HDD Design Summary Report
Crossings HDD 21B to HDD 50
in Segments 4 & 5 – Package 3

Fort Edward to Milton
Washington County to Saratoga County, New York

CHA Project Number: 066076

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1.0 INTRODUCTION

1.1 PURPOSE

The Champlain Hudson Power Express (CHPE) project consists of installing a pair of HVDC electrical transmission cables with an associated telecommunications line from Canada to New York City. The portion of the work addressed herein is located in the upland portion of the route from the south end of Lake Champlain to New York City along the uplands of the Hudson River Valley. This work includes approximately 170 crossings under roads, railroads, wetlands water bodies, and obstructions to be installed using horizontal directional drilling (HDD) methods to minimize interference with use or impacts to the environment. This Design Summary Report addresses the design for the HDD crossings in Segments 4 & 5 - Package 3 from Fort Edward to Milton. These crossings are designated HDD 21B through HDD 50.

The purposes of this Design Summary Report are to provide the following:

- Review of the existing geological, hydrogeological, and geotechnical conditions for HDD 21B through HDD 50 for a total of 60 crossings (2 per site) in Segments 4 & 5 – Package 3.
- Provide a descriptive narrative of the HDD Crossings in support of the attached design drawings and technical specifications.
- Present stress and inadvertent release analyses that support the proposed designs.
- Evaluate construction considerations including inadvertent return mitigation.

2.0 PROJECT DESCRIPTION

The proposed CHPE route follows the Hudson River Valley of New York. The new transmission line will be approximately 146 miles in length, extending from the south end of Lake Champlain to Astoria, NY. Segments 4 & 5 - Package 3 is located in approximately a 26.5-mile section of the route in Saratoga County, New York.

A Project Locus Map and a plan showing the locations of the HDD 21B through HDD 50 crossings are presented in Appendix B.

The HDD crossings addressed in this report are located as shown in Table 1 below*:*

Table 1: HDD Locations, Lengths, and Description

HDD#	Start Station	End Station	HDD Length, ft	Obstruction Crossed
21B	30058+85	30068+30	903/947	Drainage/Culvert
22	A-P3-20+50	A-P3-33+20	1251/1277	RR Crossing/Road
24	A-P3-38+60	A-P3-74+15	3406/3549	River Crossing
24A	A-P3-83+85	A-P3-92+70	884	RR Crossing & Road Crossing (at-grade)
25	30187+20	30204+45	1754/1726	Wetlands
25A	30213+80	30221+50	765	Wetlands/Drainage
26	30240+55	30261+00	2036/2042	Culvert & Wetlands
27	30280+75	30291+55	1087	Culvert & Wetlands
28	30318+70	30325+15	636/645	Culvert & Wetlands
29	30344+70	30355+40	1047/1049	Wetlands
30	30392+40	30411+60	1918	Culvert & Water
31	30545+45	30556+15	1061/1070	Culvert & Water
32	30619+20	30627+90	757/872	RR Crossing & Road Crossing (at-grade)
32A	30632+85	30639+15	633	Environmentally Sensitive Area
33	30656+65	30675+20	1859	Culvert, Rail, Environmentally Sensitive Area
35	30719+50	30745+40	2550/2552	Wetlands & Environmentally Sensitive Area
36	30796+30	30802+45	630/645	Road/Bridge over RR
37	30839+30	30847+00	765/773	Highway/Bridges over RR
38	30895+55	30910+65	1473/1518	Culvert, Water, Utilities
39	30913+95	30920+00	606/968	Road Bridge over RR
40	31001+55	31014+35	1349/1291	RR Crossing
41	31043+15	31050+35	712	Culvert & Water
42	31058+50	31064+55	565/690	Road Bridge over RR
43	31081+00	31091+55	1050	Road/RR
44	31100+35	31106+50	538/575	Road Bridge over RR
45	31157+00	31163+10	630	Road Bridge over RR
46	31176+55	31208+00	3150	Wetland & RR Culverts
47	31221+30	31227+15	562/584	Road Bridge over RR
49	31339+70	31359+00	1932	RR Crossing & Road Crossing (at-grade)
50	31369+35	31376+40	703/715	RR Crossing

3.0 BACKGROUND

The underground construction of two HVDC electrical transmission cables is proposed to be housed in individual 10-inch-diameter DR 9 HDPE conduits spaced a distance dependent on depth and soil Thermal Resistivity (TR) values provided by NKT and as shown on drawing plans. A third, typically 2-inch-diameter DR 9 conduit will be bundled with one of the 10-inch diameter conduit for a telecommunications line. Longer and deeper bores may require a larger diameter (i.e., 12-inch and 3 inch) and conduits with larger DR, thicker walls, values (i.e., DR 7) to resist tension stresses during installation and collapsing long-term. This is checked and determined on a case-by-case basis and design sizes are shown on the design drawings shown in Appendix D. The conduits are to be installed in 16 to 22-inch final ream diameter bore holes. The proposal is to install the cables at least 25 feet below congested areas, roads, railroads, under/around other obstructions, 15 to 25 feet below wetland, and 35 to 45 feet below open bodies of water using HDD methods. HDD is a widely used trenchless construction method to install conduits with limited disturbance to the ground around the bore alignment, minimal ground surface impacts above the alignment, and to minimize the potential of inadvertent releases of drilling fluids while boring. The goal for using HDD methods is to install the conduits while controlling and minimizing the amount of impact to congested areas, existing underground obstructions, and to the adjacent wetlands to the extent possible.

4.0 SITE CONDITIONS

4.1.1 Project Datum and Topography

HDD #21B

HDD #21B consists of two HDD bores with one approximately 903 feet long and other approximately 947 feet long. Both bores are on the west side of CP Rail railroad tracks, crossing a 60" RCP (reinforced concrete culvert pipe) culvert and running adjacent to a 48" RCP culvert in Fort Edward, NY, at approximately latitude 43.2806°N and longitude 73.5686°W. HDD bores will have both vertical and horizontal curves. The ground surface elevation at the entry pit of bore alignment is approximately El.143 and at exit pit is approximately El. 135, while in middle it undulates between El. 132 to El. 147 along the path (reference datum NAVD 1988).

HDD #22

HDD #22 consists of two HDD bores with one approximately 1251 feet long and other approximately 1277 feet long. Both bores start on the west side of CP Rail railroad tracks, cross underneath the tracks and East St and various utilities, and end to the east side of the tracks in Fort Edward, NY. The approximate track

crossing is at latitude 43.2722°N and longitude 73.5782°W. HDD bores will have both vertical and horizontal curves. The ground surface gently fluctuates between approximately El. 142 and El. 137 (reference datum NAVD 1988).

HDD #24

HDD #24 consists of two, horizontal, bores with one approximately 3406 feet and the other approximately 3549 feet long. Both the bores are east of CP Rail railroad tracks and cross underneath Canal Street, the Hudson River, and Rogers Island Road in Fort Edward, NY. The approximate center of the HDD bores is located at latitude 43.2680°N and longitude 73.5818°W. Both bores remain on the east side of tracks for the entire run. The ground surface elevation at the entry point is approximately El. 133, undulating between El. 130 and El.145 for the first half of alignment, while dipping down near water level at El.120 and then climbing up to El. 163 at the exit point (reference datum NAVD 1988).

HDD #24A

HDD #24A consists of two straight bores approximately 884 feet long located approximately 750 feet east of US Route-190 in Fort Edward, NY. Both bores start on east side of railroad tracks, cross underneath the tracks at W. River Rd and exit west of the railroad tracks. The bores will cross under or adjacent to a 24" CMP culvert and various utilities and will cross under W. River Road at approximately latitude 43.2587°N and longitude 73.5818°N. The ground surface elevation along the path of HDD #24A gently undulates between El. 155 and El. 163 (reference datum NAVD 1988).

HDD #25

HDD #25 consists of two straight HDD bores with one approximately 1754 feet long and the other 1726 feet long. Both bores are west of the CP Rail railroad tracks in Queensbury, NY and cross underneath wetlands and an elevation dip at approximately latitude 43.2512°N and longitude 73.5976°W. Both bores run on the west side of the railroad tracks. The ground surface elevations along the HDD path gently undulates between El.126 and El.153 (reference datum NAVD 1988).

HDD #25A

HDD #25A consists of two straight HDD bores approximately 765 feet long. Both bores are west of the CP Rail railroad tracks in Queensbury, NY and cross underneath wetlands and adjacent to a 45" RCP culvert. The approximate center of the HDD bores is at latitude 43.2464°N and longitude 73.5994°W, in Moreau, NY. The ground surface elevation is approximately El. 144 at the entry and exit points, and it fluctuates between El. 131 and El. 153 in the center of the bores (reference datum NAVD 1988).

HDD #26

HDD #26 consists of two HDD bores approximately 2036 feet and 2042 feet long that have both vertical and horizontal curves. The approximate center of the HDD bores is located at latitude 43.236797°N and longitude -73.601908°W, in Fort Edward, NY. Both bores stay on the west side of the CP Rail railroad and cross underneath a culvert and extensive wetlands. The ground surface elevation at the entry is at approximately El. 147-150, gently slopes down to El.132 near the center of bore path and slopes back up to El. 157 at the exit (reference datum NAVD 1988).

HDD #27

HDD #27 consists of two straight HDD bores approximately 1087 feet long that cross underneath water at a large culvert with an unknown invert for the North Branch Snook Kill at the CP Rail railroad tracks in Queensbury, NY. Both bores run on the west side of the railroad tracks for the entire drill at approximately 43.2295°N and longitude 73.6093°W. The ground surface elevation gently undulates between El. 158 and El. 151 for Conduit 2. Conduit 1 has a greater change in elevation, ranging from approximately El. 119 to El. 155 (reference datum NAVD 1988).

HDD #28

HDD #28 consists of two straight HDD bores approximately 636 feet and 645 feet long. Both bores are on the west side of the CP Rail railroad tracks in Queensbury, NY at approximately latitude 43.2223°N and longitude 73.6185°W. They cross underneath a 36" CMP and wetlands in the area. The ground surface elevation is at approximately El. 163 at the entry and exit points and gently dips to El. 153 at the center of the bores and the culvert crossing (reference datum NAVD 1988).

HDD #29

HDD #29 consists of two straight HDD bores approximately 1047 feet and 1049 feet long that cross underneath wetlands in Northumberland, NY. Both bores remain on the west side of the tracks with the approximate center of the bores located at latitude 43.2167°N and longitude 73.6256°W. The ground surface elevation is approximately El. 170 at the entry point and El. 174 at the exit points. It fluctuates gently between El. 168 and El. 177 (reference datum NAVD 1988).

HDD #30

HDD #30 consists of two straight HDD bores approximately 1918 feet long that cross underneath a large culvert of the Snook Kill River to the west side of the CP Rail railroad tracks in Northumberland, NY at approximately latitude 43.2062°N and longitude 73.6388°W. Both bores remain on west side of the tracks for the entire run and run unparallel to the tracks in order to enter and exit at relatively flat locations in an

otherwise steep slope. The ground surface elevation at entry point of bore alignment is approximately El. 198, while most of run it hovers between El. 160 and El. 190 followed by a final incline to exit point at El. 220 (reference datum NAVD 1988).

HDD #31

HDD #31 consists of two straight HDD bores approximately 1061 feet and 1070 feet long that cross underneath associated wetlands on the west side of the CP Rail railroad tracks in Queensbury, NY approximately latitude 43.1772°N and longitude 73.6768°W. Both bores remain on the west side of the track for the entire run. The ground surface elevation undulates at entry and exit pit is approximately El. 269, while in the middle it dips down to El. 262 (reference datum NAVD 1988).

HDD #32

HDD #32 consists of two straight HDD bores with one approximately 757 feet and the other approximately 872 feet long that cross underneath the CP Rail railroad tracks at an at-grade road crossing (Ballard Road) in Queensbury, NY at approximately latitude 43.1606°N and longitude 73.6914°W. The bores cross from the west side of43. the CP Rail railroad tracks to the east. The ground surface elevation gently undulates between approximately El. 304 and El. 310 (reference datum NAVD 1988).

*HDD #*32A

HDD #32A consists of two straight HDD bores approximately 633 feet long that runs on the east side of the CP Rail railroad tracks and south of Ballard Road in Gansevoort, NY at approximately latitude 43.1589°N and longitude 73.6924°W. The HDD bores stays on the east side of the railway tracks for entire drill and pass underneath an environmentally sensitive area. No work is proposed within this patch to limit any disturbance to this area. Contact the environmental inspector to assure the patch has been verified and marked to avoid inadvertent encroachment. The ground surface elevations along the path of HDD #32A gently slopes downwards from the proposed entry pit location (El. 308) towards the exit pit at approximately El. 303 (reference datum NAVD 1988).

HDD #33

HDD #33 consists of two straight HDD bores approximately 1859 feet long. Both the bores run from the east side of CP Rail railroad tracks and crosses to the west side in Wilton, NY at approximately latitude 43.1491°N and longitude 73.6997°W. Near the entry pits and work zone, both bores cross underneath an environmentally sensitive area. No work is proposed within this patch to limit any disturbance to this area. Contact the environmental inspector to assure the patch has been verified and marked to avoid inadvertent encroachment. At the railroad track crossing, the bores also cross underneath a 48" cast iron culvert for the

Delegan Brook. Both bores will have both vertical and horizontal curves. No segments of the bore path will be designed with compound curves (segments with compound curves would have both horizontal and vertical curves). The ground surface elevations along the path of HDD #33 gently slopes upwards from the proposed entry pit location El. 319, while hovering most of the run between El. 305 and El. 315, following towards the proposed exit pit at approximately El. 313 (reference datum NAVD 1988).

HDD #35

HDD #35 consists of two straight HDD bores approximately 2550 feet and 2552 feet long that crosses underneath wetland on the west side of CP Rail railroads tracks and south of Eddie Road in Wilton NY at approximately latitude 43.1336°N and longitude 73.7111°W. Both bores will stay on the west side of railway tracks and will have both horizontal and vertical curves At the south end of the drill path, near the exit pits, both bores cross underneath an environmentally sensitive area. No work is proposed within this patch to limit any disturbance to this area. Contact the environmental inspector to assure the patch has been verified and marked to avoid inadvertent encroachment. The ground surface elevation gently undulates between El. 318 and El. 330 (reference datum NAVD 1988).

HDD #36

HDD #36 consists of two straight HDD bores approximately 630 feet and 645 feet long that runs on the west side of the CP Rail railroad tracks and underneath (road-bridge) in Saratoga Springs, NY approximately latitude 43.1225°N and longitude 73.7291°W. Both the bores stay on west side of the tracks for the entire run. The ground surface elevation along the path of HDD #36 gently undulates from approximately El. 314 at the north end of the bore alignment, to approximately El. 327 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #37

HDD #37 consists of two straight HDD bores approximately 765 feet 773 feet long that runs on the west side of the CP Rail railroad tracks and underneath the Adirondack Northway (road-bridge) in Saratoga Springs, NY. The approximate centers of the bores are located at latitude 43.1182°N and longitude 73.7446°W. The ground surface elevations at the entry and exit points are approximately El. 323 and El. 324 respectively. The surface elevation increases drastically to about El. 356 where it remains for several hundred feet before plummeting back down to El. 324 (reference datum NAVD 1988).

HDD #38

HDD #38 consists of two straight HDD bores approximately 1473 feet and 1518 feet long that run underneath a 10-foot-wide stone culvert located on the west side of the CP Rail railroad tracks in Saratoga

Springs, NY. The approximate culvert crossing near is located at latitude 43.1133°N and 73.7651°W. The ground surface elevations at the entry are at El. 323 fluctuates between to a peak of approximately E. 327 and a low of approximately El. 293 before reaching the exit at approximate El. 310 (reference datum NAVD 1988).

HDD #39

HDD #39 consists of two HDD bores approximately 606 feet and 968 feet long that runs on the west side of the CP Rail railroad tracks and underneath Maple Ave in Wilton, NY and remain on west side of the tracks for the entire run. This HDD contains a vertical thermal design spacing. Conduit 1 is a horizontally straight bore path where Conduit 2 is significantly deeper and contains a horizontal curve to go around a rail bridge abutment at approximately latitude 43.1121°N and longitude 73.7707°W. The ground surface elevation at the entry pit is at El. 329 and as the bore runs towards the exit pit it steeps down to El. 321 (reference datum NAVD 1988).

HDD #40

HDD #40 consists of two straight HDD bores with one approximately 1349 feet long and another around 1291 feet long. Both the bores will remain on the west side of CP Rail railroad tracks and cross underneath a spur track near the entry in Saratoga Springs, NY at approximately latitude 43.0969°N and longitude 73.7969°W. The ground surface elevation at the entry is approximately El. 340 and gently undulates to approximately El. 332 at the exit of the segments (reference datum NAVD 1988).

HDD #41

HDD #41 consists of two straight bores, approximately 712 feet long, that cross underneath a 52" culvert adjacent to a stream feeding Putnam Brook in Saratoga Springs, NY at approximately latitude 43.0893°N and longitude 73.8072°W. Both bores run on the west side of CP Rail railroad tracks. The ground surface elevation gently undulates between El. 327 and El. 313 (reference datum NAVD 1988).

HDD #42

HDD #42 consists of two straight HDD bores approximately 565 feet and 690 feet long that run on the west side of the CP Rail railroad tracks and underneath NY 9N (road-bridge) in Saratoga Springs, NY at approximately latitude 43.0855°N and longitude 73.8102°W. The road is at El. 354 whereas the entry and exit points hover between El. 322 and El. 328 (reference datum NAVD 1988).

HDD #43

HDD #43 consists of two straight HDD bores approximately 1050 feet long that run on the west and east sides of the CP Rail railroad tracks and underneath the Washington St (road-bridge) in Saratoga Springs,

NY at approximately latitude 43.0795°N and longitude 73.8112°W. The ground surface elevation at the entry and exit points for conduit 1 is approximately between El. 321 and E.324, while for conduit 2 it hovers approximately at El. 317 and El. 322. The surface elevation peaks to El. 349 toward the center of the bore (reference datum NAVD 1988).

HDD #44

HDD #44 consists of two straight HDD bores approximately 538 feet and the other approximately 575 feet long that run on the west side of CP Rail railroad tracks and underneath Grand Ave (road-bridge) in Saratoga Springs, NY at approximately latitude 43.0744°N and longitude 73.8128°W. The ground surface elevation undulates between El. 316 and El. 312, while peaking at the Grand-Ave crossing (El. 346) (reference datum NAVD 1988).

HDD #45

HDD #45 consists of two straight HDD bores approximately 630 feet long that run on the west side of the CP Rail railroad tracks and underneath Geyser Road (road-bridge) in Saratoga Springs, NY at approximately latitude 43.0597°N and longitude 73.8185°W. The ground surface elevation hovers between El. 324 to El. 318 for the majority of the bore path (reference datum NAVD 1988).

HDD #46

HDD #46 consists of two straight HDD bores approximately 3150 feet long that cross underneath extensive wetlands to the west of the CP Rail railroad tracks in Saratoga Springs, NY at approximately latitude 43.0552°N and longitude 73.8182°W. Both bores remain on the west side of CP Rail railroad tracks for the entire run. The ground surface elevation gently undulates between El. 308 and El. 325 (reference datum NAVD 1988).

HDD #47

HDD #47 consists of two straight HDD bores approximately and 562 and 584 feet long that run on the west side of the CP Rail railroad tracks and crosses underneath US Route 50 (Ballston Avenue) in Saratoga Springs, NY at approximately latitude 43.0423°N and longitude 73.8189°W. The ground surface elevation at the entry point is approximately El. 328 and at exit point approximately El. 318. The surface elevation peaks to El. 350 toward the center of the bore (reference datum NAVD 1988).

HDD #49

HDD #49 consists of two straight HDD bores that cross the CP Rail railroad tracks, and Malta Ave (at-grade), from the west side of the tracks to the east in Saratoga Springs, NY at approximately latitude 43.0110°N and longitude 73.8383°W. Both the bores are approximately 1932 feet long. The ground surface

elevation at the entry pit is approximately El. 229 and at exit pit is at El. 290, while it undulates between El. 277 to El. 297 (reference datum NAVD 1988).

HDD #50

HDD #50 consists of two straight HDD bores approximately bores with one approximately 703 feet long and other approximately 715 feet long. Both bores are on the east side the CP Rail railroad tracks in Saratoga Springs, NY and crosses underneath the rails to the west side at approximately latitude 43.0063°N and longitude 73.8383°W. The ground surface gently slopes down from North to South starting at approximately El. 292 and reaching approximately El. 279 (reference datum NAVD 1988).

4.1.2 Geotechnical Data

HDD #21B

Subsurface investigations were conducted in 2022 by Kiewit. There are two draft borings to date at HDD #21B KB-133.6-DRAFT and KB-133.7-DRAFT, which reach depths of 57 and 67 feet below grade, respectively. There appears to be a 2-foot layer of compact fill over an 8-foot layer of medium compact poorly graded sand, over a 25-foot layer of medium compact well graded sand, over a 22-foot layer of very soft low plasticity clay in boring KB-133.6-DRAFT. There appears to be a 4-foot layer of loose fill over an 11-foot layer of medium stiff low plasticity clay, over a 10-foot layer of loose well graded sand, over a 42-foot layer of very soft low plasticity clay in boring KB-133.7-DRAFT. The borings were generally similar and the BoreAid analysis will be based on non-horizontal layering between the two borings. bottom depth of the HDD, the BoreAid analysis will be based on the layering observed in boring KB-133.6-DRAFT. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #21B BoreAid analysis will be divided into five (5) layers: loose fill (SC), medium compact poorly graded sand (SP), medium stiff low plasticity clay (CL), medium compact well graded sand (SW) and very soft low plasticity clay (CL). The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #22

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. There are five borings to date at HDD #22: B-134.5-1, B-134.6-1, K-134.4, K-134.5 and K-134.7 which extend to depths of 30, 30, 41, 41 and 29 feet below grade, respectively. There appears to be an 8-foot layer of loose fill over a 5.5-foot layer of loose poorly graded sand, over a 15-foot layer of loose silty sand, over a 10-foot layer of loose poorly graded sand in boring B-134.5-1. There appears to be a 4-foot layer of loose fill over a 2-foot layer of loose silty sand, over a 7.5-foot layer of loose poorly graded sand, over a 16.5-

foot layer of loose silty sand in boring B-134.6-1. There appears to be a 2-foot layer of dense well graded gravel over a 5.5-foot layer of loose well graded gravel, over a 0.5-foot layer of loose poorly graded sand, over a 4-foot layer of loose well graded gravel, over a 5-foot layer of loose poorly graded sand, over a 5-foot layer of loose well graded sand, over a 19-foot layer of soft fat clay in boring K-134.4. There appears to be a 1.8-foot layer of dense well graded sand over a 6.2-foot layer of loose well graded gravel, over a 14-foot layer of loose poorly graded sand, over a 10-foot layer of medium dense well graded sand, over a 9-foot layer of loose well graded sand in boring K-134.5. There appears to be a 2-foot layer of dense poorly graded sand over a 2-foot layer of medium compact clayey sand, over an 8-foot layer of loose well graded sand, over a 5-foot layer of loose silty sand, over a 5-foot layer of loose poorly graded gravel, over a 5-foot layer of medium compact poorly graded sand, over a 2-foot layer of medium compact well graded sand in boring B-134.7 The soil conditions observed within borings B-134.5-1, B-134.6-1, and K-134.5 were generally consistent. The BoreAid analysis will be based on non-horizontal layering corresponding to borings B-134.5-1, B-134.6-1, and K-134.5

Based on the borings, the soil profile for the HDD #22 BoreAid analysis will be divided into eight (8) layers: loose fill (SP), dense well graded sand (SW), loose well graded gravel (GW), loose poorly graded sand (SP), loose well graded sand (SW), loose poorly graded sand (SP), loose well graded sand (SW), and soft fat clay (CH). The soil profiles used for BoreAid analyses for the HDD in these segments are presented in Appendix D.

HDD #24

Subsurface investigations were conducted in 2013 by TRC, 2021 by AECOM and 2022 by Atlantic Testing Labs, Ltd. for Transmission Developers, Inc. There are five borings to date at HDD #24: B135.1-1, B135.35-1, K-134.8, FES-3 and FES-3A, which reached depths of 24.1, 67.5, 40, 40 and 45 feet below grade, respectively. There appears to be 2-foot layer of loose fill over a 11.5-foot layer of loose silty sand, over a 10.6-foot layer of loose well graded sand in boring B135.1-1. There appears to be 5-foot layer of loose fill over a 52.5-foot layer of soft silty clay, over a 10-foot layer of shale bedrock in boring B135.35-1. There appears to be a 10-foot layer of loose well graded sand, over a 4-foot layer of soft clayey sand, over a 5-foot layer of loose silt, over a 5-foot layer soft lean clay, over a 10-foot layer of soft clayey sand, over a 13-foot layer of medium compact sand with trace silt in boring K-134.8 There appears to be 9.5-foot layer of medium stiff low plasticity silt over a 5.5-foot layer of medium compact well graded sand with silt, over a 6-foot layer of medium compact poorly graded sand, over a 9-foot layer of shale bedrock in boring FES-3. There appears to be 3.5-foot layer of hand cleared silty sand, over a 4-foot layer of medium dense poorly graded sand over an 9.5-foot layer of loose to medium compact well graded sand, over a 23-foot layer of shale bedrock in boring FES-3A. There appears to be 8-foot layer of well graded sand over a 4-

foot layer of clayey sand, over a 3-foot layer of low plasticity loose silt, over a 5-foot layer of soft clay, over a 10-foot layer of stiff clay, over a 4-foot layer of well graded sand, over a 9-foot layer of silty sand in boring K-134.8. A supplemental geotechnical investigation is in progress and will be included in this report and analysis upon completion.

Based on the borings, the soil profile for the preliminary HDD #24 BoreAid analysis will be divided into four (4) layers: loose silty sand (SM), soft lean clay (CL), medium dense poorly graded sand (SP), and shale bedrock. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #24A

Subsurface investigations were conducted in 2022 by Atlantic Testing Laboratories, Ltd. There are two borings to date at HDD #24A: KB-135.7 and KB-135.8, which extend to depths of 54.7 and 55.7 feet below grade, respectively. There appears to be an 0.3-foot layer of ballast over a 3.7-foot layer of loose clayey gravel, over a 31-foot layer of very soft low plasticity clay, over a 3-foot layer of very dense weathered rock, over a 16.7-foot layer of shale bedrock in boring KB-135.7. There appears to be a 6-foot layer of loose fill over a 4-foot layer of loose poorly graded sand, over a 45-foot layer of very soft low plasticity clay, over a 0.7-foot layer of very dense weathered rock in boring KB-135.8. The BoreAid analysis will be based on non-horizontal layering of the two borings along the alignment.

Based on the layering observed in the two borings conducted along the alignment, the soil profile for the HDD #24A BoreAid analysis will be divided into six (6) layers: loose fill (SM), loose clayey gravel (GC), loose poorly graded sand (SP), very soft low plasticity clay (CL), very dense weathered rock (GW) and shale bedrock. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #25

Subsurface investigations were conducted in 2013 by TRC for Transmission Developers, Inc., and 2021 and 2022 by Kiewit. There are three borings to date at HDD #25: A136.0-1, K-136.1, FES-3B, KB-136.2-DRAFT and KB-136.3-DRAFT. Bore A136.0-1, that reaches a depth of 10 feet, shows a 2-foot layer of loose fill over an 8-foot layer of silty sand in boring. Bore K-136.1, that reaches a depth 36 feet, shows a 1-foot layer of topsoil over a 1-foot layer of medium dense silty sand, over a 4-foot layer of loose well graded sand, over a 2-foot layer of soft low plasticity silt, over an 18-foot layer of medium stiff fat clay, over a 10-foot layer of medium dense well graded sand in boring. Bore FES-3B, that reaches a depth of 40 feet, shows a 7-foot layer of loose poorly graded sand over a 6-foot layer of loose well grade sand, over a 17-foot layer of loose low plasticity silt, over a 5-foot layer of medium dense poorly graded sand, over a 3-foot layer of

medium dense well graded sand, over a 2-foot layer of loose low plasticity silt in boring. The draft bore KB-136.2 shows over a 5-foot layer of fill over an approximately 10-foot layer of loose silty sand, over medium stiff to soft lean clay reaching the bottom of the bore at a depth of 65 feet. The draft bore KB-136.3 shows a 6-foot layer of fill (stone ballast) over a 19-foot layer of medium stiff to soft lean clay, over a 10-foot layer of medium dense well graded sand, over a layer of shale that reaches the end of the bore at a depth of 42 feet. The majority of the drill path looks to be through layers of loose silt and medium dense poorly graded sand. The Geotechnical Technical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #25 BoreAid analysis will be divided into six (6) layers: loose poorly graded sand (SP), medium stiff lean clay (CL), soft lean clay (CL), medium dense well graded sand (SW), loose well graded sand (SW), and shale. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #25A

Subsurface investigations were conducted in 2022 by Atlantic Testing Labs, Ltd. and 2021 by AECOM for Transmission Developers, Inc. There are three borings to date at HDD #25A: K-136.5, K-136.6, and FES-4, which reached depths of 40, 40 and 15.5 feet below grade. There appears to be a 2-foot layer of dense fill, over a 2-foot layer of medium dense clayey sand, over a 2-foot layer of medium stiff low plasticity clay, over a 6-foot layer of stiff low plasticity silt, over a 7-foot layer of loose silty sand, over a 21-foot layer of shale bedrock in boring K-136.5. There appears to be a 2-foot layer of loose fill, over a 4-foot layer of medium stiff low plasticity clay, over a 2-foot layer of medium stiff low plasticity silt, over a 9-foot layer of loose silty sand, over a 6-foot layer of loose clayey sand, over a 17-foot layer of shale bedrock in boring K-136.6. There appears to be a 3-foot layer of fill, over a 5.5-foot layer of dense low plasticity silt, over a 2.5-foot layer of loose silty sand, over a 3.5-foot layer of loose poorly graded sand, over a 1-foot layer of very dense poorly graded gravel in boring FES-4. The majority of the drill path appears to be through the shale bedrock. The Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #25A BoreAid analysis will be divided into six (6) layers: loose fill, medium stiff low plasticity clay (CL), medium stiff low plasticity silt (ML), loose silty sand (SM), loose clayey sand (SC) and shale bedrock. The elevation for these layers will correspond to the elevations observed in boring K-136.6. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #26

Subsurface investigations were conducted in 2021 by AECOM for Transmission Developers, Inc., and 2022 by Atlantic Testing Laboratories, Ltd. There are three borings to date at HDD #26: FES-5, K-137.1 and K-

137.3, which extend to depths of 40 feet below grade. There appears to be a 3-foot layer of well graded sand over a 4-foot layer of stiff low plasticity silt, over a 2-foot layer of stiff low plasticity clay, over a 4-foot layer of stiff low plasticity silt, over a 12-foot layer of stiff low plasticity clay, over a 5-foot layer of dense well graded gravel, over a 10-foot layer of shale in boring FES-5. There appears to be a 2-foot layer of medium dense silty sand over a 2-foot layer of loose poorly graded sand, over a 2-foot layer of loose silty sand, over a 2-foot layer of loose low plasticity silt, over a 15.5-foot layer of medium stiff high plasticity clay, over a 2.5-foot layer of dense weathered rock, over a 14-foot layer of shale in boring K-137.1. There appears to be a 2-foot layer of loose fill over a 2-foot layer of loose clayey sand, over a 25-foot layer of medium stiff low plasticity clay, over a 2-foot layer of dense weathered rock, over a 9-foot layer of shale in boring K-137.3. Due to the length of the proposed HDD alignment, and the varying thickness of the four main soil layers observed onsite, the BoreAid analysis will be based on non-horizontal layering corresponding to the three soil borings, FES-5, K-137.1 and K-137.3. The Geotechnical Reports for this location can be found in Appendix C.

Based on borings, the soil profile for the HDD #26 BoreAid analysis was divided into four (4) layers: loose well graded sand (SW), medium stiff high plasticity clay (CH), dense weathered rock (GW), and shale. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #27

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. There are three borings to date at HDD #27: K-137.8, K-138.0 and B137.9-1, which extend to depths of 50, 51 and 80 feet below grade, respectively. There appears to be a 4-foot layer of loose fill over a 13-foot layer of loose clayey sand, over a 5-foot layer of soft low plasticity silt, over a 15-foot layer of very loose silty sand, over a 7-foot layer of medium stiff low plasticity silt, over a 6-foot layer of loose silty sand in boring K-137.8. There appears to be a 2.7-foot layer of loose well graded sand over a 1.3-foot layer of loose poorly graded sand, over a 2-foot layer of very soft low plasticity silt, over a 0.6-foot layer of loose silty sand, over a 44.4-foot layer of very soft fat clay in boring K-138.0. There appears to be a 6-foot layer of very loose fill over a 1-foot layer of soft low plasticity silt, over a 21.5-foot layer of very loose silty sand, over a 10-foot layer of medium stiff low plasticity clay, over a 5-foot layer of loose silty sand, over a 36.5-foot layer of very soft fat clay in boring B137.9-1. the BoreAid analysis will be based on non-horizontal layering corresponding to borings K-138.0 and B137.9-1

Based on borings, the soil profile for the HDD #27 BoreAid analysis was divided into four (4) layers: loose well graded sand (SW), soft low plasticity clay (CL), loose well graded sand (SW), and soft fat clay (CH). The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #28

Subsurface investigations were conducted in 2022 by Atlantic Testing Laboratories, Ltd. for Transmission Developers, Inc. There are two borings to date at HDD #28: K-138.5 and K-138.6, which reached depths of 45 and 44 feet below grade. There appears to be a 2-foot layer of medium dense silty sand over a 3-foot layer of loose low plasticity silt, over a 40-foot layer of soft fat clay in boring K-138.5. There appears to be a 2-foot layer of medium dense silty sand over a 7.2-foot layer of loose silty sand, over a 2.8-foot layer of soft low plasticity silt, over a 32-foot layer of soft fat clay. The Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #28 BoreAid analysis will be divided into three (3) layers: medium dense silty sand (SM), loose low plasticity silt (ML), and soft fat clay (CH). The elevation for these layers will correspond to the elevations observed in boring K-138.5. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #29

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Atlantic Testing Laboratories, Ltd. There are three borings to date at HDD #29: FES-6, K-139.0 and K-139.1, which extend to depths of 40, 45 and 45 feet below grade, respectively. There appears to be a 0.7-foot layer of well graded sand over a 1.8-foot layer of poorly graded sand, over a 1.5-foot layer of medium stiff low plasticity silt, over a 7-foot layer of medium dense poorly graded sand, over a 6.5-foot layer of silty sand, over a 24.5-foot layer of very soft fat clay in boring FES-6. There appears to be a 2-foot layer of very loose fill over a 2-foot layer of very loose well graded sand, over a 2-foot layer of very loose clayey sand, over an 11-foot layer of loose silty sand, over a 28-foot layer of very soft fat clay in boring K-139.0. There appears to be a 2-foot layer of loose fill over a 10-foot layer of loose silty sand, over a 33-foot layer of very soft fat clay in boring K-139.1. The BoreAid analysis will be based on non-horizontal layering corresponding to borings K-139.0 and K-139.1. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #29 BoreAid analyses will be divided into three [3] layers: loose well graded sand (SW), medium dense sand well graded sand (SW), and soft fat clay (CH). The soil profiles used for BoreAid analyses of the HDDs in these segments are presented in Appendix D.

HDD #30

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. There are four borings to date at HDD #30: K-140.0, K-140.1, K-140.2 and B140.0-1, which extend to depths of 89, 82, 64 and 30 feet below grade, respectively. There appears to be a 2.3-foot layer of loose fill over a 3.7-foot layer of very loose poorly graded sand, over a 2-foot layer of loose well graded sand, over

a 55-foot layer of medium stiff low plasticity clay, over a 1.1-foot layer of dense weathered rock, over a 24.9-foot layer of shale bedrock in boring K-140.0. There appears to be a 3.8-foot layer of loose fill over a 28.2-foot layer of very loose silty sand, over a 10-foot layer of very soft fat clay, over an 11-foot layer of soft low plasticity clay, over an 11-foot layer of dense weathered rock, over an 18-foot layer of shale bedrock in boring K-140.1. There appears to be a 1-foot layer to very loose fill over a 1-foot layer of very loose clayey sand, over a 2-foot layer of soft low plasticity silt, over a 2-foot layer of medium stiff low plasticity clay, over a 2-foot layer of low well graded sand, over a 4-foot layer of very loose poorly graded sand, over a 37-foot layer of medium stiff low plasticity clay, over a 15-foot layer of shale bedrock in boring K-140.2. There appears to be a 6-foot layer of loose fill over an 8.2-foot layer of soft low plasticity clay, over a 15.8-foot layer of loose silty sand in boring B140.0-1. The BoreAid analysis will be based on non-horizontal layering corresponding to borings K-140.0, K-140.1 and K-140.2. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #30 BoreAid analyses will be divided into five [5] layers: loose well graded sand (SW), very soft to soft lean clay (CL), medium stiff fat clay (CH), highly weathered rock (GW), and sedimentary rock. The soil profiles used for BoreAid analyses of the HDDs in these segments are presented in Appendix D.

HDD #31

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Atlantic Testing Laboratories, Ltd. There are three borings to date at HDD #31: FES-9, K-142.8 and K-142.9, which extend to depths of 40, 39 and 39 feet below grade, respectively. There appears to be a 5-foot layer of fill over a 13.5-foot layer of medium dense poorly graded sand, over a 5-foot layer of medium stiff low plasticity silt, over a 5-foot layer of soft low plasticity clay, over an 11.5-foot layer of medium dense poorly graded sand in boring FES-9. There appears to be a 2-foot layer of medium dense fill over a 2-foot layer of loose well graded sand, over a 2-foot layer of medium dense silty sand, over a 2-foot layer of loose well graded sand, over a 4-foot layer of very loose silty sand, over a 15-foot layer of very soft low plasticity clay, over a 10-foot layer of loose silty sand, over a 2-foot layer of loose low plasticity silt in boring K-142.8. There appears to be a 2-foot layer of medium dense fill over a 4-foot layer of very loose well graded sand, over an 11-foot layer of loose silty sand, over a 10-foot layer of very soft low plasticity clay, over a 12-foot layer of loose silty sand in boring K-142.9. The BoreAid analysis will be based on non-horizontal layering corresponding to all three borings, FES-9, K-142.8 and K-142.9. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #31 BoreAid analyses will be divided into three [3] layers: Medium Dense Sand (SP), Very Soft Clay (CH), and Lower Medium Dense Sand (SP). The soil profiles used for BoreAid analyses of the HDDs in these segments are presented in Appendix D.

HDD #32

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. for Transmission Developers, Inc. There are three borings to date at HDD #32: B144.2-1, K-144.3 and B144.3-1, which reach depths of 30, 40 and 25 feet below grade, respectively. There appears to be a 13.5-foot layer of loose silty sand over a 5-foot layer of loose poorly graded sand, over a 11.5-foot layer of dense silty sand in boring B144.2-1. There appears to be a 4-foot layer of dense fill over a 13-foot layer of loose silty sand, over a 23-foot layer of medium dense silty sand in boring K-144.3. There appears to be a 2-foot layer of loose fill over 23-foot layer of medium dense silty sand in boring B144.3-1. The Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #32 BoreAid analysis will be divided into three (3) layers: dense fill, loose silty sand (SM), and medium dense silty sand (SM). The elevation for these layers will correspond to the elevations observed in boring K-144.3, as it was the only boring to extend to the planned HDD. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #32A

Subsurface investigations were conducted in 2013 by TRC, 2022 by Kiewit, and 2022 by Atlantic Testing Laboratories, Ltd. There are four borings to date at HDD #31: K-144.4, K-144.5, B144.5-1, and KB-144.5B-DRAFT, which extend to depths of 35, 35, 30 and 57 feet below grade, respectively. There appears to be a 2-foot layer of very dense fill over a 2-foot layer of medium dense poorly graded sand, over a 2-foot layer of medium dense well graded sand, over a 21-foot layer of medium dense silty sand, over an 8-foot layer of medium dense poorly graded sand in boring K-144.4. There appears to be a 2-foot layer of medium dense fill over a 20-foot layer of loose silty sand, over a 5-foot layer of medium dense silty sand, over an 8-foot layer of loose silty sand in boring K-144.5. There appears to be a 4-foot layer of medium dense fill over a 26-foot layer of loose silty sand in boring B144.5-1. There appears to be a 4-foot layer of very loose fill over a 11-foot layer of very loose poorly graded sand, over an 18-foot layer of very loose silty sand, over a 24-foot layer of medium dense silty sand in boring KB-144.5B. The BoreAid analysis will be based on the soil layering observed in boring K-144.5. The Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #32A BoreAid analysis will be divided into two (2) layers: medium dense poorly graded sand (SP) and loose silty sand (SM). The elevation for these layers will correspond to the elevations observed in boring K-144.5, as it was the only boring to extend to the proposed bottom of HDD alignment. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #33

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. There are five borings to date at HDD #33: K-144.9, K-145.1, K-145.2, B144.8-1 and B145.0-1, which extend to depths of 61, 61, 61, 30 and 80 feet below grade, respectively. There appears to be a 1-foot of very dense ballast stone over a 36-foot layer of medium dense poorly graded sand, over a 5-foot layer of loose low plasticity silt, over a 9-foot layer of dense silty sand, over a 10-foot layer of loose silty sand in boring K-144.9. There appears to be a 1-foot layer of very dense ballast stone over an 11-foot layer of loose poorly graded sand, over a 25-foot layer of loose silty sand, over a 15-foot layer of medium dense poorly graded sand, over a 9-foot layer of very loose silty sand in boring K-145.1.There appears to be a 1-foot layer of very dense ballast stone over an 11-foot layer of loose poorly graded sand, over a 10-foot layer of very loose poorly graded sand, over a 39-foot layer of medium dense poorly graded sand in boring K-145.2. There appears to be a 4-foot layer of loose fill over a 19.5-foot layer of loose poorly graded sand, over a 6.5-foot layer of medium dense silty sand in boring B144.8-1. There appears to be a 2-foot layer of medium dense fill over a 46.5-foot layer of loose silty sand, over a 31.5-foot layer of medium dense low plasticity silt in boring B145.0-1. The BoreAid analysis will be based on non-horizontal layering corresponding to borings K-144.9, K-145.1 and K-145.2. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #33 BoreAid analyses will be divided into four [4] layers: very dense ballast (GM), medium dense poorly graded sand (SP), loose poorly graded sand (SP) and medium dense poorly graded sand (SP). The soil profiles used for BoreAid analyses of the HDDs in these segments are presented in Appendix D.

HDD #35

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. There are six borings to date at HDD #35: K-146.2, K-146.3, K-146.4, K-146.5 B146.1-1, and B146.5-1, which extend to depths of 60, 61, 61, 61, 25 and 30 feet below grade, respectively. There appears to be a 4-foot layer of loose fill over a 38-foot layer of loose poorly graded sand, over an 18-foot layer of medium dense silty sand in boring K-146.2. There appears to be a 2-foot layer of loose silty sand over a 3.2-foot

layer of very loose low plasticity silt, over a 2.8-foot layer of medium dense silty sand, over a 4-foot layer of very loose silty sand, over an 11-foot layer of loose poorly graded sand, over a 10-foot layer of medium dense silty sand, over a 9-foot layer of medium dense poorly graded sand, over a 19-foot layer of medium dense low plasticity silt in boring K-146.3. There appears to be a 6-foot layer of medium dense silty sand over a 6-foot layer of loose poorly graded sand, over a 10-foot layer of very loose poorly graded sand, over a 39-foot layer of loose silty sand in boring K-146.4. There appears to be a 1-foot layer of dense ballast over a 22-foot layer of loose poorly graded sand, over a 14-foot layer of medium dense poorly graded sand, over a 24-foot layer of loose poorly graded sand in boring K-146.5. There appears to be an 8-foot layer of loose fill over a 17-foot layer of loose silty sand in boring B146.1-1. There appears to be a 4-foot layer of medium dense poorly graded sand over a 26-foot layer of very loose silty sand in boring B146.5-1. The BoreAid analysis will be based on non-horizontal layering corresponding to borings K-146.2, K-146.3 and K-146.5. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #35 BoreAid analyses will be divided into five [5] layers: two layers of loose poorly graded sand (SP), medium dense silty sand (SM), loose silty sand (SM), and another layer of medium dense silty sand (SM). The soil profiles used for BoreAid analyses of the HDDs in these segments are presented in Appendix D.

HDD #36

Subsurface investigations were conducted in 2021 by AECOM, and 2022 by Atlantic Testing Laboratories, Ltd. for Kiewit. There are two borings to date at HDD #36: FES-10A and K-147.6, which reach depths of 40 and 41 feet below grade, respectively. There appears to be a 17-foot layer of loose silty sand, over a 9.5-foot layer of loose poorly graded sand, over a 13.5-foot layer of loose silty sand in boring FES-10A. There appears to be a 41-foot layer of medium dense poorly graded sand in boring K-147.6. The majority of the drill path looks to be through the layers of silty sand and poorly graded sand. The Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #36 BoreAid analysis will be divided three (3) layers: loose silty sand (SM), loose poorly graded sand (SP), and loose silty sand (SM). The elevations for these layers will correspond to the elevations observed in boring FES-10A. The soil profiles used for BoreAid analyses for the HDD in these segments are presented in Appendix D.

HDD #37

Subsurface investigations were conducted in 2013 by TRC for Transmission Developers, Inc., and 2022 by Kiewit. There are three borings to date at HDD #37: B148.4-1, K-148.5 and B148.4-5, which reach depths of 30.5, 36 and 30 feet below grade, respectively. There appears to be a 30.5-foot layer of loose poorly

graded sand in boring B148.4-1. There appears to be a 36-foot layer of medium dense poorly graded sand in boring K-148.5. There appears to be a 4-foot layer of loose fill over a 26-foot layer of loose poorly graded sand in boring B148.4-5. Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #37 BoreAid analysis will be divided into one (1) layer: loose poorly graded sand (SP). The elevations for these layers will correspond to the elevations observed in boring B148.4-1. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #38

Subsurface investigations were conducted in 2021 by AECOM and 2021 and 2022 by Atlantic Testing Laboratories, Ltd and in 2022 by Kiewit. There are four borings to date at HDD #38: FES-12, K-149.5, K-149.7, and KB-149.6-DRAFT which reached depths of 32, 40,40 and 62 feet below grade. There appears to be a 32-foot layer of medium dense poorly graded sand in bring FES-12. There appears to be an 8-foot layer of loose poorly graded sand over a 32-foot layer of medium dense silty sand in boring K-149.5. There appears to be a 23-foot layer of loose poorly graded sand over a 17-foot layer of medium dense silty sand in boring K-149.7. The draft log for bore KB-149.6 shows a thin layer of fill over a 18-foot layer of very loose to loose well graded sand, over a 15-foot layer of very loose to loose sand with silt, over a 10-foot layer of loose to medium dense well graded sand, over a 5-foot layer of stiff sand with clay, over a 10-foot layer of very stiff sand with silt, all over a layer of very stiff well graded sand that reaches the bottom of the bore. Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #38 BoreAid analysis will consist of two (2) layers: medium dense poorly graded sand (SP) and medium dense silty sand (SM). The soil profiles used for BoreAid analyses for the HDD in this segments are presented in Appendix C.

HDD #39

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Limited. There are three borings to date at HDD #39: K-149.8, B149.87-1 and K-149.9, which reach depths of 40, 25 and 51 feet below grade, respectively. There appears to be a 12-foot layer of loose poorly graded sand over a 11-foot layer of loose silty sand, over a 9-foot layer of medium dense poorly graded sand, over an 8-foot layer of medium dense silty sand in boring K-149.8. There appears to be a 4-foot layer of medium dense fill, over a 21-foot layer of medium dense silty sand, in boring B149.87-1. There appears to be a 2-foot layer of loose poorly graded sand over a 6-foot layer of loose well graded sand, over a 14-foot layer of loose poorly graded sand, over a 5-foot layer of medium stiff low plasticity silt, over a 24-foot layer of medium dense poorly graded sand in boring K-149.9. Due to the HDD bore path reaching depths greater

than the existing geotechnical information, an additional geotechnical investigation is in progress and will be included in this report and analysis upon completion. Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #39 BoreAid analysis will be divided into four (4) layers: loose poorly graded sand (SP), loose silty sand (SM), medium dense poorly graded sand (SP), medium dense silty sand (SM). The elevations for these layers will correspond to the elevations observed in boring K-149.8. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #40

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories. There are two borings to date at HDD #40: K-151.5 and B151.58-1, which both extended to depths of 30 feet below grade. There appears to be a 17-foot layer of medium fill, over a 13-foot layer of soft low plasticity silt, in boring K-151.5. There appears to be a 2-foot layer of medium dense fill, over a 2-foot layer of medium stiff low plasticity silt, over a 14.5-foot layer of medium stiff low plasticity clay, over a 10-foot layer of soft low plasticity silt, over a 1.5-foot layer of soft low plasticity clay in boring B151.58-1. Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #40 BoreAid analysis will be divided into two (2) layers: medium dense fill, soft low plasticity silt (ML). The elevations for these layers will correspond to the elevations observed in boring B151.58-1. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #41

Subsurface investigations were conducted in 2021 by AECOM for Transmission Developers, Inc., and 2022 by Atlantic Testing Laboratories, Ltd. There are two borings to date at HDD #41: SB-1B and K-152.3, which extend to depths of 50 and 61 feet below grade, respectively. There appears to be a 9-foot layer of dense poorly graded sand over a 7.4-foot layer of dense silty sand, over a 5.1-foot layer of very stiff low plasticity silt, over a 28.5-foot layer of medium dense silty sand in boring SB-1B. There appears to be a 4-foot layer of loose silty sand over a 2-foot layer of loose poorly graded sand, over a 11-foot layer of soft low plasticity silt, over a 5-foot layer of loose poorly graded silt, over a 21-foot layer of medium stiff low plasticity silt, over a 9-foot layer of soft low plasticity clay, over a 9-foot layer of medium dense silty sand in boring K-152.3. The Geotechnical Reports for this location can be found in Appendix C.

Based on SB-1B, the soil profile for the HDD #41 BoreAid analysis will be divided into four (4) layers: dense poorly graded sand (SP), dense silty sand (SM), very stiff low plasticity silt (ML), and medium dense

silty sand (SM). The elevations for these layers will correspond to the elevations observed in boring SB-1B. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #42

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. There are two borings to date at HDD #42: B152.6-0 and K-152.6, which extend to depths of 30 feet below grade. There appears to be a 2-foot layer of dense fill over a 11.5-foot layer of loose silty sand, over a 10-foot layer of loose poorly graded sand over a 6.5-foot layer of medium dense silty sand in boring B152.6-0. There appears to be a 4-foot layer of loose silty sand over a 4-foot layer of loose silty sand, over a 4-foot layer of loose silty sand, over a 4-foot layer of loose poorly graded gravel, over a 14-foot layer of medium dense silty sand in boring K-152.6. Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #42 BoreAid analysis will be divided into four (4) layers: dense fill, loose silty sand (SM), loose poorly graded sand (SP), medium dense silty sand (SM). The elevations for these layers will correspond to the elevations observed in boring B152.6-0. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #43

Subsurface investigations were conducted in 2012 by TRC for Transmission Developers, Inc., 2022 by Atlantic Testing Laboratories, Ltd., and 2021 by AECOM. There were three borings to date at HDD #43: SB-1A, K-153.1 and B153.1-1, which extended to depths of 40, 36 and 30 feet below grade, respectively. There appears to be a 23.5-foot layer of medium dense poorly graded sand, 5-foot layer of medium stiff high plasticity silt, and 11.5-foot layer dense poorly graded sand in boring SB-1A. There appears to be a 6-foot layer of loose poorly graded sand, over a 13-foot layer of loose well graded sand, over an 8-foot layer of loose to dense silty sand, over a 8-foot layer of dense well graded sand, over a 3-foot layer of medium dense poorly graded sand in boring K-153.1. There appears to be a 2-foot layer of loose poorly graded sand over a 16.5-foot layer of loose silty sand, over a 5-foot layer of medium stiff low plasticity silt, over a 6.5-foot layer of loose to dense silty sand in boring B153.1-1. The Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #43 BoreAid analysis will be divided into three (3) layers: medium dense poorly graded sand (SP), medium stiff high plasticity silt (MH), and dense poorly graded sand (SP). The elevations for these layers will correspond to the elevations observed in boring SB-1A. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #44

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Atlantic Testing Laboratories, Ltd. There were two borings to date at HDD #44: K-153.4 and SB-2, which extended to depths of 35 and 40 feet below grade, respectively. There appears to be a 4-foot layer of dense poorly graded sand over a 10.8-foot layer of loose poorly graded sand, over a 1.2-foot layer of loose well graded sand, over a 6-foot layer of soft low plasticity silt, over a 13-foot layer of medium dense poorly graded sand in boring K-153.4. There appears to be a 5-foot layer of well graded sand over a 35-foot layer of loose to medium dense poorly graded sand in boring SB-2. The Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #44 BoreAid analysis will be divided five (5) layers: dense poorly graded sand (SP), loose poorly graded sand (SP), loose well graded sand (SW), soft low plasticity silt (ML) and medium dense poorly graded sand (SP). The elevations for these layers will correspond to the elevations observed in boring K153.4. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #45

Subsurface investigations were conducted in 2013 by TRC for Transmission Developers, Inc., and 2021 by AECOM. There were two borings to date at HDD #45: SB-3 and K-154.5, which extended to depths of 40 and 30 feet below grade, respectively. There appears to be a 5-foot layer of loose poorly graded gravel over an 18-foot layer of medium dense well graded sand, over a 17-foot layer of dense poorly graded sand in boring SB-3. There appears to be a 2-foot layer of dense fill over a 21.5-foot layer of loose silty sand, over a 6.5-foot layer of loose to medium dense poorly graded sand in boring K-154.5. Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #45 BoreAid analysis will be divided three (3) layers: loose poorly graded gravel (GP), medium dense well graded sand (SW), and dense poorly graded sand (SP). The elevations for these layers will correspond to the elevations observed in boring SB-03. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #46

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. There are seven borings to date at HDD #46: B155.1-2, K-154.8, K-154.9, K-155.0, K-155.1, K-155.3 and K-155.4, which extend to depths of 19.2, 40, 40, 40, 40, 40, and 40 feet below grade, respectively. There appears to be a 2-foot layer of loose fill over a 2-foot layer of soft low plasticity clay, over a 10.2-foot layer of stiff low plasticity silt, over a 2.1-foot layer of very dense glacial till over a 2.9-foot layer of shale bedrock in boring B155.2-1. There appears to be a 0.7-foot layer of very dense well graded gravel over a 5.3-foot

layer of very dense poorly graded sand, over a 2-foot layer of medium dense silty sand, over a 4-foot layer of loose poorly graded sand, over a 5-foot layer of medium dense low plasticity silt, over a 10.3-foot layer of soft low plasticity clay, over a 7.7-foot layer of very dense weathered rock, over a 5-foot layer of shale bedrock in boring K-154.8. There appears to be an 8-foot layer of very loose poorly graded sand over a 4-foiot layer of medium dense clayey sand, over a 6-foot layer of soft fat clay, over a 3-foot layer of dense weathered rock, over a 19-foot layer of shale bedrock in boring K-154.9. There appears to be a 2-foot layer of very dense well graded sand over a 2-foot layer of dense poorly graded sand, over an 8-foot layer of loose silty sand, over a 7-foot layer of medium dense well graded sand, over a 6-foot layer of very dense weathered rock, over a 15-foot layer of shale bedrock in boring K-155.0. There appears to be a 2-foot layer of very loose poorly graded sand over a 6-foot layer of medium stiff low plasticity silt, over a 4-foot layer of loose silty sand, over an 8-foot layer of very dense weathered rock, over a 20-foot layer of shale bedrock in boring K-155.1. There appears to be a 6-foot layer of very loose silty sand over a 26-foot layer of dense silty sand over an 8-foot layer of hard low plasticity silt in boring K-155.3. There appears to be a 4-foot layer of very loose fill over an 8-foot layer of loose silty sand, over a 5-foot layer of soft fat clay, over a 5-foot layer of stiff low plasticity silt, over a 9-foot layer of dense silty sand, over a 6-foot layer of hard low plasticity clay over a 3-foot layer of very dense silty sand in boring K-155.4. The BoreAid analysis will be based on non-horizontal layering corresponding to borings K-K-154.8, K-154.9 and K-155.0. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #46 BoreAid analyses will be divided into seven [7] layers: medium dense well graded sand (SW), medium stiff fat clay (CH), medium dense well graded sand (SW), medium stiff fat clay (CH), stiff low plasticity clay (CL), dense weathered rock (GW) and shale bedrock. The soil profiles used for BoreAid analyses of the HDDs in these segments are presented in Appendix D.

HDD #47

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. There are two borings to date at HDD #47: B155.7-1 and K-155.7, which extend to depths of 20 and 51 feet below grade, respectively. There appears to be a 13.5-foot layer of medium dense poorly graded sand over a 6.5-foot layer of loose silty sand in boring B155.7-1. There appears to be a 2-foot layer of medium dense poorly graded sand over a 4-foot layer of loose well graded sand, over an 8-foot layer of loose poorly graded sand, over a 10-foot layer of loose poorly graded gravel, over a 4-foot layer of loose silty sand, over a 12-foot layer of medium dense poorly graded sand, over a 6-foot layer of medium dense well graded sand, over a 5-foot layer of dense well graded sand in boring K-155.7. The soil extending to a depth of 46 feet below grade in K-155.7 consisted of existing fill soil. Boring K-155.7 extended deeper than B155.7-1, to a

depth below the bottom of HDD alignment. Therefore, the soil layering for the BoreAid analysis will be based on the layering encountered in K-155.7. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the layering observed in boring K-155.7, the soil profile for the HDD #47 BoreAid analysis will be divided into seven (7) layers: loose well graded sand (SW), loose poorly graded sand (SP), loose poorly graded gravel (GP), loose silty sand (SM), medium dense poorly graded sand (SP), medium dense well graded sand (SW) and dense well graded sand (SW). The soil profiles used for BoreAid analyses of the HDDs in these segments are presented in Appendix D.

HDD #49

Subsurface investigations were conducted in 2013 by TRC and 2022 by Atlantic Testing Laboratories, Ltd. There are six borings to date at HDD #49: K-158.1, K-158.2, K-158.3, B157.9-1, B158.1-1 and B158.22-1, which extend to depths of 40, 40, 39, 42.5, 29.1 and 25.5 feet below grade, respectively. There appears to be a 2-foot layer of medium dense well graded sand over a 2-foot layer of medium dense poorly graded sand, over a 2-foot layer of very loose well graded sand, over an 11-foot layer of loose silty sand, over a 3.5-foot layer of very dense weathered rock, over a 19.5-foot layer of shale bedrock in boring K-158.1. There appears to be a 6-foot layer of loose well graded sand over a 2-foot layer of medium dense silty sand, over a 9-foot layer of medium dense low plasticity silt, over a 3.5-foot layer of medium dense silty sand, over a 4.5-foot layer of very dense weathered rock, over a 15-foot layer of shale bedrock in boring K-158.2. There appears to be a 2-foot layer of loose well graded sand over a 2-foot layer of medium dense clayey sand, over an 8-foot layer of very dense weathered rock, over a 27-foot layer of shale bedrock in boring K-158.3. There appears to be a 3-foot layer of medium dense fill over a 5-foot layer of medium dense silty sand, over a 10.5-foot layer of stiff low plasticity silt, over a 24-foot layer of very dense glacial till in boring B157.9-1. There appears to be a 2-foot layer of medium dense fill over a 4-foot layer of medium dense low plasticity silt, over a 17.5-foot layer of loose low plasticity silt, over a 5.6-foot layer of very dense glacial till in boring B158.1-1. There appears to be a 2-foot layer of medium dense fill over a 4-foot layer of stiff low plasticity silt, over a 9.5-foot layer of very dense glacial till over a 10-foot layer of shale bedrock in boring B158.22-1. The BoreAid analysis will be based on non-horizontal layering corresponding to borings K-158.2, K-158.3 and B158.22-1. The Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #49 BoreAid analysis will be divided four (4) layers: loose poorly graded sand (SP), medium dense poorly graded sand (SP), weathered rock, and shale bedrock. The elevations for these layers will correspond to the elevations observed in boring K-158.3. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

HDD #50

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Atlantic Testing Laboratories, Ltd. There were two borings to date at HDD #50: BM-1A and K-158.5, which extended to depths of 33 and 35feet below grade, respectively. There appears to be a 7-foot layer of dense poorly graded sand over a 4-foot layer of dense poorly graded gravel, over a 22-foot layer of shale bedrock in boring BM-1A. There appears to be a 2-foot layer of loose well graded sand over a 4-foot layer of loose silty sand, over a 2-foot layer of well graded sand, over a 6-foot layer of dense silty sand, over a 21-foot layer of shale bedrock in boring K-158.5. Geotechnical Reports for this location can be found in Appendix C.

Based on the borings, the soil profile for the HDD #50 BoreAid analysis will be divided three (3) layers: dense poorly graded sand (SP), dense poorly graded gravel (GP), and shale bedrock. The elevations for these layers will correspond to the elevations observed in boring BM-1A. The soil profiles used for BoreAid analyses for the HDDs in these segments are presented in Appendix D.

5.0 DESIGN SUMMARY

The HDD construction process generally consists of three steps:

Step 1: Drill a small diameter (approximately 7 to 9 inches diameter) pilot hole along the preplanned bore path. During the pilot hole boring, the location of the drill bit is tracked to confirm that it is following the planned path. If the drilling is observed to start to deviate from the planned path, corrections are made using a "bent" lead drilling section and controlled rotation of drill pipe string. The drill bit is designed to cut through the soil in combination with pressurized drilling fluid assisting the cutting of the soil, and transport of the cuttings to the entry pit for removal. The drilling fluid is generally a combination of bentonite (a clay mineral) and water, combined with NSF certified additives to support sides of the borehole and to better carry the cuttings to the entry pit at lower pressures and velocities. The drilling fluids typically used under waterbodies and wetland areas are typically required in the project specifications to be "non-toxic and environmentally friendly". Once the pilot bore reaches the exit point, the next step of the process, hole enlargement begins.

Step 2: Enlarge the pilot hole to the diameter required for insertion of the conduits. This is accomplished by using successively larger reaming bits pulled through the pilot bore to gradually enlarge the bore from about 8 inches diameter to 16 to 20 inches diameter to accommodate in this case a HDPE conduit about 10 inches in diameter in one bore and a bundle of two, conduits, one 10 inches diameter and the other 2 inches diameter that are to be pulled into the enlarged bore hole. We estimate that one and possibly a second reaming pass will be used to create the 16 to 20 inch -inch-diameter borehole. This pulling in of a bundle

of conduits is sometimes referred to as a slick bore. During this step, the borehole is still filled with drilling fluid to support the sides of the bore hole in preparation for Step 3, the insertion of the conduit.

Step 3: Pull the conduits into the enlarged hole. While the pilot hole and reaming operations are ongoing, the contractor will also be fabricating the conduits to be installed. The conduits come in about 40-foot-long sections and need to be fusion butt welded, debeaded internally, and arranged for the pullback into to the borehole. Ideally, the complete conduit (or bundle of conduits) will be welded (and bundled) into one long length for insertion. The goal is usually to pull the bundle into the bore in one, continuous, smooth, around the clock, operation. However, depending on work area and access constraints, sometimes the pipe is assembled in 2 or 3 lengths that then joined (welded), "on the fly" as the conduit (bundle) is slowly pulled into the borehole. As the conduit (bundle) is pulled into the hole it is usually ballasted with clean water, and some of the drilling fluid supporting the sides of the hole is displaced by the conduit and collected for eventual disposal. Upon completion of the conduit installation, the conduit will be allowed to relax and come to equilibrium in the hole, and the conduit will be cleaned and capped as described in the HDD technical specifications.

5.1 GEOMETRY AND LAYOUT

The HDD profiles are generally defined by the following parameters:

- Entry point location;
- Exit point location;
- Entry angle;
- Exit angle;
- Horizontal and vertical radius of Curvature;
- Lengths of tangent sections;
- Length of crossing;
- Depth of crossing and depth of cover;
- Site constraints and obstructions; and
- Available work and layout areas

The proposed bore paths entry angle, exit angle, and a vertical and horizontal design radii of curvature for each HDD crossing in these segments are shown in the design drawings provided in Appendix D. The design drawings to summarize the proposed HDD installations are in Appendix D. The HDD technical specifications are found in Section 330507.13 of the Technical Specifications. Inadvertent release prevention and mitigation plans for each HDD crossing are provided as separate documents.

The site conditions posed various challenges in developing a design that is both constructible and minimizes the potential for negative environmental impacts. The proposed design has entry and exit pits and work

areas constrained by available easements and traffic considerations. Available work areas may limit the lengths of the conduit that can be pre-assembled, necessitating having to pre-assemble the bundle several segments that will have to be welded together during the pull back. Typical workspace requirements are provided in Figures 1a-1c. HDD specific work areas at the entry and exit ends of the bores are noted on the drawings in Appendix D. In addition, space and easement constraints will require that during pullback, the above ground sections of the conduit will not be straight and will require rollers to accommodate a horizontal bend. Conduit assembly is expected to be performed at the ends of the alignment shown on the drawings in Appendix D for HDD specific work areas. In some cases, the limited work area at the one end of the HDD alignment, may require that the drilling and reaming prior to pullback be performed by the HDD rig located at the one end of the alignment, but the HDD rig may need to be relocated to the other end of the alignment for the pullback/conduit installation phase of the work. In addition, for some longer bores in soft/weak ground conditions, the intersection bore method may be used to better control the risk of inadvertent drilling fluid releases.

5.2 SUBSURFACE MODEL DEVELOPMENT

A subsurface model was developed for each HDD location based on the boring logs to approximately represent the subsurface conditions along the proposed HDD alignment. BoreAid Version 5.0.14 (2015) modeling software (a product of Vermeer) was used to model the HDD. Geotechnical input parameters of the soil were estimated as described below.

The internal friction angles (AASHTO LRFD, Ed. 7) were estimated using the SPT blow counts. The shear modulus (G) of each layer was estimated using soil density or consistency based on SPT blow count (N-value) and representative soil layer descriptions were used to estimate Young's Modulus (E) using Hunt (1986). The shear modulus was estimated using the relationship $G = E/[2(1+\nu)]$, taking Poisson's Ratio (ν) equal to 0.3. Dry and saturated unit weights were selected based on soil type using Table 2-8 from the Manual on Estimating Soil Properties for Foundation Design (EPRI, 1990). For cohesive soils, cohesion was estimated based on empirical correlations with SPT blow counts (EPRI 1990). A table with the soil properties that will be used for the HDDs in Segments 4 & 5 – Package 3 is presented in Appendix E.

5.2.1 BoreAid Analysis

For the BoreAid analyses, the pipe configuration analyzed was for a pipe with a dimension ratio (DR) of 9 which is assumed to be ballasted with water during pullback to create a near neutral buoyancy. The following conduit configurations were used:

1) An individual 10-inch-diameter DR 9 HDPE HDPE (or 12-inch diameter DR 7 HDPE) conduit, and

2) A bundle consisting of a 10-inch-diameter DR 9 HDPE conduit and a 2-inch-diameter DR 9 HDPE conduit (or a 12-inch diameter DR 7 HDPE conduit with a 3-inch-diameter DR 7 HDPE conduit)

The stresses and deflections of the pipe are evaluated and compared to allowable values as shown on the BoreAid runs presented in Appendix C.

In addition, a run where 2-inch-diameter DR 9 or 3-inch diameter DR 7 HDPE conduit is modeled alone was performed to check installation stresses in that conduit.

5.2.2 Inadvertent Return and Hydro-fracture Analysis

BoreAid modeling software was used to perform inadvertent return analyses for each HDD alignment. The bore path alignment was selected and checked so that the allowable bore pressures are greater than the static and circulating pressures throughout most of the alignment except at the ends. The allowable pressures are related to in-situ ground and water stresses around the bore hole, and the strength of the ground. The Limiting Formation Pressure Figure from BoreAid, indicates a generally acceptable factor of safety against the potential for inadvertent return along the proposed bore paths except at the ends.

Based on the bore path selection process, areas with the greatest potential for an inadvertent return were examined and adjusted during the design process to further limit the risks associated with an inadvertent return when possible. The entry and exit points exhibited the greatest potential for inadvertent returns. The depth of the entry/exit pits should be considered by the Contractor to increase the effective soil stress and provide a storage volume for returns to and near the entry and exit points. Note that while the potential for inadvertent return has been reduced through the design process, inadvertent returns are still possible through existing fissures in the soil or rock, shrinkage cracks, weak soils, or porous deposits of coarse gravel.

Fractures within and/or hydraulic fracturing (frac-out) of the surrounding soils may cause loss of drilling fluid pressures or inadvertent return of drilling fluid into the wetlands. The areas of greatest concern are reduced soil cover over the bore alignment and where there is a risk of release to the wetlands. The contractor will be required to institute pre-emptive measures in this area to mitigate the effects of a release in the event that one should occur. Such measures may include containment booms and a standby vacuum truck to collect any released drilling fluids immediately. Ground heave or settlement from frac-out and inadvertent returns also pose risks to structures such as roadways. The HDD alignment were designed with

geometries to providing enough soil cover to reduce the risk of inadvertent return. The Inadvertent Return Contingency Plan describes additional methods for mitigating inadvertent returns.

5.3 LIMITATIONS

The structural analysis and inadvertent return mitigation analysis were performed using the proposed design bore paths and typically anticipated equipment and means and methods. The HDD subcontractor must submit structural and inadvertent return mitigation calculations and analysis for each bore path, including their final bore path geometry reflecting its specific equipment and contractor's specific means, methods drilling fluids, and proposed final contractor refined final planned alignment. It is important to note that the Kiewit Design Team's analysis has been done without consideration for point loading due to unpredictable subsurface features such as encountering rocks, boulders, or other extremely dense material that may damage the pipe. The risk of such pipeline damage is low, yet has been reported on some projects in recent years.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 RISK AWARENESS AND ASSESSMENT

The risks to be aware of during HDD include: inadvertent returns or fluid loss: any potential obstructions blocking or causing large deviations from the planned bore path and electromagnetic effects of the HDD steering equipment from nearby high voltage power lines.

6.2 SITE ANALYSIS

A site analysis must be performed prior to commencing HDD operations. Considerations might need to be taken for items such as for site access, construction of HDD entry and exit pits, and layout area for equipment and supplies.

6.3 EROSION CONTROL

The proposed bore path crosses under roads, parking lots, water, stormwater and gas and electric utility lines, as well as under streams/wetlands, bodies of water, and railroads. The soil erosion control drawing will show where primary soil erosion control measures are required. The technical specifications and Inadvertent Return Contingency Plan both detail the requirements for both primary and secondary sediment and erosion control measures to be followed in case of an inadvertent return, which ultimately could deposit the fine bentonite sediment into the stream or wetland or bodies of water if not controlled. Construction of the entry and exit pits and the related work area may be close to the stream/wetlands. Silt fence, straw bales, and other soil erosion control measures will be required to be installed as shown in the construction drawings. Secondary control measures are to be readily accessible at or near the work areas in accordance with the project specifications and Inadvertent Return Contingency Plan.

6.4 SURVEILLANCE AND MONITORING

During installation of the pipe by HDD, monitoring the stream, wetlands, waterbodies and bore alignment for indications of potential inadvertent returns or hydrofracture will be necessary. The contractor will have primary responsibility for this monitoring and associated response and reporting in real-time. This will be accomplished as detailed in the Inadvertent Return Contingency Plan. Continuous visual inspection of the entire path is the most significant method of detection. However, an experienced drill crew can often prevent a return by monitoring drilling fluid pressures. A loss of pressure may indicate that an inadvertent return has occurred. Regardless of the level of preparation, inspection, monitoring, etc., inadvertent returns are not always possible to predict or prevent. However, a significant effort can minimize the possibility but not eliminate it.

7.0 REFERENCES

American Association of State Highway and Transportation Officials. (2014). AASHTO LRFD bridge design specifications, Seventh edition, U.S. customary units. Washington, DC: American Association of State Highway and Transportation Officials.

Mayne, P.W., and Kulhawy, F.H. (1990). Manual on Estimating Soil Properties for Foundation Design. Electric Power Research Institute (EPRI).

Hunt, R.E. (1986). Geotechnical Engineering Analysis and Evaluation, McGraw-Hill Book Company, New York.

Appendix A

Work Zones

Introduction:

In general, HDD requires ample space for both entry and exit operations, work area, or Work zones. The HDD contractor or subcontractor ideally wants to consolidate all operations within these footprints. The exit Work zone also includes a narrower extension for the assembly of the full length pull back string of conduit or pipe. The size of these desired Work zones is driven by rig size in Table 1.

TYPICAL HDD ENTRY AND EXIT WORKSPACE		
SYSTEM DESCRIPTION	ENTRY WORKSPACE	EXIT WORKSPACE
MAXI (24″-48″)	150′ X 350′	150′ X 250′
MIDI (12″-<24″)	150′ X 250′	100′ X 200′
MINI (2″-<12″)	VARIES PER SITE	VARIES PER SITE

TABLE 1

An example of an entry Work zones is shown in Figure 1a below.

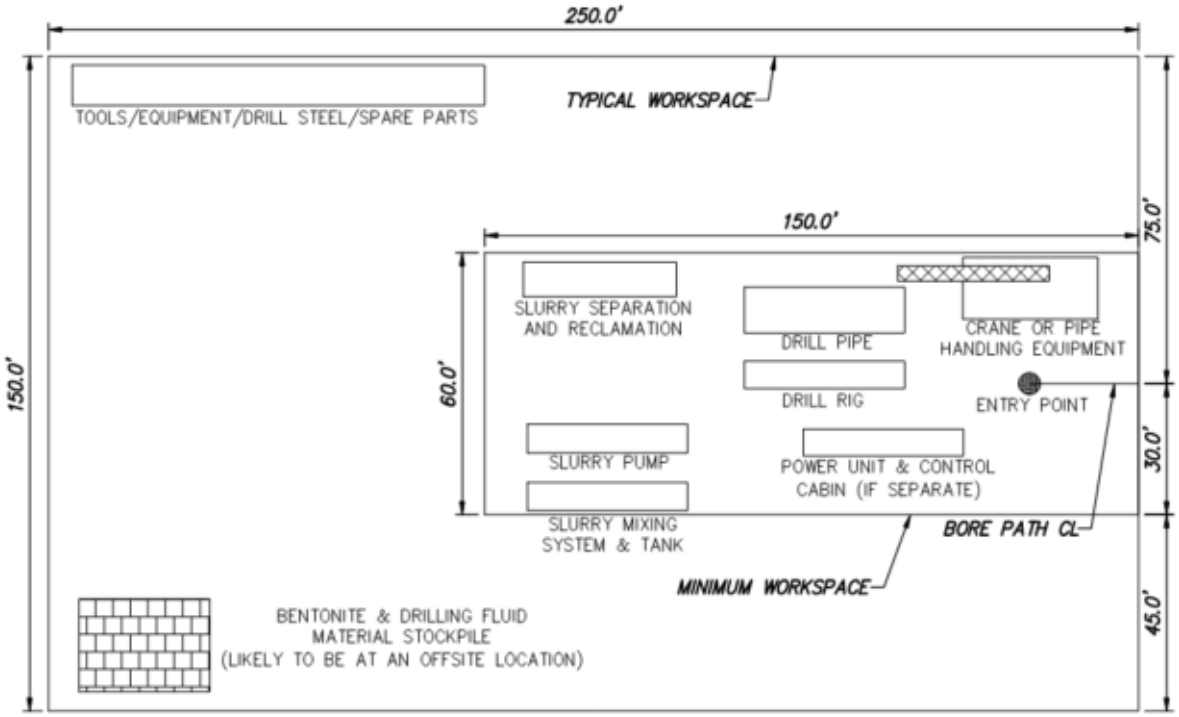


FIGURE 1a: Typical Entry Work Zone Configuration

An example of an exit Work zones is shown in Figure 1b below.

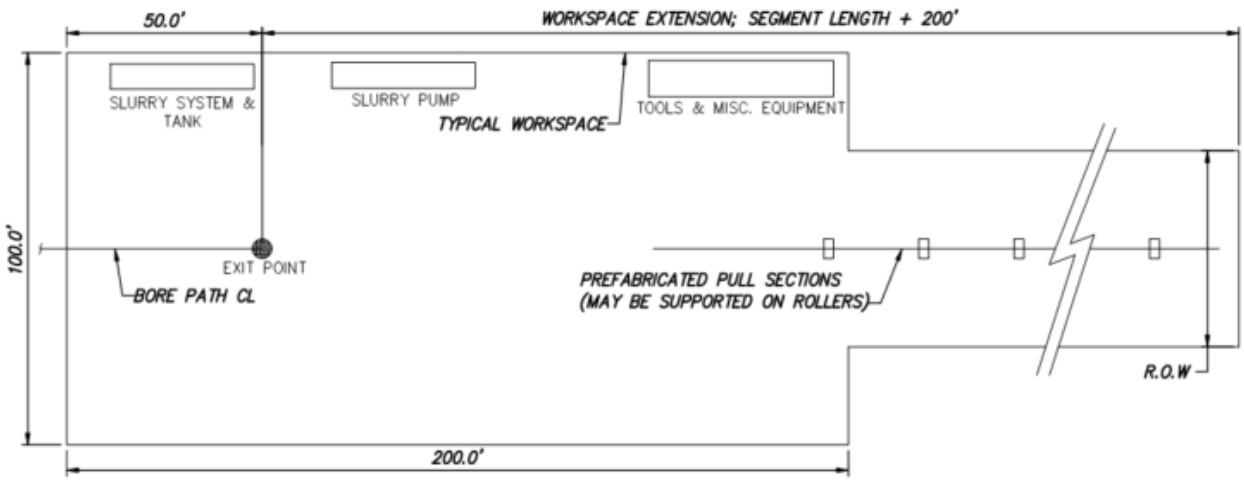


FIGURE 1b: Typical Exit Work Zone Configuration

Work zones should also be able to facilitate contingencies for space to recover a failed bore hole and a new offset bore, the ability swap entry for exit, or in some cases rigs on both ends.

CHPE Project Limitations:

Available Work zone areas for the Champlain Hudson Power Express Project (CHPE) are constrained because the project occupies a narrow existing corridor and is essential in a linear brown field. This is complicated by the rail corridor which precedes most forms of environmental regulations, and it traverses numerous wetlands or other sensitive areas which affects available Work zone areas.

We have assumed the majority of HDDs will be accommodated by a Mini or Midi HDD class machine and support equipment, <12-inch diameter and 1500 feet individual bores.

1. Ideally, an Entry workspace approximately 20 to 25 feet wide x 150 to 200 feet long for a small rig with a mounted pipe rack and self-contained power unit and operator control cabin on the rig; a separate mud mixing and pumping unit, plus a separate mud processing and separation unit support by equipment arranged linearly. Since each crossing is a pair two, 20 x 150 Work zones are equivalent to a 40 x 150 overall work area, and we have assumed the support equipment will be set once for both HDDs. It is also assumed existing roads or access roads will parallel one side of a Work zone.
2. Ideally, an exit workspace approximately 15 to 20 feet wide and between 60% and 110% of the bore length is needed to layout and assemble the conduit for pullback.

A somewhat smaller entry Work zones may be possible depending on drill rig specifics and the availability of nearby areas for support equipment support operations. The project will have remote yards. Small work areas tend to reduce access and efficiency of operations, raise costs, but are necessitated by the specific project and site constraints.

See Figure 1c below covers general considerations and typical workspace configurations drafted for the CHPE Project.

GROUND TYPE	RIG SIZE	BORE LENGTH (ft)	WORK AREA (ft^2)	NOMINAL FOOTPRINT (ft x ft)
SOIL	Large/Maxi	>2,500	37,500*	150 x 250*
	Medium/Midi	1000-2500	15,000*	100 x 150*
	Small/Mini	<1000	3,000*	30 x 100*
ROCK	Large/Maxi	>2,500	37,500*	150 x 250*
	Small/Mini & Medium/Midi	1000-2500	15,000*	100 x 150*
PIPE ASSEMBLY	ALL	ALL	**	25 x (conduit length + 50)**

Notes:

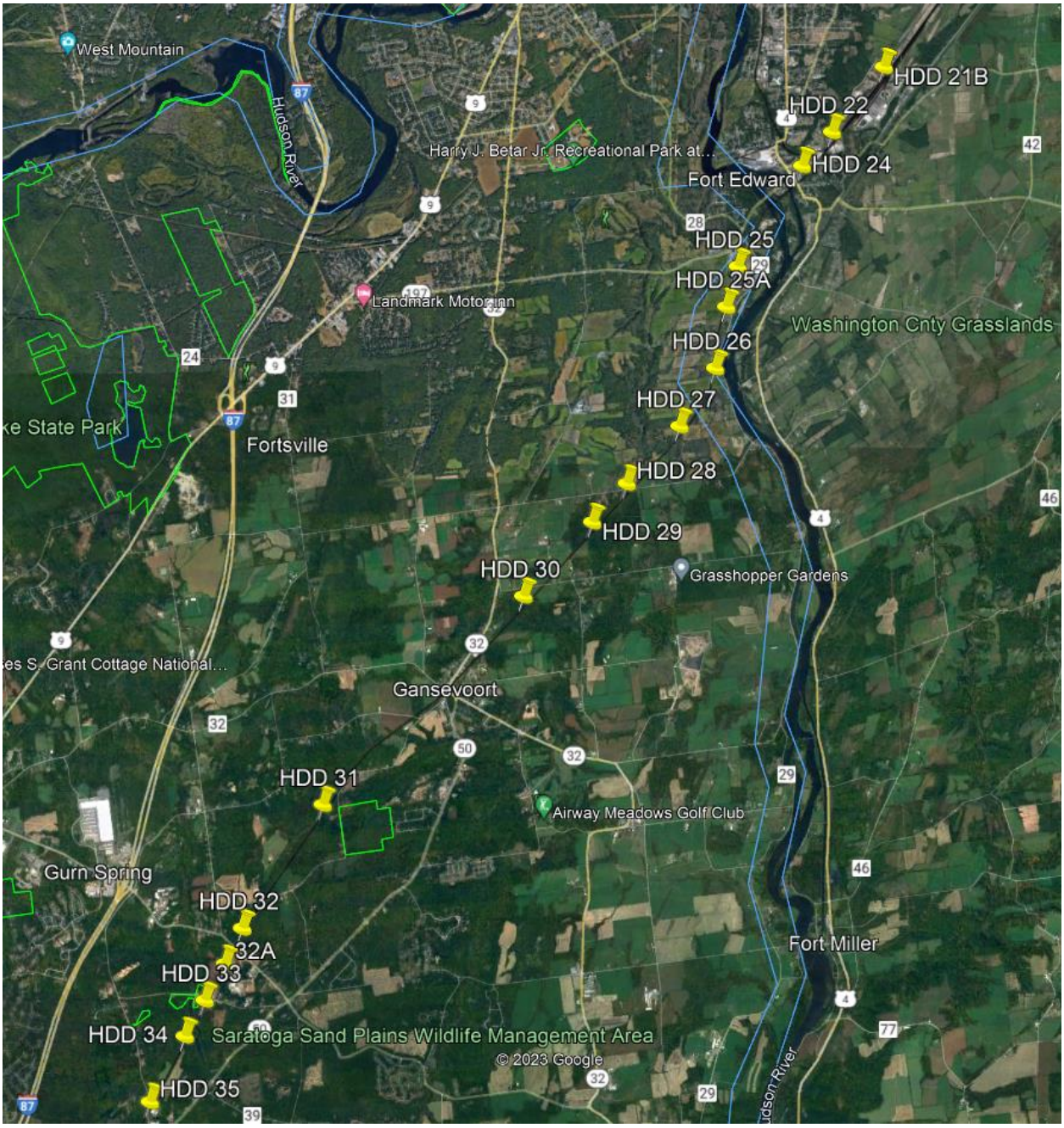
* The entry and exit workspaces typically need space for a drill rig and support equipment such as a pipe rack, power unit operator control cabin, a mud mixing and pumping unit, plus a separate mud processing and separation unit support equipment arranged linearly in line may be possible. Somewhat smaller work areas may be possible depending on drill rig specifics and availability of nearby areas for support equipment and support operations. Often need to coordinate final work areas with selected contractor's specific operations. Smaller work areas tend to reduce access and efficiency of operations.

** For HDD conduit bundle assembly and pullback, need a corridor equal to at least 1/3 to ½ of the length of the total bundle length and minimum 20 feet wide, typically at the exit end. Best if corridor equals the full length of the total bundle length plus about 50 ft

FIGURE 1c

Appendix B

Locus Map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HDD 22
HDD 24
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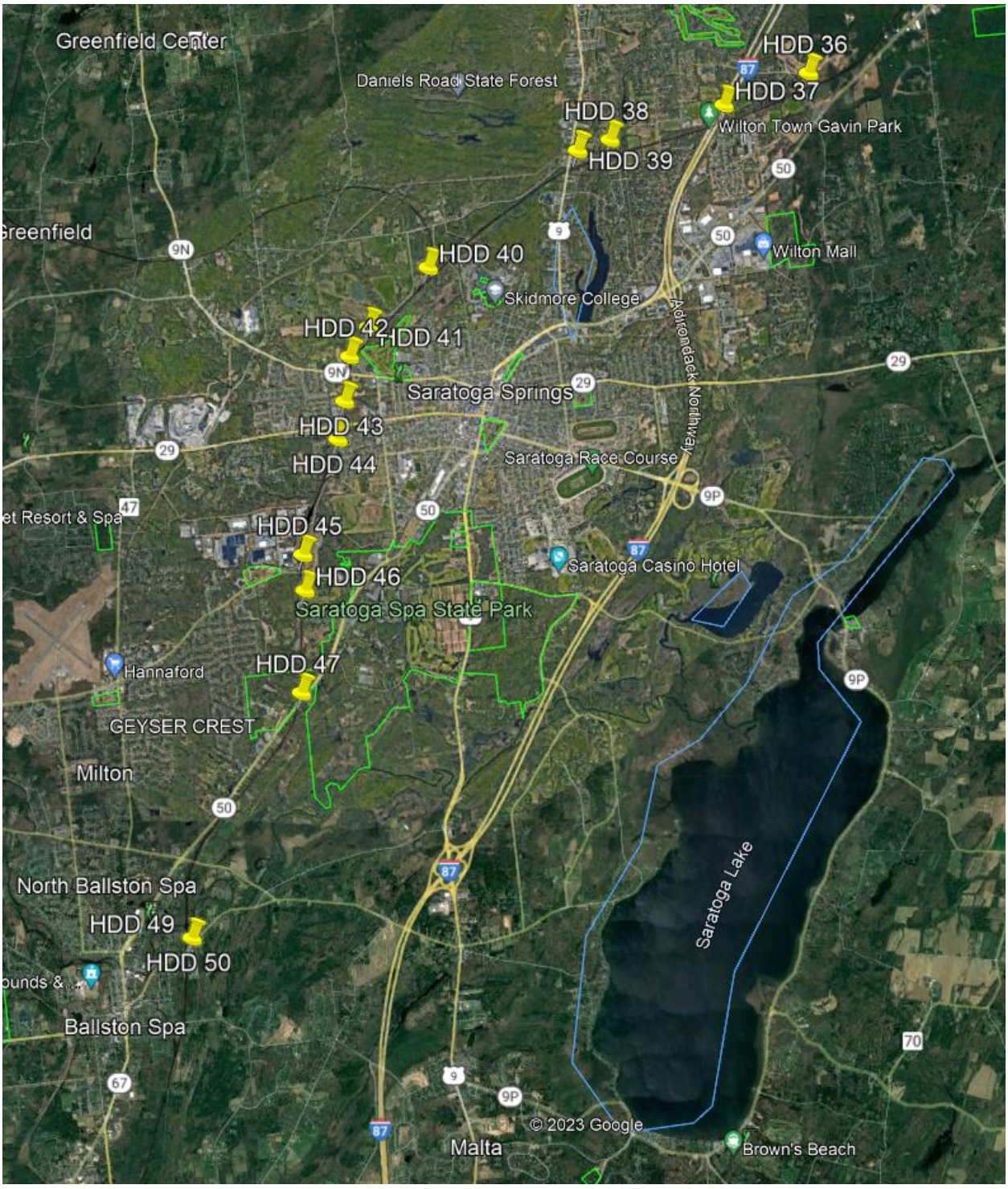
Fort Edward
HDD 25
HDD 25A
Landmark Motor Inn
Washington Cnty Grasslands
HDD 26
HDD 27
Fortsville
HDD 28
HDD 29
HDD 30
Grasshopper Gardens
Gansevoort
HDD 31
Airway Meadows Golf Club
Gurn Spring
HDD 32
32A
HDD 33
Fort Miller
HDD 34
Saratoga Sand Plains Wildlife Management Area
© 2023 Google
HDD 35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Daniels Road State Forest
HDD 36
HDD 37
HDD 38
HDD 39
Wilton Town Gavin Park
Greenfield
HDD 40
Wilton Mall
Skidmore College
HDD 42
HDD 41
Adirondack Northway
Saratoga Springs
HDD 43
HDD 44
Saratoga Race Course
et Resort & Spa
HDD 45
HDD 46
Saratoga Casino Hotel
Saratoga Spa State Park
Hannaford
HDD 47
GEYSER CREST
Milton
North Ballston Spa
HDD 49
HDD 50
Ballston Spa
Saratoga Lake
© 2023 Google
Malta
Brown's Beach

Appendix C

HDD Geotechnical Data Reports for CHPE Segments 4 & 5 - Package 3 HDDs

MEMORANDUM

DATE: December 7, 2022

TO: Antonio Marruso, P.E.; CHA Consulting, Inc.

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp.
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 4 - Package 3 - HDD Crossings 21.B
Champlain Hudson Power Express Project
Fort Edward, New York

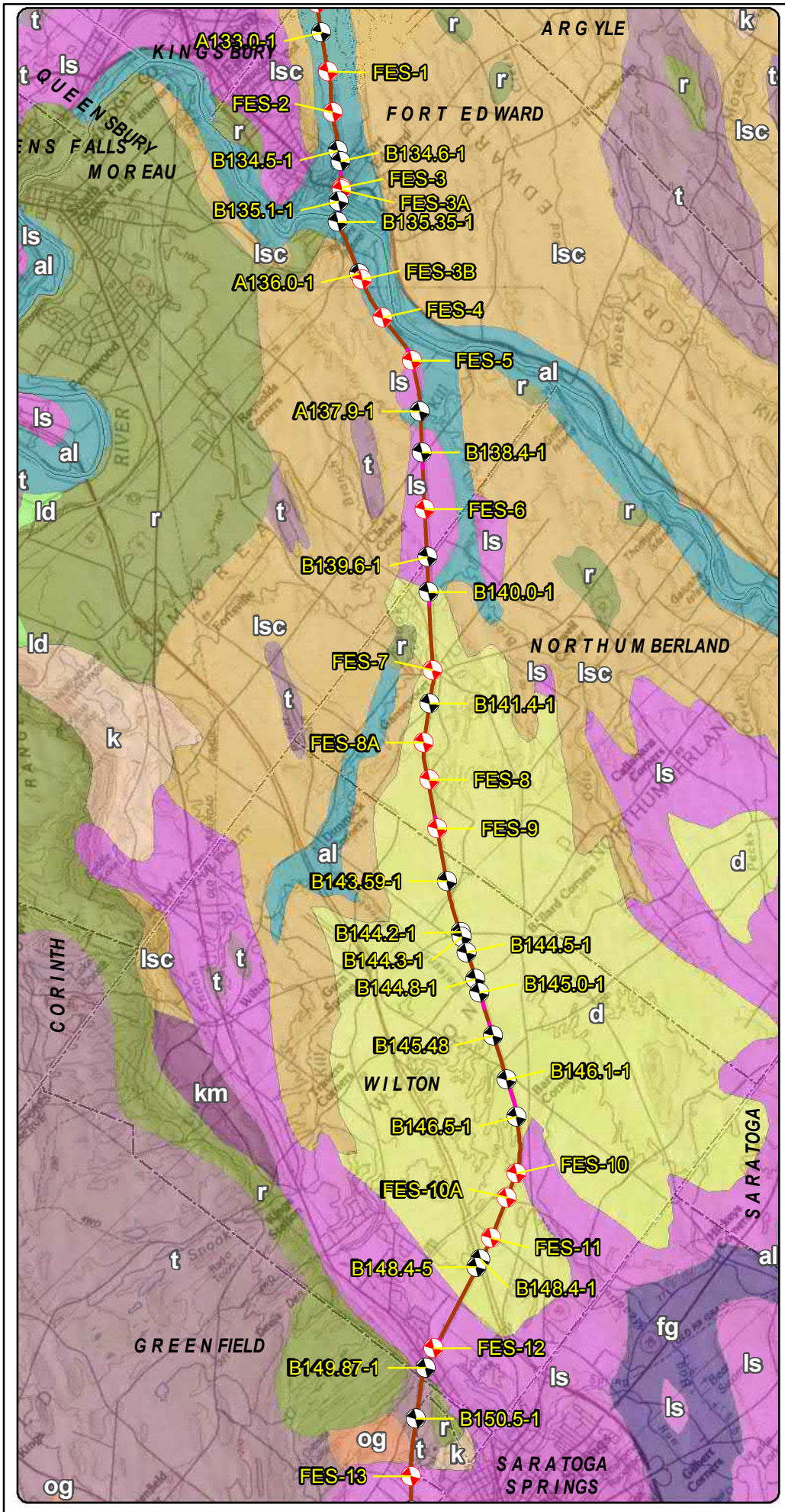
Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located north of Fort Edward, New York. The approximate stationing for the start of HDD crossing number 21.B is STA 30059+00 (43.2816° N, 73.5676° W).

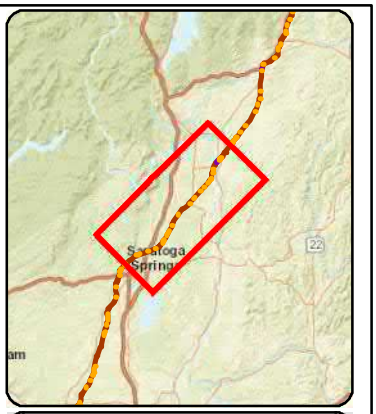
The geotechnical data at this HDD crossing is attached. The available data is from an ongoing investigation by Kiewit. This report will be finalized when final boring and laboratory data is available.

- Kiewit Engineering (NY) Corp. Draft Boring Logs, December 2022.

Contact us if you have questions or require additional information.

HDD 21.B
Borings KB-133.6 (pending), KB-133.7
Segment 4 - Design Package 3





LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surficial Geology

- al - Recent alluvium
- d - Dunes
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- pm - Swamp deposits
- r - Bedrock
- t - Till

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings
Fort Edward to Saratoga
Figure 3-4

Prepared on 4/29/2021
by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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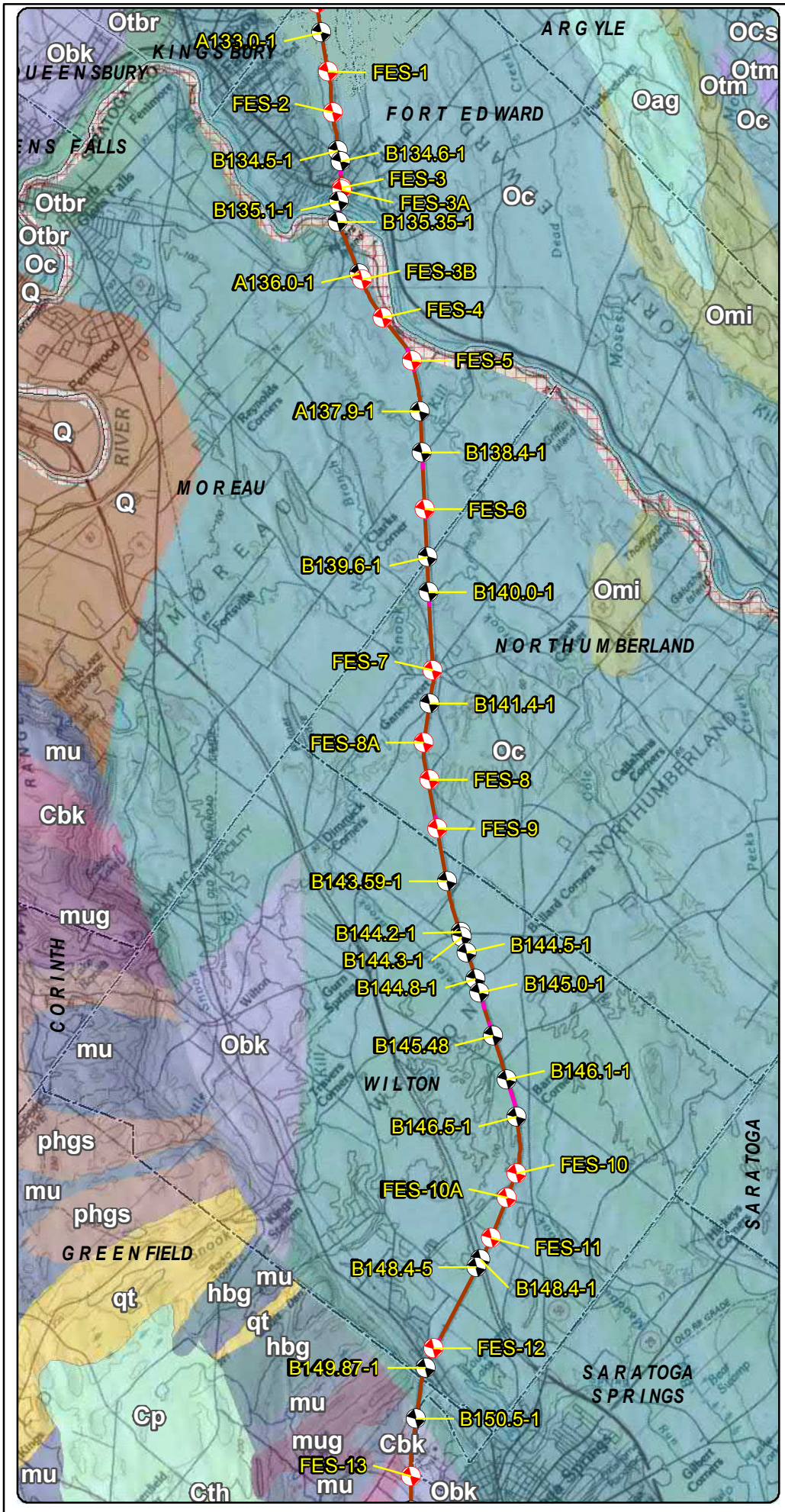

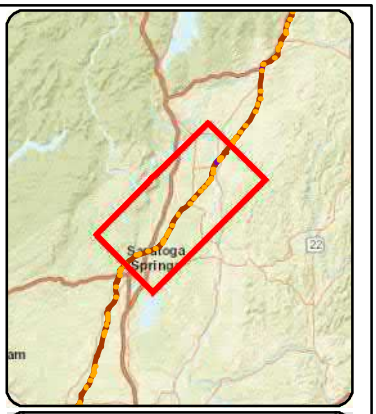

LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

- Cbk - Beekmantown Group
- Cp - Potsdam Sandstone
- Cth - Theresa (Galway) Formation
- No Label
- OCs - Cambrian thru Middle Ordovician
- Oag - Austin Glen Form (graywacke, shale)
- Obk - Beekmantown Group
- Oc - Canajoharie Shale
- Omi - Mount Merino Formation
- Otbr - Dolgeville Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- hbg - Biotite/hornblende granite gneiss
- mu - Undivided metasedimentary rock
- mug - Interlayered metasedimentary rock
- phgs - Charnockite, granitic, quartz syenite
- qt - Quartzite

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Fort Edward to Saratoga Figure 4-4

Prepared on 5/18/2021

by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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FES-1
133.5
133.6
KB-133.6 - HDD 21B
133.7
KB-133.7 - HDD 21B
Towpath Rd
Towpath Parking Area
Towpath Ln
Towpath Ln
Google Earth
700 ft

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: KB-133.6-DRAFT

PROJECT NUMBER	20001480	**LOGGED BY**	Shahbaz	**APPROXIMATE COORDINATES**	N 1621669.30 E 740165.46
START DATE	12/07/2022	**DRILLER/RIG**	John / Geoprobe 7822DT	**GROUND ELEV.**	
FINISH DATE	12/07/2022	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	

Depth (ft)	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
0	FILL: Clayey SAND (SC), brown to black, medium dense, moist		1	75%		4-16-16-19 (32)	
	SAND with Gravel (SP), brown, medium dense, moist		2	79%		11-11-13-32 (24)	
5			3	79%		22-20-17-19 (37)	
	no gravel		4	100%		15-13-13-17 (26)	
	loose to medium dense		5	100%		10-10-10-12 (20)	
10	SAND with Silt (SW), gray, medium dense, moist, fine-grained		6	100%		10-12-15-16 (27)	
15	SAND (SW), gray, loose, moist, fine-grained		7	46%		6-9-6-6 (15)	
20			8	58%		5-7-8-8 (15)	
25	loose to medium dense		9	58%		7-7-11-15 (18)	
30							

Legend

- SPT N Value
- MC (%)
- PL & LL (%)
- Fines Content (%)

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: KB-133.6-DRAFT

PROJECT NUMBER	20001480	**LOGGED BY**	Shahbaz	**APPROXIMATE COORDINATES**	N 1621669.30 E 740165.46
START DATE	12/07/2022	**DRILLER/RIG**	John / Geoprobe	**GROUND ELEV.**	
FINISH DATE	12/07/2022	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	

Depth (ft)	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
35	SAND (SW), gray, loose to medium dense, moist, fine-grained		10	50%		7-8-10-15 (18)	
	Lean CLAY (CL), gray, soft, moist		1	92%		1-3-4-4	3 inch ring sampler
40	very soft		11	100%		0-0-0-0 (0)	
45			12	100%		0-0-0-0 (0)	
50			13	100%		0-0-1-2 (1)	
55			14	100%		0-0-0-0 (0)	
60	Boring Terminated at 57ft						

Legend

SPT N Value
MC (%)
PL & LL (%)
Fines Content (%)

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: KB-133.7-DRAFT

PROJECT NUMBER	20001480	**LOGGED BY**	Shahbez	**COORDINATES**	N 1621268.62 E 739830.57
START DATE	11/29/2022	**DRILLER/RI**	Eric /	**GROUND ELEV.**	135 ft approx.
FINISH DATE	12/01/2022	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			FILL: Sandy material, large angular pieces of gravel		1	34%		6-5-3-2 (8)	
					2	29%		3-1-3-4 (4)	
	131.0		Silty CLAY (CL-ML), gray, stiff, organic material		3	46%		5-5-5-6 (10)	
5			no organics		4	38%		5-3-1-1 (4)	
			high plasticity		5	100%		2-1-1-1 (2)	
10					6	100%		1-2-5-8 (7)	
15	120.0		SAND (SW), gray, loose, moist		7	46%		3-4-6-8 (10)	
20			loose to medium		8	66%		4-7-10-11 (17)	
25	110.0		Lean CLAY (CL), gray, very soft to soft, moist		9	50%		0-0-1-2 (1)	
30									

Legend

- SPT N Value
- MC (%)
- PL & LL (%)
- Fines Content (%)

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: KB-133.7-DRAFT

PROJECT NUMBER	20001480	**LOGGED BY**	Shahbez	**COORDINATES**	N 1621268.62 E 739830.57
START DATE	11/29/2022	**DRILLER/RIG**	Eric /	**GROUND ELEV.**	135 ft approx.
FINISH DATE	12/01/2022	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			Lean CLAY (CL), gray, very soft to soft, moist		1	100%		0-0-0-4	3 inch ring sampler
35			very soft		10	92%		0-0-0-0 (0)	
40					11	92%		0-0-0-0 (0)	
45					12	100%		0-0-0-0 (0)	
50					13	100%		0-0-0-1 (0)	
55			no recovery			0%		0-0-0-0 (0)	
60									

Legend

- SPT N Value
- MC (%)
- PL & LL (%)
- Fines Content (%)

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: KB-133.7-DRAFT

PROJECT NUMBER	20001480	**LOGGED BY**	Shahbez	**COORDINATES**	N 1621268.62 E 739830.57
START DATE	11/29/2022	**DRILLER/RIG**	Eric /	**GROUND ELEV.**	135 ft approx.
FINISH DATE	12/01/2022	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
65			Lean CLAY (CL), gray, very soft, moist to wet						
					14	92%		0-0-0-0 (0)	
	68.0		Boring Terminated at 67ft						
70									
75									
80									
85									
90									

Legend

▲ SPT N Value
● MC (%)
— PL & LL (%)
⊠ Fines Content (%)

20 40 60 80

Kiewit

MEMORANDUM

DATE: April 10, 2023

TO: Antonio Marruso, P.E.; CHA Consulting, Inc.

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp. MKH
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 4 - Package 3 - HDD Crossing 22
Champlain Hudson Power Express Project
Fort Edward, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located in Fort Edward, New York. The approximate station for the start of HDD crossing number 22 is STA 30104+00 (43.2721°N, 73.5781°W).

The geotechnical data at this HDD crossing is attached. The available data is from the investigations by TRC and Atlantic Testing Laboratories (ATL), referenced below.

- Atlantic Testing Laboratories, Subsurface Investigation Services, Champlain Hudson Power Express, Design Package 3, Glens Falls to Ballston Spa, New York, dated June 15, 2022.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 113.1-177.1, dated March 29, 2013.

Contact us if you have questions or require additional information.

HDD 22
Borings B134.5-1, B134.6-1, K-134.4, K-134.5, K-134.7, Segment 4 - Design Package 3

CHPE Segments 4 & 5 - Package 3
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A136.0-1	1611762.7	732951.9	146.6
	B134.5-1	1618254.8	737493.3	137.7
	B134.6-1	1617614.3	737160.7	140.2
	B135.1-1	1615942.5	735298.2	130.7
	B135.35-1	1615043.9	734326.1	147.7
	B137.9-1	1602848.9	729488.6	157.2
	B140.0-1	1594313.7	721767.2	205.0
	B144.2-1	1577578.6	707868.0	307.5
	B144.3-1	1577307.0	707733.5	307.4
	B144.5-1	1576380.0	707249.6	308.5
	B144.8-1	1574825.2	706447.7	310.8
	B145.0-1	1574014.3	706034.4	312.7
	B145.48	1571450.2	704693.3	320.4
	B146.1-1	1568896.3	703364.4	321.4
	B146.5-1	1566773.3	702083.1	323.6
	B148.4-1	1561976.4	694067.5	326.0
	B148.4-5	1561817.7	693531.9	327.4
	B149.87-1	1559610.1	686723.2	325.2
	B151.58-1	1553784.9	679646.1	336.4
	B152.6-0	1550004.2	676432.6	329.3
	B153.1-1	1547302.8	676031.8	322.5
	B154.3-1	1541375.5	674232.0	321.5
	B155.2-1	1536685.4	674403.7	313.7
	B155.7-1	1534202.1	674175.1	340.0
	B157.9-1	1524284.2	668932.6	246.0
	B158.1-1	1523474.2	668924.1	243.0
	B158.22-1	1522640.9	669168.4	279.1
AECOM**	BM-1A	1521184.8	669107.0	292.4
	FES-3	1616410.4	736040.4	143.9
	FES-3A	1616311.4	735904.6	139.3
	FES-3B	1611359.3	732784.5	142.5
	FES-4	1608699.4	732017.0	142.6
	FES-5	1605493.6	731399.7	147.1
	FES-6	1598212.9	725299.3	174.4
	FES-9	1583302.9	711497.9	271.6
	FES-10A	1563547.6	698025.3	321.4
	FES-12	1560130.5	687972.2	322.5
	SB-1A	1547803.7	676160.2	321.0
	SB-1B	1551257.2	677175.4	327.5
	SB-2	1545717.0	675698.7	316.3
	SB-3	1540348.5	674275.0	322.4

Notes:

- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.

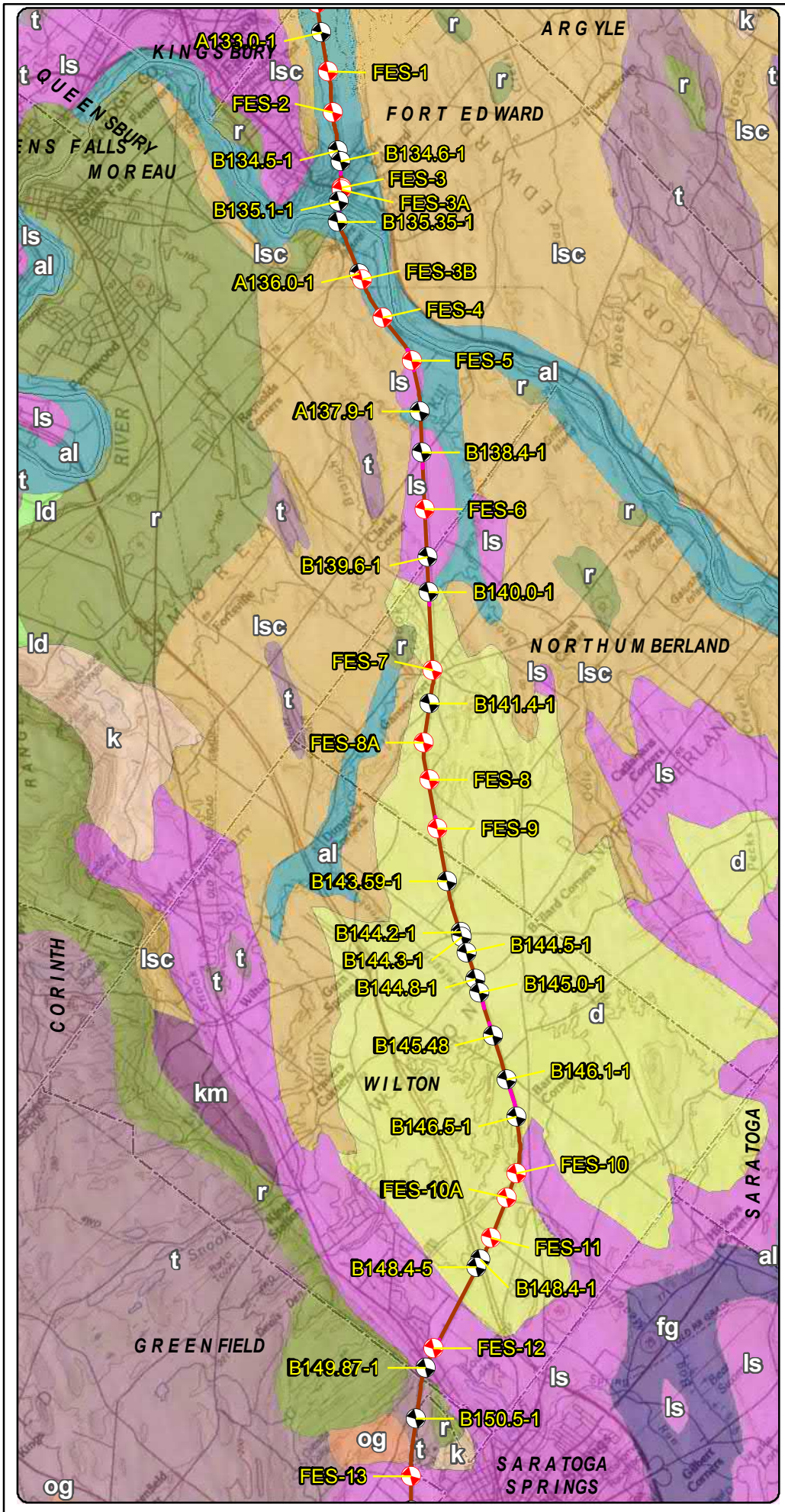
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

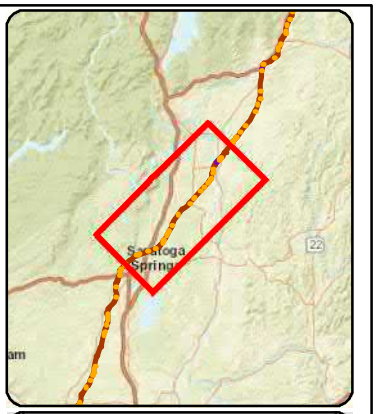
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.

*** Kiewit boring coordinates and elevations are noted on the boring logs.

Reference:

AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.





LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surficial Geology

- al - Recent alluvium
- d - Dunes
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- t - Till

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings
Fort Edward to Saratoga
Figure 3-4

Prepared on 4/29/2021
by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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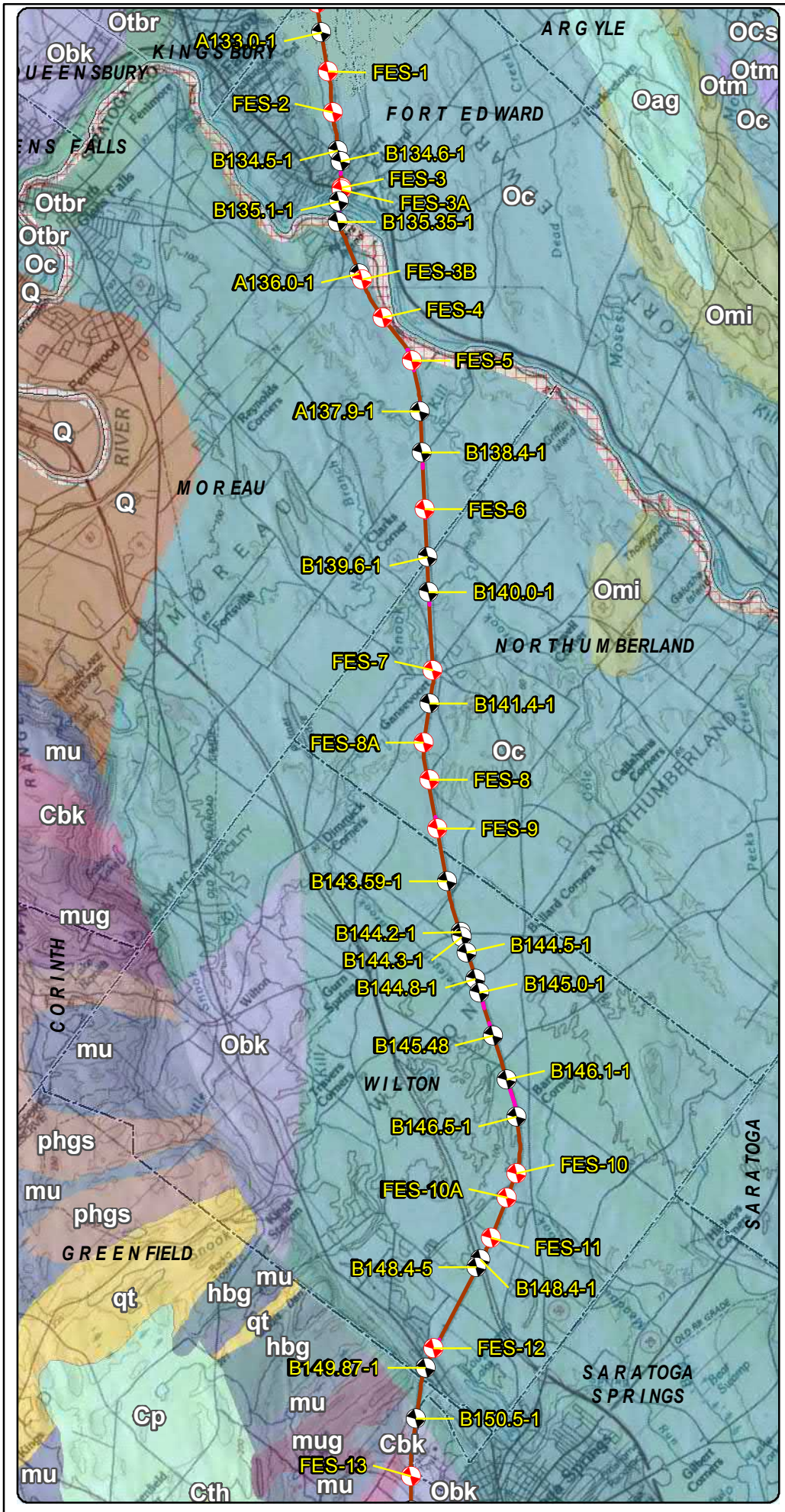

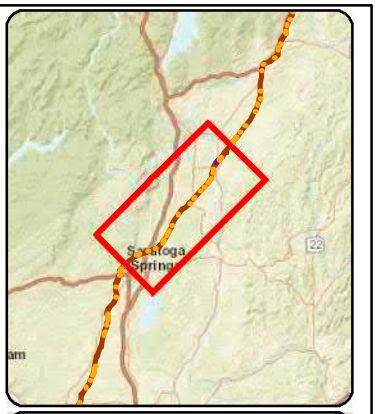

LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

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- Cp - Potsdam Sandstone
- Cth - Theresa (Galway) Formation
- No Label
- OCs - Cambrian thru Middle Ordovician
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- phgs - Charnockite, granitic, quartz syenite
- qt - Quartzite

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Fort Edward to Saratoga Figure 4-4

Prepared on 5/18/2021

by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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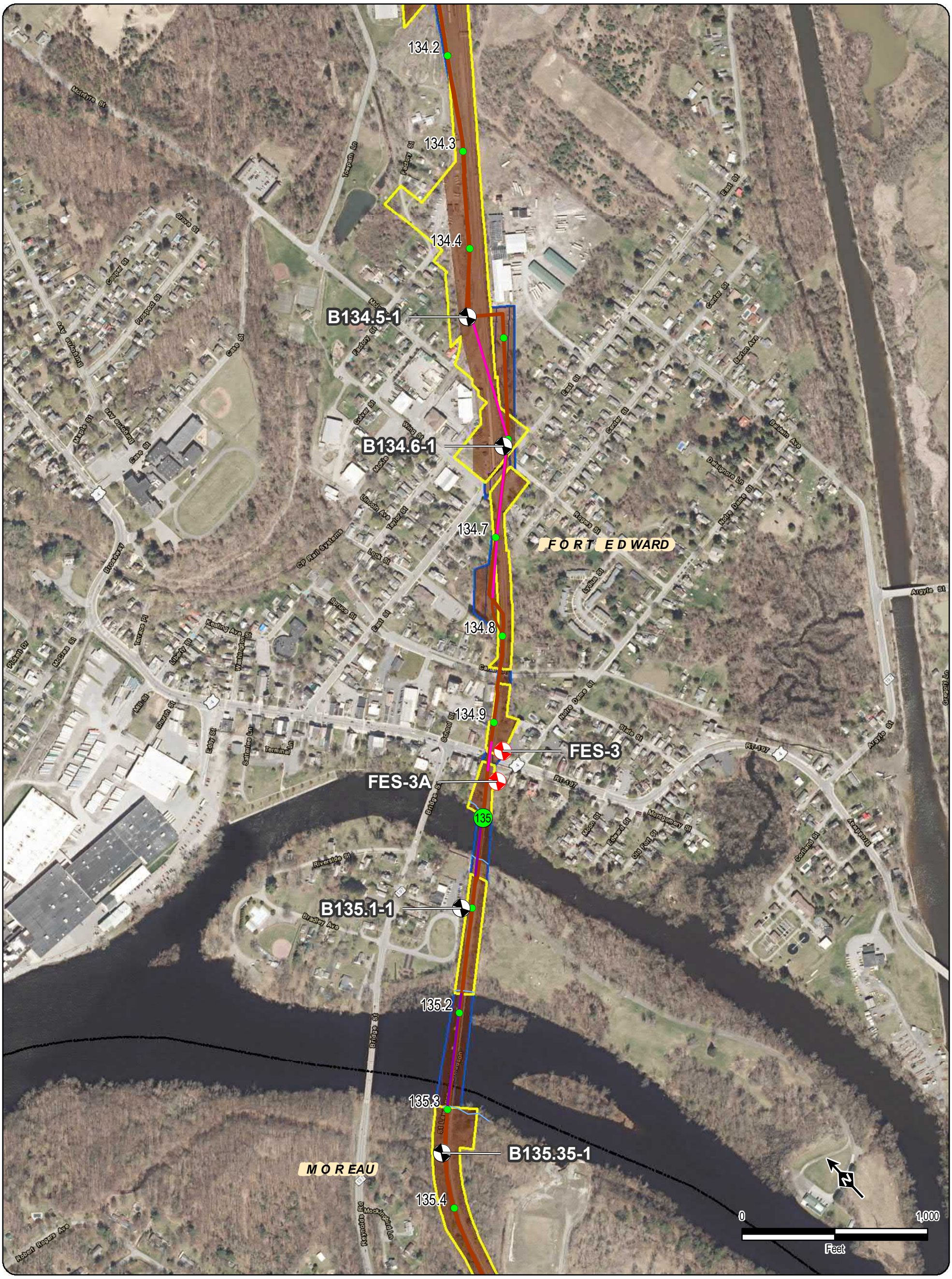

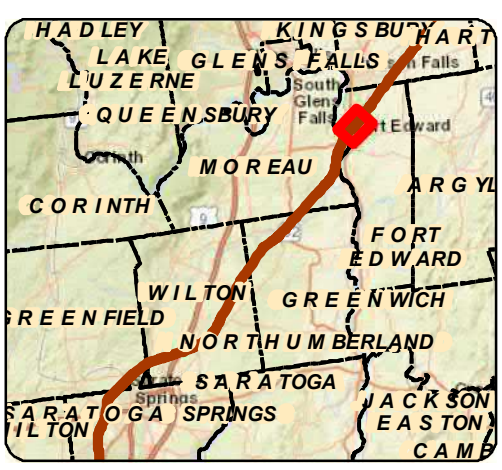

LEGEND

- Certified Milepost - Tenths
- Certified Milepost
- Preferred Alternative Milepost - Tenths
- Preferred Alternative Milepost
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- 2021 Boring Location
- Previous (2013) Boring Location
- Streams/Ditches
- Railroad ROW
- Deviation Zone
- Deviation Zone Outside ROW
- Preferred Alternative Deviation Zone
- Preferred Alternative Deviation Zone Outside ROW
- Town Boundary
- Village Boundary
- State Park (OPRHP)

Parcel Ownership: TOWN NAME

Road Name: Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Fort Edward to Saratoga

Figure A-4

Sheet 2 of 15

Prepared by: AECOM 5/19/2021

DATA SOURCES: ESRI, NETWORK MAPPING 2010, NYSDOT, OPRHP, TDI, TRC

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TEST BORING LOG

BORING	**B134.5-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
22.2'	NR	1/7	0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	30.0 '

DRILLER	J. MEHALICK
HELPER	M. KERLIN
INSPECTOR	J. STAPLETON
DATE STARTED	01/07/2013
DATE COMPLETED	01/07/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	13 8 8 6		***BLACK M/C/F SAND, SM F/ GRAVEL-SIZED ROCK FRAGMENTS, TR TO SM SILT (FILL)***	17.8	
	S-2	6 5 4 3		4.0		
5	S-3	2 2 1 2		***BLACK/RED M/C SAND, SM F/ GRAVEL SIZED ROCK FRAGMENTS, TR-SM COAL (FILL)***	21.0	
	S-4	3 2 1 1		8.0		
10	S-5	3 3 5 7		***BROWN F/M SAND, TR SILT***	8.3	
▽				13.5		
15	S-6	5 5 5			18.5	
20	S-7	4 2 2		***GRAY F/M/C SAND, SM SILT, TR F/ GRAVEL***	21.8	
▼						
25	S-8	4 4 5			20.5	
				28.5		
30	S-9	4 4 4		***GRAY F/M SAND, TR SILT*** 30.0	23.7	
				END OF BORING AT 30'		
35						

DRN.	CMP
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/27/13

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

BORING	**B134.6-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
18.9'	10:46	1/8	0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	30.0 '

DRILLER	J. MEHALICK
HELPER	M. KERLIN
INSPECTOR	C. POPPE
DATE STARTED	01/08/2013
DATE COMPLETED	01/08/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	2 6 6 5		***BLACK/ORANGE-BROWN F/M SAND, TR SILT (FILL)***		
	S-2	3 4 3 11		2.0 ***BLACK/WHITE F/M SAND, TR TO SM SILT, TR COAL (FILL)*** 4.0		
5	S-3	3 2 2 3		***ORANGE-BROWN F/ SAND, TR TO SM SILT*** 6.0	11.0	
	S-4	4 4 5 5			6.6	
10	S-5	5 6 7 7		***LIGHT ORANGE-BROWN F/M SAND***		
▽				13.5		
15	S-6	4 8 5			20.5	
▼ 20	S-7	4 4 6		***GRAY TO BROWN M/F/C SAND, TR TO SM SILT, TR F/ GRAVEL***		
25	S-8	5 5 7			15.7	
30	S-9	7 9 9		30.0		
				END OF BORING AT 30'		
35						

DRN.	CMP
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/27/13

SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CP
Client Name: Transmission Developers, Inc.
TRC Project #: 195651

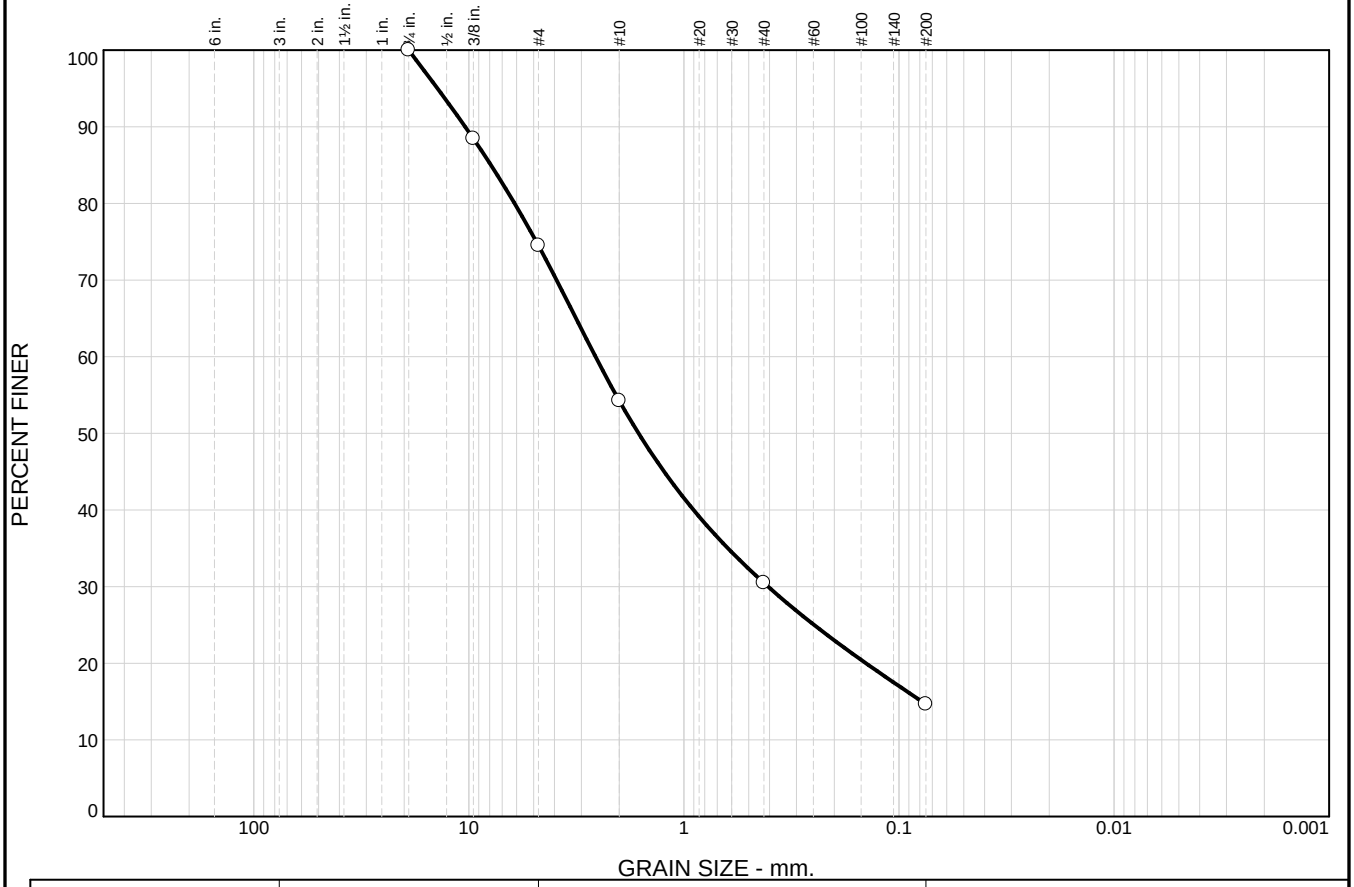
SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
A133.0-1	S-3	4.0-6.0	SM	0.0	73.0	27.0		-	-	-	-	-	10.6	-	-	-
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	-	18.8	-	-	-
B134.5-1	S-1	0.0-2.0	SM	25.5	59.8	14.7		-	-	-	-	-	17.8	-	-	-
	S-2	2.0-4.0														
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	21.0	-	-	-
	S-5	8.0-10.0	SP-SM	0.0	93.9	6.1		-	-	-	-	-	8.3	-	-	-
	S-6	13.5-15.0	-	-	-	-	-	-	-	-	-	-	18.5	-	-	-
	S-7	18.5-20.0	-	-	-	-	-	-	-	-	-	-	21.8	-	-	-
	S-8	23.5-25.0	SM	3.5	76.5	20.0		-	-	-	-	-	20.5	-	-	-
	S-9	28.5-30.0	-	-	-	-	-	-	-	-	-	-	23.7	-	-	-
B134.6-1	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	-	11.0	-	-	-
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	6.6	-	-	-
	S-6	13.5-15.0	SM	2.2	85.9	11.9		-	-	-	-	-	20.5	-	-	-

SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CP
Client Name: Transmission Developers, Inc.
TRC Project #: 195651

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
	S-8	23.5-25.0	SM	6.5	75.9	17.6		-	-	-	-	-	15.7	-	-	-
B135.1-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	-	17.8	-	-	-
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	23.2	-	-	-
	S-5	8.0-10.0	SM	0.0	61.5	38.5		-	-	-	-	-	27.7	-	-	-
	S-6	13.5-15.0	-	-	-	-	-	-	-	-	-	-	26.9	-	-	-
	S-7	18.5-20.0	SM	12.3	74.6	13.1		-	-	-	-	-	17.8	-	-	-
B135.35-1	S-1	0.0-2.0	GM	43.2	35.8	21.0		-	-	-	-	-	14.5	-	-	-
	S-2	2.0-4.0														
	S-3	4.0-6.0														
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	40.0	81.9	-	-
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	-	37.2	-	-	-
	S-6	13.5-15.0	CL	-	-	-	-	47	23	24	0.6	-	38.2	-	-	-
	S-8	23.5-25.0	-	-	-	-	-	-	-	-	-	-	36.3	-	-	-

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	25.5	20.2	23.8	15.8	14.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
○			7.8982	2.5760	1.6252	0.4061	0.0782			

Material Description	USCS	AASHTO
○ BROWN TO BLACK M/C/F SAND, SM F/ GRAVEL, TR TO SM SILT	SM	

Project No. 195651 **Client:** TDI CHAMPLAIN HUDSON POWER EXPRESS - CP

Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B134.5-1 **Depth:** 0.0-4.0 FT **Sample Number:** S-1 & S-2

TRC Engineers, Inc.

Mt. Laurel, NJ

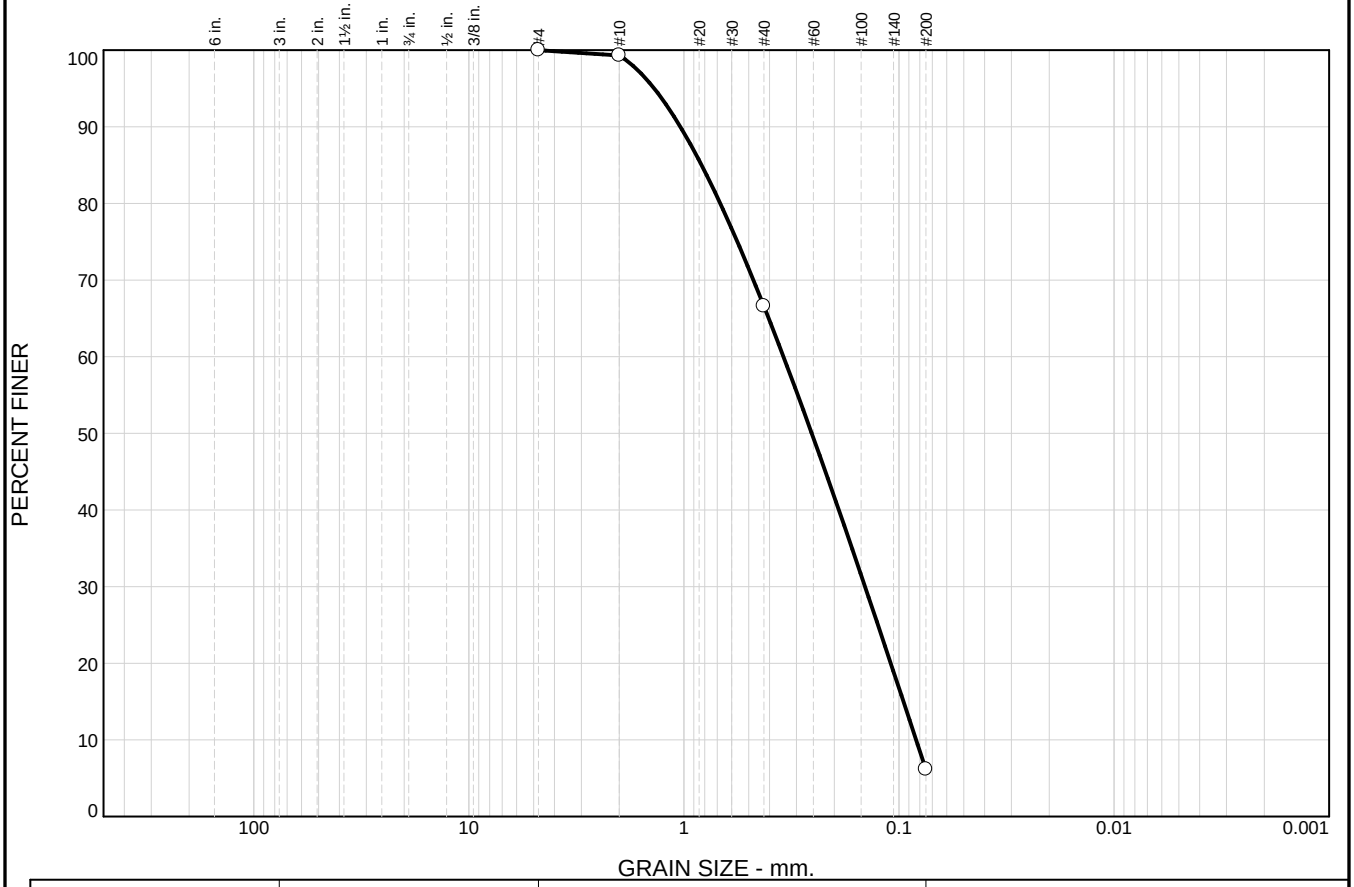
Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 30

Tested By: BMH 02/06/13 **Checked By:** _____

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.7	32.7	60.5	6.1	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.8279	0.3445	0.2545	0.1438	0.0953	0.0832	0.72	4.14

Material Description	USCS	AASHTO
○ BROWN TO LIGHT GRAY F/M SAND, TR SILT	SP-SM	

Project No. 195651 **Client:** TDI CHAMPLAIN HUDSON POWER EXPRESS - CP

Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B134.5-1 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

TRC Engineers, Inc.

Mt. Laurel, NJ

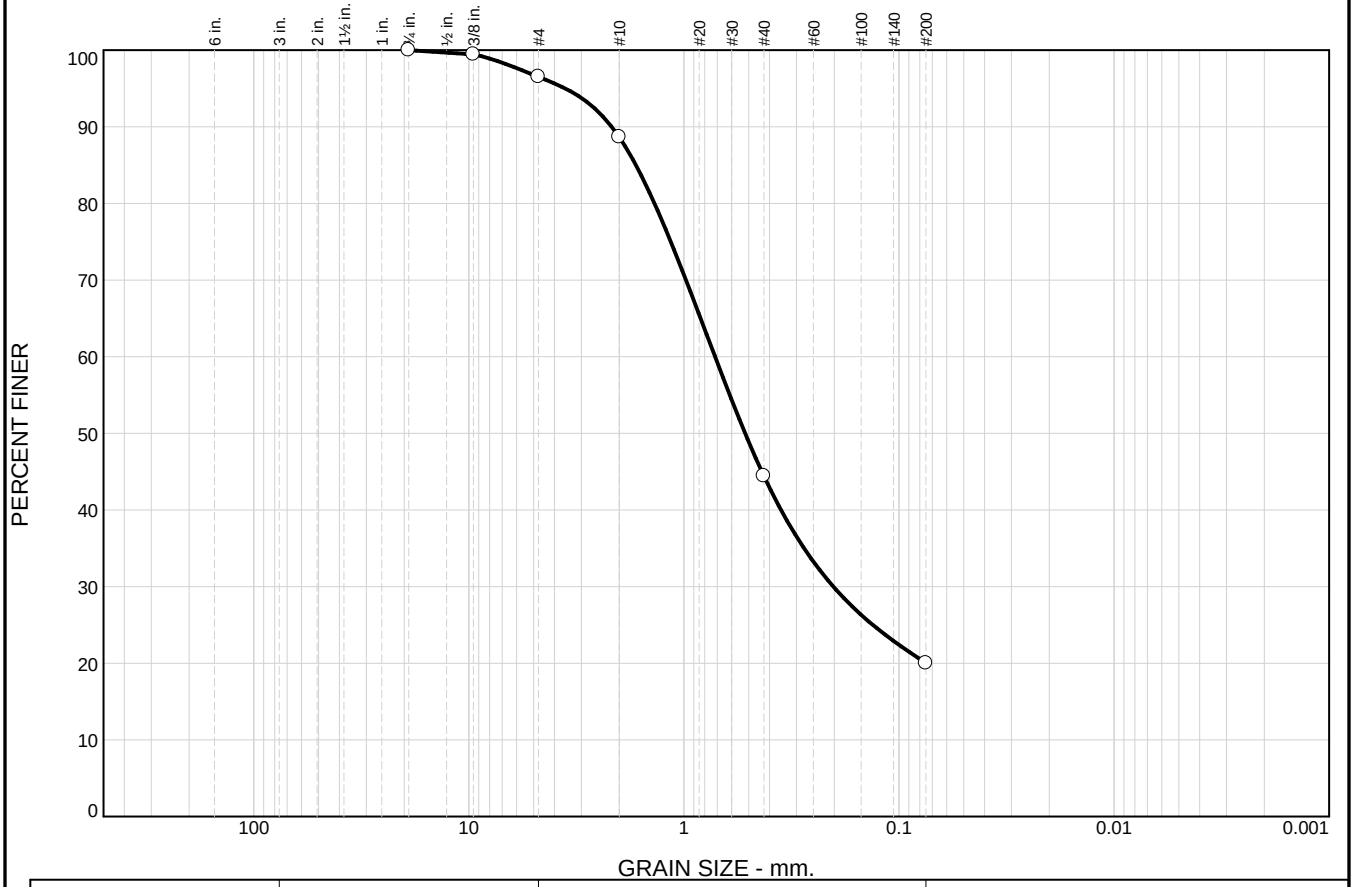
Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 31

Tested By: BMH 02/06/13 **Checked By:** _____

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.5	7.8	44.3	24.4	20.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
○			1.6727	0.7166	0.5193	0.2019				

Material Description	USCS	AASHTO
○ DARK GRAY TO BROWN M/F/C SAND, SM SILT, TR F/ GRAVEL	SM	

Project No. 195651 **Client:** TDI CHAMPLAIN HUDSON POWER EXPRESS - CP

Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B134.5-1 **Depth:** 23.5-25.0 FT **Sample Number:** S-8

TRC Engineers, Inc.

Mt. Laurel, NJ

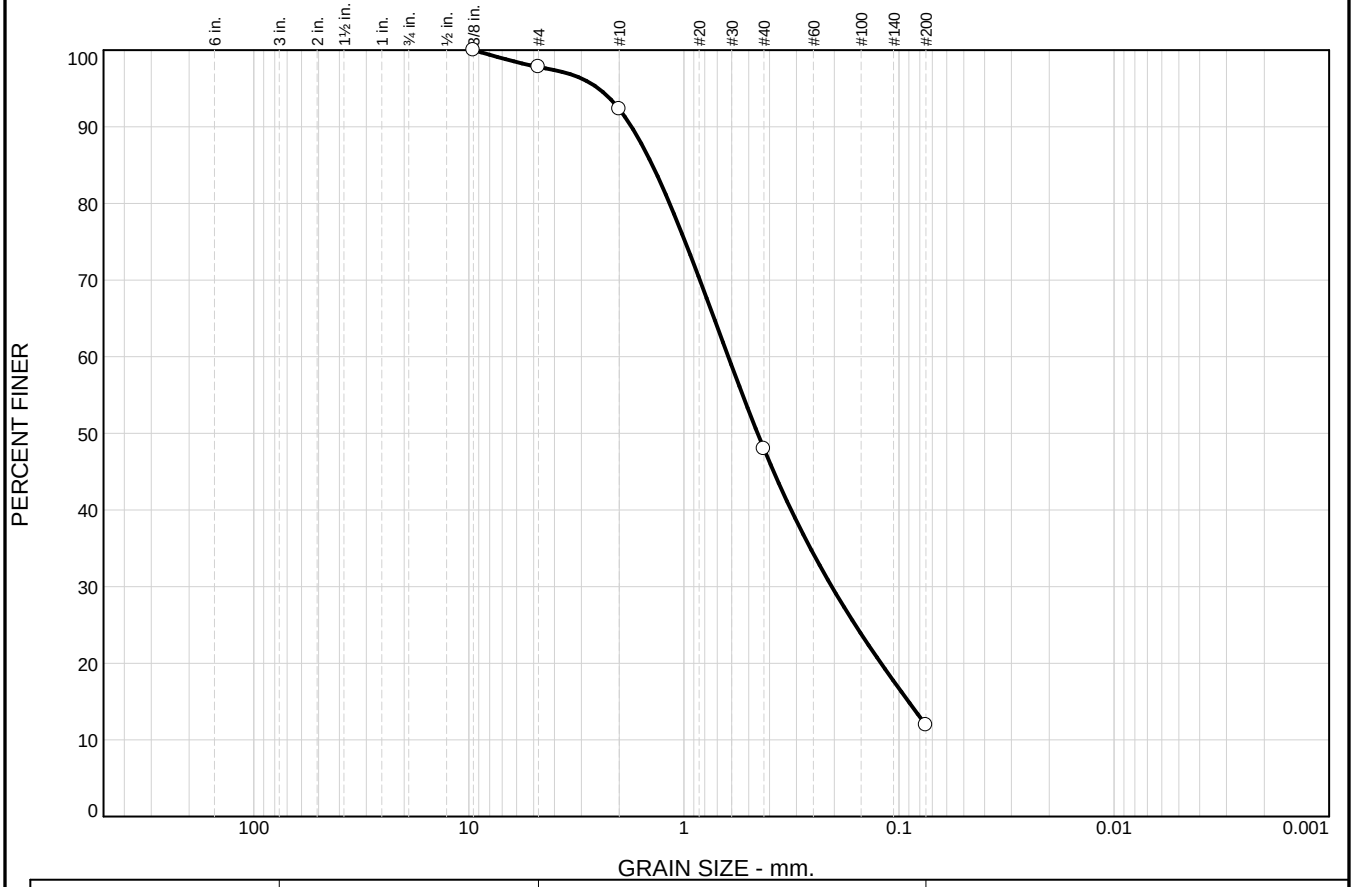
Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 32

Tested By: BMH 02/11/13 **Checked By:** _____

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.2	5.5	44.3	36.1	11.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
○			1.4030	0.6219	0.4544	0.2054	0.0903			

Material Description	USCS	AASHTO
○ BROWN M/F/C SAND, TR TO SM SILT, TR F/ GRAVEL	SM	

Project No. 195651 **Client:** TDI CHAMPLAIN HUDSON POWER EXPRESS - CP

Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B134.6-1 **Depth:** 13.5-15.0 FT **Sample Number:** S-6

TRC Engineers, Inc.

Mt. Laurel, NJ

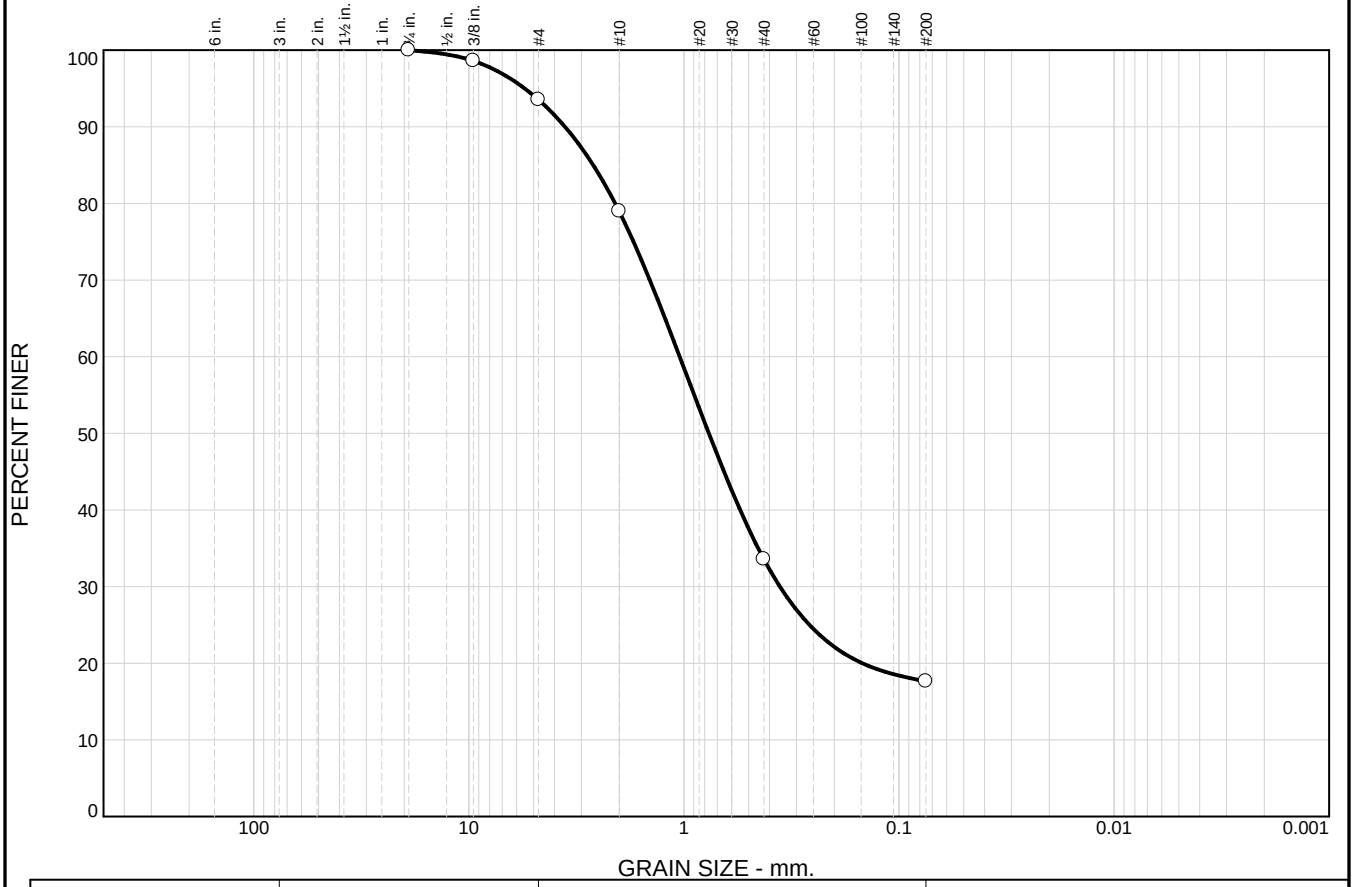
Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 33

Tested By: BMH 02/11/13 **Checked By:** _____

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	6.5	14.5	45.4	16.0	17.6	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			2.6412	1.0462	0.7656	0.3579				

Material Description	USCS	AASHTO
○ DARK BROWN M/F/C SAND, SM SILT, TR F/ GRAVEL	SM	

Project No. 195651 **Client:** TDI CHAMPLAIN HUDSON POWER EXPRESS - CP

Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B134.6-1 **Depth:** 23.5-25.0 FT **Sample Number:** S-8

TRC Engineers, Inc.

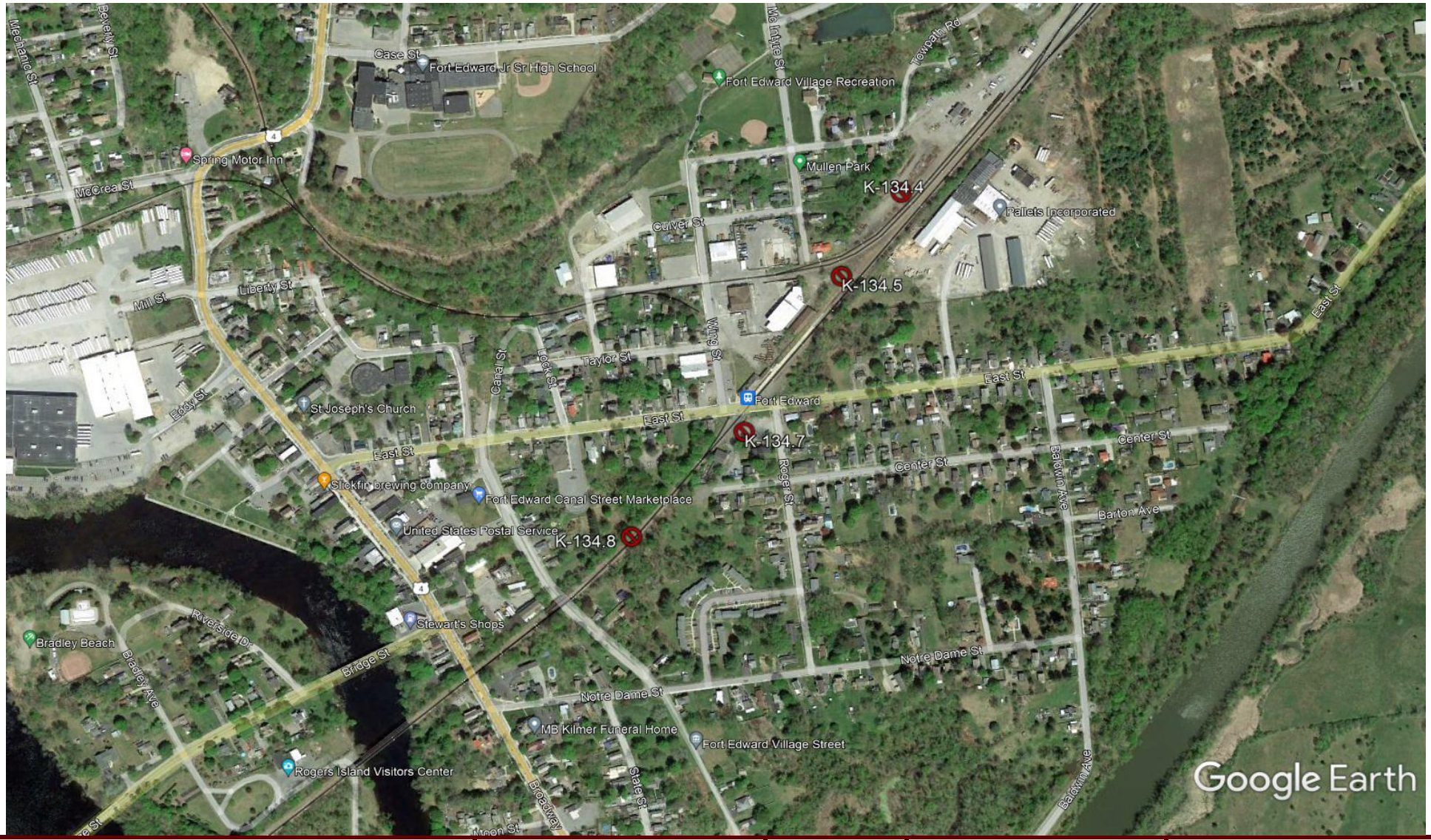
Mt. Laurel, NJ

Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 34

Tested By: BMH 02/11/13 **Checked By:** _____



Boring Location Plans Page 2 of 18	Drawn by: ADW	Scale: Not to scale	Project No.: CD10279	Date: April 2022

Champlain Hudson Power Express
Design Package 3
Glens Falls to Ballston Spa, New York

***ATLANTIC TESTING LABORATORIES*, Limited**

Albany, NY	Binghamton, NY	Canton, NY	Elmira, NY	Plattsburgh, NY
Poughkeepsie, NY	Syracuse, NY	Rochester, NY	Utica, NY	Watertown, NY

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: **CD10279D-01-04-22**

Client: **Kiewit Engineering (NY) Corp.**

Boring Location: **See Boring Location Plan**

Project: **Subsurface Investigation**
Champlain Hudson Power Express, Design Package 3
Various Locations, New York

Start Date: **2/2/2022** Finish Date: **2/3/2022**

Boring No.: **K-134.4** Sheet **1** of **2**

Groundwater Observations

Date	Time	Depth	Casing
2/2/2022	PM	DRY	4.0'
2/3/2022	AM	*5.5'	9.0'
2/3/2022	PM	*7.3'	23.0'

Coordinates
Northing **1618412.6**
Easting **737629.4**

Sampler Hammer
Weight: **140** lbs.
Fall: **30** in.
Hammer Type: **Automatic**

Ground Elev.: **137.9**

Boring Advance By: **HW (4") Casing/3 7/8" Wet Rotary**

Borehole caved at 10.3 feet. *May be affected by water utilized to advance the borehole.

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL	Recovery (Inches)
								f - fine; m - medium; c - coarse; and - 35-50%; some - 20-35%; little - 10-20%; trace - 0-10%	
1	CASING	1	0.0	2.0	SS	15 32 22 19		Black cmf GRAVEL; and cmf SAND; trace SILT (non-plastic) Frozen GW	24
2							2.0		
3		2	2.0	4.0	SS	5 4 3 3		Black cmf GRAVEL; and cmf SAND; trace SILT (moist, non-plastic) GW	16
4		3	4.0	6.0	SS	3 1 1 1		Similar Soil (wet, non-plastic) GW	6
6		4	6.0	8.0	SS	1 1 4 5		Similar Soil (wet, non-plastic) GW	12
7							7.5		
8		5	8.0	10.0	SS	1 1 3 5	8.0	Encountered loss of drilling water return at 7.5 feet. Tan mf SAND; trace SILT (moist, non-plastic) SP	8
10								Black cmf GRAVEL; and cmf SAND; trace SILT (wet, non-plastic) GW	
12							12.0		
14		6	14.0	16.0	SS	4 6 6 5		Light Brown c-mf SAND; trace SILT; trace m+f GRAVEL (moist, non-plastic) w = 19.1%, % Fines = 9.4% SP-SM	12
19		7	19.0	21.0	SS	4 3 2 5		Black cmf SAND; little mf GRAVEL; trace SILT (wet, non-plastic) SW	10
20								Encountered flowing sands at 19.0 feet.	
22							22.0		
23	WETRO	8A	23.0	25.0	SS	4 6 4 5		Advanced casing to 23.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole. Grey CLAY; and SILT; trace f SAND (wet, plastic) CH	16
25									

SS Split Spoon Sample
NX Rock Core
SH Undisturbed Sample (Shelby Tube)
Estimated Groundwater

Drillers: **Jake Crary; Ian Ross**

Inspector: **Ryan Morrison (ATL); Tom Kimmins (Kiewit)**

ATL-LOG1 NE CD10279 KIEWIT INFRASTRUCTURE CO - VARIOUS LOCATIONS (PACKAGE 3).GPJ ATL4-08.GDT 6/9/22

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: **K-134.4** Report No.: **CD10279D-01-04-22** Sheet **2** of **2**

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL	RECOVERY (inches)
								f - fine; m - medium; c - course; and - 35-50%; some - 20-35%; little - 10-20%; trace - 0-10%	
26	TARY	8B	25.0	27.0	SS	WH/12" 5 5		(3" Brass Lined Split Spoon) Similar Soil (wet, plastic) w = 52.9%, LL = 53, PL = 19, PI = 34 % Fines = 99.8% CH	16
29		9	29.0	31.0	SS	WH/12" 1 2		(3" Brass Lined Split Spoon) Similar Soil (wet, plastic) CH	24
34		10	34.0	36.0	SS	WH/18" 3		Similar Soil (wet, plastic) w = 34.4% CH	24
39		11	39.0	41.0	SS	WH/18" 3		Similar Soil (wet, plastic) CH	24
41							41.0		

Boring terminated at 41.0 feet.

Notes:
1. Borehole backfilled with cement-bentonite grout.
2. Soil classifications based on ATL Field Engineer's field classification.
3. Borehole was advanced with ATL's CME 45 Truck (Rig Unit No. CDGA461) drill rig.

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: **CD10279D-01-04-22**

Client: **Kiewit Engineering (NY) Corp.**

Boring Location: **See Boring Location Plan**

Project: **Subsurface Investigation**
Champlain Hudson Power Express, Design Package 3
Various Locations, New York

Start Date: **2/3/2022** Finish Date: **2/4/2022**

Boring No.: **K-134.5** Sheet **1** of **2**

Groundwater Observations

Date	Time	Depth	Casing
2/3/2022	PM	2.0'	1.5'
2/3/2022	PM	11.9'	14.0'
2/4/2022	AM	12.0'	14.0'
2/4/2022	AM	*12.0'	24.0'

Coordinates
Northing **1618060.4**
Easting **737386.8**

Sampler Hammer
Weight: **140** lbs.
Fall: **30** in.
Hammer Type: **Automatic**

Ground Elev.: **138.9**

Boring Advance By: **HW (4") Casing/3 7/8" Wet Rotary**

Borehole caved at 12.5 feet. *May be affected by water utilized to advance the borehole.

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL (f - fine; m - medium; c - coarse; and - 35-50%; some - 20-35%; little - 10-20%; trace - 0-10%)	Recovery (Inches)
0	CASING	1	0.0	1.8	SS	15 50/3"	0.5	6" TOPSOIL & ORGANIC MATERIAL	8
1							1.8	Blackish-Tan cmf SAND; some mf GRAVEL; trace SILT (frozen, non-plastic) SW	
2		2	2.0	4.0	SS	6 6 5 5		Black cmf GRAVEL; and cmf SAND; trace SILT (moist, non-plastic) GW	10
3									
4		3	4.0	6.0	SS	1 1 1 1		Similar Soil (moist, non-plastic) GW	6
5									
6		4	6.0	8.0	SS	WR/24"		Similar Soil (moist, non-plastic) GW	1
7							8.0		
8		5	8.0	10.0	SS	WH 1 2 2		Brown mf SAND; trace SILT (moist, non-plastic) w = 21.0% SP	12
9									
10									
11									
12									
13									
14		6	14.0	16.0	SS	1 1 2 2		Similar Soil (wet, non-plastic) SP	18
15									
16									
17									
18									
19		7	19.0	21.0	SS	3 4 4 9		Similar Soil (moist, non-plastic) SP	16
20									
21									
22							22.0		
23								Advanced casing to 24.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
24		8A	23.0	25.0	SS	6 7 8 9		(3" Brass Lined Split Spoon) Brown cmf SAND; little cmf GRAVEL; trace SILT (moist, non-plastic) SW	18
25	WETR								

SS Split Spoon Sample
NX Rock Core
SH Undisturbed Sample (Shelby Tube)
Estimated Groundwater

Drillers: **Jake Crary; Ian Ross**

Inspector: **Ryan Morrison (ATL); Doug Neutzling (Kiewit)**

ATL-LOG1 NE CD10279 KIEWIT INFRASTRUCTURE CO - VARIOUS LOCATIONS (PACKAGE 3).GPJ ATL4-08.GDT 6/9/22

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: **K-134.5** Report No.: **CD10279D-01-04-22** Sheet **2** of **2**

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL (f - fine; m - medium; c - course; and - 35-50%; some - 20-35%; little - 10-20%; trace - 0-10%)	RECOVERY (inches)
26	OTARY	8B	25.0	27.0	SS	3 6 9 10		(3" Brass Lined Split Spoon) Similar Soil (moist, non-plastic) SW	18
27									
28		8C	27.0	29.0	SS	6 7 9 8		(3" Brass Lined Split Spoon) Brown cm+f SAND; little SILT; trace mf+ GRAVEL (moist, non-plastic) w = 15.3%, % Fines = 15.0% SM	18
29									
30		9	29.0	31.0	SS	6 7 9 8		Brownish-Black cmf SAND; little cmf GRAVEL; trace SILT (moist, non-plastic) SW	18
31									
32									
33									
34									
35		10	34.0	36.0	SS	5 4 4 4		Brownish-Black cm+f SAND; little mf GRAVEL; trace SILT (moist, non-plastic) w = 19.2%, % Fines = 7.2% SP-SM	6
36									
37									
38									
39									
40		11	39.0	41.0	SS	5 4 5 4		Brownish-Black cmf SAND; little cmf GRAVEL; trace SILT (wet, non-plastic) SW	12
41							41.0		
42								Boring terminated at 41.0 feet.	
43									
44								Notes:	
45								1. Borehole backfilled with cement-bentonite grout.	
46								2. Soil classifications based on ATL Field Engineer's field classification.	
47								3. Borehole was advanced with ATL's CME 45 Truck (Rig Unit No. CDGA461) drill rig.	
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: **CD10279D-01-04-22**

Client: **Kiewit Engineering (NY) Corp.**

Boring Location: **See Boring Location Plan**

Project: **Subsurface Investigation**
Champlain Hudson Power Express, Design Package 3
Various Locations, New York

Start Date: **2/7/2022** Finish Date: **2/8/2022**

Boring No.: **K-134.7** Sheet **1** of **2**

Groundwater Observations

Date	Time	Depth	Casing
2/8/2022	AM	*13.1'	10.0'

Coordinates
Northing **1617437.7**
Easting **737001.8**

Sampler Hammer
Weight: **140** lbs.
Fall: **30** in.
Hammer Type: **Automatic**

Ground Elev.: **141.6**

Boring Advance By: **HW (4") Casing/3 7/8" Wet Rotary**

***May be affected by water utilized to advance the borehole.**

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL (f - fine; m - medium; c - coarse; and - 35-50%; some - 20-35%; little - 10-20%; trace - 0-10%)	Recovery (Inches)
1	CASING	1	0.0	2.0	SS	45 49 37 35	2.0	Brown f SAND; little mf GRAVEL; trace SILT (frozen, non-plastic) SP	24
3	CASING	2	2.0	4.0	SS	10 11 12 21	4.0	Brownish-Grey mf SAND; little CLAY; trace SILT (moist, slightly plastic) SC	16
5		3	4.0	6.0	SS	2 1 1 2		Brown Mf SAND; little SILT (moist, non-plastic) SM	8
7		4	6.0	8.0	SS	1 2 2 4		Brown cmf SAND; trace SILT; trace CLAY (moist, very slightly plastic) w = 7.6% SW-SC	11
9		5	8.0	10.0	SS	4 5 5 7		Similar Soil (moist, very slightly plastic) SW-SC	18
11	WET ROTARY							Advanced casing to 10.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
15		6	14.0	16.0	SS	3 2 3 4	17.0	Brownish-Grey cm+f SAND; little SILT; trace mf GRAVEL; trace CLAY (moist, very slightly plastic) w = 16.9%, % Fines = 24.0% SM	8
19		7	19.0	21.0	SS	4 2 3 3	22.0	Dark Grey mf GRAVEL; and cmf SAND; trace SILT; trace CLAY (moist, very slightly plastic) GP-GC	14
23		8	23.0	25.0	SS	9 11 13 13		(3" Brass Lined Split Spoon) Grey cm+f SAND; little SILT; little f GRAVEL; trace CLAY (wet, very slightly plastic) w = 12.6%	12

SS Split Spoon Sample
NX Rock Core
SH Undisturbed Sample (Shelby Tube)
Estimated Groundwater

Drillers: **Jeffrey Donovan; John Trathen**

Inspector: **James LaMarco (ATL)**

ATL-LOG1 NE CD10279 KIEWIT INFRASTRUCTURE CO - VARIOUS LOCATIONS (PACKAGE 3).GPJ ATL4-08.GDT 6/9/22

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: **K-134.7** Report No.: **CD10279D-01-04-22** Sheet **2** of **2**

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL	RECOVERY (inches)
								f - fine; m - medium; c - course; and - 35-50%; some - 20-35%; little - 10-20%; trace - 0-10%	
		ST-1A	25.0	27.0	SS	9 10 11 10		% Fines = 22.0% SP-SM (3" Brass Lined Split Spoon) Grey cmf SAND; trace mf GRAVEL; trace CLAY; trace SILT (wet, very slightly plastic) SW-SC	12
		ST-1B	27.0	29.0	SS	12 11 12 10		(3" Brass Lined Split Spoon) Similar Soil (wet, very slightly plastic) SW-SC	14
							29.0		
								Boring terminated at 29.0 feet.	

Notes:
1. Borehole backfilled with cement-bentonite grout.
2. Soil classifications based on ATL Field Engineer's field classification.
3. Borehole was advanced with ATL's Geoprobe 7822D7 (Rig Unit No. CDGV706) drill rig.

ATLANTIC TESTING LABORATORIES

LABORATORY TEST SUMMARY TABLE

ATL No. CD10279: Kiewit Infrastructure Co. - Champlain Hudson Power Express - Design Package 3

Boring ID	Sample No.	Sample Depth (ft.)	Soil/Rock Description	Percent Finer No. 200 Sieve	Moisture Content (%)	Atterburg Limits			Organic Content (%)	Water-Soluble Sulfate (ppm)	Water-Soluble Chloride (ppm)	pH	Resistivity (ohm-cm)	Rock Unconfined Compressive Strength (psi)	Rock Splitting Tensile Strength (psi)	Rock CERCHAR Abrasiveness Corrected CAI
						LL	PL	PI								
K-134.4	S-3	4.0 - 6.0	Black cmf GRAVEL; and cmf SAND; trace SILT	--	--	--	--	--	--	600	40	8.14	47,730	--	--	--
	S-6	14.0 - 16.0	Light Brown c-mf SAND; trace SILT; trace m+f GRAVEL	9.4	19.1	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.5 - 26.5	Grey CLAY; and SILT; trace f SAND	99.8	52.9	53	19	34	--	--	--	--	--	--	--	--
	S-10	34.0 - 36.0	Grey CLAY; and SILT; trace f SAND	--	34.4	--	--	--	--	--	--	--	--	--	--	--
K-134.5	S-5	8.0-10.0	Brown mf SAND; trace SILT	--	21.0	--	--	--	--	--	--	--	--	--	--	--
	S-8C	27.0 - 29.0	Brown cm+f SAND; little SILT; trace mf+ GRAVEL	15.0	15.3	--	--	--	--	--	--	--	--	--	--	--
	S-10	34.0-36.0	Brownish-Black cm+f SAND; little mf GRAVEL; trace SILT	7.2	19.2	--	--	--	--	--	--	--	--	--	--	--
K-134.7	S-4	6.0-8.0	Brown cmf SAND; trace SILT; trace CLAY	--	7.6	--	--	--	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brownish-Grey cm+f SAND; little SILT; trace mf GRAVEL; trace CLAY	24.0	16.9	--	--	--	--	--	--	--	--	--	--	--
	S-8	23.0-25.0	Grey cm+f SAND; little SILT; little f GRAVEL; trace CLAY	22.0	12.6	--	--	--	--	--	--	--	--	--	--	--
K-134.8	S-5	8.0-10.0	Brown mf SAND; little CLAY; trace SILT	--	16.0	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0-21.0	Brownish-Grey CLAY; some SILT; trace f SAND	56.5	29.9	25	20	5	--	--	--	--	--	--	--	--
	ST-1	37.0-37.9	Grey cmf+ SAND; trace SILT; trace f GRAVEL	8.3	17.1	--	--	--	--	--	--	--	--	--	--	--
K-136.1	S-5	8.0-10.0	Brownish-Grey CLAY; little SILT; trace f SAND	99.1	40.3	62	23	39	--	--	--	--	--	--	--	--
	S-8	23.0-25.0	Brownish-Grey CLAY; little SILT; trace f SAND	99.5	34.8	34	18	16	--	--	--	--	--	--	--	--
	S-10	34.0-36.0	Black c-m+f SAND; trace SILT ; trace f GRAVEL	8.4	18.6	--	--	--	--	--	--	--	--	--	--	--
K-136.5	S-4	6.0-8.0	Greyish-Brown SILT; some CLAY; little cmf SAND; trace OM	85.0	31.9	29	14	15	--	--	--	--	--	--	--	--
	S-5	8.0-10.0	Greyish-Brown SILT; some CLAY; trace cmf SAND; trace OM	--	--	--	--	--	0.8	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown mf+ SAND; little SILT	15	--	--	--	--	--	--	--	--	--	--	--	--
	RC-2	25.0-30.0	Greyish-Black SHALE	--	--	--	--	--	--	--	--	--	--	3,650	599	1.46
K-136.6	S-4	6.0-8.0	Brown SILT; trace mf SAND; trace CLAY	98.3	39.7	30	19	11	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown f SAND; some SILT	34.0	22.8	--	--	--	--	--	--	--	--	--	--	--
	RC-1	25.0-30.0	Greyish-Black SHALE	--	--	--	--	--	--	--	--	--	--	550	956	2.16

TEST DATA (continued)

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
[redacted]			
K-134.4	S-6 [1]	14-16	19.1
	S-8	24.5-26.5	52.9
	S-10	34-36	34.4

1. Sample mass was less than the minimum mass outlined in the referenced test method.

Reviewed By: _____ Date: 02/18/22

ATLANTIC TESTING LABORATORIES

WBE certified company

LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS

ASTM D 2216

PROJECT INFORMATION

Client: Kiewit Intrastructure Co.
Project: Champlain Hudson Power Express
United Cable Installation
Various Locations, New York

ATL Report No.: CD10279E-04-03-22
Report Date: March 1, 2022
Date Received: February 18, 2022

TEST DATA

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
[redacted]			
K-134.5	S-5 [1]	8-10	21.0
	S-8c [1]	27-29	15.3
	S-10 [1]	34-36	19.2
K-134.7	S-4 [1]	6-8	7.6
	S-6 [1]	14-16	16.9
	S-8	23-25	12.6
K-134.8	S-5	8-10	16.0
	S-7	19-21	29.9
	ST-1	37-39	17.1
K-137.3	S-4	6-8	40.2
	S-6	14-16	33.7
	ST-1	24-26	35.5

ATLANTIC TESTING LABORATORIES

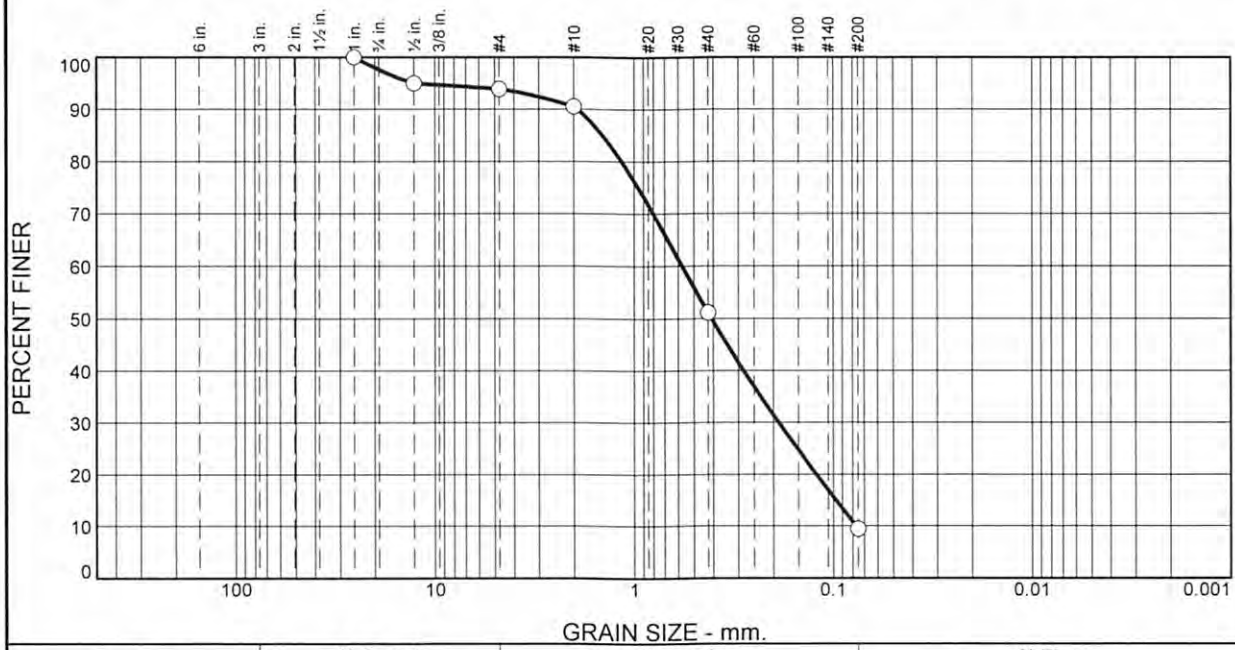
Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-03-02-22

Client: Kiewit Intrastructure Co. **Date:** 02/18/22

Sample No: K-134.4, S-6 **Source of Sample:** Boring Sample

Location: In-place **Elev./Depth:** 14-16'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	4	3	40	42	9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1"	100		
1/2"	95		
#4	94		
#10	91		
#40	51		
#200	9.4		

Soil Description

Light Brown c-mf SAND; trace SILT; trace m+f GRAVEL

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D_{85}= 1.4386 D_{60}= 0.5729 D_{50}= 0.4082
D_{30}= 0.1882 D_{15}= 0.0969 D_{10}= 0.0770
C_u= 7.44 C_c= 0.80

Classification

USCS= AASHTO=

Remarks

Moisture Content= 19.1%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 02/18/22

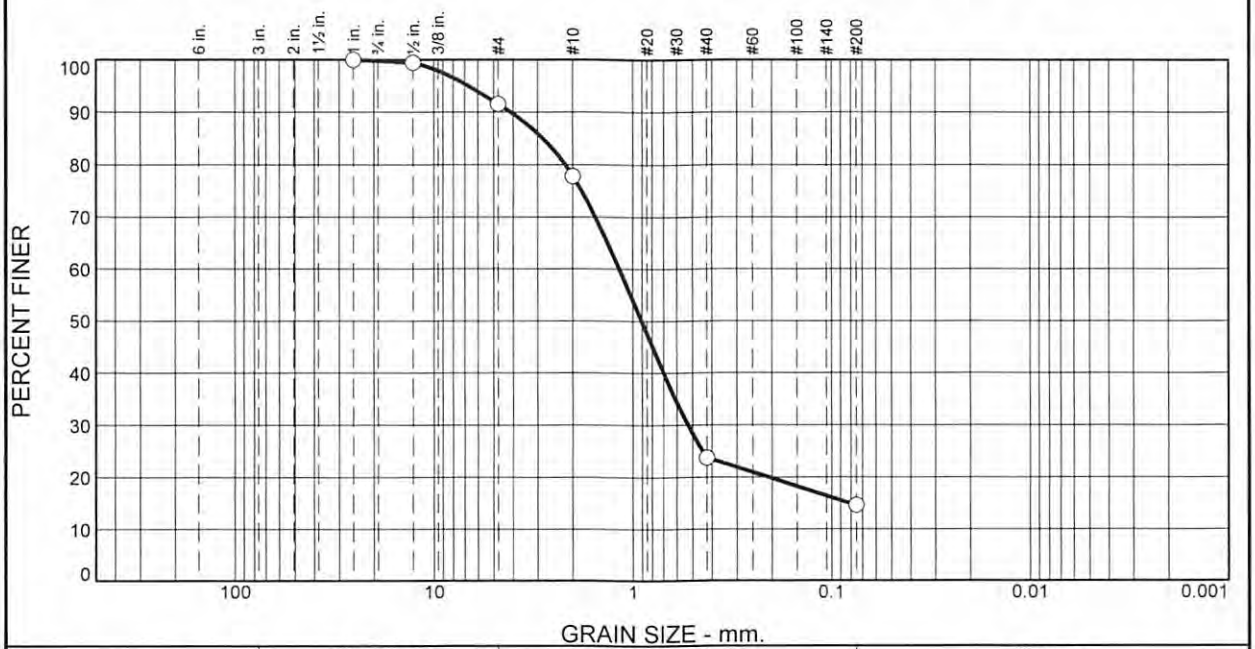
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-04-03-22

Client: Kiewit Intrastructure Co. **Date:** 03/01/22

Sample No: K-134.5, S-8c **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 27-29'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	8	14	54	9	15	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1"	100		
1/2"	99		
#4	92		
#10	78		
#40	24		
#200	15		

Soil Description

Brown cm+f SAND; little SILT; trace mf+ GRAVEL

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D_{85}= 2.8219 D_{60}= 1.1694 D_{50}= 0.9054
D_{30}= 0.5268 D_{15}= 0.0810 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 15.3%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 03/01/22

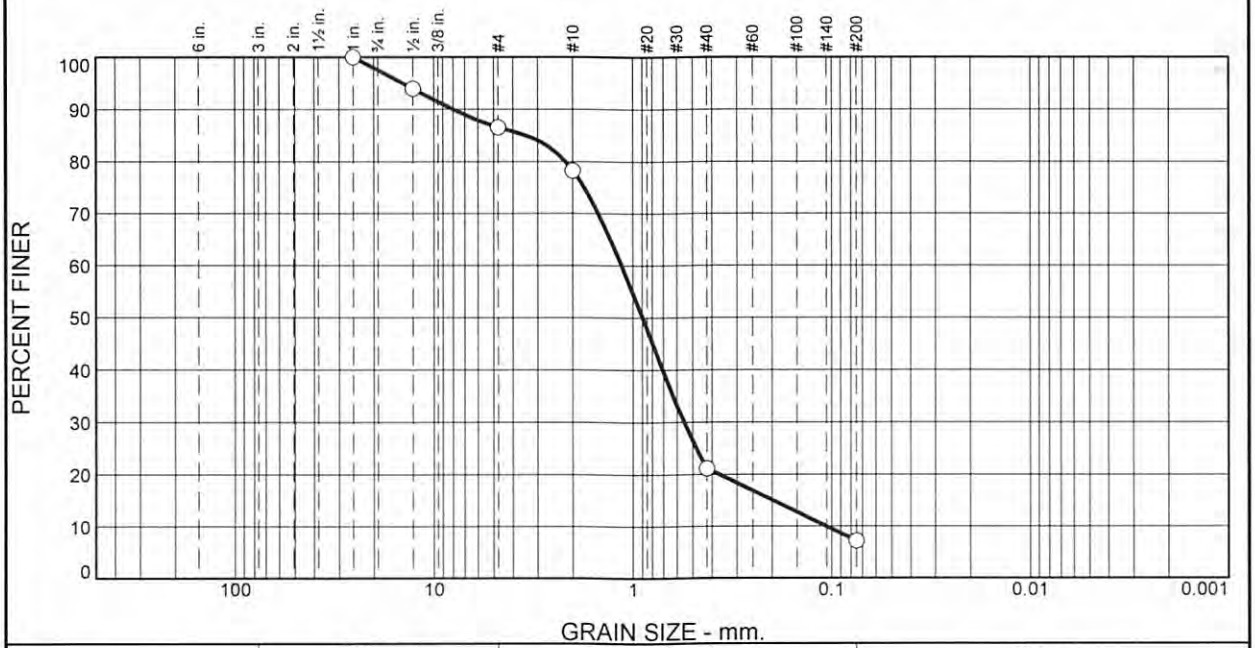
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-04-03-22

Client: Kiewit Intrastructure Co. **Date:** 03/01/22

Sample No: K-134.5, S-10 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 34-36'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	3	10	9	57	14	7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1"	100		
1/2"	94		
#4	87		
#10	78		
#40	21		
#200	7.2		

Soil Description

Brownish Black cm+f SAND; little mf GRAVEL; trace SILT

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D_{85}= 3.4431 D_{60}= 1.1403 D_{50}= 0.8963
D_{30}= 0.5511 D_{15}= 0.1976 D_{10}= 0.1062
C_u= 10.74 C_c= 2.51

Classification

USCS= AASHTO=

Remarks

Moisture Content= 19.2%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: _____ Date: 03/01/22

ATLANTIC TESTING LABORATORIES

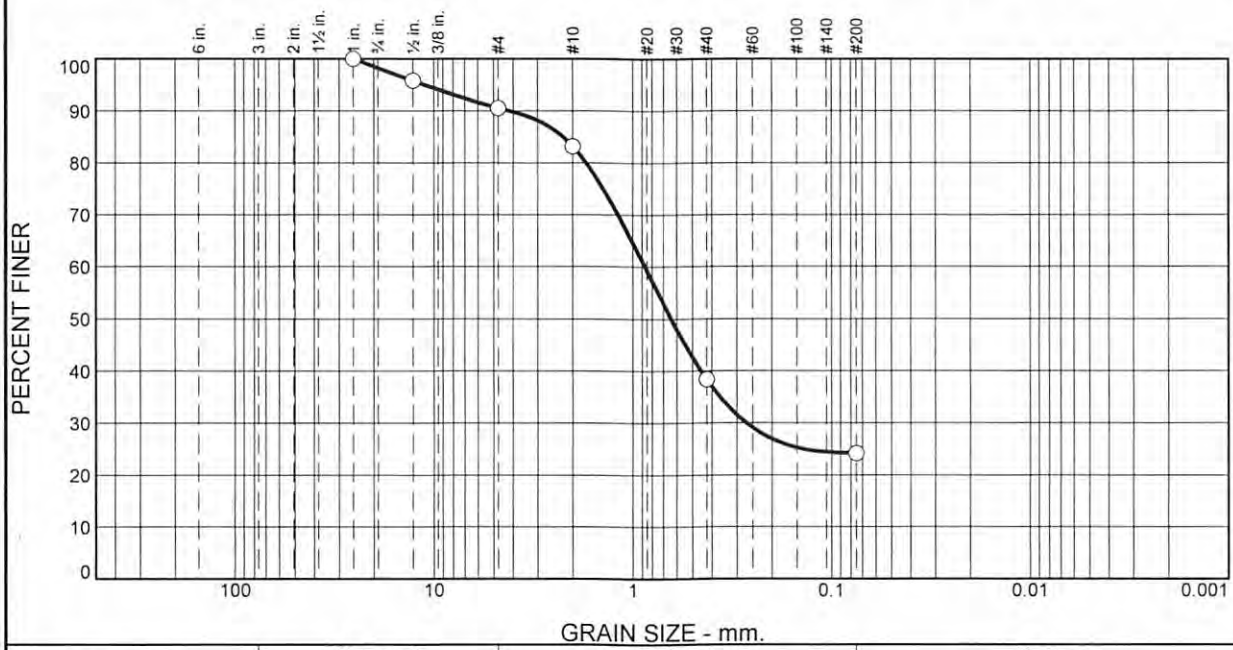
Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-04-03-22

Client: Kiewit Intrastructure Co. **Date:** 03/01/22

Sample No: K-134.7, S-6 **Source of Sample:** Boring Sample

Location: In-place **Elev./Depth:** 14-16'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	7	8	45	14	24	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1"	100		
1/2"	96		
#4	91		
#10	83		
#40	38		
#200	24		

Soil Description

Brownish Grey cm+f SAND; little SILT; trace mf GRAVEL; trace CLAY

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D_{85}= 2.2377 D_{60}= 0.8705 D_{50}= 0.6409
D_{30}= 0.2679 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 16.9%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 03/01/22

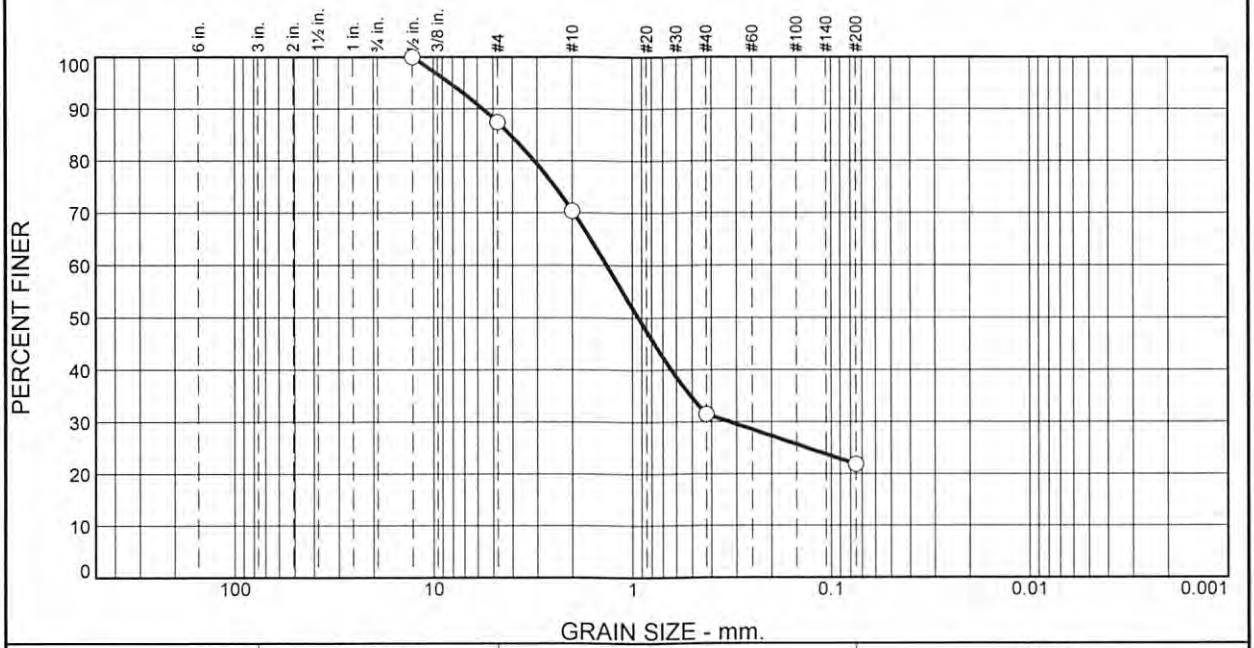
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-04-03-22

Client: Kiewit Intrastructure Co. **Date:** 03/01/22

Sample No: K-134.7, S-8 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 23-25'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	13	17	38	10	22	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	87		
#10	70		
#40	32		
#200	22		

Soil Description

Grey cm+f SAND; little SILT; little f GRAVEL; trace CLAY

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D_{85}= 4.0850 D_{60}= 1.3435 D_{50}= 0.9344
D_{30}= 0.3242 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 12.6%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: _____ Date: 03/01/22

ATLANTIC TESTING LABORATORIES

WBE certified company

AMOUNT OF MATERIAL IN SOILS FINER THAN THE NO. 200 SIEVE
ASTM D 1140

PROJECT INFORMATION

Client:	Kiewit Intrastructure Co.	**ATL Report No.:**	CD10279E-03-02-22
Project:	Champlain Hudson Power Express	**Report Date:**	February 18, 2022
	United Cable Installation	**Test Date:**	February 11, 2022
	Various Locations, New York	**Performed By:**	A. Rivers

TEST DATA

Boring No.	Sample No.	Depth (ft)	Method (A or B)	Soak Time (min)	Initial Dry Weight (g)	% Finer than #200
[redacted]						
K-134.4	S-8	24.5-26.5	A	10	328.47	99.8

Reviewed By: _____ Date: February 18, 2022

ATLANTIC TESTING LABORATORIES

WBE certified company

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOIL
ASTM D 4318

PROJECT INFORMATION

Client:	Kiewit Instrastructure Co.	**ATL Report No.:**	CD10279E-03-02-22
Project:	Champlain Hudson Power Express	**Report Date:**	February 18, 2022
	United Cable Installation	**Date Received:**	February 7, 2022
	Various Locations, New York		

TEST DATA

Boring No.	Sample No.	LL	PL	PI
[redacted]				
K-134.4	S-8	53	19	34

SAMPLE INFORMATION

Boring No.	Sample No.	Maximum Grain Size (mm)	Estimated Amount of Sample Retained on No. 40 Sieve (%)	As Received Moisture Content (%)
[redacted]				
K-134.4	S-8	0.595	1	52.9

PREPARATION INFORMATION

Boring No.	Sample No.	Preparation	Method of Removing Oversized Material
[redacted]			
K-134.4	S-8	Air Dry	Pulverizing and Screening

EQUIPMENT INFORMATION

Liquid Limit Procedure:	Multipoint - Method A	X	Single Point - Method B	
Liquid Limit Apparatus:	Manual	X	Motor Driven	
Liquid Limit Grooving Tool Material:	Plastic	X	Metal	
Liquid Limit Grooving Tool Shape:	Flat	X	Curved (AASHTO Only)	
Plastic Limit:	Hand Rolled	X	Mechanical Rolling Device	

Reviewed By: _____ Date: 02/18/22

ATLANTIC TESTING LABORATORIES

CORROSION ANALYSIS SUITE

Client: Kiewit Intrastructure Co.
Project: Champlain Hudson Power Express
United Cable Installation
Location: Various Locations, New York

ATL Report No. CD10279E-03-02-22
Report Date: February 18, 2022
Date Received: February 7, 2022

Sample: K-134.4, S-3 **Depth (ft):** 4-6

MEASURING pH OF SOIL FOR USE IN CORROSION TESTING
ASTM G 51

Type of Test	Soil Temperature (°C)	pH Readings			Average
Laboratory	19.9	8.14	8.15	8.12	8.14

pH of calibration standards used: 7.00

MEASUREMENT OF SOIL RESISITIVITY USING THE TWO-ELECTRODE SOIL BOX METHOD
ASTM G 187 (LABORATORY)

Test Date: 02/16/22 Performed by: A. Rivers
Meter Used: Miller 400A Soil Box Factor: 1.29

Date Collected	Temperature at Collection (°C)	Measured Resistance (Ω)	Calculated Resistivity (Ω/cm)
10/19/2021	Not Provided	37,000	47,730

WATER-SOLUBLE CHLORIDE ION CONTENT IN SOIL
AASHTO T 291, Method A

Chloride by Mass of Soil (mg/kg)
40

WATER-SOLUBLE SULFATE IN SOIL
ASTM C 1580

Sulfate by Mass of Sample (%)	Sulfate by Mass of Sample (mg/kg)
0.06	600

Reviewed By: Date: 02/18/22

Kiewit

MEMORANDUM

DATE: April 10, 2023

TO: Antonio Marruso, P.E.; CHA Consulting, Inc.

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp. MKH
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 4 - Package 3 - HDD Crossing 24
Champlain Hudson Power Express Project
Fort Edward, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located in Fort Edward, New York. The approximate station for the start of HDD crossing number 24 is STA 30122+00 (43.2680°N, 73.5818°W).

The geotechnical data at this HDD crossing is attached. The available data is from the investigations by AECOM, TRC, and Atlantic Testing Laboratories (ATL), referenced below.

- AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.
- Atlantic Testing Laboratories, Subsurface Investigation Services, Champlain Hudson Power Express, Design Package 3, Glens Falls to Ballston Spa, New York, dated June 15, 2022.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 113.1-177.1, dated March 29, 2013.

Contact us if you have questions or require additional information.

HDD 24
Borings K-134.8, FES-3, FES-3A, B135.1-1, B135.35-1
Segment 4 - Design Package 3

CHPE Segments 4 & 5 - Package 3
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A136.0-1	1611762.7	732951.9	146.6
	B134.5-1	1618254.8	737493.3	137.7
	B134.6-1	1617614.3	737160.7	140.2
	B135.1-1	1615942.5	735298.2	130.7
	B135.35-1	1615043.9	734326.1	147.7
	B137.9-1	1602848.9	729488.6	157.2
	B140.0-1	1594313.7	721767.2	205.0
	B144.2-1	1577578.6	707868.0	307.5
	B144.3-1	1577307.0	707733.5	307.4
	B144.5-1	1576380.0	707249.6	308.5
	B144.8-1	1574825.2	706447.7	310.8
	B145.0-1	1574014.3	706034.4	312.7
	B145.48	1571450.2	704693.3	320.4
	B146.1-1	1568896.3	703364.4	321.4
	B146.5-1	1566773.3	702083.1	323.6
	B148.4-1	1561976.4	694067.5	326.0
	B148.4-5	1561817.7	693531.9	327.4
	B149.87-1	1559610.1	686723.2	325.2
	B151.58-1	1553784.9	679646.1	336.4
	B152.6-0	1550004.2	676432.6	329.3
	B153.1-1	1547302.8	676031.8	322.5
	B154.3-1	1541375.5	674232.0	321.5
	B155.2-1	1536685.4	674403.7	313.7
	B155.7-1	1534202.1	674175.1	340.0
	B157.9-1	1524284.2	668932.6	246.0
	B158.1-1	1523474.2	668924.1	243.0
	B158.22-1	1522640.9	669168.4	279.1
AECOM**	BM-1A	1521184.8	669107.0	292.4
	FES-3	1616410.4	736040.4	143.9
	FES-3A	1616311.4	735904.6	139.3
	FES-3B	1611359.3	732784.5	142.5
	FES-4	1608699.4	732017.0	142.6
	FES-5	1605493.6	731399.7	147.1
	FES-6	1598212.9	725299.3	174.4
	FES-9	1583302.9	711497.9	271.6
	FES-10A	1563547.6	698025.3	321.4
	FES-12	1560130.5	687972.2	322.5
	SB-1A	1547803.7	676160.2	321.0
	SB-1B	1551257.2	677175.4	327.5
	SB-2	1545717.0	675698.7	316.3
	SB-3	1540348.5	674275.0	322.4

Notes:

- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.

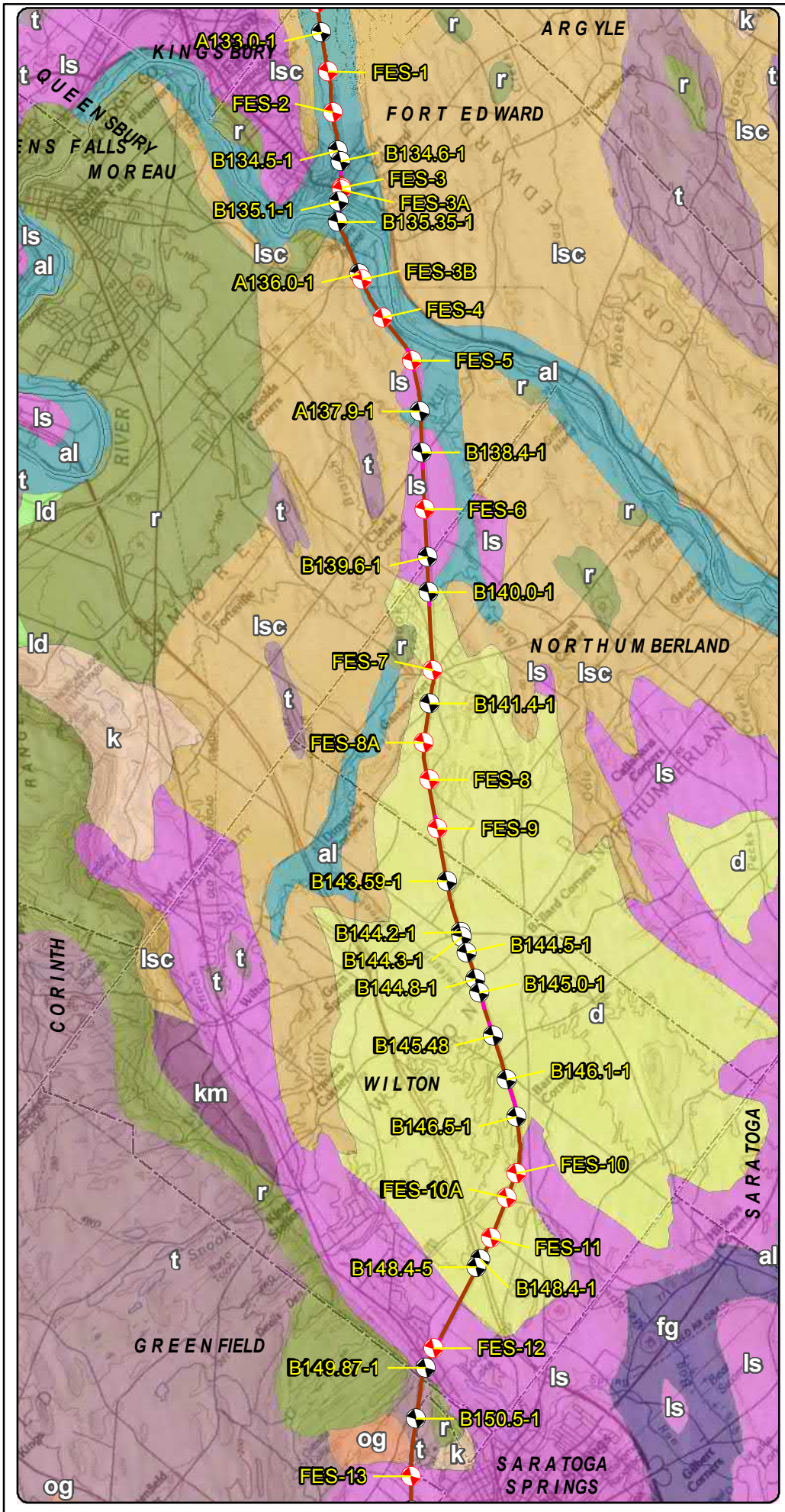
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

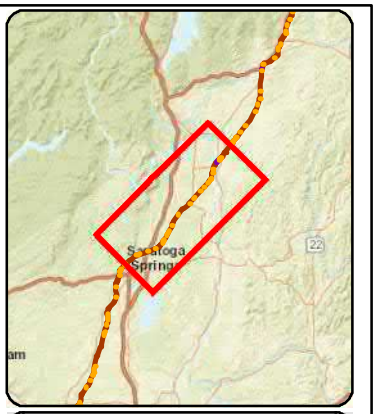
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.

*** Kiewit boring coordinates and elevations are noted on the boring logs.

Reference:

AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.





LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surficial Geology

- al - Recent alluvium
- d - Dunes
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- pm - Swamp deposits
- r - Bedrock
- t - Till

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

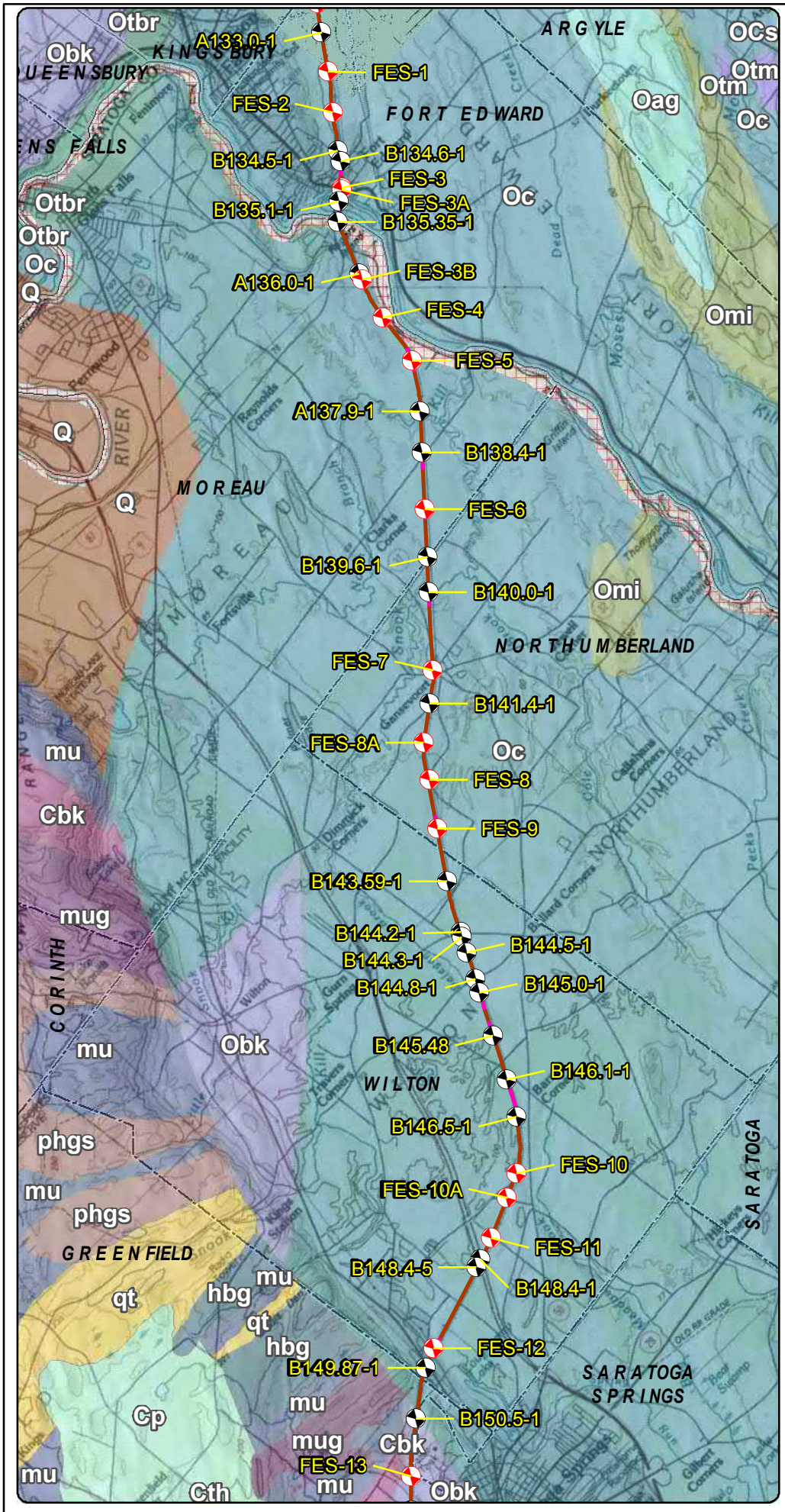
Champlain Hudson Power Express Inc.

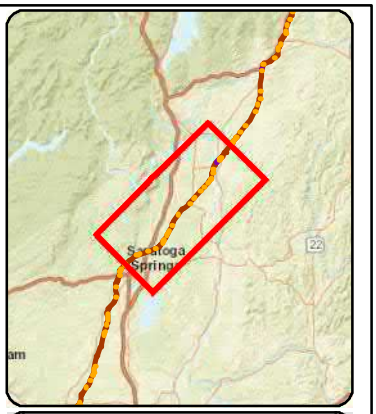
Surficial Geology and Geotechnical Borings
Fort Edward to Saratoga
Figure 3-4

Prepared on 4/29/2021
by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt 5_Routes_DZ_20190908oring_Locations\Maps_for_May_2021_Report\Ft_Edward_to_Saratoga_Boring_Locations_Surficial_May_2021_Report.mxd





LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

- Cbk - Beekmantown Group
- Cp - Potsdam Sandstone
- Cth - Theresa (Galway) Formation
- No Label
- OCs - Cambrian thru Middle Ordovician
- Oag - Austin Glen Form (graywacke, shale)
- Obk - Beekmantown Group
- Oc - Canajoharie Shale
- Omi - Mount Merino Formation
- Otbr - Dolgeville Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- hbg - Biotite/hornblende granite gneiss
- mu - Undivided metasedimentary rock
- mug - Interlayered metasedimentary rock
- phgs - Charnockite, granitic, quartz syenite
- qt - Quartzite

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

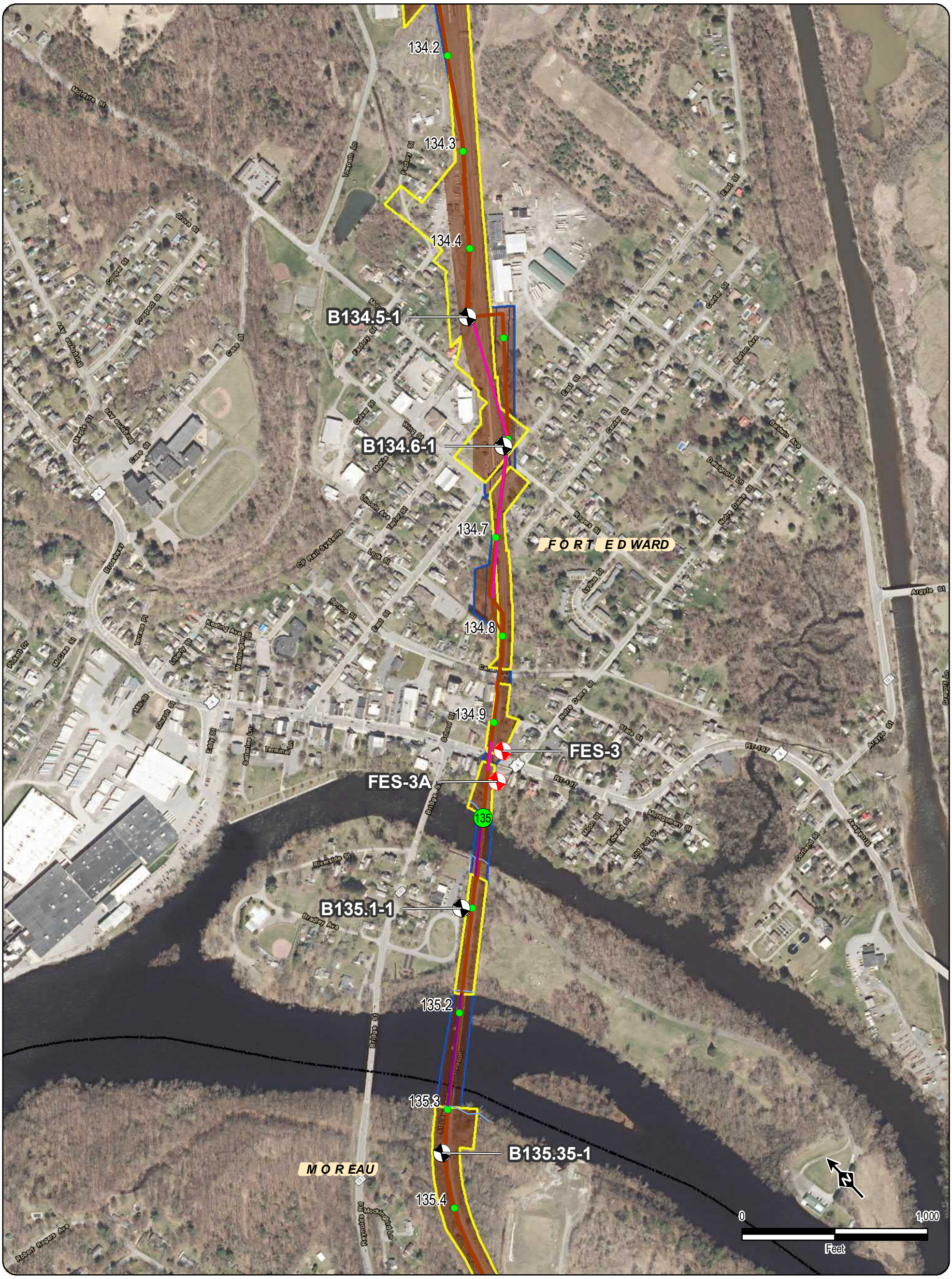
Bedrock Geology and Geotechnical Borings Fort Edward to Saratoga Figure 4-4

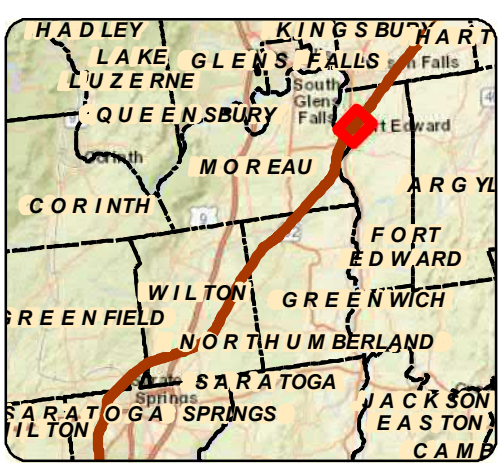
Prepared on 5/18/2021

by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\IRoute\Consensus_Alternative_Routes\MXD\Alt 5_Routes_DZ_20190909Boring_Locations\Maps_for_May_2021_Report\Ft_Edward_to_Saratoga_Boring_Locations_Bedrock_May_2021_Report.mxd





LEGEND

- Certified Milepost - Tenths
- Certified Milepost
- Preferred Alternative Milepost - Tenths
- Preferred Alternative Milepost
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- 2021 Boring Location
- Previous (2013) Boring Location
- Streams/Ditches
- Railroad ROW
- Deviation Zone
- Deviation Zone Outside ROW
- Preferred Alternative Deviation Zone
- Preferred Alternative Deviation Zone Outside ROW
- Town Boundary
- Village Boundary
- State Park (OPRHP)

Parcel Ownership: TOWN NAME

Road Name: Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Fort Edward to Saratoga

Figure A-4

Sheet 2 of 15

Prepared by: AECOM 5/19/2021

DATA SOURCES: ESRI, NETWORK MAPPING 2010, NYSDOT, OPRHP, TDI, TRC

Y:\Projects\CHPEI\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Ft_Edward_to_Saratoga_Boring_Locations_Mapset_May_2021_Report.mxd

TEST BORING LOG

BORING	**B135.1-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
15.4'	16:33	1/7	0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	24.1 '

DRILLER	J. MEHALICK
HELPER	M. KERLIN
INSPECTOR	C. POPPE
DATE STARTED	01/07/2013
DATE COMPLETED	01/07/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	4 8 8 11		***BLACK SILTY F/M SAND, TR-SM F/ GRAVEL SIZED ROCK FRAGMENTS (FILL)***		
				2.0		
	S-2	8 4 4 3			17.8	
5	S-3	4 2 2 1				
	S-4	2 3 3 3		***BROWN SILTY F/ SAND***	23.2	
	S-5	2 3 2 3			27.7	
10						
▽				13.5		
15	S-6	2 1 3		***GRAY F/ SAND, TR SILT***	26.9	
▼				18.5		
20	S-7	7 6 7		***DARK BROWN M/F/C SAND, TR TO SM SILT, TR TO SM F/ GRAVEL***	17.8	
	S-8	7 50/0.1		24.1		SPOON REFUSAL
25				***END OF BORING AT 24.1'***		
30						
35						

DRN.	CMP
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/27/13

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

BORING	**B135.35-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 2

GROUNDWATER DATA			
FIRST ENCOUNTERED 21.0 '			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	57.5 '
c_2	FROM	57.5 '	TO	67.5 '

DRILLER	G. SPIZZIRRI
HELPER	E. WARD
INSPECTOR	J. STAPLETON
DATE STARTED	01/24/2013
DATE COMPLETED	01/31/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	3 1 2 1		***BLACK TO BROWN M/C/F SANDY C/F GRAVEL, SM SILT WITH ASH, CINDERS AND SLAG (FILL)***	14.5	
	S-2	2 1 1 2				
5	S-3	1 1 1 2		5.0		
	S-4	2 2 2 2			40.0	
	S-5	2 1 2 2			37.2	
10						
				BROWN CLAY, SM SILT		
15	S-6	1 2 2			38.2	
	S-7	2 2 2				SILT CONTENT INCREASING WITH DEPTH
20						
				23.5		
25	S-8	1 2 1		***GRAY CLAY, SM SILT***	36.3	
					37.5	
30	S-9	1 1 2				
				33.5		
35	S-10	1 1 1		***GRAY SILTY CLAY***		

DRN.	JPB
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/27/13

TEST BORING LOG

BORING	**B135.35-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	2 OF 2

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
40	S-11	1 1 2			36.3	
45	S-12	1 1 1		***GRAY SILTY CLAY***		
50	S-13	WOH				
55	S-14	3 9 13		53.5 ***DARK GRAY CLAY, SM SILT***		
60	R-1	REC =100% RQD =30%		57.5 ***DARK GRAY/BLACK FRESH TO SLIGHTLY WEATHERED SHALE, 45 DEGREE DIP, SOME CALCAREOUS VEINS***		
65	R-2	REC =100% RQD =100%				
	R-3	REC =100% RQD =100%		67.5 ***END OF BORING AT 67.5'***		
70						
75						

NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/27/13

SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CP
Client Name: Transmission Developers, Inc.
TRC Project #: 195651

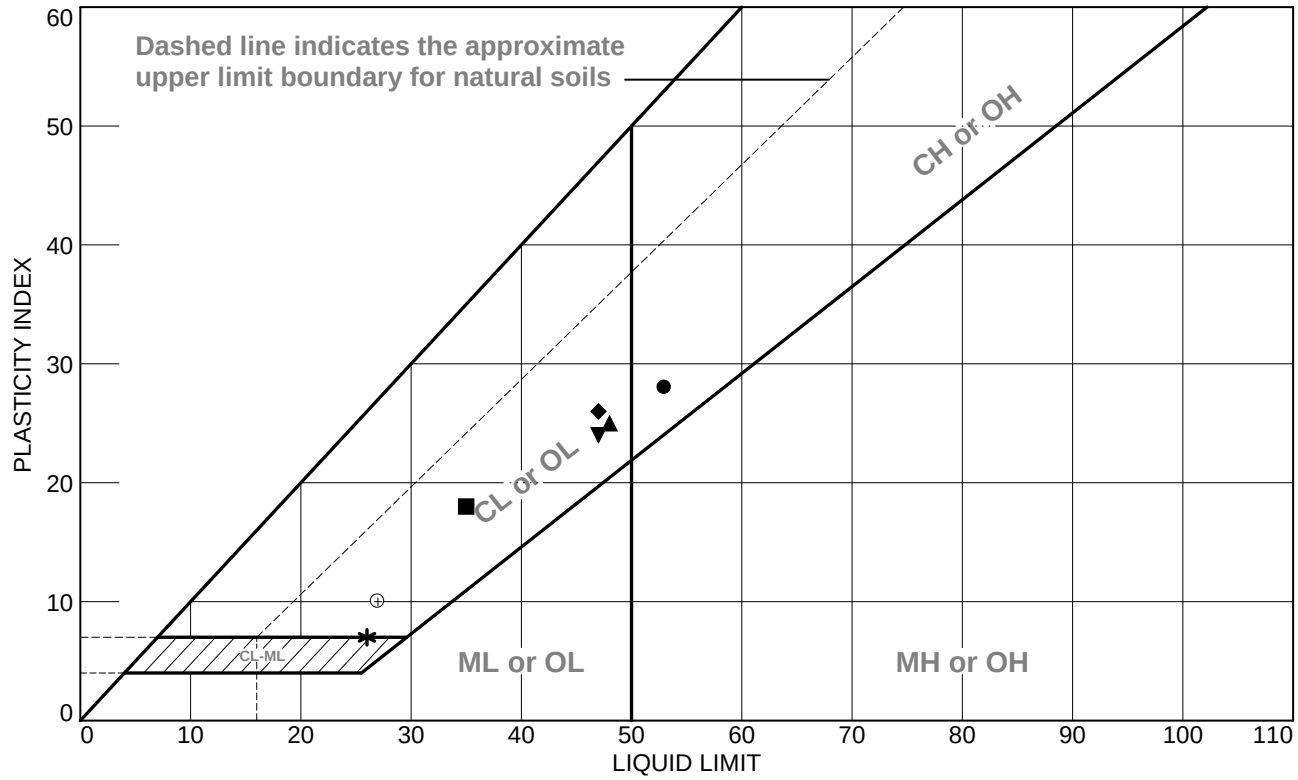
SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
	S-8	23.5-25.0	SM	6.5	75.9	17.6		-	-	-	-	-	15.7	-	-	-
B135.1-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	-	17.8	-	-	-
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	23.2	-	-	-
	S-5	8.0-10.0	SM	0.0	61.5	38.5		-	-	-	-	-	27.7	-	-	-
	S-6	13.5-15.0	-	-	-	-	-	-	-	-	-	-	26.9	-	-	-
	S-7	18.5-20.0	SM	12.3	74.6	13.1		-	-	-	-	-	17.8	-	-	-
B135.35-1	S-1	0.0-2.0	GM	43.2	35.8	21.0		-	-	-	-	-	14.5	-	-	-
	S-2	2.0-4.0														
	S-3	4.0-6.0														
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	40.0	81.9	-	-
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	-	37.2	-	-	-
	S-6	13.5-15.0	CL	-	-	-	-	47	23	24	0.6	-	38.2	-	-	-
	S-8	23.5-25.0	-	-	-	-	-	-	-	-	-	-	36.3	-	-	-

SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CP
Client Name: Transmission Developers, Inc.
TRC Project #: 195651

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
	S-9	28.5-30.0	-	-	-	-	-	-	-	-	-	-	37.5	-	-	-
	S-11	38.5-40.0	CL-ML	-	-	-	-	26	19	7	2.5	-	36.3	-	-	-
	R-1	59.1-59.8	-	-	-	-	-	-	-	-	-	-	-	174.2	585	-
B136.0-1	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	-	41.8	-	-	-
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	-	47.2	-	-	-
B137.9-1	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	7.8	-	-	-
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	-	10.4	-	-	-
	S-6	13.5-15.0	SM	0.0	88.0	12.0		-	-	-	-	-	10.5	-	-	-
	S-7	18.5-20.0	SM	0.0	80.2	19.8		-	-	-	-	-	16.5	-	-	-
	S-8	23.5-25.0	-	-	-	-	-	-	-	-	-	-	20.3	-	-	-
	S-9	28.5-30.0	-	-	-	-	-	-	-	-	-	-	31.7	-	-	-
	S-10	33.5-35.0	-	-	-	-	-	-	-	-	-	-	33.8	-	-	-
	S-11	38.5-40.0	-	0.1	40.7	59.2		-	-	-	-	-	33.7	-	-	-

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

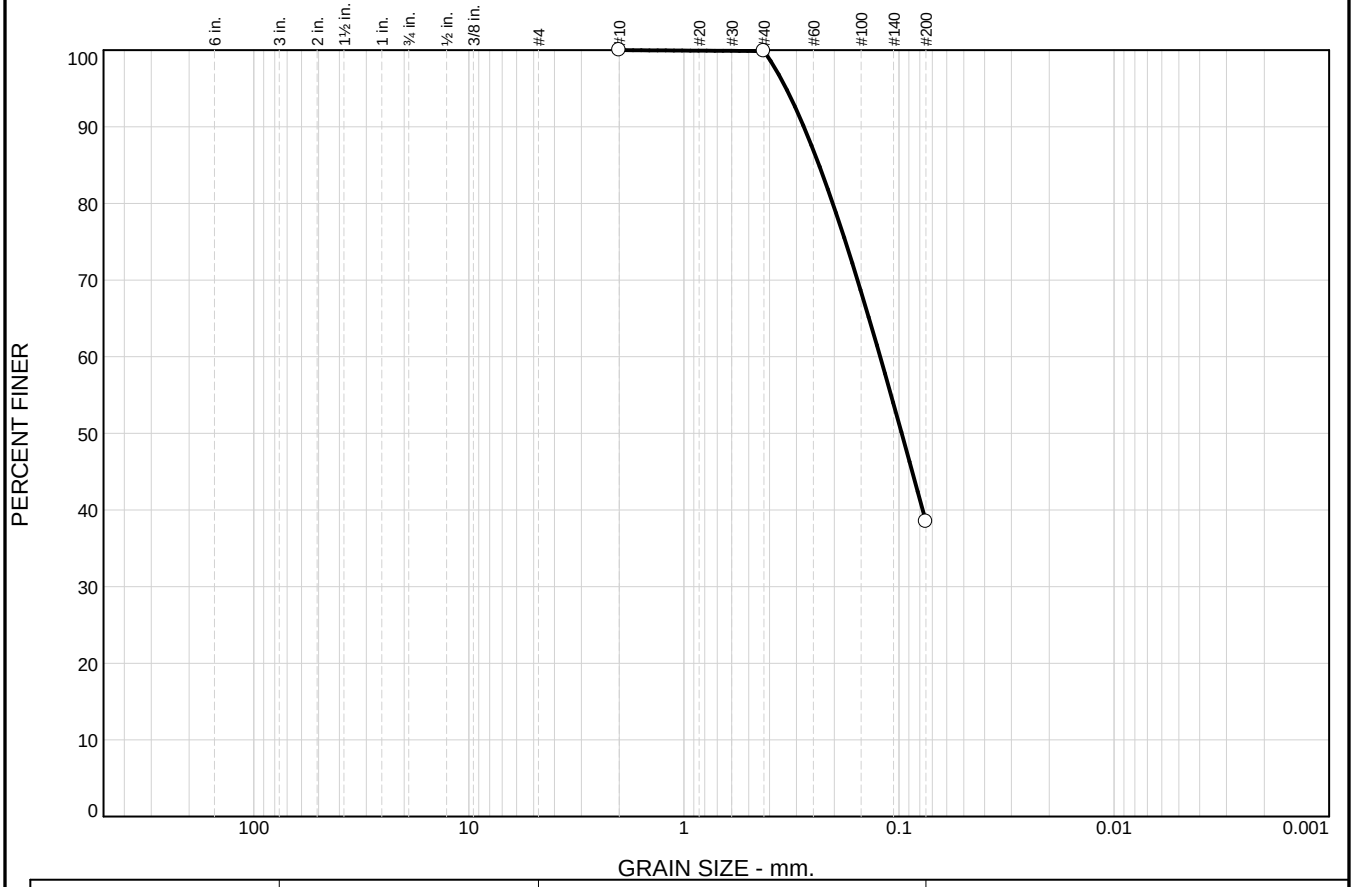
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B125.1-1	S-8	23.5-25.0 FT	29.1	25	53	28	CH
■	B130.8-1	S-6 & S-7	13.5-20.0 FT	45.7	17	35	18	CL
▲	B131.5-1	S-3	4.0-6.0 FT	30.0	23	48	25	CL
◆	B131.5-1	S-6	13.5-15.0 FT	25.5	21	47	26	CL
▼	B135.35-1	S-6	13.5-15.0 FT	38.2	23	47	24	CL
✱	B135.35-1	S-11	38.5-40.0 FT	36.3	19	26	7	CL-ML
⊕	B143.59-1	S-8	23.5-25.0 FT	29.6	17	27	10	CL
⊞	B145.0-1	S-15	58.5-60.0 FT	23.7	20	18	NP	
⊗	B150.5-1	S-3	4.0-6.0 FT	21.5	NP	NV	NP	SM
⊠	B153.1-1	S-7	18.5-20.0 FT	22.8	20	19	NP	

TRC Engineers, Inc. Mt. Laurel, NJ

Client: TDI CHAMPLAIN HUDSON POWER EXPRESS - CP
Project: TRANSMISSION DEVELOPERS, INC.

Project No.: 195651 **Figure** 2

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.1	61.4	38.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
○			0.2354	0.1223	0.0971					

Material Description	USCS	AASHTO
○ BROWN SILTY F/ SAND	SM	

Project No. 195651 **Client:** TDI CHAMPLAIN HUDSON POWER EXPRESS - CP

Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B135.1-1 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

TRC Engineers, Inc.

Mt. Laurel, NJ

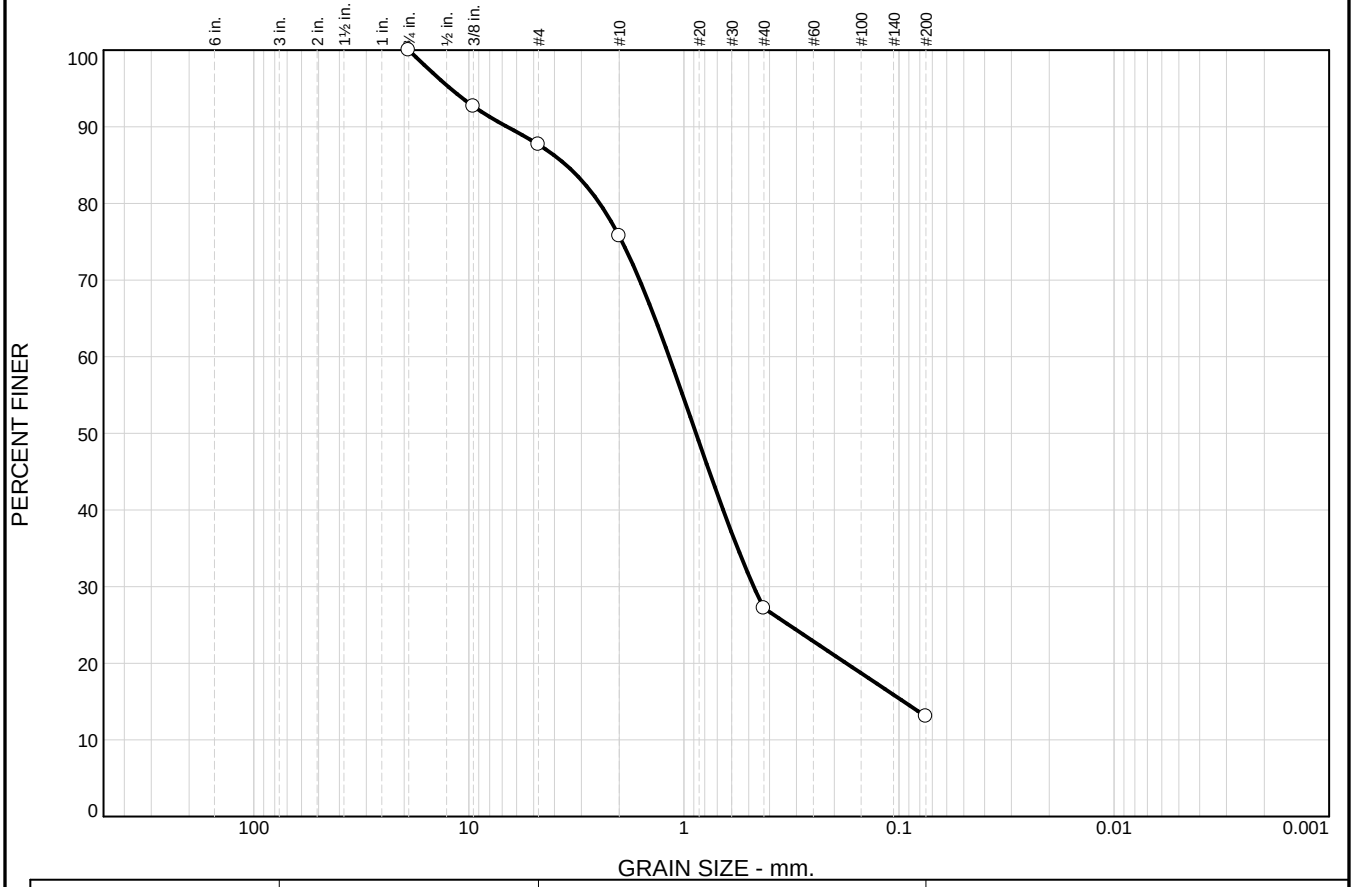
Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 35

Tested By: BMH 02/08/13 **Checked By:** _____

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	12.3	12.0	48.5	14.1	13.1	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			3.5280	1.1722	0.8788	0.4738	0.0951			

Material Description	USCS	AASHTO
○ BROWN TO DARK BROWN M/F/C SAND, TR TO SM SILT, TR TO SM F/ GRAVEL	SM	

Project No. 195651 **Client:** TDI CHAMPLAIN HUDSON POWER EXPRESS - CP

Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B135.1-1 **Depth:** 18.5-20.0 FT **Sample Number:** S-7

TRC Engineers, Inc.

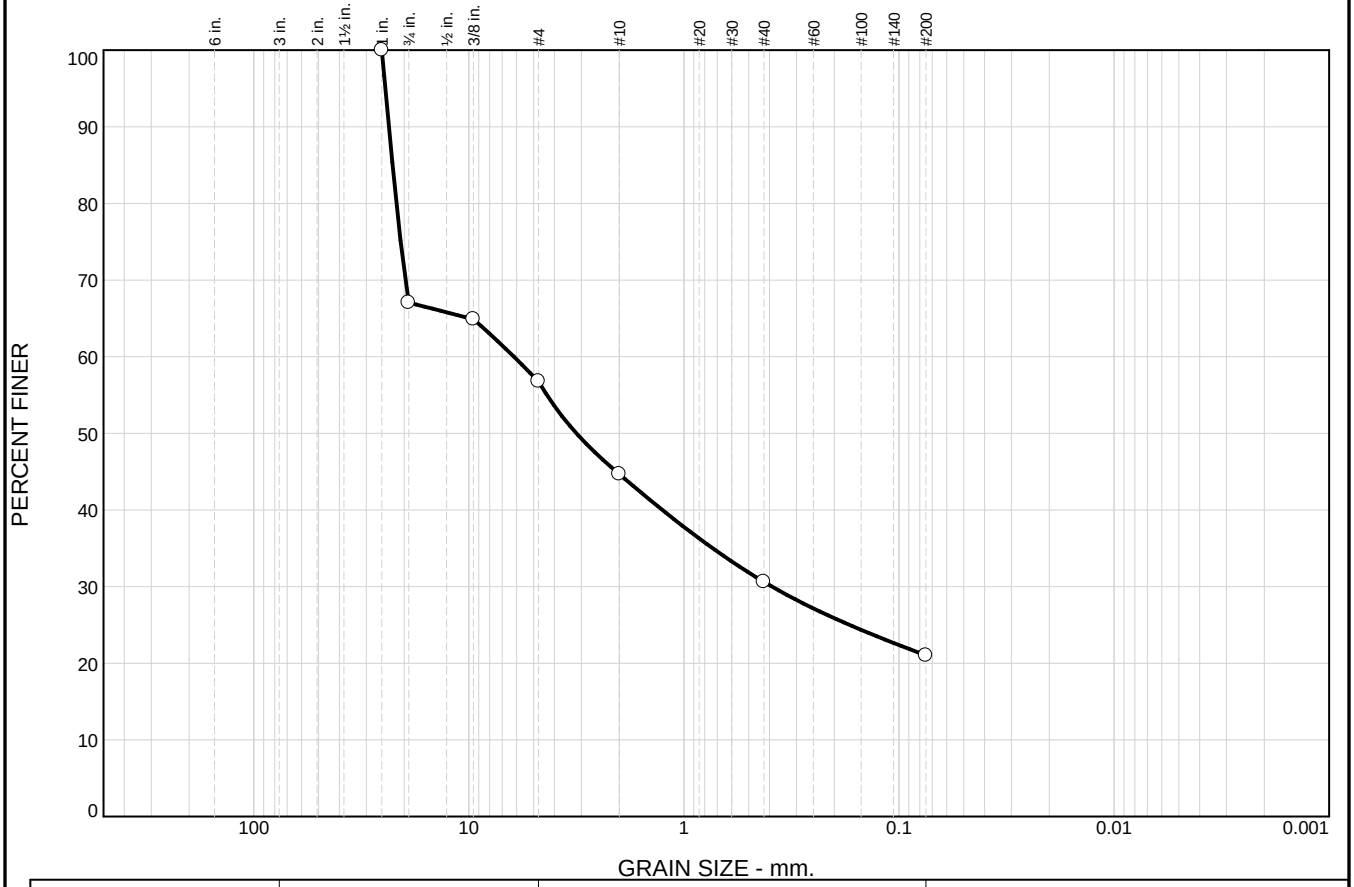
Mt. Laurel, NJ

Remarks:
○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 36

Tested By: BMH 02/13/13 **Checked By:** _____

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	32.9	10.3	12.1	14.1	9.6	21.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			22.6296	6.1735	3.1623	0.3893				

Material Description	USCS	AASHTO
○ BLACK TO BROWN M/C/F SANDY C/F GRAVEL, SM SILT	GM	

Project No. 195651 **Client:** TDI CHAMPLAIN HUDSON POWER EXPRESS - CP

Project: TRANSMISSION DEVELOPERS, INC.

○ **Sample Source:** B135.35-1 **Depth:** 0.0-6.0 FT **Sample No.:** S-1, S-2, & S-3

TRC Engineers, Inc.

Mt. Laurel, NJ

Remarks:
○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 37

Tested By: BMH 02/13/13 **Checked By:** _____

BORING CONTRACTOR: ADT	AECOM		SHEET 1 OF 2
DRILLER: Francisco M.			PROJECT NAME: CHPE -
SOILS ENGINEER/GEOLOGIST: Alexandra Golden	**BORING LOG**		PROJECT NO.: 60323056
LOCATION: Saratoga Springs, NY MP - 134.9			HOLE NO.: **FES-3**
			START DATE: 2/5/2021
			FINISH DATE: 2/5/2021
			OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: Geoprobe 7822DT
No water observed	TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit	NQ	BORING TYPE: SPT/Core
	SIZE I.D.	4"	2.5"	- -	1 7/8"	BORING O.D.: 4.5"/3"
	SIZE O.D.	4.5"	3"	3 7/8"	3"	SURFACE ELEV.:
	HAMMER WT.	140 lbs	140 lbs			LONGITUDE:
	HAMMER FALL	30"	30"			LATITUDE:

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		0'-5'				Hand Cleared		MH		Brown SILT, little clay, trace organics; medium-high plasticity, dry
1.0										
2.0										
3.0										
		3'-5'	S-1							TR-1; (3.0'-5.0')
4.0										
5.0									SILT	
		5'-7'	S-2	24"	15"	6 7 9 6	10	MH		SAA; dry, medium stiff
6.0										TR-2; (5.6-6.0')
7.0										
		7'-9'	S-3	24"	24"	7 7 7 10	5	MH		SAA
8.0										
9.0										
		9'-11'	S-4	24"		7 10 8 11	12	MH		SAA
10.0								SM		10': Brown medium-coarse SAND; dry, uniform
11.0										TR-3; (10.0'-10.5')
		11'-'13'	S-5	24"		10 11 13 11	16	SM		SAA
12.0										
13.0										
		13'-15'	S-6	24"		8 8 11 4	12	SM		SAA, large subangular gravel throughout, poorly sorted
14.0										TR-4; (14.5'-15.17')
15.0									SAND	
		15'-16'	S-7	12"		9 10 14 15	16	SP		Brown-light brown coarse SAND, dry
16.0										
17.0										
18.0										
19.0										
20.0										

NOTES:

(1) Thick-wall ring lined drive sampler (California sampler) used for SPT samples. Rings dimensions = 2-1/2" O.D. by 2-7/16" I.D. by 6" length.

(2) Correction factor: $N_{corr}=N*(2.0^2-1.375^2)in./(3.0^2-2.4^2)in. = N*0.65$.

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

BORING CONTRACTOR: ADT

DRILLER: Francisco M.

SOILS ENGINEER: Alexandra Golden

LOCATION: Saratoga Springs, NY MP - 134.9

AECOM

BORING LOG

SHEET 2 OF 2

PROJECT NAME: CHPE -

PROJECT NO.: 60323056

HOLE NO.: **FES-3**

START DATE: 2/5/2021

FINISH DATE: 2/5/2021

OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		20'-22'	S-8	15"	9"	26 50/3"				SAA
21.0										21.0': Dark gray shale; weak, highly weathered
22.0										
	3	22'-27'	R-1	60"	54"					Dark gray shale, breaks with hammer, fine grain, clastic; iron staining at 23'5"
23.0										
	2									TR-5; (22'2"-22'7.5")
24.0										
	3									
25.0										
	4									
26.0										
27.0										
	4	27'-32'	R-2	60"	56"	RQD: 60%, Rec: 93%				SAA
28.0										
	3									
29.0										
	4									
30.0										
	4								SHALE	
31.0										
32.0										
	4	32'-37'	R-3	60"	60"	RQD: 94%, Rec: 100%				SAA
33.0										
										TR-6; (36'5"-37')
34.0	3									
35.0										
	3									
36.0										
	4									
37.0										
	4.0	37'-40'	R-4	36"	36"	RQD: 96%, Rec: 100%				SAA
38.0										
	3.0									
39.0										
40.0										
										FES -3 terminated at 40'
41.0										
42.0										
43.0										
44.0										
45.0										

NOTES:

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.

SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

BORING CONTRACTOR: ADT

DRILLER: Chris Chaillou

SOILS ENGINEER/GEOLOGIST: Chris French

LOCATION: Fort Edward, NY (CP Rail) MP - 134.95

AECOM

Boring Log

SHEET 1 OF 2

PROJECT NAME: CHPE -

PROJECT NO.: 60323056

HOLE NO.: **FES-3A**

START DATE: 2/11/21

FINISH DATE: 2/11/21

OFFSET: N/A

DRILL RIG: CME LC-55

BORING TYPE: SPT/Core

BORING O.D.: 4.5"/3"

SURFACE ELEV.:

LONGITUDE:

LATITUDE:

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL
Water at 13'	TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit	NQ
	SIZE I.D.	4"	2.5"	- -	1 7/8"
	SIZE O.D.	4.5"	3"	3 7/8"	3"
	HAMMER WT.	140 lbs	140 lbs		
	HAMMER FALL	30"	30"		

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		0'-5'				Hand Cleared					SM		Black fine-coarse SAND, some silt, little subrounded gravel; frozen
1.0											SM		0.6': Dark brown fine-coarse SAND, little silt, little angular-subrounded gravel; medium dense, moist (rubble/fill)
2.0													
3.0											SP		3.5':Light brown medium SAND, little fine sand, trace silt, trace subangular gravel; medium dense, moist
		3'-5'	S-1										TR-1; (3.0'-5.0')
4.0													
5.0													
		5'-7'	S-2	24"	8"	10	12	9	9	14	SP		SAA
6.0													
7.0													
		7'-9'	S-3	24"	14"	6	11	7	10	5	SP		SAA
8.0													7.5': Brown medium-coarse SAND, some fine sand, trace clayey silt; loose, moist
9.0													TR-2; (8.0'-8.5')
		9'-11'	S-4	24"	16"	19	13	13	14	17	SW	SAND and SILT	Brown fine-coarse SAND, little subangular-subrounded gravel, trace silt; medium dense, moist
10.0													
11.0													
		11'-'13'	S-5	24"	13"	13	9	11	15	13	SW		SAA
12.0													TR-3; (12.0'-12.5')
13.0													
		13'-15'	S-6	13"		18	53	45/1"	-	-	SW		Brown fine-coarse SAND, some subrounded-subangular gravel, little fine sand, trace silt; very dense, sasturated
14.0													
15.0													
16.0													
17.0													
	2.5	17'-22'	R-1	60"	55"	RQD: 30"/60"=50%							Dark gray shale, very thinly laminated to very thinly bedded, some quartzite sealed cracks, moderately jointed. Joints from 35°-50°, fractures with oxidation staining at 17.2', 18.4' and 18.7'
18.0												SHALE	
19.0													TR-4; (17.2'-17.9')
20.0													

NOTES:

(1) Thick-wall ring lined drive sampler (California sampler) used for SPT samples. Rings dimensions = 2-1/2" O.D. by 2-7/16" I.D. by 6" length.

(2) Correction factor: $N_{corr}=N*(2.0^2-1.375^2)/(3.0^2-2.4^2)$ in./in. = N*0.65.

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

BORING CONTRACTOR: ADT

DRILLER: Chris Chaillou

SOILS ENGINEER: Chris French

AECOM

Boring Log

SHEET 2 OF 2

PROJECT NAME: CHPE -

PROJECT NO.: 60323056

HOLE NO.: **FES-3A**

START DATE: 2/11/21

FINISH DATE: 2/11/21

LOCATION: Fort Edward, NY (CP Rail) MP - 134.95

OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
21.0										
22.0	2.6	22'-27'	R-2	60"	60"	RQD: 52.5"/60"=88%				22.0'-25.0'; Very lightly jointed 25.0'-27.0'; Lightly jointed
23.0										
24.0										
25.0										
26.0										
27.0	2.4	27'-32'	R-3	60"	58.5"	RQD: 29.5"/60"=49%				27.0'-30.5'; Moderately jointed 30.5'-32.0'; Very heavily jointed TR-5; (29.2'-30.1')
28.0										
29.0										
30.0									SHALE	
31.0										
32.0										
33.0	2.4	32'-37'	R-4	60"	60"	RQD: 18"/60"=30%				32.0'-33.5'; Moderately jointed 33.5'-35.0'; Very heavily jointed 35.0'-37.0'; Moderately jointed
34.0										
35.0										
36.0										
37.0	2.0	37'-40'	R-5	36"	34.5"	RQD: 8.5"/36"=24%				Moderate-heavily jointed throughout (consistantly jointed throughout)
38.0										
39.0										
40.0										
41.0										FES-3A termianted at 40', grouted to surface
42.0										
43.0										
44.0										
45.0										

NOTES:

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.

SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Fort Edward - Saratoga Segment**

Boring No.	Depth (ft.)
FES-3	22.0-40.0

Boring No.	Depth (ft.)
FES-3A	17.0-37.0

Note: Black foam inserts represent core pieces that were removed for geotechnical and/or thermal resistivity laboratory testing

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Fort Edward - Saratoga Segment**

Boring No.	Depth (ft.)
FES-3A	37.0-40.0

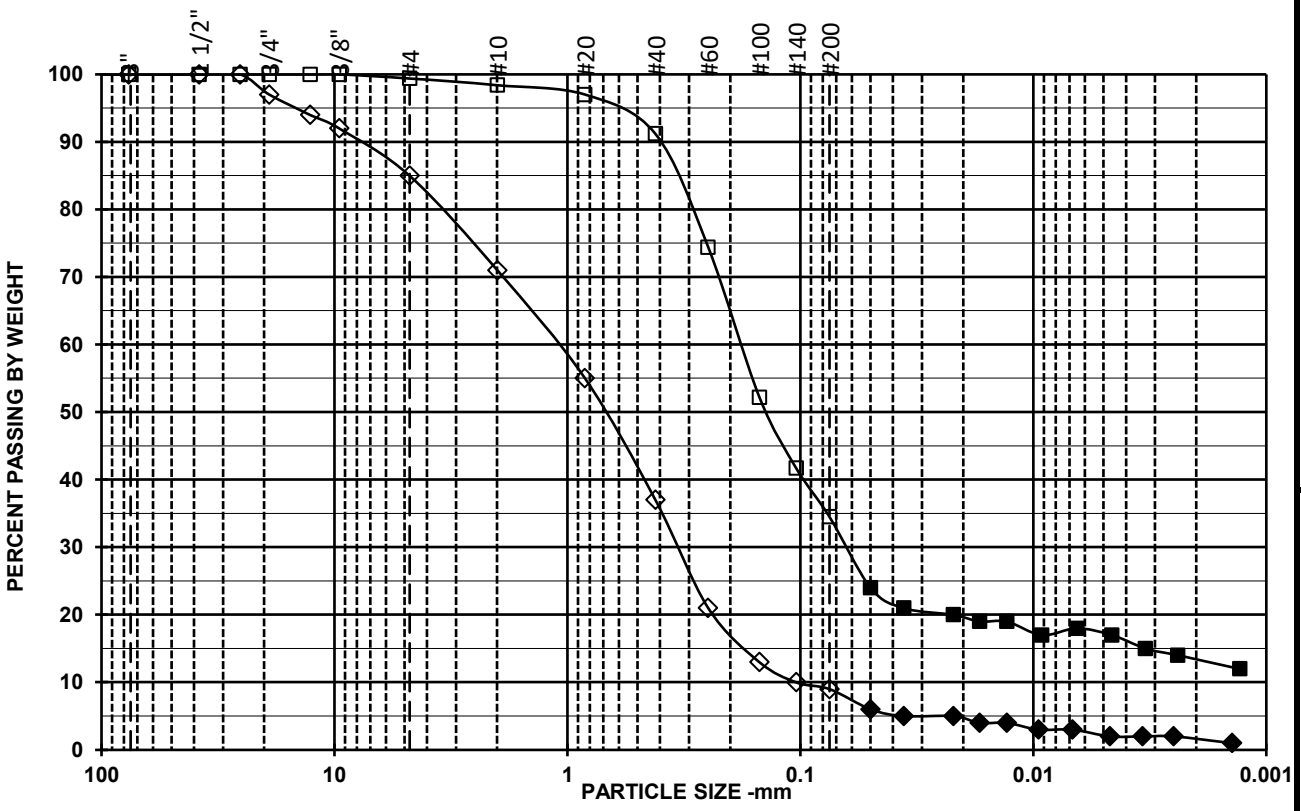
Boring No.	Depth (ft.)
FES-5	29.0-40.0

Note: Black foam inserts represent core pieces that were removed for geotechnical and/or thermal resistivity laboratory testing

Aquifer
CHPE - Ft. Edward - Saratoga Borings
LABORATORY SOIL TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
FES-1	S-2	5-7	18.9				ML	75.9	5	
FES-1	S-4	9-11	19.5				SM	35	4	
FES-3	S-2	7-9	18.4	20	15	5	SC-SM	34.5	13	
FES-3	S-5	13-15	7.0				SW-SM	9	2	
FES-3B	S-3	7-9	15.6				SM	28	7	
FES-3B	S-8	20-22	24.8	42	18	24	CL	80.3	29	
FES-3B	S-10	30-32	19.1	-	16	NP	SP-SM	9.6	3	
FES-5	S-3	7-9	40.2	97	28	69	CH	99	80	
FES-5	S-7	15-17	44.0	84	27	57	CH	100	87	
FES-7	S-3	7-9	26.2				SP-SM	9.6	2	
FES-7	S-7	15-17	23.2				SP-SM	11.2	2	
FES-7	S-10	30-32	54.0	65	21	44	CH	99	67	
FES-9	S-3	7-9	26.3				SM	22.1	2	
FES-9	S-7	15-17	22.6				SM	20.5	3	
FES-9	S-9	25-27	55.4	63	19	44	CH	99	54	
FES-10A	S-3	7-9	11.0				SM	13.1	2	
FES-10A	S-7	15-17	21.3				SM	13.7	3	
FES-10A	S-9	25-27	24.8				SP-SM	8.5	2	
FES-12	S-3	7-9	6.3				SP-SM	6.2	2	
FES-12	S-6	15-17	10.2				SM	43.7	2	
FES-12	S-8	25-27	2.6				SP-SM	6.8	2	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Open Symbols: Sieve analysis by ASTM D6913
Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	18.4	20	15	5	SC-SM		Brown, Silty, clayey sand	03/25/21
◇	7.0				SW-SM		Brown, Well-graded sand with silt and gravel, Insufficient sample size	03/25/21
○								

Aquifer

TerraSense, LLC #7853-21002

CHPE - Ft. Edward - Saratoga Borings

Symbol	□	◇	○
Boring	FES-3	FES-3	
Sample	S-2	S-5	
Depth	7-9	13-15	
% +3"	0	0	
% Gravel	0.6	15	
% SAND	64.9	76	
%C SAND	1	14	
%M SAND	7.2	34	
%F SAND	56.7	28	
% FINES	34.5	9	
D_{100} (mm)	9.53	25.4	
D_{60} (mm)	0.179	1.1	
D_{30} (mm)	0.063	0.33	
D_{10} (mm)		0.1	
Cc		1	
Cu		11	

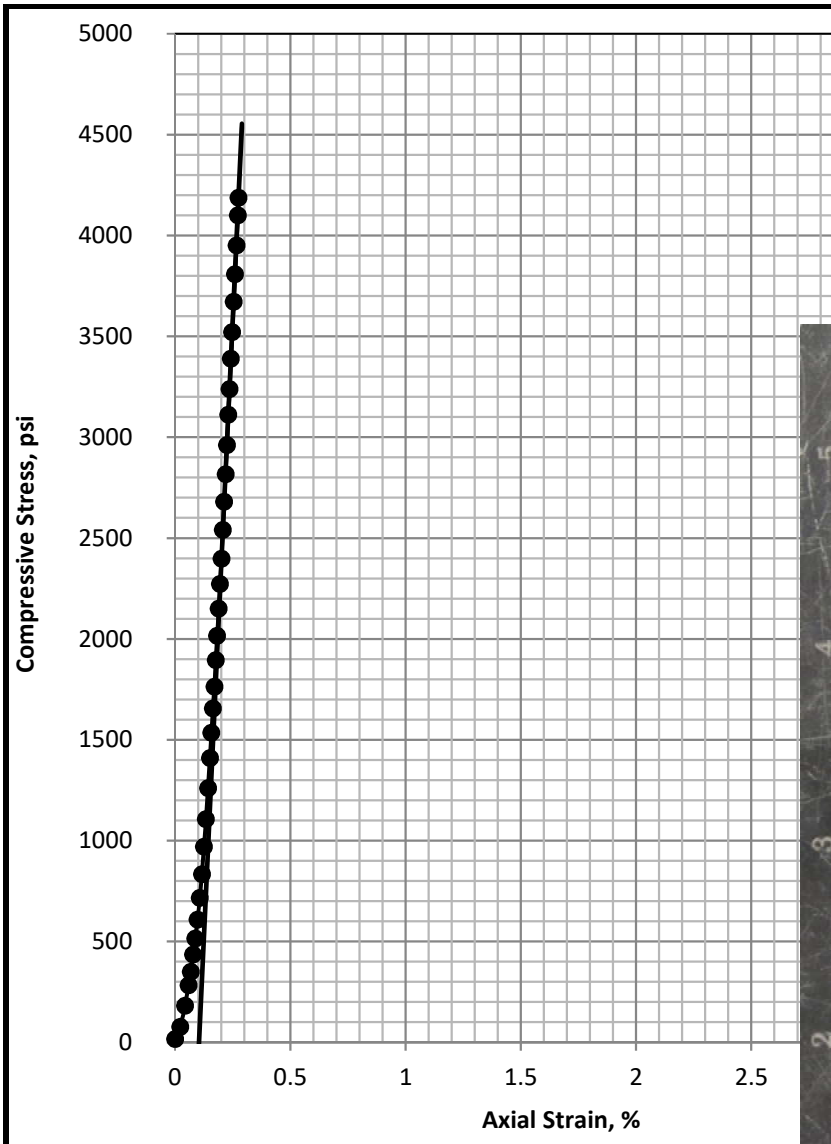
Sieve Size/ID #	Percent Finer Data		
6"	100.0	100	
4"	100.0	100	
3"	100.0	100	
1 1/2"	100.0	100	
1"	100.0	100	
3/4"	100.0	97	
1/2"	100.0	94	
3/8"	100.0	92	
#4	99.4	85	
#10	98.4	71	
#20	97.0	55	
#40	91.2	37	
#60	74.4	21	
#100	52.2	13	
#140	41.7	10	
#200	34.5	9	
5μ m	17	2	
2μ m	13	2	
1μ m	11	0	

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

Aquifer
CHPE - Ft. Edward - Saratoga Borings
SUMMARY OF ROCK TESTING

SAMPLE IDENTIFICATION			STATE PROPERTIES			ENGINEERING PROPERTY TESTS					REMARKS
Boring	Run	Depth	WATER CONTENT (1) (%)	TOTAL UNIT WGT. (pcf)	DRY UNIT WGT. (pcf)	TEST TYPE (2)	Mohs HARDNESS (-)	UNCONFINED COMPRESSION TESTS (ASTM D7012) COMPRESSIVE STRENGTH (psi)	AXIAL STRAIN @ FAILURE (%)	ESTIMATED (5) ELASTIC MODULUS (psi)	
FES-3	R-2	28.0-28.3				M	4.5				
FES-3	R-2	28.55-28.95	0.5	170	169	UC		4190	0.17	2E+06	
FES-3A	R-2	22.0-22.6				M	3.5				
FES-3A	R-2	22.7-23.1	0.6	170	169	UC		5690	0.22	3E+06	
FES-5	R-1	31.1-31.4				M	3				
FES-5	R-1	31.4-31.8	0.6	170	169	UC		3430	0.23	1E+06	

Notes: (1) Water contents determined after trimming and shearing.
(2) Test Type Abbreviations: M: Mohs Hardness, UC: UC Compression test with estimated elastic moduli
(5) Modulus estimated based on corrected gross deformations.



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.45	170	169	4.360	1.971

Specimen meets ASTM D4543 shape tolerances

FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.12	0.17	4190	2E+06

Test by: DM
Test Date: Mar-31-21
Reviewed by: GET

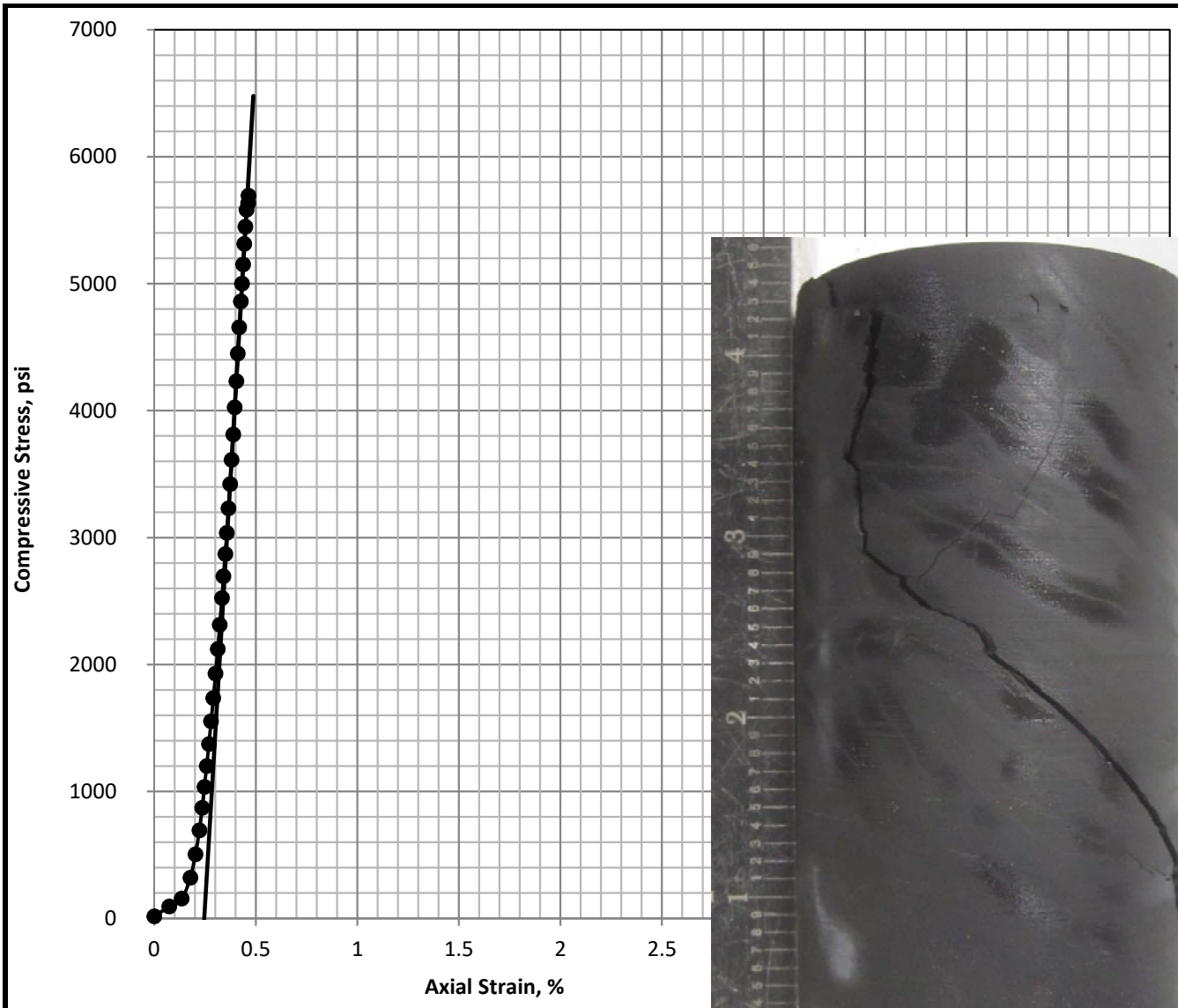
Aquifer

TerraSense, LLC
Project # 7853-21002

CHPE - Ft. Edward - Saratoga Borings

COMPRESSIVE STRESS VS STRAIN
UNCONFINED COMPRESSIVE STRENGTH TEST

Boring: FES-3 Run: R-2
Depth 28.55-28.95 ft.



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.60	170	169	4.364	1.970

Specimen meets ASTM D4543 shape tolerances

FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.11	0.22	5690	3E+06

Test by: DM
Test Date: Mar-31-21
Reviewed by: GET

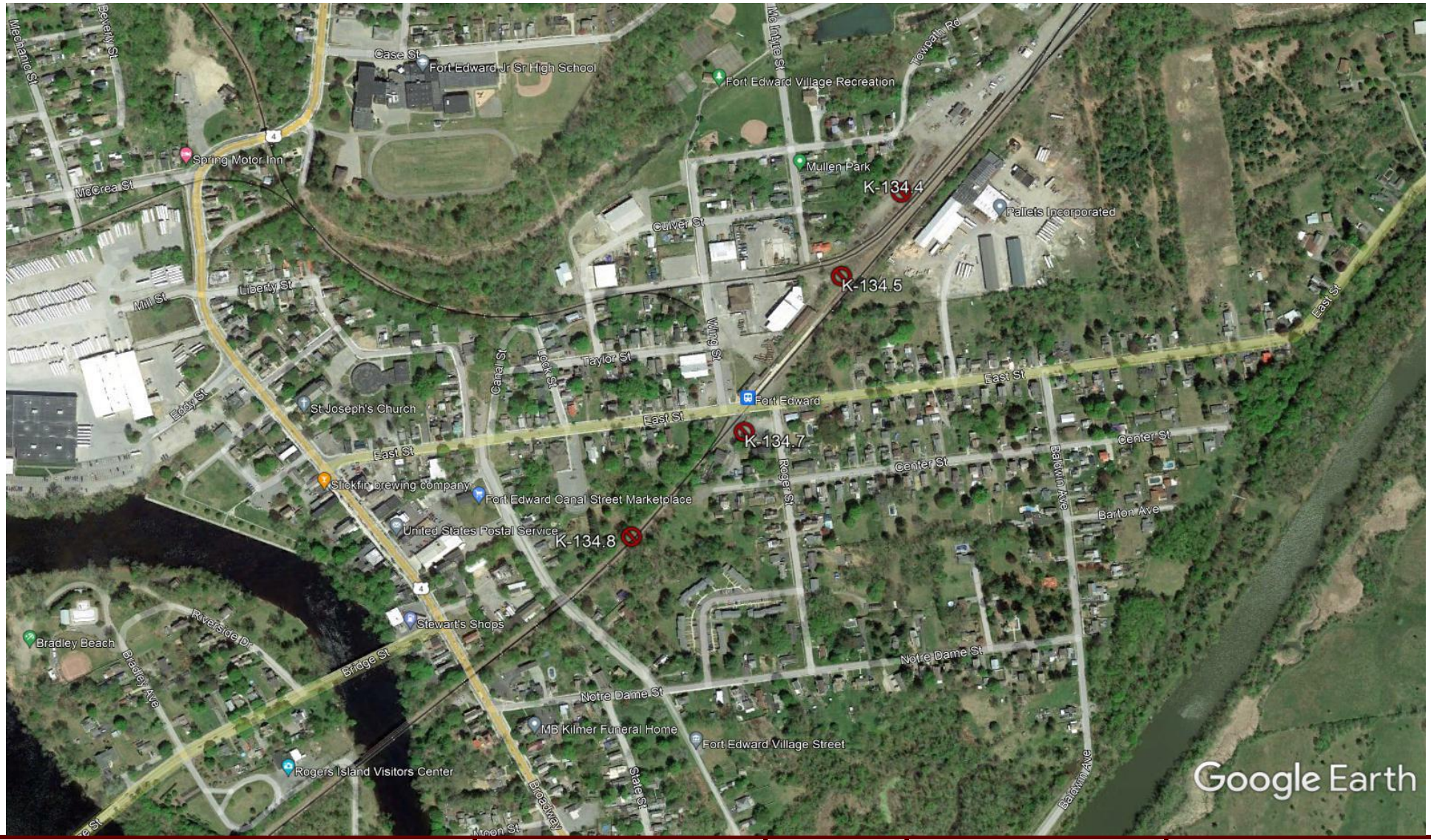
Aquifer

TerraSense, LLC
Project # 7853-21002

CHPE - Ft. Edward - Saratoga Borings

COMPRESSIVE STRESS VS STRAIN
UNCONFINED COMPRESSIVE STRENGTH TEST

Boring: FES-3A Run: R-2
Depth 22.7-23.1 ft.



Boring Location Plans Page 2 of 18	Drawn by: ADW	Scale: Not to scale	Project No.: CD10279	Date: April 2022

Champlain Hudson Power Express
Design Package 3
Glens Falls to Ballston Spa, New York

***ATLANTIC TESTING LABORATORIES*, Limited**

Albany, NY	Binghamton, NY	Canton, NY	Elmira, NY	Plattsburgh, NY
Poughkeepsie, NY	Syracuse, NY	Rochester, NY	Utica, NY	Watertown, NY

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: **CD10279D-01-04-22**

Client: **Kiewit Engineering (NY) Corp.**

Boring Location: **See Boring Location Plan**

Project: **Subsurface Investigation**
Champlain Hudson Power Express, Design Package 3
Various Locations, New York

Start Date: **2/8/2022** Finish Date: **2/8/2022**

Boring No.: **K-134.8** Sheet **1** of **2**

Groundwater Observations

Date	Time	Depth	Casing
2/8/2022	PM	*13.1'	10.0'

Coordinates
Northing **1617015.3**
Easting **736599.6**

Sampler Hammer
Weight: **140** lbs.
Fall: **30** in.
Hammer Type: **Automatic**

Ground Elev.: **146.6**

Boring Advance By:
HW (4") Casing/3 7/8" Wet Rotary

***May be affected by water utilized to advance the borehole.**

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL (f - fine; m - medium; c - coarse; and - 35-50%; some - 20-35%; little - 10-20%; trace - 0-10%)	Recovery (Inches)
1	CASING	1	0.0	2.0	SS	13 6 6 4		Black cmf SAND; and mf GRAVEL; trace SILT (moist, non-plastic) SW	16
2							2.0		
3	CASING	2	2.0	4.0	SS	3 4 6 6		Brown cmf SAND; trace SILT (moist, non-plastic) SW	16
4		3	4.0	6.0	SS	4 5 4 4		Similar Soil (moist, non-plastic) SW	18
6		4	6.0	8.0	SS	4 4 5 5		Similar Soil (moist, non-plastic) SW	18
8							8.0		
8		5	8.0	10.0	SS	4 4 3 3		Brown mf SAND; little CLAY; trace SILT (moist, slightly plastic) w = 16.0% SC	16
10	WET ROTARY							Advanced casing to 10.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
12							12.0		
14		6	14.0	16.0	SS	1 1 1 1		Brown SILT; little cmf SAND; trace CLAY (moist, very slightly plastic) ML	20
17							17.0		
19		7	19.0	21.0	SS	1 1 1 5		Brownish-Grey CLAY; some SILT; trace f SAND (moist, plastic) w = 29.9%, LL = 25, PL = 20, PI = 5, % Fines = 56.5% CL	12
22							22.0		
24		8	24.0	26.0	SS	4 6 3 2		NO RECOVERY	0

SS Split Spoon Sample
NX Rock Core
SH Undisturbed Sample (Shelby Tube)
Estimated Groundwater

Drillers: **Jeffrey Donovan; John Trathen**

Inspector: **James LaMarco (ATL)**

ATL-LOG1 NE CD10279 KIEWIT INFRASTRUCTURE CO - VARIOUS LOCATIONS (PACKAGE 3).GPJ ATL4-08.GDT 6/9/22

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: **K-134.8** Report No.: **CD10279D-01-04-22** Sheet **2** of **2**

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL (f - fine, m - medium, c - course; and - 35-50%, some - 20-35%, little - 10-20%, trace - 0-10%)	RECOVERY (inches)
29		9	29.0	31.0	SS	4 6 5 6		Grey cmf SAND; little mf GRAVEL; little CLAY; trace SILT (wet, slightly plastic) SC	14
32							32.0		
33		N/A	33.0	35.0	SS	16 14 12 16		(3" Brass Lined Split Spoon) NO RECOVERY	0
35		10	35.0	37.0	SS	19 20 26 24		(3" Brass Lined Split Spoon) Grey cmf SAND; little mf GRAVEL; trace SILT (wet, non-plastic) COBBLE Fragments SW	1
37		ST-1A	37.0	39.0	SS	5 4 3 3		(3" Brass Lined Split Spoon) Grey cmf+ SAND; trace SILT; trace f GRAVEL (wet, non-plastic) w = 17.1%, % Fines = 8.3% SP-SM	18
39		ST-1B	39.0	40.0	SS	20 31 50/0"		(3" Brass Lined Split Spoon) Similar Soil (wet, non-plastic) SP-SM	
43		11	43.0	45.0	SS	31 50/0"		NO RECOVERY	0
45							45.0		

Boring terminated at 45.0 feet.

Notes:
1. Borehole backfilled with cement-bentonite grout.
2. Soil classifications based on ATL Field Engineer's field classification.
3. Borehole was advanced with ATL's Geoprobe 7822D7 (Rig Unit No. CDGV706) drill rig.

ATLANTIC TESTING LABORATORIES

LABORATORY TEST SUMMARY TABLE

ATL No. CD10279: Kiewit Infrastructure Co. - Champlain Hudson Power Express - Design Package 3

Boring ID	Sample No.	Sample Depth (ft.)	Soil/Rock Description	Percent Finer No. 200 Sieve	Moisture Content (%)	Atterburg Limits			Organic Content (%)	Water-Soluble Sulfate (ppm)	Water-Soluble Chloride (ppm)	pH	Resistivity (ohm-cm)	Rock Unconfined Compressive Strength (psi)	Rock Splitting Tensile Strength (psi)	Rock CERCHAR Abrasiveness Corrected CAI
						LL	PL	PI								
K-134.4	S-3	4.0 - 6.0	Black cmf GRAVEL; and cmf SAND; trace SILT	--	--	--	--	--	--	600	40	8.14	47,730	--	--	--
	S-6	14.0 - 16.0	Light Brown c-mf SAND; trace SILT; trace m+f GRAVEL	9.4	19.1	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.5 - 26.5	Grey CLAY; and SILT; trace f SAND	99.8	52.9	53	19	34	--	--	--	--	--	--	--	--
	S-10	34.0 - 36.0	Grey CLAY; and SILT; trace f SAND	--	34.4	--	--	--	--	--	--	--	--	--	--	--
K-134.5	S-5	8.0-10.0	Brown mf SAND; trace SILT	--	21.0	--	--	--	--	--	--	--	--	--	--	--
	S-8C	27.0 - 29.0	Brown cm+f SAND; little SILT; trace mf+ GRAVEL	15.0	15.3	--	--	--	--	--	--	--	--	--	--	--
	S-10	34.0-36.0	Brownish-Black cm+f SAND; little mf GRAVEL; trace SILT	7.2	19.2	--	--	--	--	--	--	--	--	--	--	--
K-134.7	S-4	6.0-8.0	Brown cmf SAND; trace SILT; trace CLAY	--	7.6	--	--	--	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brownish-Grey cm+f SAND; little SILT; trace mf GRAVEL; trace CLAY	24.0	16.9	--	--	--	--	--	--	--	--	--	--	--
	S-8	23.0-25.0	Grey cm+f SAND; little SILT; little f GRAVEL; trace CLAY	22.0	12.6	--	--	--	--	--	--	--	--	--	--	--
K-134.8	S-5	8.0-10.0	Brown mf SAND; little CLAY; trace SILT	--	16.0	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0-21.0	Brownish-Grey CLAY; some SILT; trace f SAND	56.5	29.9	25	20	5	--	--	--	--	--	--	--	--
	ST-1	37.0-37.9	Grey cmf+ SAND; trace SILT; trace f GRAVEL	8.3	17.1	--	--	--	--	--	--	--	--	--	--	--
K-136.1	S-5	8.0-10.0	Brownish-Grey CLAY; little SILT; trace f SAND	99.1	40.3	62	23	39	--	--	--	--	--	--	--	--
	S-8	23.0-25.0	Brownish-Grey CLAY; little SILT; trace f SAND	99.5	34.8	34	18	16	--	--	--	--	--	--	--	--
	S-10	34.0-36.0	Black c-m+f SAND; trace SILT ; trace f GRAVEL	8.4	18.6	--	--	--	--	--	--	--	--	--	--	--
K-136.5	S-4	6.0-8.0	Greyish-Brown SILT; some CLAY; little cmf SAND; trace OM	85.0	31.9	29	14	15	--	--	--	--	--	--	--	--
	S-5	8.0-10.0	Greyish-Brown SILT; some CLAY; trace cmf SAND; trace OM	--	--	--	--	--	0.8	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown mf+ SAND; little SILT	15	--	--	--	--	--	--	--	--	--	--	--	--
	RC-2	25.0-30.0	Greyish-Black SHALE	--	--	--	--	--	--	--	--	--	--	3,650	599	1.46
K-136.6	S-4	6.0-8.0	Brown SILT; trace mf SAND; trace CLAY	98.3	39.7	30	19	11	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown f SAND; some SILT	34.0	22.8	--	--	--	--	--	--	--	--	--	--	--
	RC-1	25.0-30.0	Greyish-Black SHALE	--	--	--	--	--	--	--	--	--	--	550	956	2.16

ATLANTIC TESTING LABORATORIES

WBE certified company

LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS

ASTM D 2216

PROJECT INFORMATION

Client: Kiewit Intrastructure Co.
Project: Champlain Hudson Power Express
United Cable Installation
Various Locations, New York

ATL Report No.: CD10279E-04-03-22
Report Date: March 1, 2022
Date Received: February 18, 2022

TEST DATA

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
[redacted]			
K-134.5	S-5 [1]	8-10	21.0
	S-8c [1]	27-29	15.3
	S-10 [1]	34-36	19.2
K-134.7	S-4 [1]	6-8	7.6
	S-6 [1]	14-16	16.9
	S-8	23-25	12.6
K-134.8	S-5	8-10	16.0
	S-7	19-21	29.9
	ST-1	37-39	17.1
K-137.3	S-4	6-8	40.2
	S-6	14-16	33.7
	ST-1	24-26	35.5

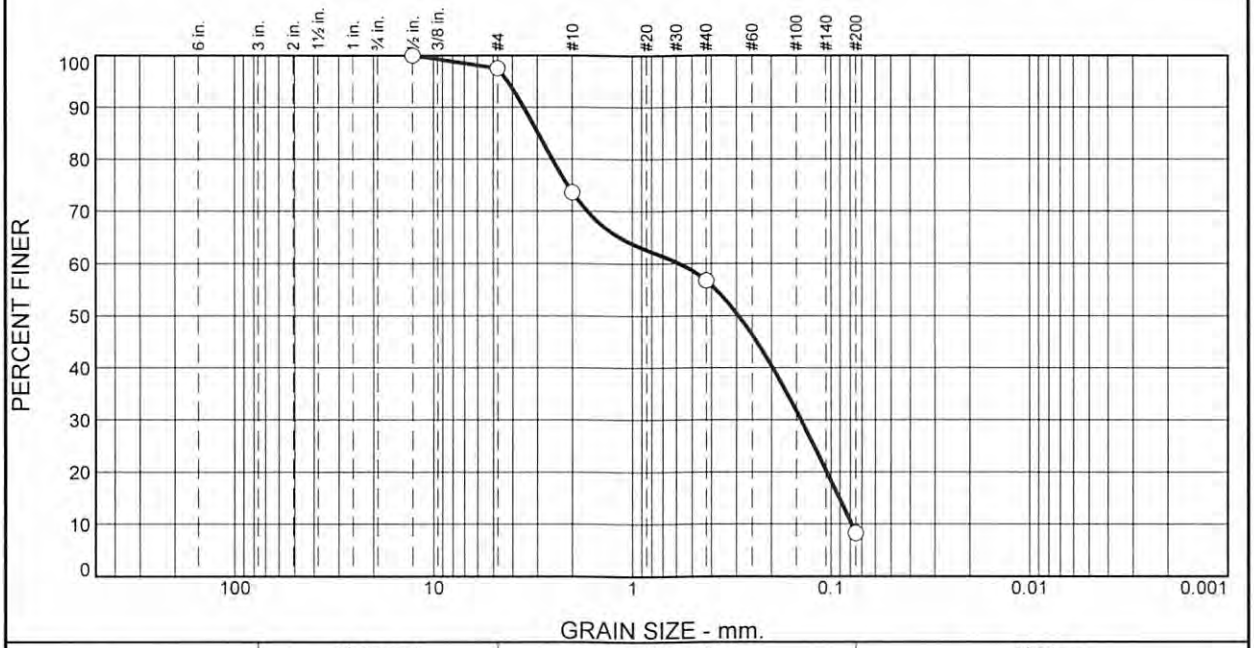
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-04-03-22

Client: Kiewit Intrastructure Co. **Date:** 03/01/22

Sample No: K-134.8, ST-1 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 37-39'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	24	17	49	8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	98		
#10	74		
#40	57		
#200	8.3		

Soil Description

Grey cmf+ SAND; trace SILT; trace f GRAVEL

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D_{85}= 2.9732 D_{60}= 0.5769 D_{50}= 0.2926
D_{30}= 0.1419 D_{15}= 0.0909 D_{10}= 0.0787
C_u= 7.33 C_c= 0.44

Classification

USCS= AASHTO=

Remarks

Moisture Content= 17.1%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: _____ Date: 03/01/22

ATLANTIC TESTING LABORATORIES

WBE certified company

AMOUNT OF MATERIAL IN SOILS FINER THAN THE NO. 200 SIEVE
ASTM D 1140

PROJECT INFORMATION

Client:	Kiewit Intrastructure Co.	**ATL Report No.:**	CD10279E-04-03-22
Project:	Champlain Hudson Power Express	**Report Date:**	March 1, 2022
	United Cable Installation	**Test Date:**	February 18, 2022
	Various Locations, New York	**Performed By:**	A. Rivers

TEST DATA

Boring No.	Sample No.	Depth (ft)	Method (A or B)	Soak Time (min)	Initial Dry Weight (g)	% Finer than #200
K-134.8	S-7	19-21	A	10	73.88	56.5
K-137.3	S-6	14-16	A	10	47.83	96
K-137.3	ST-1	24-26	A	10	145.26	99.8
K-138.0	S-5	8-10	A	10	47.83	94.2
K-138.0	S-8	24-26	A	10	32.88	99.6
K-138.0	S-11	38-40	A	10	81.67	99.8
K-138.5	S-5	8-10	A	10	56.95	97.9
K-138.5	S-8	24-26	A	10	25.91	99.8
K-138.5	S-11	36-38	A	10	85.84	99.2
K-138.6	S-8	24-26	A	10	36.43	99.7
K-138.6	S-10	35-37	A	10	90.96	99.7
K-139.0	S-7	19-21	A	10	37.57	99.1
K-139.0	ST-1	33-35	A	10	111.89	99.5
K-139.1	S-8	24-26	A	10	29.63	99.6
K-139.1	ST-1	38-40	A	10	97.68	99.2

Reviewed By: _____ Date: March 1, 2022

ATLANTIC TESTING LABORATORIES

WBE certified company

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOIL
ASTM D 4318

PROJECT INFORMATION

Client:	Kiewit Instrastructure Co.	**ATL Report No.:**	CD10279E-04-03-22
Project:	Champlain Hudson Power Express	**Report Date:**	March 1, 2022
	United Cable Installation	**Date Received:**	February 18, 2022
	Various Locations, New York		

TEST DATA

Boring No.	Sample No.	LL	PL	PI
[redacted]				
K-134.8	S-7	25	20	5
K-137.3	S-6	38	18	20
K-137.3	ST-1	42	22	20
K-138.0	S-5	77	31	46
K-138.0	S-8	73	27	46
K-138.0	S-11	73	29	44
K-138.5	S-5	70	25	45
K-138.5	S-8	75	25	50
K-138.5	S-11	68	25	43
K-138.6	S-8	73	23	50
K-138.6	S-10	70	23	47
K-139.0	S-7	61	22	39
K-139.0	ST-1	65	24	41
K-139.1	S-8	64	21	43
K-139.1	ST-1	66	20	46

SAMPLE INFORMATION

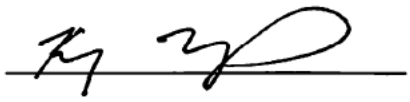
Boring No.	Sample No.	Maximum Grain Size (mm)	Estimated Amount of Sample Retained on No. 40 Sieve (%)	As Received Moisture Content (%)
[redacted]				
K-134.8	S-7	2.38	1	29.9
K-137.3	S-6	4.76	1	33.7
K-137.3	ST-1	0.297	0	35.5
K-138.0	S-5	0.297	0	40.2
K-138.0	S-8	0.297	0	73.5
K-138.0	S-11	0.297	0	61.1
K-138.5	S-5	0.297	0	50.2
K-138.5	S-8	0.297	0	80.8
K-138.5	S-11	0.297	0	69.5
K-138.6	S-8	0.297	0	75.9
K-138.6	S-10	0.297	0	77.7
K-139.0	S-7	0.297	0	62.3
K-139.0	ST-1	0.297	0	77.7
K-139.1	S-8	0.297	0	79.2
K-139.1	ST-1	0.297	0	70.6

PREPARATION INFORMATION

Boring No.	Sample No.	Preparation	Method of Removing Oversized Material
[redacted]			
K-134.8	S-7	Air Dry	Pulverizing and Screening
K-137.3	S-6	Air Dry	Pulverizing and Screening
K-137.3	ST-1	Air Dry	Not Necessary
K-138.0	S-5	Air Dry	Not Necessary
K-138.0	S-8	Air Dry	Not Necessary
K-138.0	S-11	Air Dry	Not Necessary
K-138.5	S-5	Air Dry	Not Necessary
K-138.5	S-8	Air Dry	Not Necessary
K-138.5	S-11	Air Dry	Not Necessary
K-138.6	S-8	Air Dry	Not Necessary
K-138.6	S-10	Air Dry	Not Necessary
K-139.0	S-7	Air Dry	Not Necessary
K-139.0	ST-1	Air Dry	Not Necessary
K-139.1	S-8	Air Dry	Not Necessary
K-139.1	ST-1	Air Dry	Not Necessary

EQUIPMENT INFORMATION

Liquid Limit Procedure:	Multipoint - Method A	X	Single Point - Method B	
Liquid Limit Apparatus:	Manual	X	Motor Driven	
Liquid Limit Grooving Tool Material:	Plastic	X	Metal	
Liquid Limit Grooving Tool Shape:	Flat	X	Curved (AASHTO Only)	
Plastic Limit:	Hand Rolled	X	Mechanical Rolling Device	

Reviewed By: 

Date: 03/01/22

Kiewit

MEMORANDUM

DATE: April 10, 2023

TO: Antonio Marruso, P.E.; CHA Consulting, Inc.

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp. MKH
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 4 – Package 3 – HDD Crossing 24A
Champlain Hudson Power Express Project
Fort Edward, New York

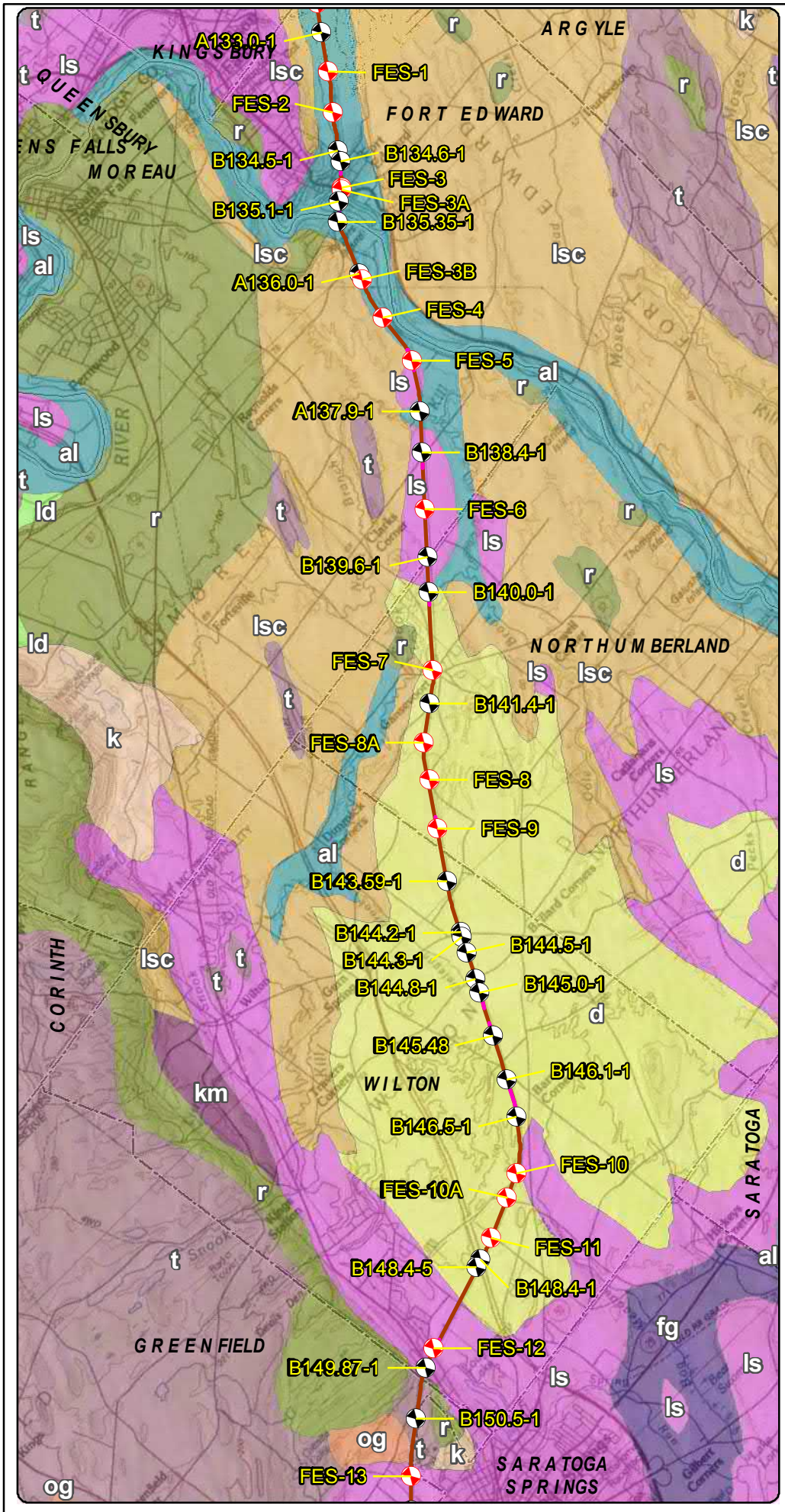
Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located in Fort Edward, New York. The approximate station for the start of HDD crossing 24A is STA 30167+00 (43.2587°N, 73.5927°W).

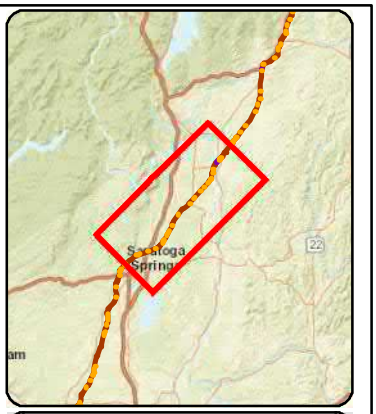
The geotechnical data at this HDD crossing is attached. The available data is from the recent investigation by Terracon, referenced below.

- Terracon, Results of Field Exploration, Champlain-Hudson Power Express – Additional HDD Borings – Phase 3, Fort Ann to Coxsackie, NY, dated November 3, 2022.

Contact us if you have questions or require additional information.

HDD 24A
Borings KB-135.7, KB-135.8
Segment 4 - Design Package 3





LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surficial Geology

- al - Recent alluvium
- d - Dunes
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- pm - Swamp deposits
- r - Bedrock
- t - Till

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

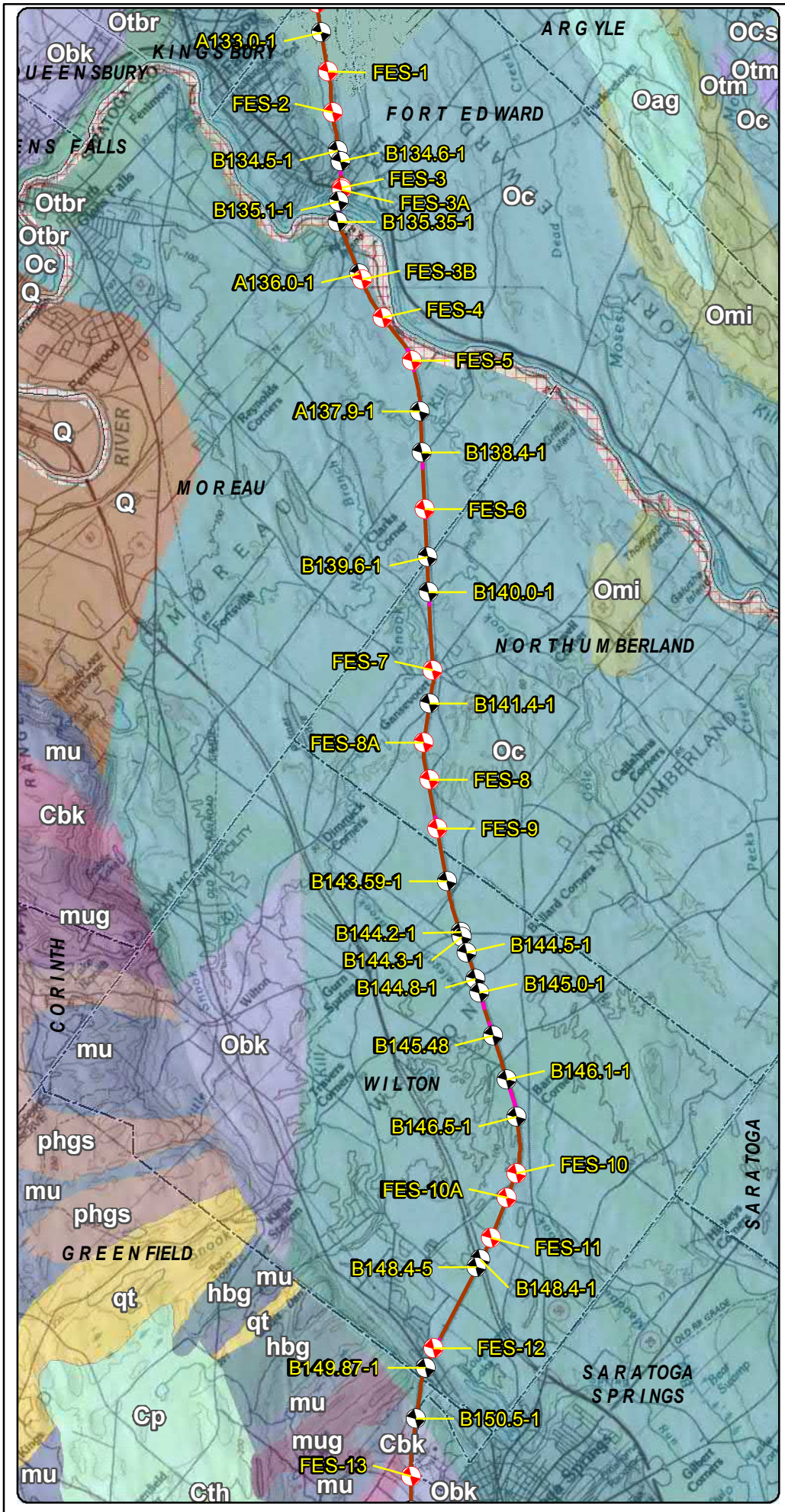
Champlain Hudson Power Express Inc.

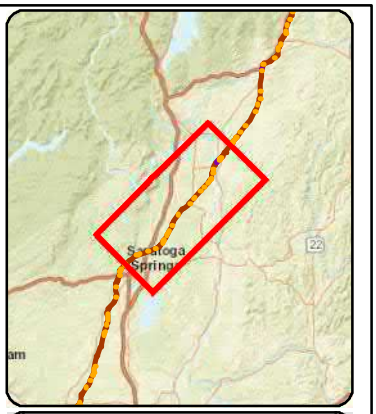
Surficial Geology and Geotechnical Borings
Fort Edward to Saratoga
Figure 3-4

Prepared on 4/29/2021
by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt 5_Routes_DZ_20190908oring_Locations\Maps_for_May_2021_Report\Ft_Edward_to_Saratoga_Boring_Locations_Surficial_May_2021_Report.mxd





LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

- Cbk - Beekmantown Group
- Cp - Potsdam Sandstone
- Cth - Theresa (Galway) Formation
- No Label
- OCs - Cambrian thru Middle Ordovician
- Oag - Austin Glen Form (graywacke, shale)
- Obk - Beekmantown Group
- Oc - Canajoharie Shale
- Omi - Mount Merino Formation
- Otbr - Dolgeville Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- hbg - Biotite/hornblende granite gneiss
- mu - Undivided metasedimentary rock
- mug - Interlayered metasedimentary rock
- phgs - Charnockite, granitic, quartz syenite
- qt - Quartzite

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Fort Edward to Saratoga Figure 4-4

Prepared on 5/18/2021

by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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Terracon GeoReport

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. KB-135.7

PROJECT: CHPE - Additional HDD Borings - Phase 3

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

SITE: Fort Ann to Coxsackie, NY

LOCATION See Exploration Plan

Latitude: 43.258409° Longitude: -73.593209°

Surface Elev.: 155.2847 (Ft.)

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	155									
BALLAST										
CLAYEY GRAVEL WITH SAND (GC), gray, very loose to medium dense						4	4-4-6-4 N=10			
						18	2-1-1-1 N=2	36.6	41-24-17	26
4.0	151.3									
LEAN CLAY (CL), varved silt and clay, gray, very soft			5			24	WH-WH-WH-WH			
						24	WH-WH-WH-WH			
			10			24	WH-WH-WH-WH			
			15			24	WH-WH-WH-WH	41.9	40-21-19	92
			20			24	WH-WH-WH-WH			
			25			24	WH-WH-WH-WH			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4 HSA, Tricone roller bit through weathered rock

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

Logged by JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 84.7% +/-5.0%
Hammer Efficiency Correction (CE): 1.41
WH = Weight of Hammer
Coring performed in offset hole

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 07-25-2022 | Boring Completed: 07-27-2022

Drill Rig: Diedrich D-50 | Driller: S. Morey

Project No.: JB215256G

BORING LOG NO. KB-135.7

PROJECT: CHPE - Additional HDD Borings - Phase 3

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

SITE: Fort Ann to Coxsackie, NY

LOCATION See Exploration Plan

Latitude: 43.258409° Longitude: -73.593209°

Surface Elev.: 155.2847 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		LEAN CLAY (CL), varved silt and clay, gray, very soft *(continued)*					
			24	WH-WH-WH-WH	34.8	35-19-16	97
35.0	120.3						
		WEATHERED SHALE, gray	6	22-50/2"			
		Tricone roller bit to 38 feet					
38.0	117.3						
		SHALE, slightly weathered, extremely close to very close fractured, very poor RQD		REC= 42% RQD = 0%			
43.0	112.3						
		SHALE, slightly weathered, extremely close to close fractured, poor RQD		REC= 100% RQD =28%			
48.0	107.3						
		SHALE, slightly weathered, very close to close fractured, good RQD		REC= 97% RQD =78%			
53.0	102.3						
		SHALE, highly weathered, extremely close to very close fractured, very poor RQD		REC = 100% RQD = 0%			
54.7	100.6						
		Boring Terminated at 54.7 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4 HSA, Tricone roller bit through weathered rock

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

Logged by JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 84.7% +/-5.0%
Hammer Efficiency Correction (CE): 1.41
WH = Weight of Hammer
Coring performed in offset hole

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 07-25-2022 | Boring Completed: 07-27-2022

Drill Rig: Diedrich D-50 | Driller: S. Morey

Project No.: JB215256G

BORING LOG NO. KB-135.8

PROJECT: CHPE - Additional HDD Borings - Phase 3

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

SITE: Fort Ann to Coxsackie, NY

LOCATION See Exploration Plan

Latitude: 43.256835° Longitude: -73.594153°

Surface Elev.: 154.0937 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - SILTY SAND, cinders noted, brown and black			14	3-2-3-3 N=5			
					14	3-2-3-3 N=5	5.6		17
					6	7-50/4"			
6.0	148.1	**sandy topsoil noted at 6'**	5						
		POORLY GRADED SAND (SP), gray, medium dense			10	7-4-6-7 N=10			
10.0	144.1		10						
		LEAN CLAY (CL), varved silt and clay, gray, very soft to soft			16	2-1-1-1 N=2			
			15		24	WH-WH-WH-WH	42.7	39-20-19	94
			20		24	WH-WH-WH-WH			
			25		24	WH-WH-WH-WH			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

Logged by JL
Hammer Efficiency Summary:
Energy Transfer Ratio: 84.7% +/-5.0%
Hammer Efficiency Correction (CE): 1.41
WH = Weight of Hammer

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 07-28-2022 | Boring Completed: 07-28-2022

Drill Rig: Diedrich D-50 | Driller: S. Morey

Project No.: JB215256G

BORING LOG NO. KB-135.8

PROJECT: CHPE - Additional HDD Borings - Phase 3

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

SITE: Fort Ann to Coxsackie, NY

LOCATION See Exploration Plan

Latitude: 43.256835° Longitude: -73.594153°

Surface Elev.: 154.0937 (Ft.)

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), varved silt and clay, gray, very soft to soft *(continued)*									
			30			24	WH-WH-WH-WH	36.8	34-20-14	94
			35			24	WH-WH-WH-WH			
			40			24	WH-WH-WH-WH 3" Spoon with ring samplers	28.3	28-17-11	99
			45			24	3-1-1-1 N=2			
			50			24	WH-WH-WH-WH			
55.0	99.1									
55.7	**WEATHERED ROCK**, weathered shale, dark gray, very dense 98.4		55			6	42-50/2"			
	Boring Terminated at 55.7 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

Logged by JL
Hammer Efficiency Summary:
Energy Transfer Ratio: 84.7% +/-5.0%
Hammer Efficiency Correction (CE): 1.41
WH = Weight of Hammer

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

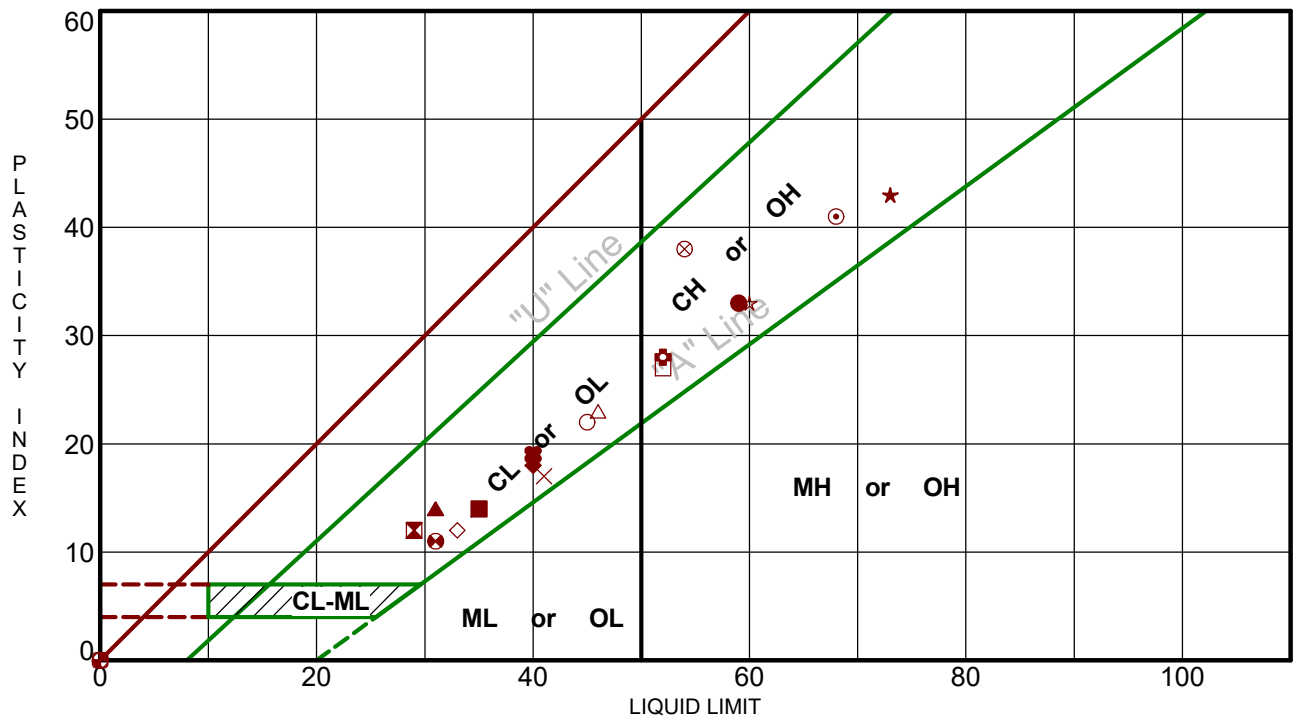
Boring Started: 07-28-2022 | Boring Completed: 07-28-2022

Drill Rig: Diedrich D-50 | Driller: S. Morey

Project No.: JB215256G

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	KB-115.5	15 - 17	59	26	33	86.6	CH	FAT CLAY
⊠	KB-117.6-1.6D	20 - 22	29	17	12	25.5	SC	CLAYEY SAND
▲	KB-117.6-1.6D	35 - 37	31	17	14	48.6	SC	CLAYEY SAND
★	KB-122.9	25 - 27	73	30	43	98.8	CH	FAT CLAY
⊙	KB-122.9	45 - 47	68	27	41	91.5	CH	FAT CLAY
✿	KB-123.0	20 - 22	52	24	28	81.5	CH	FAT CLAY with SAND
○	KB-123.0	35 - 37	45	23	22	75.9	CL	LEAN CLAY with SAND
△	KB-123.0	50 - 52	46	23	23	65.8	CL	SANDY LEAN CLAY
⊗	KB-123.0	65 - 67	54	16	38	91.9	CH	FAT CLAY
⊕	KB-132.1A	4 - 6	NP	NP	NP	10.0	SP-SM	POORLY GRADED SAND with SILT and GRAVEL
□	KB-132.1A	15 - 17	52	25	27	96.9	CH	FAT CLAY
⊛	KB-132.1A	30 - 32	31	20	11	100.0	CL	LEAN CLAY
◕	KB-132.3A	4 - 6	NP	NP	NP	31.7	SM	SILTY SAND
☆	KB-132.3A	15 - 17	60	27	33	88.6	CH	FAT CLAY
❀	KB-132.3A	30 - 32	NP	NP	NP	53.0	ML	SANDY SILT with GRAVEL
■	KB-132.5A	4 - 6	35	21	14	94.3	CL	LEAN CLAY
◆	KB-132.5A	30 - 32	40	22	18	98.7	CL	LEAN CLAY
◇	KB-132.5A	45 - 47	33	21	12	94.9	CL	LEAN CLAY
×	KB-135.7	2 - 4	41	24	17	26.1	GC	CLAYEY GRAVEL with SAND
✖	KB-135.7	15 - 17	40	21	19	91.9	CL	LEAN CLAY

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

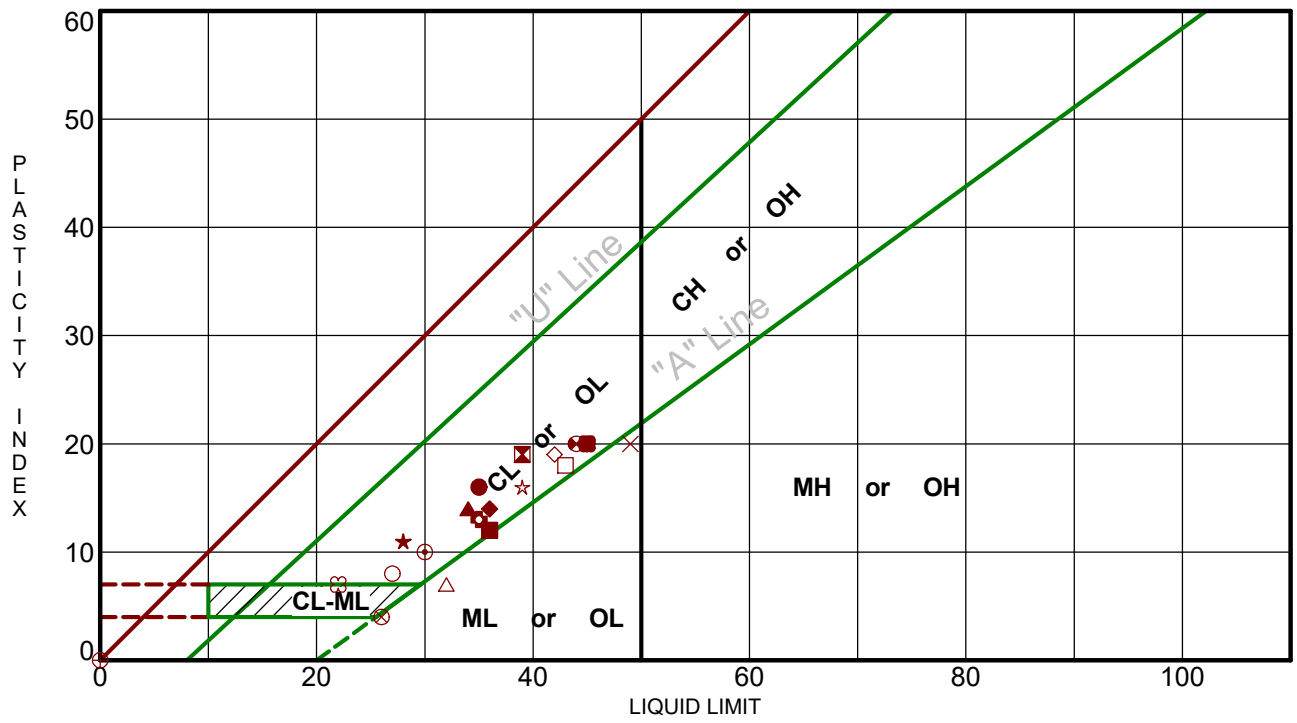
SITE: Fort Ann to Coxsackie, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	KB-135.7	30 - 32	35	19	16	96.6	CL	LEAN CLAY
⊠	KB-135.8	15 - 17	39	20	19	93.6	CL	LEAN CLAY
▲	KB-135.8	30 - 32	34	20	14	94.2	CL	LEAN CLAY
★	KB-135.8	40 - 42	28	17	11	99.5	CL	LEAN CLAY
⊙	KB-182.7B	20 - 22	30	20	10	98.6	CL	LEAN CLAY
✿	KB-182.7B	50 - 52	35	22	13	98.6	CL	LEAN CLAY
○	KB-182.7B	80 - 82	27	19	8	98.3	CL	LEAN CLAY
△	KB-184.9	10 - 12	32	25	7	86.1	ML	SILT
⊗	KB-185.4	6 - 8	26	22	4	87.4	ML	SILT
⊕	KB-185.4	20 - 21.5	NP	NP	NP	15.8	SM	SILTY SAND
□	KB-192.4	15 - 17	43	25	18	87.5	CL	LEAN CLAY
⊠	KB-192.4	25 - 27	44	24	20	97.7	CL	LEAN CLAY
◕	KB-192.4	45 - 47	45	25	20	92.4	CL	LEAN CLAY
☆	KB-192.8B	15 - 17	39	23	16	81.8	CL	LEAN CLAY with SAND
✿	KB-192.8B	50 - 50.2	22	15	7	26.0	SC-SM	SILTY, CLAYEY SAND
■	KB-194.0-3.6B	5 - 7	36	24	12	89.4	CL	LEAN CLAY
◆	KB-194.0-3.6B	30 - 32	36	22	14	95.7	CL	LEAN CLAY
◇	KB-194.0-3.6B	50 - 52	42	23	19	95.7	CL	LEAN CLAY
×	KB-194.0-3.6B	70 - 72	49	29	20	91.9	ML	SILT
✖	KB-194.0-3.9B	4 - 6	45	25	20	76.6	CL	LEAN CLAY with SAND

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

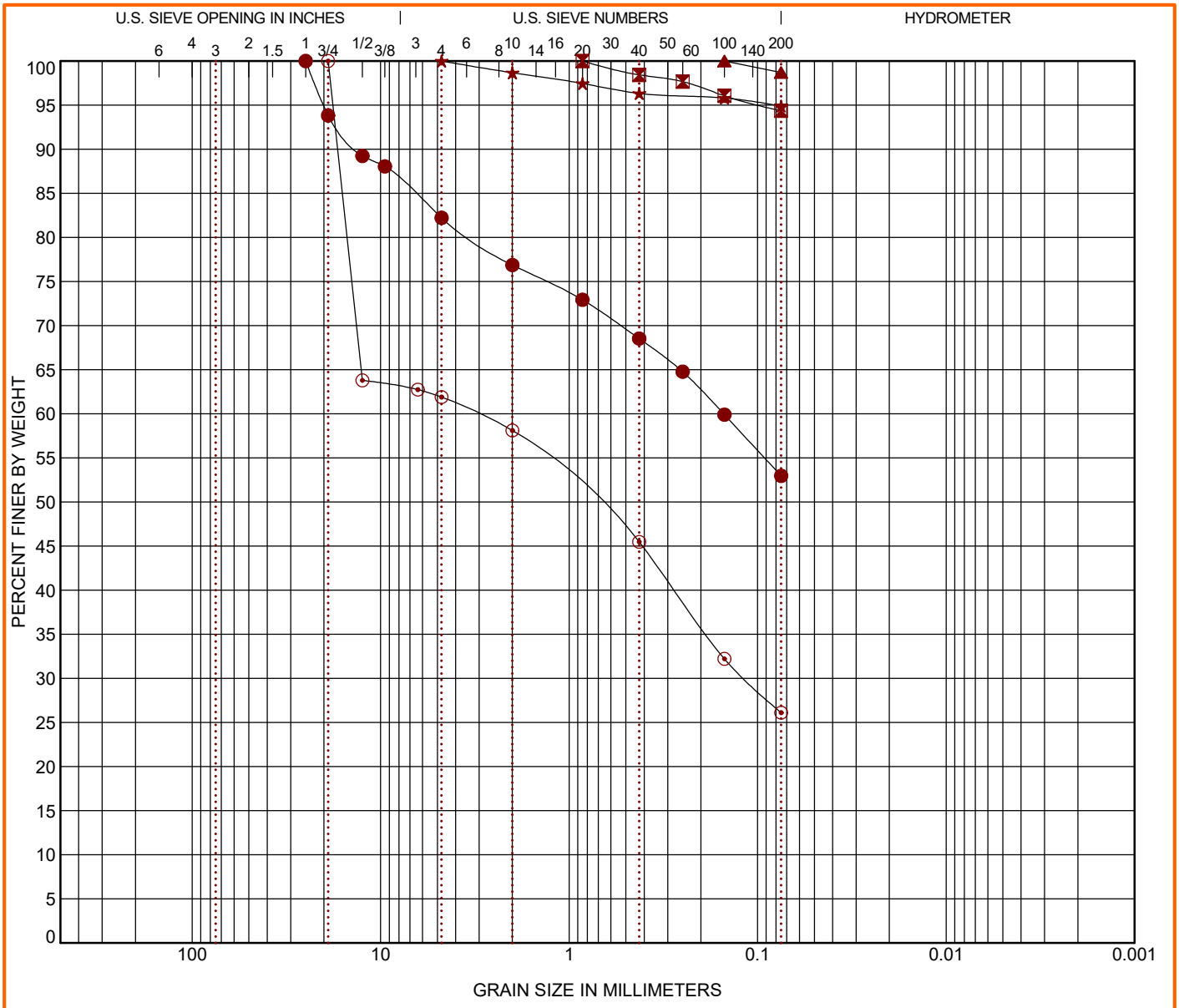
SITE: Fort Ann to Coxsackie, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-132.3A	30 - 32	SANDY SILT with GRAVEL (ML)	37.2	NP	NP	NP		
⊠	KB-132.5A	4 - 6	LEAN CLAY (CL)	17.4	35	21	14		
▲	KB-132.5A	30 - 32	LEAN CLAY (CL)	38.8	40	22	18		
★	KB-132.5A	45 - 47	LEAN CLAY (CL)	38.2	33	21	12		
⊙	KB-135.7	2 - 4	CLAYEY GRAVEL with SAND (GC)	36.6	41	24	17		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-132.3A	30 - 32	25	0.152			0.0	17.8	29.3		53.0	
⊠	KB-132.5A	4 - 6	0.85				0.0	0.0	5.7		94.3	
▲	KB-132.5A	30 - 32	0.15				0.0	0.0	1.3		98.7	
★	KB-132.5A	45 - 47	4.75				0.0	0.0	5.1		94.9	
⊙	KB-135.7	2 - 4	19	3.082	0.117		0.0	38.1	35.8		26.1	

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

SITE: Fort Ann to Coxsackie, NY

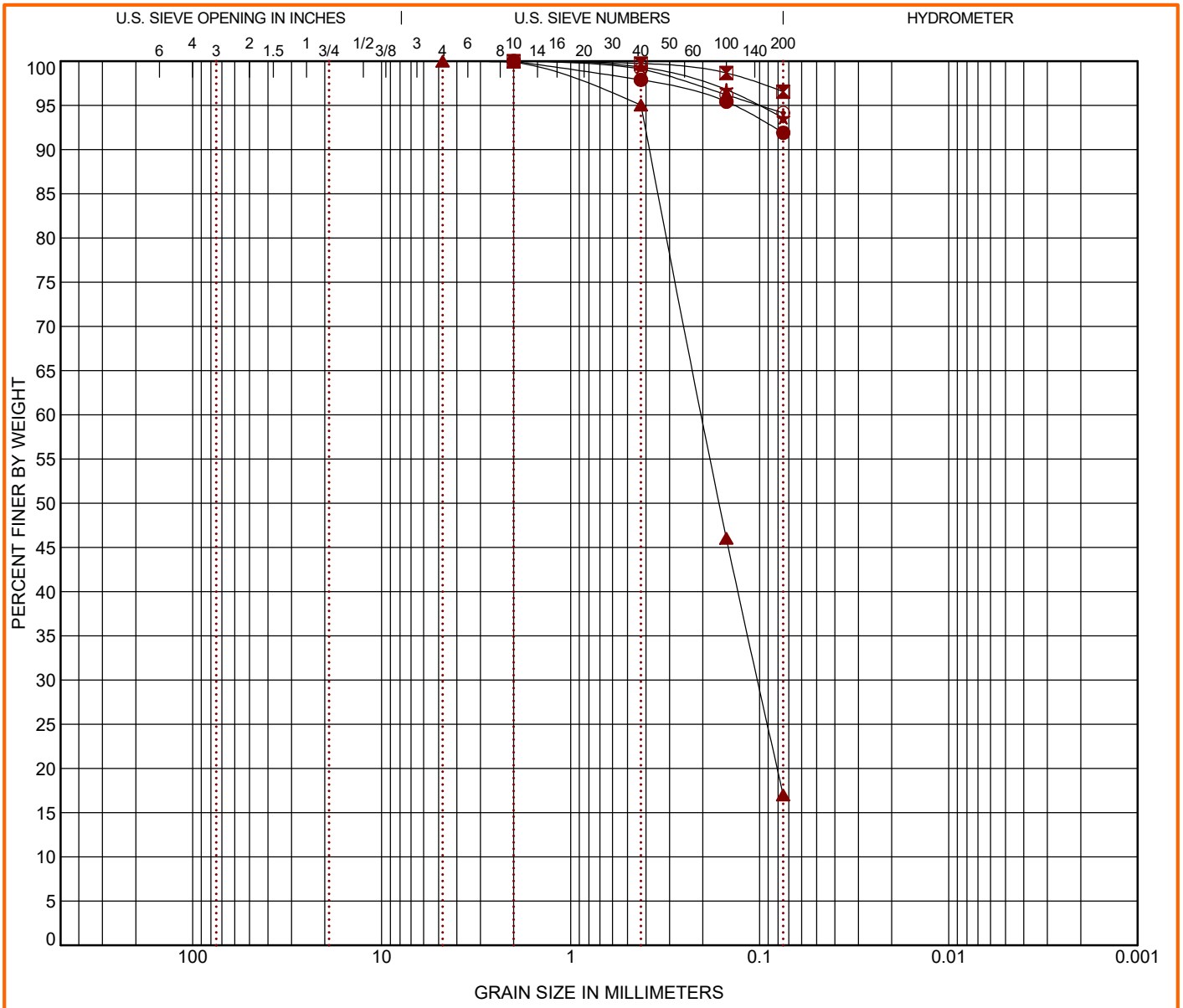
Terracon
30 Corporate Cir Ste 201
Albany, NY

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256G CHPE - ADDITIONAL.GPJ TERRACON_DATATEMPLATE.GDT 11/2/22

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-135.7	15 - 17	LEAN CLAY (CL)	41.9	40	21	19		
⊠	KB-135.7	30 - 32	LEAN CLAY (CL)	34.8	35	19	16		
▲	KB-135.8	2 - 4	SILTY SAND (SM)	5.6					
★	KB-135.8	15 - 17	LEAN CLAY (CL)	42.7	39	20	19		
⊙	KB-135.8	30 - 32	LEAN CLAY (CL)	36.8	34	20	14		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-135.7	15 - 17	2				0.0	0.0	8.1		91.9	
⊠	KB-135.7	30 - 32	2				0.0	0.0	3.4		96.6	
▲	KB-135.8	2 - 4	4.75	0.202	0.102		0.0	0.0	83.0		17.0	
★	KB-135.8	15 - 17	2				0.0	0.0	6.4		93.6	
⊙	KB-135.8	30 - 32	2				0.0	0.0	5.8		94.2	

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

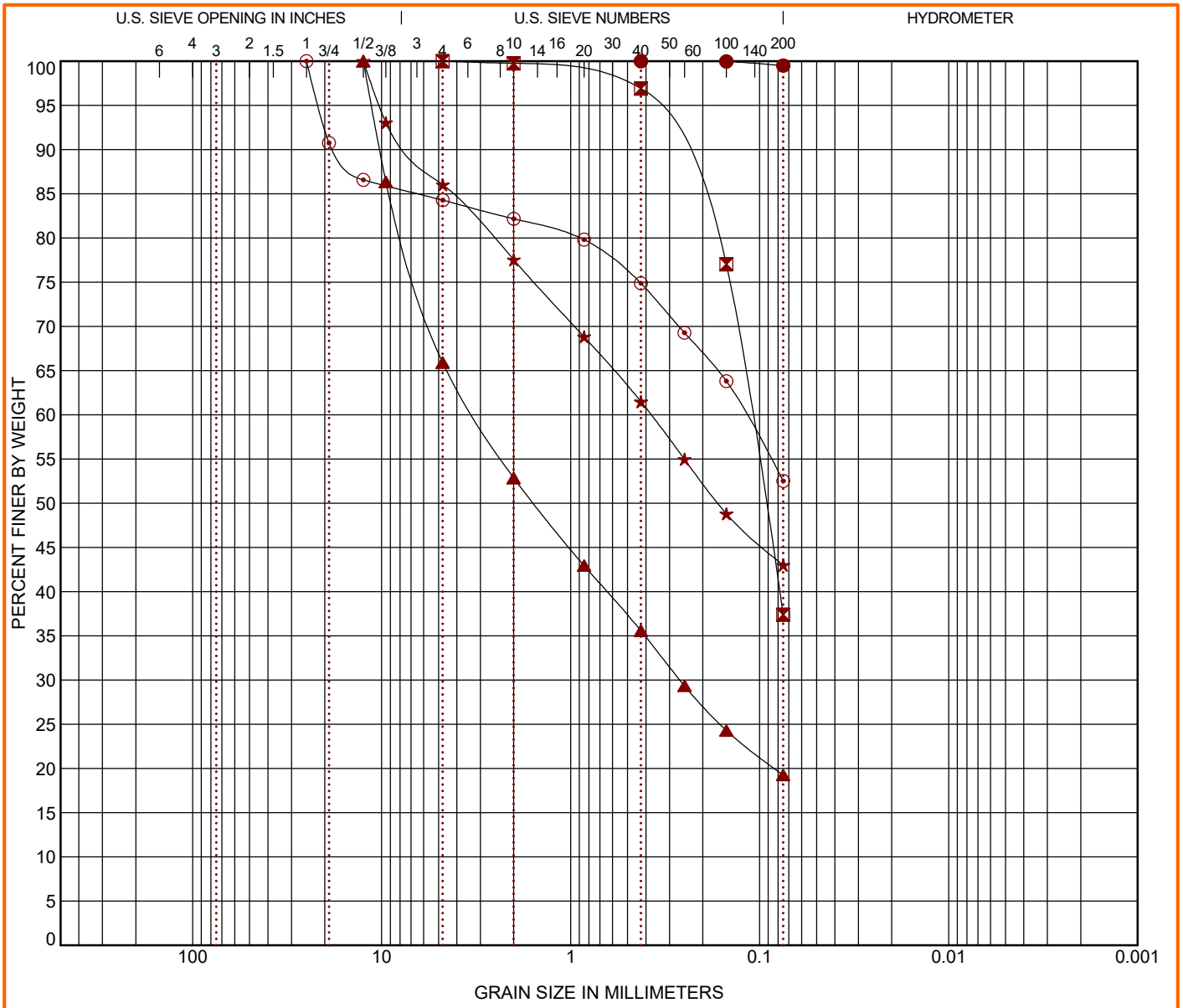
SITE: Fort Ann to Coxsackie, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-135.8	40 - 42	LEAN CLAY (CL)	28.3	28	17	11		
⊠	KB-160.6	2 - 4	SILTY SAND (SM)	12.2					
▲	KB-163.1	4 - 6	SILTY SAND with GRAVEL (SM)	11.7					
★	KB-163.2	8 - 10	SILTY SAND (SM)	12.1					
⊙	KB-169.0-3.3	6 - 8	SILTY SAND with GRAVEL (SM)	12.0					

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-135.8	40 - 42	0.425				0.0	0.0	0.5		99.5	
⊠	KB-160.6	2 - 4	4.75	0.111			0.0	0.0	62.6		37.4	
▲	KB-163.1	4 - 6	12.5	3.213	0.264		0.0	34.1	46.6		19.3	
★	KB-163.2	8 - 10	12.5	0.376			0.0	14.0	43.0		43.0	
⊙	KB-169.0-3.3	6 - 8	25	0.119			0.0	15.7	31.8		52.5	

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

SITE: Fort Ann to Coxsackie, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

Rock Core – Boring KB-135.7

Rock Core – Boring KB-160.6 Runs 1 through 3

Kiewit

MEMORANDUM

DATE: December 7, 2022

TO: Antonio Marruso, P.E.; CHA Consulting, Inc.

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp.
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 4 - Package 3 - HDD Crossing 25 – Revision 1
Champlain Hudson Power Express Project
Fort Edward, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located south of Fort Edward, New York. The approximate station for the start of HDD crossing Number 25 is STA 30187+00 (43.2542°N, 73.5958°W).

The geotechnical data at this HDD crossing is attached. The available data is from the previous investigations by AECOM and TRC and from recent investigations by Atlantic Testing Laboratories (ATL) and Kiewit, referenced below. This report will be revised to include final boring logs and laboratory data from the Kiewit investigation when available.

- AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 113.1-177.1, dated March 29, 2013.
- Atlantic Testing Laboratories, Subsurface Investigation Services, Champlain Hudson Power Express, Design Package 3, Glens Falls to Ballston Spa, New York, dated June 15, 2022.
- Kiewit Draft Boring Logs, November 2022.

Contact us if you have questions or require additional information.

HDD 25
Borings A136.0-1, K-136.1,
FES-3B, KB-136.2, KB-136.3
Segment 4 - Design Package 3

CHPE Segments 4 & 5 - Package 3
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A136.0-1	1611762.7	732951.9	146.6
	B134.5-1	1618254.8	737493.3	137.7
	B134.6-1	1617614.3	737160.7	140.2
	B135.1-1	1615942.5	735298.2	130.7
	B135.35-1	1615043.9	734326.1	147.7
	B137.9-1	1602848.9	729488.6	157.2
	B140.0-1	1594313.7	721767.2	205.0
	B144.2-1	1577578.6	707868.0	307.5
	B144.3-1	1577307.0	707733.5	307.4
	B144.5-1	1576380.0	707249.6	308.5
	B144.8-1	1574825.2	706447.7	310.8
	B145.0-1	1574014.3	706034.4	312.7
	B145.48	1571450.2	704693.3	320.4
	B146.1-1	1568896.3	703364.4	321.4
	B146.5-1	1566773.3	702083.1	323.6
	B148.4-1	1561976.4	694067.5	326.0
	B148.4-5	1561817.7	693531.9	327.4
	B149.87-1	1559610.1	686723.2	325.2
	B151.58-1	1553784.9	679646.1	336.4
	B152.6-0	1550004.2	676432.6	329.3
	B153.1-1	1547302.8	676031.8	322.5
	B154.3-1	1541375.5	674232.0	321.5
	B155.2-1	1536685.4	674403.7	313.7
	B155.7-1	1534202.1	674175.1	340.0
	B157.9-1	1524284.2	668932.6	246.0
	B158.1-1	1523474.2	668924.1	243.0
	B158.22-1	1522640.9	669168.4	279.1
AECOM**	BM-1A	1521184.8	669107.0	292.4
	FES-3	1616410.4	736040.4	143.9
	FES-3A	1616311.4	735904.6	139.3
	FES-3B	1611359.3	732784.5	142.5
	FES-4	1608699.4	732017.0	142.6
	FES-5	1605493.6	731399.7	147.1
	FES-6	1598212.9	725299.3	174.4
	FES-9	1583302.9	711497.9	271.6
	FES-10A	1563547.6	698025.3	321.4
	FES-12	1560130.5	687972.2	322.5
	SB-1A	1547803.7	676160.2	321.0
	SB-1B	1551257.2	677175.4	327.5
	SB-2	1545717.0	675698.7	316.3
	SB-3	1540348.5	674275.0	322.4

Notes:

- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.

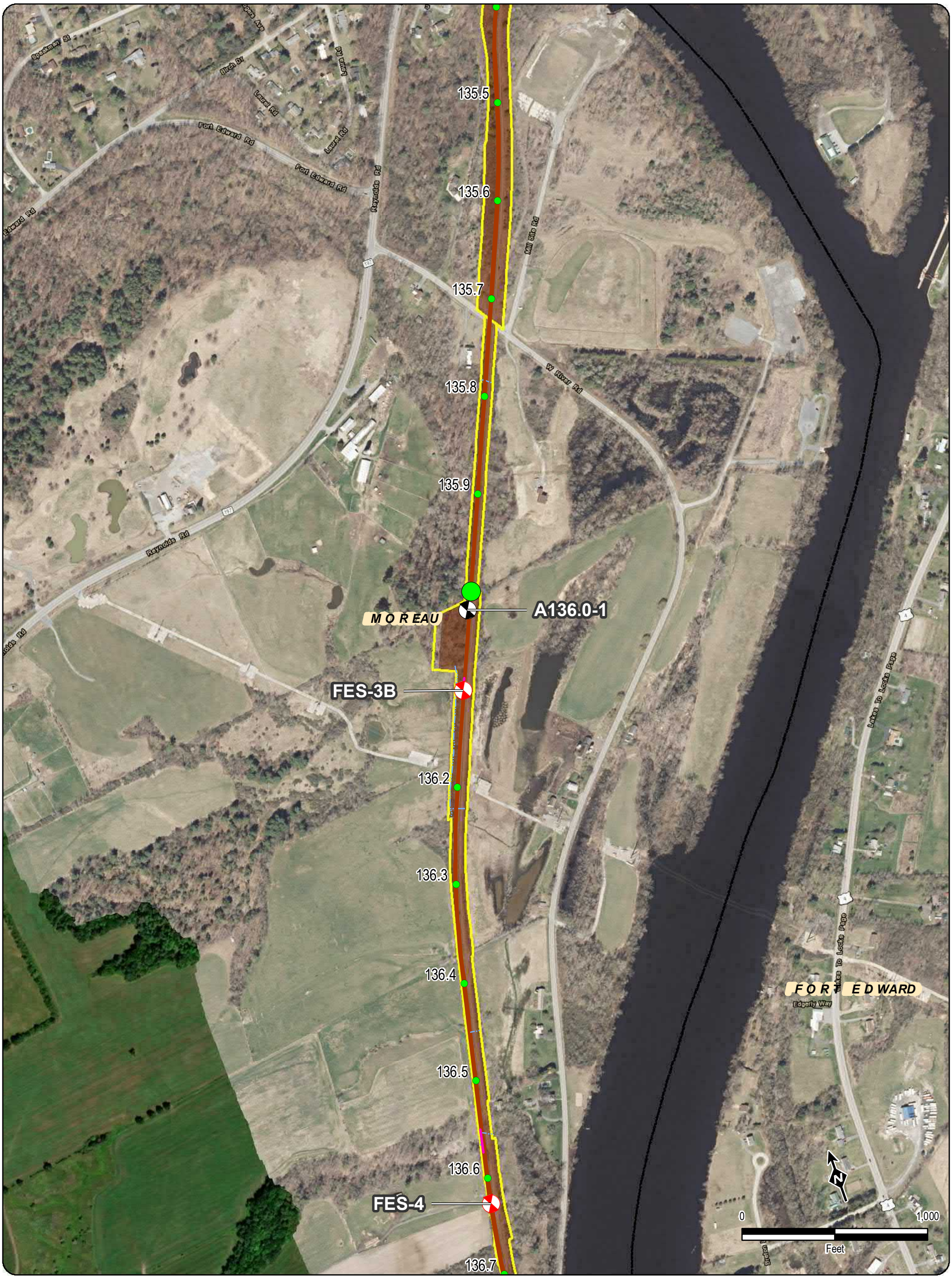
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

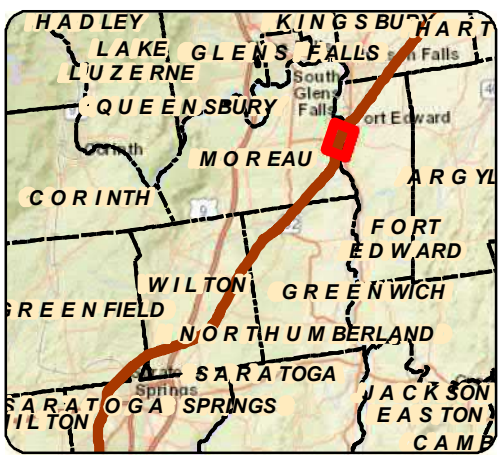
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.

*** Kiewit boring coordinates and elevations are noted on the boring logs.

Reference:

AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.





111.8 Certified Milepost - Tenths

135 Certified Milepost

111.8 Preferred Alternative Milepost - Tenths

135 Preferred Alternative Milepost

Terrestrial Route HVDC

Submarine Route HVDC

Terrestrial Route HVAC

Preliminary HDD Locations

Preliminary Pipe Bridge Location

2021 Boring Location

Previous (2013) Boring Location

LEGEND

Streams/Ditches

Railroad ROW

Deviation Zone

Deviation Zone Outside ROW

Preferred Alternative Deviation Zone

Preferred Alternative Deviation Zone Outside ROW

Town Boundary

Village Boundary

State Park (OPRHP)

Parcel Ownership

TOWN NAME

Road Name

Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Fort Edward to Saratoga

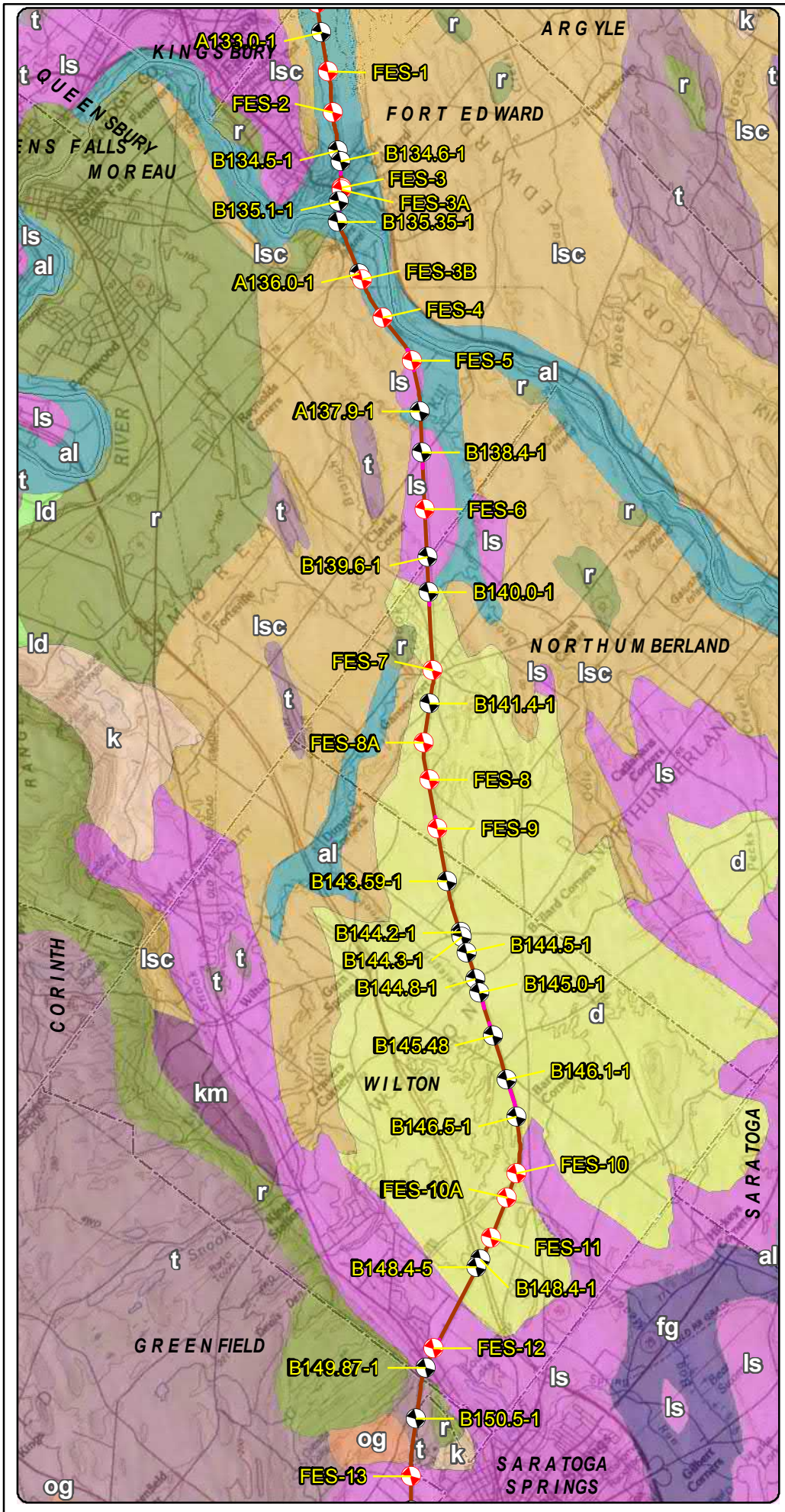
Figure A-4

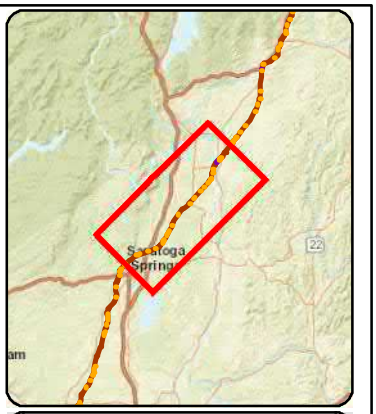
Sheet 3 of 15

Prepared by: AECOM 5/19/2021

DATA SOURCES: ESRI, NETWORK MAPPING 2010, NYSDOT, OPRHP, TDI, TRC

Y:\Projects\CHPEI\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Ft_Edward_to_Saratoga_Boring_Locations_Mapset_May_2021_Report.mxd





LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surficial Geology

- al - Recent alluvium
- d - Dunes
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- pm - Swamp deposits
- r - Bedrock
- t - Till

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

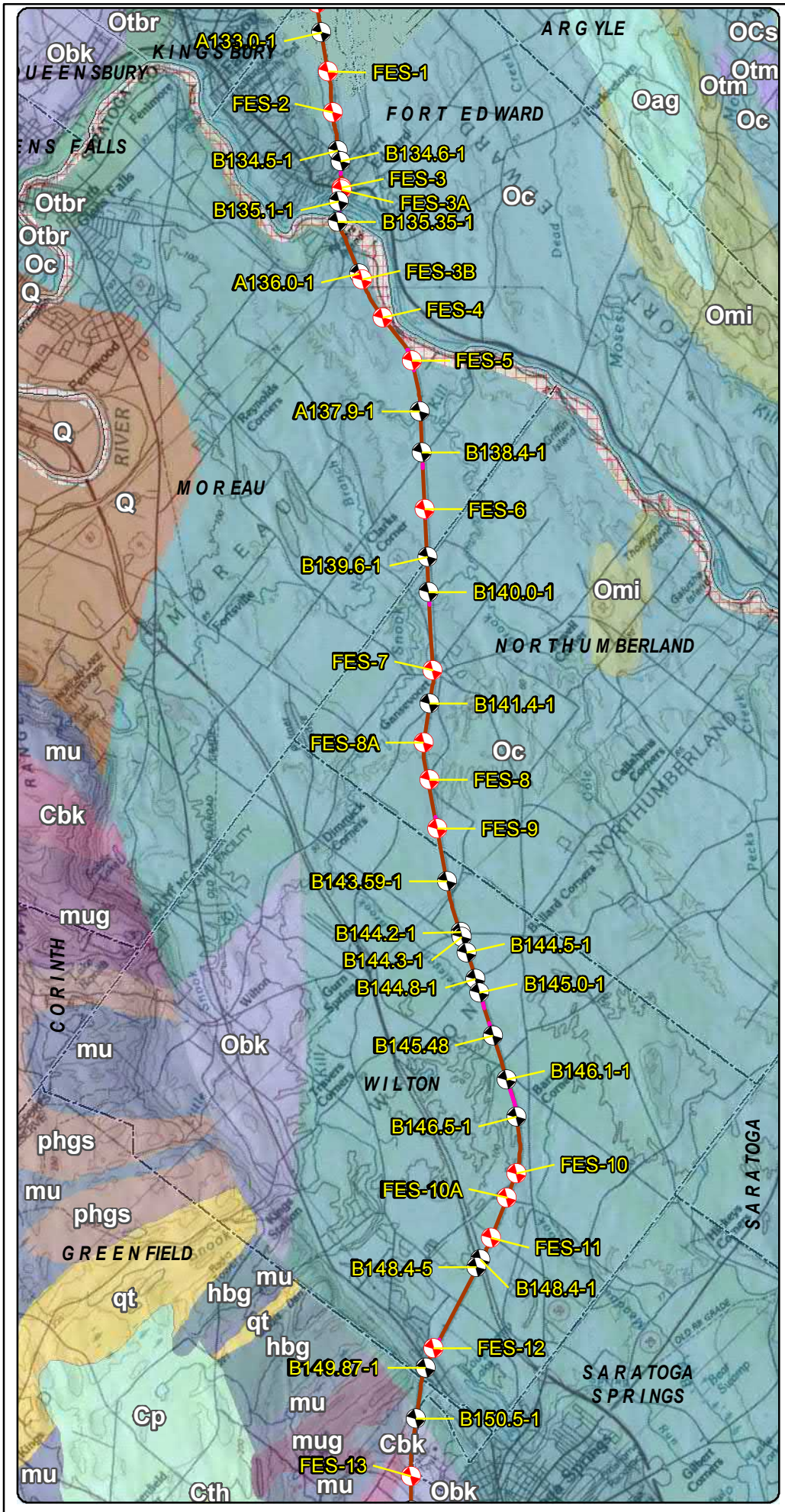
Champlain Hudson Power Express Inc.

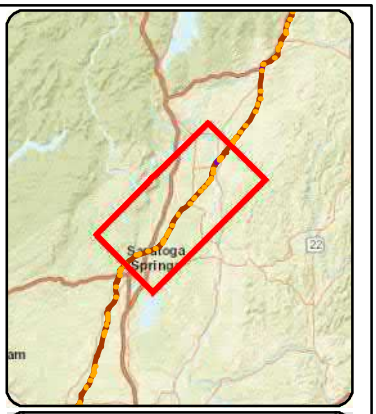
Surficial Geology and Geotechnical Borings
Fort Edward to Saratoga
Figure 3-4

Prepared on 4/29/2021
by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt 5_Routes_DZ_20190908oring_Locations\Maps_for_May_2021_Report\Ft_Edward_to_Saratoga_Boring_Locations_Surficial_May_2021_Report.mxd





LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

- Cbk - Beekmantown Group
- Cp - Potsdam Sandstone
- Cth - Theresa (Galway) Formation
- No Label
- OCs - Cambrian thru Middle Ordovician
- Oag - Austin Glen Form (graywacke, shale)
- Obk - Beekmantown Group
- Oc - Canajoharie Shale
- Omi - Mount Merino Formation
- Otbr - Dolgeville Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- hbg - Biotite/hornblende granite gneiss
- mu - Undivided metasedimentary rock
- mug - Interlayered metasedimentary rock
- phgs - Charnockite, granitic, quartz syenite
- qt - Quartzite

N

1 0.5 0 1 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Fort Edward to Saratoga Figure 4-4

Prepared on 5/18/2021

by: AECOM

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\IRoute\Consensus_Alternative_Routes\MXD\Alt 5_Routes_DZ_20190909Boring_Locations\Maps_for_May_2021_Report\Ft_Edward_to_Saratoga_Boring_Locations_Bedrock_May_2021_Report.mxd

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

BORING	**A136.0-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED 10.0 '			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	J. STAPLETON
DATE STARTED	01/28/2013
DATE COMPLETED	01/28/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	5 3 3 2		***CINDER, ASH GRAVEL AND SAND (FILL)***		
				2.0		
	S-2	4 4 5 4				
5	S-3	3 5 3 3		***LIGHT BROWN CLAY, SM SILT***	41.8	
	S-4	7 6 6 6				
▽ 10	S-5	6 6 5 7		10.0	47.2	
				END OF BORING AT 10'		
15						
20						
25						
30						
35						

DRN.	JPB
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/27/13

BORING CONTRACTOR: ADT			AECOM										SHEET 1 OF 2	
DRILLER: Chris Chaillou													PROJECT NAME: CHPE -	
SOILS ENGINEER/GEOLOGIST: Chris French			**BORING LOG**										PROJECT NO.: 60323056	
LOCATION: Moreau, NY (CP Rail) MP - 136.1													HOLE NO.: **FES-3B**	
GROUND WATER .				CASING	SAMPLER	DRILL BIT	CORE BARREL						START DATE: 1/18/21	
Water at 25' (inferred)			TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit							FINISH DATE: 1/18/21	
			SIZE I.D.	4"	2.5"	- -							OFFSET: N/A	
			SIZE O.D.	4.5"	3"	3 7/8"							DRILL RIG: CME LC-55	
			HAMMER WT.	140 lbs	140 lbs								BORING TYPE: SPT	
			HAMMER FALL	30"	30"								BORING O.D.: 4.5"	
													SURFACE ELEV.:	
													LONGITUDE:	
													LATITUDE:	

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		0'-5'				Hand Cleared					SP	SAND and SILT	Black fine SAND, some large angular gravel, trace silt; frozen
1.0											SP		0.5': Black fine-coarse SAND, some angular gravel; loose, moist
2.0											ML		1.5': Brown SILT, little clay, little fine-medium sand; medium stiff, moist
3.0		3'-5'	S-1								SP		TR-1; (3.0'-5.0')
4.0													2.0': Black fine-coarse SAND, little angular-subangular gravel, trace silt; very loose, moist
5.0		5'-7'	S-2	24"	10"	2	3	4	4	5	SP		SAA
6.0													
7.0		7'-9'	S-3	24"	10"	3	3	5	4	5	SP/SW		SAA
8.0													8.6': Light brown fine SAND, trace silt; loose, moist
9.0		9'-11'	S-4	24"	0"	7	6	5	4	7	-		No recovery
10.0													
11.0		11'-'13'	S-5	24"	6.0	2	2	3	4	3	SW	SILT	Brown fine-medium SAND, trace silt; very loose, moist
12.0													
13.0		13'-15'	S-6	24"	24"	2	3	3	4	4	ML		Brown SILT, little clay, trace fine sand; medium stiff, wet
14.0													
15.0		15'-17'	S-7	24"	24"	WOH	6	4	5	7	ML/OL		SAA
16.0													16.5': Dark brown SILT, trace fine sand; soft, moist
17.0													TR-2; (16.0'-16.5')
18.0													
19.0													
20.0													

NOTES:

(1) Thick-wall ring lined drive sampler (California sampler) used for SPT samples. Rings dimensions = 2-1/2" O.D. by 2-7/16" I.D. by 6" length.

(2) Correction factor: $N_{corr}=N*(2.0^2-1.375^2)in./(3.0^2-2.4^2)in. = N*0.65$.

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.

SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

BORING CONTRACTOR: ADT

DRILLER: Chris Chaillou

SOILS ENGINEER: Chris French

LOCATION: Moreau, NY (CP Rail) MP - 136.1

AECOM

BORING LOG

SHEET 2 OF 2

PROJECT NAME: CHPE -

PROJECT NO.: 60323056

HOLE NO.: **FES-3B**

START DATE: 1/18/21

FINISH DATE: 1/18/21

OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		20'-22'	S-8	24"	20"	7	10	13	16	15	ML		Brown and gray SILT and clay, trace fine sand; stiff, moist
21.0													
22.0													
23.0													
24.0													
25.0												SILT and CLAY	
		25'-27'	S-9	24"	22"	WOH	WOH	2	3	1	ML		Gray SILT, trace clay, trace fine sand; very stiff, saturated
26.0													TR-3; (26.0'-26.5')
27.0													
28.0													
29.0													
30.0													
		30'-32'	S-10	24"	14"	8	11	16	18	18	SP		Dark brown medium SAND, little fine sand, little silt; loose, saturated
31.0													
32.0													
33.0													
34.0													
35.0												SAND	
		35'-37'	S-11	24"	12"	7	14	12	10	17	SW		Black fine-coarse SAND, little subangular-angular gravel, trace silt; loose, saturated
36.0													TR-4; (36.0'-36.5')
37.0													
38.0													
		38'-40'	S-12	24"	21"	WOH	WOH	3	2	2	ML		Gray SILT, little clay; very soft, wet
39.0													TR-5; (38.0'-38.5')
40.0												SILT and CLAY	
													FES-3B terminated at 40', grouted to surface
41.0													
42.0													
43.0													
44.0													
45.0													

NOTES:

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.

SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

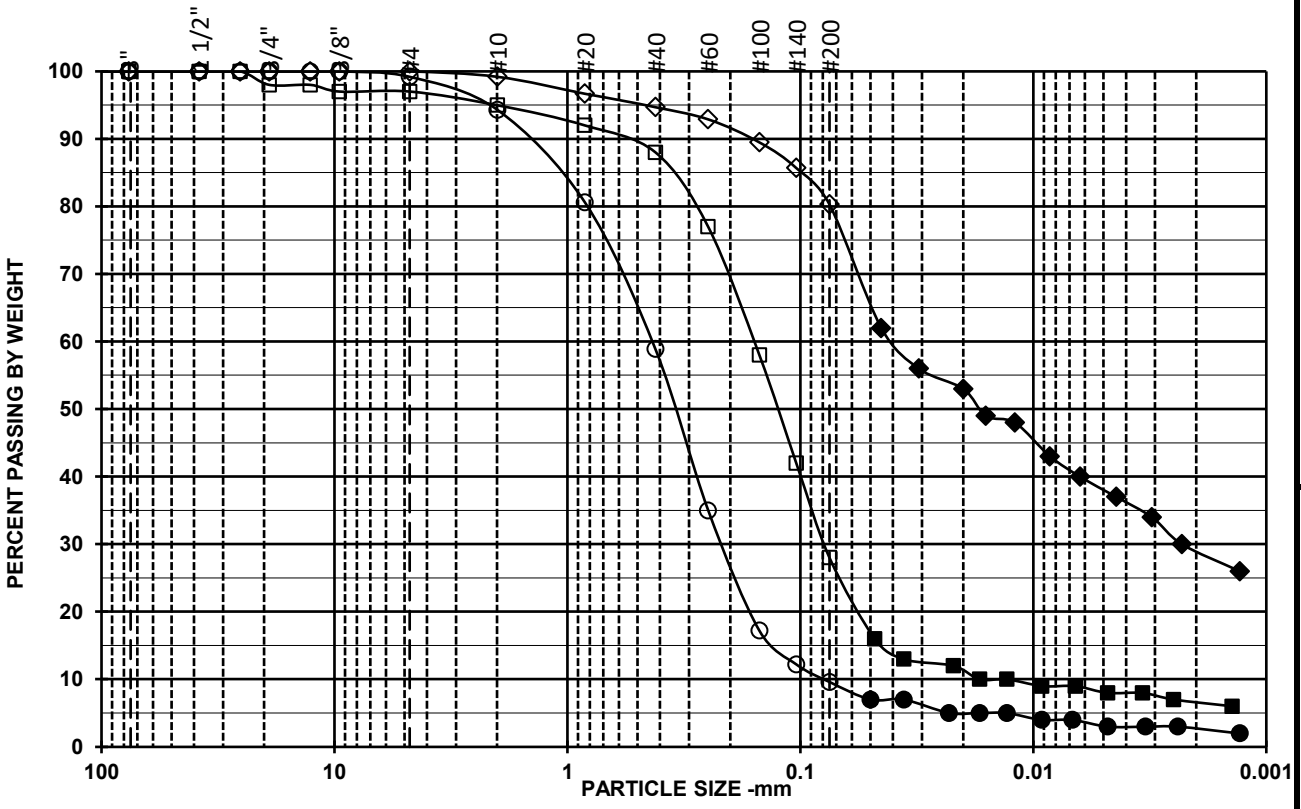
Table 3-4: Summary of Geotechnical Laboratory Testing of Soil Samples Fort Edward to Saratoga Segment (FES)												
Boring ID	Sample ID	Depth (ft)	USCS Symbol	% Gravel	% Sand	% Silt	% Clay	LL [(1)] (%)	PL [(2)] (%)	PI [(3)] (%)	Water Content	Org. Content (%)
FES-1	S-2	5-7	ML	0	24.1	70.9	5	-	-	-	18.9	-
	S-4	9-11	SM	0.3	64.7	31	4	-	-	-	19.5	-
FES-3	S-2	7-9	SC-SM	0.6	64.9	21.5	13	20	15	5	18.4	-
	S-5	13-15	SW-SM	15	76	7	2	-	-	-	7	-
FES-3B	S-3	7-9	SM	3	69	21	7	-	-	-	15.6	-
	S-8	20-22	CL	0	19.7	51.3	29	42	18	24	24.8	-
	S-10	30-32	SP-SM	0.8	89.6	6.6	3	-	16	NP	19.1	-
FES-5	S-3	7-9	CH	0	1	19	80	97	28	69	40.2	-
	S-7	15-17	CH	0	0	13	87	84	27	57	44	-
FES-7	S-3	7-9	SP-SM	0	90.4	7.6	2	-	-	-	26.2	-
	S-7	15-17	SP-SM	0	88.8	9.2	2	-	-	-	23.2	-
	S-10	30-32	CH	0	1	32	67	65	21	44	54	-
FES-9	S-3	7-9	SM	0	77.9	20.1	2	-	-	-	26.3	-
	S-7	15-17	SM	0	79.5	17.5	3	-	-	-	22.6	-
	S-9	25-27	CH	0	1	45	54	63	19	44	55.4	-
FES-10A	S-3	7-9	SM	0	86.9	11.1	2	-	-	-	11	-
	S-7	15-17	SM	0	86.3	10.7	3	-	-	-	21.3	-
	S-9	25-27	SP-SM	0	91.5	6.5	2	-	-	-	24.8	-
FES-12	S-3	7-9	SP-SM	0	93.8	4.2	2	-	-	-	6.3	-
	S-6	15-17	SM	0	56.3	41.7	2	-	-	-	10.2	-
	S-8	25-27	SP-SM	0	93.2	4.8	2	-	-	-	2.6	-

Notes:
(1) LL = Liquid Limit
(2) PL = Plastic Limit
(3) PI = Plasticity Index
(4) SG = Specific Gravity

Aquifer
CHPE - Ft. Edward - Saratoga Borings
LABORATORY SOIL TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
FES-1	S-2	5-7	18.9				ML	75.9	5	
FES-1	S-4	9-11	19.5				SM	35	4	
FES-3	S-2	7-9	18.4	20	15	5	SC-SM	34.5	13	
FES-3	S-5	13-15	7.0				SW-SM	9	2	
FES-3B	S-3	7-9	15.6				SM	28	7	
FES-3B	S-8	20-22	24.8	42	18	24	CL	80.3	29	
FES-3B	S-10	30-32	19.1	-	16	NP	SP-SM	9.6	3	
FES-5	S-3	7-9	40.2	97	28	69	CH	99	80	
FES-5	S-7	15-17	44.0	84	27	57	CH	100	87	
FES-7	S-3	7-9	26.2				SP-SM	9.6	2	
FES-7	S-7	15-17	23.2				SP-SM	11.2	2	
FES-7	S-10	30-32	54.0	65	21	44	CH	99	67	
FES-9	S-3	7-9	26.3				SM	22.1	2	
FES-9	S-7	15-17	22.6				SM	20.5	3	
FES-9	S-9	25-27	55.4	63	19	44	CH	99	54	
FES-10A	S-3	7-9	11.0				SM	13.1	2	
FES-10A	S-7	15-17	21.3				SM	13.7	3	
FES-10A	S-9	25-27	24.8				SP-SM	8.5	2	
FES-12	S-3	7-9	6.3				SP-SM	6.2	2	
FES-12	S-6	15-17	10.2				SM	43.7	2	
FES-12	S-8	25-27	2.6				SP-SM	6.8	2	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Open Symbols: Sieve analysis by ASTM D6913
Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	15.6				SM		Brown, Silty sand, Insufficient sample size	03/25/21
◇	24.8	42	18	24	CL		Brown, Lean clay with sand	03/25/21
○	19.1		16	NP	SP-SM		Gray, Poorly graded sand with silt	03/25/21

Aquifer

TerraSense, LLC #7853-21002

CHPE - Ft. Edward - Saratoga Borings

Symbol	□	◇	○
Boring	FES-3B	FES-3B	FES-3B
Sample	S-3	S-8	S-10
Depth	7-9	20-22	30-32
% +3"	0	0	0
% Gravel	3	0	0.8
% SAND	69	19.7	89.6
%C SAND	2	0.8	4.9
%M SAND	7	4.5	35.4
%F SAND	60	14.4	49.3
% FINES	28	80.3	9.6
D_{100} (mm)	25.4	4.75	9.53
D_{60} (mm)	0.158	0.0397	0.434
D_{30} (mm)	0.079	0.0023	0.22
D_{10} (mm)	0.017		0.079
Cc	2.3		1.4
Cu	9.3		5.5

Sieve Size/ID #	Percent Finer Data		
6"	100	100.0	100.0
4"	100	100.0	100.0
3"	100	100.0	100.0
1 1/2"	100	100.0	100.0
1"	100	100.0	100.0
3/4"	98	100.0	100.0
1/2"	98	100.0	100.0
3/8"	97	100.0	100.0
#4	97	100.0	99.2
#10	95	99.2	94.3
#20	92	96.7	80.6
#40	88	94.7	58.9
#60	77	92.9	35.0
#100	58	89.5	17.2
#140	42	85.7	12.2
#200	28	80.3	9.6
5μ m	8	38	3
2μ m	7	29	3
1μ m	5	24	2

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

Boring Location Plans Page 3 of 18	Drawn by: ADW	Scale: Not to scale	Project No.: CD10279	Date: April 2022

Champlain Hudson Power Express
Design Package 3
Glens Falls to Ballston Spa, New York

***ATLANTIC TESTING LABORATORIES*, Limited**

Albany, NY	Binghamton, NY	Canton, NY	Elmira, NY	Plattsburgh, NY
Poughkeepsie, NY	Syracuse, NY	Rochester, NY	Utica, NY	Watertown, NY

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: **CD10279D-01-04-22**

Client: **Kiewit Engineering (NY) Corp.**

Boring Location: **See Boring Location Plan**

Project: **Subsurface Investigation**
Champlain Hudson Power Express, Design Package 3
Various Locations, New York

Start Date: **2/14/2022** Finish Date: **2/14/2022**

Boring No.: **K-136.1** Sheet **1** of **2**

Groundwater Observations

Date	Time	Depth	Casing
2/14/2022	PM	DRY	4.0'
2/14/2022	PM	*7.1'	9.0'
2/14/2022	PM	*11.8'	9.0'

Coordinates
Northing **1611554**
Easting **732863.8**

Sampler Hammer
Weight: **140** lbs.
Fall: **30** in.
Hammer Type: **Automatic**

Ground Elev.: **144.0**

Boring Advance By: **HW (4") Casing/3 7/8" Wet Rotary**

Borehole caved at 29.4 feet. *May be affected by water utilized to advance the borehole.

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL (f - fine; m - medium; c - coarse; and - 35-50%; some - 20-35%; little - 10-20%; trace - 0-10%)	Recovery (Inches)
1	CASING	1	0.0	2.0	SS	12 10 9 7	1.0	12" TOPSOIL & ORGANIC MATERIAL	18
2							2.0	Brown f SAND; and SILT; trace mf GRAVEL (frozen, non-plastic) SM	
3		2	2.0	4.0	SS	5 5 4 2		Black cmf SAND; some cmf GRAVEL; trace SILT (moist, non-plastic) SW	8
4									
5		3	4.0	6.0	SS	2 1 WH/12"		Similar Soil (moist, non-plastic) SW	6
6							6.0		
7		4	6.0	8.0	SS	1 1 3 3		Brown SILT; some CLAY; trace f SAND (moist, moderately plastic) ML	12
8							8.0		
9	WET ROTARY	5	8.0	10.0	SS	3 3 4 5		Brownish-Grey CLAY; little SILT; trace f SAND (moist, plastic) w = 40.3%, LL = 62, PL = 23, PI = 39, % Fines = 99.1% CH	18
10								Advanced casing to 9.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
11									
12									
13									
14		6	14.0	16.0	SS	2 3 3 3		Similar Soil (moist, plastic) CH	24
15									
16									
17									
18									
19		7	19.0	21.0	SS	2 2 2 2		Similar Soil (moist, plastic) CH	24
20									
21									
22									
23		8	23.0	25.0	SS	3 3 3 4		(3" Brass Lined Split Spoon) Similar Soil (moist, plastic) w = 34.8%, LL = 34, PL = 18, PI = 16, % Fines = 99.5% CL	24
24									
25									

SS Split Spoon Sample
NX Rock Core
SH Undisturbed Sample (Shelby Tube)
Estimated Groundwater

Drillers: **Mark Childs; Ian Ross**

Inspector: **Ryan Morrison (ATL); Tom Kimmins (Kiewit)**

ATL-LOG1 NE CD10279 KIEWIT INFRASTRUCTURE CO - VARIOUS LOCATIONS (PACKAGE 3).GPJ ATL4-08.GDT 6/9/22

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: **K-136.1** Report No.: **CD10279D-01-04-22** Sheet **2** of **2**

DEPTH	METHOD OF ADVANCE	SAMPLE NO.	DEPTH OF SAMPLE From	DEPTH OF SAMPLE To	SAMPLE TYPE	BLOWS ON SAMPLER PER 6" 2" O.D. SAMPLER	DEPTH OF CHANGE	CLASSIFICATION OF MATERIAL	RECOVERY (inches)
							26.0	f - fine; m - medium; c - course; and - 35-50%; some - 20-35%; little - 10-20%; trace - 0-10%	
29		9	29.0	31.0	SS	2 5 7 6		Black cmf SAND; trace SILT (moist, non-plastic) SW	18
34		10	34.0	36.0	SS	7 6 6 7		Black c-m+f SAND; trace SILT; trace f GRAVEL (moist, non-plastic) w = 18.6%, % Fines = 8.4% SP-SM	18
							36.0	Boring terminated at 36.0 feet.	

Notes:
1. Borehole backfilled with cement-bentonite grout.
2. Soil classifications based on ATL Field Engineer's field classification.
3. Borehole was advanced with ATL's CME 45 Trailer (Rig Unit No. CDGV429) drill rig.

ATL-LOG1 NE CD10279 KIEWIT INFRASTRUCTURE CO - VARIOUS LOCATIONS (PACKAGE 3).GPJ ATL4-08.GDT 6/9/22

ATLANTIC TESTING LABORATORIES

LABORATORY TEST SUMMARY TABLE

ATL No. CD10279: Kiewit Infrastructure Co. - Champlain Hudson Power Express - Design Package 3

Boring ID	Sample No.	Sample Depth (ft.)	Soil/Rock Description	Percent Finer No. 200 Sieve	Moisture Content (%)	Atterburg Limits			Organic Content (%)	Water-Soluble Sulfate (ppm)	Water-Soluble Chloride (ppm)	pH	Resistivity (ohm-cm)	Rock Unconfined Compressive Strength (psi)	Rock Splitting Tensile Strength (psi)	Rock CERCHAR Abrasiveness Corrected CAI
						LL	PL	PI								
K-134.4	S-3	4.0 - 6.0	Black cmf GRAVEL; and cmf SAND; trace SILT	--	--	--	--	--	--	600	40	8.14	47,730	--	--	--
	S-6	14.0 - 16.0	Light Brown c-mf SAND; trace SILT; trace m+f GRAVEL	9.4	19.1	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.5 - 26.5	Grey CLAY; and SILT; trace f SAND	99.8	52.9	53	19	34	--	--	--	--	--	--	--	--
	S-10	34.0 - 36.0	Grey CLAY; and SILT; trace f SAND	--	34.4	--	--	--	--	--	--	--	--	--	--	--
K-134.5	S-5	8.0-10.0	Brown mf SAND; trace SILT	--	21.0	--	--	--	--	--	--	--	--	--	--	--
	S-8C	27.0 - 29.0	Brown cm+f SAND; little SILT; trace mf+ GRAVEL	15.0	15.3	--	--	--	--	--	--	--	--	--	--	--
	S-10	34.0-36.0	Brownish-Black cm+f SAND; little mf GRAVEL; trace SILT	7.2	19.2	--	--	--	--	--	--	--	--	--	--	--
K-134.7	S-4	6.0-8.0	Brown cmf SAND; trace SILT; trace CLAY	--	7.6	--	--	--	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brownish-Grey cm+f SAND; little SILT; trace mf GRAVEL; trace CLAY	24.0	16.9	--	--	--	--	--	--	--	--	--	--	--
	S-8	23.0-25.0	Grey cm+f SAND; little SILT; little f GRAVEL; trace CLAY	22.0	12.6	--	--	--	--	--	--	--	--	--	--	--
K-134.8	S-5	8.0-10.0	Brown mf SAND; little CLAY; trace SILT	--	16.0	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0-21.0	Brownish-Grey CLAY; some SILT; trace f SAND	56.5	29.9	25	20	5	--	--	--	--	--	--	--	--
	ST-1	37.0-37.9	Grey cmf+ SAND; trace SILT; trace f GRAVEL	8.3	17.1	--	--	--	--	--	--	--	--	--	--	--
K-136.1	S-5	8.0-10.0	Brownish-Grey CLAY; little SILT; trace f SAND	99.1	40.3	62	23	39	--	--	--	--	--	--	--	--
	S-8	23.0-25.0	Brownish-Grey CLAY; little SILT; trace f SAND	99.5	34.8	34	18	16	--	--	--	--	--	--	--	--
	S-10	34.0-36.0	Black c-m+f SAND; trace SILT ; trace f GRAVEL	8.4	18.6	--	--	--	--	--	--	--	--	--	--	--
K-136.5	S-4	6.0-8.0	Greyish-Brown SILT; some CLAY; little cmf SAND; trace OM	85.0	31.9	29	14	15	--	--	--	--	--	--	--	--
	S-5	8.0-10.0	Greyish-Brown SILT; some CLAY; trace cmf SAND; trace OM	--	--	--	--	--	0.8	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown mf+ SAND; little SILT	15	--	--	--	--	--	--	--	--	--	--	--	--
	RC-2	25.0-30.0	Greyish-Black SHALE	--	--	--	--	--	--	--	--	--	--	3,650	599	1.46
K-136.6	S-4	6.0-8.0	Brown SILT; trace mf SAND; trace CLAY	98.3	39.7	30	19	11	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown f SAND; some SILT	34.0	22.8	--	--	--	--	--	--	--	--	--	--	--
	RC-1	25.0-30.0	Greyish-Black SHALE	--	--	--	--	--	--	--	--	--	--	550	956	2.16

ATLANTIC TESTING LABORATORIES

WBE certified company

LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS
ASTM D 2216

PROJECT INFORMATION

Client: Kiewit Intrastructure Co.
Project: Champlain Hudson Power Express
United Cable Installation
Various Locations, New York

ATL Report No.: CD10279E-05-03-22
Report Date: March 3, 2022
Date Received: February 23, 2022

TEST DATA

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
K-136.1	S-5	8-10	40.3
	S-8	23-25	34.8
	S-10	34-36	18.6
K-136.5	S-4	6-8	31.9
K-136.6	S-4	6-8	39.7
	S-6	14-16	22.8
K-137.1	S-5	8-10	41.3
	S-8 [1]	23-24.8	15.3
K-137.8	S-5	8-10	23.5
	S-8	24-26	30.0
	ST-1c	44-46	32.6
K-142.8	S-4	6-8	26.5
	S-7	19-21	22.0
	S-9	29-31	28.4
	ST-1c	37-39	22.8
K-142.9	S-5	8-10	45.7
	S-8	24-26	40.8
	ST-1c	37-39	25.8
K-144.3	S-5	8-10	25.5
	S-7	19-21	21.7
	ST-1c	34-36	26.7

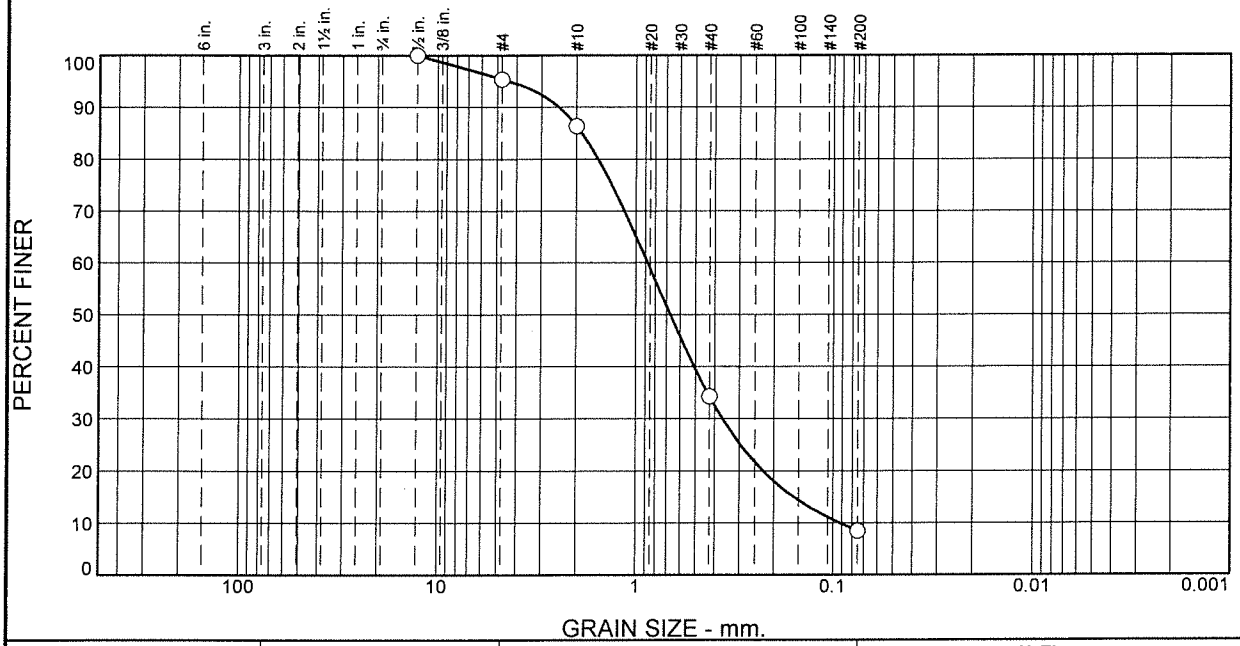
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-05-03-22

Client: Kiewit Intrastructure Co. **Date:** 03/03/22

Sample No: K-136.1, S-10 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 34-36'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	5	9	52	26	8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	95		
#10	86		
#40	34		
#200	8.4		

Soil Description

Black c-m+f SAND; trace SILT; trace f GRAVEL

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D_{85}= 1.8840 D_{60}= 0.8753 D_{50}= 0.6723
D_{30}= 0.3648 D_{15}= 0.1580 D_{10}= 0.0922
C_u= 9.49 C_c= 1.65

Classification

USCS= AASHTO=

Remarks

Moisture Content= 18.6%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: _____ Date: 03/09/22

ATLANTIC TESTING LABORATORIES

WBE certified company

AMOUNT OF MATERIAL IN SOILS FINER THAN THE NO. 200 SIEVE
ASTM D 1140

PROJECT INFORMATION

Client:	Kiewit Intrastructure Co.	**ATL Report No.:**	CD10279E-05-03-22
Project:	Champlain Hudson Power Express	**Report Date:**	March 3, 2022
	United Cable Installation	**Test Date:**	February 18, 2022
	Various Locations, New York	**Performed By:**	A. Rivers

TEST DATA

Boring No.	Sample No.	Depth (ft)	Method (A or B)	Soak Time (min)	Initial Dry Weight (g)	% Finer than #200
K-136.1	S-5	8-10	A	10	44.67	99.1
K-136.1	S-8	23-25	A	10	175.81	99.5
K-136.5	S-4	6-8	A	10	40.42	85.0
K-136.6	S-4	6-8	A	10	30.04	98.3
K-137.1	S-5	8-10	A	10	23.69	93.8
K-142.8	S-7	19-21	A	10	23.68	89.5
K-142.9	S-8	24-26	A	10	23.42	99.8

Reviewed By: _____ Date: March 3, 2022

ATLANTIC TESTING LABORATORIES

WBE certified company

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOIL
ASTM D 4318

PROJECT INFORMATION

Client: Kiewit Instrastructure Co.
Project: Champlain Hudson Power Express
United Cable Installation
Various Locations, New York

ATL Report No.: CD10279E-05-03-22
Report Date: March 3, 2022
Date Received: February 23, 2022

TEST DATA

Boring No.	Sample No.	LL	PL	PI
K-136.1	S-5	62	23	39
K-136.1	S-8	34	18	16
K-136.5	S-4	29	14	15
K-136.6	S-4	30	19	11
K-137.1	S-5	77	26	51
K-137.8	ST-1c	NP	NP	NP
K-142.8	S-7	47	18	29
K-142.9	S-8	37	16	21

SAMPLE INFORMATION

Boring No.	Sample No.	Maximum Grain Size (mm)	Estimated Amount of Sample Retained on No. 40 Sieve (%)	As Received Moisture Content (%)
K-136.1	S-5	0.074	0	40.3
K-136.1	S-8	0.002	0	34.8
K-136.5	S-4	0.074	0	31.9
K-136.6	S-4	0.074	0	39.7
K-137.1	S-5	0.074	0	41.3
K-137.8	ST-1c	0.42	1	32.6
K-142.8	S-7	0.074	0	22.0
K-142.9	S-8	0.002	0	40.8

PREPARATION INFORMATION

Boring No.	Sample No.	Preparation	Method of Removing Oversized Material
K-136.1	S-5	Air Dry	Not Necessary
K-136.1	S-8	Air Dry	Not Necessary
K-136.5	S-4	Air Dry	Not Necessary
K-136.6	S-4	Air Dry	Not Necessary
K-137.1	S-5	Air Dry	Not Necessary
K-137.8	ST-1c	Air Dry	Pulverizing and Screening
K-142.8	S-7	Air Dry	Not Necessary
K-142.9	S-8	Air Dry	Not Necessary

EQUIPMENT INFORMATION

Liquid Limit Procedure:	Multipoint - Method A	X	Single Point - Method B	
Liquid Limit Apparatus:	Manual	X	Motor Driven	
Liquid Limit Grooving Tool Material:	Plastic	X	Metal	
Liquid Limit Grooving Tool Shape:	Flat	X	Curved (AASHTO Only)	
Plastic Limit:	Hand Rolled	X	Mechanical Rolling Device	

Reviewed By: _____ Date: 03/03/22