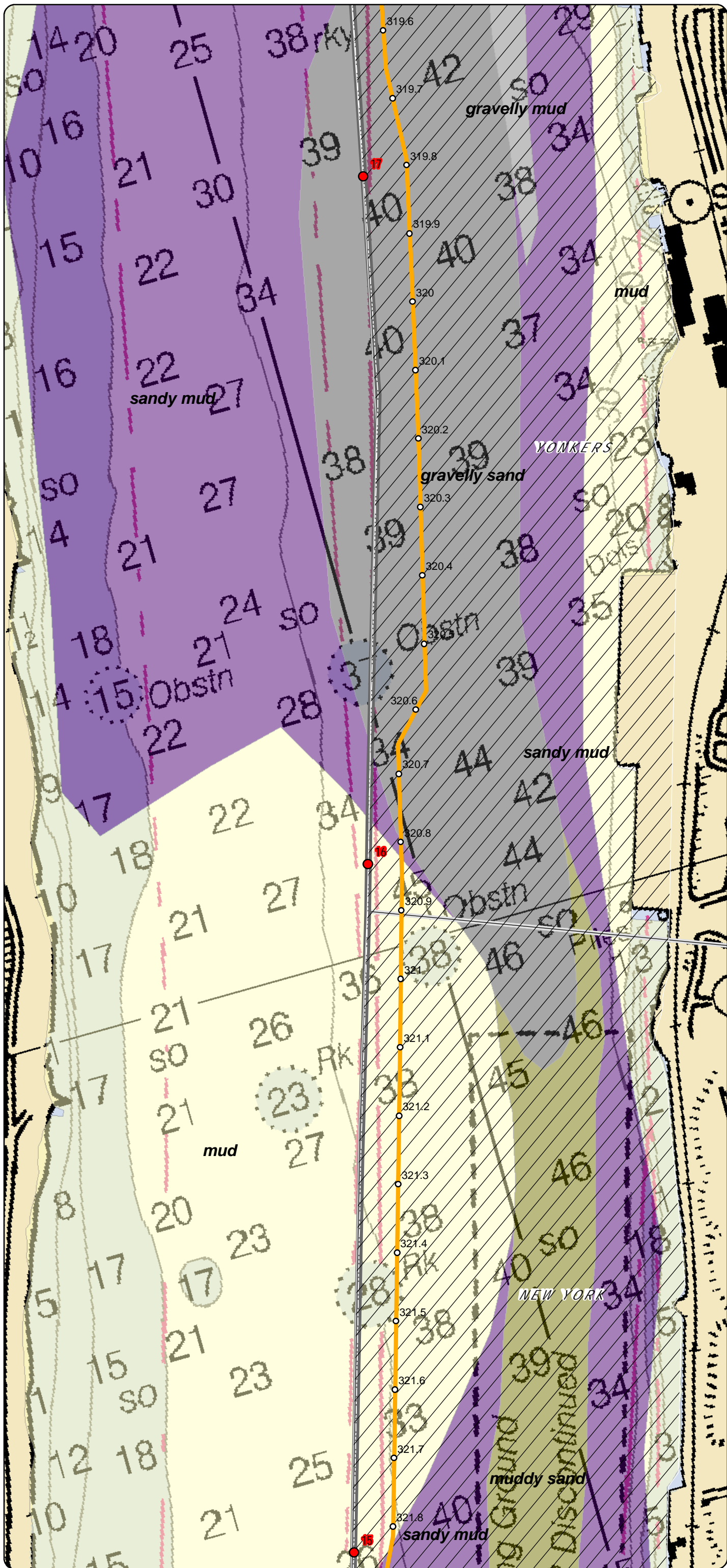


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Hudson River
Project Route
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by: **HDR** **UTA** & **CTRC**



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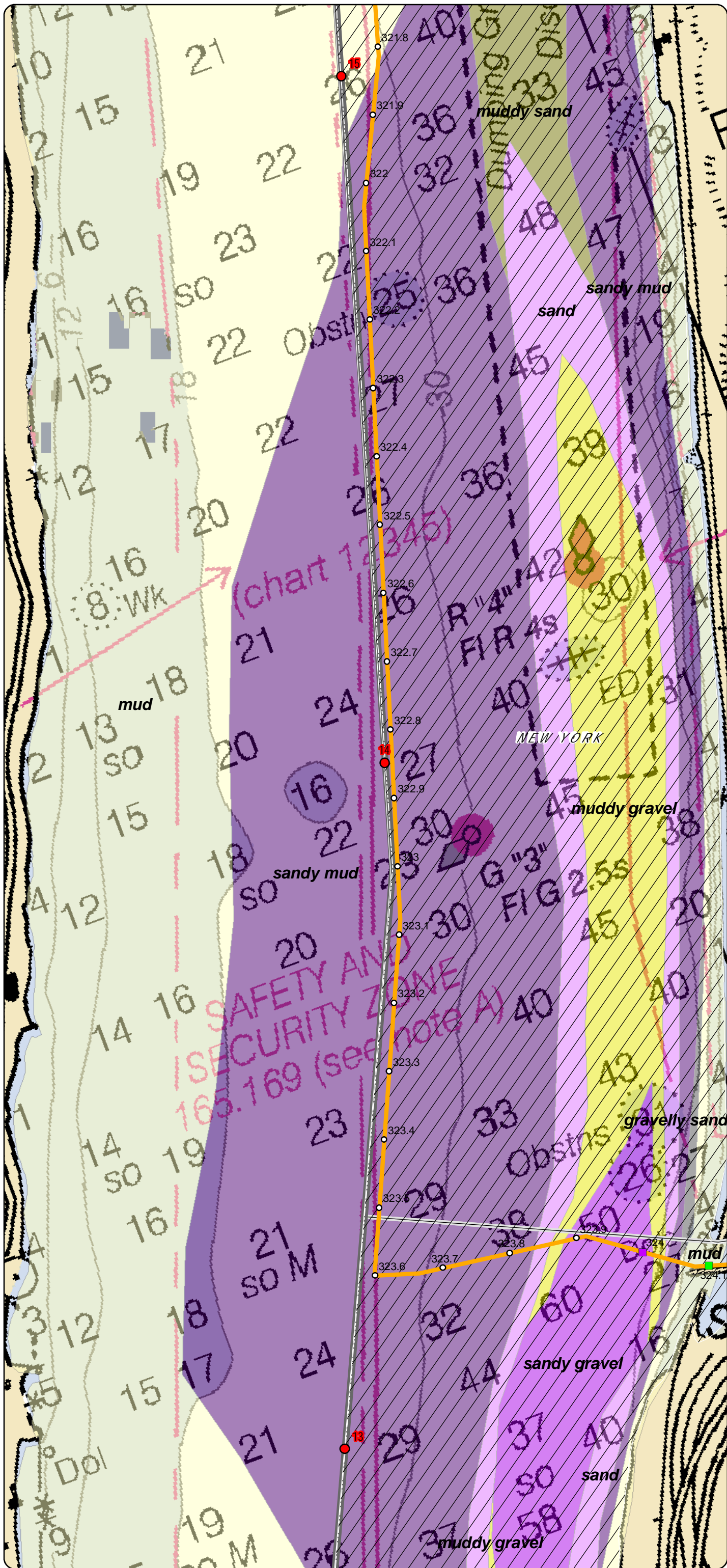
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Champlain Hudson Power Express Inc.

Hudson River Project Route
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Champlain Hudson Power Express Inc.

**Hudson River
Project Route**

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