HDD Design Summary Report
Crossings HDD 62 to HDD 70B
in Segment 7 – Package 4B

Schenectady to Rotterdam
Saratoga & Schenectady County, New York

CHA Project Number: 066076

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1.0 INTRODUCTION

1.1 PURPOSE

The Champlain Hudson Power Express (CHPE) 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 Segment 7 – Package 4B from Schenectady to Rotterdam. These crossings are designated HDD 62 through HDD 70, inclusive of A and B designations.

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

- Review of the existing geological, hydrogeological, and geotechnical conditions for HDD 62 through HDD 70B for a total of 26 crossings (2 per site) in the Segment 7 – Package 4B.
- 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 upland portion of the new transmission line will be approximately 146 miles in length, extending from the south end of Lake Champlain to Astoria, NY. Segment 7 – Package 4B is located in an approximately 9.6-mile section of the route in Schenectady County, New York.

A Project Locus Map and a plan showing the locations of the HDD 62 through HDD 70B crossings are presented in Appendix B.

The HDD crossing 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
62	45000+80	45009+50	832/875	D.O.T Road
62A	45019+80	45027+05	714/728	Wetland
63	45052+33	45064+70	1237/1236	D.O.T Road/Rail/Culvert/Wetland
64	45098+36	45112+07	1338/1353	Wetland
64A	45139+75	45149+00	937	Culverts
65A	45171+50	45199+00	2752/2591	Amtrak/D.O.T Road/Bridge
66	45228+90	45238+60	970	D.O.T Road
67	45279+00	45287+70	690/885	Rail Spur
68	45314+10	45333+00	1897/1895	Road/Mohawk River
69	45337+00	45359+10	2217/2211	Road/Rail
69A	45375+40	45399+50	2331/2239	Rail/Culvert
70A	45414+70	45432+90	1794/1796	Rail
70B	45447+45	45453+45	608/609	Road

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 drawings plans. A third, 2-inch-diameter DR 9 conduit will be bundled with one of the 10-inch diameter conduits for a telecommunications line. Longer and deeper bores may require an 8-inch-diameter conduit composed of the stronger, fusible PVC (FPVC) with an appropriate wall thickness (typically DR 14 or DR 17) to resist tensile stresses during installation and collapse-related long-term. The 8-inch conduit would typically be bundled with a 3-inch diameter HDPE for the telecommunications line, such as HDD#65A, HDD#68, HDD#69, and HDD#69A. This is checked and determined on a case-by-case basis and design sizes are shown on the design drawings shown in Appendix E. The conduits are to be installed in 16 to 22-inch final ream diameter bore holes. Using the 8-inch FPVC may permit a slightly smaller, 12-to-16-inch final ream diameter bore hole. 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 small streams, and 35 to 45 feet below open bodies

(i.e., ponds, lakes, canals, and rivers) 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 #62

HDD #62 consists of two straight HDD bores with one approximately 832 feet long and the other approximately 875 feet long. Both the bores run on the north-west side of the CSX Rail railroad tracks, passing an existing gas line and water stream, and running adjacent to a road bridge over Maple Avenue in East Glenville, NY at approximately latitude 42.8637°N and longitude 73.9059°W. The bores will remain on the west side of the CSX Rail railroad tracks for the entire run. The ground surface elevations along the path of HDD #62 rises upward from the proposed entry pit location El. 240 towards the proposed exit pit at approximately El. 267 (reference datum NAVD 1988).

HDD #62A

HDD #62A consists of two straight HDD bores with one approximately 714 feet long and the other approximately 728 feet long. Both the bores are approximately 650 feet west of Maple Avenue, crosses underneath a ditch/drainage adjacent to a culvert and NY designated wetland in East Glenville, NY, at approximately latitude 42.8595°N and longitude 73.9106°W. The ground surface elevation at the entry is approximately El. 284 and gently undulates to approximately El. 278 at the exit of the segment in a storm water basin, with the exception of a ditch at El. 260 (reference datum NAVD 1988).

HDD #63

HDD #63 consists of two straight HDD bores located underneath a drainage adjacent to a 9-foot-tall Stone Arch culvert, an 18-inch CMP culvert, and a rail grade crossing of Ronald Reagan Way in East Greenville, NY, at approximately latitude 42.8499°N and longitude 73.9182°W. The bores are approximately 1236 feet and 1237 feet long and will pass underneath NY designated wetlands and existing utilities. The HDD bores cross approximately 19-21 feet underneath the bottom elevation of the stone arch culvert and 20 feet underneath the 18-inch culvert. The bores run from west side of CSX Rail railroad tracks, crossing underneath the tracks, and exiting at the east side. The ground surface elevations along the HDD path gently undulates between El. 288 and El. 296, while dipping down to El. 268 near the Stone Arch culvert (reference datum NAVD 1988).

HDD #64

HDD #64 consists of two straight HDD bores approximately 1338 feet and 1353 feet long that runs on the south east side of CSX Rail railway tracks and cross underneath a drainage and NY designated wetlands in East Glenville, NY, at approximately latitude 42.8446°N and longitude 73.9287°W. The HDD bores will pass 15 to 45 feet below wetlands and the bores will remain on the east side of CSX Rail. The ground surface elevations along the HDD path gently undulates between El. 282 and El. 290, while dipping down to El. 263 near the wetlands (reference datum NAVD 1988).

HDD #64A

HDD #64A consists of two straight HDD bores approximately 937 feet long that runs on the east side of CSX Railroad tracks and cross underneath two drainages adjacent to a culvert and a bridge over the drainages in East Glenville, NY, at approximately latitude 42.8394°N and longitude 73.9420°W. Both bores remain on the east side of the tracks for the entire run. The HDD bores will pass approximately 13 to 26 feet below the estimated mudline (assuming a 5' water depth). The ground surface elevation at entry and exit of bore alignment is approximately El. 281 and El. 279, while in between it dips down to the water level at El. 271 and El. 262 (reference datum NAVD 1988).

HDD #65A

HDD #65A consists of two HDD bores with longer horizontal curves, one approximately 2752 feet long and the other approximately 2591 feet long. Both bores run on the south east to south side of CSX Rail railroad tracks and cross underneath Amtrak running from northeast to southwest, multiple culverts, and various utilities (i.e., gas lines, electric lines, fiber optic lines) in Glenville, NY, at approximately latitude 42.8351°N and longitude 73.9529°W. The bores will remain on the south east side of the CSX tracks throughout the run while crossing Amtrak near CSX MP 6.28. The bores intersect in plan and run over and under each other to limit permanent easements and outbuilding interactions. The ground surface elevation along the path of HDD #65A, at the entry is approximately El. 270 and gently undulates to approximately El. 249 at the exit of the segment (reference datum NAVD 1988).

HDD #66

HDD #66 consists of two HDD bores approximately 970 feet long, with short horizontal curve near an at-grade crossing (Sacandaga Road) in Scotia, NY at approximately latitude 42.8384°N and longitude 73.9529°W. HDD bores run on the south side of CSX Rail railway tracks and are located on the southernly side of CSX Rail crossing a Sacandaga Road, and a gas line. The ground surface elevation along the path of HDD#66 gently undulates between El. 284 to El. 287 (reference datum NAVD 1988).

HDD #67

HDD #67 consists of two straight HDD bores with one approximately 690 feet long and the other approximately 885 feet long, that runs on the east side of CSX Rail railway tracks. The HDD bores crosses approximately 35 feet (conduit 1) & 50 feet (conduit 2) underneath a CSX Rail Sideline/Spur tracks and approximately 15 and 28 feet (conduit 1) & 30 and 43 feet (conduit 2) below two gas lines in Glenville, NY at approximately latitude 42.8454°N and longitude 73.9894°W. The ground surface elevations along the HDD path gently undulates between El. 290 and El. 292 (reference datum NAVD 1988).

HDD #68

HDD #68 consists of two HDD bores with one approximately 1895 feet long and other approximately 1897 feet long and ends on the lands of the I-890 to I-90 interchange in Glenville, NY at approximately latitude 42.8490°N and longitude 73.9997°W. The bores will pass approximately 60 feet underneath Mohawk River water level. The HDD bores contain a horizontal curve, observed near STA 7+25 of the bore alignment. The ground surface elevation at the entry pit of the bore alignment is approximately El. 232, while it dips down to El. 215 near the horizontal curve and at the exit pit it elevates to a temporary grade of approximately El. 283 (reference datum NAVD 1988).

HDD #69

HDD #69 consists of two HDD bores with a horizontal curve, with one approximately 2211 feet long and the other approximately 2217 feet long in Rotterdam, NY, at approximately latitude 42.8411°N and longitude 74.0054°W. The HDD bores cross both, I-890 and the exit ramps associated with the I-890 & I-90 interchange. After the interchange they cross a high volage electric corridor on a side hill and under a pair of CSX Rails at approximately 45 feet and 52 feet below the rails. The ground surface varies greatly. The entry is at El. 231 and the ground steadily rises across the highway interchange to about El. 280. After the interchange a steep incline is encountered with the exit pit at El. 356 reference datum NAVD 1988

HDD #69A

HDD #69A consists of two HDD bores with horizontal curve, approximately 2331 feet and 2339 feet long in Rotterdam, NY, at approximately latitude 42.8340°N and longitude 73.9993°W. The HDD bores crosses 67 foot underneath a CSX Rail railway track, 18-foot below a pair of 4-foot-wide concrete box culvert and under both a previously drilled and trenched gas transmission lines with depth to be determined. The bores run from west side of CSX Rail railway tracks, crossing under one of two rails and comes up between two rails. The ground surface elevation at the entry is approximately El. 355 and gently undulates then rises to approximately El. 375 at the exit of the segment, boring right to left in profile, (reference datum NAVD 1988). HDD #69A is under development pending additional geotechnical..

HDD #70A

HDD #70A consists of two HDD bores with one approximately 1794 feet long and the other approximately 1796 feet long, that runs between two CSX Rail railway tracks, crossing underneath one of the tracks and exiting at the east side in Rotterdam, NY, at approximately latitude 42.8235°N and longitude 73.9951°W. The HDD bores will pass approximately 32 to 34 feet below an CSX rails. HDD #70A contain one horizontal curve, spotted after crossing STA 9+50 of the bore alignment. The ground surface elevation along the path of HDD #70A gently undulates between El. 351 and El. 357, while dipping down to El. 344 near the drainage between two culverts (reference datum NAVD 1988). HDD #70A is under development pending additional geotechnical.

HDD #70B

HDD #70B consists of two HDD bores approximately 608 feet and 609 feet long that run on the west side of CSX Rail railroad tracks and cross underneath Gordon Road adjacent to rail bridge crossing in Rotterdam, NY, at approximately latitude 42.8171°N and longitude 73.9968°W. The HDD bores will pass approximately 50-57 feet below the road. The ground surface elevation at entry and exit of bore alignment is approximately El. 356, while in the middle it elevates to El.382 (reference datum NAVD 1988).

4.1.2 Geotechnical Data

HDD #62

Subsurface investigations were conducted in 2013 by TRC for Transmission Developers, Inc., and 2022 by Atlantic Testing Laboratories, Ltd. There are three borings to date at HDD #62: B169.1-1, K-169.0-0.1A, and K-169.0-0.1B, which reach depths of 30 feet, 40 feet and 46 feet below grade, respectively. There appears to be an 8-foot layer of medium dense fill over a 5.5-foot layer of loose silty sand, over a 5-foot layer of loose low plasticity silty sand, over an 11.5-foot layer of loose silty sand in B169.1-1. 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 loose poorly graded sand, over a 34-foot layer of silty sand in boring K-169.0-0.1A. There appears to be a 0.4-foot layer of medium dense fill over a 1.2-foot layer of medium dense well graded sand, over a 0.4-foot layer of medium dense poorly graded sand, over a 4-foot layer of loose low plasticity silt, over a 22-foot layer of loose

silty sand, over a 4-foot layer of medium stiff low plasticity clay, over a 5-foot layer of soft low plasticity silt, over a 9-foot layer of soft low plasticity clay in K-169.0-0.1B. Boring K-169.0-0.1B was the only boring to extend to the bottom depth of the HDD, therefore the BoreAid analysis will be based on the layering observed in K-169.0-0.1B. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #62 BoreAid analysis will be divided into eight (8) layers: medium dense fill (GP), medium dense well graded sand (SW), medium dense poorly graded sand (SP), loose low plasticity silt (ML), loose silty sand (SM), medium stiff low plasticity clay (CL), soft low plasticity silt (ML), and soft low plasticity clay (CL). The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

HDD #62A

Subsurface investigations were conducted in 2022 by Atlantic Testing Laboratories, Ltd. There are two borings to date at HDD #62A: K-169.0-0.4 and K-169.0-0.5, which reached depths of 46 feet and 41 feet below grade, respectively. There appears to be a 0.5-foot layer of medium dense well graded sand over a 1.5-foot layer of medium dense well graded gravel, over a 15-foot layer of loose poorly graded sand, over a 29-foot layer of medium stiff low plasticity clay in K-169.0-0.4. There appears to be a 1.1-foot layer of medium dense silty sand over a 0.5-foot layer of medium dense well graded sand, over a 0.4-foot layer of medium dense poorly graded gravel, over a 0.6-foot layer of loose well graded sand, over a 1.4-foot layer of loose silty sand, over a 2-foot layer of medium dense low plasticity silt, over a 6-foot layer of loose poorly graded sand, over a 5-foot layer of loose low plasticity silt, over a 24-foot layer of soft low plasticity clay in K-169.0-0.5. The borings were similar and the BoreAid analysis will be based on the layering observed in boring K-169.0-0.4. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #62A BoreAid analysis will be divided four (4) layers: medium dense well graded sand (SW), medium dense well graded gravel (GW), loose poorly graded sand (SP), and medium stiff low plasticity clay (CL). The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

HDD #63

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Atlantic Testing Laboratories, Ltd., and in 2023 by Kiewit Engineering. There are three borings to date at HDD #63 SCH-2, KB-169.0-1.0 and K-169.0-1.2, which reached depths of 40 feet, 72 feet and 40 feet below grade, respectively. There appears to be a 3.5-foot layer of loose poorly graded sand over a 35.5-foot layer of shale bedrock in boring SCH-2. There appears to be a 15-foot layer of medium dense silty sand over a 57-foot layer of medium stiff low plasticity clay in boring KB-169.0-1.0. There appears to be a 3-foot layer of dense silty sand over a 12-foot layer of dense weathered rock, over a 25-foot layer of shale bedrock in boring K-169.0-1.2. Borings KB-169.0-1.0 and K-169.0-1.2 were similar, therefore the BoreAid analysis soil layering will be based on nonhorizontal layers based on the observations in these two borings. The Geotechnical Data Report for this location is provided in Appendix C.

Based on borings drilled for this project, the soil profile for the HDD #63 BoreAid analysis was divided into (4) layers: loose poorly graded sand with silty (SP), dense and stiff low plasticity clay (CL), dense poorly graded gravel (GP) and shale bedrock.The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

HDD #64

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Atlantic Testing Laboratories, Ltd. There are five borings to date at HDD #64: SCH-3, SCH-3A, K-169.0-1.8, K-169.0-1.9 and 169.0-2.0, which reach depths of 40 feet, 40 feet, 39.7 feet, 40 feet, and 41 feet below grade, respectively. There appears to be a 11-foot layer of well graded sand with some gravel over 12-foot of silty sand over 11-foot dense till of silty sand to sand with gravel over unweathered shale to termination at 40 foot in boring SCH-3. There appears to be a 11-foot layer of loose silty sand over a 4-foot layer of loose poorly graded sand, over a 5-foot layer of loose well graded sand, over a 20-foot layer of stiff low plasticity clay in boring SCH-3A. There appears to be a 4-foot layer of loose poorly graded gravel over an 8-foot layer of loose poorly graded sand, over a 5-foot layer of medium dense silty sand, over a 22.7-foot layer of dense silty sand in boring K-169.0-1.8. There appears to be a 4-foot layer of medium dense well graded sand over an 8-foot layer of loose silty sand, over a 6-foot layer of loose low plasticity silt, over a 7-foot layer of medium dense silty sand, over a 5-foot layer of medium dense silty gravel, over a 2-foot layer of

dense low plasticity silt, over a 2-foot layer of dense silty sand in K-169.0-1.9. There appears to be a 4-foot layer of loose poorly graded sand over an 8-foot layer of loose silty sand, over a 5-foot layer of medium dense well graded sand, over a 3-foot layer of stiff low plasticity silt, over a 21-foot layer of medium stiff low plasticity clay in K-169.0-2.0. The BoreAid analysis soil layering will be based on nonhorizontal layering based on the observations in boring K-169.0-1.8 and K-169.0-2.0, as the borings were variable across the alignment, as it was the only boring to extend to the planned HDD depth. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #64 BoreAid analysis will be divided into six (6) layers: medium dense graded sand (SW), loose poorly graded sand (SP), medium dense well graded sand (SW), medium dense silty sand (SM), stiff lean clay (CL), and shale bedrock. The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

HDD #64A

Subsurface investigations were conducted in 2021 by AECOM, and 2022 by Atlantic Testing Laboratories, Ltd. There are three borings to date at HDD #64A: SCH-5, K-169.0-2.6 and K-169.0-2.7, which reach depths of 36.7 feet, 40 feet and 39.3 feet below grade, respectively. There appears to be a 2-foot layer of loose well graded sand over a 5-foot layer of loose low plasticity silt, over a 6-foot layer of medium dense poorly graded sand, over a 4-foot layer of dense weathered rock, over a 19.7-foot layer of shale bedrock in SCH-5. There appears to be a 4-foot layer of medium dense well graded sand over a 2-foot layer of loose clayey sand, over an 11-foot layer of medium dense poorly graded sand, over a 5-foot layer of loose low plasticity silt, over a 5-foot layer of medium stiff low plasticity clay, over a 5-foot layer of stiff low plasticity silt, over a 4-foot layer of medium dense silty sand, over a 4-foot layer of stiff low plasticity silt in K-169.0-2.6. There appears to be a 2-foot layer of medium dense fill over a 2-foot layer of loose poorly graded sand, over an 8-foot layer of medium dense silty sand, over a 5-foot layer of medium dense poorly graded sand, over a 15-foot layer of medium stiff low plasticity clay, over a 7.3-foot layer of dense well graded sand in K-169.0-2.7. The borings were similar and the BoreAid analysis will be based on the layering observed in boring K-169.0-2.7. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #64A BoreAid analysis will be divided into six (6) layers: medium dense fill (SW), loose poorly graded sand (SP), medium dense silty sand (SM), medium dense poorly graded sand (SP), medium stiff low plasticity clay (CL), and dense well graded sand (SW). The elevations for these layers will correspond to the elevations observed in boring K-169.0-2.7. The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

HDD #65A

Subsurface investigations were conducted in 2021 by AECOM, 2022 by Terracon, and 2022 by Kiewit. There are five borings to date at HDD #65A: SCH-6, SCH-6A, KB-169.0-3.3, KB-169.0-3.6, KB-169.0-3.7, which extended to depths of 37, 36.5, 60, 75 and 75 feet below grade, respectively. There appears to be an 11-foot layer of medium dense poorly graded gravel over an 11-foot layer of medium dense silty gravel, over a 15-foot layer of shale bedrock in boring SCH-6. There appears to be a 6-foot layer of silty sand over a 10.5-foot layer of medium dense well graded sand, over a 19.5-foot layer of medium dense well graded gravel, over a 0.5-foot layer of shale bedrock in boring SCH-6A. There appears to be a 20-foot layer of medium dense fill over a 3.5-foot layer of loose silty gravel, over a 6.5-foot layer of medium dense silty gravel, over a 10-foot layer of very dense silty sand, over a 20-foot layer of shale bedrock in boring KB-169.0-3.3. There appears to be a 2-foot layer of medium dense fill over a 4-foot layer of medium dense poorly graded gravel, over a 7-foot layer of medium dense silty sand, over a 10.5-foot layer of very loose silty sand, over an 11.5-foot layer of medium dense silty sand, over a 14-foot layer of medium dense well graded gravel, over a 6-foot layer of very dense silty sand, over a 20-foot layer of shale bedrock in boring KB-169.0-3.6. There appears to be a 2-foot layer of loose fill over an 8-foot layer of loose silty sand, over a 16-foot layer of loose low plasticity silt, over a 9-foot layer of dense poorly graded gravel, over a 5-foot layer of very dense poorly graded sand over a 20-foot layer of medium dense poorly graded gravel, over a 3.5-foot layer of medium dense silty sand, over a 9.5-foot layer of very dense silty sand, over a 2-foot layer of shale bedrock in boring KB-169.0-3.7. The BoreAid analysis will be based on non-horizontal layering corresponding to borings KB-169.0-3.3, KB-169.0-3.6, KB-169.0-3.7, which all encountered similar conditions and extended to deeper depths than the other borings along the alignment. The Geotechnical Data Report for this location is provided in Appendix C.

Boring SCH-6 indicates a Gravel layer approximately 21 feet thick from the ground surface to 20 feet deep. Below 21 feet SCH-6 log indicates bedrock (Shale). The SCH-6 descriptions of the gravel soils are silty, sandy Gravel. Blow counts (N-values corrected for modified California sampler) in the gravel range from 11 to 28, averaging 21, which corresponds to medium-dense granular soils. The recoveries for the six samples collected using a 3-inch modified California sampler range from 2 inches to 18 inches and averaging 11 inches for 24 inches of penetration. Gradation test data indicate that 40% to 55% of the soil is in the sand and silt size range. Problems with water loss during the drilling were not noted on the boring log.

Boring SCH-6A indicates a Gravel layer approximately 19 feet thick from 17 feet deep to 36 feet deep. Below 36 feet SCH-6 indicates bedrock (Shale). The SCH-6A descriptions of the gravel soils are fine to coarse gravel with some sand. Blow counts (N-values corrected for modified California sampler) in the gravel range from 7 to 42 averaging 23, which corresponds to medium-dense to dense granular soils. The recoveries for the three samples collected using a 3-inch modified California sampler range from 0 inches to 16 inches and averaging 7 inches for 24 inches of penetration. No gradation test data were available for the SHC-6A gravels layer. Problems with water loss during the drilling were not noted on the boring log.

Based on the borings, the soil profile for the HDD #65A BoreAid analysis will be divided into three (3) layers: medium dense poorly graded sand (SP), dense well graded sand (SW), and shale bedrock. The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

Based on the boring data described above, we recommend that the contractor consider use of drilling additives to increase the carrying capacity of the drilling mud, additives to plug coarser gravels and prevent slurry loss, and use of conductor casings for the entry and exit vertical tangent sections of the alignments be considered.

HDD #66

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Atlantic Testing Laboratories, Ltd. There are three borings to date at HDD #66: SCH-8, K-169.0-4.4 and K-169.0-4.5, which reached depths of 17 feet, 31 feet and 31 feet below grade, respectively. There appears to be a 5-foot layer of loose silty sand over a 12-foot layer of loose poorly graded sand in SCH-8. There appears to be a 4-foot layer of medium dense fill over a 4-foot layer of loose well graded sand, over a 2-foot layer of medium dense poorly graded sand, over a 4-foot layer of loose well

graded gravel, over a 15-foot layer of medium dense well graded sand in K-169.0-4.4. There appears to be a 2-foot layer of loose well graded sand over a 2-foot layer of soft low plasticity clay, over a 4-foot layer of loose silty sand, over a 14-foot layer of loose poorly graded sand, over a 9-foot layer of medium dense silty sand in K-169.0-4.5. The borings are generally similar, therefore the layering encountered in K-169.0-4.5 will be used for the BoreAid analysis. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #66 BoreAid analysis will consist of five (5) layers: loose well graded sand (SW), soft low plasticity clay (CL), loose silty sand (SM), loose poorly graded sand (SP), and medium dense silty sand (SM). The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

HDD #67

Subsurface investigations were conducted in 2021 by AECOM. There are two borings to date at HDD #67: SCH-10 and SCH-10A, which reached depths of 42 feet below grade.
Boring SCH-10 indicates a Gravel layer approximately 30 feet thick from the 12 deep to 42 feet deep (bottom of boring). The SCH-10 descriptions of the Gravel and Sand soils are silty, sandy Gravel. Blow counts (N-values corrected for modified California sampler) in the gravel range from 32 to more than 68, averaging more than 68, which corresponds to dense to very dense granular soils. The recoveries for the seven samples collected using a 3-inch modified California sampler range from 0% to 100% and averaging 70% of the penetration of the sampler. No gradation test data were available for the SHC-10 gravels layer. A 3-foot boulder was noted at 3 feet on the boring log. Problems with water loss during the drilling were not noted on the boring log.

Boring SCH-10A indicates a Gravel layer approximately 33 feet thick from 9 feet deep to 42 feet deep (bottom of the boring). Below 36 feet SCH-6 indicates bedrock (Shale)The SCH1-0A descriptions of the gravel soils are fine to coarse gravel with some fine to coarse sand. A cobble fragment was noted in the sample at 15 feet. Blow counts (N-values corrected for modified California sampler) in the gravel range from 47 to greater than 68 averaging greater than 68, which corresponds to dense to very dense granular soils. The recoveries for the nine samples collected using a 3-inch modified California sampler range from 0% to 100% and averaging 70% of the penetration of the sampler. Gradation test data indicate that 20% to 35% of the soil is in the sand and silt size range. Problems with water loss during the drilling were not noted on the boring log. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #67 BoreAid analysis will consist of four (4) layers: dense poorly graded sand (SP) dense poorly graded gravel (GP), medium dense well graded sandy gravel (GW), and medium dense poorly graded gravel (GP). The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

The HDD 67 vertical alignment has been selected so that the horizontal portion of the alignments will be at about 35 and 50 feet below the rail. Therefore, most of each bore alignment will be in gravel soils. Based on the boring data described above, and the presence of significant amounts of sand is likely to make loss of drill fluid a limited problem at most. However, given the limited gradation data and the presence of the gravel, the we recommend that the contractor consider use of drilling additives to increase the carrying capacity of the drilling mud, additives to plug coarser gravels and prevent slurry loss, use of a larger reamed hole to give more room for coarse gravel to fall to bottom of the borehole and use of conductor casings for the entry and exit vertical tangent sections of the alignments be considered.

HDD #68

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Atlantic Testing Laboratories, Ltd. There are four borings to date at HDD #68: SCH-11, SCH-12, K-169.0-6.0 and K-169.0-6.1, which reached depths of 120 feet, 120 feet, 80 feet and 80 feet below grade, respectively.

Boring SCH-11 indicates a Gravel layer approximately 53 feet thick from 10 feet deep to 63 feet deep. Below 63 feet SCH-11 log indicates very dense fine sand. The SCH-11 descriptions of the gravel soils are Gravel with little to trace of sand. Difficult drilling noted on log, with inferred cobbles and boulders and drill rig chatter reported. Blow counts (N-values corrected for modified California sampler) in the gravel were generally greater than 100, which corresponds to very-dense granular soils. The recoveries for the six samples collected using a 3-inch modified California sampler range from 0 inches to 3 inches for 0 to 7 inches of penetration. Gradation test data (one gravel sample) indicate that 63% of the soil is in the sand and silt size range. From 63 to 120 feet deep, soils are described as very dense sands. Problems with water loss during the drilling were not noted on the boring log.

The Boring K169.0-6.0 log does not indicate a Gravel layer, per se, but describes the soils as fine to coarse gravel with some sand to 80 feet. No gradation test data were available for the SHC-6A gravels layer. Problems with water loss during the drilling were not noted on the boring log.

The Boring K169.0-6.1 log indicate a Gravel layer from the ground surface to 31 feet. Blow counts (N-values) in the gravel range from 15 to 100, averaging 58, which corresponds to very dense granular soils. The recoveries for the seven samples collected using a 2-inch standard split spoon sampler in the gravel range from 0 inches to 8 inches and averaging 4 inches for 24 inches of penetration. Gradation test data indicate that 45% of the soil is in the sand and silt size range. Below 31 feet, the soils are described as medium dense to dense silty sands to a depth of 80 feet. Problems with water loss during the drilling were not noted on the boring log. A probable boulder was noted on the log at 28 feet.

The Boring SCH-12 log does not indicate a Gravel layer, per se, but describes the soils as medium-dense to dense to fine to medium sands with trace of silts. To a depth of 120 feet. The recoveries for the samples collected using a 3-inch modified California sampler range from 0 inches to 24 inches for 24 inches of penetration, with most recoveries in the 24-inch range. Gradation test data indicate that 40% to 55% of the soil is in the sand and silt size range. Problems with water loss during the drilling were not noted on the boring log. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #68 BoreAid analysis will consist of two (2) layers: loose poorly graded sand (SP) and dense poorly graded sand (SP). The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

The HDD 68 vertical alignment has been selected so that the horizontal approximately 900 feet of the alignments will be at about Elevation 163 in the silty sand layer well below the gravel layer. Therefore, the gravel layer will only be encounter on the vertical entry and exit tangent alignments of the bores. Based on the boring data described above, we recommend that the contractor consider use of drilling additives to increase the carrying capacity of the drilling mud, additives to plug coarser gravels and prevent slurry loss, and use of conductor casings for the entry and exit vertical tangent sections of the alignments be considered.

HDD #69

Subsurface investigations were conducted in 2021 by AECOM, 2022 by Terracon, and 2022 by Atlantic Testing Laboratories, Ltd. There are eleven borings to date at HDD #69: SCH-13, SCH-13A, SCH-13B, SCH-14, K-169.0-6.4, K-169.0-6.7, K-169.0-6.9, KB-169.0-6.7, KB-169.0-6.8, KB-169.0-6.6 and KB-169.0-6.6A, which extended to depths of 52, 52, 52, 50.2, 45, 47, 50, 65, 22, 67 and 102 feet below grade, respectively. There are seven historic DOT borings shown in the

alignment as well. There appears to be a 7-foot layer of dense silty gravel over a 21.5-foot layer of medium dense poorly graded gravel, over a 15-foot layer of medium dense poorly graded sand, over an 8.5-foot layer of medium dense silty sand in boring SCH-13. There appears to be a 7-foot layer of very dense poorly graded sand over a 3-foot layer of dense poorly graded gravel, over a 2-foot layer of dense low plasticity silt, over a 6-foot layer of very dense well graded gravel, over a 25-foot layer of very dense silty gravel, over a 5-foot layer of very stiff low plasticity silt, over a 3.5-foot layer of medium dense well graded gravel in boring SCH-13A. There appears to be a 23.5-foot layer of medium dense silty gravel over a 20-foot layer of medium dense inorganic silt, over a 5-foot layer of medium dense poorly graded gravel, over a 3.5-foot layer of medium dense inorganic silt in boring SCH-13B. There appears to be a 1-foot layer of loose silty sand over a 1-foot layer of soft low plasticity silt, over a 4-foot layer of very dense well graded gravel, over a 44.2-foot layer of shale bedrock in boring SCH-14. There appears to be a 2-foot layer of stiff low plasticity clay over a 2-foot layer of loose clayey sand, over a 2-foot layer of dense well graded gravel, over a 16-foot layer of medium dense silty sand, over a 5-foot layer of medium dense well graded sand, over a 2-foot layer of very dense well graded gravel, over a 16-foot layer of medium dense well graded sand in boring K-169.0-6.4. There appears to be a 4-foot layer of medium dense poorly graded gravel over a 2-foot layer of very soft low plasticity clay, over a 17-foot layer of loose silty sand, over a 4-foot layer of very dense weathered rock, over a 20-foot layer of shale bedrock in boring K-169.0-6.7. There appears to be a 6-foot layer of loose fill over a 2-foot layer of loose silty sand, over a 4-foot layer of loose silty gravel, over a 3-foot layer of very dense weathered rock, over a 35-foot layer of shale bedrock in boring K-169.0-6.9. There appears to be 30-foot layer of medium dense silty sand over a 20-foot layer of very stiff low plasticity silt, 15-foot layer of shale bedrock in boring KB-169.0-6.7. There appears to be 3.6-foot layer of stiff to hard low plasticity silt over a 18-foot layer of shale bedrock in boring KB-169.0-6.8. There appears to be 6-foot layer of loose fill over a 36-foot layer of dense poorly graded silty sand, over a 13-foot layer of stiff low plasticity clay, over a 12-foot layer of medium dense silty sand in boring KB-169.0-6.6. Boring KB-169.0-6.6A is augered up to 65 feet, from there it appears to be 37-foot layer of medium dense to dense poorly graded sand. The BoreAid analysis will be based on non-horizontal layering corresponding to borings SCH-13, SCH-13A, SCH-13B, SCH-14, K-169.0-6.7, K-169.0-6.4, K-169.0-6.8, K-169.0-6.9, KB-169.0-6.7, KB-169.0-6.6, and KB-169.0-6.6A. The Geotechnical Data Report for this location is provided in Appendix C.

Boring SCH-13 indicates a Gravel layer approximately 35 feet thick from ground surface to 35 feet deep. Below 35 feet SCH-11 log indicates Medium dense to very dense fine sand to 52 feet (bottom of boring). The SCH-13 descriptions of the gravel soils are medium to fine Gravel with little to some sand. Difficult drilling noted on log, with lost water reported at 15 to 35 feet. Blow counts (N-values corrected for modified California sampler) in the gravel from 10 to 35, averaging 27 which corresponds to medium-dense to dense granular soils. The recoveries for the nine samples collected using a 3-inch modified California sampler range from 0 inches to 24 inches for 24 inches of penetration. Gradation test data (two gravel samples) indicate that 30% of the soil is in the sand and silt size range. Problems with water loss during the drilling were noted on the boring log.

The Boring K169.0-6.4 log does not indicate a Gravel layer, per se, but describes the soils as medium-dense to dense sand and gravel to 45 feet. Blow counts (N-values) in the gravel range from 9 to 82, averaging 34, which corresponds to medium-dense to very dense granular soils. The recoveries for the seven samples collected using a 2-inch standard split spoon sampler in the gravel range from 3 inches to 24 inches and averaging 12 inches for 24 inches of penetration. Gradation test data from 4 samples indicate that 35% to 95%, with an average of 65% of the soil is in the sand and silt size range. Problems with water loss during the drilling were not noted on the boring log. A probable boulder was noted on the log at 28 feet.

The Boring SCH-13A log indicates a Gravel layer approximately 45 feet thick from 7 feet deep to 52 feet deep. The SCH-13A descriptions of the gravel soils are dense silty, sandy, fine to coarse gravel (glacial till). An inferred boulder was noted on the log at 7 feet. Blow counts (N-values corrected for modified California sampler) in the gravel range from 14 to 60, averaging 42 which corresponds to medium-dense to dense granular soils. The recoveries for the nine samples collected using a 3-inch modified California sampler range from 6 inches to 24 inches for 24 inches of penetration, with 12 of 13 samplings having 24 inches of recovery. No gradation test data were available.

The Boring SCH-13B log indicates a silty Sand and Gravel (glacial till) layer approximately 20 feet thick from ground surface to 20 feet deep. The SCH-13B descriptions of the gravel soils are silty, sandy, fine to coarse gravel (glacial till). An inferred boulder was noted on the log at 11 feet. Below 20 feet the ground is generally described as dense silt with little to trace fine gravel to 52 feet (bottom of boring). An inferred boulder is noted on the log at 30 feet with high blow counts

at 40 feet. Blow counts (N-values corrected for modified California sampler) in the gravel range from 23 to 60, averaging 31 which corresponds to medium-dense to dense granular soils. The recoveries for the nine samples collected using a 3-inch modified California sampler range from 6 inches to 24 inches for 24 inches of penetration, with average of about 20 inches of recovery in the gravel zone. Gradation test data (two gravel samples) indicate that 60% of the soil is in the sand and silt size range. Problems with water loss during the drilling were not noted on the boring log.

The Boring K-169.0-6.7 stick log on the profile drawings indicates a 4-foot-thick gravel layer at the top of the boring over lying a 17-foot-thick loose to medium dense silty sand layer, which transitions to bedrock (the detail boring log was not yet available on the Kiewit share point site).

The Boring K-169.0-6.9 stick log on the profile drawings indicates a 6-foot layer of fill (silty sand with gravel) over a 2-foot layer of loose silty sand with gravel, over a 4-foot layer of silty gravel with sand, over a 3-foot layer of weathered rock, over slightly weather to unweathered shale that reaches the termination of the bore at 50 feet below grade.

The Boring SCH-14 stick log on the profile drawings indicates a two, 1-foot layers of silt and silty sand over a 5-foot layer of well graded gravel over a 40-foot layer of shale.

Based on borings drilled for this project, the soil profile for the HDD #69 BoreAid analysis consisted of six (6) layers: silty sand (SM), dense silty gravel (GM), medium dense poorly graded sand (SP), dense well graded gravel (GW), medium dense silty sand (SM), and shale bedrock. The soil profiles used for BoreAid analyses of the HDD in this segment are presented in Appendix D.

The HDD 69 vertical alignment has been selected so that the bottom tangents and horizontal curve of the alignments will be at about Elevation 160 generally well below the gravel layers. Therefore, the gravel layer will only be encounter on the vertical entry and exit tangent alignments of the bores. Based on the boring data described above, we recommend that the contractor consider use of drilling additives to increase the carrying capacity of the drilling mud, additives to plug coarser gravels and prevent slurry loss, and use of conductor casings for the entry and exit vertical tangent sections of the alignments be considered.

HDD #69A

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Terracon. There are three borings to date at HDD #69A: SCH-15, K-169.0-7.4 and K-169.0-7.5, which reached depths of 16, 40 and 75 feet below grade, respectively. There appears to be a 13-foot layer of medium dense poorly graded sand over a 3-foot layer of medium dense silty sand in boring SCH-15. There appears to be a 4-foot layer of loose fill over a 5-foot layer of medium stiff low plasticity clay, over a 1-foot layer of dense weathered rock, over a 30-foot layer of shale bedrock in boring KB-169.0-7.4. There appears to be a 0.5-foot layer of topsoil over a 1.5-foot layer of medium stiff low plasticity clay, over a 3.2-foot layer of dense weathered rock, over a 70-foot layer of shale bedrock in boring KB-169.0-7.4. The BoreAid soil layering will be based on nonhorizontal layering between borings SCH-15, K-169.0-7.4 and K-169.0-7.5. Two additional borings are planned for HDD #69A to confirm soil conduitions and top of rock. One test bore, around STA 8+50 is in progress and will be included once final geotechnical bores and reports are received. The second bore, closer to STA: 0+00, will occur during construction when tree clearing is completed.

Based on borings drilled for this project, the soil profile for the HDD #69A BoreAid analysis consisted of two (2) layers: medium dense well graded sand (SM) and shale bedrock. The soil profiles used for BoreAid analyses of the HDD in this segment are presented in Appendix D.

HDD #70A

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Terracon. There are two borings to date at HDD #70A: SCH-16 and K-169.0-7.9, which reached depths of 16.3 feet and 75 feet below grade, respectively. There appears to be a 1.5-foot layer of loose poorly graded sand over a 14.8-foot layer of shale bedrock in boring SCH-16. There appears to be a 4-foot layer of loose fill over a 5-foot layer of medium stiff low plasticity clay, over a 1-foot layer of dense weathered rock, over a 65-foot layer of shale bedrock in boring KB-169.0-7.9. The BoreAid soil layering will be based on nonhorizontal layering between borings SCH-16 and K-169.0-7.9. Two addtional test borings are pending will be included in this report and analysis upon completion.

Based on borings drilled for this project, the soil profile for the HDD #70A BoreAid analysis consisted of two (2) layers: loose to medium dense silty sand (SM) and shale bedrock. The soil profiles used for BoreAid analyses of the HDD in this segment are presented in Appendix D.

HDD #70B

Subsurface investigations were conducted in 2021 by AECOM and 2022 by Terracon. There are three borings to date at HDD #70B: SCH-17, K-169.0-8.5 and K-169.0-8.6, which extend to depths of 16 feet, 33.7 feet and 33.5 feet below grade. There appears to be a 4-foot layer of loose fill over a 10-foot layer of dense silty sand, over a 2-foot layer of dense poorly graded gravel in SCH-18. There appears to be a 15-foot layer of loose fill over a 15-foot layer of medium dense poorly graded gravel, over a 3-foot layer of dense silty sand, over a 0.7-foot layer of weathered rock in K-169.0-8.5. There appears to be a 10-foot layer of loose fill over an 8-foot layer of medium dense silty gravel, over a 12-foot layer of medium dense to very dense glacial till, over a 3.5-foot layer of weathered rock in K-169.0-8.6. The borings consisted of similar soil conditions, therefore the BoreAid soil layering will be based on nonhorizontal layering between borings K-169.0-8.5 and K-169.0-8.6, both of which extended closest to the bottom of HDD alignment elevation. The Geotechnical Data Report for this location is provided in Appendix C.

Based on the borings, the soil profile for the HDD #70B BoreAid analysis will be divided four (4) layers: loose fill (SM), medium dense to very dense poorly graded gravel (GP), dense silty sand (SM), and very dense weathered rock (GP). Consideration should be given to identification of the weathered rock to bedrock interface. The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

5.0 DESIGN SUMMARY

The HDD construction process in soils 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 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 22 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 22 inches 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 are 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 may be 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 this segment are shown in the design drawings provided in Appendix E.

The design drawings that summarize the proposed HDD installations are in Appendix E. The HDD technical specifications are found in Section 33057.13 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 constraints. Available work areas may limit the lengths of the conduit that can be pre-assembled, necessitating having to pre-

assemble the bundle multiple intermediate length segments that will have to be welded together during the pull back. Work zone requirements are shown in Appendix A. HDD specific work areas at the entry and exit ends of the bores are noted on the drawings in Appendix E. 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 E 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 based on the boring logs as approximate representation of 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 Standard Penetration Test (SPT) blow counts. The shear modulus (G) of each layer was estimated using soil density or consistency based on SSPT 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 Poison'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). Tables for soil properties used for the HDDs in Segment 7 – Package 4B are presented in Appendix F.

5.2.1 BoreAid Analysis

For the BoreAid analyses, the pipe configuration analyzed was for a pipe with a dimension ratio (DR) of 9 unless stress and deflection calculations indicated a need for a larger diameter conduit with a thicker, (larger DR) or a change to the stronger FPVC material. The designs do not include consideration of ballast or rollers unless the analyses indicated a need for such actions to manage installation stresses. The following conduit configurations were used in the modeling analyses:

1) An individual 10-inch-diameter DR 9 HDPE or 8-inch FPVC of DR 17 conduit for the conductor, and
2) A bundle consisting of a 10-inch-diameter DR 9 HDPE conduit and a 2-inch-diameter DR 9 HDPE conduit or an 8" FPVC of varied DR 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 D.

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. If a 2-inch HDPE DR 9 is run and the contractors means, and methods are to substitute 3-inch HDPE DR7 the HDD subcontractor must run and submit their analysis.

The BoreAid software does not list IPS PVC 8-inch DR 17 as an data entry option, therefore where DR 17 FPVC was needed, the analyses were performed for IPS 8-inch DR 18. If the DR 18, which is a slightly thinner walled than the DR 17, model indicated adequate factors of safety relative to deformations and stresses, then the DR 17 is assumed to be feasible conduit for the design. Cases where the DR 18 did not show adequate factors of safety, the use of DR 17 pipe was checked using the based on safe pull stresses from the Underground Solutions technical literature and via hand calculations to check collapse related stresses using the methodology from JM Eagle technical bulletin and Handbook of PVC pipe CH 7. These calculations are included with the BoreAid modeling of DR 18 pipe in Appendix C where applicable. DIPS PVC 8-inch DR 14 is and alternative modeled and used in the CHPE Project in some segments and packages.

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 inadvertent releases through 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 inadvertent release also pose risks to structures such as roadways. The HDD alignment was designed with geometries to provide enough soil cover to reduce the risk of inadvertent return. The Inadvertent Release Contingency Plan details 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 conduit. The risk of such 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 on 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 Release 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 related work area will 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 Release 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 inadvertent releases 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 Release 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 an inadvertent release 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

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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.

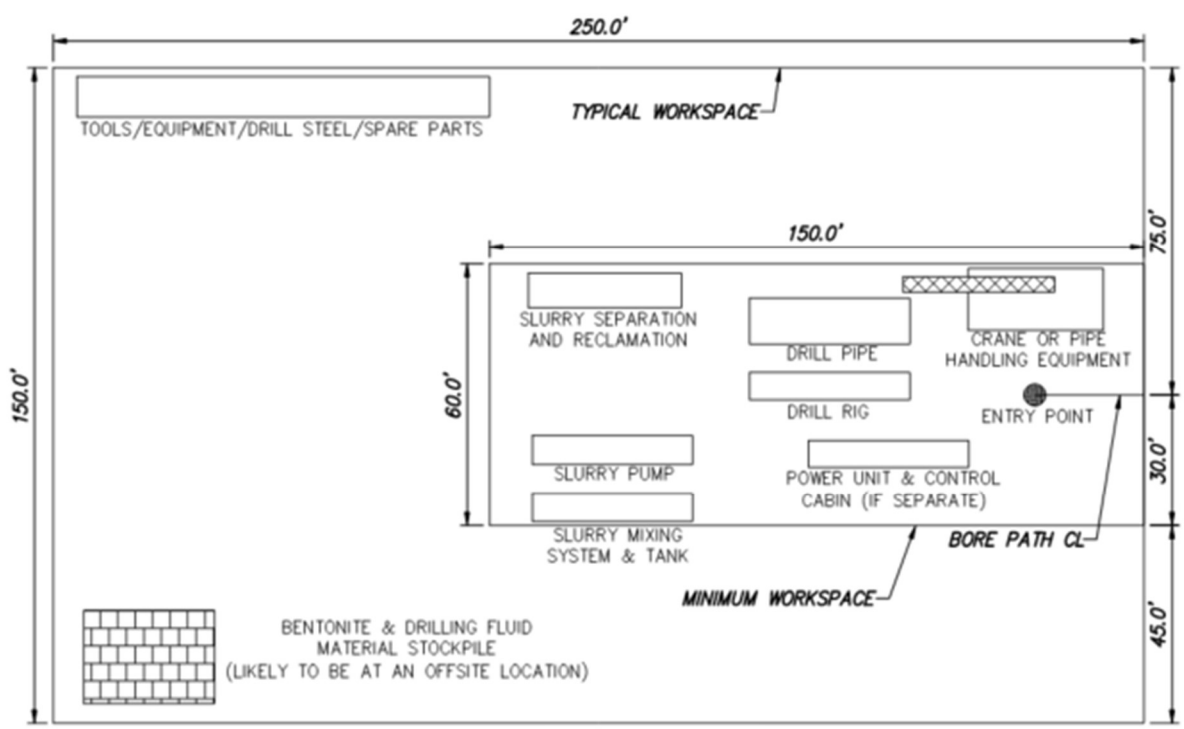


FIGURE 1a: Typical Entry Work Zone Configuration

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

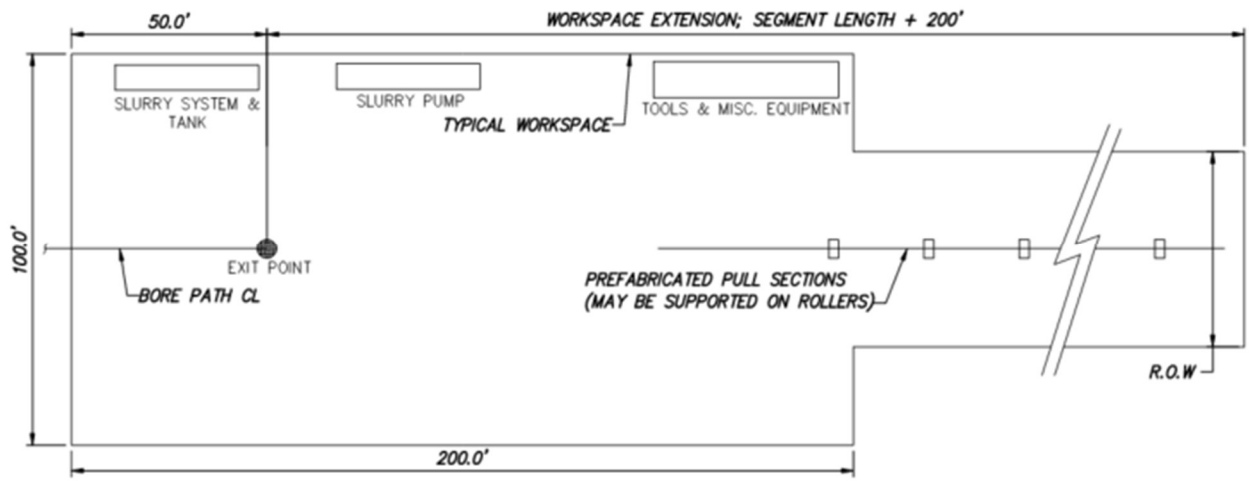


FIGURE 1b: Typical Exit Work Zone Configuration

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:

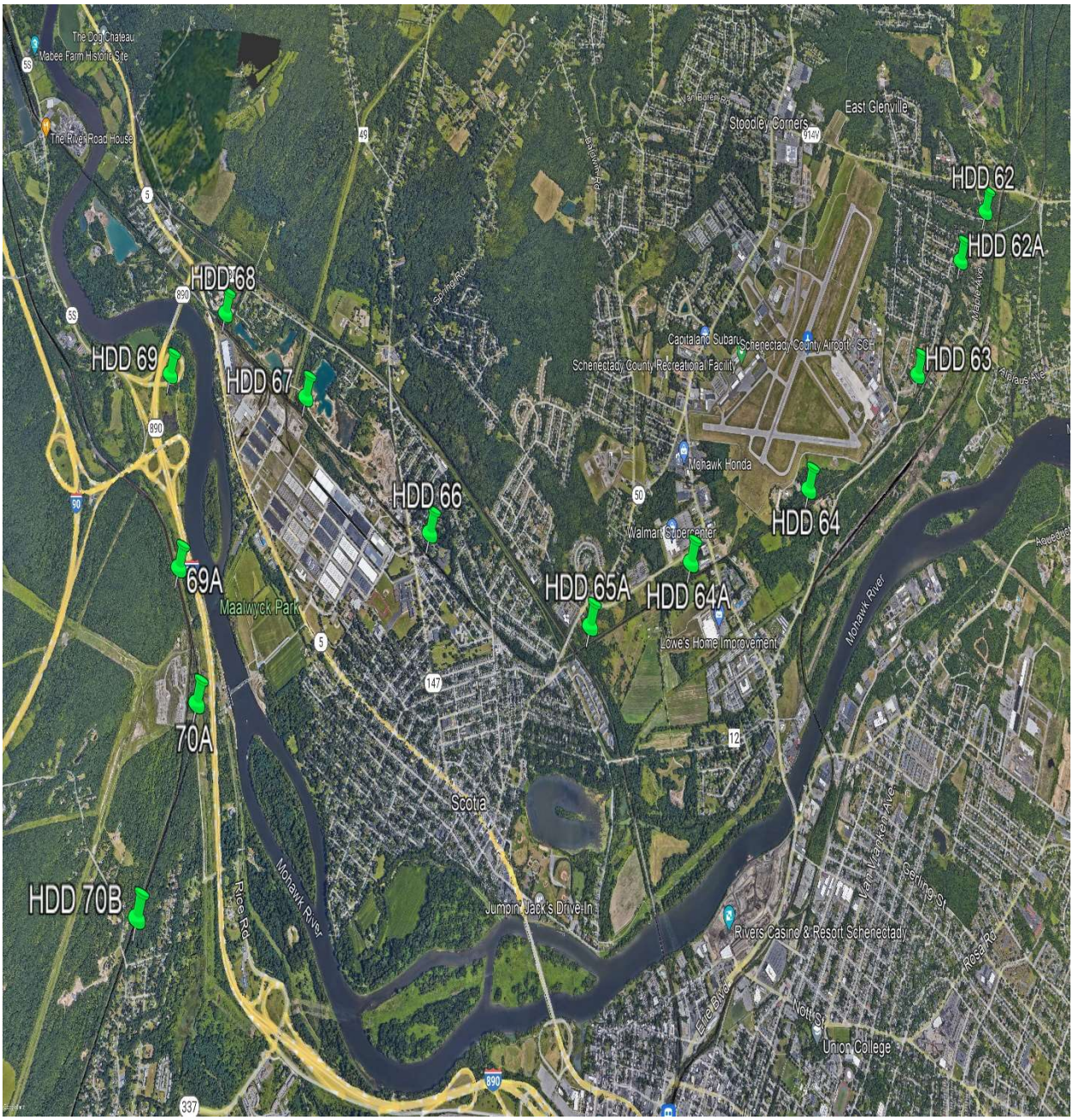
* The entry and exit workspaces typically need space for a drill rig and support equipment such as a pipe rack, power unit operator control cabin, a mud mixing and pumping unit, plus a separate mud processing and separation unit support equipment arranged linearly in line may be possible. Somewhat smaller 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


HDD 62
HDD 62A
HDD 63
HDD 64
HDD 64A
HDD 65A
HDD 66
HDD 67
HDD 68
HDD 69
69A
70A
HDD 70B
The Dog Chateau
Mabee Farm Historic Site
The River Road House
Stoodley Corners
East Glenville
Capitaland Subaru
Schenectady County Airport - SCH
Schenectady County Recreational Facility
Mohawk Honda
Walmart Supercenter
Lowe's Home Improvement
Maalwyck Park
Scotia
Jumpin' Jack's Drive-In
Rivers Casino & Resort Schenectady
Union College
Mohawk River
Rice Rd
Van Vranken Ave
Erie Blvd
Nott St
Rosa Rd
Aqueduct

Appendix C

HDD Geotechnical Data Report for CHPE Segment 7 – Package 4B HDDs

Kiewit

MEMORANDUM

DATE: January 26, 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 7 - Package 4B - HDD Crossing 62 – Revision 1
Champlain Hudson Power Express Project
East Glenville, 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 near East Glenville, New York. The approximate station for the start of HDD crossing Number 62 is STA 45001+00 (42.8637° N, 73.9054° W).

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

- TRC, Geotechnical Data Report, Champlain Hudson Power Express Canadian Pacific Railway Borings MP 133.1-177.1, Washington, Saratoga and Schenectady Counties, New York, dated March 29, 2013.
- Atlantic Testing Laboratories, Subsurface Investigation Services, Champlain Hudson Power Express, Design Package 4B, Glenville to Scotia, New York, dated June 15, 2022.

Contact us if you have questions or require additional information.

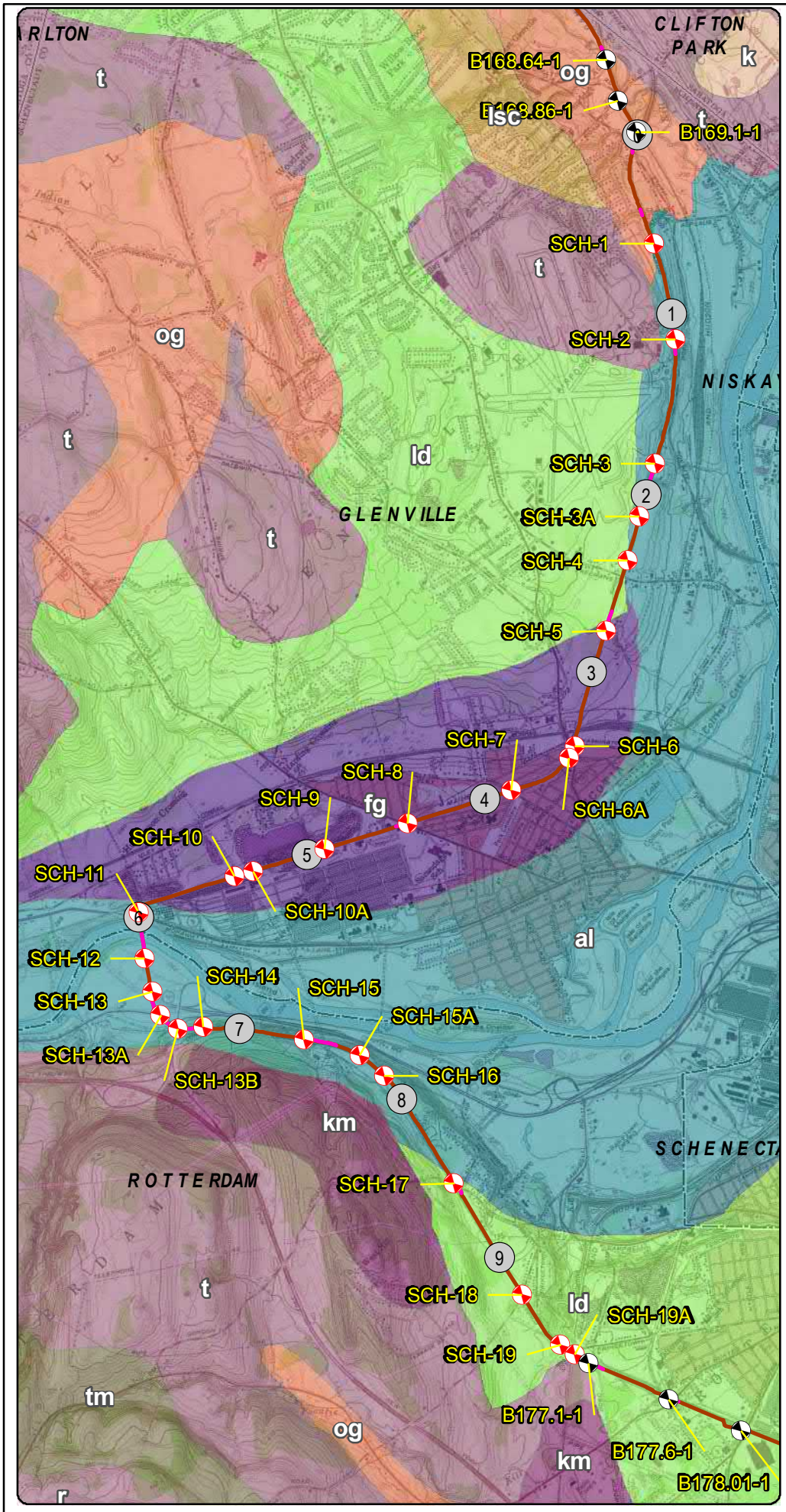
HDD 62
Borings B169.1-1, K-169.0-0.1A,
K-169.0-0.1B
Segment 7 - Design Package 4B

CHPE Segment 7 Package 4B
Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B169.1-1	1469045.0	651801.8	236.7
AECOM**	SCH-1	1466449.8	649931.4	279.8
	SCH-2	1464095.5	648426.9	288.3
	SCH-3	1462008.4	645522.0	286.8
	SCH-3A	1461257.5	644144.0	287.3
	SCH-4	1460618.5	643021.4	285.4
	SCH-5	1459621.8	641171.4	279.3
	SCH-6	1457944.8	638238.9	241.7
	SCH-6A	1457817.7	637889.5	249.6
	SCH-7	1458325.7	636073.8	271.1
	SCH-8	1459763.1	633330.0	287.2
	SCH-9	1460902.6	631152.2	297.0
	SCH-10	1462154.8	628796.0	290.3
	SCH-10A	1461888.1	629265.0	291.0
	SCH-11	1463366.6	626127.1	289.2
	SCH-12	1462321.8	625339.2	227.3
	SCH-13	1461493.8	624804.4	229.1
	SCH-13A	1460855.7	624513.9	272.0
	SCH-13B	1460233.8	624596.1	295.4
	SCH-14	1459768.5	625134.5	281.3
	SCH-15	1457493.3	626917.2	338.6
	SCH-15A	1456046.5	627705.8	352.4
	SCH-16	1455146.0	627794.1	350.1
	SCH-17	1451579.9	627027.1	357.8
	SCH-18	1447982.8	626167.9	354.4
NYS DOT ***	DAB-6(2)	1460628.7	625081.5	248
	DH-24S	1460655.9	625133.7	237
	DH-25S	1460602.7	625066.5	236
	DH-26S	1460543.7	624985.5	235
	DH-27S	1460696.2	625101.3	236
	DH-28S	1460650.3	625027.7	235
	DH-29S	1460597.5	624949.4	234.5

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.
*** NYS DOT boring coordinates and elevations are approximated from drawing D257014 Sheet 170 "GENERAL SUBSURFACE PROFILE, STRUCTURE #3 - RAMP TWY OVER I-890"
**** 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
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

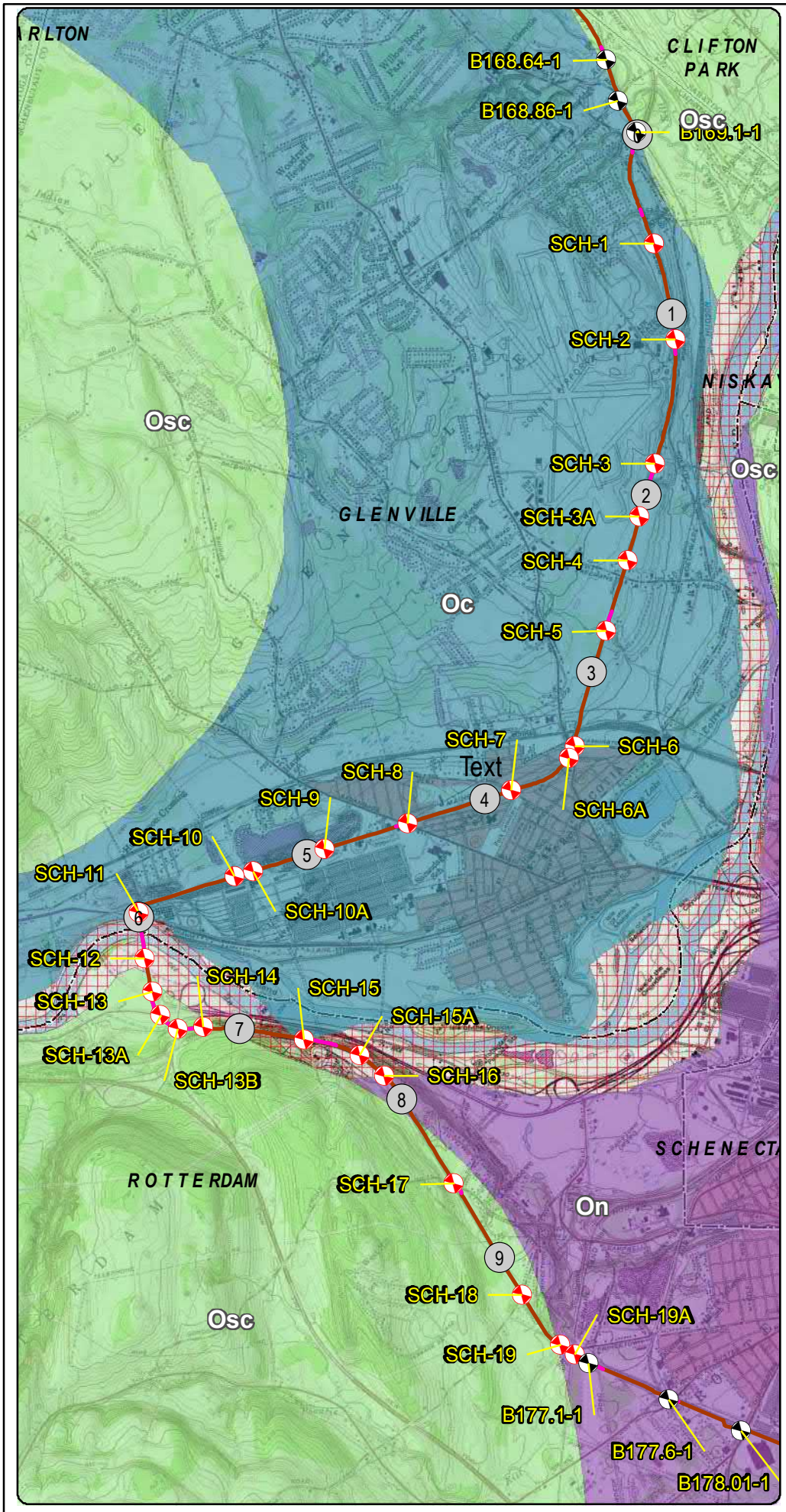
Surficial Geology and Geotechnical Borings Schenectady Preferred Alt Figure 3-7

Prepared on 4/27/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Surficial_Map_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

- No Label
- Oc - Canajoharie Shale
- On - Normanskill Shale
- Osc - Schenectady Formation

* Schenectady Formation includes: graywacke, sandstone, siltstone, shale

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Schenectady Preferred Alt Figure 4-7

Prepared on 4/29/2021

by: AECOM

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

Y:\Projects\CHPE\IRoute\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Bedrock_Map_May_2021_Report.mxd

#B168.64-1
Lat: 42.869667
Long: -73.901245
Distance to Nearest Crossing:
0.2 mi N of Glenridge Rd

#B168.86-1
Lat: 42.866957
Long: -73.903375
Distance to Nearest Crossing:
At Glenridge Rd

#B169.1-1
Lat: 42.864227
Long: -73.904342
Distance to Nearest Crossing:
0.2 mi S of Glenridge Rd

#B169.65-1
Lat: 42.856306
Long: -73.907322
Distance to Nearest Crossing:
At Aplaus Ave

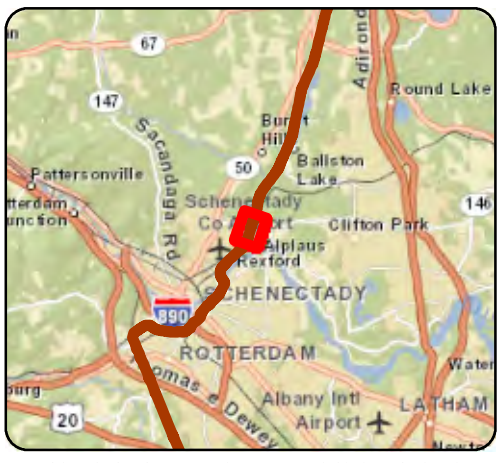
CLIFTON PARK

GLENVILLE

Hetcheltown Rd
Maple Ave Ext
Glenridge Rd
Glenridge Ct
Woodcrest Dr
Woodhaven Dr
Maplewood Dr
Glenhill Dr
Governor Dr
Elmwood Dr
Oakwood Dr
Acorn Dr
Valleywood Dr
Glenwood Dr
Mountainwood Dr
Redwood Dr
Knollwood Dr
Maple Ave
Bruce Dr
Hill St
Bath St
Aplaus Ave
Belmont Ave
Mohawk Ave
Brookside Ave
Riverside
Snyder Ln
2nd St
Madison Ave
Brackett Ave

168.5 21.5
168.6 21.4
168.7 21.3
168.8 21.2
168.9 21.1
169 21
169.1 20.9
169.2 20.8
169.3 20.7
169.4 20.6
169.5 20.5
169.6 20.4
169.7 20.3

0 1,000
Feet



LEGEND

111.8 Milepost - Tenths
135 Milepost
Terrestrial Route HVDC
Submarine Route HVDC
Preliminary HDD Locations
Preliminary Pipe Bridge Location
Approximate RR Mileposts
CP/CSX ROW
DOT ROW

Perennial Stream
Intermittent Stream
Ditch
Surface Water
Wetland
Town Boundary
Village Boundary

Geotechnical Borings
Not Drilled
As Built

Road Name
TOWN NAME
Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Geotechnical Boring Locations

Glenville - CP

Sheet 39 of 81

Prepared by: HDR DTA & TRC 3/22/2013

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

T:\PROJECTS\AUGUSTA\CHPEI\Geotechnical_Boring_Locations_As_Built_11x17.mxd

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS
LOCATION: CP RAILROAD ROW, NY

BORING	**B169.1-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED 6.0 '			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	4.0 '
d	FROM	4.0 '	TO	30.0 '

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	N/A
DATE STARTED	02/28/2013
DATE COMPLETED	02/28/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	9 7 7 8		***BORWN C/ GRAVEL-SIZED ROCK FRAGMENTS, SM SILT, TR M/C SAND (FILL)*** 2.0		
	S-2	10 10 11 13		***BROWN CLAY, SM F/M SAND, TR SILT (FILL)*** 4.0		
5	S-3	50/.4		***DARK BROWN F/C GRAVEL-SIZED ROCK FRAGMENTS, TR SILT, TR F/M SAND (FILL)***		WOOD
	S-4	50/.1		8.0		
10	S-5	4 5 5 4		***YELLOW BROWN F/M SAND, SM SILT*** 13.5		
15	S-6	2 5 3		***GREY BROWN F/M/C SANDY SILT*** 18.5		
20	S-7	1 2 1		***YELLOW BROWN F/M/C SAND, SM SILT, TR TO SM F/ GRAVEL*** 23.5	20.5	
25	S-8	2 3 2		***F/M/C SAND, TR TO SM SILT***		
30	S-9	1 3 2		30.0		
				END OF BORING AT 30'		
35						

DRN.	KR
CKD.	PWK

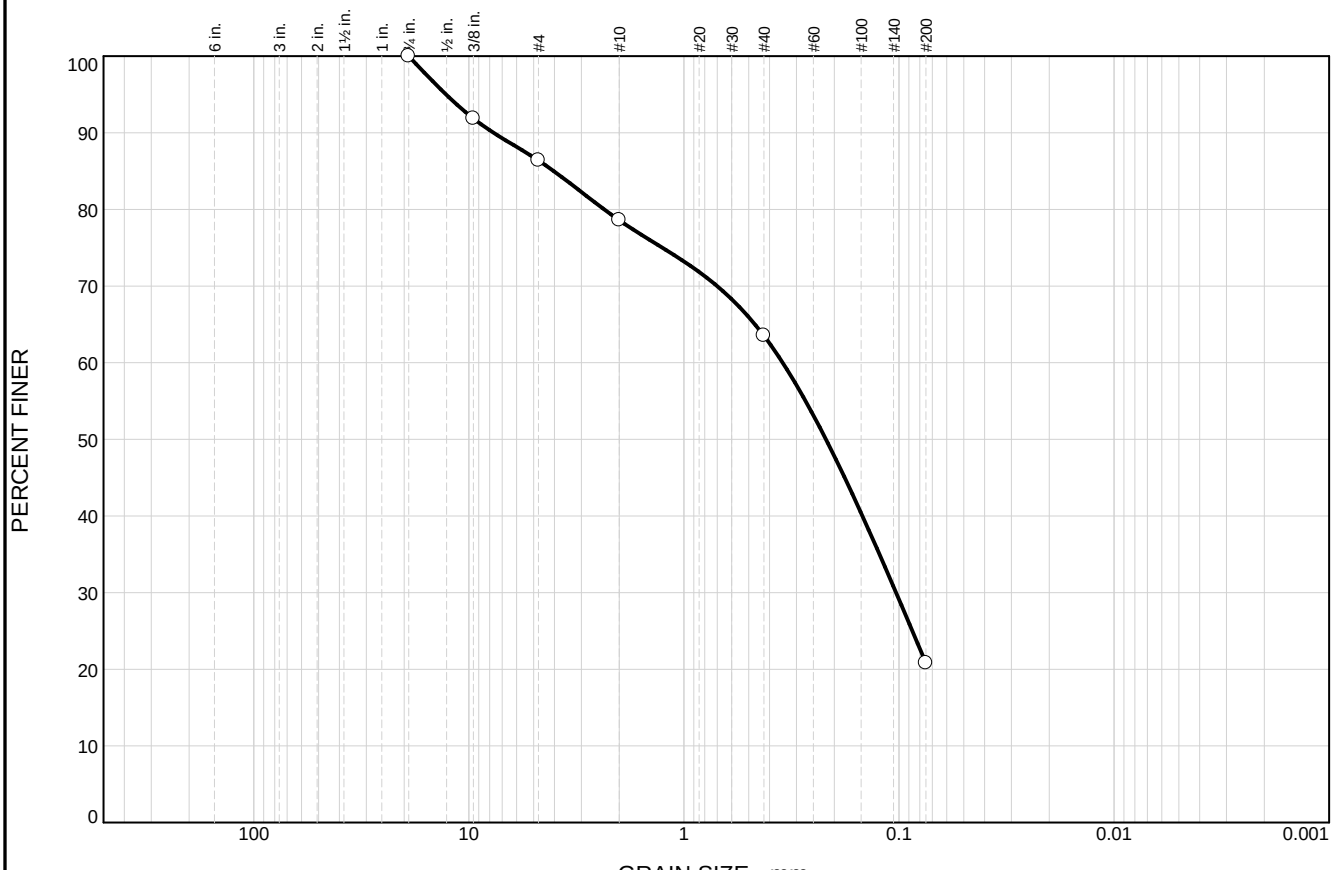
NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/27/13

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)					
	S-6	13.5-15.0	CL	-	-	-	-	41	25	16	0.1	-	27.2	-	-	-
B168.86-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	-	23.6	-	-	-
	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	-	25.8	-	-	-
	S-4	6.0-8.0	ML	-	-	-	-	29	23	6	0.6	-	26.6	-	-	-
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	-	34.7	-	-	-
	S-6	13.5-15.0	SP-SM	1.1	93.2	5.7		-	-	-	-	-	28.8	-	-	-
B169.1-1	S-7	18.5-20.0	SM	13.6	65.6	20.8		-	-	-	-	-	20.5	-	-	-
B169.65-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	-	24.9	-	-	-
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	37.3	90.7	-	-
	S-6	13.5-15.0	CL	-	-	-	-	31	22	9	0.9	-	30.1	-	-	-
B170.1-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	-	17.7	-	-	-
	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	-	29.0	-	-	-
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	21.9	105.7	-	-

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	13.6	7.8	15.1	42.7	20.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			4.0319	0.3474	0.2187	0.1032				

Material Description	USCS	AASHTO
○ BROWN F/M/C SAND, 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:** B169.1-1 **Depth:** 18.5-20.0 FT **Sample Number:** S-7

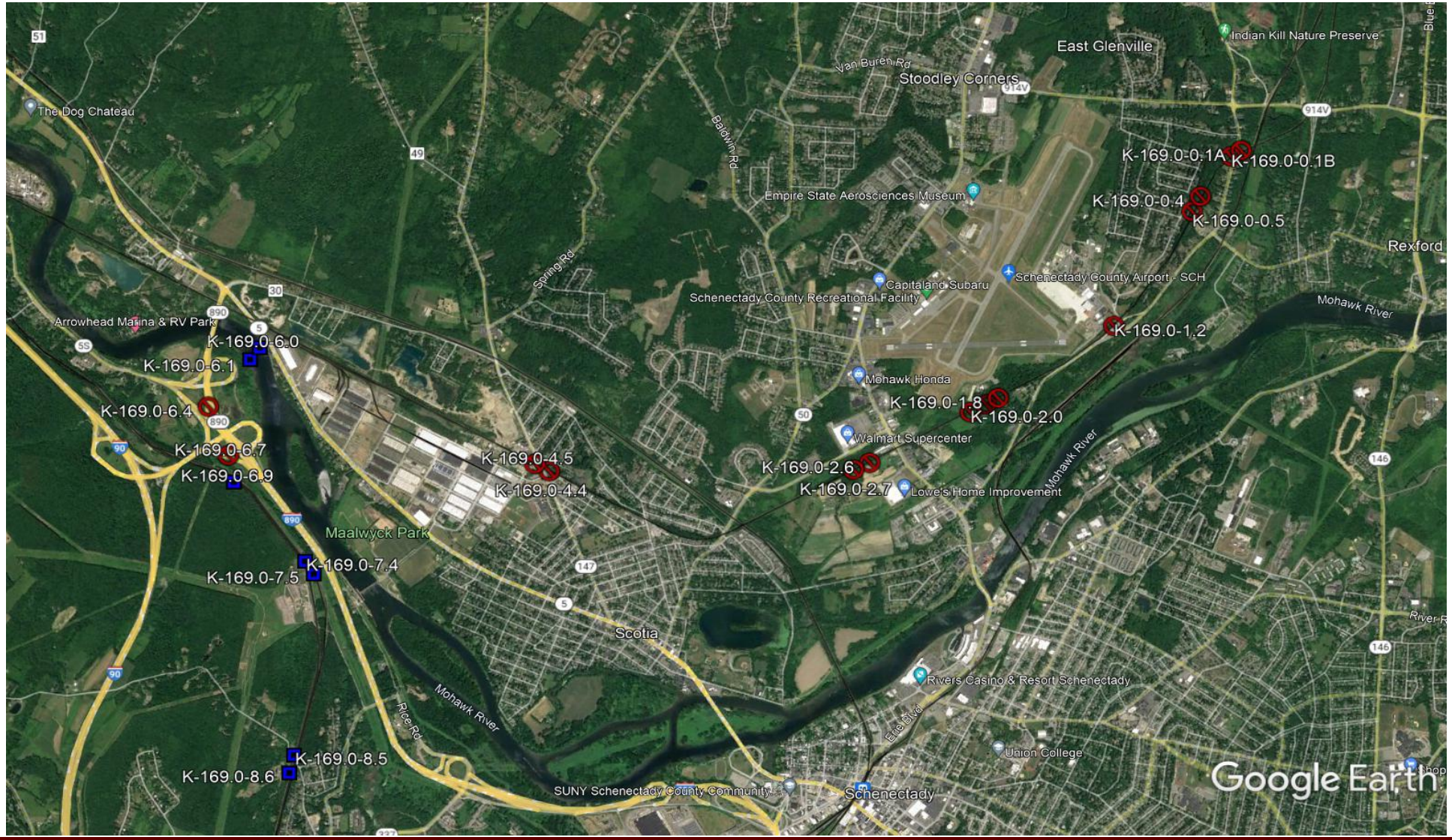
Remarks:
○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 90

Tested By: TBT 03/13/13 **Checked By:** _____



Boring Location Plans Page 1 of 9	Drawn by: ADW	Scale: Not to scale	Project No.: CD10279	Date: May 2022

Champlain Hudson Power Express
Design Package 4B
Glenville to Scotia, 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-01-05-22

Client: Kiewit Engineering (NY) Corp.

Boring Location: See Boring Location Plan

Project: Subsurface Investigation
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: 3/30/2022 Finish Date: 3/30/2022

Boring No.: K-169.0-0.1A Sheet 1 of 2

Groundwater Observations

Date	Time	Depth	Casing
3/30/2022	PM	*23.5'	23.0'

Coordinates
Northing 1468812.14
Easting 651482.3

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

Ground Elev.: 264.1

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	2 7 9 5	2.0	Blackish-Brown cmf SAND; some cmf GRAVEL; trace SILT (moist, non-plastic) FILL SW	5
2–4		2	2.0	4.0	SS	9 7 3 3	4.0	Brown cmf SAND; little mf GRAVEL; trace SILT; trace ORGANIC MATERIAL (moist, non-plastic) OC = 2.0% SW	3
4		3	4.0	6.0	SS	4 2 2 2		Brown mf SAND; trace SILT (moist, non-plastic) SP	8
6		4	6.0	8.0	SS	2 2 2 2		Brown f SAND; little SILT (moist, non-plastic) w = 10.4% % Fines = 18.0% SM	15
8		5	8.0	10.0	SS	3 2 2 2		Brown mf SAND; little cf GRAVEL; trace SILT (moist, non-plastic) COBBLE Fragment in split spoon shoe SP	2
14		6	14.0	16.0	SS	4 4 6 7		Brown mf SAND; little SILT (moist, non-plastic) SM	8
19		7	19.0	21.0	SS	2 4 4 3		Similar Soil (moist, non-plastic) SM	6
23	WETRO	ST-1A	23.0	25.0	SS	4 5 7 7		Advanced casing to 23.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole. (3" Brass Lined Split Spoon) Similar Soil (wet, non-plastic) SM	16

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

Drillers: Jeffrey Donovan; Chase Bertrand

Inspector: James LaMarco (ATL)

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: **K-169.0-0.1A** Report No.: **CD10279D-01-05-22** 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)
	TARY	ST-1B	25.0	27.0	SS	4 6 8 10		(3" Brass Lined Split Spoon) Similar Soil (wet, non-plastic) SM	10
26									
27		8	27.0	29.0	SS	3 5 7 9		(3" Brass Lined Split Spoon) Brown f SAND; little SILT (wet, non-plastic) w = 14.4%, % Fines = 13.0% SM	12
28									
29									
30									
31									
32									
33									
34		9	34.0	36.0	SS	4 4 5 6		Similar Soil (wet, non-plastic) SM	7
35									
36									
37									
38		10	38.0	40.0	SS	3 5 6 8		Similar Soil (wet, non-plastic) SM	7
39									
40							40.0		
41								Boring terminated at 40.0 feet.	
42									
43								Notes:	
44								1. Borehole backfilled with cement-bentonite grout.	
45								2. Soil classifications based on ATL Field Engineer's field classifications.	
46								3. Borehole was advanced with ATL's Geoprobe 7822D7 (Rig Unit No. CDGV706) drill rig.	
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: **CD10279D-01-05-22**

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

Boring Location: **See Boring Location Plan**

Project: **Subsurface Investigation**
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: **3/17/2022** Finish Date: **3/17/2022**

Boring No.: **K-169.0-0.1B** Sheet **1** of **2**

Coordinates
Northing **1468611.84**
Easting **651177.03**

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

Ground Elev.: **265.5**

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

Groundwater Observations

Date	Time	Depth	Casing
3/17/2022	AM	DRY	OPEN
3/17/2022	AM	5.3'	14.0'
3/17/2022	AM	8.1'	24.0'
3/17/2022	PM	*8.5'	29.0'

***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)
	CASING	1	0.0	2.0	SS	5 8 7 6	0.4	Black CINDERS; trace ORGANIC MATERIAL (leaves)	19
1							1.6	Greyish-Brown cmf SAND; trace f GRAVEL; trace SILT (saturated, non-plastic) SW	
2		2	2.0	4.0	SS	3 7 10 7	2.0	Brown mf SAND; trace SILT (saturated, non-plastic) SP	16
3								Brown SILT; little f SAND (saturated, non-plastic) ML	
4		3	4.0	6.0	SS	3 3 4 3		Similar Soil (saturated, non-plastic) ML	8
5							6.0		
6		4	6.0	8.0	SS	5 5 5 5		Brown f SAND; some SILT (saturated, non-plastic) w = 10.2% SM	7
7									
8		5	8.0	10.0	SS	2 3 4 3		Brown f SAND; little SILT (saturated, non-plastic) SM	9
9									
10									
11									
12									
13									
14		6	14.0	16.0	SS	2 3 4 2		Brown cmf+ SAND; little SILT (saturated, non-plastic) w = 21.1%, % Fines = 13.0% SM	5
15									
16									
17									
18									
19		7	19.0	21.0	SS	1 1 2 3		Brown f SAND; little SILT (saturated, non-plastic) SM	4
20									
21									
22									
23									
24		8	24.0	26.0	SS	1 1 3 3	24.8	Reddish-Brown Similar Soil (saturated, non-plastic) SM	15
25									

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

Drillers: **Ben Crary; Jake Crary**

Inspector: **Tom Hunter (ATL); Tom Kimmins (Kiewit)**

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: **K-169.0-0.1B** Report No.: **CD10279D-01-05-22** 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								Brown mf SAND; and SILT (saturated, non-plastic) w = 28.0%, LL = NP, PL = NP, PI = NP, % Fines = 48.4% SM	
27									
28							28.0		
29	WET ROTARY	9	29.0	31.0	SS	5 4 4 4		Bluish-Grey CLAY; little SILT (saturated, plastic) CL	16
30								Advanced casing to 29.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
31									
32							32.0		
33									
34		10	34.0	36.0	SS	1 1 1 1		Bluish-Grey SILT; trace CLAY; trace f SAND (saturated, very slightly plastic) ML	23
35									
36									
37							37.0		
38									
39									
40		11	40.0	42.0	SS	1 1 3 3		(3" Brass Lined Split Spoon) Bluish-Grey CLAY; little SILT; little f SAND (saturated, plastic) w = 28.2%, LL = 38, PL = 19, PI = 19, % Fines = 83.0% CL	24
41									
42									
43									
44		12	44.0	46.0	SS	WH/12" 1 3		Blackish-Grey CLAY; little SILT; trace f SAND (saturated, plastic) CL	24
45									
46							46.0		
47								Boring terminated at 46.0 feet.	
48									
49								Notes:	
50								1. Borehole backfilled with cement-bentonite grout.	
51								2. Soil classifications based on ATL Field Engineer's field classifications.	
52								3. Borehole was advanced with ATL's Geoprobe 7822DT (Rig Unit No. CDGV667) drill rig.	
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									

ATLANTIC TESTING LABORATORIES

LABORATORY TEST SUMMARY TABLE

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

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-169.0-0.1A	S-2	2.0-4.0	Brown cmf SAND; little mf GRAVEL; trace SILT; trace OM	--	--	--	--	--	2.0	--	--	--	--	--	--	--
	S-4	6.0 - 8.0	Brown f SAND; little SILT	18.0	10.4	--	--	--	--	--	--	--	--	--	--	--
	S-8	27.0-29.0	Brown f SAND; little SILT	13.0	14.4	--	--	--	--	--	--	--	--	--	--	--
K-169.0-0.1B	S-3	4.0-6.0	Brown SILT; little f SAND	--	--	--	--	--	--	2,300	50	8.08	39,990	--	--	--
	S-4	6.0-8.0	Frown f SAND; some SILT	--	10.2	--	--	--	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown cmf+ SAND; little SILT	13.0	21.1	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Brown mf SAND; and SILT	48.4	28.0	NP	NP	NP	--	--	--	--	--	--	--	--
	S-11	40.0-42.0	Blackish-Grey CLAY; little SILT; little f SAND	83.0	28.2	38	19	19	--	--	--	--	--	--	--	--
K-169.0-0.4	S-4	6.0-8.0	Brown cf+ SAND; little SILT; trace f GRAVEL	12.0	15.8	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0 - 21.0	Grey CLAY; little SILT; trace f SAND	99.9	24.8	40	19	21	--	--	--	--	--	--	--	--
	S-11	37.0-39.0	Blackish-Grey SILT; little CLAY; trace f SAND	99.1	30.6	38	19	19	--	--	--	--	--	--	--	--
K-169.0-0.5	S-4	6.0-8.0	Reddish Brown mf+ SAND; little SILT; trace f GRAVEL	12.0	17.4	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Grey SILT; trace CLAY; trace f SAND	99.4	31.9	36	18	18	--	--	--	--	--	--	--	--
	S-11	37.0-39.0	Light Brown-Grey SILT; some CLAY; trace f SAND	94.6	22.8	27	17	10	--	--	--	--	--	--	--	--
K-169.0-1.2	S-2	2.0-4.0	Greyish-Black cmf- SAND; and cmf+ GRAVEL; little SILT	19.0	8.2	--	--	--	--	--	--	--	--	--	--	--
	RC-3	25.0-30.0	Black SHALE	--	--	--	--	--	--	--	--	--	--	10,540	1252	1.14
K-169.0-1.8	S-2	2.0-4.0	Grey c+mf GRAVEL; little cmf SAND; trace SILT	3.0	2.4	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown cmf SAND; trace SILT	--	--	--	--	--	--	300	--	7.9	--	--	--	--
	S-5	8.0-10.0	Brown mf SAND; trace SILT	--	--	--	--	--	--	--	20	--	8,514	--	--	--
	S-7	18.0-20.0	Grey c-mf SAND; some SILT; little mf GRAVEL	34.0	7.5	--	--	--	--	--	--	--	--	--	--	--
	S-10	24.0-26.0	Grey cmf SAND; and SILT; little mf GRAVEL	38	8.1	--	--	--	--	--	--	--	--	--	--	--
	S-13	39.0-39.7	Grey cmf SAND; and mf GRAVEL; some SILT	--	9.5	--	--	--	--	--	--	--	--	--	--	--
K-169.0-1.9	S-2	2.0-4.0	Brown cmf GRAVEL; and cmf SAND; trace SILT	--	3.2	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown c-mf SAND; little SILT; little c+mf- GRAVEL	20.0	11.6	--	--	--		--	--	--	--	--	--	--
	S-8	18.0-20.0	Brown c-mf+ SAND; trace SILT; trace OM; trace f GRAVEL	7.0	20.7	--	--	--	--	--	--	--	--	--	--	--
	S-13	38.0-40.0	Grey cmf SAND; and SILT; trace f GRAVEL	39.0	7.8	--	--	--	--	--	--	--	--	--	--	--

ATLANTIC TESTING LABORATORIES

WBE certified company

LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS

ASTM D 2216

PROJECT INFORMATION

Client:	Kiewit Intrastructure Co.	**ATL Report No.:**	CD10279E-10-04-22
Project:	Champlain Hudson Power Express	**Report Date:**	April 4, 2022
	United Cable Installation	**Date Received:**	March 22, 2022
	Various Locations, New York		

TEST DATA

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
[redacted]			
K-169.0-0.1B	S-4	6-8	10.2
	S-6 [1]	14-16	21.1
	S-8 [1]	24-26	28.0
	S-11	40-42	28.2

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-14-04-22
Report Date: April 29, 2022
Date Received: April 19, 2022

TEST DATA

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
K-169.0-0.1A	S-4	6-8	10.4
	S-8	27-29	14.4
K-169.0-2.6	S-5	8-10	16.1
	S-8	24-26	26.7
	S-9	32-34	22.7
K-169.0-2.7	S-4	6-8	23.1
	S-7	19-21	29.5
	ST-1	28-30	39.3
K-169.0-4.4	S-5 [1]	8-10	5.4
	ST-1c [1]	27-29	15.8
K-169.0-4.5	S-3	4-6	10.6
	S-7 [1]	19-21	11.5
	S-8	29-31	17.7
K-169.0-6.4	S-4 [1]	6-8	6.2
	S-6 [1]	14-16	9.4
	ST-1c [1]	27-29	6.0
	S-10 [1]	39-41	22.0

Remarks

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

Reviewed By: _____ Date: 04/29/22

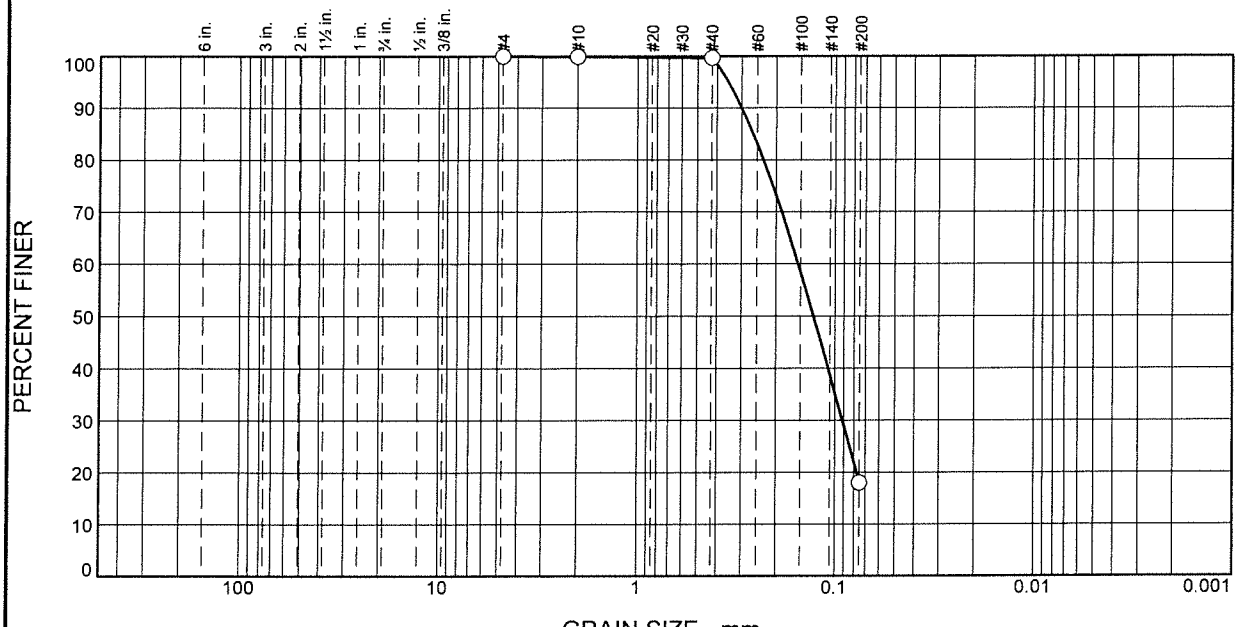
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-14-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/29/22

Sample No: K-169.0-0.1A **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 6-8'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	82	18	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#4	100		
#10	100		
#40	100		
#200	18		

Soil Description

Brown f SAND; little SILT

Atterberg Limits

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

Coefficients

D_{85}= 0.2623 D_{60}= 0.1544 D_{50}= 0.1288
D_{30}= 0.0915 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 10.4%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: _____ Date: 04/29/22

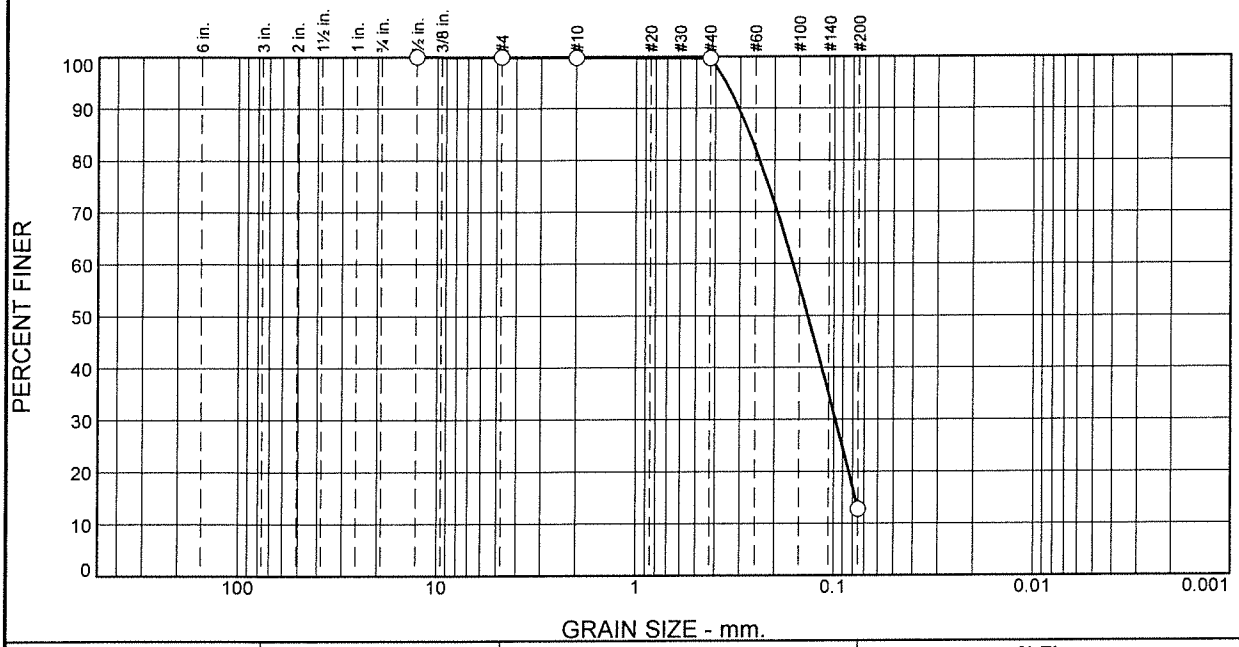
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-14-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/29/22

Sample No: K-169.0-0.1A **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	0	0	0	87	13	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	100		
#10	100		
#40	100		
#200	13		

* (no specification provided)

Soil Description

Brown f SAND; little SILT

Atterberg Limits

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

Coefficients

D_{85}= 0.2679 D_{60}= 0.1613 D_{50}= 0.1357
D_{30}= 0.0981 D_{15}= 0.0776 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 14.4%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: _____ Date: 04/29/22

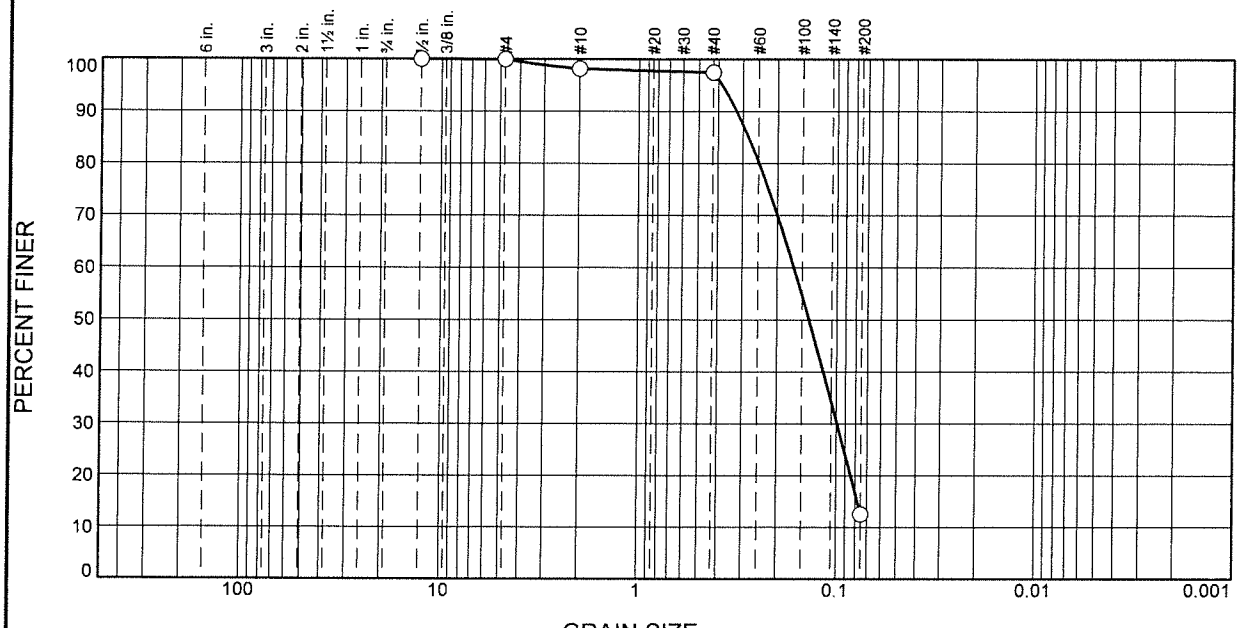
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-10-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/04/22

Sample No: K-169.0-0.1B **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 14-16'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	1	84	13	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	100		
#10	98		
#40	97		
#200	13		

* (no specification provided)

Soil Description

Brown cmf+ SAND; little SILT

Atterberg Limits

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

Coefficients

D_{85}= 0.2807 D_{60}= 0.1651 D_{50}= 0.1382
D_{30}= 0.0991 D_{15}= 0.0780 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 21.1%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/04/22

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-10-04-22
Project:	Champlain Hudson Power Express	**Report Date:**	April 4, 2022
	United Cable Installation	**Test Date:**	March 30, 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-169.0-0.1B	S-8	24-26	A	10	179.23	48.4
K-169.0-0.1B	S-11	40-42	A	10	34.01	83.0
K-169.0-0.4	S-7	19-21	A	10	160.51	99.9
K-169.0-0.4	S-11	37-39	A	10	168.68	99.1
K-169.0-0.5	S-8	24-26	A	10	78.40	99.4
K-169.0-0.5	S-11	37-39	A	10	46.68	94.6

Reviewed By: _____ Date: 04/04/22

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-10-04-22
Report Date: April 4, 2022
Date Received: March 22, 2022

TEST DATA

Boring No.	Sample No.	LL	PL	PI
[redacted]				
K-169.0-0.1B	S-8	NP	NP	NP
K-169.0-0.1B	S-11	38	19	19
K-169.0-0.4	S-7	40	19	21
K-169.0-0.4	S-11	38	19	19
K-169.0-0.5	S-8	36	18	18
K-169.0-0.5	S-11	27	17	10

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-169.0-0.1B	S-8	9.51	30	28.0
K-169.0-0.1B	S-11	0.074	0	28.2
K-169.0-0.4	S-7	0.05	0	24.8
K-169.0-0.4	S-11	0.074	0	30.6
K-169.0-0.5	S-8	0.074	0	31.9
K-169.0-0.5	S-11	0.074	0	22.8

PREPARATION INFORMATION

Boring No.	Sample No.	Preparation	Method of Removing Oversized Material
[redacted]			
K-169.0-0.1B	S-8	Air Dry	Pulverizing and Screening
K-169.0-0.1B	S-11	Air Dry	Not Necessary
K-169.0-0.4	S-7	Air Dry	Not Necessary
K-169.0-0.4	S-11	Air Dry	Not Necessary
K-169.0-0.5	S-8	Air Dry	Not Necessary
K-169.0-0.5	S-11	Air Dry	Not Necessary

ATLANTIC TESTING LABORATORIES

WBE certified company

PROJECT INFORMATION

Client:	Kiewit Intrastructure Co.	**ATL Report No.:**	CD10279E-14-04-22
Project:	Champlain Hudson Power Express	**Report Date:**	April 29, 2022
	United Cable Installation	**Date Received:**	April 19, 2022
	Various Locations, New York		

PERCENT ORGANICS, ASH CONTENT, AND MOISTURE CONTENT

ASTM D 2974

Boring No.	Sample No.	Organics (%)	Ash (%)	Moisture (%)	Test Method	Furnace Temperature (°C)
K-169.0-0.1A	S-2	2.0	98.0	7.5	A	440
K-169.0-6.4	S-2	1.4	98.6	12.7	A	440

Reviewed By: _____ Date: 04/29/22

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-10-04-22
Report Date: April 4, 2022
Date Received: March 22, 2022

Sample: K-169.0-0.1B, 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	23.0	8.07	8.09	8.08	8.08

pH of calibration standards used: 7.00

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

Test Date: 03/25/22 Performed by: E. Hannon
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	31,000	39,990

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

Chloride by Mass of Soil (mg/kg)
50

WATER-SOLUBLE SULFATE IN SOIL
ASTM C 1580

Sulfate by Mass of Sample (%)	Sulfate by Mass of Sample (mg/kg)
0.23	2300

Reviewed By: Date: 04/04/22

Kiewit

MEMORANDUM

DATE: January 26, 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 7 - Package 4B - HDD Crossing 62A – Revision 1
Champlain Hudson Power Express Project
East Glenville, New York

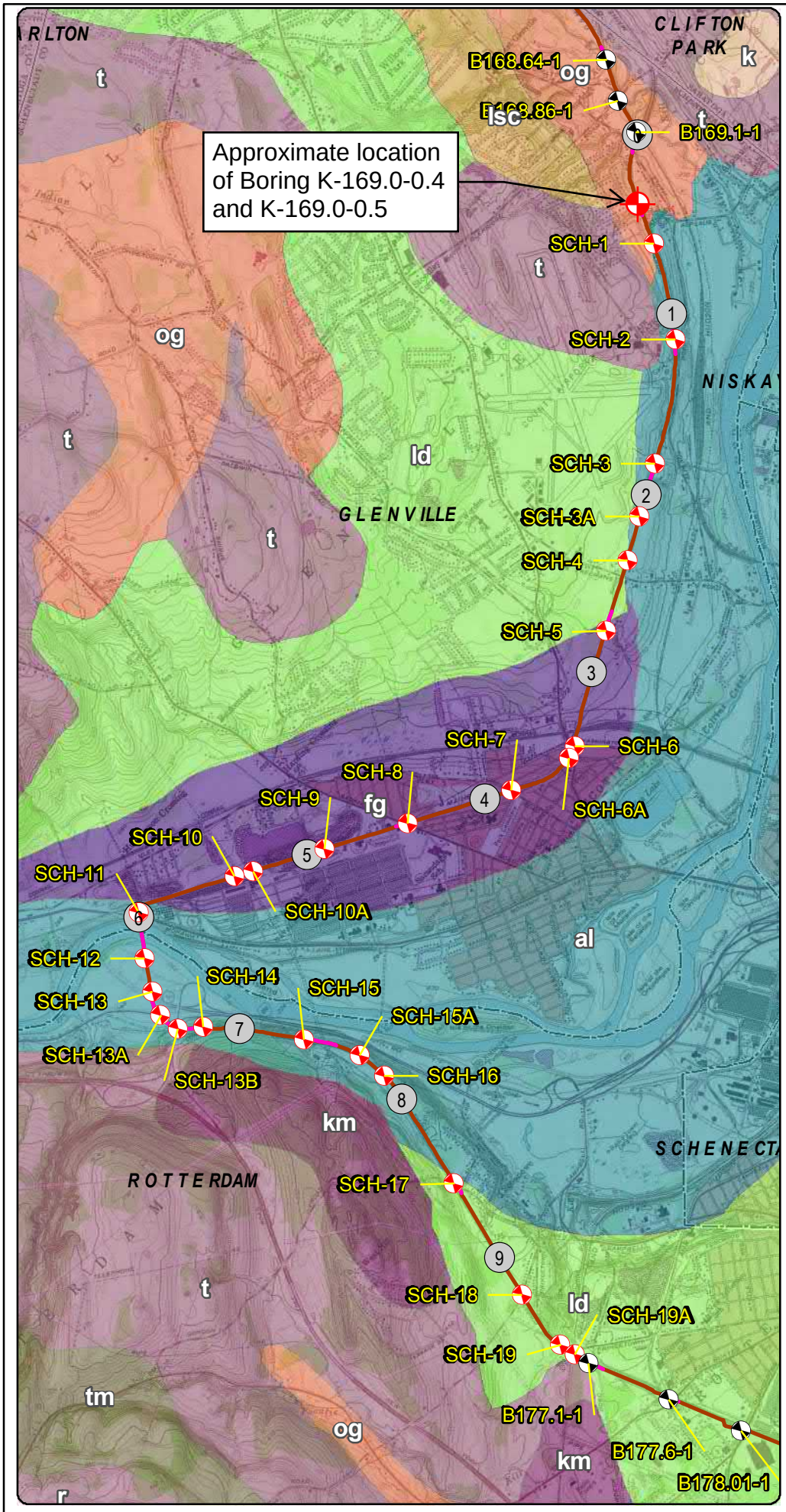
Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located near East Glenville, New York. The approximate station for the start of HDD crossing Number 62A is STA 45020+00 (42.8604°N, 73.9095°W).

The geotechnical data at this HDD crossing is attached. The available data is from a recent investigation by Atlantic Testing Laboratories (ATL).

- ATL, Subsurface Investigation Services, Champlain Hudson Power Express, Design Package 4B, Glenville to Scotia, New York, dated June 15, 2022.

Contact us if you have questions or require additional information.

HDD 62A
Borings K-169.0-0.4, K-169.0-0.5
Segment 7 - Design Package 4B



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
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

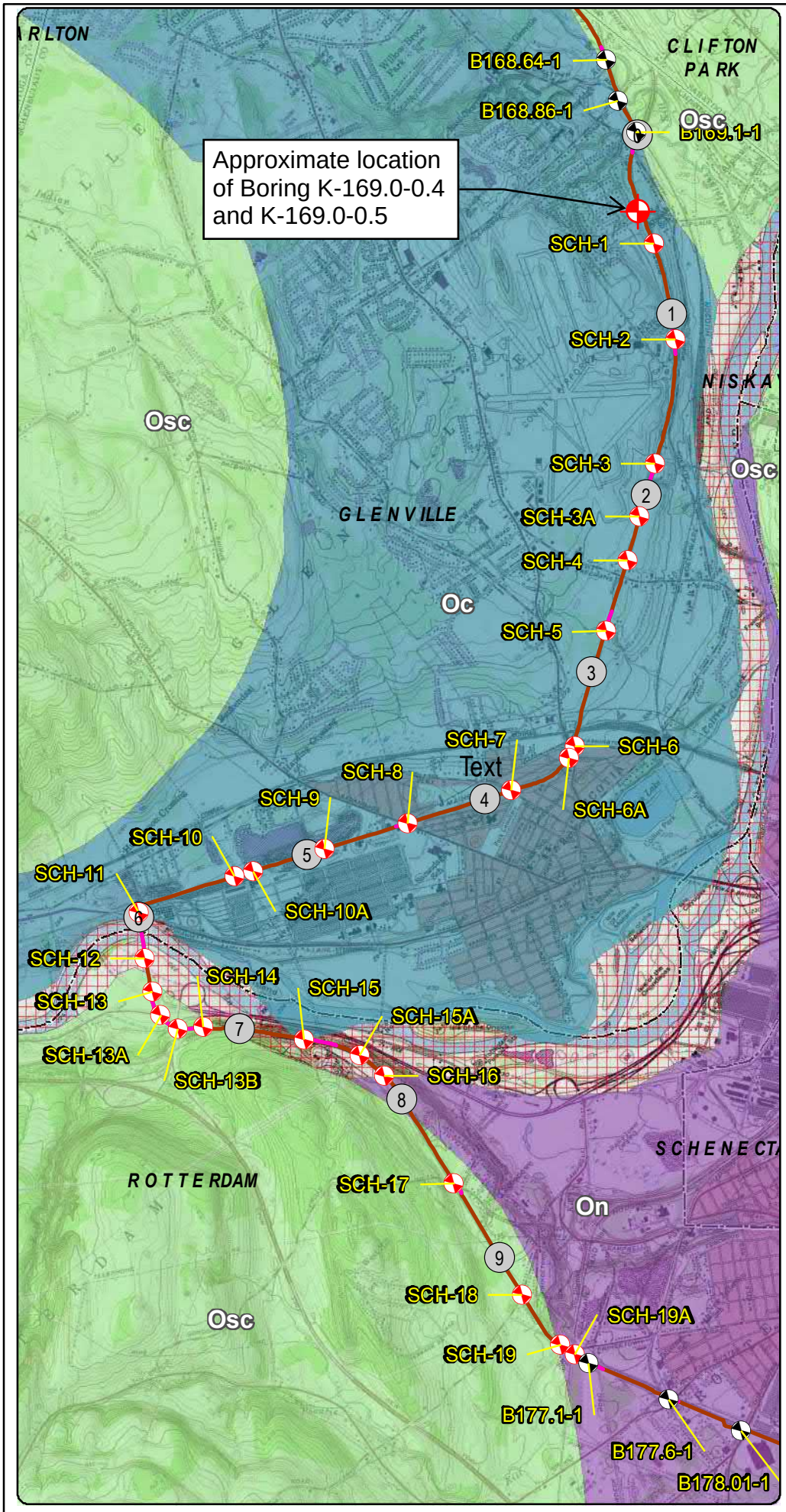
Surficial Geology and Geotechnical Borings Schenectady Preferred Alt Figure 3-7

Prepared on 4/27/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Surficial_Map_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

- No Label
- Oc - Canajoharie Shale
- On - Normanskill Shale
- Osc - Schenectady Formation

* Schenectady Formation includes: graywacke, sandstone, siltstone, shale

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

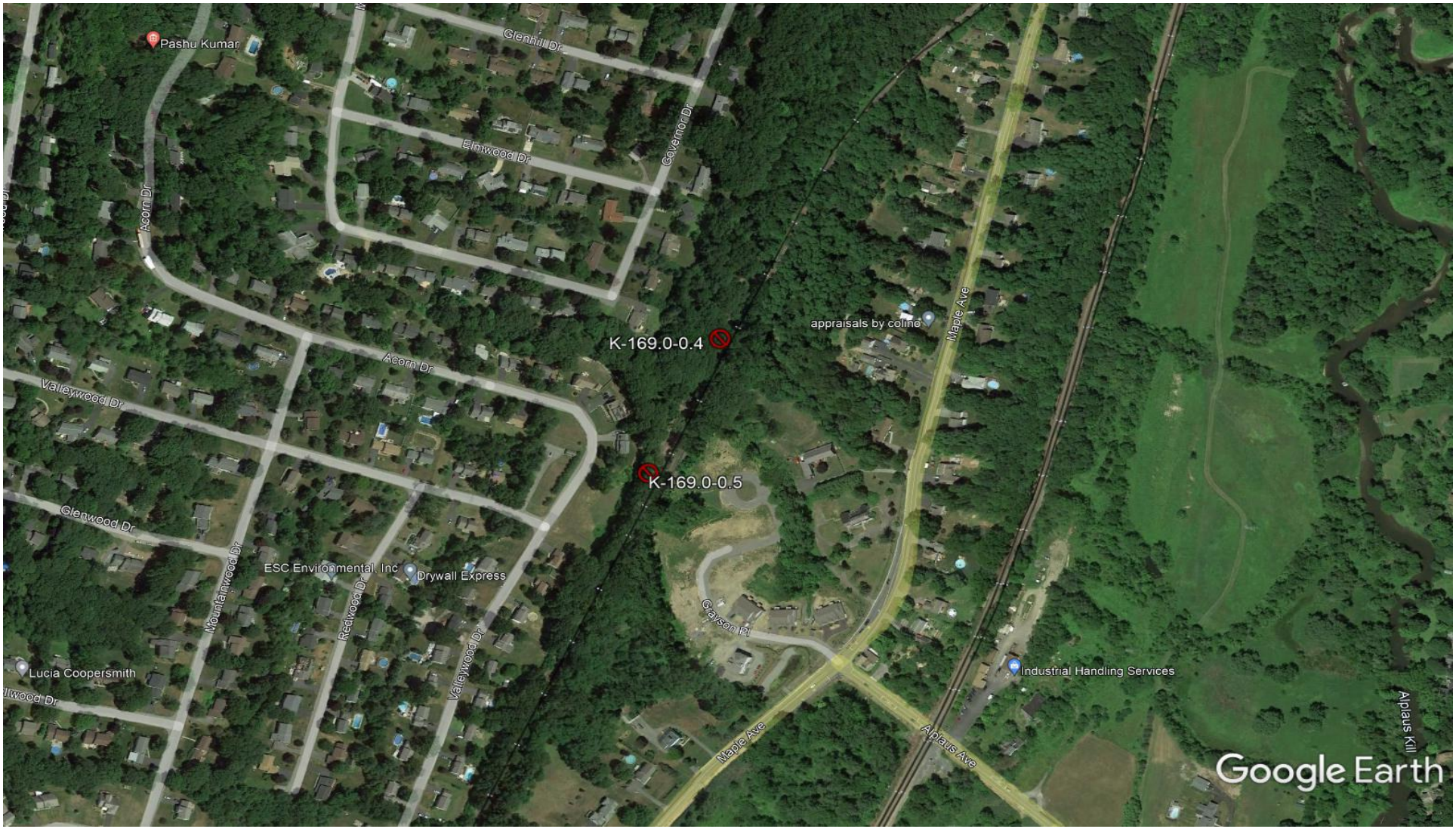
Bedrock Geology and Geotechnical Borings Schenectady Preferred Alt Figure 4-7

Prepared on 4/29/2021

by: AECOM

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

Y:\Projects\CHPE\IRoute\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Bedrock_Map_May_2021_Report.mxd



Boring Location Plans Page 3 of 9	Drawn by: ADW	Scale: Not to scale	Project No.: CD10279	Date: May 2022

Champlain Hudson Power Express
Design Package 4B
Glenville to Scotia, 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-01-05-22

Client: Kiewit Engineering (NY) Corp.

Boring Location: See Boring Location Plan

Project: Subsurface Investigation
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: 3/17/2022 Finish Date: 3/18/2022

Boring No.: K-169.0-0.4 Sheet 1 of 2

Groundwater Observations

Date	Time	Depth	Casing
3/17/2022	PM	4.5'	14.0'
3/18/2022	AM	9.5'	14.0'
3/18/2022	AM	*13.0'	19.0'
3/18/2022	AM	*12.3'	CAVED

Borehole caved at 42.8 feet. *May be affected by water utilized to advance the borehole.

Coordinates
Northing 1467494.4
Easting 650405.86

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

Ground Elev.: 272.4

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

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	11 12 9 6	0.5	Black cmf SAND; little f GRAVEL; trace SILT; trace ORGANIC MATERIAL (leaves) (saturated, non-plastic) SW	14
2		2	2.0	4.0	SS	5 5 7 8	2.0	Greyish-Brown cmf GRAVEL; and cmf SAND; trace SILT (wet, non-plastic) GW	16
4		3	4.0	6.0	SS	2 4 4 4		Brown f SAND; little SILT (saturated, non-plastic) SM Dark Brown f SAND; trace SILT (saturated, non-plastic) SP	8
6		4	6.0	8.0	SS	4 4 4 4		Brown cf+ SAND; little SILT; trace f GRAVEL (saturated, non-plastic) w = 15.8%, % Fines = 12.0% SP-SM	12
8		5	8.0	10.0	SS	3 3 3 3		Brown f SAND; little SILT (saturated, non-plastic) SM	6
14		6	14.0	16.0	SS	1 WH/12" 1		Brown f SAND; trace f GRAVEL; trace SILT (saturated, non-plastic) SP	4
17							17.0	Advanced casing to 19.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
19	WET ROTARY	7	19.0	21.0	SS	1 2 3 4		(3" Brass Lined Split Spoon) Grey CLAY; little SILT; trace f SAND (saturated, plastic) w = 24.8%, LL = 40, PL = 19, PI = 21, % Fines = 99.9% CL	24
22							22.0		
24		8	24.0	26.0	SS	4 2 3 3		Blackish-Grey CLAY; trace SILT; trace f SAND (saturated, plastic)	23

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

Drillers: Ben Crary; Jake Crary

Inspector: Tom Hunter (ATL); Tom Kimmins (Kiewit)

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: K-169.0-0.4 Report No.: CD10279D-01-05-22 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)
								CL	
26									
27									
28									
29		9	29.0	31.0	SS	1 1 2 2		Similar Soil (saturated, plastic) CL	24
30									
31									
32									
33									
34		10	34.0	36.0	SS	1 1 2 2		Similar Soil (saturated, plastic) CL	24
35									
36									
37		11	37.0	39.0	SS	3 4 7 10		(3" Brass Lined Split Spoon) Blackish-Grey CLAY; little SILT;	24
38								trace f SAND (saturated, plastic) w = 30.6%	
39		12	39.0	41.0	SS	1 1 1 2		LL = 38, PL = 19, PI = 19, % Fines = 99.1% CL Similar Soil (saturated, plastic) CL	24
40									
41									
42									
43									
44		13	44.0	46.0	SS	WH/12" 1 2		Similar Soil (saturated, plastic) CL	24
45									
46							46.0		
47								Boring terminated at 46.0 feet.	
48									
49								Notes:	
50								1. Borehole backfilled with cement-bentonite grout.	
51								2. Soil classifications based on ATL Field Engineer's field classifications.	
52								3. Borehole was advanced with ATL's Geoprobe 7822DT (Rig Unit No. CDGV667) drill rig.	
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: CD10279D-01-05-22

Client: Kiewit Engineering (NY) Corp.

Boring Location: See Boring Location Plan

Project: Subsurface Investigation
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: 3/16/2022 Finish Date: 3/16/2022

Boring No.: K-169.0-0.5 Sheet 1 of 2

Groundwater Observations

Date	Time	Depth	Casing
3/16/2022	AM	2.5'	8.0'
3/16/2022	AM	8.8'	24.0'
3/16/2022	PM	*11.0'	24.0'
3/16/2022	PM	*10.5'	CAVED

Coordinates
Northing 1467096.3
Easting 650229.66

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

Ground Elev.: 274.0

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

Borehole caved at 36.5 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)
1	CASING	1	0.0	2.0	SS	5 11 11 23	1.1	Reddish-Brown f SAND; little SILT; trace ORGANIC MATERIAL (leaves) (wet, non-plastic) SM	18
							1.6		
2		2	2.0	4.0	SS	6 6 5 4	2.0	Black cmf SAND; trace SILT (wet, non-plastic) SW	9
							2.6	Greyish-Brown mf GRAVEL; little cmf SAND; trace SILT (wet, non-plastic) GP	
4		3	4.0	6.0	SS	23 10 5 5	4.0	Reddish-Grey cmf SAND; some f GRAVEL; trace SILT (saturated, non-plastic) SW	10
							6.0		
6		4	6.0	8.0	SS	7 5 9 5		Orangish-Brown f SAND; some SILT (saturated, non-plastic) SM	7
								Reddish-Brown SILT; some f SAND (saturated, non-plastic) ML	
8		5	8.0	10.0	SS	5 5 5 5		Reddish-Brown mf+ SAND; little SILT; trace f GRAVEL (saturated, non-plastic) w = 17.4%, % Fines = 12.0% SP-SM	4
								Similar Soil (saturated, non-plastic) SP-SM	
							12.0		
14		6	14.0	16.0	SS	1 2 2 3		Dark Brown SILT; and f SAND (saturated, non-plastic) ML	5
							17.0		
19		7	19.0	21.0	SS	2 2 2 2		NO RECOVERY	0
24	WET R	8	24.0	26.0	SS	1 1 1 2		Grey CLAY; trace SILT; trace f SAND (saturated, plastic) w =	24

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

Drillers: Ben Crary; Jake Crary

Inspector: Tom Hunter (ATL); Tom Kimmins (Kiewit)

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: K-169.0-0.5 Report No.: CD10279D-01-05-22 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)
	ROTARY							31.9%, LL = 36, PL = 18, PI = 18, % Fines = 99.4% CL	
26								Advanced casing to 24.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
27									
28									
29		9	29.0	31.0	SS	WH 1 2 2		Light Brownish-Grey CLAY; little SILT; trace f SAND (saturated, plastic) CL	24
30									
31									
32									
33									
34		10	34.0	36.0	SS	WH 1 1 1		Similar Soil (saturated, plastic) CL	21
35									
36									
37		11	37.0	39.0	SS	1 3 4 8		(3" Brass Lined Split Spoon) Similar Soil (saturated, plastic) w = 22.8%, LL = 27, PL = 17, PI = 10, % Fines = 94.6% CL	24
38									
39		12	39.0	41.0	SS	WH 1 2 2		Grey Similar Soil (saturated, plastic) CL	24
40									
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 classifications.	
47								3. Borehole was advanced with ATL's Geoprobe 7822DT (Rig Unit No. CDGV667) drill rig.	
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									

ATLANTIC TESTING LABORATORIES

LABORATORY TEST SUMMARY TABLE

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

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-169.0-0.1A	S-2	2.0-4.0	Brown cmf SAND; little mf GRAVEL; trace SILT; trace OM	--	--	--	--	--	2.0	--	--	--	--	--	--	--
	S-4	6.0 - 8.0	Brown f SAND; little SILT	18.0	10.4	--	--	--	--	--	--	--	--	--	--	--
	S-8	27.0-29.0	Brown f SAND; little SILT	13.0	14.4	--	--	--	--	--	--	--	--	--	--	--
K-169.0-0.1B	S-3	4.0-6.0	Brown SILT; little f SAND	--	--	--	--	--	--	2,300	50	8.08	39,990	--	--	--
	S-4	6.0-8.0	Frown f SAND; some SILT	--	10.2	--	--	--	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown cmf+ SAND; little SILT	13.0	21.1	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Brown mf SAND; and SILT	48.4	28.0	NP	NP	NP	--	--	--	--	--	--	--	--
	S-11	40.0-42.0	Blackish-Grey CLAY; little SILT; little f SAND	83.0	28.2	38	19	19	--	--	--	--	--	--	--	--
K-169.0-0.4	S-4	6.0-8.0	Brown cf+ SAND; little SILT; trace f GRAVEL	12.0	15.8	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0 - 21.0	Grey CLAY; little SILT; trace f SAND	99.9	24.8	40	19	21	--	--	--	--	--	--	--	--
	S-11	37.0-39.0	Blackish-Grey SILT; little CLAY; trace f SAND	99.1	30.6	38	19	19	--	--	--	--	--	--	--	--
K-169.0-0.5	S-4	6.0-8.0	Reddish Brown mf+ SAND; little SILT; trace f GRAVEL	12.0	17.4	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Grey SILT; trace CLAY; trace f SAND	99.4	31.9	36	18	18	--	--	--	--	--	--	--	--
	S-11	37.0-39.0	Light Brown-Grey SILT; some CLAY; trace f SAND	94.6	22.8	27	17	10	--	--	--	--	--	--	--	--
K-169.0-1.2	S-2	2.0-4.0	Greyish-Black cmf- SAND; and cmf+ GRAVEL; little SILT	19.0	8.2	--	--	--	--	--	--	--	--	--	--	--
	RC-3	25.0-30.0	Black SHALE	--	--	--	--	--	--	--	--	--	--	10,540	1252	1.14
K-169.0-1.8	S-2	2.0-4.0	Grey c+mf GRAVEL; little cmf SAND; trace SILT	3.0	2.4	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown cmf SAND; trace SILT	--	--	--	--	--	--	300	--	7.9	--	--	--	--
	S-5	8.0-10.0	Brown mf SAND; trace SILT	--	--	--	--	--	--	--	20	--	8,514	--	--	--
	S-7	18.0-20.0	Grey c-mf SAND; some SILT; little mf GRAVEL	34.0	7.5	--	--	--	--	--	--	--	--	--	--	--
	S-10	24.0-26.0	Grey cmf SAND; and SILT; little mf GRAVEL	38	8.1	--	--	--	--	--	--	--	--	--	--	--
	S-13	39.0-39.7	Grey cmf SAND; and mf GRAVEL; some SILT	--	9.5	--	--	--	--	--	--	--	--	--	--	--
K-169.0-1.9	S-2	2.0-4.0	Brown cmf GRAVEL; and cmf SAND; trace SILT	--	3.2	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown c-mf SAND; little SILT; little c+mf- GRAVEL	20.0	11.6	--	--	--		--	--	--	--	--	--	--
	S-8	18.0-20.0	Brown c-mf+ SAND; trace SILT; trace OM; trace f GRAVEL	7.0	20.7	--	--	--	--	--	--	--	--	--	--	--
	S-13	38.0-40.0	Grey cmf SAND; and SILT; trace f GRAVEL	39.0	7.8	--	--	--	--	--	--	--	--	--	--	--

TEST DATA (continued)

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
K-169.0-0.4	S-4 [1]	6-8	15.8
	S-7	19-21	24.8
	S-11	37-39	30.6
K-169.0-0.5	S-4	6-8	17.4
	S-8	24-26	31.9
	S-11	37-39	22.8
K-169.0-1.2	S-2 [1]	2-4	8.2

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

Reviewed By: _____ Date: 04/04/22

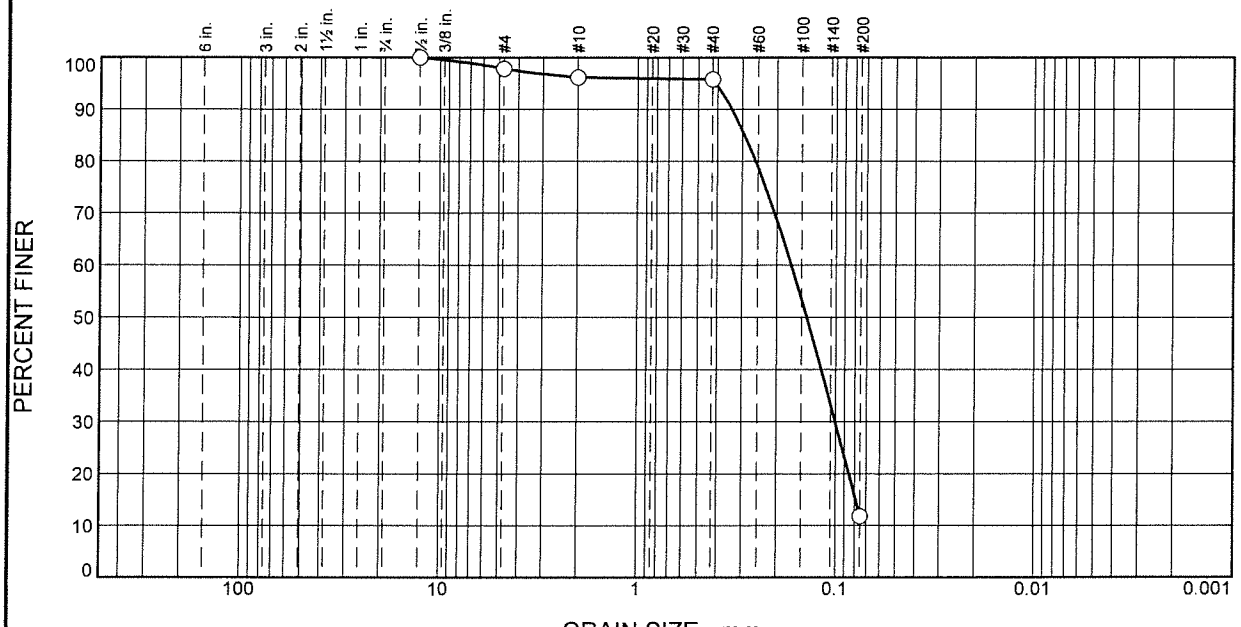
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-10-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/04/22

Sample No: K-169.0-0.4 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 6-8'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	2	0	84	12	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	98		
#10	96		
#40	96		
#200	12		

Soil Description

Brown cf+ SAND; little SILT; trace f GRAVEL

Atterberg Limits

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

Coefficients

D_{85}= 0.2922 D_{60}= 0.1690 D_{50}= 0.1409
D_{30}= 0.1006 D_{15}= 0.0789 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 15.8%

* (no specification provided)

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: _____ Date: 04/04/22

ATLANTIC TESTING LABORATORIES

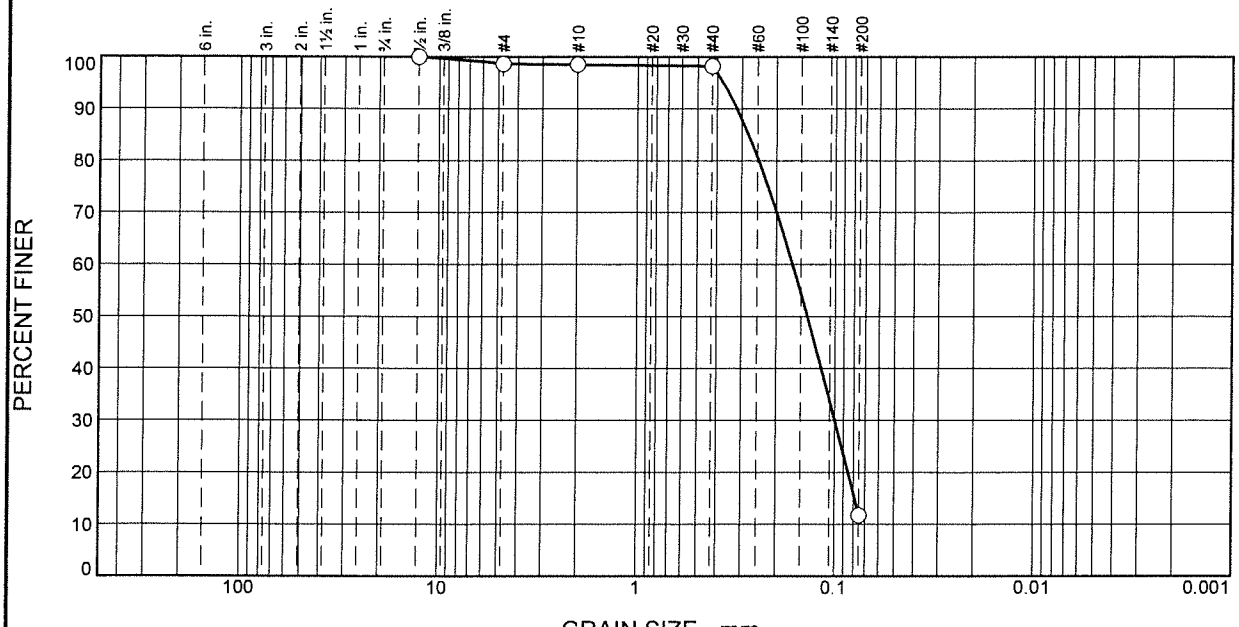
Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-10-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/04/22

Sample No: K-169.0-0.5 **Source of Sample:** Boring Sample

Location: In-place **Elev./Depth:** 6-8'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	0	1	86	12	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	99		
#10	99		
#40	98		
#200	12		

* (no specification provided)

Soil Description

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

Atterberg Limits

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

Coefficients

D_{85}= 0.2776 D_{60}= 0.1652 D_{50}= 0.1386
D_{30}= 0.0999 D_{15}= 0.0789 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 17.4%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/04/22

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-10-04-22
Project:	Champlain Hudson Power Express	**Report Date:**	April 4, 2022
	United Cable Installation	**Test Date:**	March 30, 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-169.0-0.1B	S-8	24-26	A	10	179.23	48.4
K-169.0-0.1B	S-11	40-42	A	10	34.01	83.0
K-169.0-0.4	S-7	19-21	A	10	160.51	99.9
K-169.0-0.4	S-11	37-39	A	10	168.68	99.1
K-169.0-0.5	S-8	24-26	A	10	78.40	99.4
K-169.0-0.5	S-11	37-39	A	10	46.68	94.6

Reviewed By: _____ Date: 04/04/22

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-10-04-22
Report Date: April 4, 2022
Date Received: March 22, 2022

TEST DATA

Boring No.	Sample No.	LL	PL	PI
[redacted]				
K-169.0-0.1B	S-8	NP	NP	NP
K-169.0-0.1B	S-11	38	19	19
K-169.0-0.4	S-7	40	19	21
K-169.0-0.4	S-11	38	19	19
K-169.0-0.5	S-8	36	18	18
K-169.0-0.5	S-11	27	17	10

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-169.0-0.1B	S-8	9.51	30	28.0
K-169.0-0.1B	S-11	0.074	0	28.2
K-169.0-0.4	S-7	0.05	0	24.8
K-169.0-0.4	S-11	0.074	0	30.6
K-169.0-0.5	S-8	0.074	0	31.9
K-169.0-0.5	S-11	0.074	0	22.8

PREPARATION INFORMATION

Boring No.	Sample No.	Preparation	Method of Removing Oversized Material
[redacted]			
K-169.0-0.1B	S-8	Air Dry	Pulverizing and Screening
K-169.0-0.1B	S-11	Air Dry	Not Necessary
K-169.0-0.4	S-7	Air Dry	Not Necessary
K-169.0-0.4	S-11	Air Dry	Not Necessary
K-169.0-0.5	S-8	Air Dry	Not Necessary
K-169.0-0.5	S-11	Air Dry	Not Necessary

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 7 - Package 4B - HDD Crossing 63 – Revision 1
Champlain Hudson Power Express Project
East Glenville, 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 near East Glenville, New York. The approximate station for the start of HDD crossing number 63 is STA 45052+50 (42.8525°N, 73.9154°W).

The geotechnical data at this HDD crossing is attached. The available data is from the investigations by AECOM, Atlantic Testing Laboratories (ATL), and Kiewit 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 4B, Glenville to Scotia, New York, dated June 15, 2022.
- Kiewit Engineering (NY) Corp., Package 4B Phase 4 Borings Rev. 1, Champlain Hudson Power Express, New York, dated March 31, 2023.

Contact us if you have questions or require additional information.

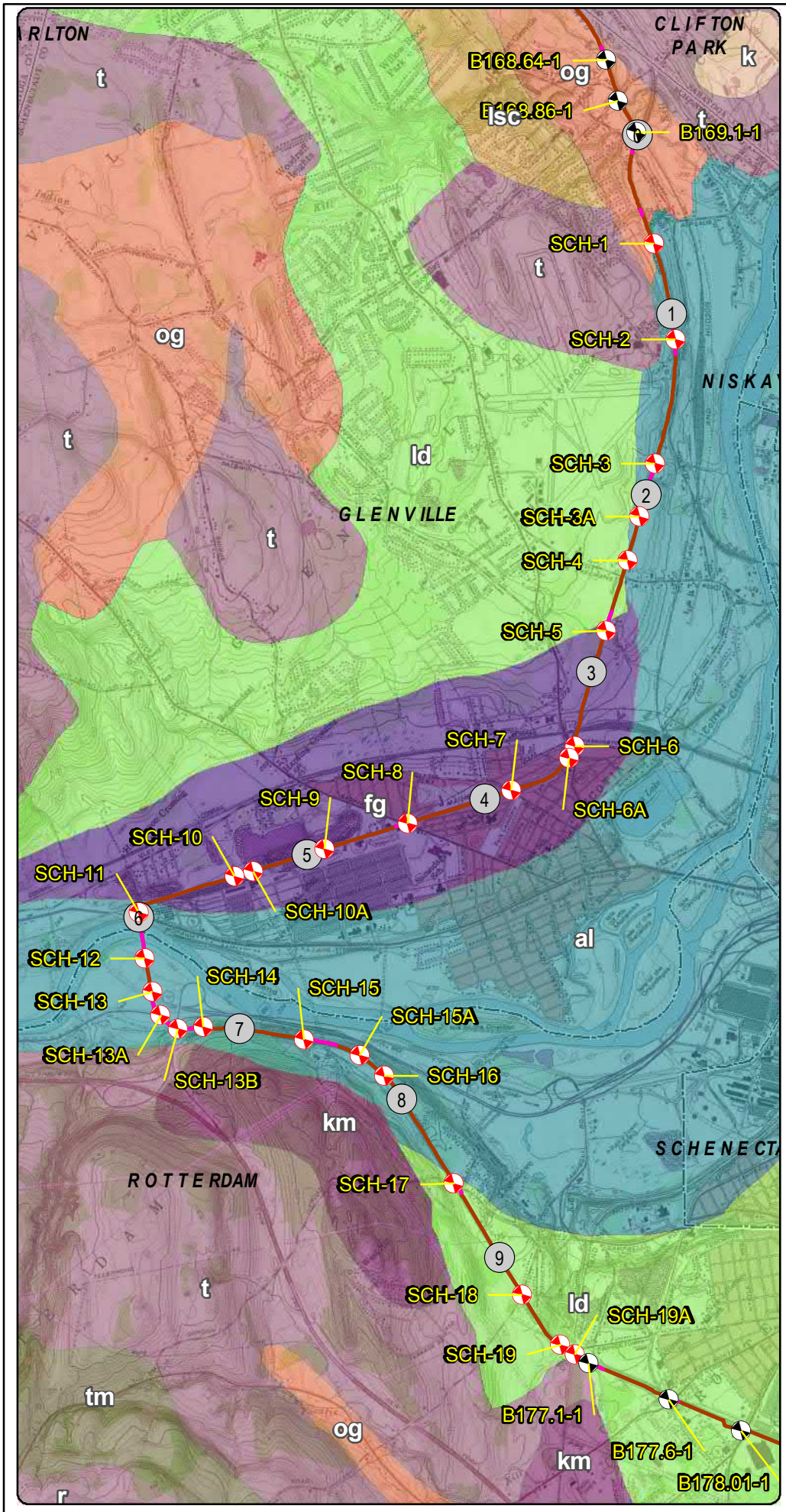
HDD 63
Borings SCH-2, K-169.0-1.2
KB-169.0-1.0
Segment 7 - Design Package 4B

CHPE Segment 7 Package 4B
Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B169.1-1	1469045.0	651801.8	236.7
AECOM**	SCH-1	1466449.8	649931.4	279.8
	SCH-2	1464095.5	648426.9	288.3
	SCH-3	1462008.4	645522.0	286.8
	SCH-3A	1461257.5	644144.0	287.3
	SCH-4	1460618.5	643021.4	285.4
	SCH-5	1459621.8	641171.4	279.3
	SCH-6	1457944.8	638238.9	241.7
	SCH-6A	1457817.7	637889.5	249.6
	SCH-7	1458325.7	636073.8	271.1
	SCH-8	1459763.1	633330.0	287.2
	SCH-9	1460902.6	631152.2	297.0
	SCH-10	1462154.8	628796.0	290.3
	SCH-10A	1461888.1	629265.0	291.0
	SCH-11	1463366.6	626127.1	289.2
	SCH-12	1462321.8	625339.2	227.3
	SCH-13	1461493.8	624804.4	229.1
	SCH-13A	1460855.7	624513.9	272.0
	SCH-13B	1460233.8	624596.1	295.4
	SCH-14	1459768.5	625134.5	281.3
	SCH-15	1457493.3	626917.2	338.6
	SCH-15A	1456046.5	627705.8	352.4
	SCH-16	1455146.0	627794.1	350.1
	SCH-17	1451579.9	627027.1	357.8
	SCH-18	1447982.8	626167.9	354.4
NYS DOT ***	DAB-6(2)	1460628.7	625081.5	248
	DH-24S	1460655.9	625133.7	237
	DH-25S	1460602.7	625066.5	236
	DH-26S	1460543.7	624985.5	235
	DH-27S	1460696.2	625101.3	236
	DH-28S	1460650.3	625027.7	235
	DH-29S	1460597.5	624949.4	234.5

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.
*** NYS DOT boring coordinates and elevations are approximated from drawing D257014 Sheet 170 "GENERAL SUBSURFACE PROFILE, STRUCTURE #3 - RAMP TWY OVER I-890"
**** 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
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings Schenectady Preferred Alt Figure 3-7

Prepared on 4/27/2021

by: AECOM

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

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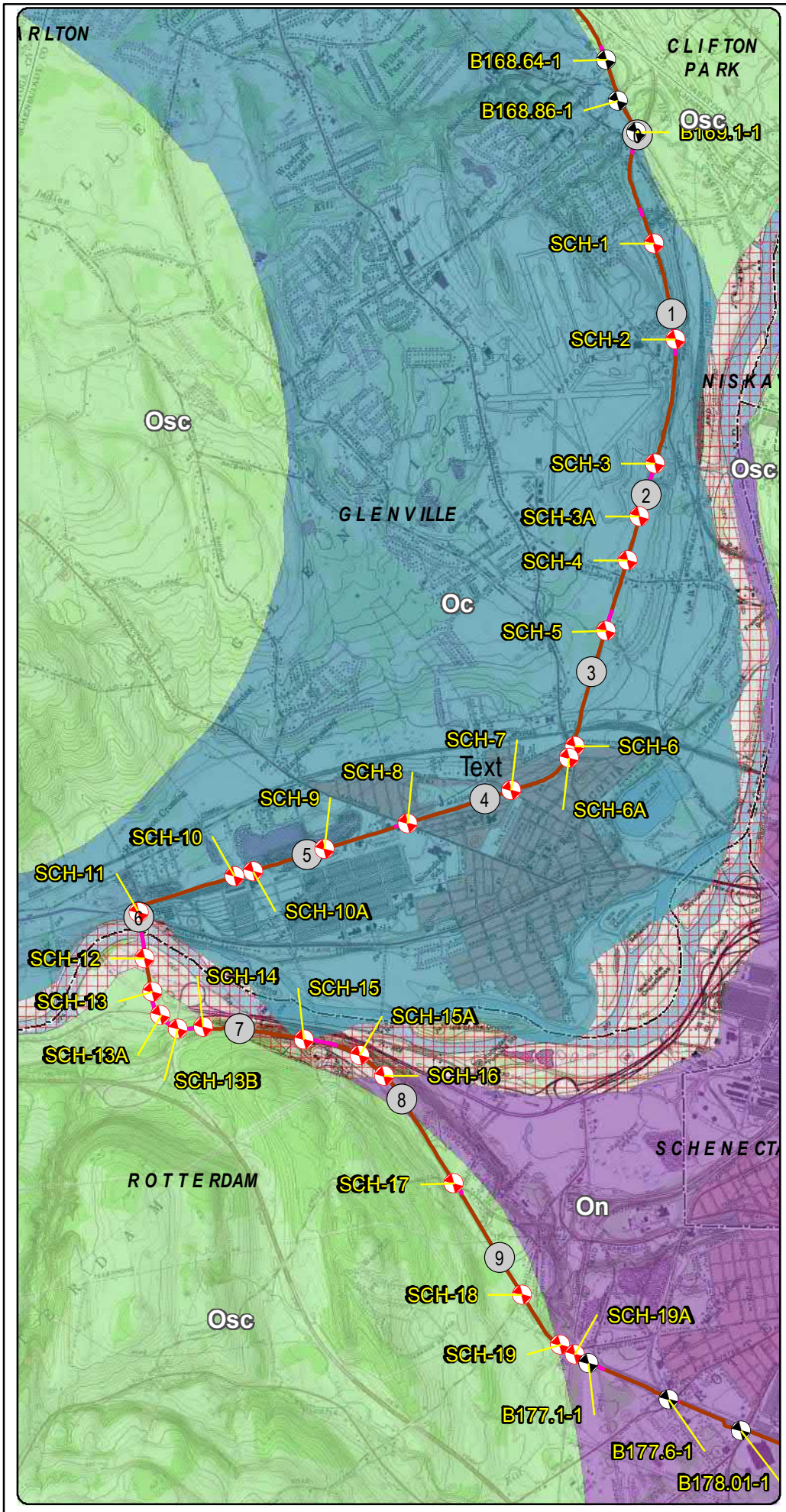


LEGEND

- 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

- No Label
- Oc - Canajoharie Shale
- On - Normanskill Shale
- Osc - Schenectady Formation

* Schenectady Formation includes: graywacke, sandstone, siltstone, shale

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Schenectady Preferred Alt Figure 4-7

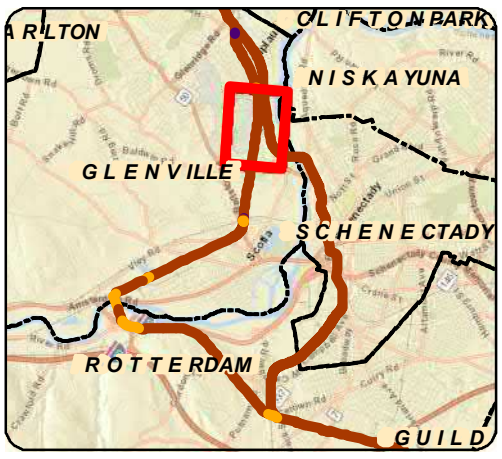
Prepared on 4/29/2021

by: AECOM

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

Y:\Projects\CHPE\IRoute\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Bedrock_Map_May_2021_Report.mxd

SCH-2
SCH-3
SCH-3A
SCH-4
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4
170.3
170.4
170.5
170.6
170.7
170.8
170.9
171
171.1
171.2
171.3
171.4
NISKAYUNA
SCHENECTADY
GLENVILLE
Ronald Reagan Way
Haber Ln
Maple Ave
Rail System
Delaware & Hudson
Schenectady County Airport
0
1,000
Feet



LEGEND

- 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
- 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

Schenectady Preferred Alternative

Figure A-7

Sheet 2 of 8

Prepared by: AECOM 4/27/2021

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Mapset_May_2021_Report.mxd

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-2**
SOILS ENGINEER/GEOLOGIST: Chris French	**Boring Log**	START DATE: 03/03/21
		FINISH DATE: 03/03/21
LOCATION: Scotia, NY MP 1.1 (Pan-Am Rail)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
	TYPE	Flush Joint Steel	California Modified		NQ	BORING TYPE: Core
	SIZE I.D.	4"	2.5"		1 7/8"	BORING O.D.: 3"
	SIZE O.D.	4.5"	3"		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)	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
		0-2.5'		N/A	N/A	Hand Cleared				Black fine to coarse SAND, some angular Gravel, trace Silt, frozen
1.0										1':Black fine to coarse SAND, some angular Gravel, trace Silt, moist
2.0										2.1': Gray angular GRAVEL, trace fine to coarse Sand, dense (pulverized rock)
3.0										
4.0	4.2	4'-9'	R-1	60"	59.5"	RQD: 4" = 7%			Shale	Gray SHALE, thinly laminated to thinly bedded, unweathered, very heavily jointed, joints parallel w/ bedding plane at 0°-5°
5.0										
6.0										
7.0										
8.0										
9.0	1.9	9'-14'	R-2	60"	60"	RQD: 51" = 85%				SAA; Very lightly jointed
10.0										
11.0										TR-1; (10.0'-10.5')
12.0										
13.0										
14.0	2.7	14'-19'	R-3	60"	57.5"	RQD: 58" = 97%				SAA; Lightly jointed
15.0										
16.0										
17.0										
18.0										
19.0	2.0	19'-24'	R-4	60"	59"	RQD: 50" = 83%				SAA; Lightly jointed
20.0										TR-2; (23.4'-23.9')

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	AECOM	SHEET 2 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-2**
SOILS ENGINEER: Chris French		START DATE: 03/03/21
	Boring Log	FINISH DATE: 03/03/21
LOCATION: Scotia, NY MP 1.1 (Pan-Am Rail)		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										
23.0										
24.0	2.4	24.0'-29.0'	R-5	60"	57"	RQD: 51" = 85%				SAA; Lightly jointed
25.0										
26.0										
27.0										
28.0										TR-3; (28.1'-28.75')
29.0	2.2	29.0'-34.0'	R-6	60"	57"	RQD: 19" = 32%				SAA; Moderately jointed, near vertical fracture (80°-85°) running from 29.0' to 31.8'
30.0									SHALE	
31.0										
32.0										
33.0										
34.0	1.9	34.0'-39.0'	R-7	60"	56"	RQD: 31" = 52%				SAA; Moderately fractured (65°-75°) fracture running from 35.5' to 36.4'
35.0										
36.0										
37.0										37.9': Very heavily jointed (pulverized)
38.0										
39.0										SAA; Lightly jointed
	4.5	39.0'-40.0'	R-8	12.5"	12.5"	RQD: 12" = 96%				
40.0										TR-4 (39.0'-39.65')
41.0										SCH-2 terminated at 40' and 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: **Schenectady Bypass Segment**

Boring No.	Depth (ft.)
SCH-2	4.0-24.0

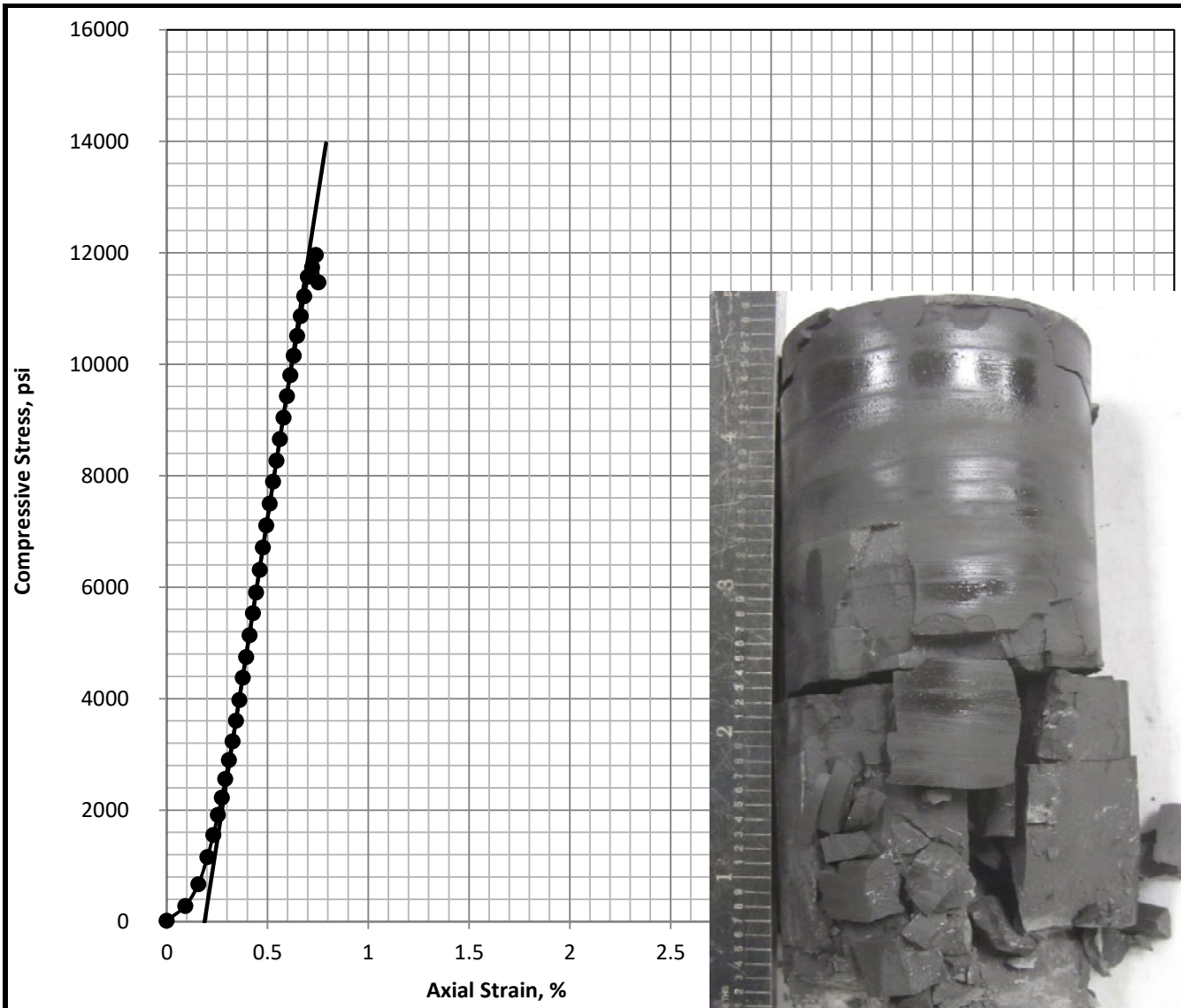
Boring No.	Depth (ft.)
SCH-2	24.0-40.0

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

Aquifer
CHPE - Schenectady Bypass 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 (-)	POINT LOAD TEST (ASTM D5731) STRENGTH INDEX Is(50) (MPa)	ESTIMATED (4) COMPRESSIVE STRENGTH (psi)	UNCONFINED COMPRESSION TESTS (ASTM D7012) COMPRESSIVE STRENGTH (psi)	AXIAL STRAIN @ FAILURE (%)	ESTIMATED (5) ELASTIC MODULUS (psi)	
SCH-2	R-2	10.7-11.1	1.2	170	167	UC				11960	0.55	2E+06	
SCH-2	R-2	11.3-11.6				M	3						
SCH-2	R-5	25.3-25.7				M	4						
SCH-2	R-5	28.5-26.2	2.7	79.6	77.5	UC				12670	0.64	2E+06	
SCH-6	R-2	24.0-24.2	1.10			PL		0.4	1375				
SCH-6	R-2	24.0-24.2				PL		3.3	9964				
SCH-6	R-2	24.6				M	3						
SCH-14	R-2	15.2				M	3						
SCH-14	R-3	17.8				M	4						
SCH-14	R-3	17.95-18.35	1.2	168	166	UC				8570	0.45	2E+06	
SCH-14	R-5	30.4				M	3-4						
SCH-14	R-5	30.4-30.55	1.10			PL		0.3	917				
SCH-14	R-5	30.4-30.55				PL		2.2	5910				

Notes: (1) Water contents determined after trimming and shearing.
(2) Test Type Abbreviations: M: Mohs Hardness, PL: Pont Load, 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)
1.22	170	167	4.414	1.971

Specimen meets ASTM D4543 shape tolerances

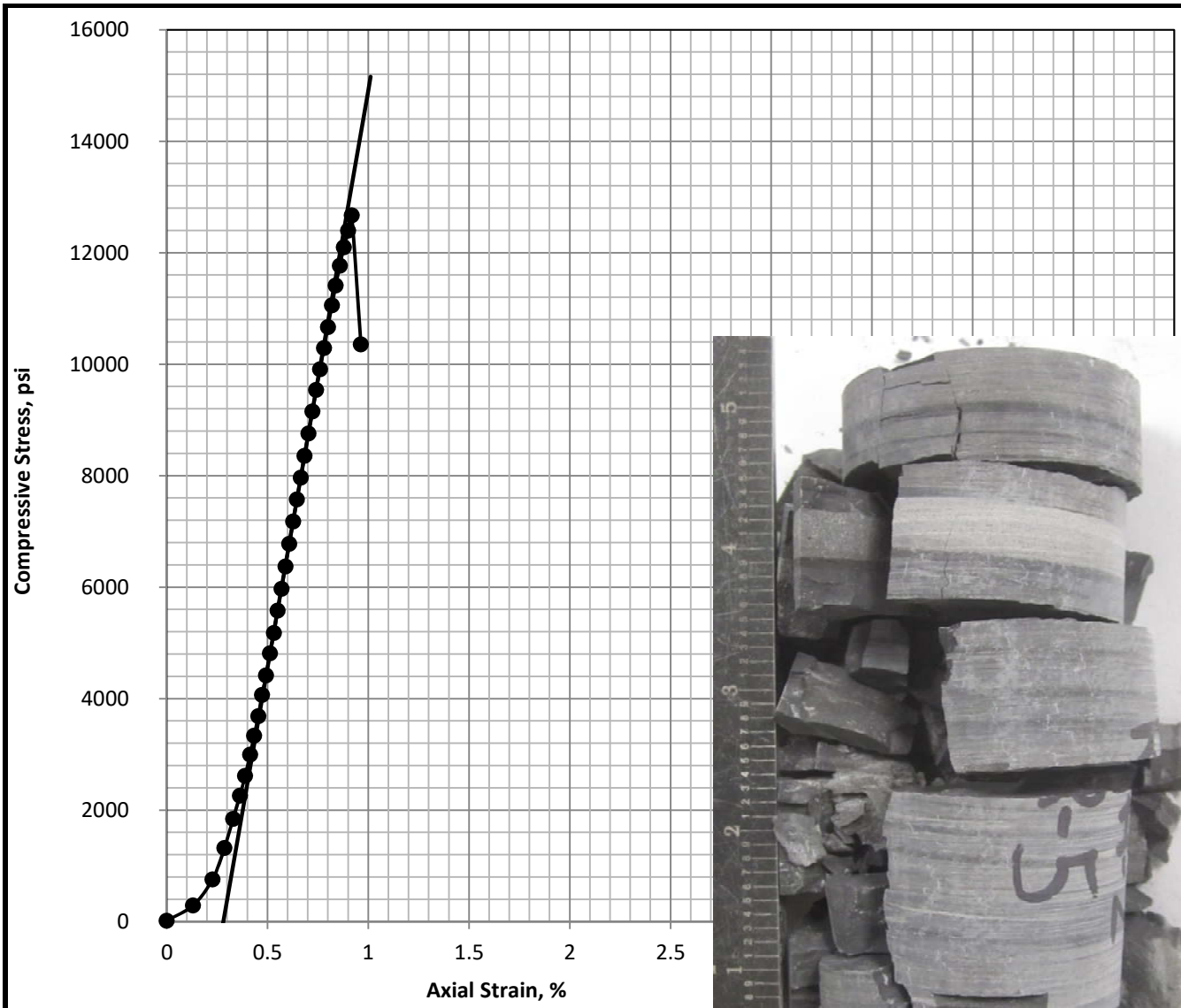
FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.13	0.55	11960	2E+06

Test by: DM
Test Date: Apr-08-21
Reviewed by: GET

Aquifer	**CHPE - Schenectady Bypass Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21006		**Boring: SCH-2 Run: R-2 Depth 10.7-11.1 ft.**



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
2.72	80	77	4.556	1.970

Specimen meets ASTM D4543 shape tolerances

FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.13	0.64	12670	2E+06

Test by: DM
Test Date: Apr-08-21
Reviewed by: GET

Aquifer	**CHPE - Schenectady Bypass Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21006		**Boring: SCH-2 Run: R-5 Depth 28.5-26.2 ft.**

Boring Location Plans Page 4 of 9	Drawn by: ADW	Scale: Not to scale	Project No.: CD10279	Date: May 2022
Champlain Hudson Power Express **Design Package 4B** **Glenville to Scotia, 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-01-05-22

Client: Kiewit Engineering (NY) Corp.

Boring Location: See Boring Location Plan

Project: Subsurface Investigation
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: 3/14/2022 Finish Date: 3/15/2022

Boring No.: K-169.0-1.2 Sheet 1 of 2

Coordinates
Northing 1463895.74
Easting 648231.59

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

Ground Elev.: 289.9

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

Groundwater Observations

Date	Time	Depth	Casing
3/15/2022	AM	DRY	OPEN
3/15/2022	AM	*0.0'	4.0'
3/15/2022	PM	*11.0'	4.0'
3/15/2022	PM	*20.5'	OUT

*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)
	CASING WET ROTARY	1	0.0	2.0	SS	WH 1 2 3	0.5	6" TOPSOIL & ORGANIC MATERIAL	8
1								Orangish-Brown mf SAND: some SILT; trace f GRAVEL (frozen, non-plastic) SM	
2		2	2.0	4.0	SS	5 10 35 40	3.0		18
3								Greyish-Black cmf- SAND; and cmf+ GRAVEL; little SILT (moist, non-plastic) Possible WEATHERED ROCK Fragments	
4		3	4.0	4.8	SS	47 50/3"		w = 8.2%, % Fines = 19.0% SM	8
5								Black Similar Soil (moist, non-plastic) Possible WEATHERED	
6		4	6.0	6.3	SS	50/3"		ROCK Fragments SM	3
7								Advanced casing to 4.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
8		5	8.0	8.1	SS	50/1"		Similar Soil (moist, non-plastic) Possible WEATHERED ROCK	1
9								Fragments SM	
10								Similar Soil (moist, non-plastic) Possible WEATHERED ROCK	
11								Fragments SM	
12									
13									
14		6	14.0	14.1	SS	50/1"		Similar Soil (moist, non-plastic) Possible WEATHERED ROCK	1
15							15.0	Fragments SM	
16	NX CORE (WET)		15.0	20.0	NX	RUN 1		Advanced 3 7/8" tri-cone roller bit wet rotary open hole to 15.0 feet and began coring.	56.5
17								Black SHALE	
18								56.5" or 94% Recovery	
19								7 Pieces (56.5") - 0% Chips and Fragments	
20							20.0	5 Pieces longer than 4" (50") - RQD = 89%	
21			20.0	25.0	NX	RUN 2		Black SHALE	60
22								60" or 100% Recovery	
23								6 Pieces (60") - 0% Chips and Fragments	
24								6 Pieces longer than 4" (60") - RQD = 100%	
25							25.0		

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

Drillers: Ben Crary; Jake Crary

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

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: K-169.0-1.2 Report No.: CD10279D-01-05-22 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)
			25.0	30.0	NX	RUN 3		Black SHALE 60" or 100% Recovery 4 Pieces (60") - 0% Chips and Fragments 3 Pieces longer than 4" (57") - RQD = 95%	60
			30.0	35.0	NX	RUN 4	30.0	Black SHALE 59" or 98% Recovery 5 Pieces (53") - 10% Chips and Fragments 4 Pieces longer than 4" (51") - RQD = 85%	59
			35.0	40.0	NX	RUN 5	35.0	Black SHALE 60" or 100% Recovery 4 Pieces (57") - 5% Chips and Fragments 4 Pieces longer than 4" (57") - RQD = 95%	60
							40.0	Boring terminated at 40.0 feet.	

Notes:
1. Borehole backfilled with cement-bentonite grout.
2. Soil classifications based on ATL Field Engineer's field classifications.
3. Borehole was advanced with ATL's Geoprobe 7822DT (Rig Unit No. CDGV667) drill rig.

ATLANTIC TESTING LABORATORIES

LABORATORY TEST SUMMARY TABLE

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

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-169.0-0.1A	S-2	2.0-4.0	Brown cmf SAND; little mf GRAVEL; trace SILT; trace OM	--	--	--	--	--	2.0	--	--	--	--	--	--	--
	S-4	6.0 - 8.0	Brown f SAND; little SILT	18.0	10.4	--	--	--	--	--	--	--	--	--	--	--
	S-8	27.0-29.0	Brown f SAND; little SILT	13.0	14.4	--	--	--	--	--	--	--	--	--	--	--
K-169.0-0.1B	S-3	4.0-6.0	Brown SILT; little f SAND	--	--	--	--	--	--	2,300	50	8.08	39,990	--	--	--
	S-4	6.0-8.0	Frown f SAND; some SILT	--	10.2	--	--	--	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown cmf+ SAND; little SILT	13.0	21.1	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Brown mf SAND; and SILT	48.4	28.0	NP	NP	NP	--	--	--	--	--	--	--	--
	S-11	40.0-42.0	Blackish-Grey CLAY; little SILT; little f SAND	83.0	28.2	38	19	19	--	--	--	--	--	--	--	--
K-169.0-0.4	S-4	6.0-8.0	Brown cf+ SAND; little SILT; trace f GRAVEL	12.0	15.8	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0 - 21.0	Grey CLAY; little SILT; trace f SAND	99.9	24.8	40	19	21	--	--	--	--	--	--	--	--
	S-11	37.0-39.0	Blackish-Grey SILT; little CLAY; trace f SAND	99.1	30.6	38	19	19	--	--	--	--	--	--	--	--
K-169.0-0.5	S-4	6.0-8.0	Reddish Brown mf+ SAND; little SILT; trace f GRAVEL	12.0	17.4	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Grey SILT; trace CLAY; trace f SAND	99.4	31.9	36	18	18	--	--	--	--	--	--	--	--
	S-11	37.0-39.0	Light Brown-Grey SILT; some CLAY; trace f SAND	94.6	22.8	27	17	10	--	--	--	--	--	--	--	--
K-169.0-1.2	S-2	2.0-4.0	Greyish-Black cmf- SAND; and cmf+ GRAVEL; little SILT	19.0	8.2	--	--	--	--	--	--	--	--	--	--	--
	RC-3	25.0-30.0	Black SHALE	--	--	--	--	--	--	--	--	--	--	10,540	1252	1.14
K-169.0-1.8	S-2	2.0-4.0	Grey c+mf GRAVEL; little cmf SAND; trace SILT	3.0	2.4	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown cmf SAND; trace SILT	--	--	--	--	--	--	300	--	7.9	--	--	--	--
	S-5	8.0-10.0	Brown mf SAND; trace SILT	--	--	--	--	--	--	--	20	--	8,514	--	--	--
	S-7	18.0-20.0	Grey c-mf SAND; some SILT; little mf GRAVEL	34.0	7.5	--	--	--	--	--	--	--	--	--	--	--
	S-10	24.0-26.0	Grey cmf SAND; and SILT; little mf GRAVEL	38	8.1	--	--	--	--	--	--	--	--	--	--	--
	S-13	39.0-39.7	Grey cmf SAND; and mf GRAVEL; some SILT	--	9.5	--	--	--	--	--	--	--	--	--	--	--
K-169.0-1.9	S-2	2.0-4.0	Brown cmf GRAVEL; and cmf SAND; trace SILT	--	3.2	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown c-mf SAND; little SILT; little c+mf- GRAVEL	20.0	11.6	--	--	--		--	--	--	--	--	--	--
	S-8	18.0-20.0	Brown c-mf+ SAND; trace SILT; trace OM; trace f GRAVEL	7.0	20.7	--	--	--	--	--	--	--	--	--	--	--
	S-13	38.0-40.0	Grey cmf SAND; and SILT; trace f GRAVEL	39.0	7.8	--	--	--	--	--	--	--	--	--	--	--

TEST DATA (continued)

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
K-169.0-0.4	S-4 [1]	6-8	15.8
	S-7	19-21	24.8
	S-11	37-39	30.6
K-169.0-0.5	S-4	6-8	17.4
	S-8	24-26	31.9
	S-11	37-39	22.8
K-169.0-1.2	S-2 [1]	2-4	8.2

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

Reviewed By: _____ Date: 04/04/22

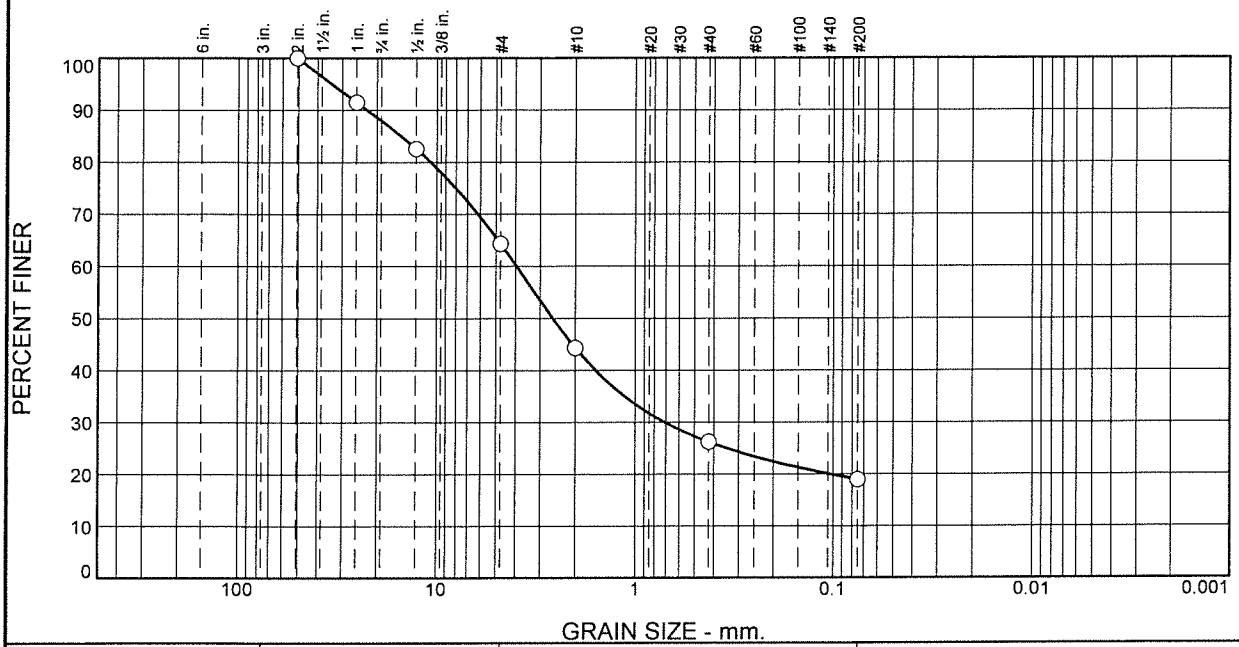
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-10-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/04/22

Sample No: K-169.0-1.2 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 2-4'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	12	24	20	18	7	19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
2"	100		
1"	91		
1/2"	83		
#4	64		
#10	44		
#40	26		
#200	19		

* (no specification provided)

Soil Description

Greyish Black cmf- SAND; and cmf+ GRAVEL; little SILT

Atterberg Limits

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

Coefficients

D_{85}= 15.1261 D_{60}= 3.9461 D_{50}= 2.5946
D_{30}= 0.7092 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 8.2%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/04/22

ATLANTIC TESTING LABORATORIES

WBE certified company

PROJECT INFORMATION

Client:	Kiewit Intrastructure Co.	**ATL Report No.:**	CD10279E-10-04-22
Project:	Champlain Hudson Power Express	**Report Date:**	April 4, 2022
	United Cable Installation	**Date Received:**	March 22, 2022
	Various Locations, New York		

UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS
ASTM D 7012, Method C

Boring No.	Sample No.	Depth (ft)	Diameter (in)	Length (in)	Load Rate (lbs/sec)	Total Load (lbs)	Area (in^2)	Compressive Strength (psi)
[redacted]								
K-169.0-1.2	S-9	26.6-26.9	1.96	3.94	380	31,800	3.02	10,540

Failure Pictures

[redacted]

K-169.0-1.2, S-9, 26.6 - 26.9'

Reviewed By: _____ Date: 04/04/22

CERCHAR Abrasiveness
ASTM D7625

CLIENT	Atlantic Testing Labs LTD	JOB NO.	2161-015
PROJECT	Champlain Hudson Power Express	LOCATION	--
PROJECT NO.	CD10279		

BORING NO.	
DEPTH	169.0
SAMPLE NO.	K-169.0-1.2-9
DATE SAMPLED	
DATE TESTED	04/25/22
TECHNICIAN	HN
ROCK TYPE	

Surface Type:	Saw Cut
Moisture Condition	As Received
Reading A.1 (in):	0.00205
Reading A.2 (in):	0.00236
Reading A.3 (in):	0.00283
Reading A.4 (in):	0.00276
Reading A.5 (in):	0.00339
Reading B.1 (in):	0.00206
Reading B.2 (in):	0.00205
Reading B.3 (in):	0.00370
Reading B.4 (in):	0.00260
Reading B.5 (in):	0.00252
Average Reading (in):	0.00263
Average Reading (mm):	0.0669
Uncorrected CAI or CAI_s:	**0.67**
Corrected CAI:	**1.14**

NOTES

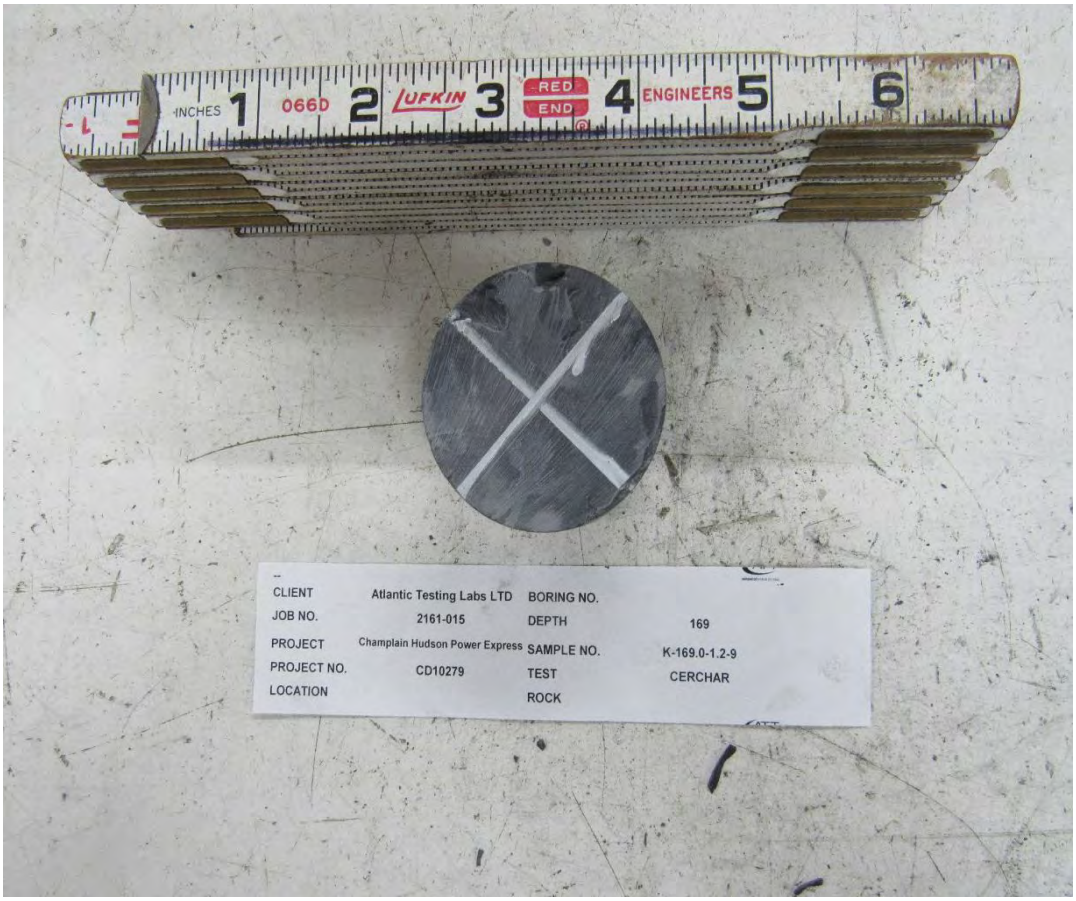
CAI_s is the CAI calculated on saw cut specimens.
Corrected CAI for saw cut specimens based on R. Plinger and H. Kasling
Suggested formula CAI = 0.99*CAIs + 0.48.
Applied pins had a Rockwell Hardness of 54-56.

Data entry by:	HN	Date:	04/26/22
Checked by:	DL	Date:	04/26/22
File name:	2161015__CHERCHAR ASTM D7625_1.xlsm		

CHERCHAR Abrasiveness
ASTM D7625

CLIENT	Atlantic Testing Labs LTD	BORING NO.	--
JOB NO.	2161-015	DEPTH	169.0
PROJECT	Champlain Hudson Power Express	SAMPLE NO.	K-169.0-1.2-9
PROJECT NO.	CD10279	DATE SAMPLED	--
LOCATION	--	DATE TESTED	04/25/22
		TECHNICIAN	HN
		ROCK TYPE	--

Before Picture



NOTES

Picture File: 5.JPG
File name: 2161015__CHERCHAR ASTM D7625_1.xlsm

CHERCHAR Abrasiveness
ASTM D7625

CLIENT	Atlantic Testing Labs LTD	BORING NO.	--
JOB NO.	2161-015	DEPTH	169.0
PROJECT	Champlain Hudson Power Express	SAMPLE NO.	K-169.0-1.2-9
PROJECT NO.	CD10279	DATE SAMPLED	--
LOCATION	--	DATE TESTED	04/25/22
		TECHNICIAN	HN
		ROCK TYPE	--

After Picture

NOTES

Picture File: 5a.JPG
File name: 2161015__CHERCHAR ASTM D7625_1.xlsm

Champlain Hudson Power Express
Kiewit Engineering (NY) Corp.

K-169.0-1.2 - Runs 1 through 4

K-169.0-1.2 - Run 5

Package 4B Phase 4 Borings Rev 1

Champlain Hudson Power Express

New York

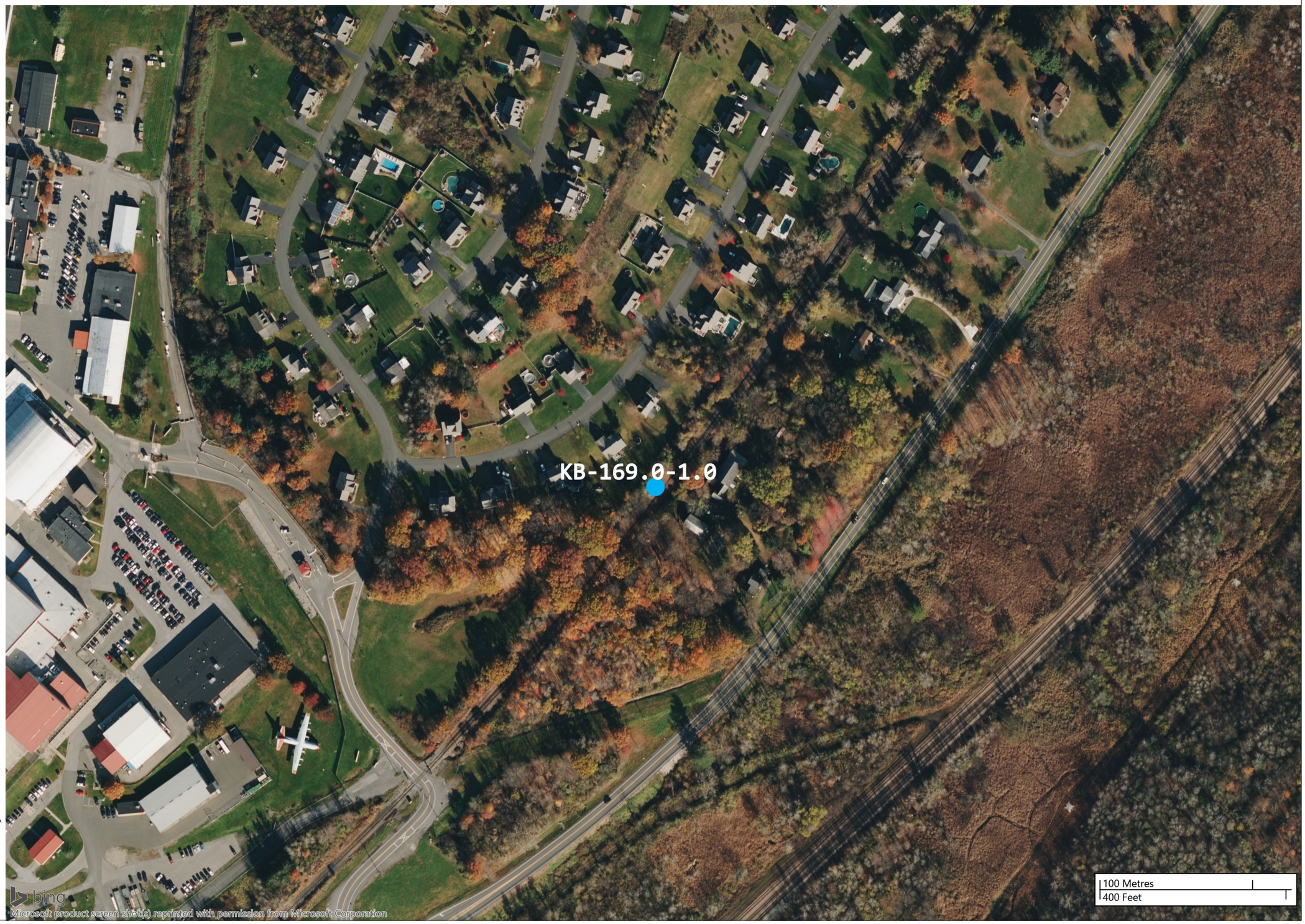
PROJECT NUMBER 20001480

CREATED BY Kiewit

DATE 03/31/2023

Legend Key

- Kiewit Borings



EXPLORATORY BORING LOG

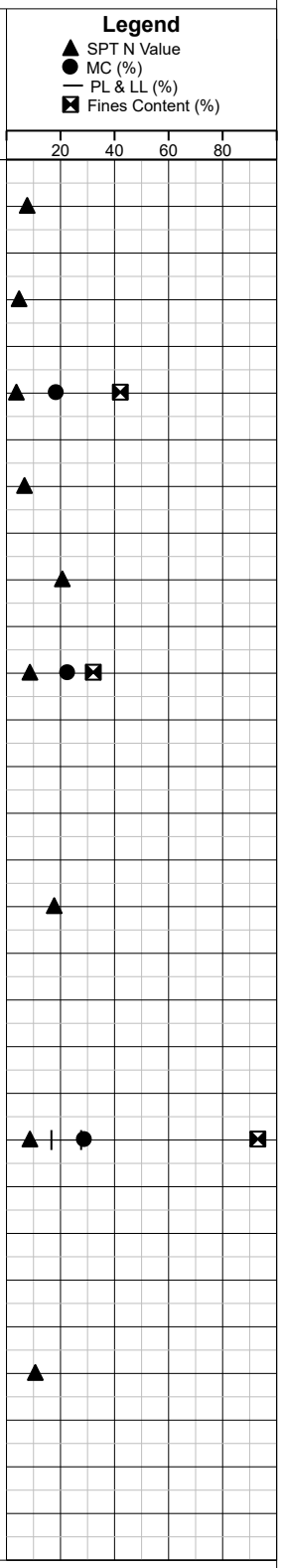
Champlain Hudson Power Express

New York

BORING NO: KB-169.0-1.0

PROJECT NUMBER	20001480	**LOGGED BY**	J.Techel	**COORDINATES**	N 1464694.07 E 648877.01
START DATE	01/04/2023	**DRILLER/RIG**	Eric / Geoprobe 7822DT	**GROUND ELEV.**	286.8 ft
FINISH DATE	01/06/2023	**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: Silty SAND (SM), dark gray, loose, moist, contains organics		1	17%		1-4-4-3 (8)	
			yellowish brown		2	25%		2-3-2-3 (5)	
	282.8		Silty SAND (SM), brown to dark yellowish brown, very loose, fine-grained		3	42%		3-2-2-2 (4)	
5			dark brown						
	279.8		Poorly Graded SAND (SP), yellowish brown to pale brown, very loose, fine to medium grained		4	75%		3-4-3-4 (7)	
	278.8		Silty SAND (SM), yellow brown to dark brown, loose to medium dense, fine to medium grained, moist, trace fine roots		5	84%		12-11-10-9 (21)	
10					6	58%		6-5-4-5 (9)	
15	271.8		CLAY (CL), gray to dark gray, soft to very stiff, moist		7	88%		5-9-9-8 (18)	
20			no gravel		8	50%		3-4-5-7 (9)	
25			with fine sand		9	92%		2-3-8-9 (11)	
30									



EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

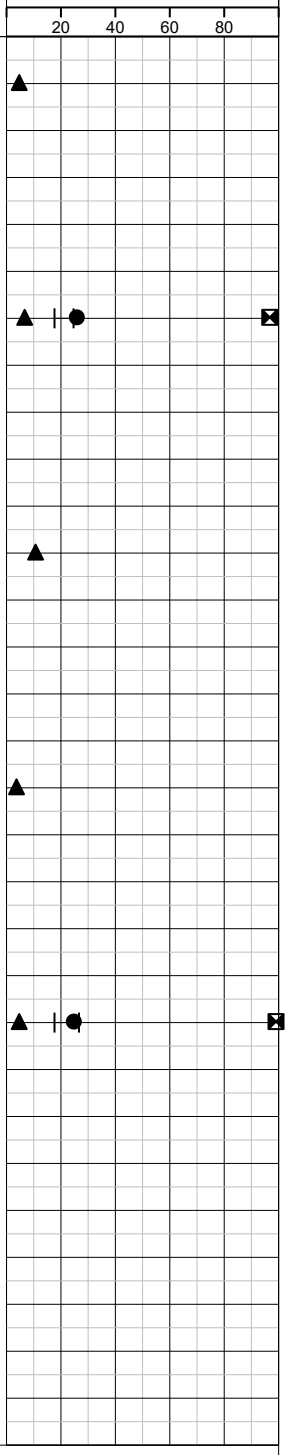
BORING NO: KB-169.0-1.0

PROJECT NUMBER	20001480	**LOGGED BY**	J.Techel	**COORDINATES**	N 1464694.07 E 648877.01
START DATE	01/04/2023	**DRILLER/RIG**	Eric / Geoprobe 7822DT	**GROUND ELEV.**	286.8 ft
FINISH DATE	01/06/2023	**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
			CLAY (CL), gray to dark gray, stiff, silty, moist		10	100%		2-2-3-8 (5)	
35					11	100%		2-3-4-3 (7)	
40					12	88%		2-4-7-6 (11)	
45					13	100%		1-1-3-4 (4)	
50					14	100%		0-2-3-3 (5)	
55					1			3-5-6-8	3-inch ring sampler
60									

Legend

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



EXPLORATORY BORING LOG

Champlain Hudson Power Express

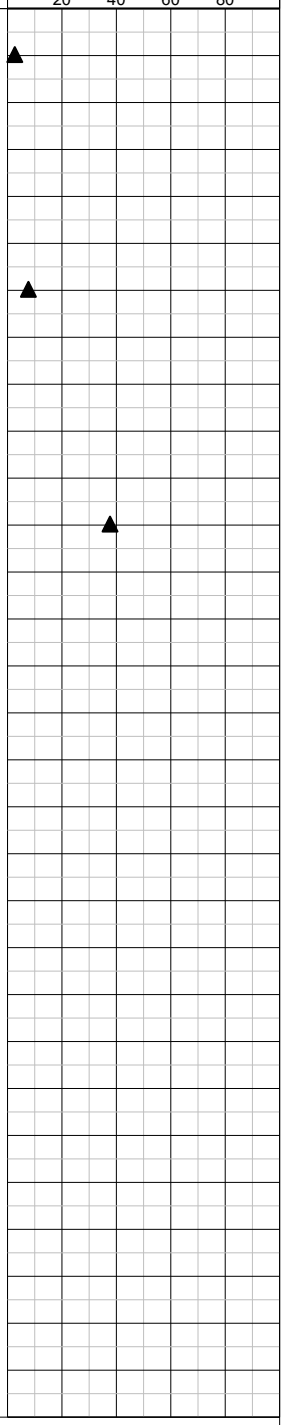
New York

BORING NO: KB-169.0-1.0

PROJECT NUMBER	20001480	**LOGGED BY**	J.Techel	**COORDINATES**	N 1464694.07 E 648877.01
START DATE	01/04/2023	**DRILLER/RIG**	Eric / Geoprobe 7822DT	**GROUND ELEV.**	286.8 ft
FINISH DATE	01/06/2023	**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
			CLAY (CL), gray to dark gray, firm		15	100%		0-1-2-5 (3)	
65					16	100%		1-3-5-5 (8)	
70	216.8		Sandy CLAY with Gravel (CL), dark gray, hard		17	42%		8-16-22-36 (38)	
	214.8		Boring Terminated at 72ft						
75									
80									
85									
90									

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



Summary of Laboratory Results

BORING ID	Depth (Ft.)	Water Content (%)
KB-169.0-1.0	4-6	18.6
KB-169.0-1.0	10-12	22.8
KB-169.0-1.0	20-22	29.0
KB-169.0-1.0	35-37	26.2
KB-169.0-1.0	50-52	25.1
KB-169.0-2.4	4-6	9.7
KB-169.0-2.4	20-22	20.1
KB-169.0-2.4	35-37	29.8
KB-169.0-2.4	55-57	23.6
KB-169.0-2.5	4-6	18.0
KB-169.0-2.5	10-12	18.5
KB-169.0-2.5	30-32	28.0
KB-169.0-2.5	40-42	24.7
KB-169.0-3.6	4-6	13.0
KB-169.0-3.6	10-12	3.4
KB-169.0-3.6	25-27	13.3
KB-169.0-3.6	40-42	9.3
KB-169.0-3.6	50-52	2.5
KB-169.0-3.7	4-6	11.7
KB-169.0-3.7	20-22	23.0
KB-169.0-3.7	40-42	4.4
KB-169.0-3.7	60-62	8.6
KB-169.0-7.9	4-6	18.1
KB-221.0B	4-6	11.0
KB-221.0B	10-12	40.8
KB-221.0B	30-32	37.4
KB-221.0B	50-52	29.6
KB-221.8B	4-6	32.1
KB-221.8B	20-22	44.4
KB-221.8B	35-37	46.6
KB-221.8B	55-57	39.2
KB-222.8	6-8	33.6
KB-222.8	20-22	43.2
KB-222.8	45-47	39.4
KB-222.8	65-67	45.0

PROJECT: Lab Testing

SITE: Champlain to Hudsdon Power Express

Terracon
30 Corporate Cir Ste 201
Albany, NY

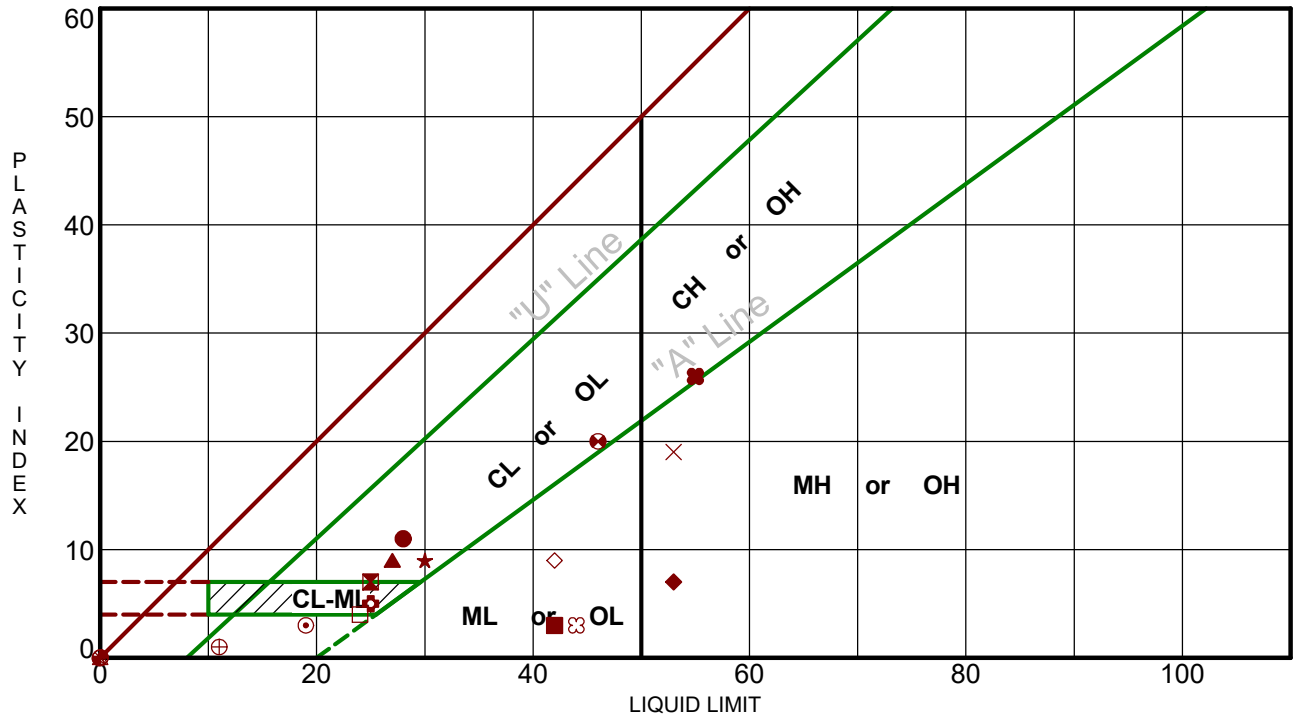
PROJECT NUMBER: JB215256H

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

EXHIBIT: B-1

ATTERBERG LIMITS RESULTS

ASTM D4318



	Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	KB-169.0-1.0	20 - 22	28	17	11	93.4	CL	LEAN CLAY
⊠	KB-169.0-1.0	35 - 37	25	18	7	97.1	CL-ML	SILTY CLAY
▲	KB-169.0-1.0	50 - 52	27	18	9	99.4	CL	LEAN CLAY
★	KB-169.0-2.4	20 - 22	30	21	9	73.6	ML	SANDY SILT
⊙	KB-169.0-2.4	35 - 37	19	16	3	87.9	ML	SILT
✿	KB-169.0-2.5	30 - 32	25	20	5	92.5	CL-ML	SILTY CLAY
○	KB-169.0-2.5	40 - 42	NP	NP	NP	95.7	ML	SILT
△	KB-169.0-3.6	4 - 6	NP	NP	NP	8.8	GP-GM	POORLY GRADED GRAVEL with SILT and SAND
⊗	KB-169.0-3.6	50 - 52	NP	NP	NP	43.6	SM	SILTY SAND
⊕	KB-169.0-3.7	60 - 62	11	10	1	39.1	SM	SILTY SAND
□	KB-221.0B	4 - 6	24	20	4	16.9	SC-SM	SILTY, CLAYEY SAND with GRAVEL
⊗	KB-221.0B	10 - 12	46	26	20	96.3	CL	LEAN CLAY
◕	KB-221.0B	30 - 32	NP	NP	NP	96.0	ML	SILT
☆	KB-221.0B	50 - 52	NP	NP	NP	99.4	ML	SILT
✿	KB-221.8B	4 - 6	44	41	3	72.3	ML	SILT with GRAVEL
■	KB-221.8B	20 - 22	42	39	3	98.3	ML	SILT
◆	KB-221.8B	35 - 37	53	46	7	95.5	MH	ELASTIC SILT
◇	KB-221.8B	55 - 57	42	33	9	99.6	ML	SILT
×	KB-222.8	6 - 8	53	34	19	97.5	MH	ELASTIC SILT
✖	KB-222.8	20 - 22	55	29	26	92.8	CH	FAT CLAY

PROJECT: Lab Testing

SITE: Champlain to Hudsdon Power Express

Terracon
30 Corporate Cir Ste 201
Albany, NY

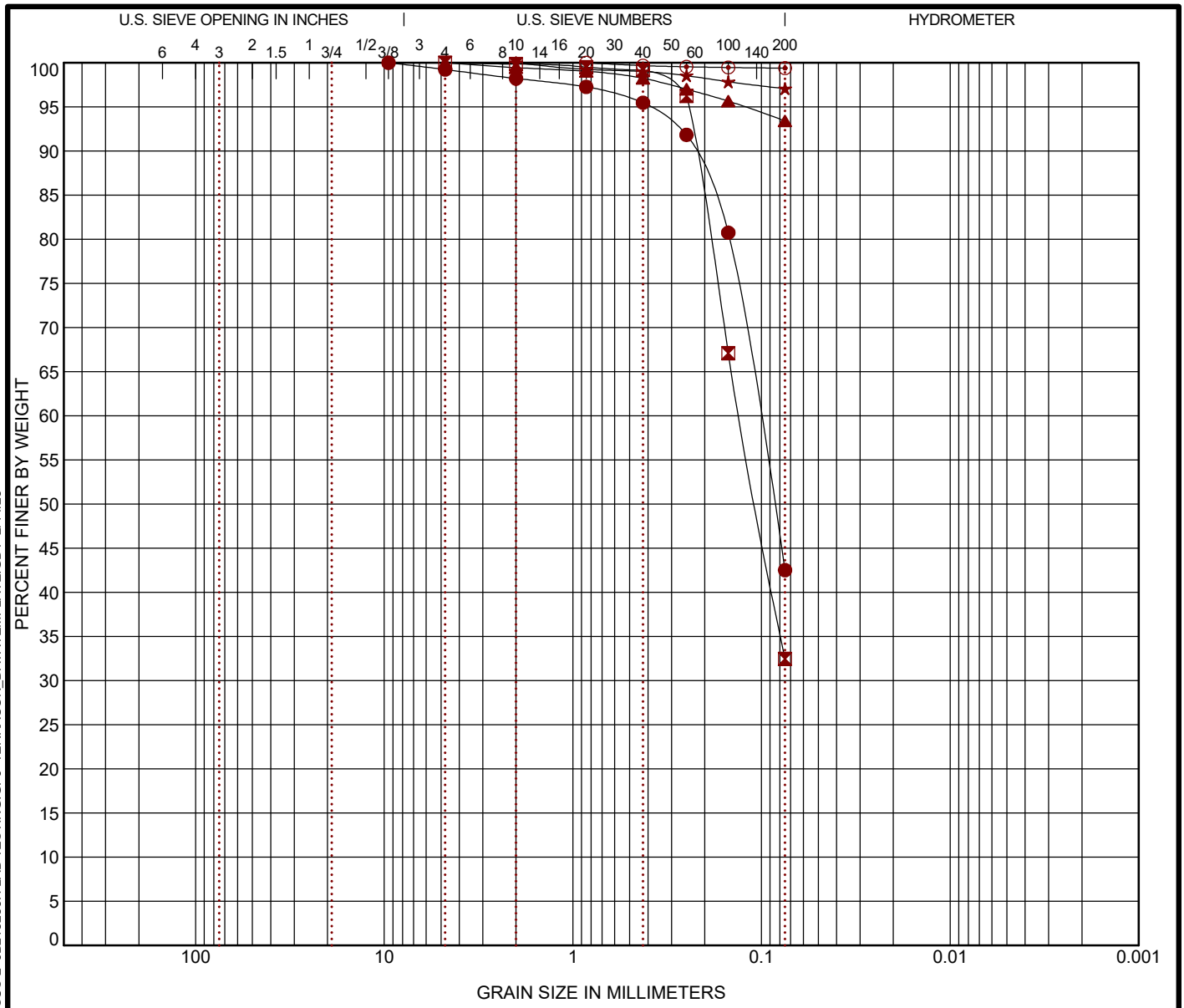
PROJECT NUMBER: JB215256H

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

EXHIBIT: B-1

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-169.0-1.0	4 - 6	SILTY SAND (SM)	18.6					
⊠	KB-169.0-1.0	10 - 12	SILTY SAND (SM)	22.8					
▲	KB-169.0-1.0	20 - 22	LEAN CLAY (CL)	29.0	28	17	11		
★	KB-169.0-1.0	35 - 37	SILTY CLAY (CL-ML)	26.2	25	18	7		
⊙	KB-169.0-1.0	50 - 52	LEAN CLAY (CL)	25.1	27	18	9		

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-169.0-1.0	4 - 6	9.5	0.103			0.0	0.8	56.7		42.5	
⊠	KB-169.0-1.0	10 - 12	4.75	0.13			0.0	0.0	67.5		32.5	
▲	KB-169.0-1.0	20 - 22	4.75				0.0	0.0	6.6		93.4	
★	KB-169.0-1.0	35 - 37	2				0.0	0.0	2.9		97.1	
⊙	KB-169.0-1.0	50 - 52	0.85				0.0	0.0	0.6		99.4	

PROJECT: Lab Testing

SITE: Champlain to Hudsdon Power Express

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256H

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

EXHIBIT: B-1

Kiewit

MEMORANDUM

DATE: January 26, 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 7 - Package 4B - HDD Crossing 64 – Revision 1
Champlain Hudson Power Express Project
Glenville, 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 Glenville, New York. The approximate station for the start of HDD crossing Number 64 is STA 45099+00 (42.8447°N, 73.9287°W).

The geotechnical data at this HDD crossing is attached. The available data is from the previous investigation by AECOM and data from a recent investigation by 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 4B, Glenville to Scotia, New York, dated June 15, 2022.

Contact us if you have questions or require additional information.

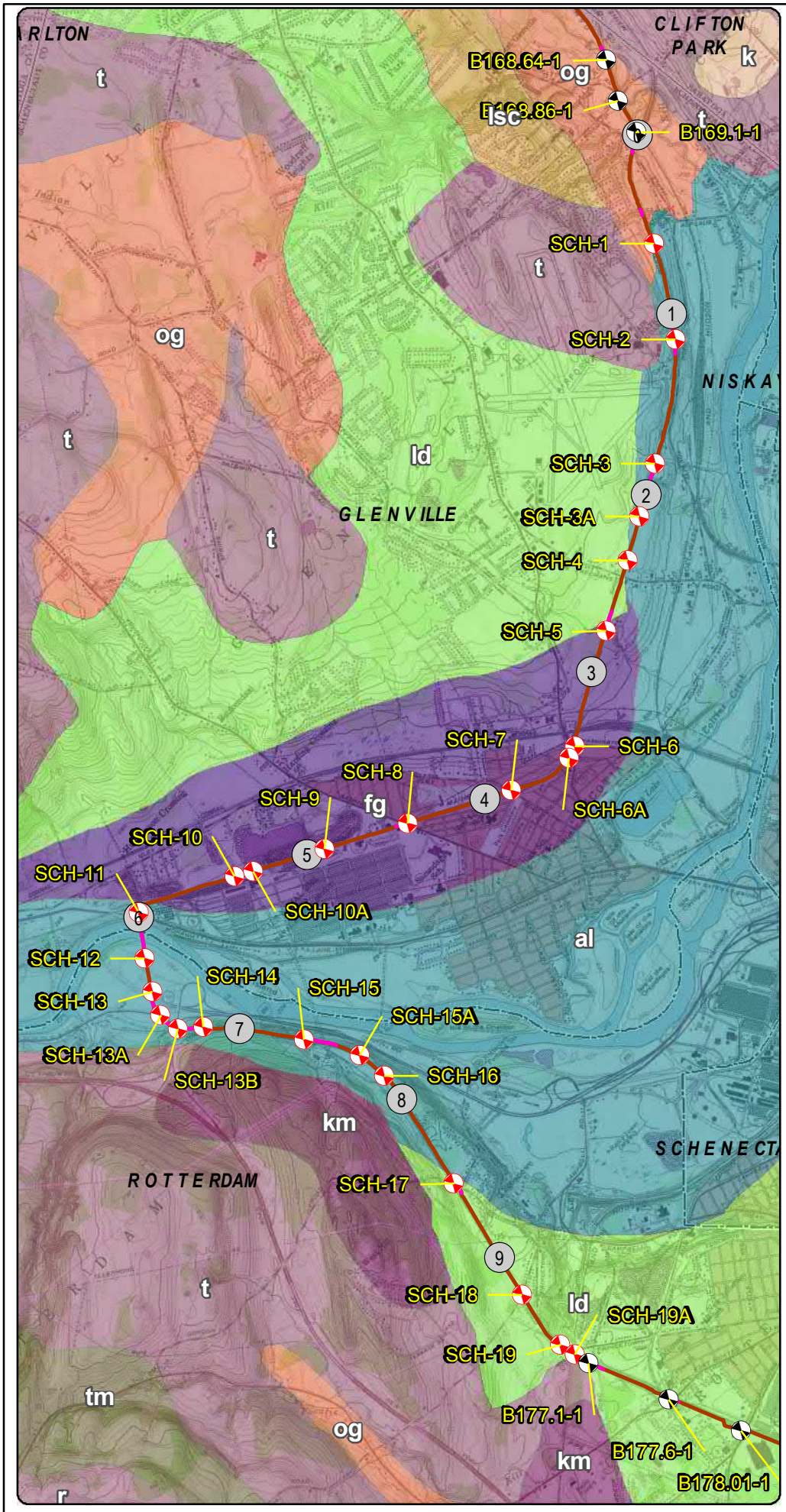
HDD 64
Borings SCH-3, K-169.0-1.8,
K-169.0-1.9, K-169.0-2.0, SCH-3A
Segment 7 - Design Package 4B

CHPE Segment 7 Package 4B
Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B169.1-1	1469045.0	651801.8	236.7
AECOM**	SCH-1	1466449.8	649931.4	279.8
	SCH-2	1464095.5	648426.9	288.3
	SCH-3	1462008.4	645522.0	286.8
	SCH-3A	1461257.5	644144.0	287.3
	SCH-4	1460618.5	643021.4	285.4
	SCH-5	1459621.8	641171.4	279.3
	SCH-6	1457944.8	638238.9	241.7
	SCH-6A	1457817.7	637889.5	249.6
	SCH-7	1458325.7	636073.8	271.1
	SCH-8	1459763.1	633330.0	287.2
	SCH-9	1460902.6	631152.2	297.0
	SCH-10	1462154.8	628796.0	290.3
	SCH-10A	1461888.1	629265.0	291.0
	SCH-11	1463366.6	626127.1	289.2
	SCH-12	1462321.8	625339.2	227.3
	SCH-13	1461493.8	624804.4	229.1
	SCH-13A	1460855.7	624513.9	272.0
	SCH-13B	1460233.8	624596.1	295.4
	SCH-14	1459768.5	625134.5	281.3
	SCH-15	1457493.3	626917.2	338.6
	SCH-15A	1456046.5	627705.8	352.4
	SCH-16	1455146.0	627794.1	350.1
	SCH-17	1451579.9	627027.1	357.8
	SCH-18	1447982.8	626167.9	354.4
NYS DOT ***	DAB-6(2)	1460628.7	625081.5	248
	DH-24S	1460655.9	625133.7	237
	DH-25S	1460602.7	625066.5	236
	DH-26S	1460543.7	624985.5	235
	DH-27S	1460696.2	625101.3	236
	DH-28S	1460650.3	625027.7	235
	DH-29S	1460597.5	624949.4	234.5

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.
*** NYS DOT boring coordinates and elevations are approximated from drawing D257014 Sheet 170 "GENERAL SUBSURFACE PROFILE, STRUCTURE #3 - RAMP TWY OVER I-890"
**** 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
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings Schenectady Preferred Alt Figure 3-7

Prepared on 4/27/2021

by: AECOM

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

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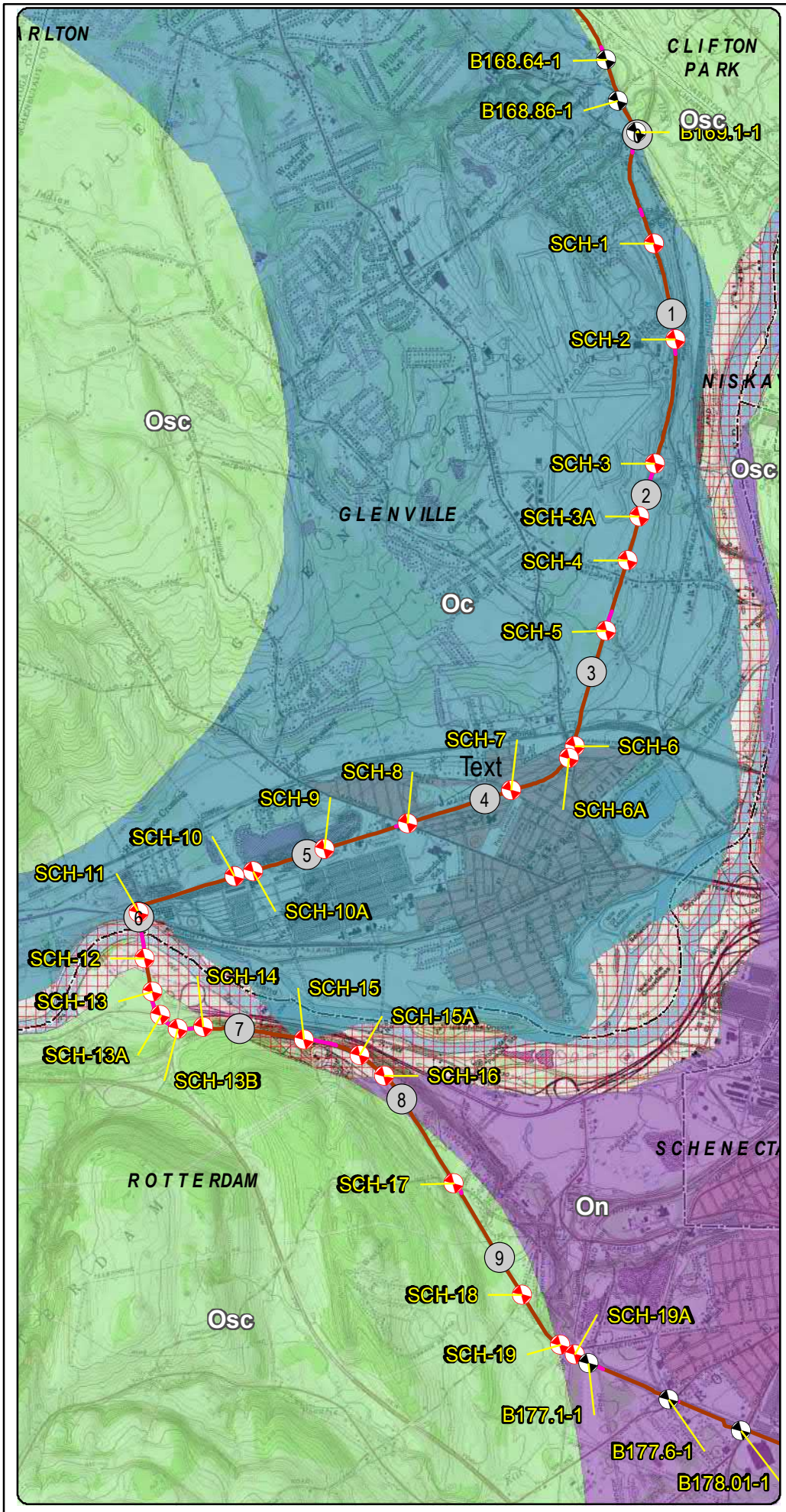

LEGEND

- 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

- No Label
- Oc - Canajoharie Shale
- On - Normanskill Shale
- Osc - Schenectady Formation

* Schenectady Formation includes: graywacke, sandstone, siltstone, shale

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Schenectady Preferred Alt Figure 4-7

Prepared on 4/29/2021

by: AECOM

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

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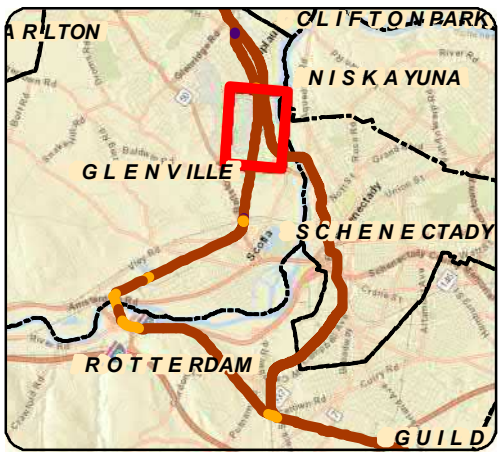
SCH-2
SCH-3
SCH-3A
SCH-4
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4
170.3
170.4
170.5
170.6
170.7
170.8
170.9
171
171.1
171.2
171.3
171.4
NISKAYUNA
SCHENECTADY
GLENVILLE
Ronald Reagan Way
Haber Ln
Maple Ave
Rail System
Delaware & Hudson
Schenectady County Airport
0
1,000
Feet



LEGEND

- 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
- 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

Schenectady Preferred Alternative

Figure A-7

Sheet 2 of 8

Prepared by: AECOM 4/27/2021

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Mapset_May_2021_Report.mxd

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-3**
SOILS ENGINEER/GEOLOGIST: Chris French	**Boring Log**	START DATE: 3/4/21
		FINISH DATE: 3/4/21
LOCATION: Scotia, NY MP 1.82 (Pan-Am Rail)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
Water at 9' (inferred)	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)	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					SW	SAND & GRAVEL	Brown fine-coarse SAND, little rounded-subrounded gravel, trace silt, trace cobbles; frozen
1.0											SW		1.2'-5.0.'; SAA, dense, moist
2.0													
3.0													
		3'-5'	S-1										TR-1; (3.0'-5.0')
4.0													
5.0													
		5'-7'	S-2	24"	0"	14	16	18	18	22	-		No recovery, rock embedded in shoe
6.0													
7.0													
		7'-9'	S-3	24"	2"	13	18	19	15	24	SW		No recovery, 2" in shoe. Brown fine-coarse SAND, some subrounded gravel, little silt; dense, moist
8.0													
9.0													
		9'-11'	S-4	24"	6"	19	21	12	9	21	SW		SAA
10.0													
11.0													
		11'-'13'	S-5	24"	9"	6	7	6	7	8	SM	Silty SAND	Brown fine-coarse SAND and silt, trace subrounded gravel; medium dense, moist
12.0													
13.0													
		13'-15'	S-6	24"	6"	8	8	8	8	10	SM		Brown fine SAND, some silt, trace medium sand; medium dense, moist
14.0													
15.0													
		15'-17'	S-7	24"	6"	5	8	7	6	10	ML		Brown SILT, some fine sand; soft, saturated
16.0													TR-2; (16.5'-17.0')
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.

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	AECOM	SHEET 2 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-3**
SOILS ENGINEER: Chris French		START DATE: 3/4/21
	Boring Log	FINISH DATE: 3/4/21
LOCATION: Scotia, NY MP 1.82 (Pan-Am Rail)		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"	7"	4	6	6	7	8	SM	Silty SAND	Brown fine SAND and silt, trace medium-coarse sand, trace rounded gravel; loose, saturated
21.0													
22.0													
23.0													23.5' (*inferred*)
24.0											SM	Silty, Gravelly SAND (dense till)	
25.0													
		25'-27'	S-9	7"	5"	96	69/1"			-	SM		Brown fine-coarse SAND, some silt, little subangular-rounded gravel; very dense, moist (till)
26.0													
27.0													
28.0													
29.0													
30.0													
		30'-32'	S-10	24"	13"	62	50	41	97	59	SW		Gray fine-coarse SAND, some subangular-subrounded gravel, little silt; very dense, moist TR-3; (31.0'-31.5')
31.0													
32.0													
33.0													
34.0													
35.0													
		35'-37'	S-11	0.5"	0"	67/0.5"				-	-	SHALE	No recovery
36.0	2.3	35'-40'	R-1	60"	59"	RQD: 58" = 97%							R-1; 35.0'-40.0'; Gray to light gray interbedded shale and very fine grained sandstone, thickly laminated to thinly bedded, unweathered, lightly jointed, joints parallel with bedding, joints at 0°-5° TR-4; (35.9'-36.4')
37.0													
38.0													
39.0													
40.0													
41.0													SCH-3 terminated 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: **Schenectady Bypass Segment**

AECOM

Boring No.	Depth (ft.)
SCH-3	35.0-40.0

Boring No.	Depth (ft.)
SCH-5	17.0-37.0

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-3A**
SOILS ENGINEER/GEOLOGIST: Chris French		START DATE: 3/4/2021
	Boring Log	FINISH DATE: 3/4/2021
LOCATION: Scotia, NY MP 2.12 (PAN-AM Rail)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
Water observed at 3.2'	TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit		BORING TYPE: SPT
	SIZE I.D.	4"	2.5"	- -		BORING O.D.: 4.5"
	SIZE O.D.	4.5"	3"	3 7/8"		SURFACE ELEV.:
	HAMMER WT.	140 lbs	140 lbs			LONGITUDE:
	HAMMER FALL	30"	30"			LATITUDE:

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	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							Brown fine to coarse SAND, little silt, little rounded to subrounded gravel, frozen
1.0											SM		1.5': SAA, medium dense, soft
2.0													3.2': Brown fine SAND and SILT, medium dense, saturated
3.0													
		3'-5'	S-1								SM		TR-1; (3.0'-5.0')
4.0													
5.0													
		5'-7'	S-2	24"	16"	3	2	3	2	3	SM	Silty SAND	Brown fine SAND, some silt, loose, saturated
6.0													
7.0													
		7'-9'	S-3	24"	20"	5	5	5	7	7	SM		SAA
8.0													TR-2; (8.0'-8.25')
9.0													
		9'-11'	S-4	24"	3"	7	4	5	6	6	SM		Brown fine SAND, little silt, loose, saturated
10.0													
11.0													
		11'-'13'	S-5	24"	5"	6	5	4	6	6	SP		Brown fine to medium SAND, trace silt, loose, saturated
12.0													
13.0													
		13'-15'	S-6	24"	0"	3	4	5	4	6	-		No recovery
14.0												SAND	
15.0													
		15'-17'	S-7	24"	6"	5	3	3	13	4	SW		Brown fine to medium SAND, little coarse sand, trace subrounded gravel, trace silt, loose, saturated
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.

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	AECOM	SHEET 2 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-3A**
SOILS ENGINEER: Chris French		START DATE: 3/4/2021
	Boring Log	FINISH DATE: 3/4/2021
LOCATION: Scotia, NY MP 2.12 (PAN-AM Rail)		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"	24"	5	10	8	12	12	CL		Gray silty CLAY; stiff, moist
21.0													TR-3; 21.0'-21.5'
22.0													
23.0													
24.0													
25.0													
		25'-27'	S-9	24"	24"	11	18	15	14	21	CL		Gray silty CLAY; very stiff, moist
26.0													
27.0													
28.0													
29.0													
30.0												Silty CLAY	
		30'-32'	S-10	24"	24"	5	7	10	13	11	CL		Gray CLAY and silt, stiff, moist
31.0													TR-4; 31.0'-31.5'
32.0													
33.0													
34.0													
35.0													
		35'-37'	S-11	24"	24"	13	19	19	16	25	ML		Gray clayey SILT, trace fine sand; very stiff, saturated
36.0													
37.0													
38.0													
		38'-40'	S-12	24"	24"	8	12	10	14	14	CL		Gray CLAY and silt; stiff, moist
39.0													TR-5; 39.0'-39.5'
40.0													
													Boring 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.

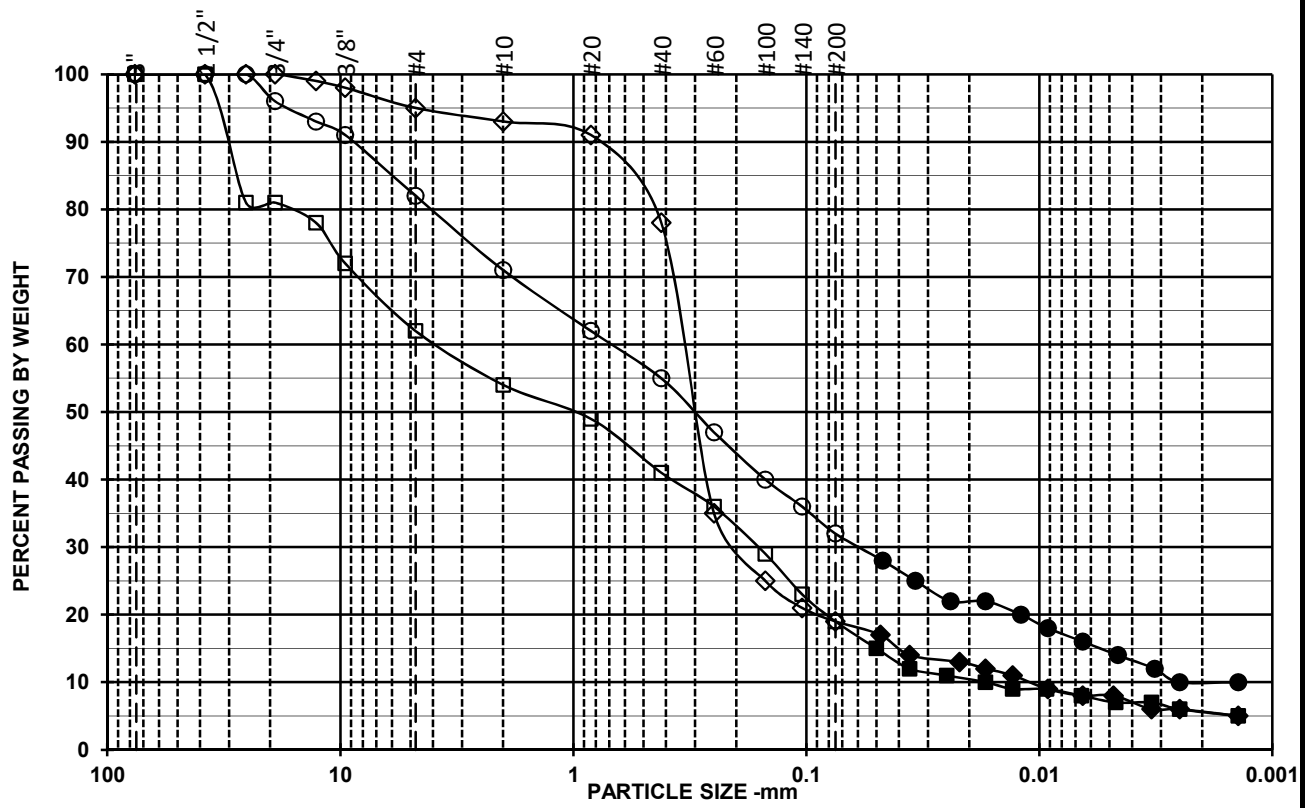
SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

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

Aquifer
CHPE - Schenectady Bypass 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 (%)	ORGANIC CONTENT (burnoff) (%)	
SCH-3	S-4	9-11	12.1				SC	19	6		
SCH-3	S-6	13-15	15.8				SM	19	6		
SCH-3	S-10	30-32	6.0				SM	32	10		
SCH-3A	S-3	7-9	22.9				SP-SM	12	3		
SCH-3A	S-7	15-17	15.2				SP-SM	12	4		
SCH-3A	S-9	25-27	26.3				CL	99.1	40		
SCH-6	S-3	7-9	8.8	36	21	15	GC	14	5		
SCH-6	S-7	15-17	10.4				GC	17	5		
SCH-7	S-2	5-7	21.6	25	19	6	CL-ML	79.3	16		
SCH-7	S-4	9-11	13.9				SM	39	7		
SCH-10A	S-3	7-9	6.3				GP-GM	8	2		
SCH-10A	S-6	15-17	4.6				GW-GM	8	2		
SCH-10A	S-10	30-32	4.0				GP-GM	5			
SCH-11	S-3	7-9	9.6				SC	21	6		
SCH-11	S-16	60-62	5.6				SW-SM	12	3		
SCH-11	S-20	80-82	19.3				SM	17.5	3		
SCH-11	S-25	105-107	21.1				SM	24.3	3		
SCH-12	S-3	7-9	28.5	33	19	14	CL	85	18		
SCH-12	S-9	25-27	23.3				SM	19.8	3		
SCH-12	S-14	50-52	18.3				SM	15	3		
SCH-12	S-19	75-77	7.6	18	11	7	SC-SM	41	14		
SCH-12	S-25	105-107	7.6	19	11	8	SC	41	14		
SCH-13	S-3	7-9	7.0				GP-GM	6	2		
SCH-13	S-6	13-15	0.3				GW	2	1		
SCH-13	S-11	35-37	20.9				SM	18.4	3		
SCH-13B	S-2	5-7	12.8				GC	19	6		
SCH-13B	S-3	7-9	11.3				GC	22	6		
SCH-17	S-2	5-7	9.1				GM	28	5		
SCH-17	S-4	9-11	8.5				GP-GM	10	3		
SCH-19	S-2	5-7	10.7				SM	19	5		
SCH-19	S-7	15-17	7.8				GP-GM	11	3		
SCH-19	S-10	30-32	13.9	22	12	10	SC	28	11		

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	□	◇	○
Boring	SCH-3	SCH-3	SCH-3
Sample	S-4	S-6	S-10
Depth	9-11	13-15	30-32
% +3"	0	0	0
% Gravel	38	5	18
% SAND	43	76	50
%C SAND	8	2	11
%M SAND	13	15	16
%F SAND	22	59	23
% FINES	19	19	32
D_{100} (mm)	38.1	19.1	25.4
D_{60} (mm)	3.83	0.337	0.689
D_{30} (mm)	0.16	0.19	0.059
D_{10} (mm)	0.017	0.011	0.003
Cc	0.4	9.7	2
Cu	225.3	30.6	275.6

Sieve Size/ID #	Percent Finer Data		
6"	100	100	100
4"	100	100	100
3"	100	100	100
1 1/2"	100	100	100
1"	81	100	100
3/4"	81	100	96
1/2"	78	99	93
3/8"	72	98	91
#4	62	95	82
#10	54	93	71
#20	49	91	62
#40	41	78	55
#60	36	35	47
#100	29	25	40
#140	23	21	36
#200	19	19	32
5μ m	7	8	14
2μ m	6	6	10
1μ m	4	4	10

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	12.1				SC		Brown, Clayey sand with gravel, Insufficient sample size	04/27/21
◇	15.8				SM		Brown, Silty sand, Insufficient sample size	04/28/21
○	6.0				SM		Gray, Silty sand with gravel, Insufficient sample size	04/28/21

Aquifer

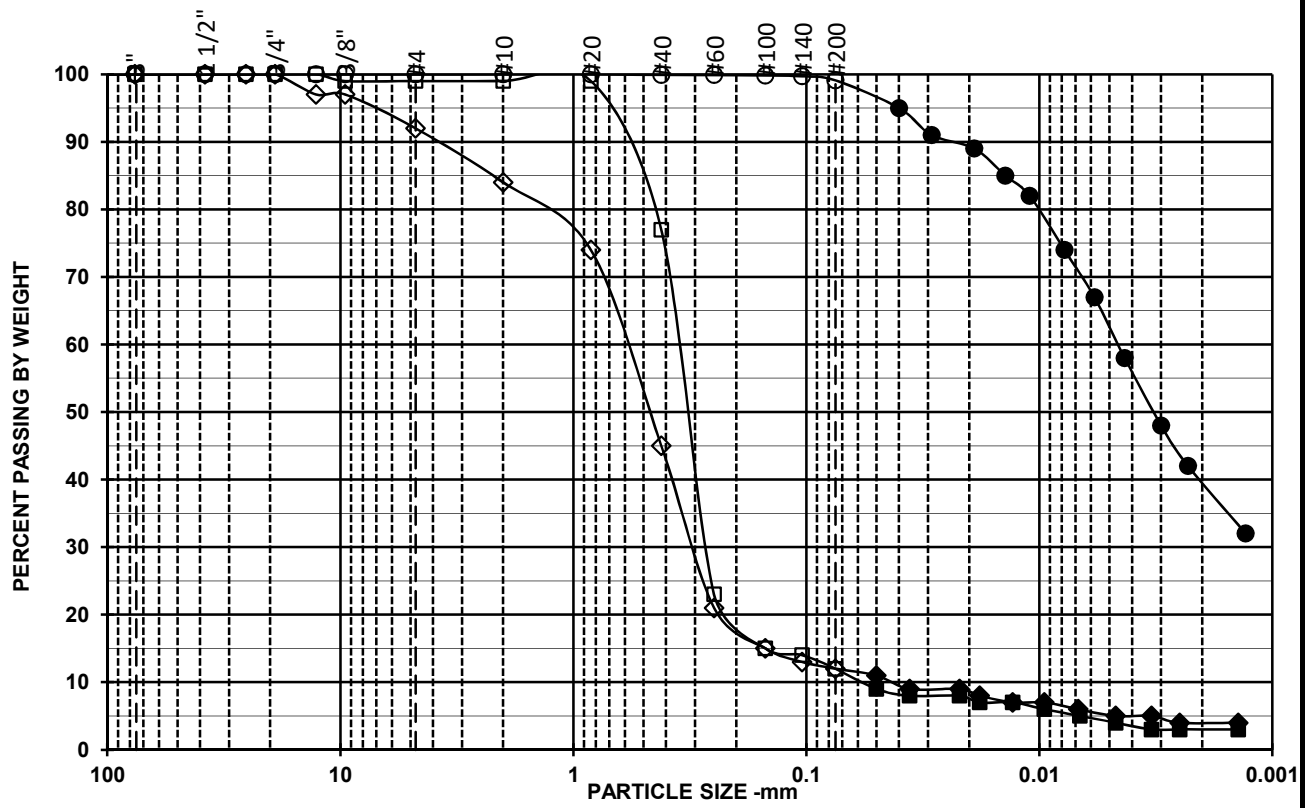
TerraSense, LLC #7853-21006

CHPE - Schenectady Bypass Borings

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

TerraSense Analysis File: GrainSizeV6Rev1a14

Siev1a.xlsx 5/7/2021



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

Symbol	□	◇	○
Boring	SCH-3A	SCH-3A	SCH-3A
Sample	S-3	S-7	S-9
Depth	7-9	15-17	25-27
% +3"	0	0	0
% Gravel	1	8	0
% SAND	87	80	0.9
%C SAND	0	8	0
%M SAND	22	39	0.1
%F SAND	65	33	0.8
% FINES	12	12	99.1
D_{100} (mm)	12.7	19.1	2
D_{60} (mm)	0.356	0.601	0.005
D_{30} (mm)	0.27	0.3	
D_{10} (mm)	0.057	0.042	
Cc	3.6	3.6	
Cu	6.2	14.3	

Sieve Size/ID #	Percent Finer Data		
6"	100	100	100.0
4"	100	100	100.0
3"	100	100	100.0
1 1/2"	100	100	100.0
1"	100	100	100.0
3/4"	100	100	100.0
1/2"	100	97	100.0
3/8"	99	97	100.0
#4	99	92	100.0
#10	99	84	100.0
#20	99	74	100.0
#40	77	45	99.9
#60	23	21	99.9
#100	15	15	99.8
#140	14	13	99.7
#200	12	12	99.1
5μ m	4	5	63
2μ m	3	4	40
1μ m	3	4	27

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	22.9				SP-SM		Brown, Poorly graded sand with silt	04/29/21
◇	15.2				SP-SM		Brown, Poorly graded sand with silt, Insufficient sample size	04/29/21
○	26.3				CL		Gray, Lean clay	04/28/21

Aquifer

TerraSense, LLC #7853-21006

CHPE - Schenectady Bypass Borings

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

TerraSense Analysis File: GrainSizeV6Rev1a14

Siev1b.xlsx 5/7/2021

Boring Location Plans Page 5 of 9	Drawn by: ADW	Scale: Not to scale	Project No.: CD10279	Date: May 2022
Champlain Hudson Power Express **Design Package 4B** **Glenville to Scotia, 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-01-05-22

Client: Kiewit Engineering (NY) Corp.

Boring Location: See Boring Location Plan

Project: Subsurface Investigation
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: 3/22/2022 Finish Date: 3/23/2022

Boring No.: K-169.0-1.8 Sheet 1 of 2

Groundwater Observations

Date	Time	Depth	Casing
3/22/2022	AM	*1.0'	8.0'
3/22/2022	PM	*5.0'	29.0'
3/23/2022	AM	*9.5'	34.0'
3/23/2022	AM	*8.5'	CAVED

Coordinates
Northing 1461832.85
Easting 645196.63

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

Ground Elev.: 287.3

Boring Advance By: HW (4") Casing/NX Core

Borehole caved at 30.0 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)
	CASING	1	0.0	2.0	SS	2 2 5 4	0.1	1" TOPSOIL & ORGANIC MATERIAL	12
1								Grey cmf GRAVEL; some cmf SAND; little SILT (wet, non-plastic) GW	
2		2	2.0	4.0	SS	8 6 6 6		Grey c+mf GRAVEL; little cmf SAND; trace SILT; trace ORGANIC MATERIAL (moist, non-plastic) w = 2.4%, % Fines = 3.0% GP	6
3							4.0		
4		3	4.0	6.0	SS	4 5 6 6		Brown mf SAND; trace SILT (wet, non-plastic) SP	8
5									
6		4	6.0	8.0	SS	10 6 10 9		Brown cmf SAND; trace SILT (wet, non-plastic) SW	18
7									
8		5	8.0	10.0	SS	4 3 2 2		Brown mf SAND; trace SILT (wet, non-plastic) SP	11
9									
10									
11									
12							12.0		
13									
14		6	14.0	16.0	SS	8 7 7 10		Grey cmf SAND; and SILT; little mf GRAVEL (wet, non-plastic) SM	11
15									
16									
17							17.0		
18		7	18.0	20.0	SS	26 27 36 37		(3" Brass Lined Split Spoon) Grey c-mf SAND; some SILT; little mf GRAVEL (wet, non-plastic) w = 7.5%, % Fines = 34.0% SM	23
19									
20		8	20.0	22.0	SS	40 39 49 50		(3" Brass Lined Split Spoon) NO RECOVERY	0
21									
22		9	22.0	24.0	SS	26 40 70 67		(3" Brass Lined Split Spoon) NO RECOVERY	0
23									
24		10	24.0	26.0	SS	17 23 27 24		Grey cmf SAND; and SILT; little mf GRAVEL (wet, non-plastic)	8
25									

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

Drillers: Ben Crary; Jarod Busch

Inspector: Tom Hunter (ATL); Matt Stiles (ATL); Tom Kimmins (Kiewit)

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: K-169.0-1.8 Report No.: CD10279D-01-05-22 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)
								w = 8.1%, % Fines = 38.0% SM	
26									
27								Encountered BOULDER from 26.5 to 28.0 feet.	
28									
29		11	29.0	31.0	SS	6 19 67 50		Grey cmf+ SAND; and SILT; trace mf GRAVEL (wet, non-plastic) SM	13
30									
31									
32									
33								NO RECOVERY	
34	NX CORE (WET)	12	34.0 34.1	34.0 39.0	SS NX	25/0" RUN 1		Advanced NX Core barrel from 34.0 to 39.0 feet. Encountered probable BOULDER from 34.0 to 35.0 feet.	0
35									
36									
37									
38									
39		13	39.0	39.7	SS	34 50/2"	39.7	Grey cmf SAND; and mf GRAVEL; some SILT (wet, non-plastic) w = 9.5% SM	6
40									
41								Boring terminated at 39.7 feet.	
42									
43								Notes:	
44								1. Borehole backfilled with cement-bentonite grout.	
45								2. Soil classifications based on ATL Field Engineer's field classifications.	
46								3. Borehole was advanced with ATL's Geoprobe 7822DT (Rig Unit No. CDGV667) drill rig.	
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: CD10279D-01-05-22

Client: Kiewit Engineering (NY) Corp.

Boring Location: See Boring Location Plan

Project: Subsurface Investigation
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: 3/23/2022 Finish Date: 3/23/2022

Boring No.: K-169.0-1.9 Sheet 1 of 2

Groundwater Observations

Date	Time	Depth	Casing
3/23/2022	AM	DRY	OPEN
3/23/2022	AM	5.5'	8.0'
3/23/2022	PM	13.0'	19.0'
3/23/2022	PM	*15.0'	19.0'

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

Coordinates
Northing 1461662.78
Easting 644883.36

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

Ground Elev.: 287.6

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

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	3 5 10 7		Brown cmf SAND; and mf GRAVEL; trace SILT; trace ORGANIC MATERIAL (wet, non-plastic) SW	9
2		2	2.0	4.0	SS	10 12 8 6		Brown cmf GRAVEL; and cmf SAND; trace SILT (moist, non-plastic) w = 3.2% GW	8
3							4.0		
4		3	4.0	6.0	SS	6 4 2 1		NO RECOVERY	0
5									
6		4	6.0	8.0	SS	5 4 2 2		Brown c-mf SAND; little SILT; little c+mf- GRAVEL (wet, non-plastic) w = 11.6%, % Fines = 20.0% SM	6
7									
8		5	8.0	10.0	SS	3 2 4 6		NO RECOVERY	0
9									
10									
11									
12									
13									
14		6	14.0	16.0	SS	3 2 1 1		NO RECOVERY	0
15							16.0		
16		7	16.0	18.0	SS	4 2 6 6		(3" Brass Lined Split Spoon) Dark Brown SILT; and mf+ SAND; some cm GRAVEL; little ORGANIC MATERIAL (decomposing wood fragments) (wet, non-plastic) ML	10
17									
18		8	18.0	20.0	SS	18 11 8 7		(3" Brass Lined Split Spoon) Brown c-mf+ SAND; trace SILT; trace ORGANIC MATERIAL (wood fragments); trace f GRAVEL (wet, non-plastic) w = 20.7%, % Fines = 7.0% SP-SM	6
19	WET ROTARY								
20									
21								Advanced casing to 19.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
22							22.0		
23									
24		9	24.0	26.0	SS	13 9 11 8		Grey cmf+ SAND; and SILT; some mf GRAVEL (wet, non-plastic)	20
25									

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

Drillers: Ben Crary; Jarod Busch

Inspector: Tom Hunter (ATL); Matt Stiles (ATL); Tom Kimmins (Kiewit)

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: K-169.0-1.9 Report No.: CD10279D-01-05-22 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)
								SM	
26									
27									
28									
29		10	29.0	31.0	SS	8 9 16 19		(3" Brass Lined Split Spoon) Grey cmf GRAVEL; and SILT; some cmf SAND (wet, non-plastic) GM	10
30									
31									
32									
33									
34		11	34.0	36.0	SS	11 11 19 21		(3" Brass Lined Split Spoon) Similar Soil (wet, non-plastic) GM	11
35									
36		12	36.0	38.0	SS	27 28 39 36		(3" Brass Lined Split Spoon) Grey SILT; and cmf GRAVEL; some cmf SAND; trace CLAY (wet, very slightly plastic) ML	18
37									
38		13	38.0	40.0	SS	27 31 41 48		(3" Brass Lined Split Spoon) Grey cmf SAND; and SILT; trace f GRAVEL (wet, non-plastic) w = 7.8%, % Fines = 39.0% SM	23
39									
40							40.0		
41								Boring terminated at 40.0 feet.	
42									
43								Notes:	
44								1. Borehole backfilled with cement-bentonite grout.	
45								2. Soil classifications based on ATL Field Engineer's field classifications.	
46								3. Borehole was advanced with ATL's Geoprobe 7822DT (Rig Unit No. CDGV667) drill rig.	
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: CD10279D-01-05-22

Client: Kiewit Engineering (NY) Corp.

Boring Location: See Boring Location Plan

Project: Subsurface Investigation
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: 3/24/2022 Finish Date: 3/24/2022

Boring No.: K-169.0-2.0 Sheet 1 of 2

Coordinates
Northing 1461451.45
Easting 644498.66

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

Ground Elev.: 287.6

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

Groundwater Observations

Date	Time	Depth	Casing
3/24/2022	AM	1.5'	8.0'
3/24/2022	AM	*7.0'	18.0'
3/24/2022	AM	*9.0'	18.0'
3/24/2022	PM	*7.5'	CAVED

Borehole caved at 9.5 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)
1	CASING	1	0.0	2.0	SS	4 6 7 8		Brown cmf SAND; and mf GRAVEL; trace SILT; trace ORGANIC MATERIAL (leaves) (moist, non-plastic) SW	10
2		2	2.0	4.0	SS	4 4 4 4		Brown cmf+ SAND; some mf GRAVEL; trace SILT (moist, non-plastic) w = 12.1% SP	14
3							4.0		
4		3	4.0	6.0	SS	2 4 6 3		Brown mf+ SAND; little SILT (wet, non-plastic) SM	11
5									
6		4	6.0	8.0	SS	7 6 4 3		Brown mf+ SAND; little SILT (wet, non-plastic) w = 24.5% % Fines = 13.0% SM	10
7									
8		5	8.0	10.0	SS	WH 1 1 2		NO RECOVERY	0
9									
10									
11									
12							12.0		
13									
14		6	14.0	16.0	SS	6 7 6 6		Dark Brown cmf SAND; and mf GRAVEL; trace SILT (wet, non-plastic) SW	10
15									
16									
17							17.0		
18	WET ROTARY	7	18.0	20.0	SS	7 5 8 6		Advanced casing to 18.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole. (3" Brass Lined Split Spoon) Grey SILT; little CLAY; trace f SAND (moist, slightly plastic) w = 28.9%, LL = 37, PL = 20, PI =17 % Fines = 96.5% ML	18
19									
20							20.0		
21		8	20.0	22.0	SS	12 13 17 15		(3" Brass Lined Split Spoon) Grey CLAY; some SILT (wet, plastic) CL	18
22		9	22.0	24.0	SS	7 7 8 8		(3" Brass Lined Split Spoon) Grey CLAY; some SILT; trace f SAND (wet, plastic) w = 29.5%, LL = 34, PL = 20, PI =14 % Fines = 97.9% CL	24
23									
24		10	24.0	26.0	SS	1 WH 2 2			24
25									

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

Drillers: Ben Crary; Jarod Busch

Inspector: Tom Hunter (ATL); Matt Stiles (ATL); Tom Kimmins (Kiewit)

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: K-169.0-2.0 Report No.: CD10279D-01-05-22 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)
								Grey CLAY; little SILT; trace f SAND (wet, plastic) CL	
26									
27									
28									
29		11	29.0	31.0	SS	2 8 5 9		Grey CLAY; and SILT; some f SAND (wet, plastic) CL	24
30									
31									
32									
33									
34		12	34.0	36.0	SS	WH/12" 1 2		Grey CLAY; some SILT; trace f SAND (wet, plastic) CL	24
35									
36									
37									
38									
39		13	39.0	41.0	SS	3 2 6 6		Grey CLAY; some SILT; some f SAND (wet, plastic) CL	24
40									
41							41.0		
42								Boring terminated at 41.0 feet.	
43								Notes:	
44								1. Borehole backfilled with cement-bentonite grout.	
45								2. Soil classifications based on ATL Field Engineer's field classifications.	
46								3. Borehole was advanced with ATL's Geoprobe 7822DT (Rig Unit No. CDGV667) drill rig.	
47									
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ATLANTIC TESTING LABORATORIES

LABORATORY TEST SUMMARY TABLE

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

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-169.0-0.1A	S-2	2.0-4.0	Brown cmf SAND; little mf GRAVEL; trace SILT; trace OM	--	--	--	--	--	2.0	--	--	--	--	--	--	--
	S-4	6.0 - 8.0	Brown f SAND; little SILT	18.0	10.4	--	--	--	--	--	--	--	--	--	--	--
	S-8	27.0-29.0	Brown f SAND; little SILT	13.0	14.4	--	--	--	--	--	--	--	--	--	--	--
K-169.0-0.1B	S-3	4.0-6.0	Brown SILT; little f SAND	--	--	--	--	--	--	2,300	50	8.08	39,990	--	--	--
	S-4	6.0-8.0	Frown f SAND; some SILT	--	10.2	--	--	--	--	--	--	--	--	--	--	--
	S-6	14.0-16.0	Brown cmf+ SAND; little SILT	13.0	21.1	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Brown mf SAND; and SILT	48.4	28.0	NP	NP	NP	--	--	--	--	--	--	--	--
	S-11	40.0-42.0	Blackish-Grey CLAY; little SILT; little f SAND	83.0	28.2	38	19	19	--	--	--	--	--	--	--	--
K-169.0-0.4	S-4	6.0-8.0	Brown cf+ SAND; little SILT; trace f GRAVEL	12.0	15.8	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0 - 21.0	Grey CLAY; little SILT; trace f SAND	99.9	24.8	40	19	21	--	--	--	--	--	--	--	--
	S-11	37.0-39.0	Blackish-Grey SILT; little CLAY; trace f SAND	99.1	30.6	38	19	19	--	--	--	--	--	--	--	--
K-169.0-0.5	S-4	6.0-8.0	Reddish Brown mf+ SAND; little SILT; trace f GRAVEL	12.0	17.4	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Grey SILT; trace CLAY; trace f SAND	99.4	31.9	36	18	18	--	--	--	--	--	--	--	--
	S-11	37.0-39.0	Light Brown-Grey SILT; some CLAY; trace f SAND	94.6	22.8	27	17	10	--	--	--	--	--	--	--	--
K-169.0-1.2	S-2	2.0-4.0	Greyish-Black cmf- SAND; and cmf+ GRAVEL; little SILT	19.0	8.2	--	--	--	--	--	--	--	--	--	--	--
	RC-3	25.0-30.0	Black SHALE	--	--	--	--	--	--	--	--	--	--	10,540	1252	1.14
K-169.0-1.8	S-2	2.0-4.0	Grey c+mf GRAVEL; little cmf SAND; trace SILT	3.0	2.4	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown cmf SAND; trace SILT	--	--	--	--	--	--	300	--	7.9	--	--	--	--
	S-5	8.0-10.0	Brown mf SAND; trace SILT	--	--	--	--	--	--	--	20	--	8,514	--	--	--
	S-7	18.0-20.0	Grey c-mf SAND; some SILT; little mf GRAVEL	34.0	7.5	--	--	--	--	--	--	--	--	--	--	--
	S-10	24.0-26.0	Grey cmf SAND; and SILT; little mf GRAVEL	38	8.1	--	--	--	--	--	--	--	--	--	--	--
	S-13	39.0-39.7	Grey cmf SAND; and mf GRAVEL; some SILT	--	9.5	--	--	--	--	--	--	--	--	--	--	--
K-169.0-1.9	S-2	2.0-4.0	Brown cmf GRAVEL; and cmf SAND; trace SILT	--	3.2	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown c-mf SAND; little SILT; little c+mf- GRAVEL	20.0	11.6	--	--	--		--	--	--	--	--	--	--
	S-8	18.0-20.0	Brown c-mf+ SAND; trace SILT; trace OM; trace f GRAVEL	7.0	20.7	--	--	--	--	--	--	--	--	--	--	--
	S-13	38.0-40.0	Grey cmf SAND; and SILT; trace f GRAVEL	39.0	7.8	--	--	--	--	--	--	--	--	--	--	--

ATLANTIC TESTING LABORATORIES

LABORATORY TEST SUMMARY TABLE

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

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-169.0-2.0	S-2	2.0-4.0	Brown cmf+ SAND; some mf GRAVEL; trace SILT	--	12.1	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown mf+ SAND; little SILT	13.0	24.5	--	--	--	--	--	--	--	--	--	--	--
	S-7	18.0-20.0	Grey SILT; little CLAY; trace f SAND	96.5	28.9	37	20	17	--	--	--	--	--	--	--	--
	S-9	22.0-24.0	Grey CLAY; some SILT; trace f SAND	97.9	29.5	34	20	14	--	--	--	--	--	--	--	--
K-169.0-2.6	S-5	8.0-10.0	Grey c-mf SAND; little f GRAVEL; trace SILT	9.4	16.1	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Grey CLAY; some SILT; trace f SAND	97.6	26.7	26	14	12	--	--	--	--	--	--	--	--
	S-9	32.0-34.0	Grey f SAND; some SILT	24.2	22.7	NP	NP	NP	--	--	--	--	--	--	--	--
K-169.0-2.7	S-4	6.0-8.0	Brown mf+ SAND; and SILT; trace CLAY	53.0	23.1	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0-21.0	Grey CLAY; some SILT; trace f SAND	98.7	29.5	36	19	17	--	--	--	--	--	--	--	--
	ST-1	28.0-30.0	Grey CLAY; some SILT; little mf SAND	89.4	39.3	25	13	12	--	--	--	--	--	--	--	--
K-169.0-4.4	S-3/4	4.0-8.0	Brown cmf SAND; trace f GRAVEL; trace SILT	--	--	--	--	--	--	300	20	8.6	139,320	--	--	--
	S-5	8.0-10.0	Greish-Brown c-m+f SAND; trace SILT; trace mf+ GRAVEL	9.4	5.4	--	--	--	--	--	--	--	--	--	--	--
	ST-1c	27.0-29.0	Brownish-Grey c-mf+ SAND; little SILT; trace m GRAVEL	17.0	15.8	--	--	--	--	--	--	--	--	--	--	--
K-169.0-4.5	S-3	4.0-6.0	Brown c-m+f SAND; little SILT; trace f GRAVEL	17.0	10.6	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0-21.0	Greyish-Brown c-mf+ SAND; little SILT; little mf+ GRAVEL	19.0	11.5	--	--	--	--	--	--	--	--	--	--	--
	S-8	29.0-31.0	Grey mf+ SAND; little SILT	12.0	17.7	--	--	--	--	--	--	--	--	--	--	--
K-169.0-6.0	S-6	13.0-15.0	Brown mf+ SAND; trace SILT	--	21.3	--	--	--	--	--	--	--	--	--	--	--
	S-9	28.0-30.0	Brown f SAND; little SILT	--	22.3	--	--	--	--	--	--	--	--	--	--	--
	S-11	38.0-40.0	Brown f SAND; trace SILT	--	26.0	--	--	--	--	--	--	--	--	--	--	--
	S-13	48.0-50.0	Brown f SAND; little SILT	--	24.0	--	--	--	--	--	--	--	--	--	--	--
	S-15	58.0-60.0	Brown f SAND; little SILT	--	23.8	--	--	--	--	--	--	--	--	--	--	--
	S-17	68.0-70.0	Brown f SAND; little SILT	--	27.8	--	--	--	--	--	--	--	--	--	--	--
K-169.0-6.1	S-4	6.0-8.0	Grey cmf GRAVEL; some cmf SAND; little CLAY	--	8.4	--	--	--	--	--	--	--	--	--	--	--
	S-10	33.0-35.0	Grey cmf+ SAND; trace SILT; trace f GRAVEL	--	25.1	--	--	--	--	--	--	--	--	--	--	--
	S-14	53.0-55.0	Grey f SAND; little SILT	--	22.3	--	--	--	--	--	--	--	--	--	--	--
	S-18	73.0-75.0	Grey cmf+ SAND; little SILT; trace mf GRAVEL	--	19.1	--	--	--	--	--	--	--	--	--	--	--

ATLANTIC TESTING LABORATORIES

WBE certified company

LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS

ASTM D 2216

PROJECT INFORMATION

Client:	Kiewit Intrastructure Co.	**ATL Report No.:**	CD10279E-11-04-22
Project:	Champlain Hudson Power Express	**Report Date:**	April 11, 2022
	United Cable Installation	**Date Received:**	March 30, 2022
	Various Locations, New York		

TEST DATA

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
[redacted]			
K-169.0-1.8	S-2 [1]	2-4	2.4
	S-7 [1]	18-20	7.5
	S-10 [1]	24-26	8.1
	S-13 [1]	39-39.7	9.5
K-169.0-1.9	S-2 [1]	2-4	3.2
	S-4 [1]	6-8	11.6
	S-8	18-20	20.7
	S-13	38-40	7.8

ATLANTIC TESTING LABORATORIES

WBE certified company

LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS

ASTM D 2216

PROJECT INFORMATION

Client:	Kiewit Intrastructure Co.	**ATL Report No.:**	CD10279E-11-04-22
Project:	Champlain Hudson Power Express	**Report Date:**	April 11, 2022
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	Various Locations, New York		

TEST DATA

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
[redacted]			
K-169.0-1.8	S-2 [1]	2-4	2.4
	S-7 [1]	18-20	7.5
	S-10 [1]	24-26	8.1
	S-13 [1]	39-39.7	9.5
K-169.0-1.9	S-2 [1]	2-4	3.2
	S-4 [1]	6-8	11.6
	S-8	18-20	20.7
	S-13	38-40	7.8

ATLANTIC TESTING LABORATORIES

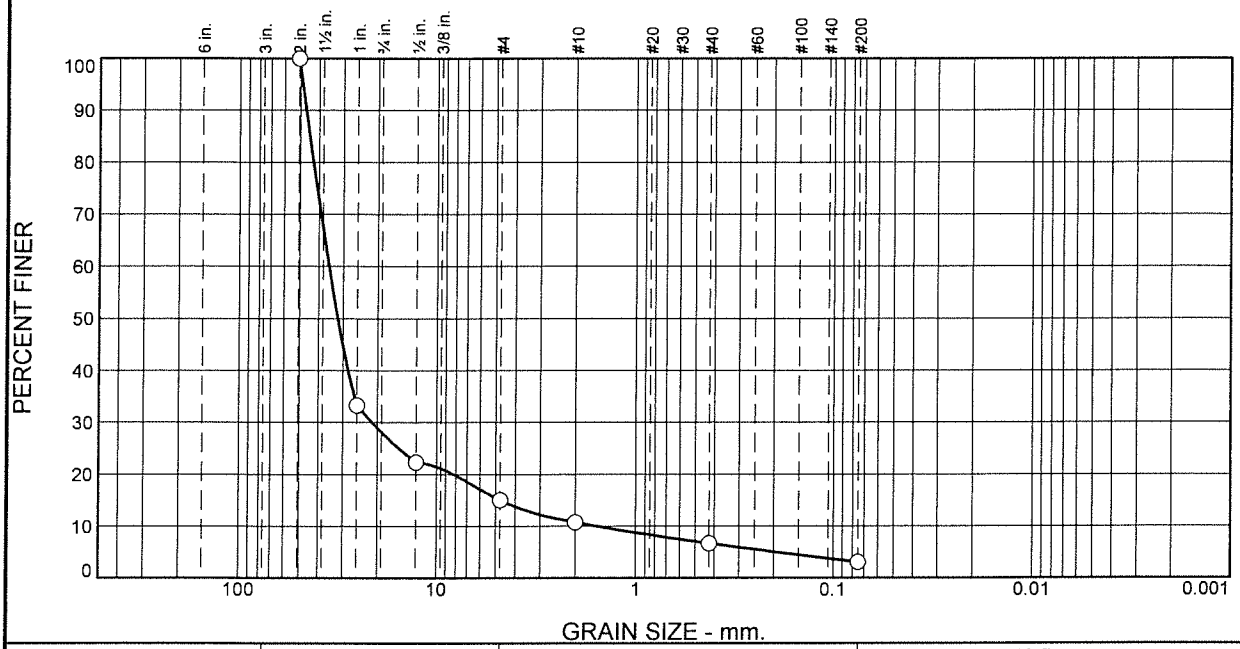
Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-11-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/11/22

Sample No: K-169.0-1.8 **Source of Sample:** Boring Sample

Location: In-place **Elev./Depth:** 2-4'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	72	13	4	4	4	3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
2"	100		
1"	33		
1/2"	22		
#4	15		
#10	11		
#40	7		
#200	3.0		

* (no specification provided)

Soil Description

Grey c+mf GRAVEL; little cmf SAND; trace SILT

Atterberg Limits

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

Coefficients

D_{85}= 44.6584 D_{60}= 35.4923 D_{50}= 31.9461
D_{30}= 21.2718 D_{15}= 4.7332 D_{10}= 1.5627
C_u= 22.71 C_c= 8.16

Classification

USCS= GP AASHTO=

Remarks

Moisture Content= 2.4%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/11/22

ATLANTIC TESTING LABORATORIES

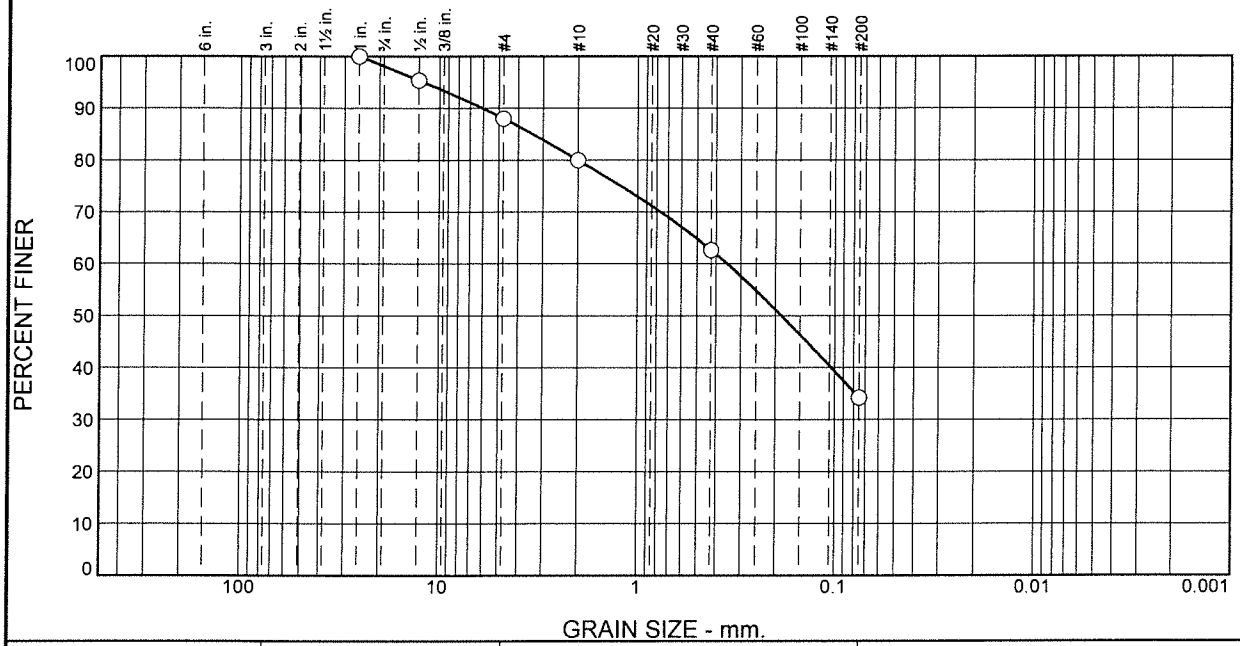
Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-11-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/11/22

Sample No: K-169.0-1.8 **Source of Sample:** Boring Sample

Location: In-place **Elev./Depth:** 18-20'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	10	8	17	29	34	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1"	100		
1/2"	95		
#4	88		
#10	80		
#40	63		
#200	34		

* (no specification provided)

Soil Description

Grey c-mf SAND; some SILT; little mf GRAVEL

Atterberg Limits

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

Coefficients

D_{85}= 3.3871 D_{60}= 0.3527 D_{50}= 0.1862
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 7.5%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/11/22

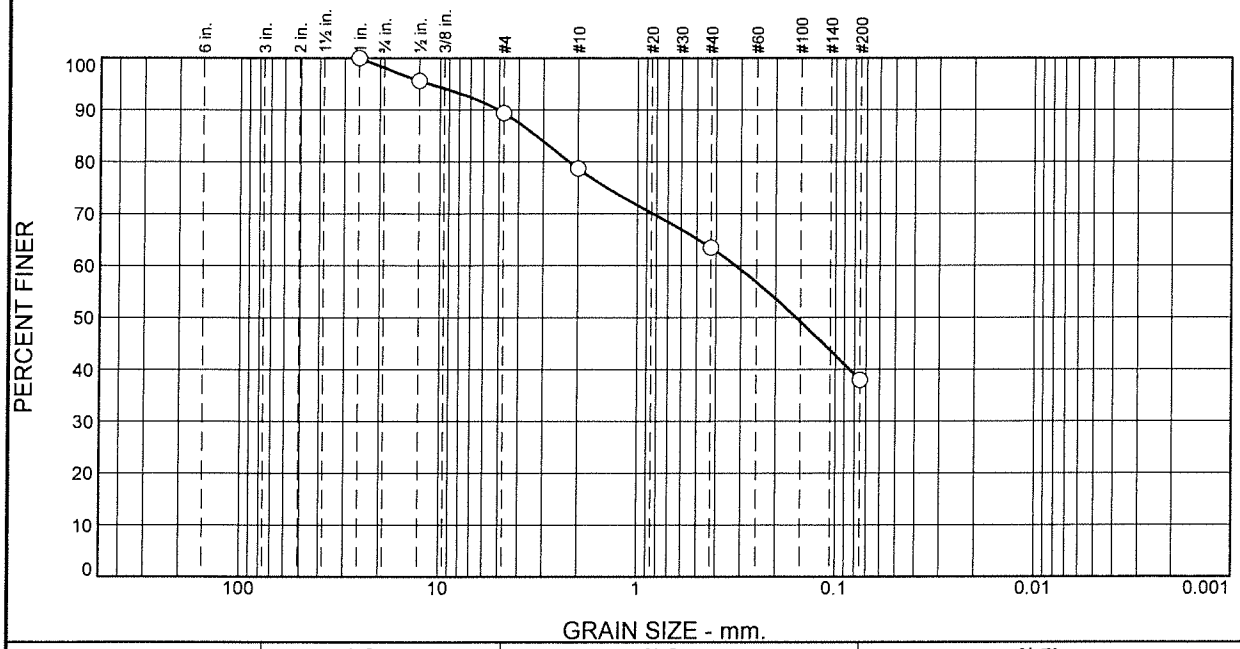
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-11-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/11/22

Sample No: K-169.0-1.8 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 24-26'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	9	10	16	25	38	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1"	100		
1/2"	96		
#4	89		
#10	79		
#40	63		
#200	38		

* (no specification provided)

Soil Description

Grey cmf SAND; and SILT; little mf GRAVEL

Atterberg Limits

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

Coefficients

D_{85}= 3.2609 D_{60}= 0.3185 D_{50}= 0.1579
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 8.1%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/11/22

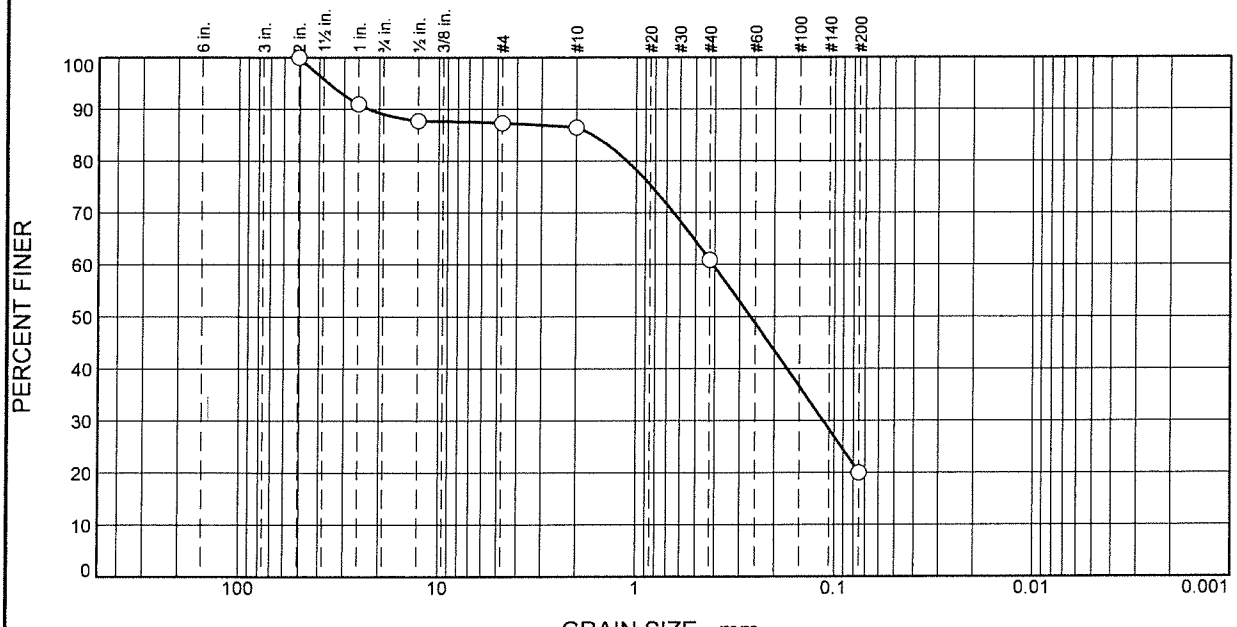
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-11-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/11/22

Sample No: K-169.0-1.9 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 6-8'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	11	2	1	25	41	20	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
2"	100		
1"	91		
1/2"	88		
#4	87		
#10	86		
#40	61		
#200	20		

* (no specification provided)

Soil Description

Brown c-mf SAND; little SILT; little c+mf- GRAVEL

Atterberg Limits

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

Coefficients

D_{85}= 1.6596 D_{60}= 0.4092 D_{50}= 0.2644
D_{30}= 0.1136 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 11.6%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: _____ Date: 04/11/22

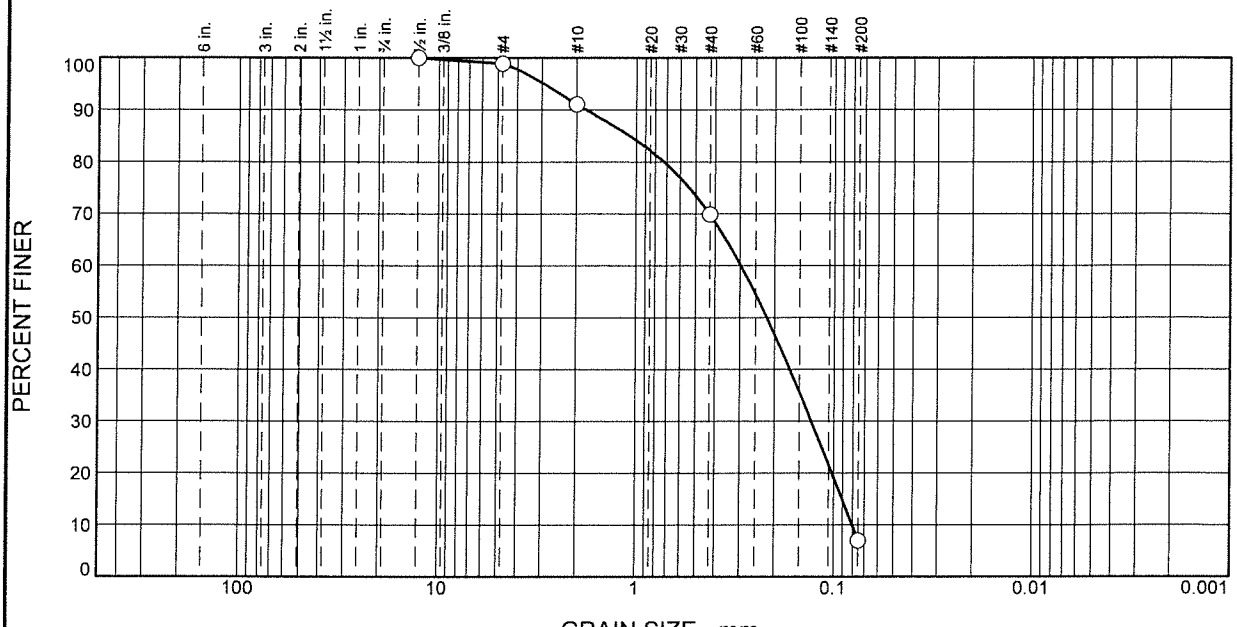
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-11-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/11/22

Sample No: K-169.0-1.9 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 18-20'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	8	21	63	7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	99		
#10	91		
#40	70		
#200	7.0		

* (no specification provided)

Soil Description

Brown c-mf+ SAND; trace SILT; trace ORGANIC MATERIAL; trace f GRAVEL

Atterberg Limits

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

Coefficients

D_{85}= 1.0815 D_{60}= 0.2966 D_{50}= 0.2194
D_{30}= 0.1301 D_{15}= 0.0906 D_{10}= 0.0806
C_u= 3.68 C_c= 0.71

Classification

USCS= AASHTO=

Remarks

Moisture Content= 20.7%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/11/22

ATLANTIC TESTING LABORATORIES

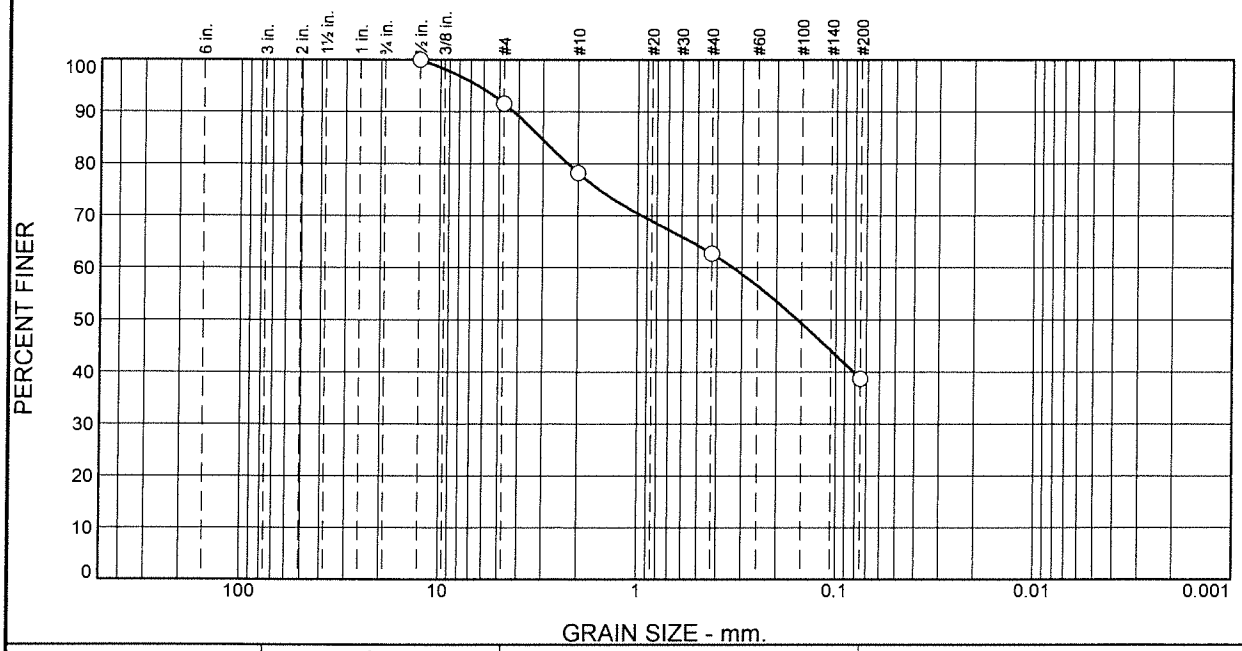
Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-11-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/11/22

Sample No: K-169.0-1.9 **Source of Sample:** Boring Sample

Location: In-place **Elev./Depth:** 38-40'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	8	14	15	24	39	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	92		
#10	78		
#40	63		
#200	39		

* (no specification provided)

Soil Description

Grey cmf SAND; and SILT; trace f GRAVEL

Atterberg Limits

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

Coefficients

D_{85}= 3.0833 D_{60}= 0.3322 D_{50}= 0.1568
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 7.8%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/11/22

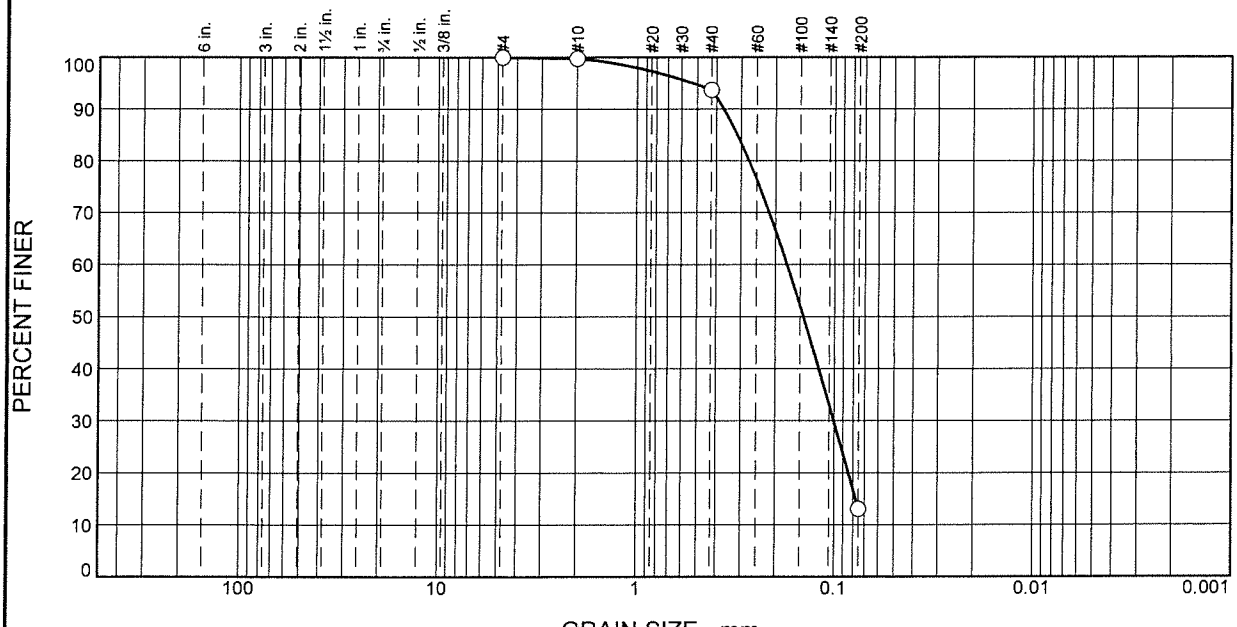
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-11-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/11/22

Sample No: K-169.0-2.0 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 6-8'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	6	81	13	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#4	100		
#10	100		
#40	94		
#200	13		

* (no specification provided)

Soil Description

Brown mf+ SAND; little SILT

Atterberg Limits

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

Coefficients

D_{85}= 0.3136 D_{60}= 0.1747 D_{50}= 0.1440
D_{30}= 0.1005 D_{15}= 0.0776 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 24.5%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/11/22

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-11-04-22
Project:	Champlain Hudson Power Express	**Report Date:**	April 11, 2022
	United Cable Installation	**Test Date:**	April 7, 2022
	Various Locations, New York	**Performed By:**	H. Brownell

TEST DATA

Boring No.	Sample No.	Depth (ft)	Method (A or B)	Soak Time (min)	Initial Dry Weight (g)	% Finer than #200
[redacted]						
K-169.0-2.0	S-7	18-20	A	10	74.43	96.5
K-169.0-2.0	S-9	22-24	A	10	127.74	97.9

Reviewed By: _____ Date: 04/11/22

ATLANTIC TESTING LABORATORIES

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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-11-04-22
Report Date: April 11, 2022
Date Received: March 30, 2022

TEST DATA

Boring No.	Sample No.	LL	PL	PI
[redacted]				
K-169.0-2.0	S-7	37	20	17
K-169.0-2.0	S-9	34	20	14

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-169.0-2.0	S-7	0.25	0	28.9
K-169.0-2.0	S-9	0.149	0	29.5

PREPARATION INFORMATION

Boring No.	Sample No.	Preparation	Method of Removing Oversized Material
[redacted]			
K-169.0-2.0	S-7	Air Dry	Not Necessary
K-169.0-2.0	S-9	Air Dry	Not Necessary

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-11-04-22
Report Date: April 11, 2022
Date Received: March 30, 2022

Sample: K-169.0-1.8, S-4 **Depth (ft):** 6-8

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

Type of Test	Soil Temperature (°C)	pH Readings			Average
Laboratory	23.0	7.91	7.90	7.89	7.90

pH of calibration standards used: 7.00

WATER-SOLUBLE SULFATE IN SOIL
ASTM C 1580

Sulfate by Mass of Sample (%)	Sulfate by Mass of Sample (mg/kg)
0.03	300

Reviewed By: Date: 04/11/22

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-11-04-22
Report Date: April 11, 2022
Date Received: March 30, 2022

Sample: K-169.0-1.8, S-5 **Depth (ft):** 8-10

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

Test Date: 04/05/22 Performed by: E. Hannon
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	6,600	8,514

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

Chloride by Mass of Soil (mg/kg)
20

Reviewed By: Date: 04/11/22

Kiewit

MEMORANDUM

DATE: January 26, 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 7 - Package 4B - HDD Crossing 64A – Revision 1
Champlain Hudson Power Express Project
Glenville, 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 Glenville, New York. The approximate station for the start of HDD crossing Number 64A is STA 45139+50 (42.8395° N, 73.9421° W).

The geotechnical data at this HDD crossing is attached. The available data is from the previous investigation by AECOM and data from a recent investigation by 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 4B, Glenville to Scotia, New York, dated June 15, 2022.

Contact us if you have questions or require additional information.

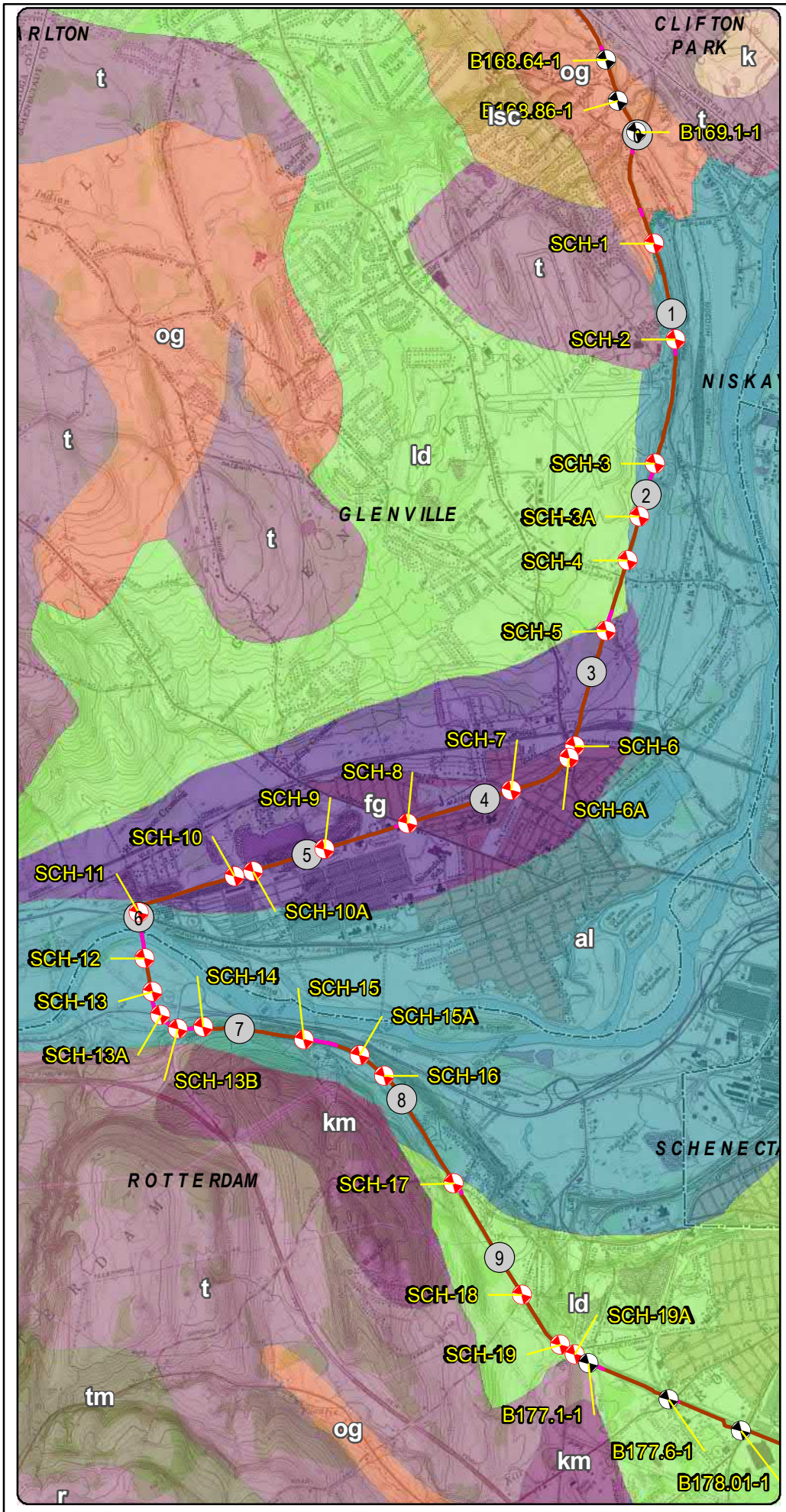
HDD 64A
Borings K-294.9-2.6, K-294.9-2.7, SCH-5
Segment 7 - Design Package 4B

CHPE Segment 7 Package 4B
Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B169.1-1	1469045.0	651801.8	236.7
AECOM**	SCH-1	1466449.8	649931.4	279.8
	SCH-2	1464095.5	648426.9	288.3
	SCH-3	1462008.4	645522.0	286.8
	SCH-3A	1461257.5	644144.0	287.3
	SCH-4	1460618.5	643021.4	285.4
	SCH-5	1459621.8	641171.4	279.3
	SCH-6	1457944.8	638238.9	241.7
	SCH-6A	1457817.7	637889.5	249.6
	SCH-7	1458325.7	636073.8	271.1
	SCH-8	1459763.1	633330.0	287.2
	SCH-9	1460902.6	631152.2	297.0
	SCH-10	1462154.8	628796.0	290.3
	SCH-10A	1461888.1	629265.0	291.0
	SCH-11	1463366.6	626127.1	289.2
	SCH-12	1462321.8	625339.2	227.3
	SCH-13	1461493.8	624804.4	229.1
	SCH-13A	1460855.7	624513.9	272.0
	SCH-13B	1460233.8	624596.1	295.4
	SCH-14	1459768.5	625134.5	281.3
	SCH-15	1457493.3	626917.2	338.6
	SCH-15A	1456046.5	627705.8	352.4
	SCH-16	1455146.0	627794.1	350.1
	SCH-17	1451579.9	627027.1	357.8
	SCH-18	1447982.8	626167.9	354.4
NYS DOT ***	DAB-6(2)	1460628.7	625081.5	248
	DH-24S	1460655.9	625133.7	237
	DH-25S	1460602.7	625066.5	236
	DH-26S	1460543.7	624985.5	235
	DH-27S	1460696.2	625101.3	236
	DH-28S	1460650.3	625027.7	235
	DH-29S	1460597.5	624949.4	234.5

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.
*** NYS DOT boring coordinates and elevations are approximated from drawing D257014 Sheet 170 "GENERAL SUBSURFACE PROFILE, STRUCTURE #3 - RAMP TWY OVER I-890"
**** 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
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

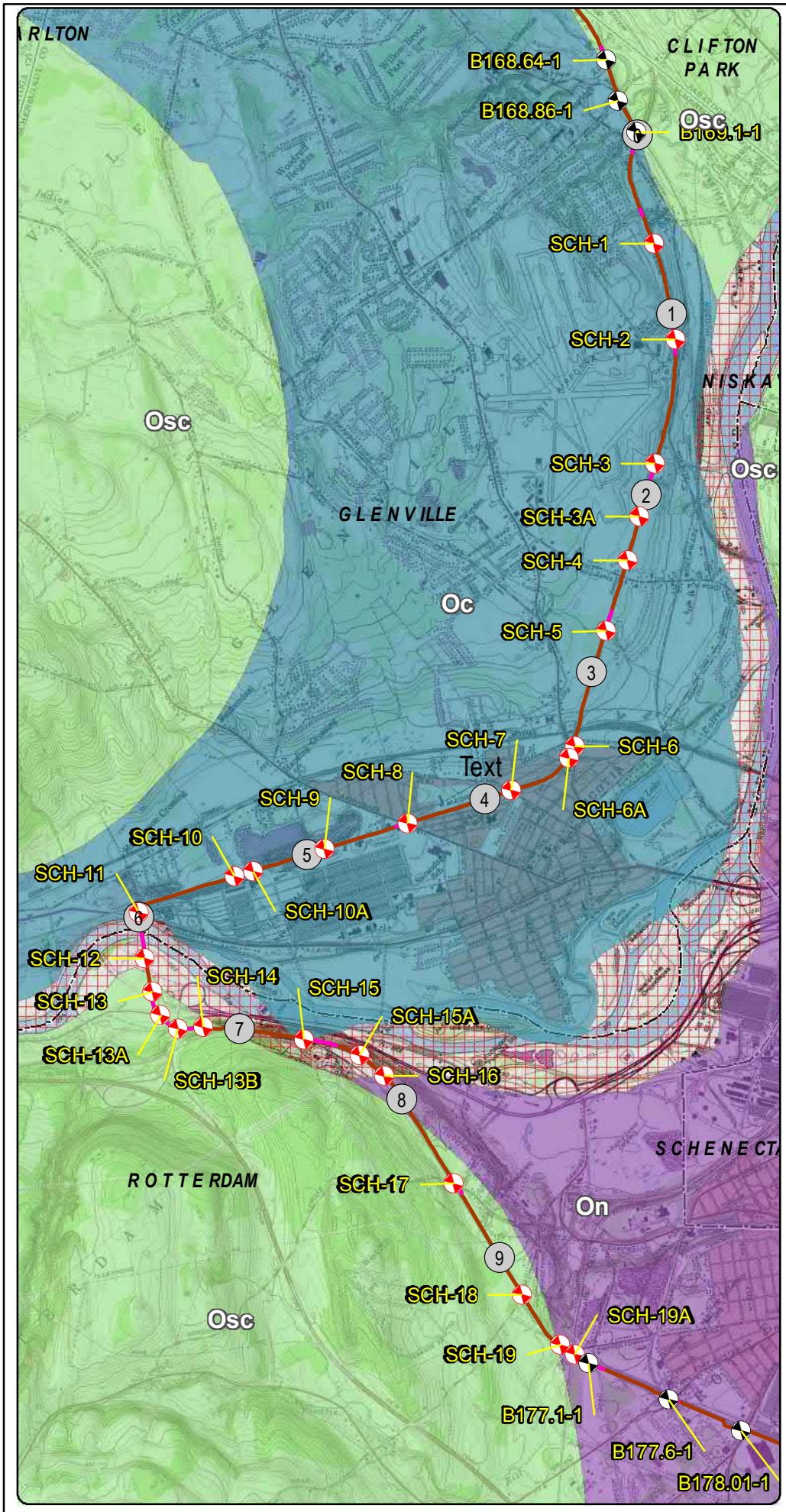
Surficial Geology and Geotechnical Borings Schenectady Preferred Alt Figure 3-7

Prepared on 4/27/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Surficial_Map_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

- No Label
- Oc - Canajoharie Shale
- On - Normanskill Shale
- Osc - Schenectady Formation

* Schenectady Formation includes: graywacke, sandstone, siltstone, shale

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Schenectady Preferred Alt Figure 4-7

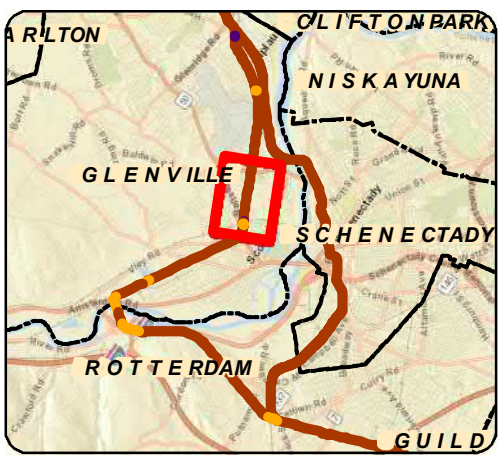
Prepared on 4/29/2021

by: AECOM

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

Y:\Projects\CHPE\IRoute\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Bedrock_Map_May_2021_Report.mxd

SCH-4
SCH-5
SCH-6
SCH-6A
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3
3.1
3.2
3.3
3.4
3.5
GLENVILLE
Freeman Bridge Rd
Dutch Meadows Ln
Ballston Rd
Ellsworth Ave
Spearhead Dr
Old Ballston Ave
Van Slyck Ave
Bancker Ave
Cullgan Dr
Amtrak
Cambridge Manor Dr
Washington Ave
Conrail
Knickerbocker Rd
Sunnyside Rd
Market St
Exchange St
Samowski Dr
Arrowhead Dr N
Arrowhead Dr S
Reserve Ct
0
1,000
Feet



LEGEND

- 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
- 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

Schenectady Preferred Alternative

Figure A-7

Sheet 3 of 8

Prepared by: AECOM 4/27/2021

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Mapset_May_2021_Report.mxd

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 2.
DRILLER: Matt Murtagh		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-5**
SOILS ENGINEER/GEOLOGIST: Mike Izdebski	**Boring Log**	START DATE: 3/17/2021
		FINISH DATE: 3/17/2021
LOCATION: Schenectady, NY MP 2.76		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: Geoprobe 7822DT
	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)	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							Brown fine to coarse SAND, some subrounded gravel, little silt, little cobbles, trace organics
1.0											SW		
2.0													2.0': Light brown clayey SILT, trace fine to coarse sand, trace organics
3.0											ML	Sandy SILT	
		3'-5'	S-1										TR-1; (3.0'-5.0')
4.0													
5.0													
		5'-7'	S-2	24"	21"	3	4	4	5	5	ML		Light Brown SILT, some fine sand, trace fine gravel, trace organics
6.0													
7.0													
		7'-9'	S-3	24"	9"	3	6	6	5	8	SP	SAND	Light brown fine to medium SAND, trace organics
8.0													
9.0													
		9'-11'	S-4	24"	24"	4	5	7	7	8	SP		Light brown, fine to medium SAND, little silt, trace organics
10.0													
													TR-2; (10.0'-10.5')
11.0													
		11'-'13'	S-5	24"	24"	7	12	9	8	14	SP		SAA
12.0													
												Till/Weathered SHALE	12.0': Gray SHALE fragments, some fine to coarse sand
13.0													
		13'-15'	S-6	12"	12"	10	50/5"						13.0': SAA, trace sand
14.0													
15.0													
		15'-17'	S-7	9"	9"	12	50/3"						Gray SHALE, highly fractured
16.0													
17.0													
		17'-22'	R-1	60"	55"	RQD: 42.5" = 71%						SHALE	Gray SHALE, thinly laminated, unweathered, @19.8' 45° fracture
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	AECOM	SHEET 2 OF 2
DRILLER: Matt Murtagh		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-5**
SOILS ENGINEER: Mike Izdebski		START DATE: 3/17/2021
	Boring Log	FINISH DATE: 3/17/2021
LOCATION: Schenectady, NY MP 2.76		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
										TR-3; (20.4'-20.85')
21.0										
22.0										
		22'-27'	R-2	60"	58"	RQD: 54" = 90%				SAA
23.0										
24.0										
25.0										
26.0										
27.0										
		27'-32'	R-3	60"	54	RQD: 50" = 83%				SAA, 45° fracture @ 27.3' and 30.55'
28.0									SHALE	
29.0										
30.0										TR-4; (29.5'-30.15')
31.0										
32.0										
		32'-37'	R-4	60"	62	RQD: 57.5" = 96%				SAA
33.0										
34.0										
35.0										
36.0										
37.0										Boring terminated at 36.75 fbg.
38.0										
39.0										
40.0										
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%

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Schenectady Bypass Segment**

AECOM

Boring No.	Depth (ft.)
SCH-3	35.0-40.0

Boring No.	Depth (ft.)
SCH-5	17.0-37.0

Boring Location Plans Page 6 of 9	Drawn by: ADW	Scale: Not to scale	Project No.: CD10279	Date: May 2022

Champlain Hudson Power Express
Design Package 4B
Glenville to Scotia, 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-01-05-22

Client: Kiewit Engineering (NY) Corp.

Boring Location: See Boring Location Plan

Project: Subsurface Investigation
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: 3/29/2022 Finish Date: 3/30/2022

Boring No.: K-169.0-2.6 Sheet 1 of 2

Coordinates
Northing 1460021
Easting 641876.07

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

Ground Elev.: 282.7

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

Groundwater Observations

Date	Time	Depth	Casing
3/29/2022	PM	*7.1'	20.0'
3/30/2022	AM	*6.5'	20.0'

*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	6 7 7 10		Greyish-Black cmf SAND; some cm GRAVEL; trace SILT (moist, non-plastic) SW	6
2		2	2.0	4.0	SS	8 6 7 6		Blackish-Brown cmf SAND; some cm GRAVEL; trace SILT (moist, non-plastic) SW	8
3							4.0		
4		3	4.0	6.0	SS	2 1 1 1		Grey mf SAND; little CLAY; trace f GRAVEL; trace SILT (moist, slightly plastic) SC	10
5							6.0		
6		4	6.0	8.0	SS	5 8 9 10		Grey cmf SAND; little mf GRAVEL; trace SILT (wet, non-plastic) SW	16
8		5	8.0	10.0	SS	4 5 7 8		Grey c-mf SAND; little f GRAVEL; trace SILT (wet, non-plastic) w = 16.1%, % Fines = 9.4% SP	21
14		6	14.0	16.0	SS	24 10 6 7		Similar Soil (wet, non-plastic) SP	4
17							17.0		
19		7	19.0	21.0	SS	3 3 5 7		Advanced casing to 20.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	17
21	WET ROTARY						22.0	Grey SILT; little f SAND; trace CLAY (wet, very slightly plastic) ML	
24		8	24.0	26.0	SS	4 3 2 2		Grey CLAY; some SILT; trace f SAND (moist, plastic) w = 26.7%,	16

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

Drillers: Jeffrey Donovan; Chase Bertrand

Inspector: James LaMarco (ATL)

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: K-169.0-2.6 Report No.: CD10279D-01-05-22 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)
								LL = 26, PL = 14, PI = 12, % Fines = 97.6% CL	
26									
27							27.0		
28		ST-1A	28.0	30.0	SS	6 10 15 19		(3" Brass Lined Split Spoon) Grey SILT; trace CLAY; trace f SAND (wet, very slightly plastic) ML	12
29									
30		ST-1B	30.0	32.0	SS	14 17 19 19		(3" Brass Lined Split Spoon) Similar Soil (wet, very slightly plastic) ML	23
31									
32		9	32.0	34.0	SS	7 9 14 19	32.0	(3" Brass Lined Split Spoon) Grey f SAND; some SILT (wet, non-plastic) w = 22.7%, LL = NP, PL = NP, PI = NP % Fines = 24.2% SM	20
33									
34									
35									
36							36.0		
37									
38		10	38.0	40.0	SS	7 8 8 10		Grey SILT; some CLAY; little mf+ SAND (wet, moderately plastic) ML	24
39									
40							40.0		
41								Boring terminated at 40.0 feet.	
42									
43								Notes:	
44								1. Borehole backfilled with cement-bentonite grout.	
45								2. Soil classifications based on ATL Field Engineer's field classifications.	
46								3. Borehole was advanced with ATL's Geoprobe 7822D7 (Rig Unit No. CDGV706) drill rig.	
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Report No.: CD10279D-01-05-22

Client: Kiewit Engineering (NY) Corp.

Boring Location: See Boring Location Plan

Project: Subsurface Investigation
Champlain Hudson Power Express, Design Package 4B
Various Locations, New York

Start Date: 3/28/2022 Finish Date: 3/29/2022

Boring No.: K-169.0-2.7 Sheet 1 of 2

Groundwater Observations

Date	Time	Depth	Casing
3/29/2022	AM	*5.9'	10.0'

Coordinates
Northing 1459794.22
Easting 641457.26

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

Ground Elev.: 280.6

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	5 6 7 4	2.0	Grey cmf SAND; and cmf GRAVEL; trace SILT (moist, non-plastic) FILL SW	10
2		2	2.0	4.0	SS	2 3 4 5	4.0	Brown mf SAND; trace CLAY; trace SILT (moist, very slightly plastic) SP	24
4		3	4.0	6.0	SS	4 5 6 6		Brown mf+ SAND; and SILT; trace CLAY (moist, very slightly plastic) SM	24
6		4	6.0	8.0	SS	9 6 6 8		Brown mf+ SAND; and SILT; trace CLAY (moist, very slightly plastic) w = 23.1%, % Fines = 53.0% SM	20
8		5	8.0	10.0	SS	4 5 5 6		Similar Soil (moist, very slightly plastic) SM	16
10	WET ROTARY						12.0	Advanced casing to 10.0 feet and began advancing 3 7/8" tri-cone roller bit wet rotary open hole within the borehole.	
14		6	14.0	16.0	SS	7 9 7 9	17.0	Grey mf SAND; trace SILT (wet, non-plastic) SP	6
19		7	19.0	21.0	SS	3 2 2 3		Grey CLAY; some SILT; trace f SAND (moist, plastic) w = 29.5%, LL = 36, PL = 19, PI = 17, % Fines = 98.7% CL	22
24		8	24.0	26.0	SS	4 4 6 7		Similar Soil (moist, plastic) CL	20

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

Drillers: Jeffrey Donovan; Chase Bertrand

Inspector: James LaMarco (ATL)

ATLANTIC TESTING LABORATORIES, Limited

Subsurface Investigation

Boring No.: K-169.0-2.7 Report No.: CD10279D-01-05-22 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)
28		ST-1	28.0	30.0	SS	4 5 9 10		(3" Brass Lined Split Spoon) Grey CLAY; some SILT; little mf SAND (moist, plastic) w = 39.3%, LL = 25, PL = 13, PI = 12, % Fines = 89.4% CL	20
32							32.0		
34		9	34.0	35.9	SS	25 37 39 50/5"		Grey cmf SAND; some mf GRAVEL; little SILT (moist, non-plastic) SW	23
38		10	38.0	39.3	SS	23 39 50/3"		Similar Soil (moist, non-plastic) SW	15
39							39.3		

Boring terminated at 39.3 feet.

Notes:
1. Borehole backfilled with cement-bentonite grout.
2. Soil classifications based on ATL Field Engineer's field classifications.
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

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-169.0-2.0	S-2	2.0-4.0	Brown cmf+ SAND; some mf GRAVEL; trace SILT	--	12.1	--	--	--	--	--	--	--	--	--	--	--
	S-4	6.0-8.0	Brown mf+ SAND; little SILT	13.0	24.5	--	--	--	--	--	--	--	--	--	--	--
	S-7	18.0-20.0	Grey SILT; little CLAY; trace f SAND	96.5	28.9	37	20	17	--	--	--	--	--	--	--	--
	S-9	22.0-24.0	Grey CLAY; some SILT; trace f SAND	97.9	29.5	34	20	14	--	--	--	--	--	--	--	--
K-169.0-2.6	S-5	8.0-10.0	Grey c-mf SAND; little f GRAVEL; trace SILT	9.4	16.1	--	--	--	--	--	--	--	--	--	--	--
	S-8	24.0-26.0	Grey CLAY; some SILT; trace f SAND	97.6	26.7	26	14	12	--	--	--	--	--	--	--	--
	S-9	32.0-34.0	Grey f SAND; some SILT	24.2	22.7	NP	NP	NP	--	--	--	--	--	--	--	--
K-169.0-2.7	S-4	6.0-8.0	Brown mf+ SAND; and SILT; trace CLAY	53.0	23.1	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0-21.0	Grey CLAY; some SILT; trace f SAND	98.7	29.5	36	19	17	--	--	--	--	--	--	--	--
	ST-1	28.0-30.0	Grey CLAY; some SILT; little mf SAND	89.4	39.3	25	13	12	--	--	--	--	--	--	--	--
K-169.0-4.4	S-3/4	4.0-8.0	Brown cmf SAND; trace f GRAVEL; trace SILT	--	--	--	--	--	--	300	20	8.6	139,320	--	--	--
	S-5	8.0-10.0	Greish-Brown c-m+f SAND; trace SILT; trace mf+ GRAVEL	9.4	5.4	--	--	--	--	--	--	--	--	--	--	--
	ST-1c	27.0-29.0	Brownish-Grey c-mf+ SAND; little SILT; trace m GRAVEL	17.0	15.8	--	--	--	--	--	--	--	--	--	--	--
K-169.0-4.5	S-3	4.0-6.0	Brown c-m+f SAND; little SILT; trace f GRAVEL	17.0	10.6	--	--	--	--	--	--	--	--	--	--	--
	S-7	19.0-21.0	Greyish-Brown c-mf+ SAND; little SILT; little mf+ GRAVEL	19.0	11.5	--	--	--	--	--	--	--	--	--	--	--
	S-8	29.0-31.0	Grey mf+ SAND; little SILT	12.0	17.7	--	--	--	--	--	--	--	--	--	--	--
K-169.0-6.0	S-6	13.0-15.0	Brown mf+ SAND; trace SILT	--	21.3	--	--	--	--	--	--	--	--	--	--	--
	S-9	28.0-30.0	Brown f SAND; little SILT	--	22.3	--	--	--	--	--	--	--	--	--	--	--
	S-11	38.0-40.0	Brown f SAND; trace SILT	--	26.0	--	--	--	--	--	--	--	--	--	--	--
	S-13	48.0-50.0	Brown f SAND; little SILT	--	24.0	--	--	--	--	--	--	--	--	--	--	--
	S-15	58.0-60.0	Brown f SAND; little SILT	--	23.8	--	--	--	--	--	--	--	--	--	--	--
	S-17	68.0-70.0	Brown f SAND; little SILT	--	27.8	--	--	--	--	--	--	--	--	--	--	--
K-169.0-6.1	S-4	6.0-8.0	Grey cmf GRAVEL; some cmf SAND; little CLAY	--	8.4	--	--	--	--	--	--	--	--	--	--	--
	S-10	33.0-35.0	Grey cmf+ SAND; trace SILT; trace f GRAVEL	--	25.1	--	--	--	--	--	--	--	--	--	--	--
	S-14	53.0-55.0	Grey f SAND; little SILT	--	22.3	--	--	--	--	--	--	--	--	--	--	--
	S-18	73.0-75.0	Grey cmf+ SAND; little SILT; trace mf GRAVEL	--	19.1	--	--	--	--	--	--	--	--	--	--	--

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-14-04-22
Report Date: April 29, 2022
Date Received: April 19, 2022

TEST DATA

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)
K-169.0-0.1A	S-4	6-8	10.4
	S-8	27-29	14.4
K-169.0-2.6	S-5	8-10	16.1
	S-8	24-26	26.7
	S-9	32-34	22.7
K-169.0-2.7	S-4	6-8	23.1
	S-7	19-21	29.5
	ST-1	28-30	39.3
K-169.0-4.4	S-5 [1]	8-10	5.4
	ST-1c [1]	27-29	15.8
K-169.0-4.5	S-3	4-6	10.6
	S-7 [1]	19-21	11.5
	S-8	29-31	17.7
K-169.0-6.4	S-4 [1]	6-8	6.2
	S-6 [1]	14-16	9.4
	ST-1c [1]	27-29	6.0
	S-10 [1]	39-41	22.0

Remarks

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

Reviewed By: _____ Date: 04/29/22

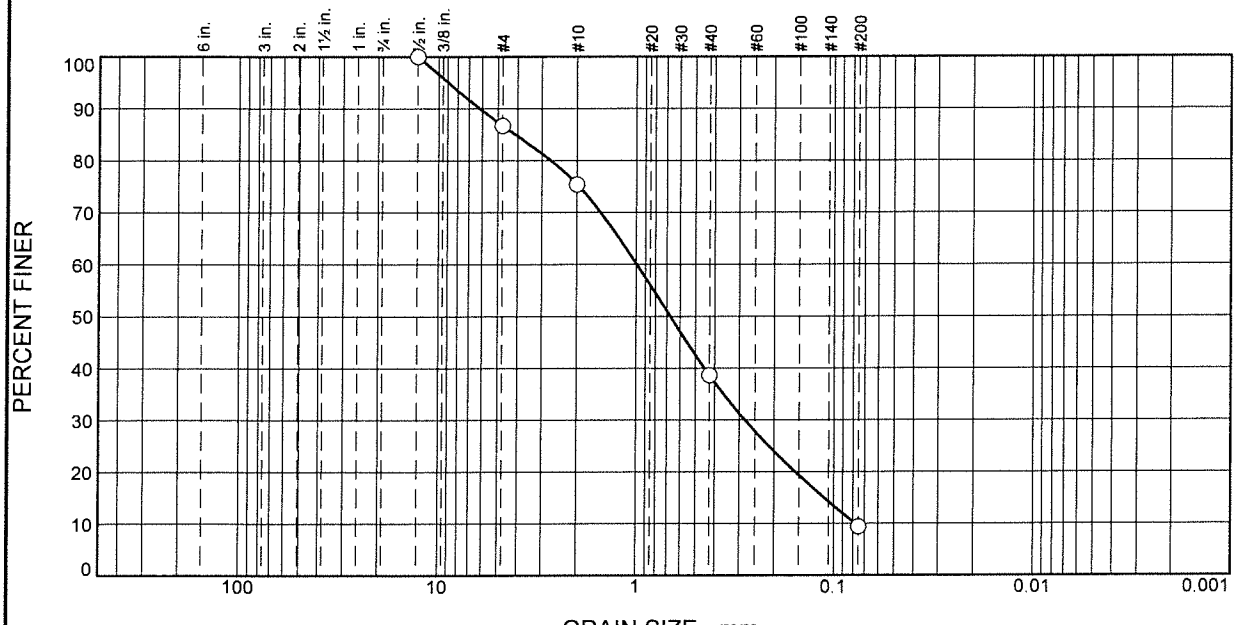
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-01-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/29/22

Sample No: K-169.0-2.6 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 8-10'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	13	12	36	30	9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
1/2"	100		
#4	87		
#10	75		
#40	39		
#200	9.4		

* (no specification provided)

Soil Description

Grey c-mf SAND; little f GRAVEL; trace SILT

Atterberg Limits

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

Coefficients

D_{85}= 4.1103 D_{60}= 0.9948 D_{50}= 0.6740
D_{30}= 0.2808 D_{15}= 0.1118 D_{10}= 0.0783
C_u= 12.71 C_c= 1.01

Classification

USCS= AASHTO=

Remarks

Moisture Content= 16.1%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: Date: 04/29/22

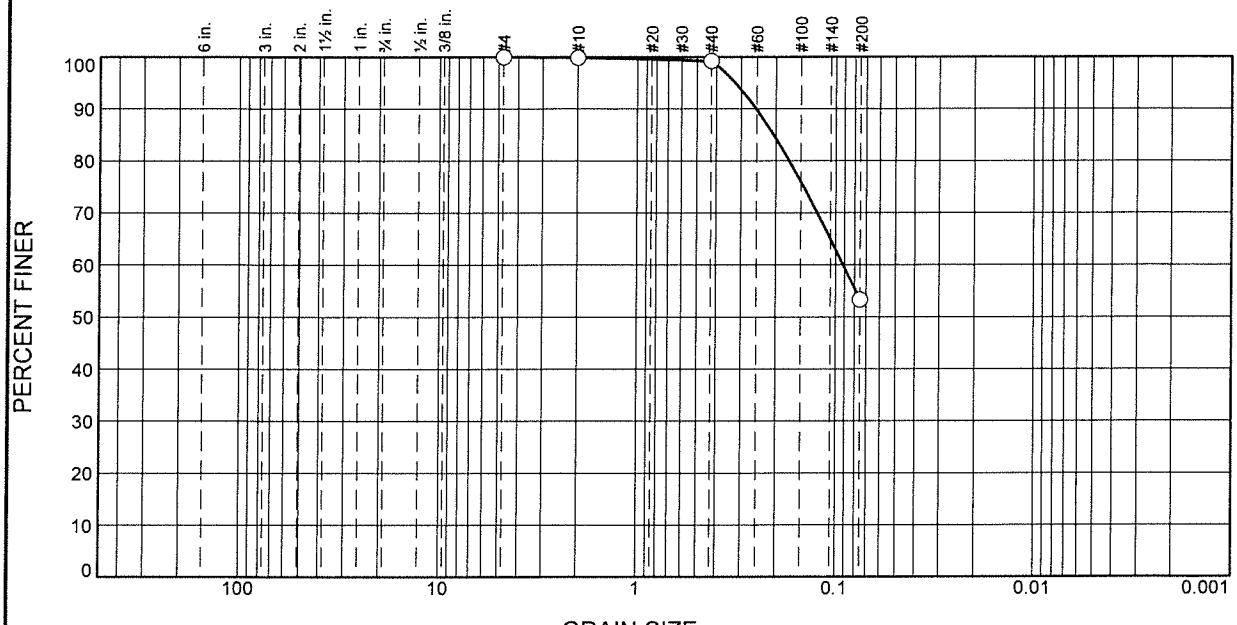
ATLANTIC TESTING LABORATORIES

Particle Size Distribution Report

Project: Champlain Hudson Power Express United Cable Install **Report No.:** CD10279E-14-04-22

Client: Kiewit Intrastructure Co. **Date:** 04/29/22

Sample No: K-169.0-2.7 **Source of Sample:** Boring Sample
Location: In-place **Elev./Depth:** 6-8'



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	1	46	53	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC. (X)
#4	100		
#10	100		
#40	99		
#200	53		

* (no specification provided)

Soil Description

Brown mf+ SAND; and SILT; trace CLAY

Atterberg Limits

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

Coefficients

D_{85}= 0.2060 D_{60}= 0.0915 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 23.1%

Figure

ATLANTIC TESTING LABORATORIES, LIMITED

Reviewed by: _____ Date: 04/29/22

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-14-04-22
Project:	Champlain Hudson Power Express	**Report Date:**	April 29, 2022
	United Cable Installation	**Test Date:**	April 19, 2022
	Various Locations, New York	**Performed By:**	E. Hannon

TEST DATA

Boring No.	Sample No.	Depth (ft)	Method (A or B)	Soak Time (min)	Initial Dry Weight (g)	% Finer than #200
K-169.0-2.6	S-8	24-26	A	10	77.67	97.6
K-169.0-2.6	S-9	32-34	A	10	110.87	24.2
K-169.0-2.7	S-7	19-21	A	10	64.37	98.7
K-169.0-2.7	ST-1	28-30	A	10	212.60	89.4

Reviewed By: _____ Date: 04/29/22

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-14-04-22
Report Date: April 29, 2022
Date Received: April 19, 2022

TEST DATA

Boring No.	Sample No.	LL	PL	PI
K-169.0-2.6	S-8	26	14	12
K-169.0-2.6	S-9	NP	NP	NP
K-169.0-2.7	S-7	36	19	17
K-169.0-2.7	ST-1	25	13	12

SAMPLE INFORMATION

Boring No.	Sample No.	Maximum Grain Size (mm)	Estimated Amount of Sample Retained on No. 40 Sieve (%)	As Received Moisture Content (%)
K-169.0-2.6	S-8	0.074	0	26.7
K-169.0-2.6	S-9	0.074	0	22.7
K-169.0-2.7	S-7	0.074	0	29.5
K-169.0-2.7	ST-1	2	5	39.3

PREPARATION INFORMATION

Boring No.	Sample No.	Preparation	Method of Removing Oversized Material
K-169.0-2.6	S-8	Air Dry	Not Necessary
K-169.0-2.6	S-9	Air Dry	Not Necessary
K-169.0-2.7	S-7	Air Dry	Not Necessary
K-169.0-2.7	ST-1	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: 04/29/22

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 7 - Package 4B - HDD Crossing 65A – Revision 1
Champlain Hudson Power Express Project
Scotia, 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 Scotia, New York. The approximate station for the start of HDD crossing number 65A is STA 45171+50 (42.8352°N, 73.9529°W).

The geotechnical data at this HDD crossing is attached. The available data is from the investigations by AECOM, Terracon, and Kiewit 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.
- Terracon, Field Exploration and Laboratory Testing Results, Champlain-Hudson Power Express – Additional HDD Borings – Phase 3, Fort Ann to Coxsackie, Schenectady, dated November 3, 2022.
- Kiewit Engineering (NY) Corp., Package 4B Phase 4 Borings Rev. 1, Champlain Hudson Power Express, New York, dated March 31, 2023.

Contact us if you have questions or require additional information.

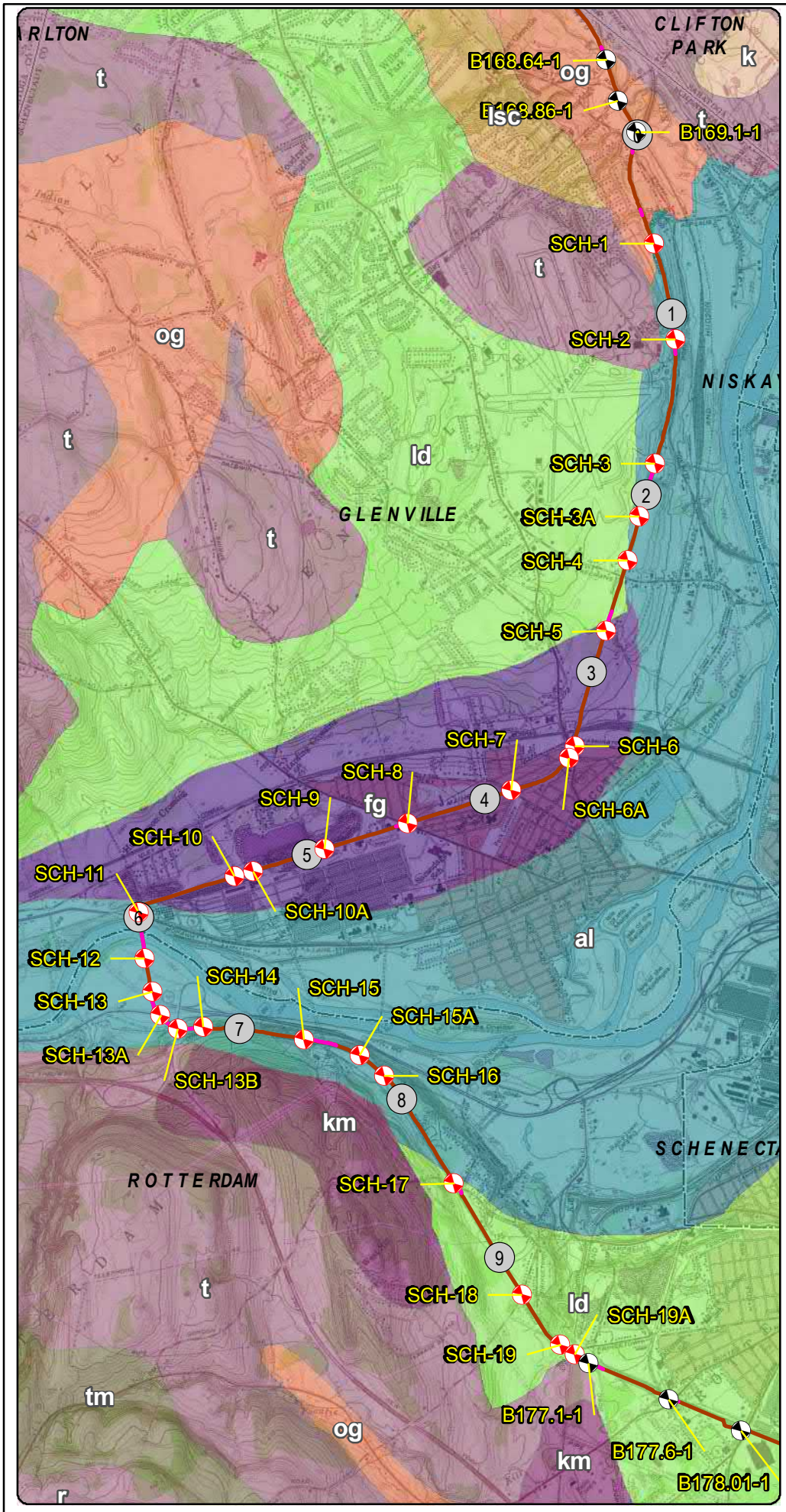
HDD 65A
Borings SCH-6, SCH-6A
KB-169.0-3.3, KB-169.0-3.6,
KB-169.0-3.7
Segment 7 - Design Package 4B

CHPE Segment 7 Package 4B
Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B169.1-1	1469045.0	651801.8	236.7
AECOM**	SCH-1	1466449.8	649931.4	279.8
	SCH-2	1464095.5	648426.9	288.3
	SCH-3	1462008.4	645522.0	286.8
	SCH-3A	1461257.5	644144.0	287.3
	SCH-4	1460618.5	643021.4	285.4
	SCH-5	1459621.8	641171.4	279.3
	SCH-6	1457944.8	638238.9	241.7
	SCH-6A	1457817.7	637889.5	249.6
	SCH-7	1458325.7	636073.8	271.1
	SCH-8	1459763.1	633330.0	287.2
	SCH-9	1460902.6	631152.2	297.0
	SCH-10	1462154.8	628796.0	290.3
	SCH-10A	1461888.1	629265.0	291.0
	SCH-11	1463366.6	626127.1	289.2
	SCH-12	1462321.8	625339.2	227.3
	SCH-13	1461493.8	624804.4	229.1
	SCH-13A	1460855.7	624513.9	272.0
	SCH-13B	1460233.8	624596.1	295.4
	SCH-14	1459768.5	625134.5	281.3
	SCH-15	1457493.3	626917.2	338.6
	SCH-15A	1456046.5	627705.8	352.4
	SCH-16	1455146.0	627794.1	350.1
	SCH-17	1451579.9	627027.1	357.8
	SCH-18	1447982.8	626167.9	354.4
NYS DOT ***	DAB-6(2)	1460628.7	625081.5	248
	DH-24S	1460655.9	625133.7	237
	DH-25S	1460602.7	625066.5	236
	DH-26S	1460543.7	624985.5	235
	DH-27S	1460696.2	625101.3	236
	DH-28S	1460650.3	625027.7	235
	DH-29S	1460597.5	624949.4	234.5

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.
*** NYS DOT boring coordinates and elevations are approximated from drawing D257014 Sheet 170 "GENERAL SUBSURFACE PROFILE, STRUCTURE #3 - RAMP TWY OVER I-890"
**** 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
- fg - Fluvial sand and/or gravel
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

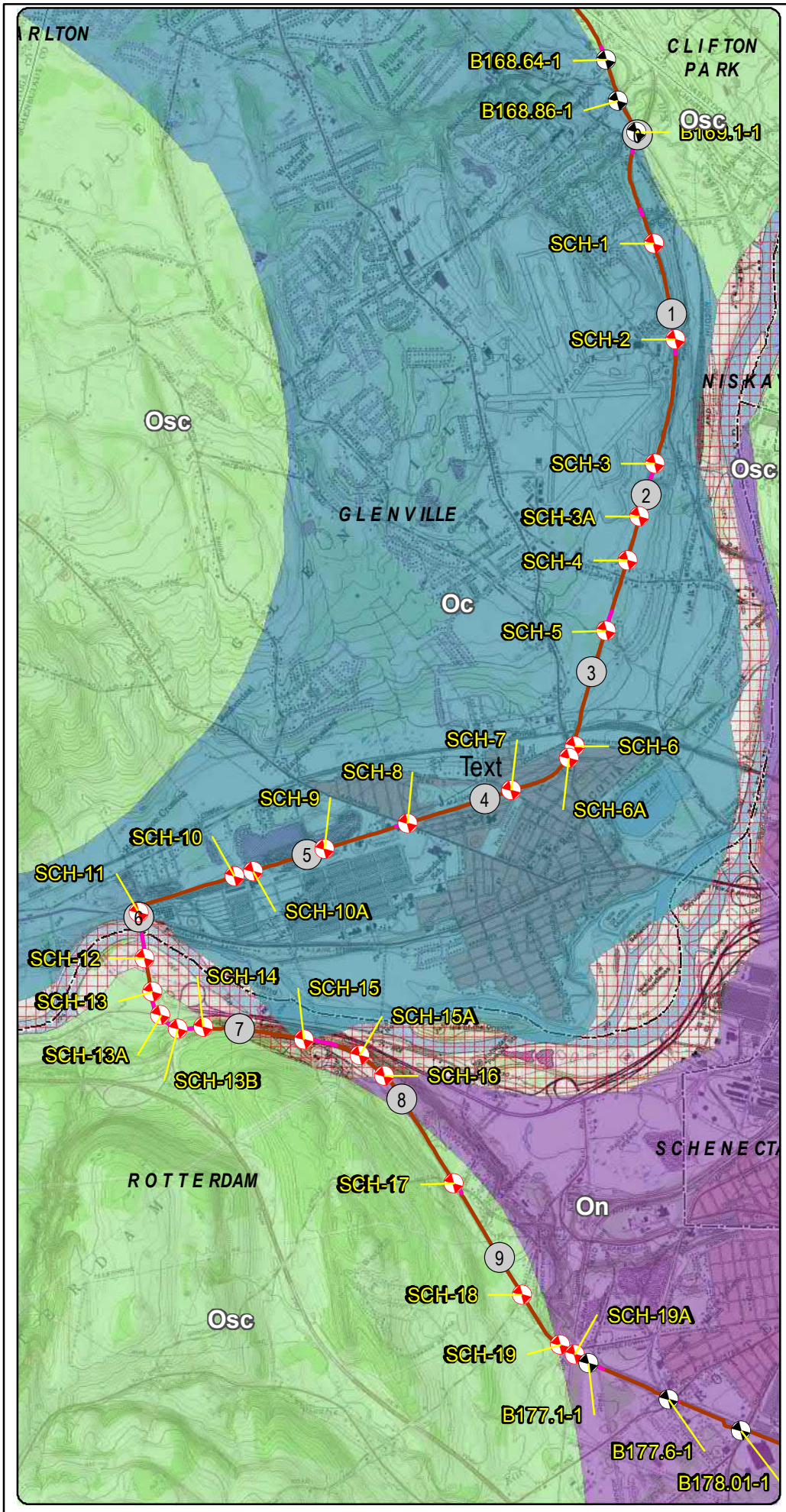
Surficial Geology and Geotechnical Borings Schenectady Preferred Alt Figure 3-7

Prepared on 4/27/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Surficial_Map_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

- No Label
- Oc - Canajoharie Shale
- On - Normanskill Shale
- Osc - Schenectady Formation

* Schenectady Formation includes: graywacke, sandstone, siltstone, shale

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Schenectady Preferred Alt Figure 4-7

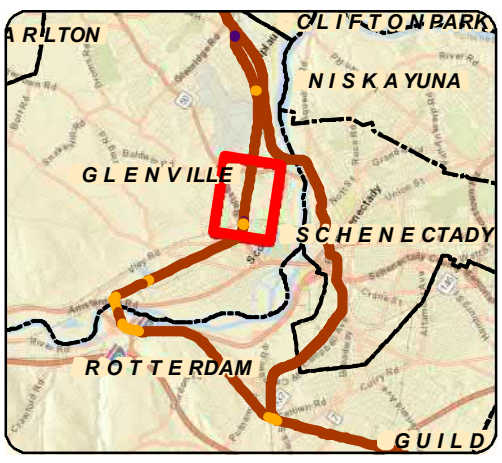
Prepared on 4/29/2021

by: AECOM

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

Y:\Projects\CHPE\IRoute\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Bedrock_Map_May_2021_Report.mxd

SCH-4
SCH-5
SCH-6
SCH-6A
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3
3.1
3.2
3.3
3.4
3.5
GLENVILLE
Freeman Bridge Rd
Dutch Meadows Ln
Ballston Rd
Ellsworth Ave
Spearhead Dr
Old Ballston Ave
Van Slyck Ave
Bancker Ave
Cullgan Dr
Amtrak
Cambridge Manor Dr
Washington Ave
Conrail
Knickerbocker Rd
Sunnyside Rd
Market St
Exchange St
Samowski Dr
Arrowhead Dr N
Arrowhead Dr S
Reserve Ct
0
1,000
Feet



LEGEND

- 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
- 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

Schenectady Preferred Alternative

Figure A-7

Sheet 3 of 8

Prepared by: AECOM 4/27/2021

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Mapset_May_2021_Report.mxd

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 2
DRILLER: Matt Murtaugh		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-6**
SOILS ENGINEER/GEOLOGIST: Mike Izdebski	**Boring Log**	START DATE: 03/10/2021
		FINISH DATE: 03/10/2021
LOCATION: Schenectady, NY MP 3.4		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: Geoprobe 7822DT
	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)	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 & GRAVEL	Brown fine to coarse SAND, some rounded medium to coarse gravel, trace claeyey silt, trace organics
1.0													
2.0													
3.0											GM		3.0': Gray rounded fine to medium GRAVEL and clayey silt, trace fine sand TR-1; (3.0'-5.0')
		3'-5'	S-1										
4.0											GP		4.0': Brown fine to medium rounded GRAVEL, little fine to coarse sand, little clayey silt
5.0													
		5'-7'	S-2	24"	3"	10	18	10	11	18	GM/SM		Brown fine to medium subrounded GRAVEL, some clayey silt, some fine to coarse sand
6.0													
7.0													
		7'-9'	S-3	24"	13"	14	10	9	8	12	GP		Brown fine to coarse subangular GRAVEL, little fine to coarse sand, trace clayey silt
8.0													
9.0													
		9'-11'	S-4	24"	2"	9	10	10	6	13	GP		Brown fine to coarse angular GRAVEL, some fine to coarse sand, trace cobble fragments
10.0													
11.0													
		11'-'13'	S-5	24"	18"	14	9	8	7	11	GP	Silty, Sandy Gravel (till)	Brown subangular fine to coarse GRAVEL, some fine to coarse sand, trace silt, moist (glacial till)
12.0													TR-2; (12.0'-12.5')
13.0													
		13'-15'	S-6	24"	17"	13	17	16	36	21	GP		SAA, moist
14.0													
15.0											GM/GP		14.5': Gray subangular GRAVEL, some silt, trace fine to coarse sand (glacial till)
		15'-17'	S-7	24"	15"	20	18	25	25	28	GM/GP		Gray - Brown angular fine to coarse gravel, some fine to coarse sand, some silt (glacial till)
16.0													
17.0													
		17'-19'	S-8	36"									No recovery
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	AECOM	SHEET 2 OF 2
DRILLER: Matt Murtaugh		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-6**
SOILS ENGINEER: Mike Izdebski		START DATE: 03/10/2021
	Boring Log	FINISH DATE: 03/10/2021
LOCATION: Schenectady, NY MP 3.4		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-9	1"		50/1"				No recovery
21.0										
22.0										
		22'-23'	R-1	12"	1.25"	RQD: 0" = 0%				Dark gray SHALE, thinly laminated, unweathered, moderately soft
23.0										
		23'-27'	R-2	48"	49.5"	RQD: 35.5" = 74%				SAA, very slightly fractured
24.0										TR-3; (23.15'-23.95')
25.0										
26.0										
27.0										
		27'-32'	R-3	60"	61"	RQD: 34.5" = 58%				SAA, vertical fractures at 28.1'-28.4' and 27.55'-27.85'
28.0										
29.0									SHALE	
30.0										TR-4; (30.8'-31.6')
31.0										
32.0										
		32'-37'	R-4	60"	60"	RQD: 49" = 82%				SAA, vertical fracture at 32.65'- 34.1' and 36.55'-37.01'
33.0										
34.0										
35.0										TR-5; (35.65'-36.55')
36.0										
37.0										
38.0										Boring terminated at 37 fbg
39.0										
40.0										
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	AECOM	SHEET 1 OF 2
DRILLER: Matt Murtaugh		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-6A**
SOILS ENGINEER/GEOLOGIST: Mike Izdebski	**Boring Log**	START DATE: 03/11/21
		FINISH DATE: 03/11/21
LOCATION: Schenectady, NY MP 3.48		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: Geoprobe 7822DT
	TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit		BORING TYPE: SPT
	SIZE I.D.	4"	2.5"	- -		BORING O.D.: 4.5"
	SIZE O.D.	4.5"	3"	3 7/8"		SURFACE ELEV.:
	HAMMER WT.	140 lbs	140 lbs			LONGITUDE:
	HAMMER FALL	30"	30"			LATITUDE:

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	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	Silty SAND	Brown SILT and fine to coarse sand, little fine to medium gravel, little organics, trace cobbles
1.0													1.0': Brown fine to coarse SAND, some silt, trace fine to medium gravel
2.0													
3.0													3.0': Light brown fine to medium SAND, some silt, trace fine to medium gravel
		3'-6'	S-1										TR-1; (3.0'-5.0')
4.0													
5.0													
6.0													
		6'-8'	S-2	24"	10"	11	9	11	10	13	SW	Gravelly SAND	Dark Brown fine to coarse SAND, some fine to medium gravel, some silt, trace organics
7.0													
8.0													
		8'-10'	S-3	24"	11"	13	9	7	7	10	SW		Brown fine to coarse SAND, some silt, some fine to medium gravel, trace organics
9.0													
10.0													
		10'-12'	S-4	24"	20"	8	9	8	17	11	SW		Brown fine to coarse SAND and fine to coarse gravel, little silt
11.0													11.5': SAA, white and red color intervals
12.0													
		12'-14'	S-5	24"	18"	32	22	24	18	30	SW		Brown fine to coarse SAND and fine gravel, little silt, trace organics, moist
13.0													
14.0													
		14'-16'	S-6	24"	12"	28	26	20	13	30	SM		Brown SILT, some fine to coarse sand, some subrounded fine to medium gravel, trace organics
15.0													
16.0													
		16'-18'	S-7	24"	4"	18	16	13	10	19	SW		Red/gray/brown fine to coarse SAND and fine gravel
17.0												Silty GRAVEL	16.5': Brown subrounded fine to coarse GRAVEL, some silt, little fine to coarse sand
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	AECOM	SHEET 2 OF 2
DRILLER: Matt Murtaugh		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-6A**
SOILS ENGINEER: Mike Izdebski		START DATE: 03/11/21
	Boring Log	FINISH DATE: 03/11/21
LOCATION: Schenectady, NY MP 3.48		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													
		21'-23'	S-8	24"	16"	7	14	16	11	30	GO		Red/gray fine to coarse GRAVEL, little fine to coarse sand
22.0													
23.0													TR-2; (22.5'-23.0')
24.0													
25.0													
26.0													
		26'-28'	S-9	24"	0"	7	6	5	5	7			No recovery
27.0												Sandy GRAVEL	
28.0													
29.0													
30.0													
31.0													
		31'-33'	S-10	24"	4"	26	35	29	50	42			Gray medium GRAVEL
32.0											GW		31.5': Gray/Brown fine to medium GRAVEL, some fine to coarse sand
33.0													32': Gray cobble fragment
34.0													
35.0													
36.0		36'-38'	S-11	11"	7"	50/5"						SHALE	Gray angular SHALE fragments, little fine to coarse sand, little fine gravel
37.0													SCH-6A terminated at 36.5 fbg
38.0													
39.0													
40.0													
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%

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Schenectady Bypass Segment**

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

Boring No.	Depth (ft.)
SCH-6	22.0-37.0

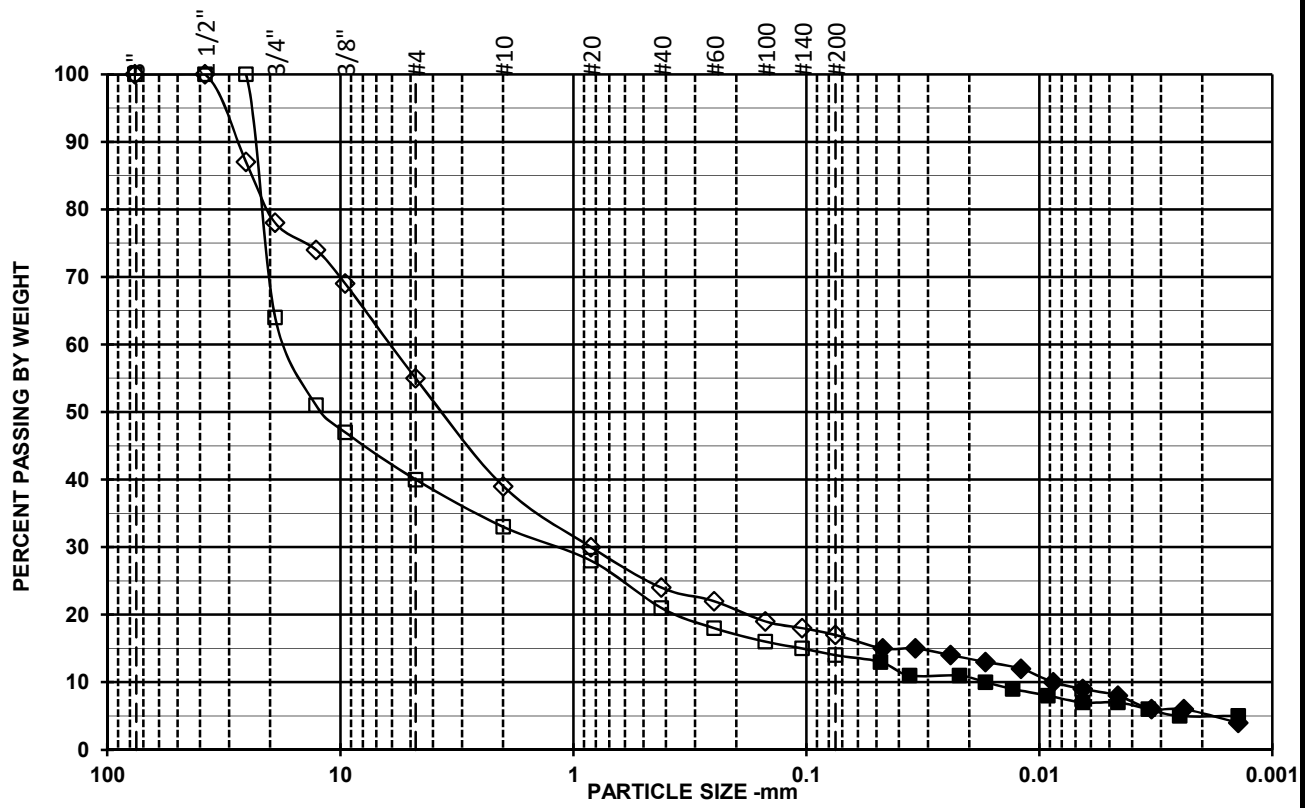
Boring No.	Depth (ft.)
SCH-14	6.0-26.0

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

Aquifer
CHPE - Schenectady Bypass 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 (%)	ORGANIC CONTENT (burnoff) (%)	
SCH-3	S-4	9-11	12.1				SC	19	6		
SCH-3	S-6	13-15	15.8				SM	19	6		
SCH-3	S-10	30-32	6.0				SM	32	10		
SCH-3A	S-3	7-9	22.9				SP-SM	12	3		
SCH-3A	S-7	15-17	15.2				SP-SM	12	4		
SCH-3A	S-9	25-27	26.3				CL	99.1	40		
SCH-6	S-3	7-9	8.8	36	21	15	GC	14	5		
SCH-6	S-7	15-17	10.4				GC	17	5		
SCH-7	S-2	5-7	21.6	25	19	6	CL-ML	79.3	16		
SCH-7	S-4	9-11	13.9				SM	39	7		
SCH-10A	S-3	7-9	6.3				GP-GM	8	2		
SCH-10A	S-6	15-17	4.6				GW-GM	8	2		
SCH-10A	S-10	30-32	4.0				GP-GM	5			
SCH-11	S-3	7-9	9.6				SC	21	6		
SCH-11	S-16	60-62	5.6				SW-SM	12	3		
SCH-11	S-20	80-82	19.3				SM	17.5	3		
SCH-11	S-25	105-107	21.1				SM	24.3	3		
SCH-12	S-3	7-9	28.5	33	19	14	CL	85	18		
SCH-12	S-9	25-27	23.3				SM	19.8	3		
SCH-12	S-14	50-52	18.3				SM	15	3		
SCH-12	S-19	75-77	7.6	18	11	7	SC-SM	41	14		
SCH-12	S-25	105-107	7.6	19	11	8	SC	41	14		
SCH-13	S-3	7-9	7.0				GP-GM	6	2		
SCH-13	S-6	13-15	0.3				GW	2	1		
SCH-13	S-11	35-37	20.9				SM	18.4	3		
SCH-13B	S-2	5-7	12.8				GC	19	6		
SCH-13B	S-3	7-9	11.3				GC	22	6		
SCH-17	S-2	5-7	9.1				GM	28	5		
SCH-17	S-4	9-11	8.5				GP-GM	10	3		
SCH-19	S-2	5-7	10.7				SM	19	5		
SCH-19	S-7	15-17	7.8				GP-GM	11	3		
SCH-19	S-10	30-32	13.9	22	12	10	SC	28	11		

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
□	8.8	36	21	15	GC		Brown, Clayey gravel with sand, Insufficient sample size	04/28/21
◇	10.4				GC		Brown, Clayey gravel with sand, Insufficient sample size	04/28/21
○								

Symbol	□	◇	○
Boring	SCH-6	SCH-6	
Sample	S-3	S-7	
Depth	7-9	15-17	
% +3"	0	0	
% Gravel	60	45	
% SAND	26	38	
%C SAND	7	16	
%M SAND	12	15	
%F SAND	7	7	
% FINES	14	17	
D_{100} (mm)	25.4	38.1	
D_{60} (mm)	16.8	6.09	
D_{30} (mm)	1.2	0.84	
D_{10} (mm)	0.017	0.009	
Cc	5	13.3	
Cu	988.2	700	

Sieve Size/ID #	Percent Finer Data		
6"	100	100	
4"	100	100	
3"	100	100	
1 1/2"	100	100	
1"	100	87	
3/4"	64	78	
1/2"	51	74	
3/8"	47	69	
#4	40	55	
#10	33	39	
#20	28	30	
#40	21	24	
#60	18	22	
#100	16	19	
#140	15	18	
#200	14	17	
5μ m	7	8	
2μ m	5	5	
1μ m	5	3	

Aquifer

TerraSense, LLC #7853-21006

CHPE - Schenectady Bypass Borings

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

Aquifer
CHPE - Schenectady Bypass 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 (-)	POINT LOAD TEST (ASTM D5731) STRENGTH INDEX Is(50) (MPa)	ESTIMATED (4) COMPRESSIVE STRENGTH (psi)	UNCONFINED COMPRESSION TESTS (ASTM D7012) COMPRESSIVE STRENGTH (psi)	AXIAL STRAIN @ FAILURE (%)	ESTIMATED (5) ELASTIC MODULUS (psi)	
SCH-2	R-2	10.7-11.1	1.2	170	167	UC				11960	0.55	2E+06	
SCH-2	R-2	11.3-11.6				M	3						
SCH-2	R-5	25.3-25.7				M	4						
SCH-2	R-5	28.5-26.2	2.7	79.6	77.5	UC				12670	0.64	2E+06	
SCH-6	R-2	24.0-24.2	1.10			PL		0.4	1375				
SCH-6	R-2	24.0-24.2				PL		3.3	9964				
SCH-6	R-2	24.6				M	3						
SCH-14	R-2	15.2				M	3						
SCH-14	R-3	17.8				M	4						
SCH-14	R-3	17.95-18.35	1.2	168	166	UC				8570	0.45	2E+06	
SCH-14	R-5	30.4				M	3-4						
SCH-14	R-5	30.4-30.55	1.10			PL		0.3	917				
SCH-14	R-5	30.4-30.55				PL		2.2	5910				

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

Load Orientation:	Diametral	Axial
Length to nearest free end, L (mm)	25.1	24.6
Specimen Width, W1 (mm)		50.2
Specimen Width, W2 (mm)		50.2
D (mm)	49.0	26.0
D' (mm)	49.0	24.0
D_e (mm)	49.0	39.2
Failure Load, P (lb)	207	1261
Point Load (N)	921	5609
Point Load (Mpa)	**0.38**	**3.28**
Index, Is50 (psi)	**60**	**480**
Unconfined Compressive Strength (psi)	**1375**	**9964**
Specimen /Failure Sketch		
Tare No.	M-18	
Wet + Tare (gm)	193.34	
Dry + Tare (gm)	191.78	
Tare (gm)	49.57	
Water Content%	**1.10**	
Comments		

Test by: MT Test Date: 4/13/2021 Reviewed by: GET

CHPE - Schenectady Bypass Borings		**POINT LOAD STRENGTH INDEX OF ROCK ASTM D5731**
Aquifer	602201207	**Boring: SCH-6 Run: R-2**
TerraSense, LLC	7853-21006	**Depth: 24.0-24.2**

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. KB-169.0-3.3

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: 42.834916° Longitude: -73.953574°

Surface Elev.: 266.2316 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.2	266	**TOPSOIL**
		FILL - POORLY GRADED SAND, cinders noted, gray
3.5	262.7	
		FILL - SILTY SAND WITH GRAVEL, cinders noted, brown and black
8.0	258.2	
		FILL - SILTY SAND, trace gravel, brown
		Similar with asphalt noted
20.0	246.2	
		SILTY GRAVEL WITH SAND (GM), occasional shale fragments and boulders, brown, loose to medium dense

DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	12	2-1-1-2 N=2			
	13	6-5-11-11 N=16			
5	16	16-12-6-4 N=18			
	1	6-9-16-24 N=25	12.0		53
	24	10-8-8-7 N=16			
10	10	6-9-12-9 N=21			
15	24	5-6-5-3 N=11			
20	10	4-2-3-4 N=5			
25	13	8-6-11-9 N=17	11.5		15

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 AB
Hammer Efficiency Summary:
Energy Transfer Ratio: 78.6% +/-2.9%
Hammer Efficiency Correction (CE): 1.31

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-17-2022
Boring Completed: 08-17-2022
Drill Rig: Diedrich D-50
Driller: C. Johnston
Project No.: JB215256G

BORING LOG NO. KB-169.0-3.3

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: 42.834916° Longitude: -73.953574°

Surface Elev.: 266.2316 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY GRAVEL WITH SAND (GM), occasional shale fragments and boulders, brown, loose to medium dense *(continued)*							
30.0	236.2	**SILTY SAND (SM)**, occasional cobbles and boulders, gray, very dense, (GLACIAL TILL)	30						
					12	19-41-30-39 N=71			
			35		16	21-27-37-38 N=64	8.4		32
40.0	226.2	**SHALE**, slightly weathered, close to moderate fractured, good RQD, gray	40			REC = 100% RQD = 78%			
45.0	221.2	**SHALE**, slightly weathered, close to moderate fractured, fair RQD, gray	45			REC = 100% RQD = 60%			
50.0	216.2	**SHALE**, slightly weathered, close to wide fractured, good RQD, gray	50			REC = 100% RQD = 85%			
55.0	211.2		55						

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 AB
Hammer Efficiency Summary:
Energy Transfer Ratio: 78.6% +/-2.9%
Hammer Efficiency Correction (CE): 1.31

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-17-2022 | Boring Completed: 08-17-2022
Drill Rig: Diedrich D-50 | Driller: C. Johnston
Project No.: JB215256G

BORING LOG NO. KB-169.0-3.3

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: 42.834916° Longitude: -73.953574°

Surface Elev.: 266.2316 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS		WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SHALE, slightly weathered, close to wide fractured, good RQD, gray *(continued)*						REC = 100% RQD = 81%				
	60.0	206.2	60								
	Boring Terminated at 60 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 AB
Hammer Efficiency Summary:
Energy Transfer Ratio: 78.6% +/-2.9%
Hammer Efficiency Correction (CE): 1.31

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-17-2022	Boring Completed: 08-17-2022
Drill Rig: Diedrich D-50	Driller: C. Johnston
Project No.: JB215256G	

Summary of Laboratory Results

BORING ID	Depth (Ft.)	Water Content (%)	Organic Content (%)
KB-115.5	2-4	13.4	3.4
KB-115.5	15-17	70.8	
KB-117.6-1.6D	3-5	4.0	
KB-117.6-1.6D	20-22	22.7	
KB-117.6-1.6D	35-37	26.2	
KB-117.6-1.6D	49-51	15.3	
KB-122.9	4-6	23.1	
KB-122.9	15-17	18.6	
KB-122.9	25-27	77.9	
KB-122.9	45-47	74.8	
KB-123.0	2-4	10.9	
KB-123.0	20-22	68.3	
KB-123.0	35-37	51.0	
KB-123.0	50-52	45.9	
KB-123.0	65-67	34.5	
KB-132.1A	4-6	27.5	
KB-132.1A	15-17	38.1	
KB-132.1A	30-32	34.0	
KB-132.3A	4-6	12.1	
KB-132.3A	15-17	45.2	
KB-132.3A	30-32	37.2	
KB-132.5A	4-6	17.4	
KB-132.5A	30-32	38.8	
KB-132.5A	45-47	38.2	
KB-135.7	2-4	36.6	
KB-135.7	15-17	41.9	
KB-135.7	30-32	34.8	
KB-135.8	2-4	5.6	
KB-135.8	15-17	42.7	
KB-135.8	30-32	36.8	
KB-135.8	40-42	28.3	
KB-160.6	2-4	12.2	
KB-163.1	4-6	11.7	
KB-163.2	8-10	12.1	
KB-169.0-3.3	6-8	12.0	
KB-169.0-3.3	25-27	11.5	
KB-169.0-3.3	35-37	8.4	
KB-177.1	10-12	8.9	
KB-177.1	25-27	11.5	
KB-177.1	40-42	11.2	
KB-177.1	50-52	5.7	
KB-182.7B	6-8	31.5	

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

SITE: Fort Ann to Coxsackie, NY

30 Corporate Cir Ste 201
Albany, NY

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