Champlain Hudson Power Express

HDD Design Summary Report
Crossings HDD 91 to HDD 111.A
in Segment 10 – Package 6

Selkirk to Catskill
Greene & Albany County, New York

KUE Project Number: P-22014TK

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1.0 INTRODUCTION

1.1 PURPOSE

The Champlain Hudson Power Express (CHPE) project consists of installing a pair of HVDC electrical transmission cables with an associated telecommunications line from Canada to New York City. The portion of the work addressed herein is located in the upland portion of the route from the south end of Lake Champlain to New York City along the uplands of the Hudson River Valley. This work includes approximately 126 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 10 - Package 6 from Selkirk Rail Yard Bypass to Catskill. These crossings are designated HDD 91 through HDD 111.A.

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

- Review of the existing geological, hydrogeological, and geotechnical conditions for HDD 91 through HDD 111.A for total of 50 crossings (2 per site) in Segment 10 – Package 6.
- Provide a descriptive narrative of the HDD Crossings in support of the attached design drawings and technical specifications.
- Present stress and inadvertent release analyses that support the proposed designs.
- Evaluate construction considerations including inadvertent return mitigation.

2.0 PROJECT DESCRIPTION

The proposed CHPE route follows the Hudson River Valley of New York. The new transmission line will be approximately 339 miles in length, extending from the south end of Lake Champlain to Astoria, NY. Segment 10 - Package 6 is located in approximately a 20.8-mile section of the route in Albany and Greene County, New York.

A Project Locus Map and a plan showing the locations of the HDD 91 through HD 111.A crossings are presented in Appendix A.

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

Table 1: HDD Locations, Lengths, and Description

HDD #	Approximate Start Station	Approximate End Station	HDD Length[1] (feet)	Obstruction Crossed
91 C1[2]	60009+50	60015+20	551	US Route 9W
91 C2[2]	60009+22	60014+73		
91.A C1&C2	60042+30	60058+40	1610	Old Ravena Road
92 & 92.A C1&C2	60099+30	60120+20	2092	Stream S-14, S-12, S-11 (Coeymans Creek), S-10, and Old Ravena Road
93 C1&C2	60154+74	60171+42	1667 1666	Wetlands and Lafarge Private (Road and Structure)
93.A C1&C2	60172+32	60179+76	744	Unnamed Stream and Stream S-14
94 C1&C2	61244+00	61255+75	1165 1176	CSX Railroad and Main Street
95 C1	61283+42	61295+83	1241	Stream S-19 and Stream S-20
95 C2	61283+28	61295+86	1258	
96.XX C1&C2	61331+63	61352+88	2111 2125	Stream S-21, Stream S-22 and New Baltimore Road
96.A & 96.B C1&C2	61375+24	61390+23	1401 1499	Stream S-23 (Hannacrois Creek) and CSX Railroad
97 C1	61414+31	61418+76	445	CSX Railroad and State Route 144
97 C2	61413+70	61418+33	463	
97.A C1&C2	62428+12	62445+62	1700 1750	Stream S-25, Stream G-S-37 and Stream S-24
98 C1	62468+61	62477+44	883	Stream S-27A
98 C2	62467+85	62477+08	923	
99 C1	62480+69	62496+78	1609	Stream and CSX Railroad
99 C2	62480+69	62496+63	1594	
99.A C1	62503+05	62530+27	2722	Stream S-28, S-29, S-30 and New York Thruway
99.A C2	62503+05	62530+30	2725	
101 C1&C2	62535+26	62546+51	1125	Culvert and Wetlands
101.A C1&C2	62575+61	62582+55	694	Ravine and Stream S-33 (Unmapped)
102 C1&C2	62595+55	62619+96	2441	Stream S-34 and Coxsackie Creek
103&104 C1	62667+22	62687+16	1994	CSX Railroad and New York State Route 385
103&104 C2	62666+78	62686+19	1941	
105 C1	62693+53	62698+85	532	CSX Railroad
105 C2	62693+85	62698+87	502	
107.A C1	62744+94	62753+13	819	CSX Railroad
107.A C2	62744+48	62752+67		
108 C1&C2	63812+20	63837+65	2554 2545	Flats Road and Murderers Creek
109 C1&C2	63917+18	63922+74	556	Wetlands
110 C1&C2	63934+73	63946+29	1156	Wetlands
111 C1&C2	63952+89	63964+15	1126	Schoharie Turnpike and CSX Railroad
111.A C1&C2	64085+07	64106+88	2181	Stream EA-S-AR (Corlaer Kill)

Notes: 1. Lengths are in 2D and do not account for horizontal or vertical bends in HDD.
2. C1 & C2 refer to Conduit 1 and Conduit 2.

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 casings spaced at varying intervals based on the thermal resistivity of soil. A third, 2-inch-diameter DR 9 casing will be bundled with one of the 10-inch diameter casings for a telecommunications line. The casings are to be installed in 16 to 20-inch final ream diameter bore holes. The proposal is to install the cables at least 25 feet below congested areas, roads, railroads, under/around other obstructions, 15 to 25 feet below wetland, and 35 to 45 feet below open bodies of water using HDD methods. HDD is a widely used trenchless construction method to install conduits with limited disturbance to the ground around the bore alignment, minimal ground surface impacts above the alignment, and to minimize the potential of inadvertent releases of drilling fluids while boring. The goal for using HDD methods is to install the conduits while controlling and minimizing the amount of impact 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 #91

HDD #91 consists of two bores that are approximately 551 feet long and are located 37.9 to 40.0 feet below US Route 9W. The HDD entry pits are at El. 172 and EL. 175, with US Route 9W at approximately El. 194, HDD exit pits are at approximately at El. 172 and El. 173 (reference datum NAVD 1988).

HDD #91.A

HDD #91.A consists of two bores with horizontal curves that are approximately 1611 feet long. The HDD bores will pass approximately 23.5 to 25.0 feet below the Old Ravena Road centerline. The ground surface elevations along the path of HDD #91.A ranges from approximately El. 158 at the northeast end of the bore alignment, to approximately El. 163 at the centerline of Old Ravena Road. The HDD entry will be at El. 162 and the exit point will be El. 154 (reference datum NAVD 1988).

HDD #92&92.A

HDD #92 and 92.A consists of two HDD bores approximately 2092 feet long, located under Stream S-14, S-12, S-11 (Coeymans Creek), S-10, and Old Ravena Road. The HDD 92&92.A entry lies in a floodplain at El. 76 and the exit point will be at El. 154 (reference datum NAVD 1988).

HDD #93

HDD #93 consists of two HDD bores located under wetlands and a private road and aggregate structure on Lafarge property. The bores are both approximately 1667 feet long as shown in Appendix B. The HDD bores will pass approximately 17 feet below the wetlands and 27 feet beneath the private road and Lafarge trestle conveyor belt structure. The ground surface elevations along the path of HDD #93 gently undulates ranges from approximately El. 162 at the north end of the bore alignment, to approximately Elevation 161 at the centerline of HDD bore, to El. 171 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #93.A

HDD #93.A consists of two HDD bores located under stream S-15. The bores are approximately 744 feet long as shown in Appendix B. The HDD bores will pass approximately 25 feet beneath the assumed mudline. The ground surface elevations along the path of HDD #93.A ranges from approximately El. 166 at the north end of the bore alignment, to approximately Elevation 152 at the centerline of HDD bore, to El. 173 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #94

HDD #94 consists of two HDD bores with horizontal curves located under Main Street and CSX Railroad tracks. The bores are approximately 1165 and 1176 feet. The ground surface elevations along the bore ranges from approximately El. 178 at the west end to approximately Elevation 186 at the centerline of the Main Street, to El. 172 at the east end of the bore alignment (reference datum NAVD 1988).

HDD #95

HDD #95 consists of two HDD bores with horizontal curves approximately 1241 and 1258 feet long. The ground surface elevation hovers between El. 190 to El. 198 for the majority of the bore path aside from where the assumed water level is approximately El. 168 (reference datum NAVD 1988).

HDD #96.XX

HDD #96.XX consists of two HDD bores with horizontal curves approximately 2111 and 2125 feet long. The bores cross underneath stream S-21, S-22 and New Baltimore Road. The HDD entry will be at El. 179 and the exit point will be El. 202 with New Baltimore Road at El. 242. (reference datum NAVD 1988).

HDD #96.A&96.B

HDD #96.A & 96.B consists of two HDD bores with horizontal curves located underneath Hannacrois Creek and CSX Railroad tracks. The bores are approximately 1401 and 1499 feet long. The HDD bores

will pass approximately 16 feet below the creek and 40 feet below the railroad tracks. The ground surface elevations along the path of HDD #96.A and 96.B ranges from approximately El. 140 at the north end of the bore alignment, to approximately Elevation 178 at the center, to El. 187 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #97

HDD #97 consists of two HDD bores located underneath State Route 44 and CSX Railroad tracks. The bores are approximately 445 and 463 feet long. The HDD bores will pass approximately 23 feet below the road and railroad tracks. The ground surface elevations along the path of HDD #97 ranges from approximately El. 186 at the north end of the bore alignment, to approximately Elevation 192 at the centerline, to El. 183 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #97.A

HDD #97.A consists of two HDD bores located underneath Stream S-25 and a ravine. The bores are both approximately 1700 feet long and contain a horizontal curve along the bottom tangent section. The ground surface elevations along the path of HDD #97.A ranges from approximately El. 178 at the north end of the bore alignment, to El. 133 at the ravine, El. 150 at Stream S-25, to El. 169 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #98

HDD #98 consists of two HDD bores located underneath Stream S-27 and a culvert. The bores are approximately 883 and 923 feet long. The ground surface elevations along the path of HDD #98 ranges from approximately El. 160 at the north end of the bore alignment, to El. 124 at Stream S-28, to El. 160 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #99

HDD #99 consists of two HDD bores located underneath CSX Railroad tracks, an existing 36-inch timberbox. The bores are approximately 1609 and 1594 feet long. The HDD bores will pass approximately 58 feet below the railroad tracks. The ground surface elevation along the path of HDD #99 ranges from approximately El. 157 at the north, to El. 160 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #99.A

HDD #99.A consists of two HDD bores with horizontal curves located underneath the New York Thruway. The bores are approximately 2722 and 2725 feet long. The ground surface elevations along the

path of HDD #99.A ranges from approximately El. 146 at the north, to El. 182 at the New York State Thruway to El. 159 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #101

HDD #101 consists of two HDD bores located underneath a culvert and wetlands. The bores are both approximately 1125 feet long. The HDD entry will be at El. 146 and the exit point will be El. 148 with the ravine at El. 123 (reference datum NAVD 1988).

*HDD #*101.A

HDD #101.A consists of two HDD bores located underneath a ravine and unmapped stream S-33. The bores are both approximately 694 feet long. The HDD entry will be at El. 125 and the exit point will be El. 122 with the stream at El. 102 (reference datum NAVD 1988).

HDD #102

HDD #102 consists of two HDD bores with horizontal curves located underneath unmapped stream S-34 and the Coxsackie Creek. The bores are both approximately 2400 feet long. The HDD bores will pass approximately 20 feet below the stream S-34 and 18 feet below Coxsackie Creek. The ground surface elevations along the path of HDD #102 ranges from approximately El. 117 at the north end of the bore alignment, to approximately El. 101 and 97 at the stream crossings to El. 108 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #103&104

HDD #103&104 consists of two HDD bores with horizontal curves located underneath CSX Railroad tracks and New York State Route 385. The bores are approximately 1990 and 1940 feet long. The HDD entry will be at El. 134 and the exit point will be El. 141 (reference datum NAVD 1988).

HDD #105

HDD #105 consists of two HDD bores located underneath CSX Railroad tracks. The bores are approximately 532 and 502 feet long. The HDD bores will pass approximately 21 to 23 feet below the CSX tracks. The HDD entry will be at El. 131 and the exit point will be El. 141 (reference datum NAVD 1988).

HDD #107.A

HDD #107.A consists of two HDD bores located underneath CSX Railroad tracks. The bores are approximately 820 feet long. The HDD bores will pass approximately 30 feet below the CSX tracks. The HDD entry will be at El. 130 and the exit point will be El. 134 (reference datum NAVD 1988).

HDD #108

HDD #108 consists of two HDD bores with horizontal curves located underneath Flats Road and Murderers Creek in Greene County, New York. The bores are both approximately 2554 and 2550 feet long. The HDD bores will pass approximately 25 feet below the creek and approximately 46 feet below Flats Road. The ground surface elevations along the path of HDD #108 ranges from approximately El. 134 at the north end of the bore alignment, to approximately 114 at the centerline, to El. 123 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #109

HDD #109 consists of two HDD bores located underneath wetlands. The bores are both approximately 556 feet long. The HDD entry and exit pit will be at El. 123 (reference datum NAVD 1988).

HDD #110

HDD #110 consists of two HDD bores located underneath wetlands. The bores are both approximately 1156 feet long. The HDD entry and exit pit will be at El. 123 (reference datum NAVD 1988).

HDD #111

HDD #111 consists of two HDD bores located underneath Schoharie Turnpike and a CSX railroad spur line. The bores are both approximately 1125 feet long. The HDD bores will pass approximately 20 to 22 feet beneath Schoharie Turnpike and 33 feet below the spur line. The ground surface elevations along the path of HDD #111 ranges from approximately El. 125 at the north end of the bore alignment, to approximately 132 at the centerline, to El. 129 at the south end of the bore alignment (reference datum NAVD 1988).

HDD #111.A

HDD #111.A consists of two HDD bores located underneath Corlaer Kill. The bores are both approximately 2181 feet long. The HDD entry will be at El. 117 and the exit point will be El. 120 (reference datum NAVD 1988)

4.1.2 Geotechnical Data

HDD #91

Subsurface investigations were conducted in 2020 by AECOM for Transmission Developers, Inc., and in 2022 by Kiewit. Borings 198.9-1 and SC-1A are located along the proposed HDD #91 alignment at various offsets from the HDD alignments. The borings were completed to depths of approximately 25 and 40 feet, as shown in Appendix B. Based on the borings, subsurface condition at this crossing location will consist of silt sand (SM) and poorly graded sand (SP), clayey silt (ML). SC-1A noted trace, less than 10 percent, gravel, and cobbles in the first 3 feet from ground surface. Lean to fat silty Clay (CL/CH) recorded in boring SC-1A is anticipated to be below the HDD borehole.

HDD #91.A

Soft soils were encountered in borings K-199.6, A199.7-1, and K-199.7. Specifically boring K-199.6 indicates the HDD borehole will be advanced through 0 blow count clays, which extend approximately 8 feet above the borehole. Appropriate drill bits should be considered for soft ground conditions and steering. Back reamers with high surface areas should be avoided as there is potential for clay adhesion to the surface.

HDD #92&92.A

Borings B200.6-1, B200.7-1, K-200.7, K-200.8, K-200.9,KB-200.6, and KB-200.8A are located at various offsets from HDD #92 & 92.A alignments. The geotechnical borings were completed to a depth of approximately 37 to 137 feet and are shown in Appendix B. Based on the borings, subsurface condition at this crossing location will consist of coarse-grained alluvium consisting of silty sand and fine-grained alluvium consisting of lean to fat Clay, and Silt. The bottom tangent will be primarily advanced through medium stiff lean clay.

HDD #93

Borings B201.7-1, K-201.8,K-201.9, and B201.9-1 are located at various offsets from HDD #93 alignments. The geotechnical borings were completed to a depth of approximately 30 and 40 feet and are shown in Appendix B. Based on the borings, subsurface condition at this crossing location will consist of Fill, silty Sand (SM), Silty fat Clay (CH-MH), and lean Clay (CL).

HDD #93.A

Boring B202.1-1 is located at an offset from HDD #93.A alignments. The geotechnical boring was completed to a depth of approximately 25 feet and is shown in Appendix B. Based on the borings, subsurface condition at this crossing location will consist of Fill, silty Sand (SM), Silty fat Clay (CH-MH), and lean Clay (CL). Note that boring does not extend to the bottom tangent of HDD crossing.

HDD #94

Borings SC-2A, K-203.4, B203.45-1, K-203.5, B203.5-1, and K-203.6 are located at various offsets from HDD alignments. HDDs will likely have a mixed drive between weathered bedrock, silt (ML), lean Clay (CL), and silty sand (SM).

KUE recommends multiple tooling options be available on-site to account for the varying geotechnical conditions should there be a need for methodology change, which may include the use of an air hammer.

HDD #95

Borings K-204.2, and B204.2-1 are located at various offsets from HDD #95 alignments, at Sta. 60287+55 and 60291+25. The geotechnical borings were completed to a depth of approximately 40 and 25 feet and are shown in Appendix B. Borings consisted of Fill, silty Clay (CL), glacial till (GM), silt (ML), and Graywacke bedrock. Graywacke bedrock was noted to have the following properties: fair RQD (rock quality designation), an average CAI (Cerchar Abrasivity Index) value of 2.8 sample 30-35 feet below ground surface (bgs), an unconfined compressive strength (UCS) of 11.6 ksi at sample 30-35 feet bgs.

HDD will likely have a mixed drive between bedrock and medium-dense glacial till. Based on the recorded CAI value, the bedrock is anticipated to be very abrasive (Cerchar, 1986). HDD crossing advancing through Graywacke bedrock should incorporate the use of appropriate tools, equipment, and drilling techniques to minimize bit wear which may include the use of an air hammer. KUE recommends multiple tooling options be available on-site should the need for methodology change.

HDD #96.XX

Borings A205.2-1 and K-205.2 are located at various offsets from proposed HDD #96.XX alignments. The geotechnical borings were completed to a depth of approximately 25 and 48 feet bgs and are shown in Appendix B. Borings consisted of Fill, Silt (ML), silty Sand (SM), and Silty Clay (CL-ML).

HDD #96.A&96.B

Borings K-205.8, K-205.9, B205.9-2, K-206.0, and KB-205.8 are located at various offsets from proposed HDD #96.A &96.B alignments. The geotechnical borings were completed to a depth of approximately 35 to 65and are shown in Appendix B. Borings consisted of Fill, Silt and Silty Clay (CL-ML), lean Clay (CL), and Graywacke bedrock. Graywacke bedrock was noted to have the following properties: poor to excellent RQD (rock quality designation), an average CAI value of 1.1 and, a UCS of 5.9 ksi at sample depth 40 to 44.5 feet bgs (El. 128.5 to 133).

HDD will likely have a mixed drive between bedrock and medium-dense glacial till. Based on the recorded CAI value, the bedrock is anticipated to be very abrasive (Cerchar, 1986). HDD crossing advancing through Graywacke bedrock should incorporate the use of appropriate tools, equipment, and drilling techniques to minimize bit wear which may include the use of an air hammer. KUE recommends multiple tooling options be available on-site should the need for methodology change.

HDD #97

Borings K-206.5, K-206.6, and A202.62-1 are located at various offsets from HDD alignments. The geotechnical borings were completed to a depth of approximately 40 and 23.8 feet. Borings consisted of Fill, Silt and Silty Clay (CL-ML), and lean Clay (CL).

HDD #97.A

Borings A207.0-1, KB-206.8, KB-207.0, and KB 207.1 are located at various offsets from HDD alignments. The geotechnical borings were completed to a depth of approximately 23 to 85 feet. Borings consisted of Fill, Silt and Silty Clay (CL-ML), lean Clay (CL), and sandstone and shale bedrock.

Sandstone bedrock was noted to have the following properties: fair to excellent RQD (rock quality designation), an average CAI value of 2.3 and, a UCS of 8.2 ksi at sample depth 60 to 65 feet bgs (El. 114 to 109).

HDD will likely have a mixed drive between bedrock and medium-dense glacial till. Based on the recorded CAI value, the bedrock is anticipated to be very abrasive (Cerchar, 1986). HDD crossing advancing through bedrock should incorporate the use of appropriate tools, equipment, and drilling techniques to minimize bit wear which may include the use of an air hammer. KUE recommends multiple tooling options be available on-site should the need for methodology change.

HDD #98

Borings K-207.6, SC-2C, and K-207 are located at various offsets from HDD alignments. The geotechnical borings were completed to a depth of approximately 40 feet. Borings consisted of Fill, Silt and Silty Clay (CL-ML), and lean Clay (CL), and coarse-grained soils consisting of SC-SM, SM, and GW-GM. While borings do not extend to the HDD bottom tangent depth, gravel and cobbles may be present during HDD advancement. Drill bits tooling, equipment, and drilling techniques should be able to handle anticipated ground conditions.

HDD #99

Borings B207.9-1, and K-208.1are located at various offsets from HDD #99. The geotechnical borings were completed to a depth of 40 to 50 feet. Borings consisted of Fill, silty Clay (CL-ML), and lean Clay (CL).

HDD #99.A

Borings K-208.2, B208.2-1, B208.3-1,B208.5-1, and K-208.7 are located at various offsets from HDD #99.A. The geotechnical borings were completed to a depth of 25 to 50 feet. Borings consisted of Fill, Silt (ML), silty Clay (CL-ML), lean Clay (CL), and graywacke bedrock. Based on Boring B208.5-1 the HDD bottom tangents straddle interface between silt and well graded gravel, which is was described as decomposed rock in the boring log. Should gravel conditions be present pressures should be monitored to ensure no loss of fluids to formation.

HDD #101

Borings A209.05-1, KB-208.8, and KB-208.9 are located at various offsets from the HDD alignments. Borings consisted of fill, elastic silt, lean to fat clay, and silty sand.

HDD #101.A

Borings B-209.5, and KB-209.7 are located at various offsets from the HDD alignments. Borings consisted of fill, elastic silt, lean to fat clay, and silty sand.

HDD #102

Borings B210.0-1, K-210.1, K-210.2, and B210.4-1 are located at various offsets from HDD alignments. The geotechnical borings were completed to a depth of 25 to 42 feet and are shown in Appendix B. Borings consisted of Fill, silt and elastic silt (ML, MH), silty Clay (CL-ML), and lean to fat Clay (CL, CH).

K-210.1 and -.2 indicate very soft clays with N-values of 0 along the bottom tangent of the HDD. Drilling bits, techniques and slurry shall account for soil conditions. HDD shall be able to adjust for steering within soft clays.

HDD #103&104

Borings B211.2-1, B211.5-1, K-211.2, K-211.3, and K-211.4 are located, at various offsets from HDD alignment #103 and 104. The geotechnical borings were completed to a depth of 20 to 37 feet and are shown in Appendix B. Borings consisted of Fill, Silt (ML), silty Clay (CL-ML), and lean to fat Clay (CL, CH).

K-211.4 indicates very soft clays with N-values of weight of hammer and weight of the rod along the bottom tangent of the HDD. Drilling bits, techniques, and slurry shall account for soil conditions. HDD shall be able to adjust for steering within elastic silts and soft clays.

HDD #105

Borings K-211.7, B211.7-1, and K-211.8, are located, at various offsets from HDD alignment #105. The geotechnical borings were completed to a depth of 40 to 42 feet and are shown in Appendix B. Borings consisted of Silt (ML), elastic Silt (MH), silty Clay (CL-ML), and lean Clay (CL).

HDD #107.A

Borings A212.8-1, SC-2E, and SC-2F, are located, at various offsets from HDD alignment #107.A. The geotechnical borings were completed to a depth of 10 to 16 feet and are shown in Appendix B. Borings consisted of silty Clay (CL-ML), lean Clay (CL), and sandstone bedrock .

Sandstone bedrock was noted to have the following properties: good to excellent RQD (rock quality designation), and a UCS of 17.5 ksi at sample depth 10 to 11 feet bgs.

HDD will likely have a mixed drive between bedrock and medium-dense glacial till. The bedrock is anticipated to be very abrasive (Cerchar, 1986). HDD crossing advancing through bedrock should incorporate the use of appropriate tools, equipment, and drilling techniques to minimize bit wear which may include the use of an air hammer. KUE recommends multiple tooling options be available on-site should the need for methodology change.

HDD #108

Borings B214.1-1, B214.6-1, K-214.5, KB-214.4, and KB-214. are located at various offsets from HDD alignments. The geotechnical borings were completed to a depth of approximately 25 to 42 feet, refer to plan and profile drawing package. Borings consisted of Fill (SM), Silt (ML), elastic Silt (MH), silty Clay (CL-ML), and lean Clay (CL). Artesian conditions were noted in boring KB-214.4 at 37 feet below the ground surface (El. 71') which is below the planned bottom tangent of the HDD>

HDD #109

Borings B216.1-1 and K-216.2 are located, at various offsets from HDD alignment #109. The geotechnical borings were completed to a depth of 25 to 37 feet and are shown in Appendix B. Borings consisted of Fill (SM), Silt (ML), elastic Silt (MH), silty Clay (CL-ML), and lean to fat Clay (CL,CH).

HDD #110

Borings B216.4-1, K-216.6-1, and K-216.6 are located, at various offsets from HDD alignment #110. The geotechnical borings were completed to a depth of 30 to 37 feet and are shown in Appendix B. Borings consisted of Fill (SM), Silt (ML), elastic Silt (MH), silty Clay (CL-ML), and lean to fat Clay (CL,CH).

K-216.6 indicates soft clays with blow counts of weight of 3 to 4 along the bottom tangent of the HDD. Drilling bits, techniques, and slurry shall account for soil conditions. HDD shall be able to adjust for steering within soft clays.

HDD #111

Borings K-216.7, and K-216.8 are located, at various offsets from HDD alignment #111. The geotechnical borings were completed to a depth of 42 feet and are shown in Appendix B. Borings consisted of Fill (Gravel), Silt (ML), silty Clay (CL-ML), and lean to fat Clay (CL,CH).

HDD #111.A

Borings A219.05-1, B219.5-1, and KB-219.4 are located, at various offsets from HDD alignment #111.A. The geotechnical borings were completed to a depth of 20 to 80 feet and are shown in Appendix B. Borings consisted of Fill (sandy silt), clayey sand with gravel (SC), weathered bedrock, and bedrock consisting of shale and greywacke.

5.0 DESIGN SUMMARY

The HDD construction process in soils generally consists of three steps:

Step 1: Drill a small diameter (approximately 3 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 design 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 inert biodegradable additives to support sides of the borehole and to better carry the cuttings to the entry pit at lower pressures and velocities. The drilling fluids typically used under waterbodies and wetland areas are typically required in the project specifications to be "non-toxic and environmentally friendly." Once the pilot bore reaches the exit point, the next step of the process, hole enlargement begins.

Step 2: Enlarge the pilot hole to the diameter required for insertion of the conduits. This is accomplished by using successively larger reaming bits pulled through the pilot bore to gradually enlarge the bore from about 8 inches diameter 16 to 20 inches diameter to accommodate in this case a HDPE conduit about 10 inches in diameter in one bore and a bundle of two, conduits, one 10 inches diameter and the other 2 inches diameter that are to be pulled into the enlarged bore hole. We estimate that one and possibly a second reaming passe will be used to create the 16 to 20 inch -inch-diameter borehole. This pulling in of a bundle of conduits is sometimes referred to as a slick bore. During this step, the borehole is still filled with drilling fluid to support the sides of the bore hole in preparation for Step 3, the insertion of the conduit.

Step 3: Pull the conduits into the enlarged hole. While the pilot hole and reaming operations are going on, 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, and arranged for the pullback into to the borehole. Ideally, the complete conduit (or bundle of conduits) will be welded (and bundled) into one long length for insertion. The goal is usually to pull the bundle into the bore in one, continuous, smooth, around the clock, operation. However, depending on work area and access constraints, sometimes the pipe is assembled in 2 or 3 lengths that then joined (welded), "on the fly" as the conduit (bundle) is slowly pulled into the borehole. As the conduit (bundle) is pulled into the hole it is usually ballasted with clean

water, and some of the drilling fluid supporting the sides of the hole is displaced by the conduit and collected for eventual disposal.

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 radius of curvature for each HDD crossing in this segment are shown in the design drawings in Appendix D. The HDD technical specifications are found in Section 330507.13 of the Technical Specifications. Inadvertent release prevention and mitigation plans for each HDD crossing are provided as separate documents.

The site conditions posed various challenges in developing a design that is both constructible and minimizes the potential for negative environmental impacts. The proposed design has entry and exit pits 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 several segments that will have to be welded together during the pull back. HDD specific work areas at the entry and exit ends of the bores are noted on the drawings in Appendix D. In addition, space and easement constraints will require that during pullback, the above ground sections of the conduit will not be straight and will require rollers to accommodate a horizontal bend. Conduit assembly is expected to be performed at the ends of the alignment shown on the drawings in Appendix D. 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 HDD Design Calculations

For carrying out HDD design calculations, KUE utilized the general guidelines (Section 8) provided in the ASTM Standard 1962-99 and Chapter 12 of PPI Handbook (2208). Specifically, the following engineering design tasks were performed:

1. Pull and Buckling Analysis considering both the installation forces during pull-back and the long-term operational loads, and
2. Inadvertent Return and Hydrofracture Analysis.

5.2.1 Pull and Buckling Analysis

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

1) An individual 10-inch-diameter DR 9 HDPE casing, and

2) A bundle consisting of a 10-inch-diameter DR 9 HDPE casing and a 2-inch-diameter DR 9 or 11 HDPE casing

The stresses and deflections of the pipe are evaluated and compared to allowable values as shown in our calculation package presented in Appendix C.

5.2.2 Inadvertent Return and Hydro-fracture Analysis

Delft equation was utilized to obtain maximum allowable pressures. 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, indicate 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 Contractor should consider the depth of the entry/exit pits to increase the effective soil stress and provide a storage volume for returns to and near the entry and exit points. Note that while the potential for inadvertent return has been reduced through the design process, inadvertent returns are still possible

through existing fissures in the soil or rock, shrinkage cracks, weak soils, or porous deposits of coarse gravel.

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

6.0 CONSTRUCTION CONSIDERATIONS

6.1 RISK AWARENESS AND ASSESSMENT

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

6.2 SITE ANALYSIS

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

6.3 EROSION CONTROL

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

6.4 SURVEILLANCE AND MONITORING

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

7.0 REFERENCES

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

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

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

ASTM F 1962 -05 Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings

ASTM F 1804-08 Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-In Installation

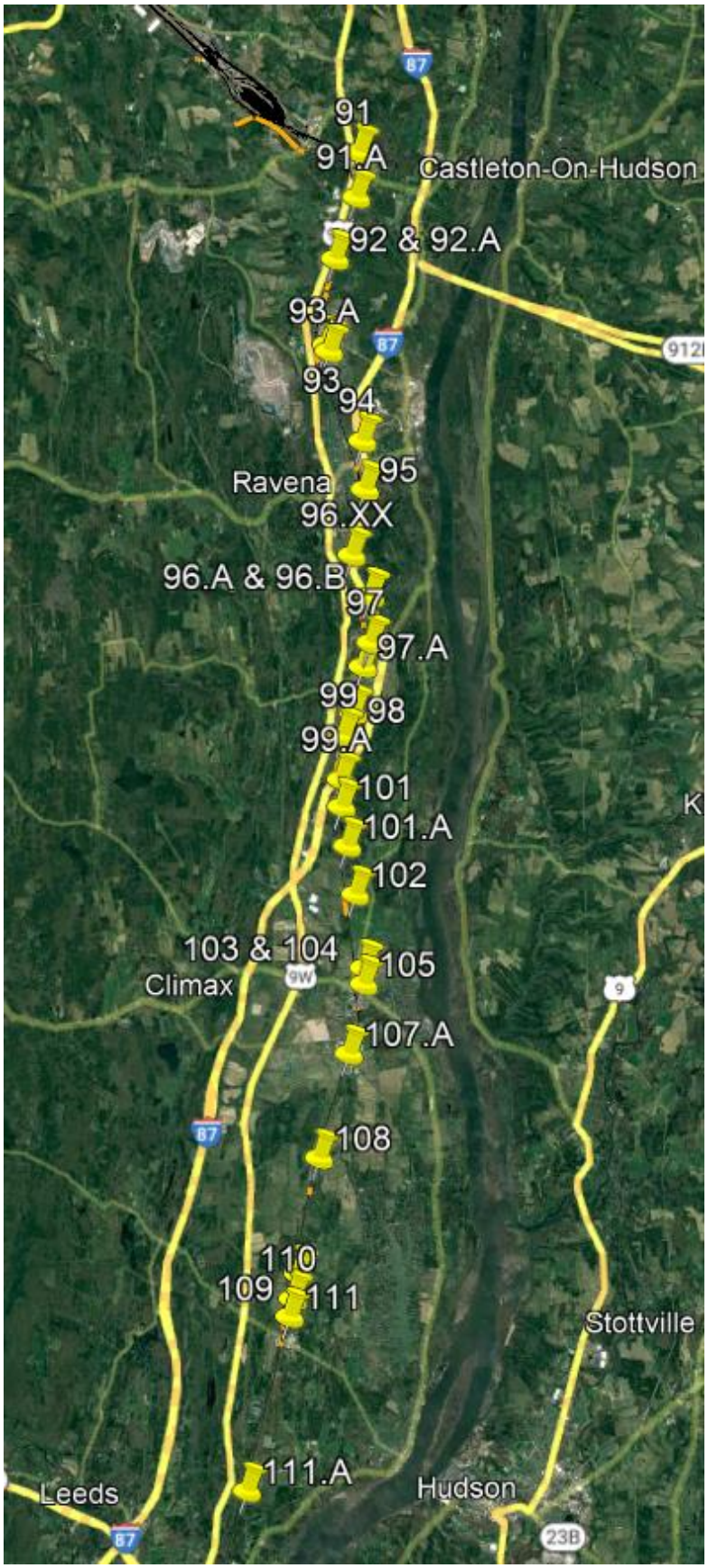
Mohammad Najafi, (2013). Trenchless Technology, First Edition, McGraw Hill

Larry Slavin, (2009) Guidelines for Use of Mini-Horizontal Direction Drilling for Placement of High-Density Polyethylene Pipe

Handbook of Polyethylene Pipe, 2008, Plastics Pipe Institute (PPI), Second Edition

Appendix A

Locus Map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91.A
Castleton-On-Hudson
92 & 92.A
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Ravena
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Climax
107.A
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110
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111
Stottville
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Leeds
Hudson
87
912
9W
9
23B

Appendix B

HDD Geotechnical Reports for CHPE Segment 10 – Package 6 HDDs

Kiewit

MEMORANDUM

DATE: November 10, 2022

TO: Todd Kilduff; Kilduff Underground Engineering, Inc.

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

SUBJECT: Geotechnical Data: Segment 10 - Package 6 - HDD Crossing 91 – Revision 1
Champlain Hudson Power Express Project
Selkirk, 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 west of Selkirk, New York. The approximate station for the start of HDD crossing number 91 is STA 60009+00 (42.53428° N, 73.80671° W).

The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigations by TRC and AECOM, 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.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013

Contact us if you have questions or require additional information.

HDD 91
Borings B198.9-1, SC-1A
Segment 10 - Design Package 6

CHPE Segment 10 - Package 6
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A199.7-1	1344990.8	678939.9	159.0
	A205.2-1	1317487.9	677289.6	204.6
	A206.62-1	1310345.7	678496.2	186.8
	A207.0-1	1308517.7	677770.1	179.6
	A209.05-1	1298062.1	675944.3	148.6
	A219.05-1	1247052.0	666820.5	128.8
	B198.9-1	1348887.4	679090.7	173.5
	B200.6-1	1340723.0	677093.4	96.3
	B200.7-1	1340001.8	676794.4	128.5
	B201.7-1	1335310.5	675758.1	162.1
	B201.9-1	1334029.9	676014.8	173.3
	B202.1-1	1333294.3	676182.6	168.3
	B203.45-1	1326328.9	678471.9	171.2
	B203.5-1	1325831.2	678645.3	183.2
	B204.2-1	1322268.4	678463.0	198.8
	B204.7-1	1320048.9	677891.8	207.1
	B205.8-1	1314638.7	678588.0	141.5
	B205.9-2	1313866.7	678637.8	190.3
	B207.9-1	1303512.5	676338.7	156.2
	B208.2-1	1302277.3	676188.9	152.0
	B208.3-1	1301673.4	676120.2	150.0
	B208.5-1	1300907.6	675929.0	116.7
	B210.0-1	1293021.1	676353.2	109.9
	B210.4-1	1291223.1	676583.0	120.5
	B211.2-1	1286509.8	676960.2	132.6
	B211.5-1	1285068.8	677013.1	140.7
	B211.7-1	1284088.5	676965.4	141.5
	B212.0-1	1282469.0	676857.5	138.9
	B212.2-1	1281498.0	676590.5	130.8
	B214.6-1	1269721.4	672670.9	124.9
	B216.1-1	1262073.1	670916.0	127.0
	B216.4-1	1260344.1	670520.5	128.3
	B216.6-1	1259315.9	670290.2	129.8
	B219.5-1	1244816.4	666093.7	130.4
AECOM**	SC-1A	1348656.7	679220.0	176.4
	SC-2A	1326692.2	678361.5	178.9
	SC-2C	1305133.1	676877.4	160.6

Notes:

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

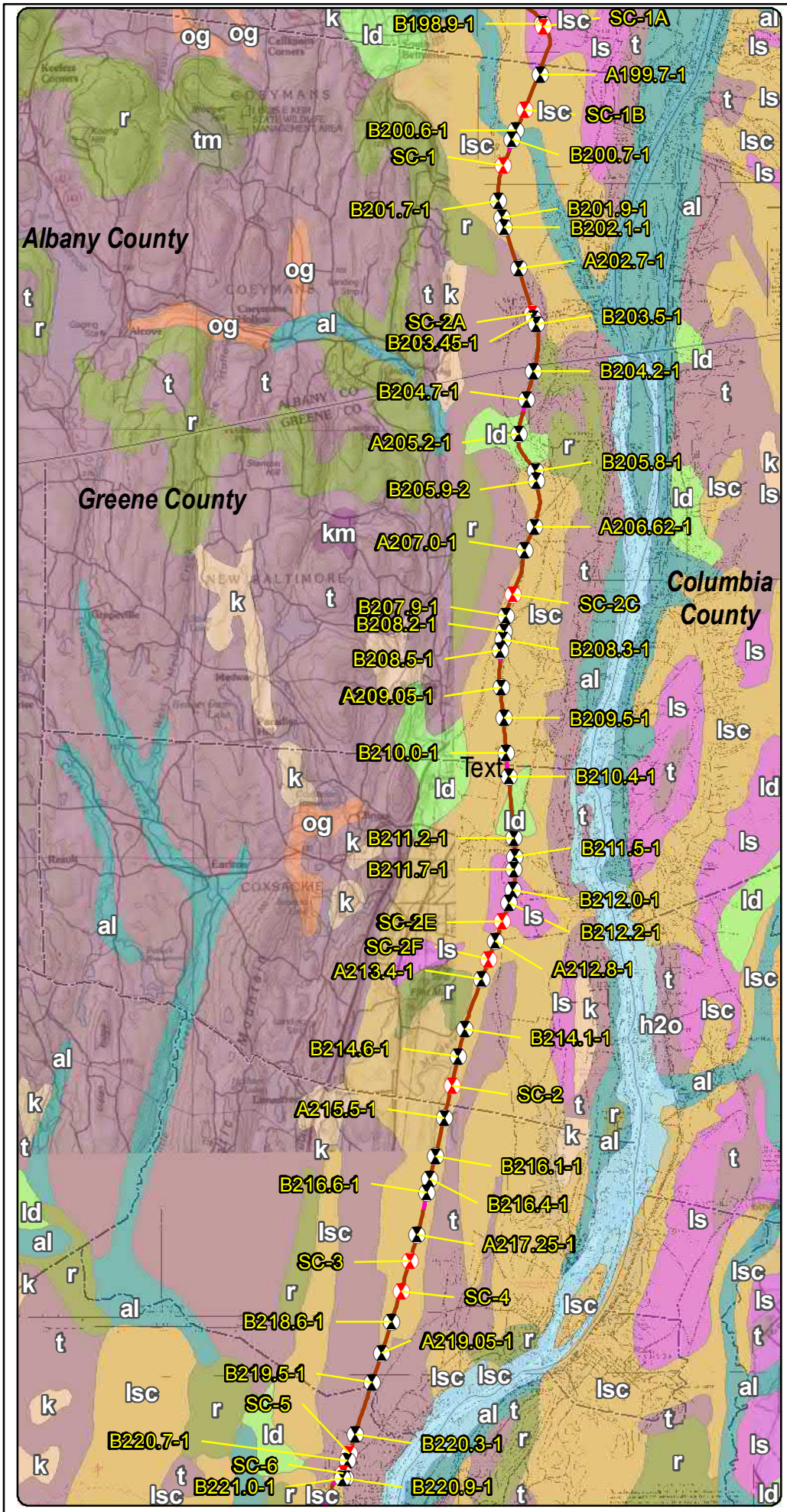
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

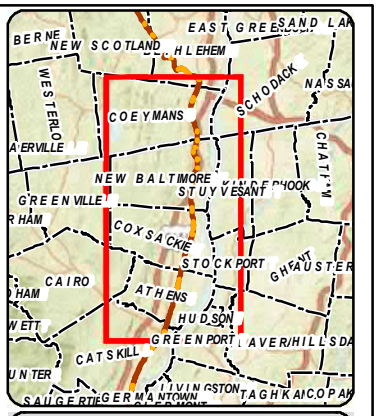
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.

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

Reference:

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





LEGEND

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

Surficial Geology

- al - Recent alluvium
- h2o - Water
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

1 0.5 0 1 Miles

Transmission Developments Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings Selkirk to Catskill Figure 3-10

Prepared on 5/3/2021

by: AECOM

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

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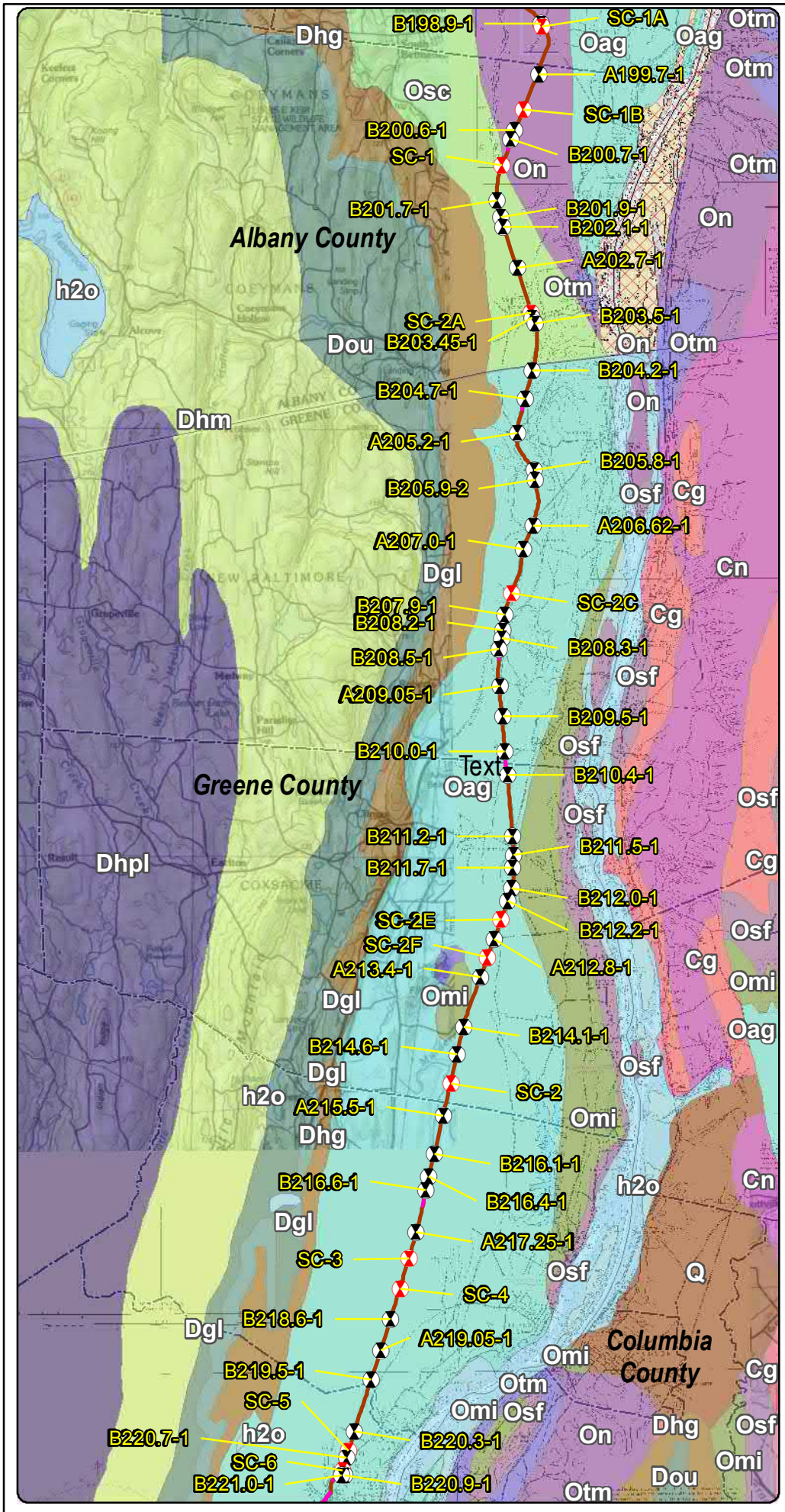

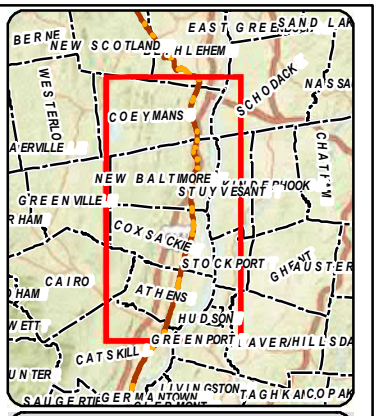

LEGEND

- 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

- Cg - Germantown Formation
- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhm - Undiff Lower Hamilton Group
- Dhpl - Plattekill Formation
- Dou - Onondaga Limestone
- No Label
- Oag - Austin Glen Form (graywacke, shale)
- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

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

N

1 0.5 0 1 Miles

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Selkirk to Catskill Figure 4-10

Prepared on 5/18/2021

by: AECOM

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

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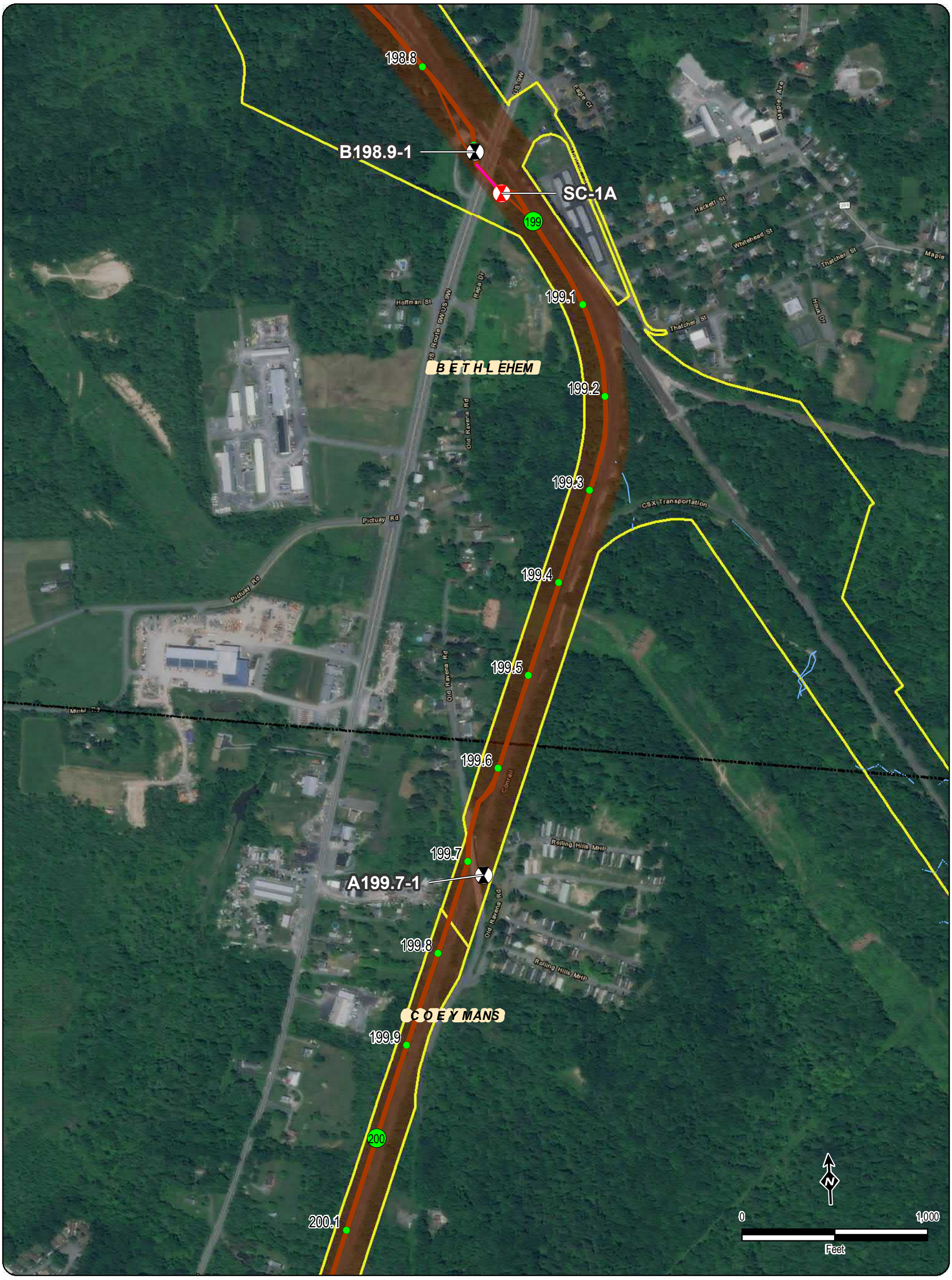

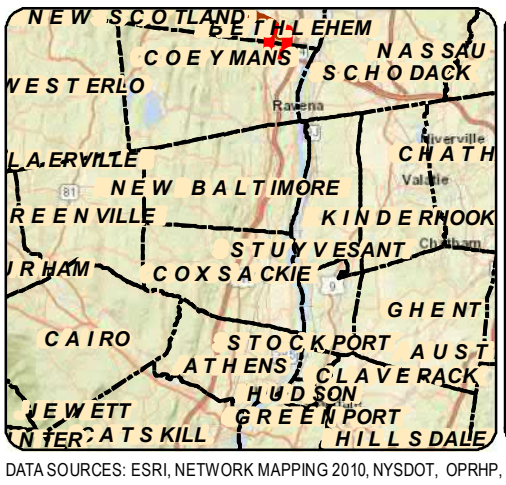

LEGEND

- 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

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

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Selkirk to Catskill

Figure A-10

Sheet 1 of 18

Prepared by: AECOM 5/19/2021

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TEST BORING LOG

BORING	**B198.9-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED 8.0 '			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	25.0 '

DRILLER	R.CARUSO
HELPER	C. SMART
INSPECTOR	C. POPPE
DATE STARTED	11/14/2012
DATE COMPLETED	11/14/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	3 5 10 13				
	S-2	9 9 12 11			9.0	
5	S-3	8 7 9 11				
	S-4	8 7 6 7		***BROWN F/ SAND, SM SILT***		WATER TABLE DETERMINED FROM WETNESS OF SAMPLE
	S-5	4 3 3 3			16.0	
10				13.5		
	S-6	6 8 7		***GRAY/BROWN F/M SAND, TR SILT***	23.3	
15				18.5		
	S-7	4 4 16		***GRAY CLAYEY SILT***	21.3	
20						
	S-8	9 5 6		25.0		
25				***END OF BORING AT 25'***		
30						
35						

DRN.	TBT
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

S.W.COLE ENGINEERING, INC.

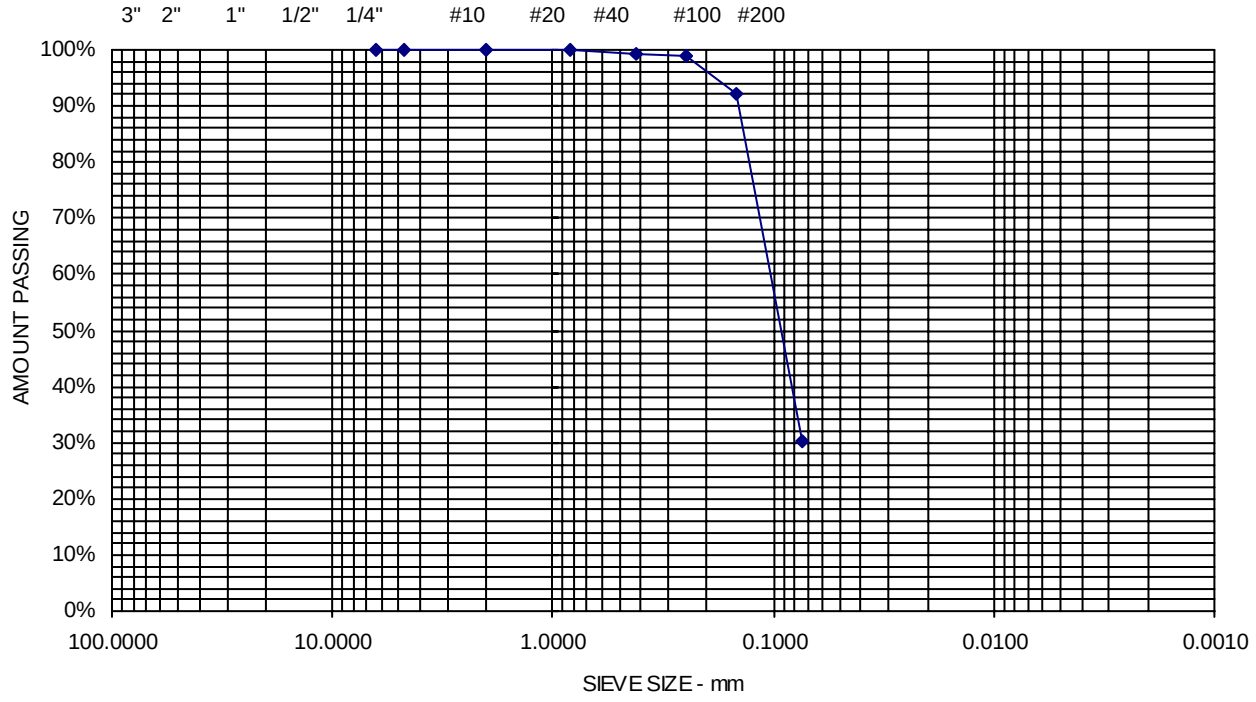
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10340S
Exploration	**B198.9-1**	Date Received	11/20/2012
Material Source	**S-1**	Date Completed	11/27/2012
		Tested By	MURRAY SWINDELL

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0% Gravel
2.00 mm	**No. 10**	**100**	
850 um	**No. 20**	**100**	
425 um	**No. 40**	**99**	69.9% Sand
250 um	**No. 60**	**99**	
150 um	**No. 100**	**92**	
75 um	**No. 200**	**30.1**	30.1% Fines

BROWN SILTY SAND (SM)



Comments: MOISTURE CONTENT = 14.5%

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S.W.COLE ENGINEERING, INC.

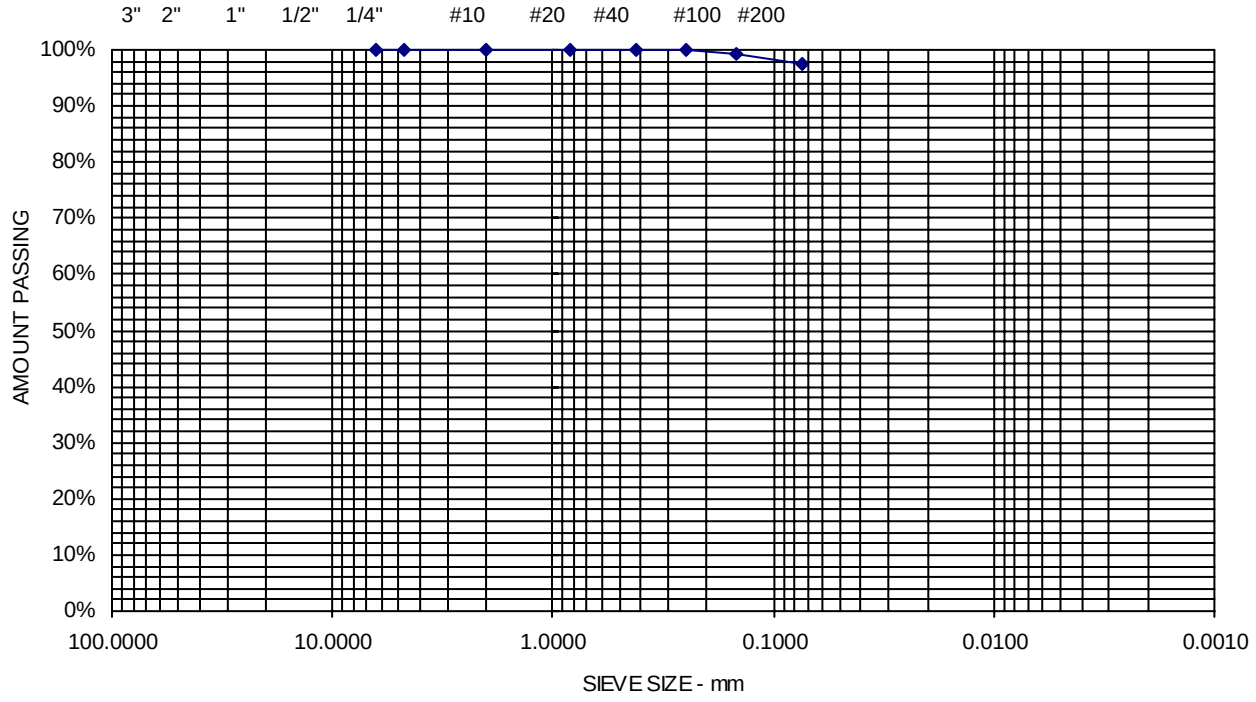
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10341S
Exploration	**B198.9-1**	Date Received	11/20/2012
Material Source	**S-8**	Date Completed	11/27/2012
		Tested By	MURRAY SWINDELL

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0% Gravel
2.00 mm	**No. 10**	**100**	
850 um	**No. 20**	**100**	
425 um	**No. 40**	**100**	2.3% Sand
250 um	**No. 60**	**100**	
150 um	**No. 100**	**99**	
75 um	**No. 200**	**97.7**	97.7% Fines

BROWN-GRAY SILTY CLAY TRACE SAND (CL)



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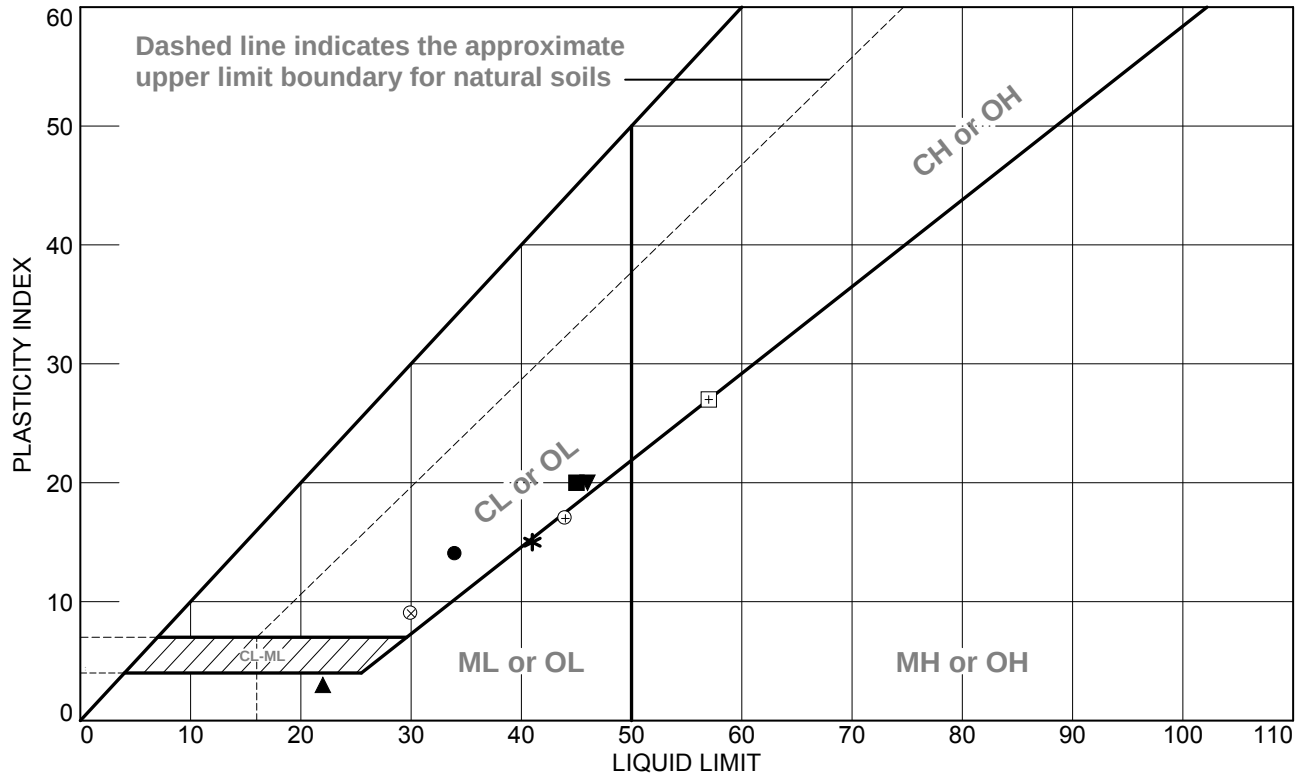
SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
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-5	8.0-10.0	ML	-	-	-	-	22	19	3	1.5	-	23.6	-	-	-
	S-7	18.5-20.0	-	0.0	3.3	25.6	71.1	-	-	-	-	2.80	38.1	-	-	-
B198.9-1	S-2	2.0-4.0	-	-	-	-		-	-	-	-	-	9.0	-	-	-
	S-3	4.0-6.0	SM	0.0	74.8	25.2		-	-	-	-	-	16.0	-	-	-
	S-4	6.0-8.0														
	S-5	8.0-10.0														
	S-6	13.5-15.0	-	-	-	-		-	-	-	-	-	23.3	-	-	-
	S-7	18.5-20.0	ML					NV	NP	NP	-	-	21.3	-	-	-
A199.7-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	17.9	-	-	-
	S-2	2.0-4.0	SM	0.0	66.6	33.4		-	-	-	-	-	10.0	-	-	-
	S-3	4.0-6.0														

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

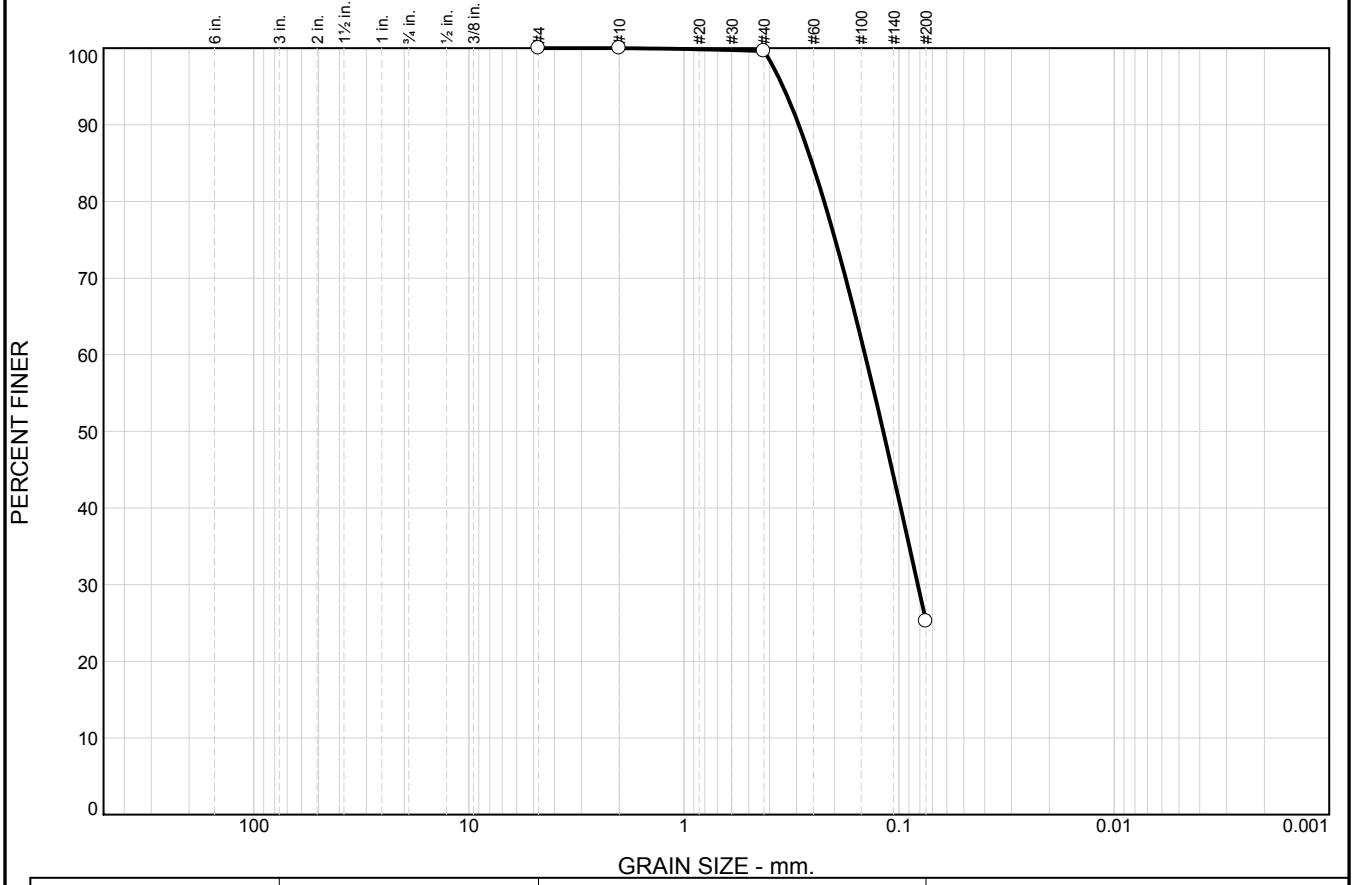
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B192.4-1	S-6	13.5-15.0 FT	28.4	20	34	14	CL
■	B193.5-1	S-7	18.5-20.0 FT	49.2	25	45	20	CL
▲	B198.7-1	S-5	8.0-10.0 FT	23.6	19	22	3	ML
◆	B198.9-1	S-7	18.5-20.0 FT	21.3	NP	NV	NP	ML
▼	B200.6-1	S-5	8.0-10.0 FT	32.3	26	46	20	CL
✱	B200.6-1	S-8	23.5-25.0 FT	35.4	26	41	15	ML
⊕	B200.7-1	S-8	23.5-25.0 FT	30.1	27	44	17	CL/ML
⊞	B201.7-1	S-3	4.0-6.0 FT	36.4	30	57	27	CH
⊗	B201.7-1	S-7	18.5-20.0 FT	29.5	21	30	9	CL

TRC
Engineers, Inc.
Mt. Laurel, NJ

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

Project No.: 195651 **Figure** 3

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.4	74.4	25.2	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
○			0.2536	0.1439	0.1184	0.0818				

Material Description	USCS	AASHTO
○ BROWN F/ SAND, SM SILT	SM	

Project No. 195651 **Client:** TRANSMISSION DEVELOPERS INC.

Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

○ **Sample Source:** B198.9-1 **Depth:** 4.0-10.0 FT **Sample No.:** S-3, S-4, & S-5

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

TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 72

Tested By: TBT 12/20/12 **Checked By:** JPB 03/12/13

BORING CONTRACTOR: ADT

DRILLER: Chris Chaillou

SOILS ENGINEER/GEOLOGIST: Chris French

LOCATION: Selkirk, NY MP-198.97

AECOM

BORING LOG

SHEET 1 OF 2

PROJECT NAME: CHPE -

PROJECT NO.: 60323056

HOLE NO.: **SC-1A**

START DATE: 2/3/21

FINISH DATE: 2/3/21

OFFSET: N/A

DRILL RIG: CME LC-55

BORING TYPE: SPT

BORING O.D.: 4.5"

SURFACE ELEV.:

LONGITUDE:

LATITUDE:

GROUND WATER OBSERVATIONS: Water at 11 ft bgs (Inferred)

	CASING	SAMPLER	DRILL BIT	CORE BARREL
TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit	
SIZE I.D.	4"	2.5"	- -	
SIZE O.D.	4.5"	3"	3 7/8"	
HAMMER WT.	140 lbs	140 lbs		
HAMMER FALL	30"	30"		

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		0'-5'				Hand Cleared		SP		0.0': Brown fine SAND, little silt; frozen
1.0								SP		0.5': Light brown fine SAND, little silt; medium dense, moist
2.0								SP		2.0': Light brown fine SAND, trace silt, trace subrounded gravel, trace cobbles
3.0		3'-5'	S-1							TR-1; (3.0'-5.0')
4.0										
5.0		5'-7'	S-2	24"	17"	16 14 17 10	20	SP		SAA
6.0										
7.0		7'-9'	S-3	24"	24"	11 18 17 19	11	SP		Light brown fine SAND, trace silt; dense, moist
8.0										TR-2; (8.0'-8.5')
9.0		9'-11'	S-4	24"	13"	12 15 14 13	19	SP	SAND/Silty SAND	SAA
10.0										
11.0		11'-'13'	S-5	24"	9"	12 15 12 11	18	SP		Brown fine SAND, little silt, medium dense, saturated
12.0										
13.0		13'-15'	S-6	24"	12"	10 13 16 19	19	SP		Brown fine SAND, trace silt; medium dense, saturated
14.0										
15.0		15'-17'	S-7	24"	16"	9 20 22 25	27	SP		SAA
16.0										TR-3; (16.0'-16.5')
17.0										
18.0										
19.0										
20.0										

NOTES:

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

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

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

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

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

BORING CONTRACTOR: ADT

DRILLER: Chris Chaillou

SOILS ENGINEER: Chris French

LOCATION: Selkirk, NY MP-198.97

AECOM

BORING LOG

SHEET 2 OF 2

PROJECT NAME: CHPE -

PROJECT NO.: 60323056

HOLE NO.: **SC-1A**

START DATE: 2/3/21

FINISH DATE: 2/3/21

OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		20'-22'	S-8	24"	13"	21	27	25	26	34	SP	SAND/Silty SAND	Brown fine SAND, little silt; medium dense, saturated
21.0													
22.0													
23.0													
24.0													
25.0													
		25'-27'	S-9	24"	18"	2	5	17	27	14	CL/ML		Gray CLAY and silt; soft, wet
26.0													26.2': Gray clayey SILT, trace fine sand; medium stiff, wet
27.0													
													TR-4; (26.0'-26.5')
28.0													
29.0													
30.0													
		30'-32'	S-10	24"	24"%	1	2	3	3	3	CH	CLAY and SILT	Gray silty CLAY; soft, wet
31.0													
32.0													
33.0													
34.0													
35.0													
		35'-37'	S-11	24"	24"	WOH	WOH	2	4	1	CH		Gray silty CLAY; very soft, wet
36.0													
													TR-5; (36.0-36.5')
37.0													
38.0													
		38'-40'	S-12	24"	18"	WOH	WOH	WOH	3		CH		SAA
39.0													
40.0													
													SC-1A terminated at 40' bgs, 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.

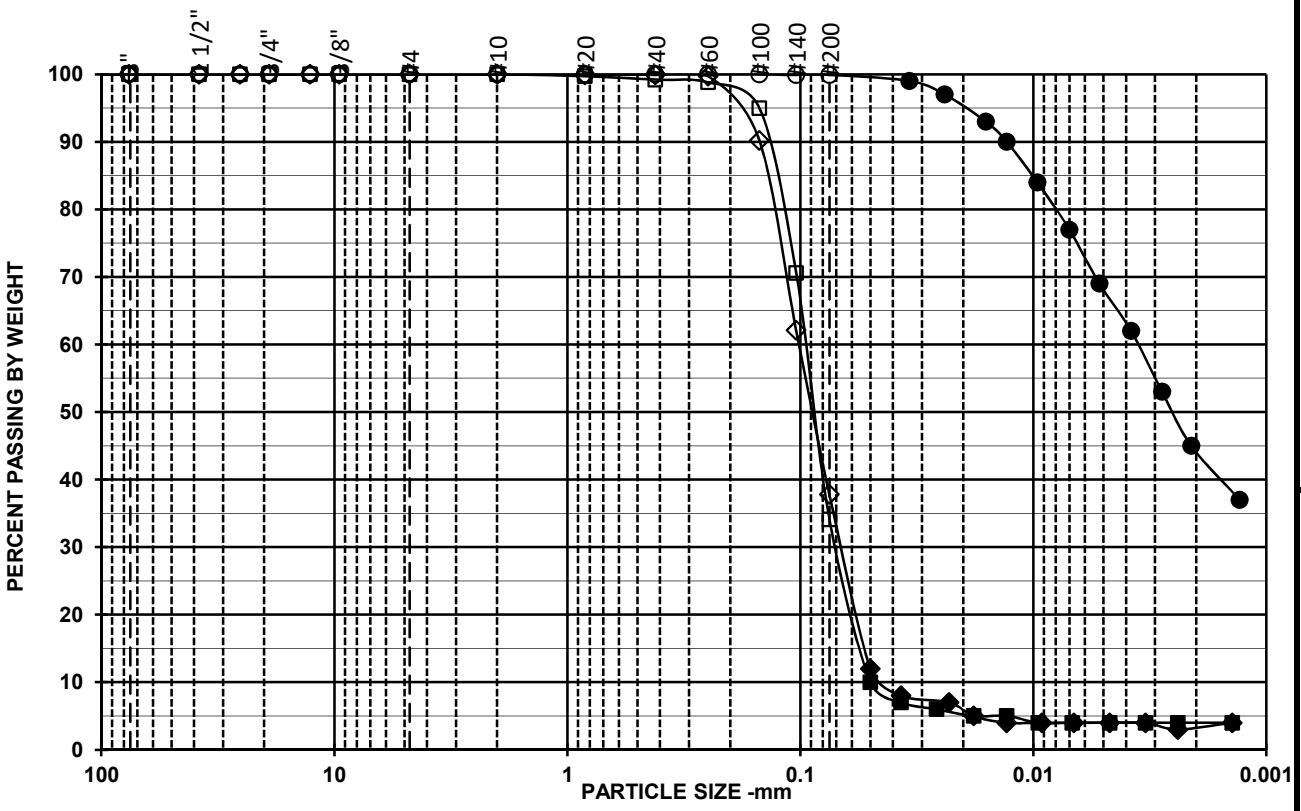
SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

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

Aquifer
CHPE - Selkirk Catskill 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 (%)	
SC-1	S-2	5-7	28.2	54	23	31	CH	99.4	45	
SC-1	S-4	9-11	25.8	44	22	22	CL	96.8	44	
SC-1A	S-3	7-9	11.7				SM	34.1	4	
SC-1A	S-8	20-22	22.6				SM	37.8	3	
SC-1A	S-10	30-32	35.3	37	19	18	CL	99.9	44	
SC-2C	S-2	5-7	5.8				GP-GM	8		
SC-2C	S-7	15-17	19.1	36	19	17	GC	35	14	
SC-2C	S-9	24-29	5.0	15	10	5	GC-GM	21	5	
SC-2E	S-2	5-7	38.1	61	25	36	CH	99.5	85	
SC-2E	S-5	11-13	39.5	47	23	24	CL	99.8	64	
SC-3	S-2	5-7	32.9	76	28	48	CH	99.4	93	
SC-3	S-8	20-22	62.4	55	24	31	CH	100	76	
SC-3	S-10	30-32	7.4				GW-GM	5	3	
SC-5	S-2	5-7	20.7	28	18	10	CL	77	15	
SC-5	S-6	13-15	24.9	40	21	19	CL	76	31	
SC-6	S-3	7-9	29.5	49	24	25	CL	99.9	50	
SC-6	S-8	20-22	35.2	49	23	26	CL	100	63	
SC-6	S-10	30-32	34.9	43	21	22	OL	99.9	62	

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
□	11.7				SM		Brown, Silty sand	04/08/21
◇	22.6				SM		Gray, Silty sand	04/08/21
○	35.3	37	19	18	CL		Brown, Lean clay	04/08/21

Aquifer #602201207

TerraSense, LLC #7853-21008

CHPE - Selkirk Catskill Borings PO

Symbol	□	◇	○
Boring	SC-1A	SC-1A	SC-1A
Sample	S-3	S-8	S-10
Depth	7-9	20-22	30-32
% +3"	0	0	0
% Gravel	0	0	0
% SAND	65.9	62.2	0.1
%C SAND	0	0	0
%M SAND	0.8	0.1	0
%F SAND	65.1	62.1	0.1
% FINES	34.1	37.8	99.9
D_{100} (mm)	4.75	4.75	2
D_{60} (mm)	0.095	0.101	0.004
D_{30} (mm)	0.07	0.066	
D_{10} (mm)	0.05	0.043	
Cc	1	1	
Cu	1.9	2.3	

Sieve Size/ID #	Percent Finer Data		
6"	100.0	100.0	100.0
4"	100.0	100.0	100.0
3"	100.0	100.0	100.0
1 1/2"	100.0	100.0	100.0
1"	100.0	100.0	100.0
3/4"	100.0	100.0	100.0
1/2"	100.0	100.0	100.0
3/8"	100.0	100.0	100.0
#4	100.0	100.0	100.0
#10	100.0	100.0	100.0
#20	99.7	99.9	100.0
#40	99.2	99.9	100.0
#60	98.8	99.7	100.0
#100	95.0	90.2	100.0
#140	70.6	62.1	99.9
#200	34.1	37.8	99.9
5μ m	4	4	68
2μ m	4	3	44
1μ m	4	5	33

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

Kiewit

MEMORANDUM

DATE: November 10, 2022

TO: Todd Kilduff; Kilduff Underground Engineering, Inc.

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

SUBJECT: Geotechnical Data: Segment 10 – Package 6 - HDD Crossing 91.A – Revision 1
Champlain Hudson Power Express Project
Selkirk, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located south of Selkirk, New York. The approximate station for the start of HDD crossing number 91.A is STA 60043+00 (42.52583° N, 73.80601° W).

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

- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013
- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Package 6, Selkirk to Catskill, Rev-1, dated June 28, 2022.

Contact us if you have questions or require additional information.

HDD 91.A
Borings K-199.6, A199.7-1, K-199.7
Segment 10 - Design Package 6

CHPE Segment 10 - Package 6
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A199.7-1	1344990.8	678939.9	159.0
	A205.2-1	1317487.9	677289.6	204.6
	A206.62-1	1310345.7	678496.2	186.8
	A207.0-1	1308517.7	677770.1	179.6
	A209.05-1	1298062.1	675944.3	148.6
	A219.05-1	1247052.0	666820.5	128.8
	B198.9-1	1348887.4	679090.7	173.5
	B200.6-1	1340723.0	677093.4	96.3
	B200.7-1	1340001.8	676794.4	128.5
	B201.7-1	1335310.5	675758.1	162.1
	B201.9-1	1334029.9	676014.8	173.3
	B202.1-1	1333294.3	676182.6	168.3
	B203.45-1	1326328.9	678471.9	171.2
	B203.5-1	1325831.2	678645.3	183.2
	B204.2-1	1322268.4	678463.0	198.8
	B204.7-1	1320048.9	677891.8	207.1
	B205.8-1	1314638.7	678588.0	141.5
	B205.9-2	1313866.7	678637.8	190.3
	B207.9-1	1303512.5	676338.7	156.2
	B208.2-1	1302277.3	676188.9	152.0
	B208.3-1	1301673.4	676120.2	150.0
	B208.5-1	1300907.6	675929.0	116.7
	B210.0-1	1293021.1	676353.2	109.9
	B210.4-1	1291223.1	676583.0	120.5
	B211.2-1	1286509.8	676960.2	132.6
	B211.5-1	1285068.8	677013.1	140.7
	B211.7-1	1284088.5	676965.4	141.5
	B212.0-1	1282469.0	676857.5	138.9
	B212.2-1	1281498.0	676590.5	130.8
	B214.6-1	1269721.4	672670.9	124.9
	B216.1-1	1262073.1	670916.0	127.0
	B216.4-1	1260344.1	670520.5	128.3
	B216.6-1	1259315.9	670290.2	129.8
	B219.5-1	1244816.4	666093.7	130.4
AECOM**	SC-1A	1348656.7	679220.0	176.4
	SC-2A	1326692.2	678361.5	178.9
	SC-2C	1305133.1	676877.4	160.6

Notes:

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

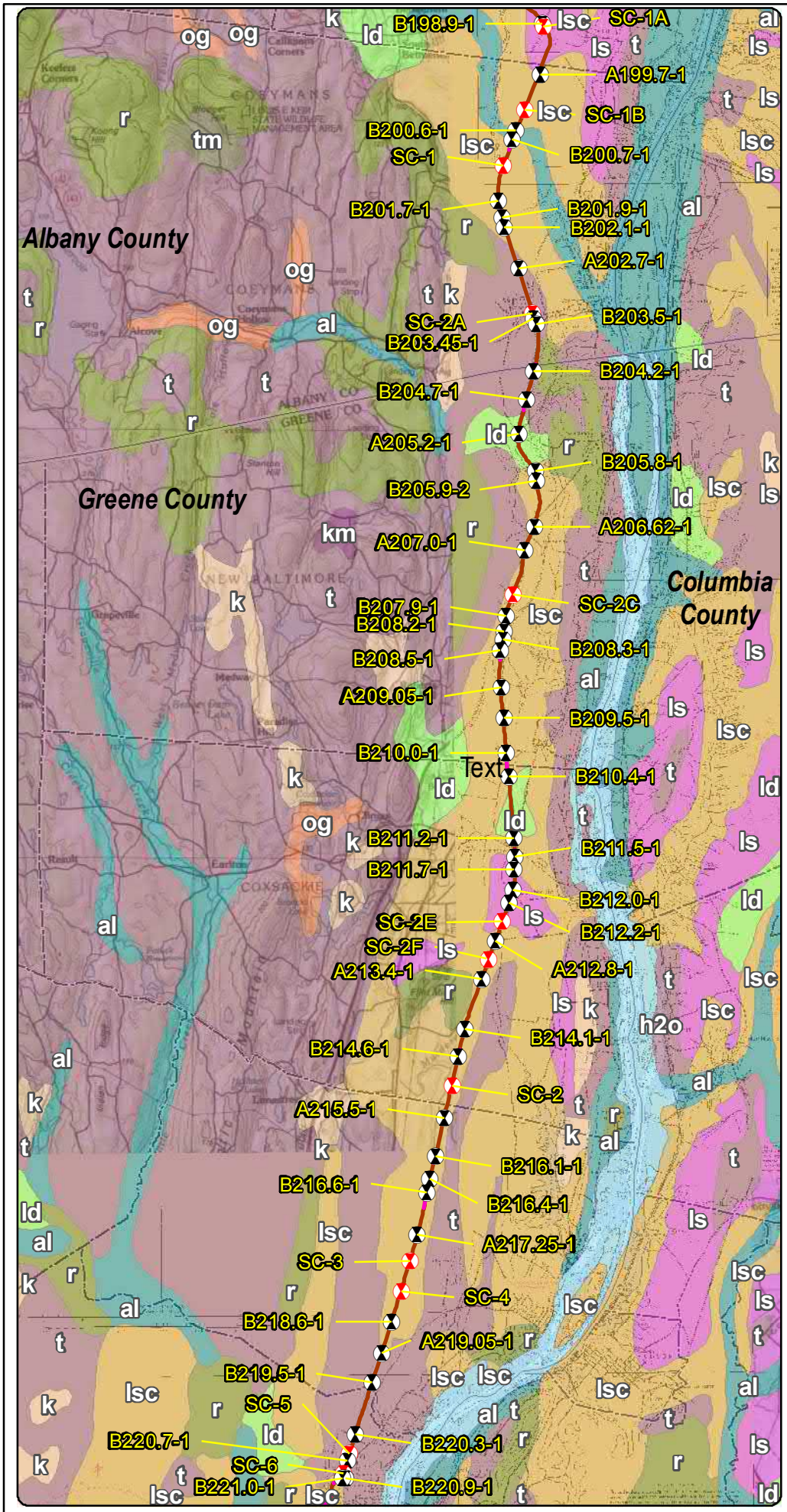
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

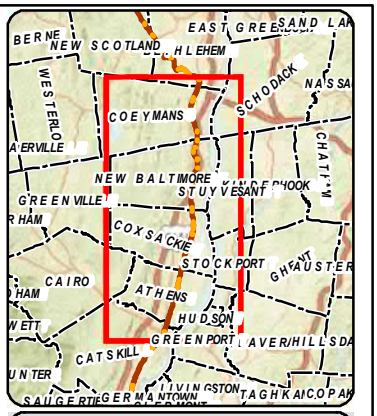
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.

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

Reference:

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





LEGEND

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

Surficial Geology

- al - Recent alluvium
- h2o - Water
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

1 0.5 0 1 Miles

Transmission Developments Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

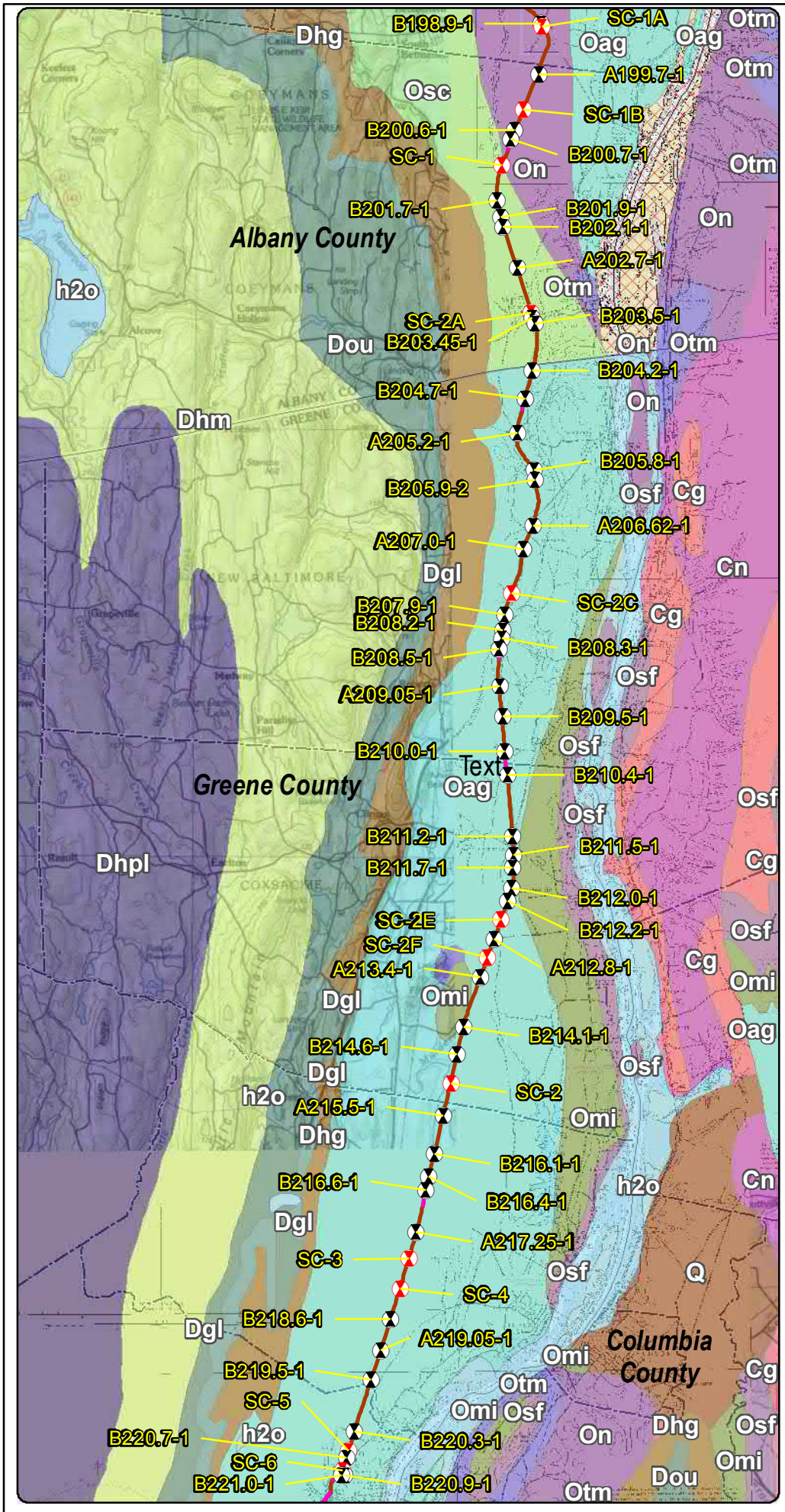
Surficial Geology and Geotechnical Borings Selkirk to Catskill Figure 3-10

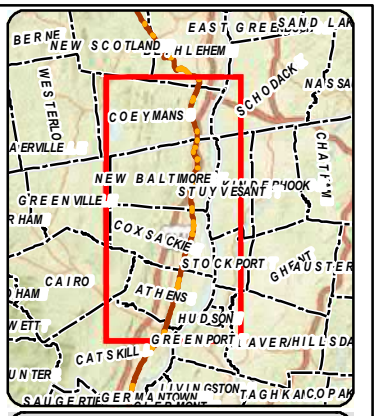
Prepared on 5/3/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190909Boring_Locations\Maps_for_May_2021_Report\Selkirk_to_Catskill_Boring_Locations_Surficial_May_2021_Report.mxd





LEGEND

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

Bedrock Geology

- Cg - Germantown Formation
- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhm - Undiff Lower Hamilton Group
- Dhpl - Plattekill Formation
- Dou - Onondaga Limestone
- No Label
- Oag - Austin Glen Form (graywacke, shale)
- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

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

N

1 0.5 0 1 Miles

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Selkirk to Catskill Figure 4-10

Prepared on 5/18/2021

by: AECOM

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

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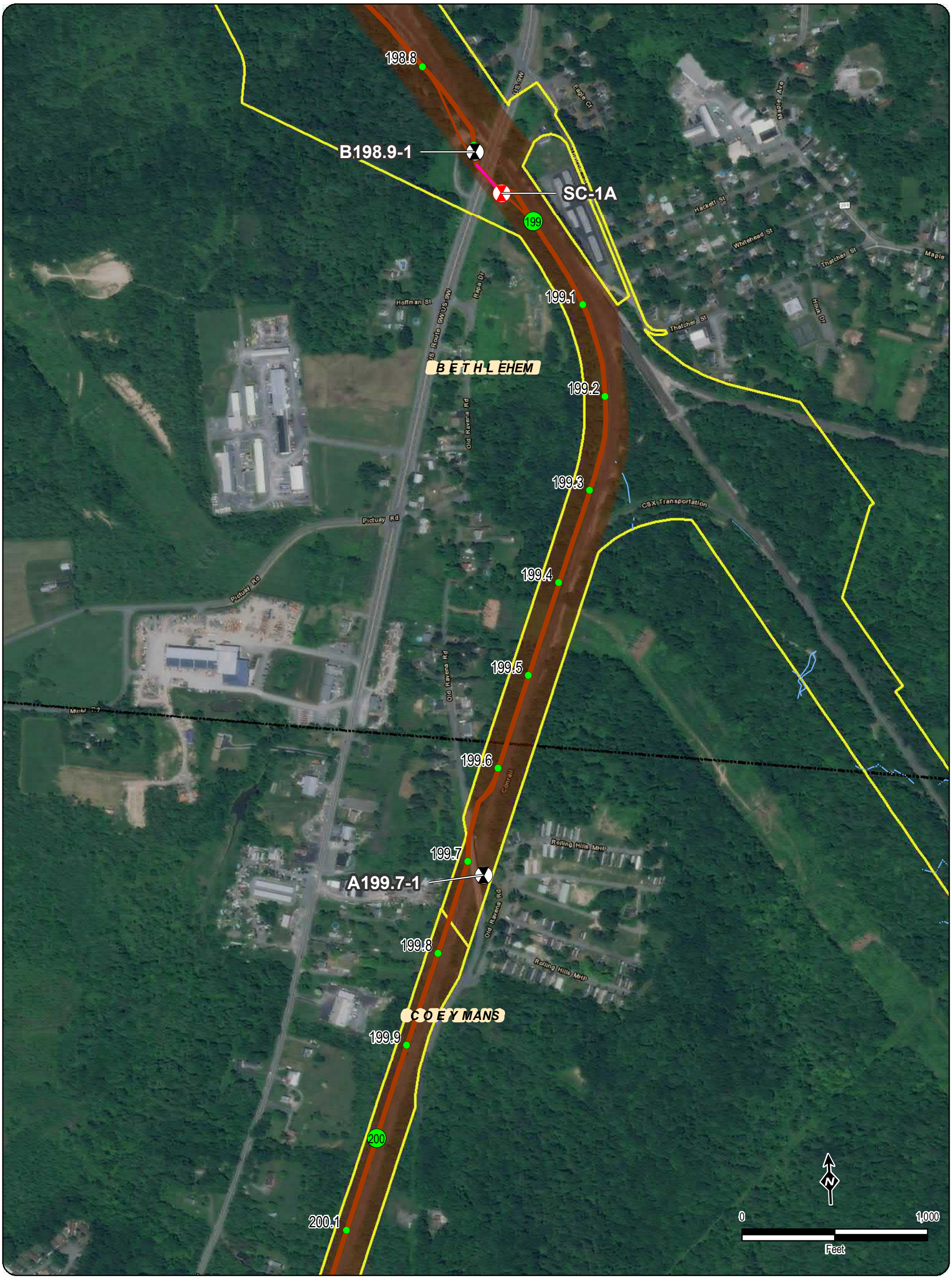
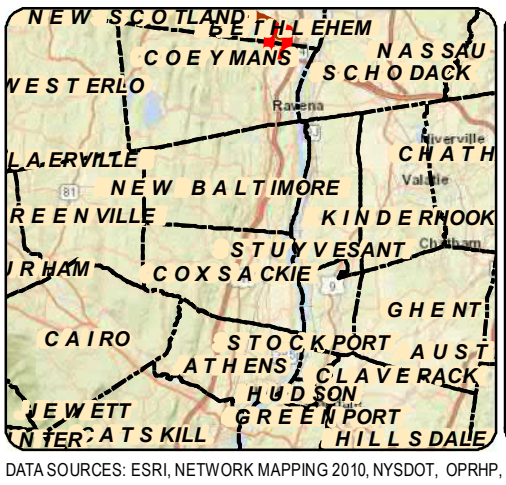




LEGEND

- 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

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

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Selkirk to Catskill

Figure A-10

Sheet 1 of 18

Prepared by: AECOM 5/19/2021

Y:\Projects\CHPEI\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Selkirk_to_Catskill_Boring_Locations_Mapset_May_2021_Report.mxd

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

BORING	**A199.7-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
4.0'	NR	11/18	0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	N/A
DATE STARTED	11/18/2012
DATE COMPLETED	11/18/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	1 2 2 2			17.9	
	S-2	10 11 11 7				
5	S-3	12 12 11		***BROWN SILTY F/ SAND, TR ORGANICS***	10.0	
	S-4	8 6 5 5				
10	S-5	7 8 8 7		10.0		
				END OF BORING AT 10'		
15						
20						
25						
30						
35						

DRN.	TBT
CKD.	PWK

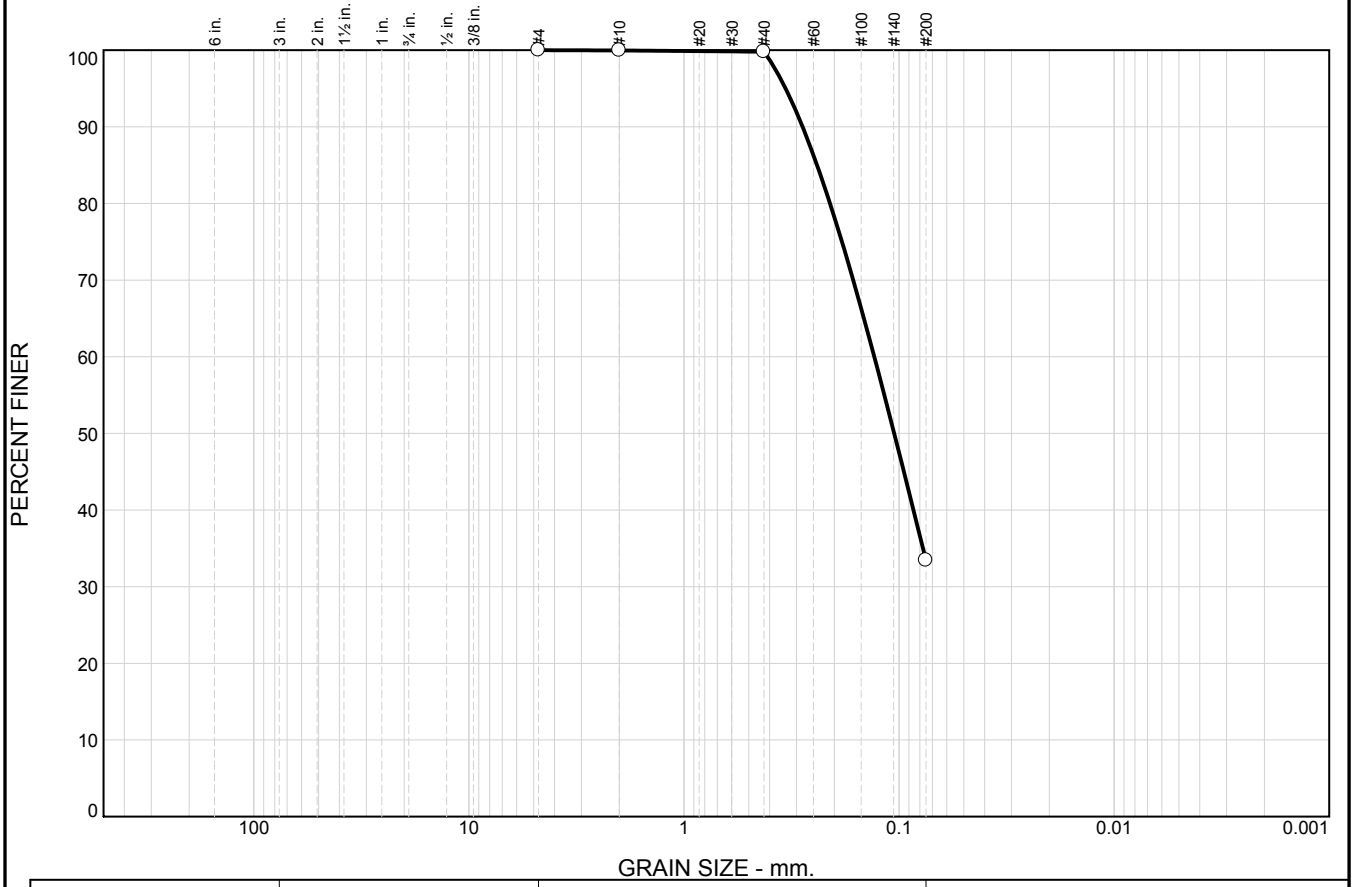
NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
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-5	8.0-10.0	ML	-	-	-	-	22	19	3	1.5	-	23.6	-	-	-
	S-7	18.5-20.0	-	0.0	3.3	25.6	71.1	-	-	-	-	2.80	38.1	-	-	-
B198.9-1	S-2	2.0-4.0	-	-	-	-		-	-	-	-	-	9.0	-	-	-
	S-3	4.0-6.0	SM	0.0	74.8	25.2		-	-	-	-	-	16.0	-	-	-
	S-4	6.0-8.0														
	S-5	8.0-10.0														
	S-6	13.5-15.0	-	-	-	-		-	-	-	-	-	23.3	-	-	-
	S-7	18.5-20.0	ML					NV	NP	NP	-	-	21.3	-	-	-
A199.7-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	17.9	-	-	-
	S-2	2.0-4.0	SM	0.0	66.6	33.4		-	-	-	-	-	10.0	-	-	-
	S-3	4.0-6.0														

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.2	66.4	33.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
○			0.2406	0.1304	0.1054					

Material Description	USCS	AASHTO
○ BROWN SILTY F/ SAND, TR ORGANICS	SM	

Project No. 195651 **Client:** TRANSMISSION DEVELOPERS INC.

Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

○ **Source of Sample:** A199.7-1 **Depth:** 2.0-6.0 FT **Sample Number:** S-2 & S-3

TRC Engineers, Inc.

Mt. Laurel, NJ

Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 73

Tested By: TBT 12/20/12 **Checked By:** JPB 03/12/13

Terracon GeoReport

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. K-199.6

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5244° Longitude: -73.8065°

Surface Elev.: 161.2 (Ft.)

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.2	161	**TOPSOIL**
2.0	159	**FILL - POORLY GRADED GRAVEL**, trace sand, black and brown, very loose
8.0	153	**POORLY GRADED SAND (SP)**, brown, loose
		LEAN CLAY (CL), gray, very soft to medium stiff

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	▽		8	4-1-1-1 N=2			
			18	3-4-4-4 N=8			
5			17	3-2-1-1 N=3			
			24	3-4-5-4 N=9	26.9		
			17	2-2-2-2 N=4			
10			24	4-3-2-3 N=5			
			24	WOH-WOH-WOH-WOH	32.3	27-20-7	99
20			24	WOH-WOH-WOH-WOH			
25			24	WOH-WOH-WOH-WOH			

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: AV
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

▽ *While drilling*

▽ *At completion of drilling*

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-15-2022 | Boring Completed: 02-15-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

BORING LOG NO. K-199.6

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5244° Longitude: -73.8065°

Surface Elev.: 161.2 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), gray, very soft to medium stiff *(continued)*								
		30			24	WOH-WOH -WOH-3 3" Split Soon With Ring Samplers	44.8	41-23-18	95
					24	WOH-WOH-WOH-WOH			
		35			24	WOH-WOH-WOH-WOH			
37.0	124								
	Boring Terminated at 37 Feet								

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: AV
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

While drilling

At completion of drilling

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-15-2022 | Boring Completed: 02-15-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

BORING LOG NO. K-199.7

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5232° Longitude: -73.8072°

Surface Elev.: 157.5 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.0	157.5	
2.0	155.5	**FILL - POORLY GRADED SAND**, organics noted, brown, medium dense
6.0	151.5	**POORLY GRADED SAND (SP)**, trace gravel and silt, brown, loose to medium dense
		LEAN CLAY (CL), gray, very soft to medium stiff

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0			16	10-10-6-6 N=16			
	▽		14	7-6-7-6 N=13			
5			17	4-4-4-2 N=8			
			24	2-2-4-5 N=6	32.4		
			24	2-3-3-3 N=6			
10			24	4-3-3-2 N=6			
15			19	WOH-WOH-1-1 N = 1	31.6	27-21-6	100
20			24	WOH-WOH-WOH-WOH			
25			24	WOH-WOH-WOH-WOH			

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: AV
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

▽ *While drilling*

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-15-2022 | Boring Completed: 02-16-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

BORING LOG NO. K-199.7

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5232° Longitude: -73.8072°

Surface Elev.: 157.5 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), gray, very soft to medium stiff *(continued)*								
		30			24	WOH-WOH-1-4 3" Split Spoon With Ring Samplers	46.8	38-21-17	90
					24	WOH-WOH-WOH-1			
		35			24	WOH-WOH-WOH-WOH			
37.0	120.5								
	Boring Terminated at 37 Feet								

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: AV
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

While drilling

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

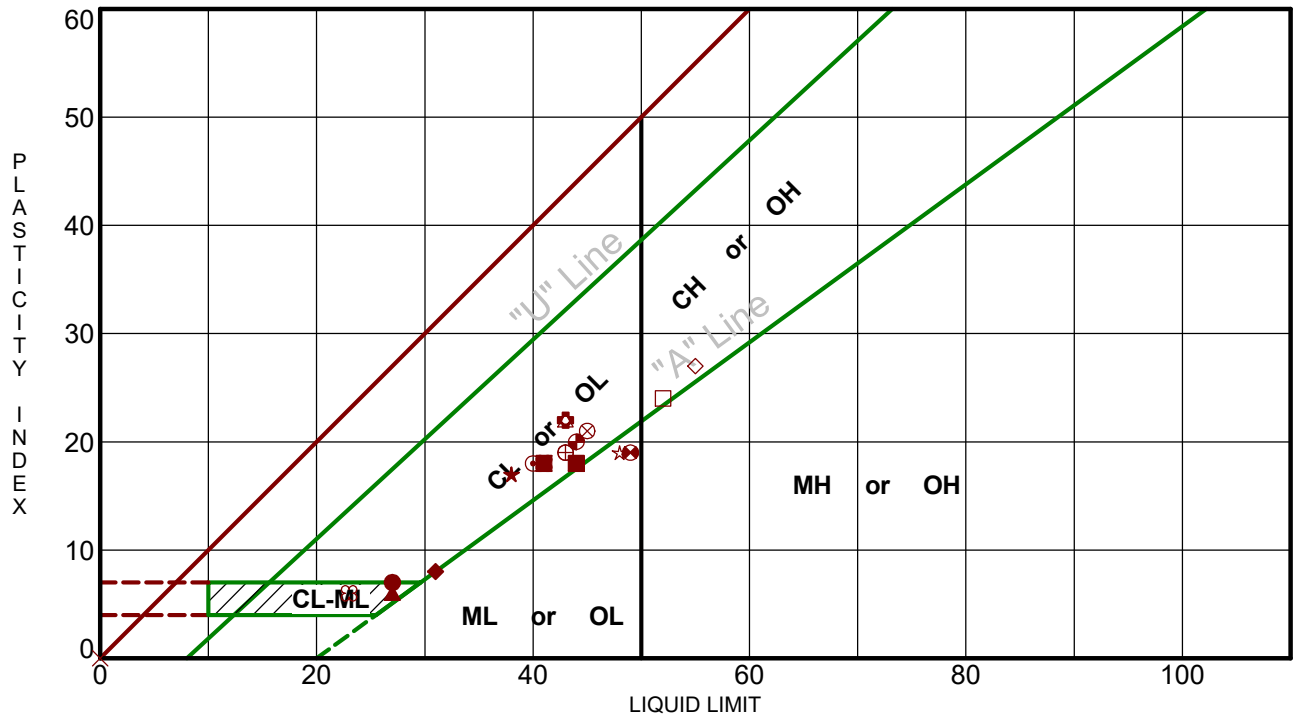
Boring Started: 02-15-2022 | Boring Completed: 02-16-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	K-199.6	15 - 17	27	20	7	98.7	CL-ML	SILTY CLAY
⊠	K-199.6	28 - 30	41	23	18	95.0	CL	LEAN CLAY
▲	K-199.7	15 - 17	27	21	6	99.7	CL-ML	SILTY CLAY
★	K-199.7	28 - 30	38	21	17	89.5	CL	LEAN CLAY
⊙	K-200.7	20 - 21.5	40	22	18	91.6	CL	LEAN CLAY
✿	K-200.7	73 - 75	43	21	22	86.9	CL	LEAN CLAY
○	K-200.8	6 - 8	43	24	19	89.6	CL	LEAN CLAY
△	K-200.8	25 - 27	43	21	22	93.8	CL	LEAN CLAY
⊗	K-200.9	6 - 8	45	24	21	70.4	CL	LEAN CLAY with SAND
⊕	K-200.9	21 - 23	43	24	19	81.3	CL	LEAN CLAY with SAND
□	K-200.9	35 - 36.5	52	28	24	70.4	CH	FAT CLAY with SAND
⊛	K-201.8	8 - 10	49	30	19	37.7	SM	SILTY SAND
◕	K-201.8	28 - 30	44	24	20	75.1	CL	LEAN CLAY with SAND
☆	K-201.9	10 - 12	48	29	19	72.4	ML	SILT with SAND
✿	K-201.9	28 - 30	23	17	6	96.8	CL-ML	SILTY CLAY
■	K-203.4	8 - 10	44	26	18	57.1	CL	SANDY LEAN CLAY
◆	K-203.4	20 - 22	31	23	8	92.9	ML	SILT
◇	K-203.5	22 - 24	55	28	27	57.6	CH	SANDY FAT CLAY
✕	K-203.5	33 - 35	NP	NP	NP	16.4	SM	SILTY SAND with GRAVEL
✖	K-203.6	10 - 12	41	23	18	83.2	CL	LEAN CLAY with SAND

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

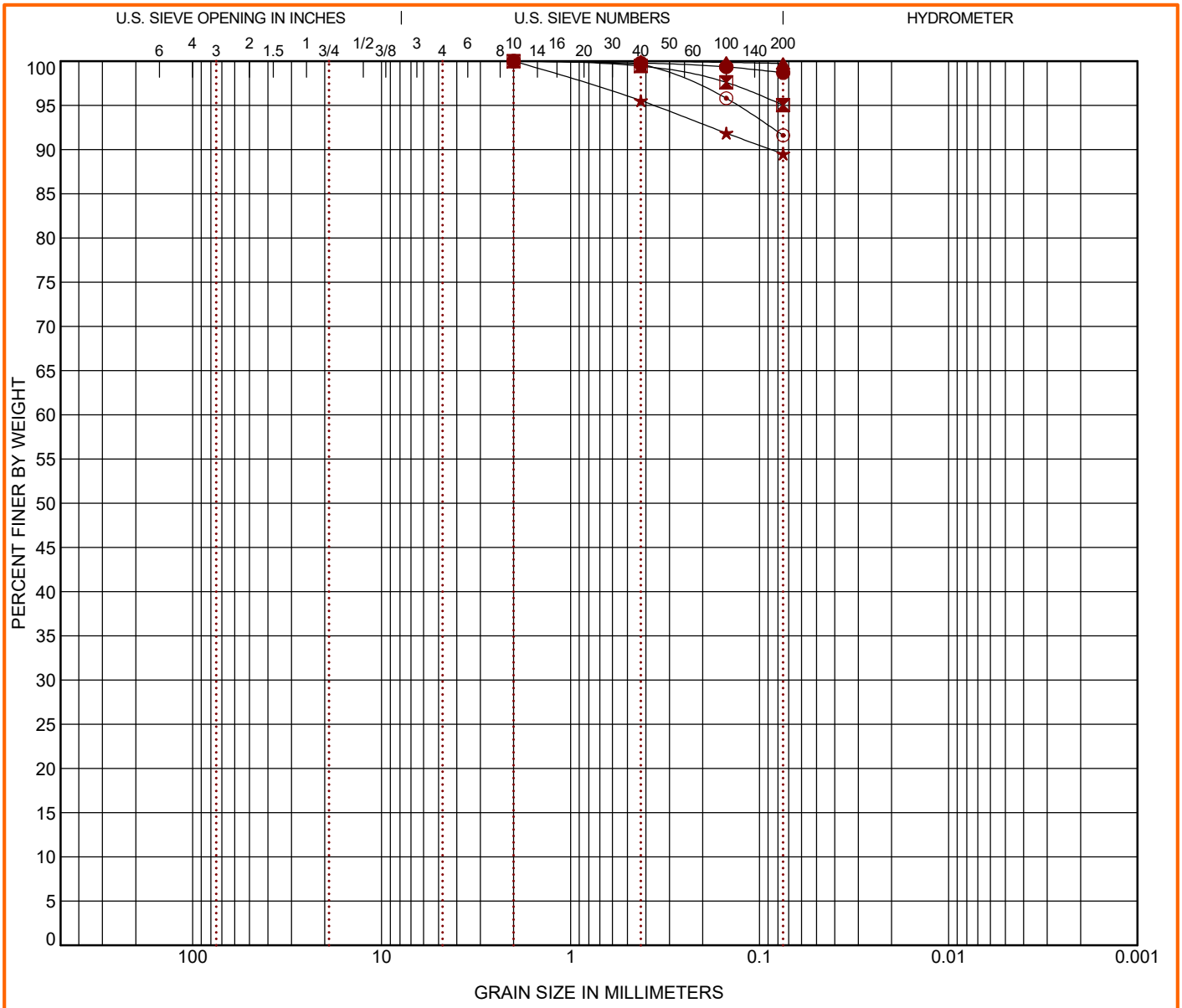
Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

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
●	K-199.6	15 - 17	SILTY CLAY (CL-ML)	32.3	27	20	7		
⊠	K-199.6	28 - 30	LEAN CLAY (CL)	44.8	41	23	18		
▲	K-199.7	15 - 17	SILTY CLAY (CL-ML)	31.6	27	21	6		
★	K-199.7	28 - 30	LEAN CLAY (CL)	46.8	38	21	17		
⊙	K-200.7	20 - 21.5	LEAN CLAY (CL)	37.6	40	22	18		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-199.6	15 - 17	2				0.0	0.0	1.3		98.7	
⊠	K-199.6	28 - 30	2				0.0	0.0	5.0		95.0	
▲	K-199.7	15 - 17	0.425				0.0	0.0	0.3		99.7	
★	K-199.7	28 - 30	2				0.0	0.0	10.5		89.5	
⊙	K-200.7	20 - 21.5	2				0.0	0.0	8.4		91.6	

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

Kiewit

MEMORANDUM

DATE: November 10, 2022

TO: Todd Kilduff; Kilduff Underground Engineering, Inc.

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

SUBJECT: Geotechnical Data: Segment 10 - Package 6 - HDD Crossing 92/92A – Revision 1
Champlain Hudson Power Express Project
Selkirk, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located south of Selkirk, New York. The approximate station for the start of HDD crossing number 92/92A is STA 60092+00 (42.5134° N, 73.8132° W).

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

- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013
- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Package 6, Selkirk to Catskill, Rev-1, dated June 28, 2022.
- Terracon, Results of Field Exploration, Champlain-Hudson Power Express – Additional HDD Borings – Phase 3, Fort Ann to Coxsackie, NY, dated November 3, 2022.

Contact us if you have questions or require additional information.

HDD 92/92.A
Borings B200.6-1, B200.7-1, K-200.7,
K-200.8, K-200.9, KB-200.6, KB-200.8A
Segment 10 - Design Package 6

CHPE Segment 10 - Package 6
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A199.7-1	1344990.8	678939.9	159.0
	A205.2-1	1317487.9	677289.6	204.6
	A206.62-1	1310345.7	678496.2	186.8
	A207.0-1	1308517.7	677770.1	179.6
	A209.05-1	1298062.1	675944.3	148.6
	A219.05-1	1247052.0	666820.5	128.8
	B198.9-1	1348887.4	679090.7	173.5
	B200.6-1	1340723.0	677093.4	96.3
	B200.7-1	1340001.8	676794.4	128.5
	B201.7-1	1335310.5	675758.1	162.1
	B201.9-1	1334029.9	676014.8	173.3
	B202.1-1	1333294.3	676182.6	168.3
	B203.45-1	1326328.9	678471.9	171.2
	B203.5-1	1325831.2	678645.3	183.2
	B204.2-1	1322268.4	678463.0	198.8
	B204.7-1	1320048.9	677891.8	207.1
	B205.8-1	1314638.7	678588.0	141.5
	B205.9-2	1313866.7	678637.8	190.3
	B207.9-1	1303512.5	676338.7	156.2
	B208.2-1	1302277.3	676188.9	152.0
	B208.3-1	1301673.4	676120.2	150.0
	B208.5-1	1300907.6	675929.0	116.7
	B210.0-1	1293021.1	676353.2	109.9
	B210.4-1	1291223.1	676583.0	120.5
	B211.2-1	1286509.8	676960.2	132.6
	B211.5-1	1285068.8	677013.1	140.7
	B211.7-1	1284088.5	676965.4	141.5
	B212.0-1	1282469.0	676857.5	138.9
	B212.2-1	1281498.0	676590.5	130.8
	B214.6-1	1269721.4	672670.9	124.9
	B216.1-1	1262073.1	670916.0	127.0
	B216.4-1	1260344.1	670520.5	128.3
	B216.6-1	1259315.9	670290.2	129.8
	B219.5-1	1244816.4	666093.7	130.4
AECOM**	SC-1A	1348656.7	679220.0	176.4
	SC-2A	1326692.2	678361.5	178.9
	SC-2C	1305133.1	676877.4	160.6

Notes:

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

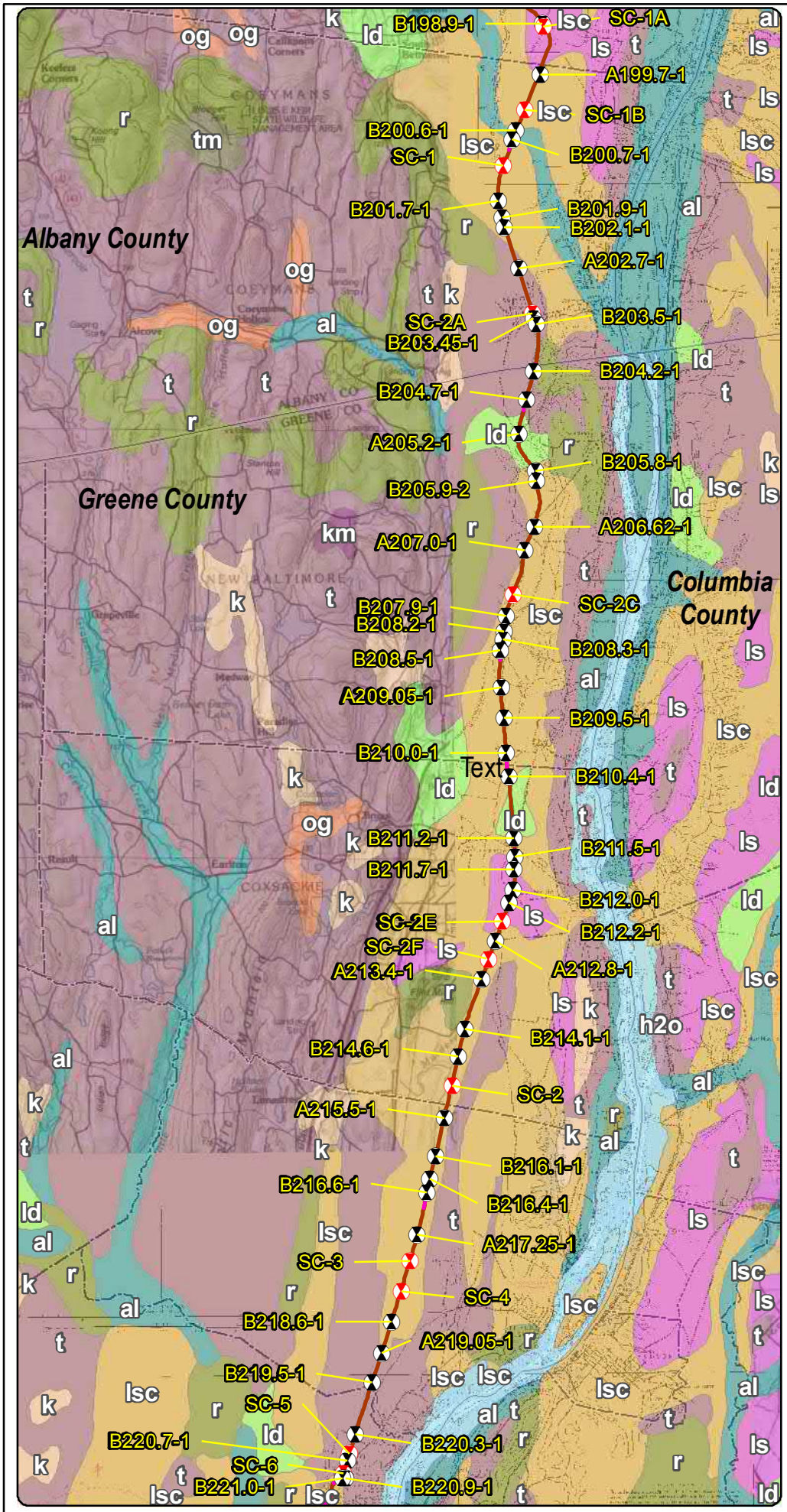
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

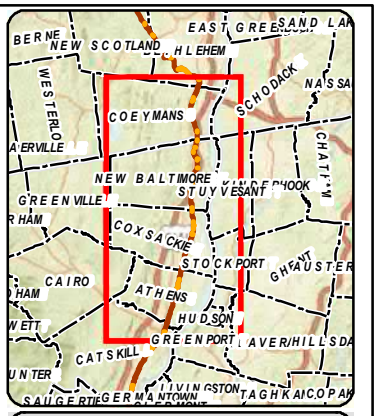
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.

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

Reference:

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





LEGEND

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

Surficial Geology

- al - Recent alluvium
- h2o - Water
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

1 0.5 0 1 Miles

Transmission Developments Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

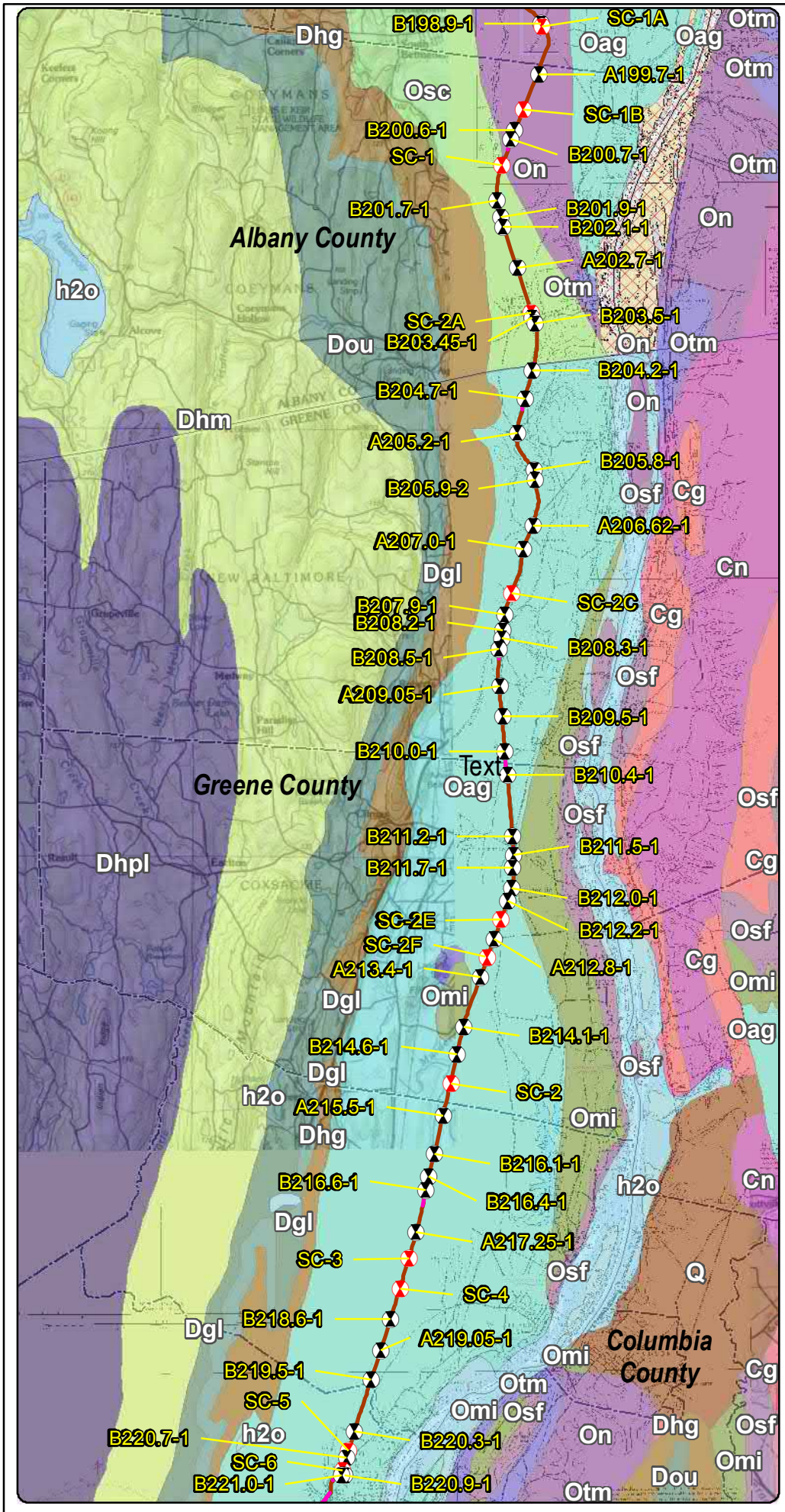
Surficial Geology and Geotechnical Borings Selkirk to Catskill Figure 3-10

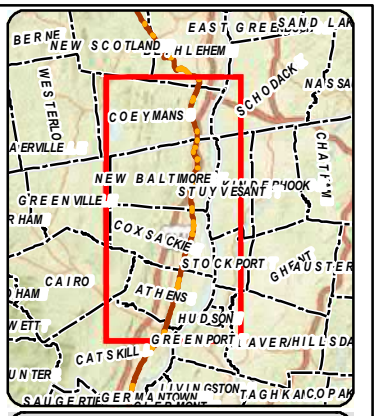
Prepared on 5/3/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190909Boring_Locations\Maps_for_May_2021_Report\Selkirk_to_Catskill_Boring_Locations_Surficial_May_2021_Report.mxd





LEGEND

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

Bedrock Geology

- Cg - Germantown Formation
- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhm - Undiff Lower Hamilton Group
- Dhpl - Plattekill Formation
- Dou - Onondaga Limestone
- No Label
- Oag - Austin Glen Form (graywacke, shale)
- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

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

N

1 0.5 0 1 Miles

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Selkirk to Catskill Figure 4-10

Prepared on 5/18/2021

by: AECOM

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

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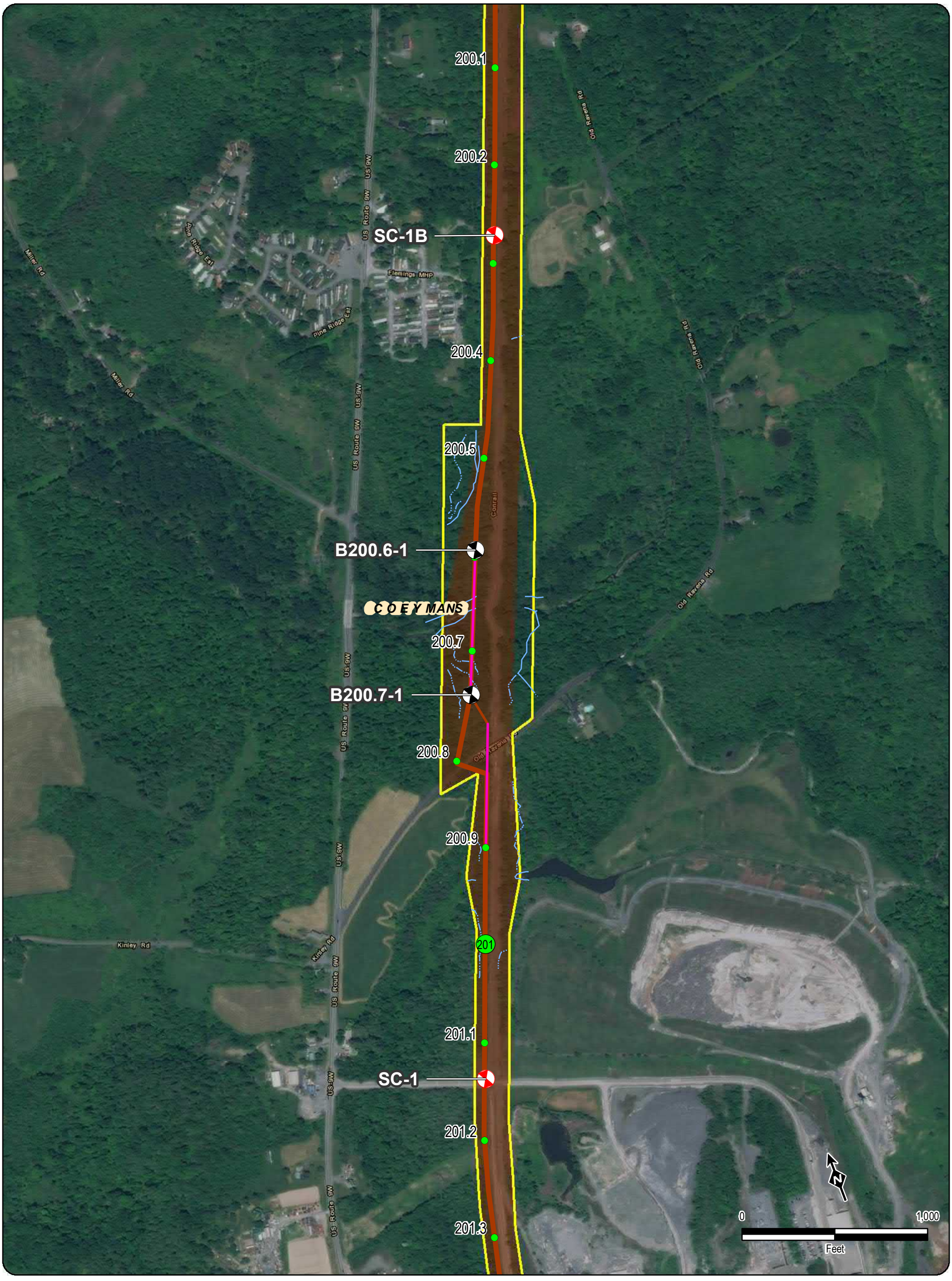

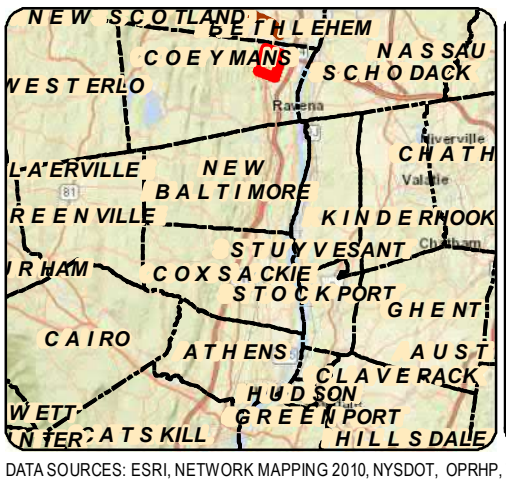

LEGEND

- 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

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

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Selkirk to Catskill

Figure A-10

Sheet 2 of 18

Prepared by: AECOM 5/19/2021

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TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

BORING	**B200.6-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 2

GROUNDWATER DATA			
FIRST ENCOUNTERED 2.0 '			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	40.0 '

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

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
▽	S-1	2 4 8 6				
	S-2	10 8 12 16			20.5	
5	S-3	10 14 16 15				
	S-4	9 9 9 4			21.6	
	S-5	7 5 8 7		***BROWN CLAY, SM SILT***		
10					32.3	
	S-6	5 5 6				
15					32.4	
				18.5		
20	S-7	6 4 5				
	S-8	7 5 7		***BROWN CLAY, TR SILT***	35.4	
25						
	S-9	7 6 5				
30				33.5		
	S-10	5 6 5		***BROWN TO GRAY CLAY, TR TO SM SILT***		
35						

DRN.	JPB
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

TEST BORING LOG

BORING	**B200.6-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	2 OF 2

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

DEPTH		A	B	C	DESCRIPTION	Wn	REMARKS
					BROWN TO GRAY CLAY, TR TO SM SILT		
40		S-11	5 5 4		40.0		
					END OF BORING AT 40'		
45							
50							
55							
60							
65							
70							
75							

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

BORING	**B200.7-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 2

GROUNDWATER DATA			
FIRST ENCOUNTERED 8.0 '			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	40.0 '

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	N/A
DATE STARTED	02/03/2013
DATE COMPLETED	02/03/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	7 9 8 10		***BROWN SILTY CLAY, TR TO SM F/M SAND*** 2.0		
	S-2	7 8 8 8			32.2	
5	S-3	10 12 16 14		***BROWN SILT, TR TO SM CLAY***		
▽	S-4	11 11 9 14		8.0	22.1	
10	S-5	6 6 7 8				
15	S-6	7 6 7			33.9	
20	S-7	6 6 6		***BROWN CLAY, TR SILT***		
25	S-8	6 4 5			30.1	
30	S-9	6 4 6				
35	S-10	6 5 5				

DRN.	JPB
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

TEST BORING LOG

BORING	**B200.7-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	2 OF 2

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

DEPTH		A	B	C	DESCRIPTION	Wn	REMARKS
40		S-11	6 5 6		***BROWN CLAY, TR SILT*** 40.0		
					END OF BORING AT 40'		
45							
50							
55							
60							
65							
70							
75							

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

S.W.COLE ENGINEERING, INC.

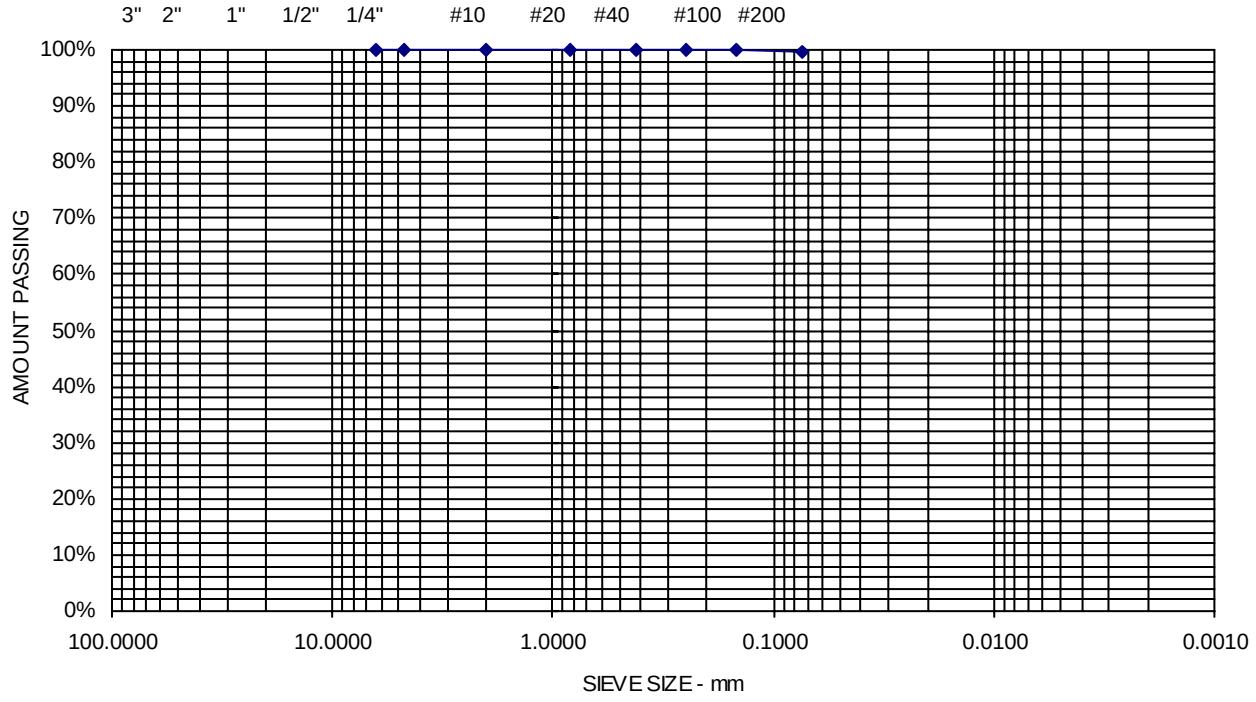
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10765S
		Date Received	2/12/2013
		Date Completed	2/15/2013
Material Source	**B200.6-1, NOT PROVIDED**	Tested By	SHAWN BENOIT

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0% Gravel
2.00 mm	**No. 10**	**100**	
850 um	**No. 20**	**100**	
425 um	**No. 40**	**100**	0.3% Sand
250 um	**No. 60**	**100**	
150 um	**No. 100**	**100**	
75 um	**No. 200**	**99.7**	99.7% Fines

BROWN CLAYEY SILT TRACE SAND (ML)



Comments: MOISTURE CONTENT = 24.9%

Sheet

S.W.COLE ENGINEERING, INC.

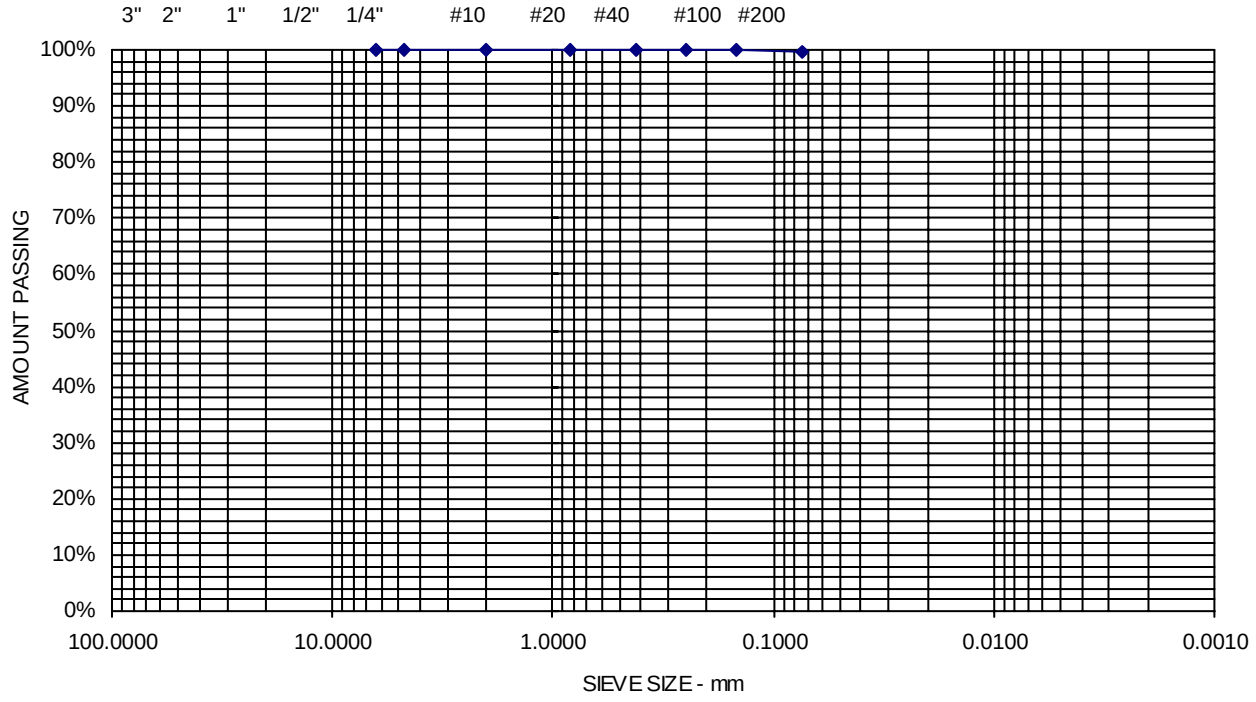
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10764S
		Date Received	2/12/2013
		Date Completed	2/15/2013
Material Source	**B200.6-1, 10.0' - 15.0'**	Tested By	SHAWN BENOIT

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0% Gravel
2.00 mm	**No. 10**	**100**	
850 um	**No. 20**	**100**	
425 um	**No. 40**	**100**	0.2% Sand
250 um	**No. 60**	**100**	
150 um	**No. 100**	**100**	
75 um	**No. 200**	**99.8**	99.8% Fines

BROWN CLAYEY SILT TRACE SAND (ML)



Comments: MOISTURE CONTENT = 31.6%

Sheet

S.W.COLE ENGINEERING, INC.

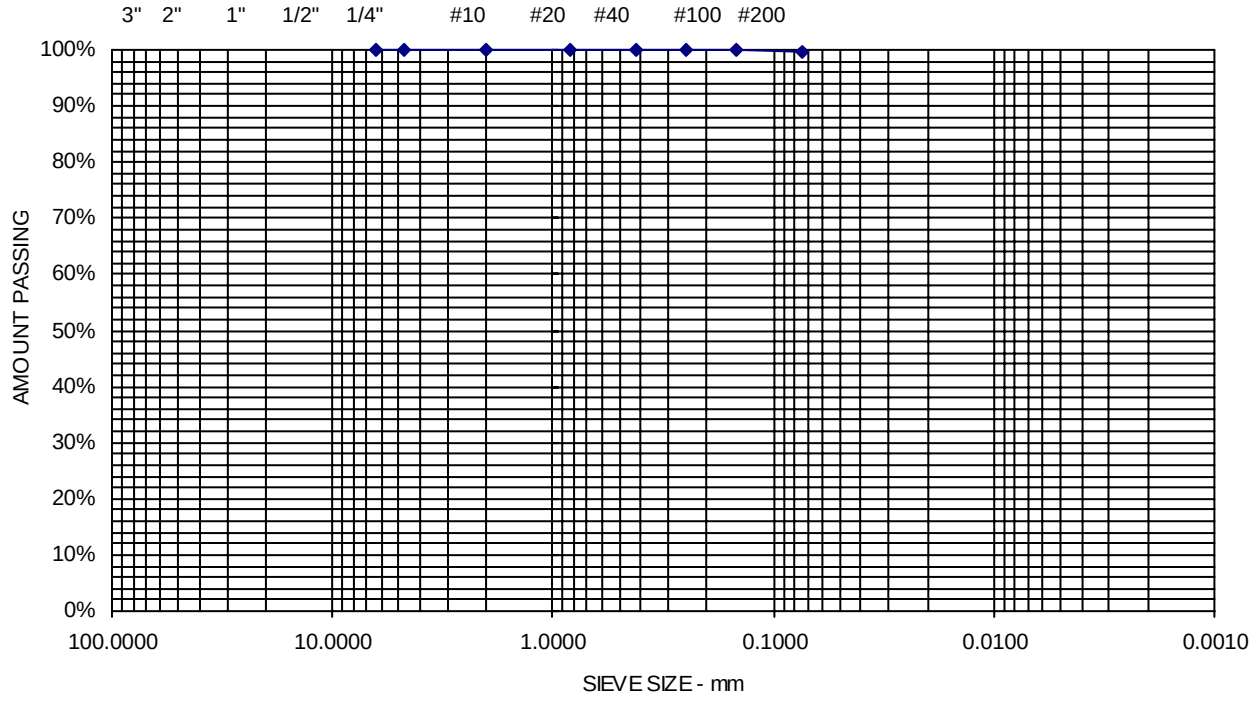
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10776S
		Date Received	2/12/2013
		Date Completed	2/14/2013
Material Source	**B200.7-1, 0.0' - 10.0'**	Tested By	SHAWN BENOIT

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0% Gravel
2.00 mm	**No. 10**	**100**	
850 um	**No. 20**	**100**	
425 um	**No. 40**	**100**	0.3% Sand
250 um	**No. 60**	**100**	
150 um	**No. 100**	**100**	
75 um	**No. 200**	**99.7**	99.7% Fines

BROWN CLAYEY SILT TRACE SAND (ML)



Comments: MOISTURE CONTENT = 23.7%

Sheet

S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D-422

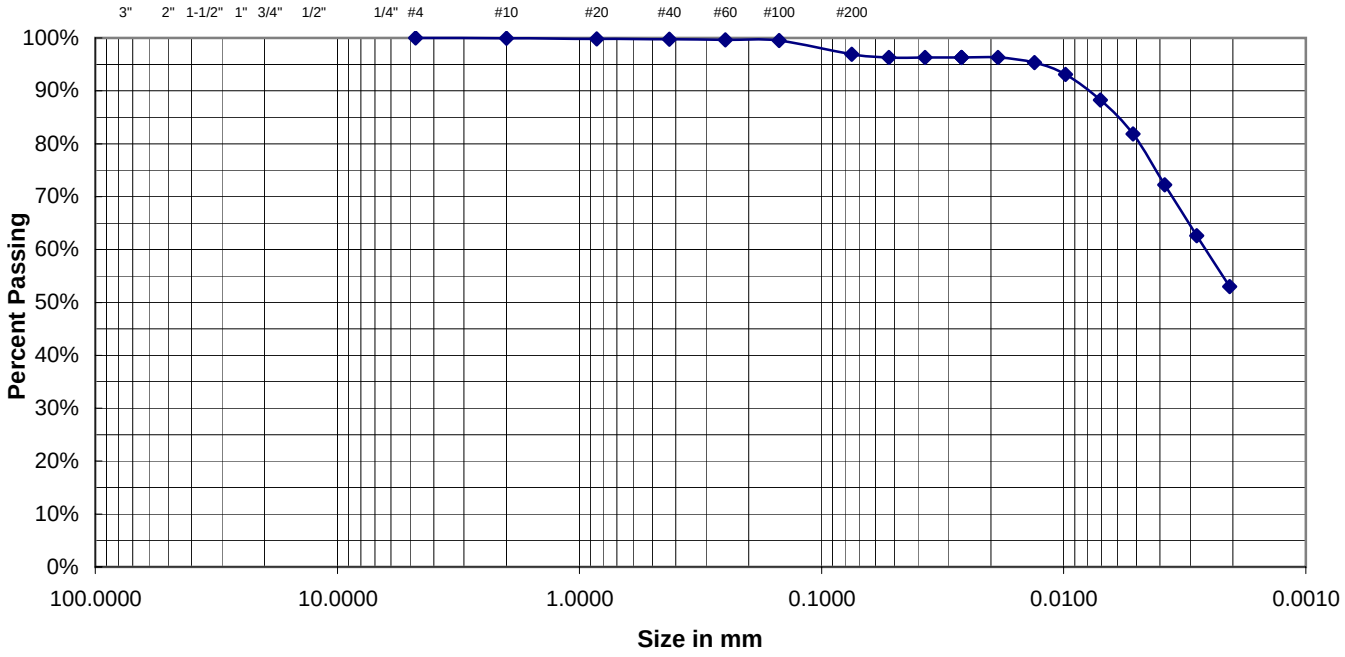
Project Name	CHAMPLAIN HUDSON POWER EXPRESS PROJECT	Project Number	10-1256
Client	TRC COMPANIES, INC	Lab ID	10796S
Material Type	BROWN SILTY CLAY TRACE SAND (CH)	Date Received	2/15/2013
Material Source	10.0'-13.0'	Date Completed	2/21/2013
Exploration	B-200.7-1	Tested By	MJS

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	**100**
2"	50	**100**
1-1/2"	37.5	**100**
1"	25	**100**
3/4"	19	**100**
1/2"	12.5	**100**
1/4"	6.3	**100**
No. 4	4.75	**100**
No. 10	2	**100**
No. 20	0.85	**100**
No. 40	0.425	**100**
No. 60	0.25	**100**
No. 100	0.15	**100**
No. 200	0.075	**96.9**

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.053	96.3
0.037	96.3
0.026	96.3
0.019	96.3
0.013	95.3
0.010	93.1
0.007	88.3
0.005	81.9
0.004	72.2
0.003	62.6
0.002	53.0



Particle Distribution	
Gravel, retained on #4	0.0%
Sand, passing #4 and retained on #200	3.1%
Fines, 0.074 to 0.005	16.1%
Clay Fraction, <0.005	80.9%

Comments: MOISTURE CONTENT = 31.2%

Chad B. Michaud
Reviewed By

S.W.COLE ENGINEERING, INC. • Geotechnical Engineering • Field & Lab Testing • Scientific & Environmental Consulting

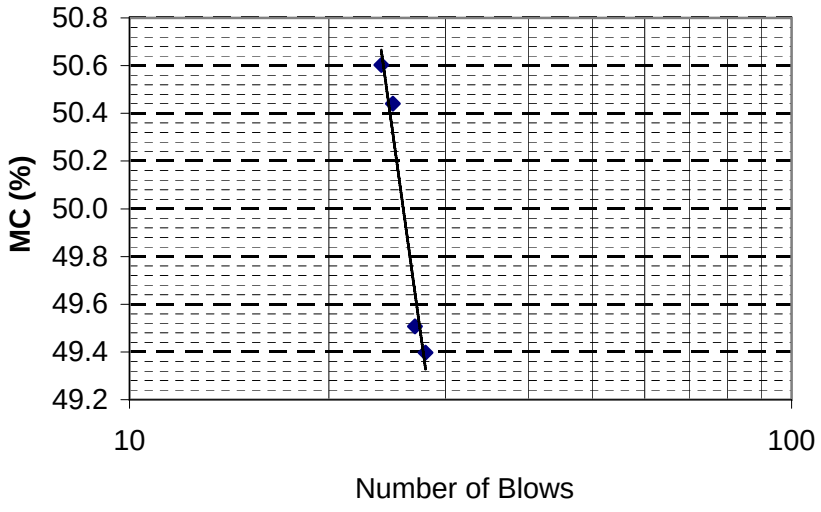
REPORT OF ATTERBERG LIMITS
ASTM D4318

Project Name	CHAMPLAIN HUDSON POWER EXPRESS	Project Number	10-1256
Client	TRC COMPANIES, INC	Laboratory ID	10796S
Soil Description	BROWN SILTY CLAY TRACE SAND (CH)	Date Received	2/15/2013
Soil Source	B-200.7-1, 10.0'-13.0'	Date Completed	2/21/2013
		Tested By	JJR

TEST RESULTS

Estimate of Material Retained On the No. 40 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0%	50	26	24

LIQUID LIMIT CURVE

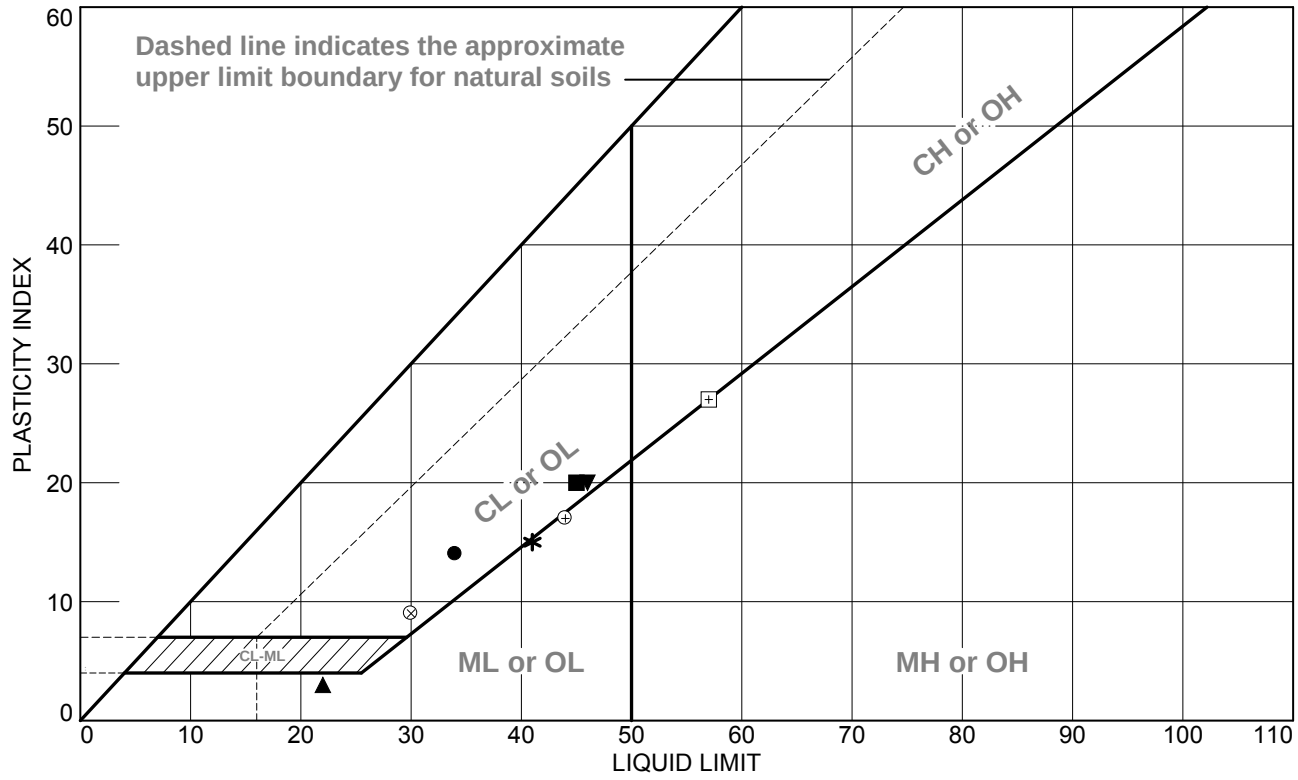


SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
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)					
B200.6-1	S-2	2.0-4.0	-	-	-	-		-	-	-	-	-	20.5	-	-	-
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	-	21.6	-	-	-
	S-5	8.0-10.0	CL	-	-	-		46	26	20	0.3	-	32.3	-	-	-
	S-6	13.5-15.0	-	-	-	-		-	-	-	-	-	32.4	-	-	-
	S-8	23.5-25.0	ML	-	-	-		41	26	15	0.6	-	35.4	-	-	-
B200.7-1	S-2	2.0-4.0	-	-	-	-		-	-	-	-	-	32.2	-	-	-
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	-	22.1	-	-	-
	S-6	13.5-15.0	-	-	-	-		-	-	-	-	-	33.9	-	-	-
	S-8	23.5-25.0	CL/ML	-	-	-		44	27	17	0.2	-	30.1	-	-	-
B201.7-1	S-3	4.0-6.0	CH	-	-	-		57	30	27	0.2	-	36.4	-	-	-
	S-7	18.5-20.0	CL	-	-	-		30	21	9	0.9	-	29.5	-	-	-

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B192.4-1	S-6	13.5-15.0 FT	28.4	20	34	14	CL
■	B193.5-1	S-7	18.5-20.0 FT	49.2	25	45	20	CL
▲	B198.7-1	S-5	8.0-10.0 FT	23.6	19	22	3	ML
◆	B198.9-1	S-7	18.5-20.0 FT	21.3	NP	NV	NP	ML
▼	B200.6-1	S-5	8.0-10.0 FT	32.3	26	46	20	CL
✱	B200.6-1	S-8	23.5-25.0 FT	35.4	26	41	15	ML
⊕	B200.7-1	S-8	23.5-25.0 FT	30.1	27	44	17	CL/ML
⊞	B201.7-1	S-3	4.0-6.0 FT	36.4	30	57	27	CH
⊗	B201.7-1	S-7	18.5-20.0 FT	29.5	21	30	9	CL

TRC
Engineers, Inc.
Mt. Laurel, NJ

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

Project No.: 195651 **Figure** 3

Terracon GeoReport

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. K-200.7

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5094° Longitude: -73.8148°

Surface Elev.: 149.1 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
1.0	148	**FILL - BALLAST**, black, loose
		SILT AND CLAY (CL-ML), trace rootlets, varved, brown, soft to medium stiff
6.5	142.5	**LEAN CLAY (CL)**, varved, gray, very soft to soft

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		18	1-1-2-3 N=3			
		12	4-4-4-4 N=8			
5		18	2-2-3-33 N=5	30.2		
		20	2-2-3-2 N=5	40.5		
		24	1-1-1-2 N=2			
10		24	2-2-2-3 N=4			
15		18	WOH-1-1 N=2			
20		18	WOH-WOH -WOH	37.6	40-22-18	92
25		18	WOH-WOH -WOH			

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer
WOR = Weight of Rod

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-14-2022 | Boring Completed: 03-15-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

BORING LOG NO. K-200.7

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5094° Longitude: -73.8148°

Surface Elev.: 149.1 (Ft.)

DEPTH ELEVATION (Ft.)

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)
			LEAN CLAY (CL), varved, gray, very soft to soft *(continued)*	
30				
		18	WOH-WOH -WOH	
35				
		18	WOH-WOH -WOH	
40				
		18	WOH-WOH -WOH	
45				
		18	WOH-WOH -WOH	
50				
		18	WOH-WOH -WOH	44.9
55				
		18	WOR-WOR	

GRAPHIC LOG | WATER LEVEL OBSERVATIONS | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer
WOR = Weight of Rod

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-14-2022 | Boring Completed: 03-15-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

BORING LOG NO. K-200.7

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5094° Longitude: -73.8148°

Surface Elev.: 149.1 (Ft.)

DEPTH ELEVATION (Ft.)

GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
LEAN CLAY (CL), varved, gray, very soft to soft *(continued)*					-WOR			
	60			18	WOR-WOR -WOR			
	65			18	WOH-WOH-1 N=1			
	70			18	WOH-WOH -WOH			
				24	WOH-WOH -WOH 3" Split Spoon with Ring Sampler	43.8	43-21-22	87
	75			18	WOH-WOH -WOH			
	80			18	WOH-WOH -WOH			

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer
WOR = Weight of Rod

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-14-2022 | Boring Completed: 03-15-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

BORING LOG NO. K-200.7

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5094° Longitude: -73.8148°

Surface Elev.: 149.1 (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
		LEAN CLAY (CL), varved, gray, very soft to soft *(continued)*	85		X	18	WOH-WOH -WOH			
			90		X	18	1-1/12"			
	91.5	57.5								
		Boring Terminated at 91.5 Feet								

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer
WOR = Weight of Rod

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-14-2022 | Boring Completed: 03-15-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

BORING LOG NO. K-200.8

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5087° Longitude: -73.8149°

Surface Elev.: 151.7 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.0	151.7	**FILL - GRAVELLY SILT**, trace sand, brown, stiff
2.0	149.5	**LEAN CLAY (CL)**, brown, medium stiff
10.0	141.5	**LEAN CLAY (CL)**, gray, very soft

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		15	5-9-5-6 N=14			
		17	3-3-4-3 N=7			
5		24	4-4-4-5 N=8			
		24	4-3-3-3 N=6	41.3	43-24-19	90
		16	2-3-3-3 N=6			
10		24	WOH-WOH-1-2 N=1			
15		24	WOH-WOH -WOH-2	40.6		
20		24	WOH-WOH -WOH-2			
25		24	WOH-WOH-2-3 3" Split Spoon With Ring Samplers	44.8	43-21-22	94

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 provided by Kiewit

Notes:

Logged by: MO
Hammer Efficiency Summary:
Energy Transfer Ratio: 86.9 +/- 2.2%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-18-2022 | Boring Completed: 02-18-2022

Drill Rig: Mobile B-57 | Driller: B. Duffy

Project No.: JB215256C

BORING LOG NO. K-200.8

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5087° Longitude: -73.8149°

Surface Elev.: 151.7 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), gray, very soft *(continued)*	30						
				24	WOH-WOH -WOH-1			
		35						
				24	WOH-WOH -WOH-1	43.0		
		40						
				24	WOH-WOH -WOH-1			
42.0	109.5							
	Boring Terminated at 42 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 provided by Kiewit

Notes:

Logged by: MO
Hammer Efficiency Summary:
Energy Transfer Ratio: 86.9 +/- 2.2%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-18-2022 | Boring Completed: 02-18-2022

Drill Rig: Mobile B-57 | Driller: B. Duffy

Project No.: JB215256C

BORING LOG NO. K-200.9

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5077° Longitude: -73.8155°

Surface Elev.: 149.0 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - BALLAST, black, loose		3	2-2-1-1 N=3			
2.5	146.5	**SILT AND CLAY (CL-ML)**, brown, medium stiff to very stiff		0	3-3-3-4 N=6			
		grades with sand partings	5	16	3-4-6-9 N=10			
6.0	143	**LEAN CLAY WITH SAND (CL)**, brown, medium stiff to very stiff		20	9-10-14-10 N=24	30.4	45-24-21	70
				19	3-4-6-7 N=10			
			10	24	8-8-10-12 N=18			
			15	18	2-3-5 N=8			
			20	18	1-3-3 N=6			
21.0	128	**LEAN CLAY WITH SAND (CL)**, varved, gray, very soft to soft		24	3-5-5-6 3" Split Spoon With Ring Samplers	35.4	43-24-19	81
			25	18	2-1-2 N=3			

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-16-2022 | Boring Completed: 03-16-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

BORING LOG NO. K-200.9

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.5077° Longitude: -73.8155°

Surface Elev.: 149.0 (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
		LEAN CLAY WITH SAND (CL), varved, gray, soft *(continued)*	30							
					X	18	WOH-1-2 N=3			
	35.0	114	35							
		FAT CLAY WITH SAND (CH), varved, gray, very soft			X	18	WOH-WOH-1 N=1	46.7	52-28-24	70
	41.5	107.5	40							
		Boring Terminated at 41.5 Feet			X	18	WOH-WOH-WOH			

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

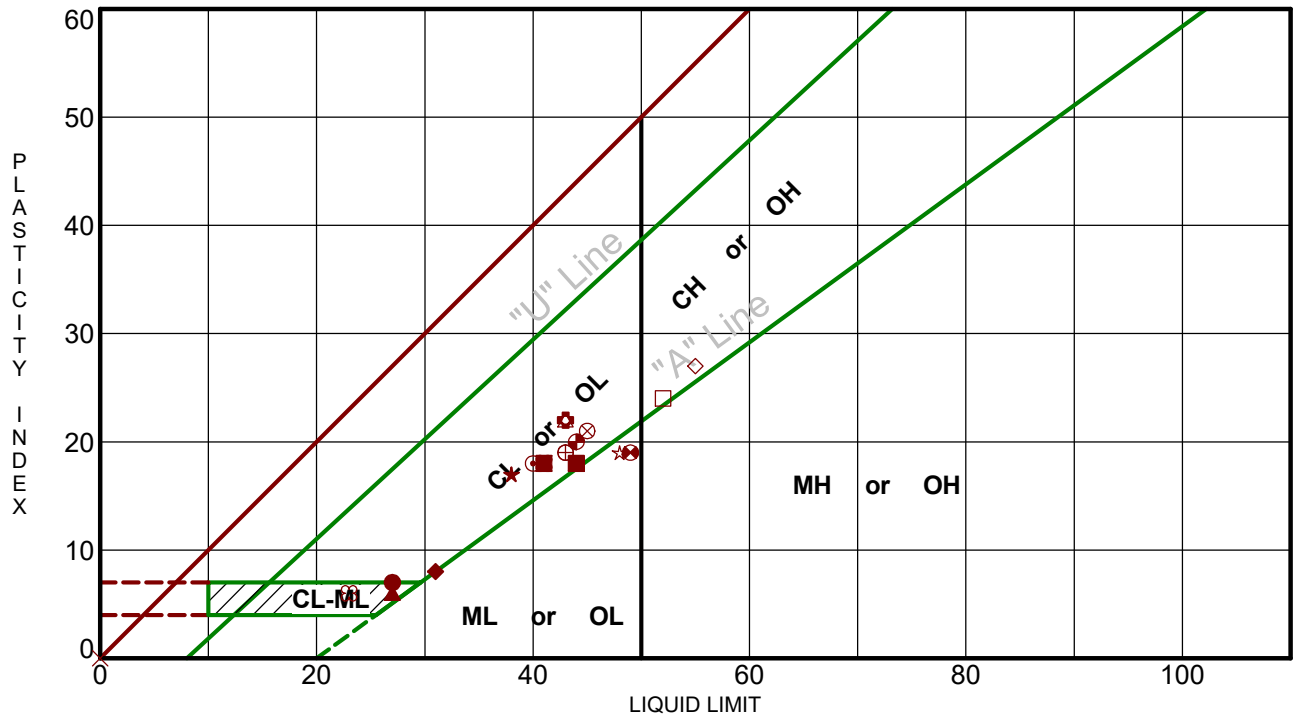
Boring Started: 03-16-2022 | Boring Completed: 03-16-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	K-199.6	15 - 17	27	20	7	98.7	CL-ML	SILTY CLAY
⊠	K-199.6	28 - 30	41	23	18	95.0	CL	LEAN CLAY
▲	K-199.7	15 - 17	27	21	6	99.7	CL-ML	SILTY CLAY
★	K-199.7	28 - 30	38	21	17	89.5	CL	LEAN CLAY
⊙	K-200.7	20 - 21.5	40	22	18	91.6	CL	LEAN CLAY
✿	K-200.7	73 - 75	43	21	22	86.9	CL	LEAN CLAY
○	K-200.8	6 - 8	43	24	19	89.6	CL	LEAN CLAY
△	K-200.8	25 - 27	43	21	22	93.8	CL	LEAN CLAY
⊗	K-200.9	6 - 8	45	24	21	70.4	CL	LEAN CLAY with SAND
⊕	K-200.9	21 - 23	43	24	19	81.3	CL	LEAN CLAY with SAND
□	K-200.9	35 - 36.5	52	28	24	70.4	CH	FAT CLAY with SAND
⊛	K-201.8	8 - 10	49	30	19	37.7	SM	SILTY SAND
◕	K-201.8	28 - 30	44	24	20	75.1	CL	LEAN CLAY with SAND
☆	K-201.9	10 - 12	48	29	19	72.4	ML	SILT with SAND
✿	K-201.9	28 - 30	23	17	6	96.8	CL-ML	SILTY CLAY
■	K-203.4	8 - 10	44	26	18	57.1	CL	SANDY LEAN CLAY
◆	K-203.4	20 - 22	31	23	8	92.9	ML	SILT
◇	K-203.5	22 - 24	55	28	27	57.6	CH	SANDY FAT CLAY
✕	K-203.5	33 - 35	NP	NP	NP	16.4	SM	SILTY SAND with GRAVEL
✖	K-203.6	10 - 12	41	23	18	83.2	CL	LEAN CLAY with SAND

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

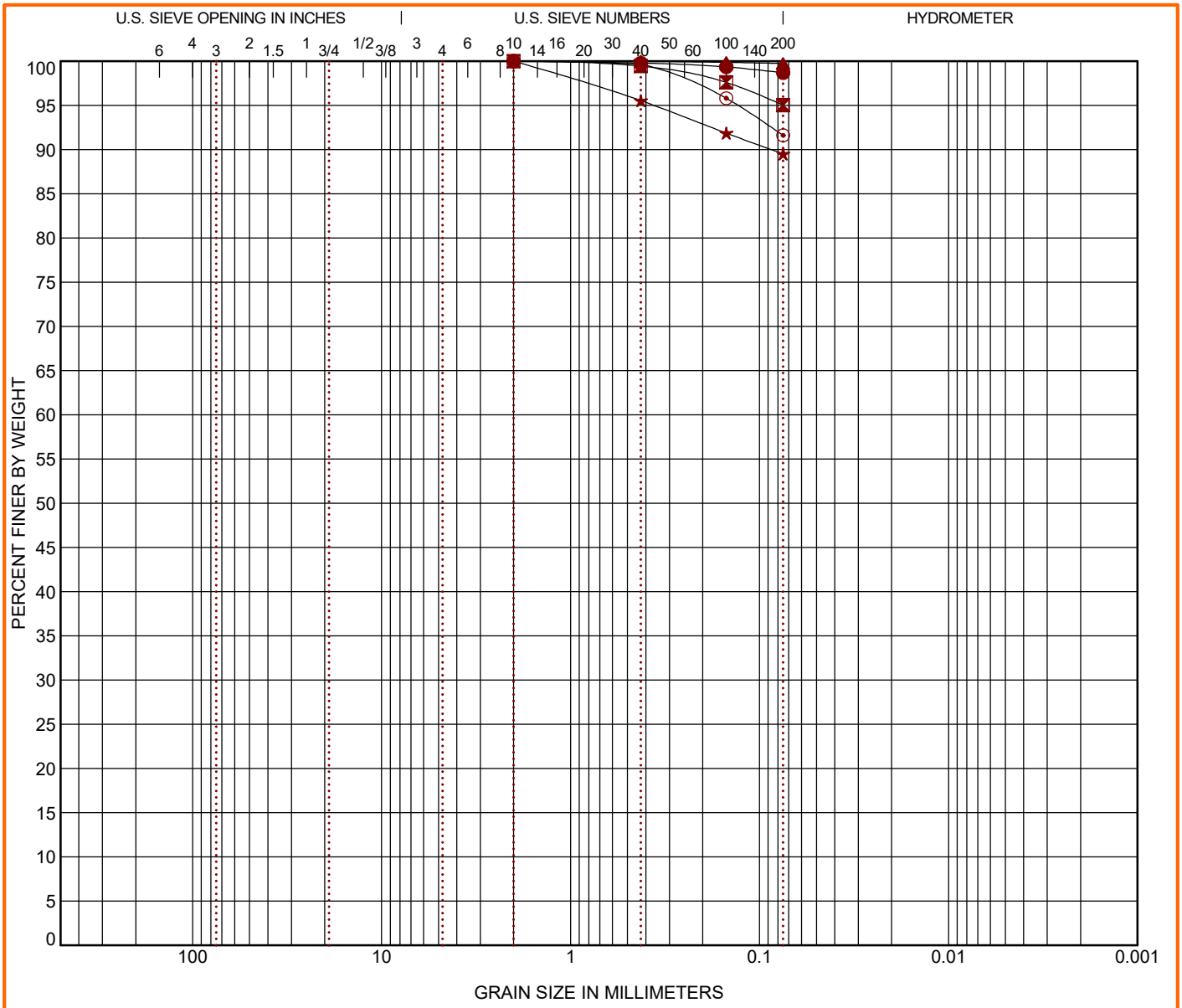
Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

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
●	K-199.6	15 - 17	SILTY CLAY (CL-ML)	32.3	27	20	7		
⊠	K-199.6	28 - 30	LEAN CLAY (CL)	44.8	41	23	18		
▲	K-199.7	15 - 17	SILTY CLAY (CL-ML)	31.6	27	21	6		
★	K-199.7	28 - 30	LEAN CLAY (CL)	46.8	38	21	17		
⊙	K-200.7	20 - 21.5	LEAN CLAY (CL)	37.6	40	22	18		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-199.6	15 - 17	2				0.0	0.0	1.3		98.7	
⊠	K-199.6	28 - 30	2				0.0	0.0	5.0		95.0	
▲	K-199.7	15 - 17	0.425				0.0	0.0	0.3		99.7	
★	K-199.7	28 - 30	2				0.0	0.0	10.5		89.5	
⊙	K-200.7	20 - 21.5	2				0.0	0.0	8.4		91.6	

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

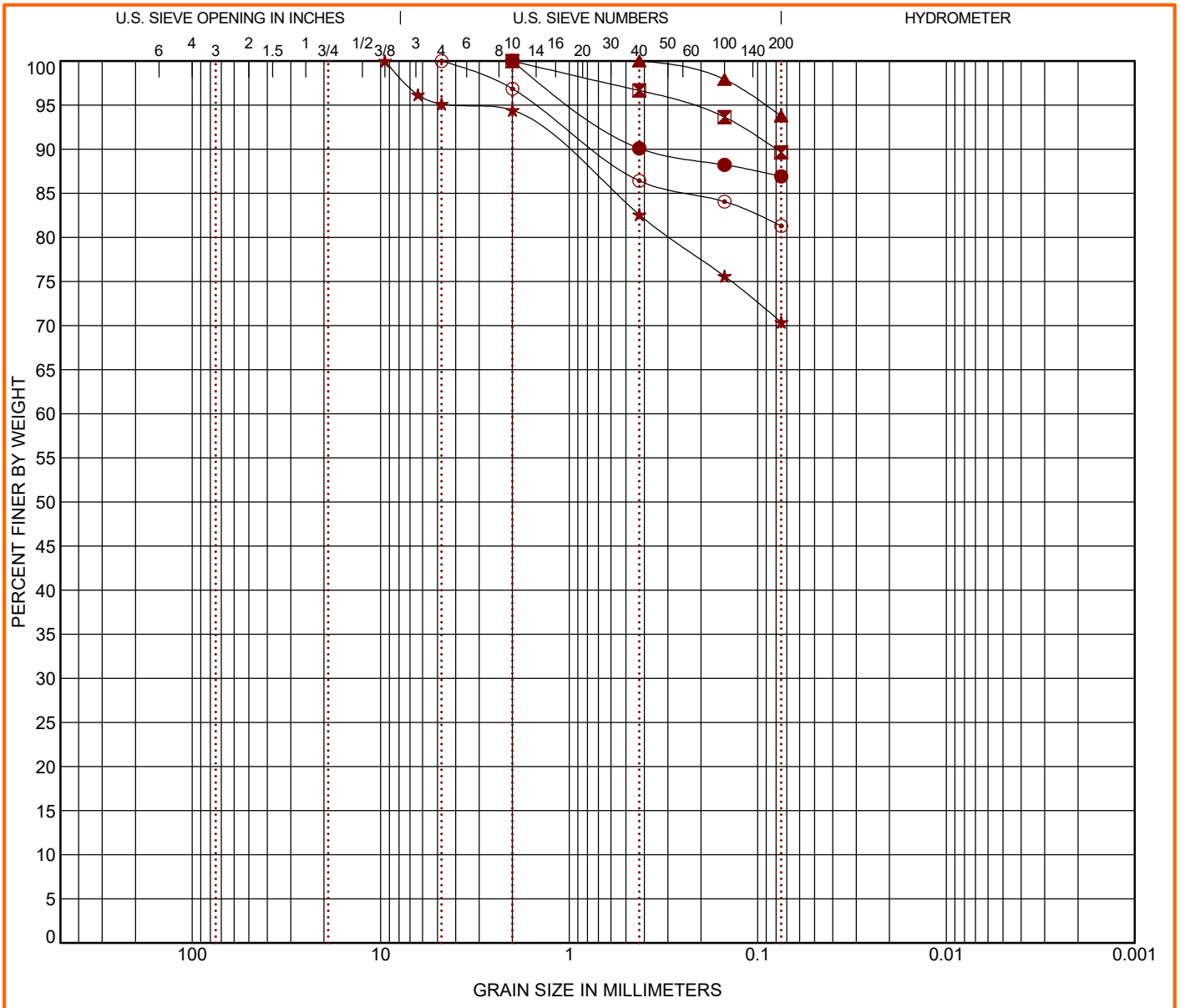
Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

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
●	K-200.7	73 - 75	LEAN CLAY (CL)	43.8	43	21	22		
⊠	K-200.8	6 - 8	LEAN CLAY (CL)	41.3	43	24	19		
▲	K-200.8	25 - 27	LEAN CLAY (CL)	44.8	43	21	22		
★	K-200.9	6 - 8	LEAN CLAY with SAND (CL)	30.4	45	24	21		
⊙	K-200.9	21 - 23	LEAN CLAY with SAND (CL)	35.4	43	24	19		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-200.7	73 - 75	2				0.0	0.0	13.1		86.9	
⊠	K-200.8	6 - 8	2				0.0	0.0	10.4		89.6	
▲	K-200.8	25 - 27	0.425				0.0	0.0	6.3		93.8	
★	K-200.9	6 - 8	9.5				0.0	4.9	24.7		70.4	
⊙	K-200.9	21 - 23	4.75				0.0	0.0	18.7		81.3	

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

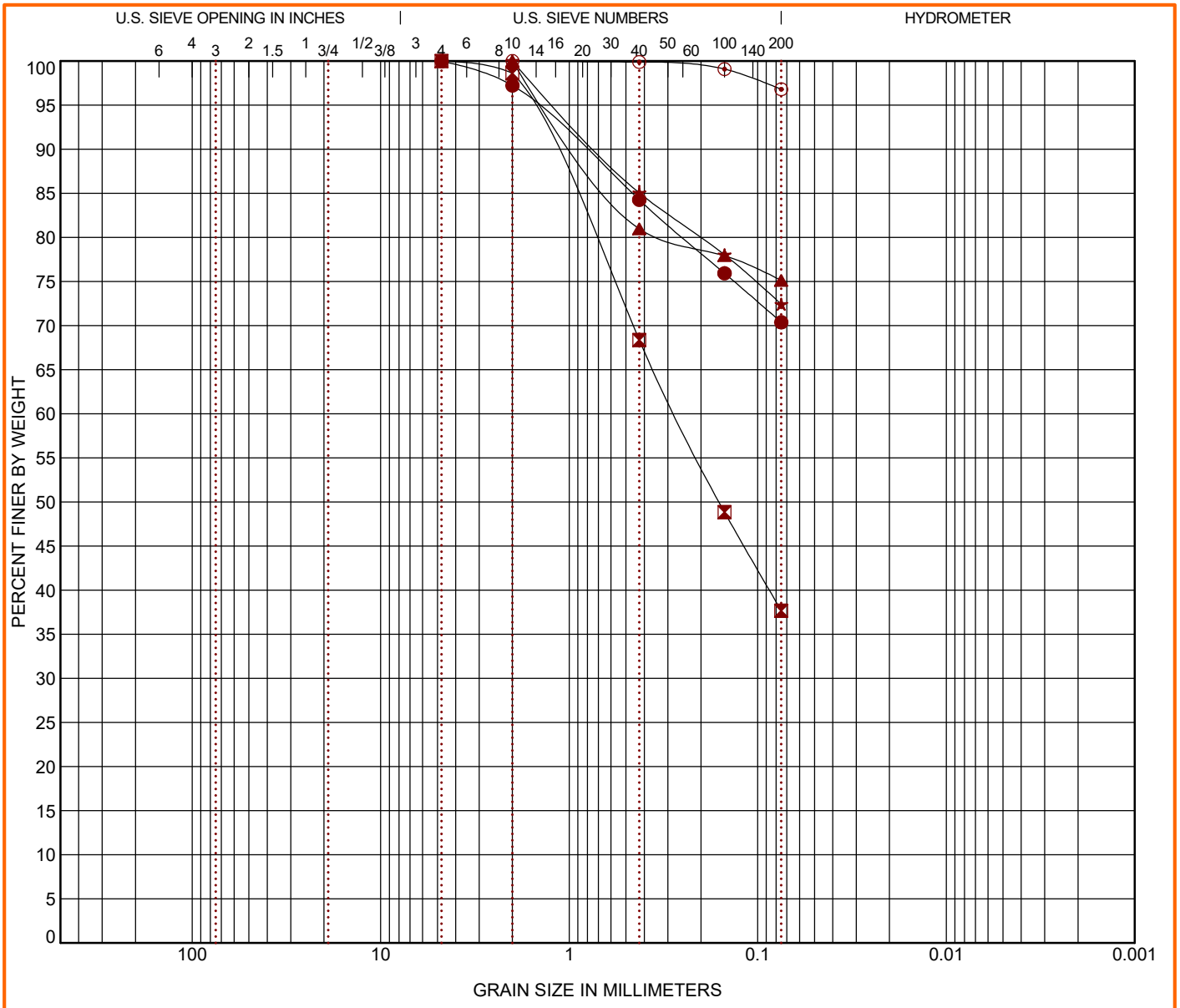
Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

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
●	K-200.9	35 - 36.5	FAT CLAY with SAND (CH)	46.7	52	28	24		
⊠	K-201.8	8 - 10	SILTY SAND (SM)	40.5	49	30	19		
▲	K-201.8	28 - 30	LEAN CLAY with SAND (CL)	40.7	44	24	20		
★	K-201.9	10 - 12	SILT with SAND (ML)	34.0	48	29	19		
⊙	K-201.9	28 - 30	SILTY CLAY (CL-ML)	20.7	23	17	6		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-200.9	35 - 36.5	4.75				0.0	0.0	29.6		70.4	
⊠	K-201.8	8 - 10	4.75	0.272			0.0	0.0	62.3		37.7	
▲	K-201.8	28 - 30	2				0.0	0.0	24.9		75.1	
★	K-201.9	10 - 12	2				0.0	0.0	27.6		72.4	
⊙	K-201.9	28 - 30	2				0.0	0.0	3.2		96.8	

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256C CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 4/12/22

Summary of Laboratory Results

BORING ID	Depth (Ft.)	Organic Content (%)
K-200.7	4-6	0.4
K-216.6	2-4	8.1

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkrik to Catskill, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

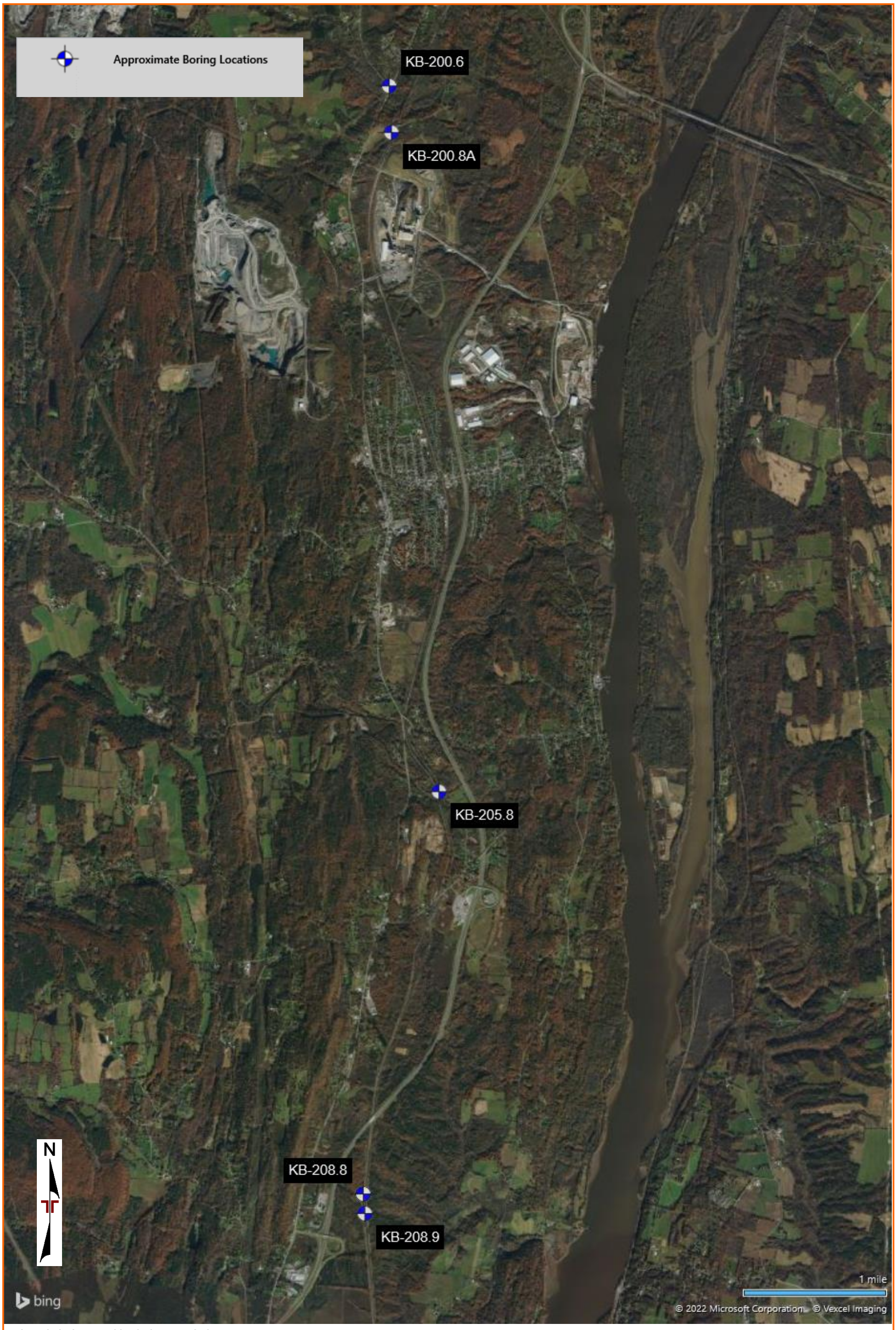


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. KB-200.6

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: 42.512930° Longitude: -73.816193°

Surface Elev.: 82.4434 (Ft.)

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	82.2									
TOPSOIL										
FILL - LEAN CLAY, brown						18	5-14-17-10 N=31			
						6	10-11-11-9 N=22			
4.0	78.4									
SANDY LEAN CLAY (CL), varved silt and clay, brown, very soft to very stiff			5			19	5-6-6-7 N=12			
						19	6-6-7-7 N=13			
						12	4-2-3-2 N=5	20.3	28-18-10	60
			10							
grades gray			15			24	2-1-1-2 N=2			
			20			24	WH-WH-WH-WH			
			25			24	WH-WH-WH-WH			

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

Hammer Type: Automatic

Advancement Method:
4 1/4 HSA to 47', mud rotary from 47' to 65'

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: 84.7% +/-5.0%
Hammer Efficiency Correction (CE): 1.41
WH = Weight of Hammer
WR = Weight of Rods

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-11-2022 | Boring Completed: 08-11-2022

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

Project No.: JB215256G

BORING LOG NO. KB-200.6

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: 42.512930° Longitude: -73.816193°

Surface Elev.: 82.4434 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDY LEAN CLAY (CL), varved silt and clay, brown, very soft to very stiff *(continued)*						
30.0	52.4		30	24	WH-WH-WH-WH	30.5	27-16-11	100
		LEAN CLAY (CL), varved silt and clay, gray	35	24	WH-WH-WH-WH			
			40	24	WH-WH-WH-WH			
45.0	37.4		45	24	WR-WR-WH-WH	26.3		7
		POORLY GRADED SAND WITH SILT (SP-SM), fine grained, gray, very loose	50	24	WH-WH-2-2 3" Split Spoon with ring samplers			
51.5	30.9							
		LEAN CLAY (CL), varved silt and clay, gray, very soft **TR sample taken from 51.5' to 52' ring where soil transitioned into clay**	55					

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

Hammer Type: Automatic

Advancement Method:
4 1/4 HSA to 47', mud rotary from 47' to 65'

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: 84.7% +/-5.0%
Hammer Efficiency Correction (CE): 1.41
WH = Weight of Hammer
WR = Weight of Rods

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-11-2022 | Boring Completed: 08-11-2022

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

Project No.: JB215256G

BORING LOG NO. KB-200.6

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: 42.512930° Longitude: -73.816193°

Surface Elev.: 82.4434 (Ft.)

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
						24	WH-WH-WH-WH	33.6	34-21-13	100
			60			24	WH-WH-WH-WH			
			65			24	WH-WH-WH-WH			
67.0	15.4									

LEAN CLAY (CL), varved silt and clay, gray, very soft
(continued)

Boring Terminated at 67 Feet

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

Hammer Type: Automatic

Advancement Method:
4 1/4 HSA to 47', mud rotary from 47' to 65'

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: 84.7% +/-5.0%
Hammer Efficiency Correction (CE): 1.41
WH = Weight of Hammer
WR = Weight of Rods

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-11-2022 | Boring Completed: 08-11-2022

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

Project No.: JB215256G

BORING LOG NO. KB-200.8A

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: 42.508106° Longitude: -73.815889°

Surface Elev.: 155.2070 (Ft.)

DEPTH	ELEVATION (Ft.)
0.5	154.7

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			TOPSOIL			
			FAT CLAY (CH), varved silt and clay, brown, soft to very stiff			
		2	7-8-9-10 N=17			
		14	11-11-9-9 N=20			
5		20	7-8-9-10 N=17			
		24	6-5-8-9 N=13			
		24	10-10-10-12 N=20			
10		24	5-6-7-9 N=13			
15		24	3-3-3-5 N=6	39.6	52-26-26	90
20		18	2-1-2 N=3			
25		18	2-1-2 N=3			

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

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

Logged by JL/AB
Hammer Efficiency Summary:
Energy Transfer Ratio: 78.6% +/-2.9%
Hammer Efficiency Correction (CE): 1.31
WH = Weight of Hammer
WR = Weight of Rods

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-11-2022 | Boring Completed: 08-12-2022

Drill Rig: Diedrich D-50 | Driller: C. Johnston

Project No.: JB215256G

BORING LOG NO. KB-200.8A

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: 42.508106° Longitude: -73.815889°

Surface Elev.: 155.2070 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), varved silt and clay, brown, soft to very stiff *(continued)*	30						
				18	1-2-2 N=4			
35.0	120.2	35						
	LEAN CLAY (CL), varved silt and clay, gray, very soft to medium stiff			18	1-1-2 N=3	45.0	48-27-21	100
		40						
				18	WR-WH-1 N=1			
		45						
				18	WR-2-3 N = 5			
		50						
				18	WR-2-3 N = 5			
		55						
				18	WR-WH-WH			

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

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

Logged by JL/AB
Hammer Efficiency Summary:
Energy Transfer Ratio: 78.6% +/-2.9%
Hammer Efficiency Correction (CE): 1.31
WH = Weight of Hammer
WR = Weight of Rods

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-11-2022 | Boring Completed: 08-12-2022

Drill Rig: Diedrich D-50 | Driller: C. Johnston

Project No.: JB215256G

BORING LOG NO. KB-200.8A

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: 42.508106° Longitude: -73.815889°

Surface Elev.: 155.2070 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), varved silt and clay, gray, very soft to medium stiff *(continued)*						
60.0	95.2	60	18	WR-WH-WH	44.6	45-28-17	100
	SILT (ML), varved silt and clay, gray, very soft	65	18	WR-WH-WH			
		70	18	WR-WH-WH			
		75	18	WR-WH-WH			
		80	18	WR-WH-WH-2 3" Spoon with Ring Samplers			

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

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

Logged by JL/AB
Hammer Efficiency Summary:
Energy Transfer Ratio: 78.6% +/-2.9%
Hammer Efficiency Correction (CE): 1.31
WH = Weight of Hammer
WR = Weight of Rods

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-11-2022 | Boring Completed: 08-12-2022

Drill Rig: Diedrich D-50 | Driller: C. Johnston

Project No.: JB215256G

BORING LOG NO. KB-200.8A

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: 42.508106° Longitude: -73.815889°

Surface Elev.: 155.2070 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
85.0	70.2	**SILT (ML)**, varved silt and clay, gray, very soft *(continued)*							
		LEAN CLAY (CL), varved silt and clay, gray, very soft to soft	85		8	WR-WH-WH	32.4	24-16-8	95
			90		8	2-1-3-1 N=4			
			95		24	2-WH-1-5 N=1			
100.0	55.2	**SILT (ML)**, varved silt and clay, gray, very soft	100		24	WH-WH-WH-WH	16.4	NP	86
105.0	50.2	**SILTY SAND (SM)**, gray, medium dense	105		24	12-9-14-15 N=23			
107.0	48.2	**LEAN CLAY (CL)**, varved silt and clay, gray, medium stiff to very stiff **8" Seam of fine sand at about 111'**	110		24	13-12-9-2 N=21			

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

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

Logged by JL/AB
Hammer Efficiency Summary:
Energy Transfer Ratio: 78.6% +/-2.9%
Hammer Efficiency Correction (CE): 1.31
WH = Weight of Hammer
WR = Weight of Rods

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-11-2022 | Boring Completed: 08-12-2022

Drill Rig: Diedrich D-50 | Driller: C. Johnston

Project No.: JB215256G

BORING LOG NO. KB-200.8A

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: 42.508106° Longitude: -73.815889°

Surface Elev.: 155.2070 (Ft.)

DEPTH ELEVATION (Ft.)

GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
LEAN CLAY (CL), varved silt and clay, gray, medium stiff to very stiff *(continued)*								
	115		X	24	WH-WH-12-16 3" Spoon with Ring Samplers			
	120		X	24	WH-WH-8-6 N=8	30.5	37-22-15	100
	125		X	24	8-9-9-9 N=18			
	130		X	24	WH-WH-8-4 N=8			
	135		X	24	17-28-31-33 N=59			
137.0 18.2								
Boring Terminated at 137 Feet								

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

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

Logged by JL/AB
Hammer Efficiency Summary:
Energy Transfer Ratio: 78.6% +/-2.9%
Hammer Efficiency Correction (CE): 1.31
WH = Weight of Hammer
WR = Weight of Rods

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 08-11-2022 Boring Completed: 08-12-2022

Drill Rig: Diedrich D-50 Driller: C. Johnston

Project No.: JB215256G

Summary of Laboratory Results

BORING ID	Depth (Ft.)	Water Content (%)	Organic Content (%)
KB-182.7B	20-22	31.1	
KB-182.7B	50-52	35.4	
KB-182.7B	80-82	26.5	
KB-184.2	4-6	17.3	
KB-184.2	20-21.5	10.0	
KB-184.9	10-12	35.4	
KB-184.9	25-26.5	8.6	
KB-184.9	40-42	9.2	
KB-184.9	55-56.5	12.2	
KB-185.4	6-8	34.3	
KB-185.4	20-21.5	13.7	
KB-185.4	35-39	9.1	
KB-185.4	45-47	14.7	
KB-192.4	15-17	36.9	
KB-192.4	25-27	42.6	
KB-192.4	45-47	46.0	
KB-192.4	65-67	8.0	
KB-192.8B	15-17	36.5	
KB-192.8B	40-40.2	14.1	
KB-192.8B	50-50.2	14.2	
KB-194.0-3.6B	5-7	31.0	
KB-194.0-3.6B	30-32	37.9	
KB-194.0-3.6B	50-52	39.6	
KB-194.0-3.6B	70-72	46.7	
KB-194.0-3.9B	4-6	31.5	
KB-194.0-3.9B	25-26.5	50.2	
KB-194.0-3.9B	45-46.5	43.4	
KB-194.0-3.9B	60-61.5	52.9	
KB-194.0-4.4	20-22	50.1	
KB-194.0-4.4	40-42	37.9	
KB-194.0-4.4	50-52	47.6	
KB-194.0-4.4	70-72	37.4	
KB-194.0-4.6B	4-6	24.1	
KB-194.0-4.6B	20-21.5	40.3	
KB-194.0-4.6B	40-41.5	42.9	
KB-194.0-4.6B	60-61.5	45.6	
KB-200.6	8-10	20.3	
KB-200.6	30-32	30.5	
KB-200.6	45-47	26.3	
KB-200.6	55-57	33.6	
KB-200.8A	15-17	39.6	
KB-200.8A	35-36.5	45.0	

PROJECT: CHPE - Additional HDD Borings - Phase 3

SITE: Fort Ann to Coxsackie, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256G

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

Summary of Laboratory Results

BORING ID	Depth (Ft.)	Water Content (%)	Organic Content (%)
KB-200.8A	60-61.5	44.6	
KB-200.8A	85-86.5	32.4	
KB-200.8A	100-102	16.4	
KB-200.8A	120-122	30.5	
KB-205.8	2-4	33.3	
KB-205.8	10-12	7.9	
KB-205.8	20-22	42.1	
KB-205.8	35-37	15.3	
KB-208.8	4-6	28.6	
KB-208.8	15-16.5	34.1	
KB-208.8	30-31.5	37.9	
KB-208.8	40-41.5	9.8	
KB-208.9	6-8	31.1	
KB-208.9	15-16.5	32.5	
KB-208.9	30-31.5	32.4	
KB-208.9	45-46.5	33.1	
KB-208.9	55-55.3	9.8	

PROJECT: CHPE - Additional HDD Borings - Phase 3

SITE: Fort Ann to Coxsackie, NY

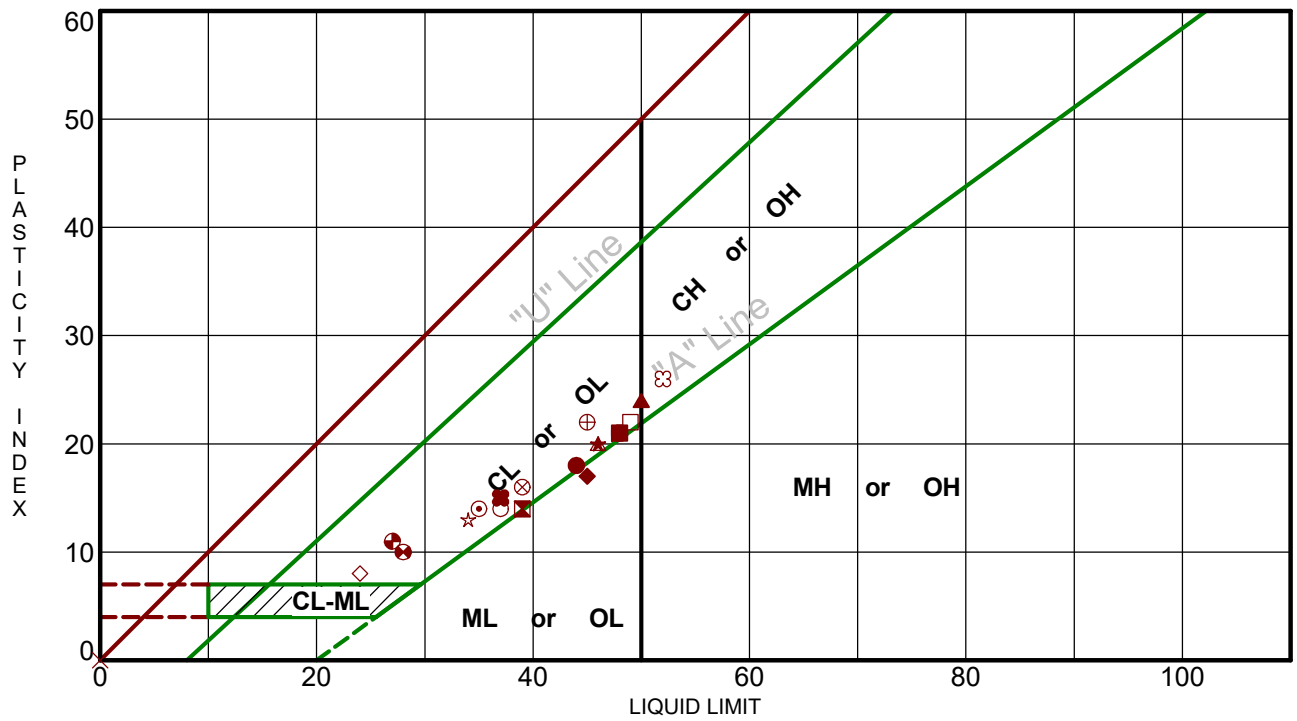
Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256G

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

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	KB-194.0-3.9B	25 - 26.5	44	26	18	90.2	CL	LEAN CLAY
⊠	KB-194.0-3.9B	45 - 46.5	39	25	14	99.7	CL	LEAN CLAY
▲	KB-194.0-3.9B	60 - 61.5	50	26	24	94.7	CH	FAT CLAY
★	KB-194.0-4.4	20 - 22	46	26	20	96.1	CL	LEAN CLAY
⊙	KB-194.0-4.4	40 - 42	35	21	14	99.0	CL	LEAN CLAY
✿	KB-194.0-4.4	50 - 52	48	27	21	90.3	CL	LEAN CLAY
○	KB-194.0-4.4	70 - 72	37	23	14	99.2	CL	LEAN CLAY
△	KB-194.0-4.6B	4 - 6	46	26	20	78.4	CL	LEAN CLAY with SAND
⊗	KB-194.0-4.6B	20 - 21.5	39	23	16	93.3	CL	LEAN CLAY
⊕	KB-194.0-4.6B	40 - 41.5	45	23	22	84.8	CL	LEAN CLAY with SAND
□	KB-194.0-4.6B	60 - 61.5	49	27	22	92.6	CL	LEAN CLAY
⊛	KB-200.6	8 - 10	28	18	10	60.1	CL	SANDY LEAN CLAY
◕	KB-200.6	30 - 32	27	16	11	100.0	CL	LEAN CLAY
☆	KB-200.6	55 - 57	34	21	13	100.0	CL	LEAN CLAY
❀	KB-200.8A	15 - 17	52	26	26	90.5	CH	FAT CLAY
■	KB-200.8A	35 - 36.5	48	27	21	100.0	CL	LEAN CLAY
◆	KB-200.8A	60 - 61.5	45	28	17	100.0	ML	SILT
◇	KB-200.8A	85 - 86.5	24	16	8	95.2	CL	LEAN CLAY
×	KB-200.8A	100 - 102	NP	NP	NP	85.6	ML	SILT
✖	KB-200.8A	120 - 122	37	22	15	100.0	CL	LEAN CLAY

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

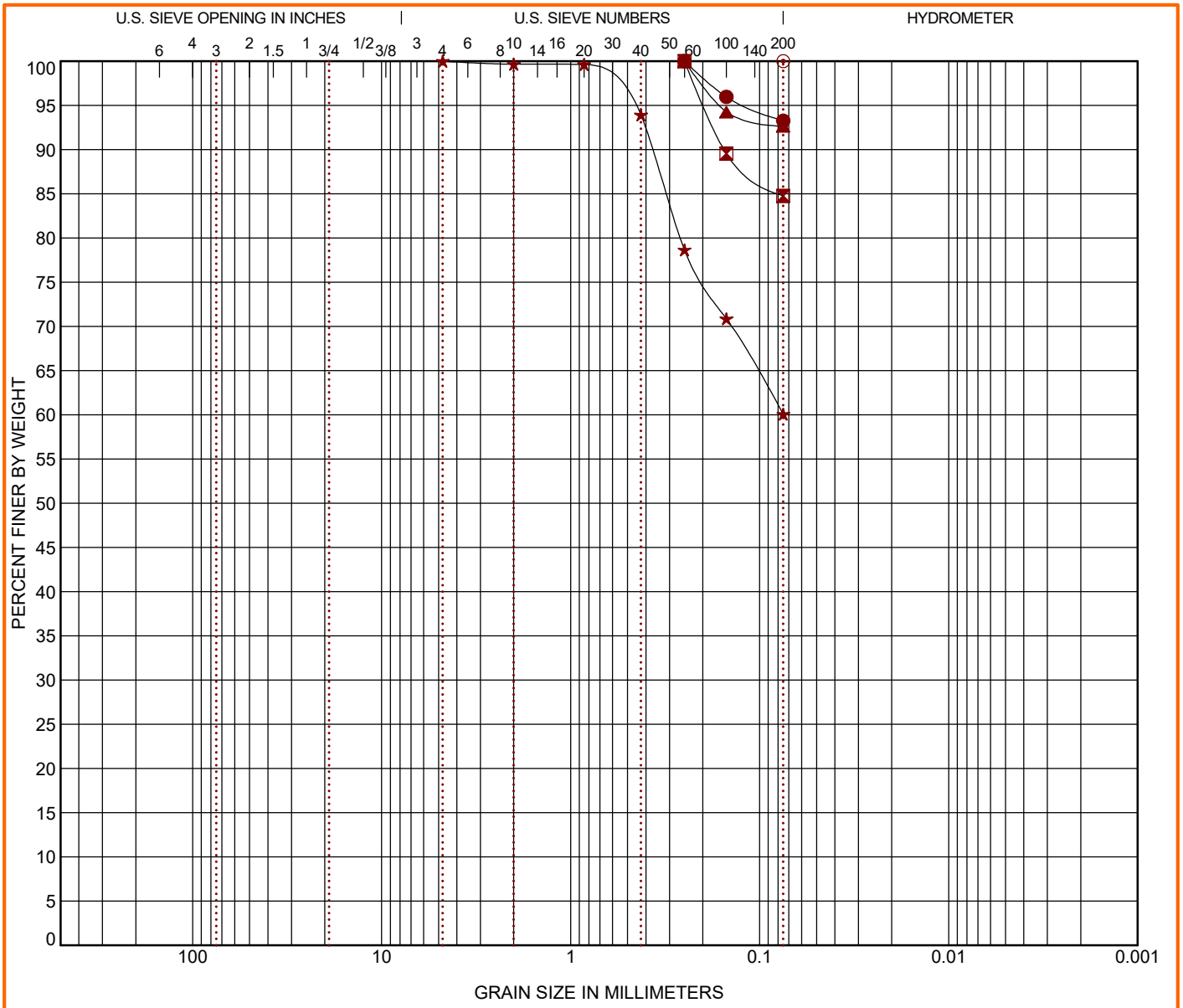
SITE: Fort Ann to Coxsackie, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

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

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-194.0-4.6B	20 - 21.5	LEAN CLAY (CL)	40.3	39	23	16		
⊠	KB-194.0-4.6B	40 - 41.5	LEAN CLAY with SAND (CL)	42.9	45	23	22		
▲	KB-194.0-4.6B	60 - 61.5	LEAN CLAY (CL)	45.6	49	27	22		
★	KB-200.6	8 - 10	SANDY LEAN CLAY (CL)	20.3	28	18	10		
⊙	KB-200.6	30 - 32	LEAN CLAY (CL)	30.5	27	16	11		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-194.0-4.6B	20 - 21.5	0.25				0.0	0.0	6.7		93.3	
⊠	KB-194.0-4.6B	40 - 41.5	0.25				0.0	0.0	15.2		84.8	
▲	KB-194.0-4.6B	60 - 61.5	0.25				0.0	0.0	7.4		92.6	
★	KB-200.6	8 - 10	4.75				0.0	0.0	39.9		60.1	
⊙	KB-200.6	30 - 32	0.075				0.0	0.0	0.0		100.0	

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

SITE: Fort Ann to Coxsackie, NY

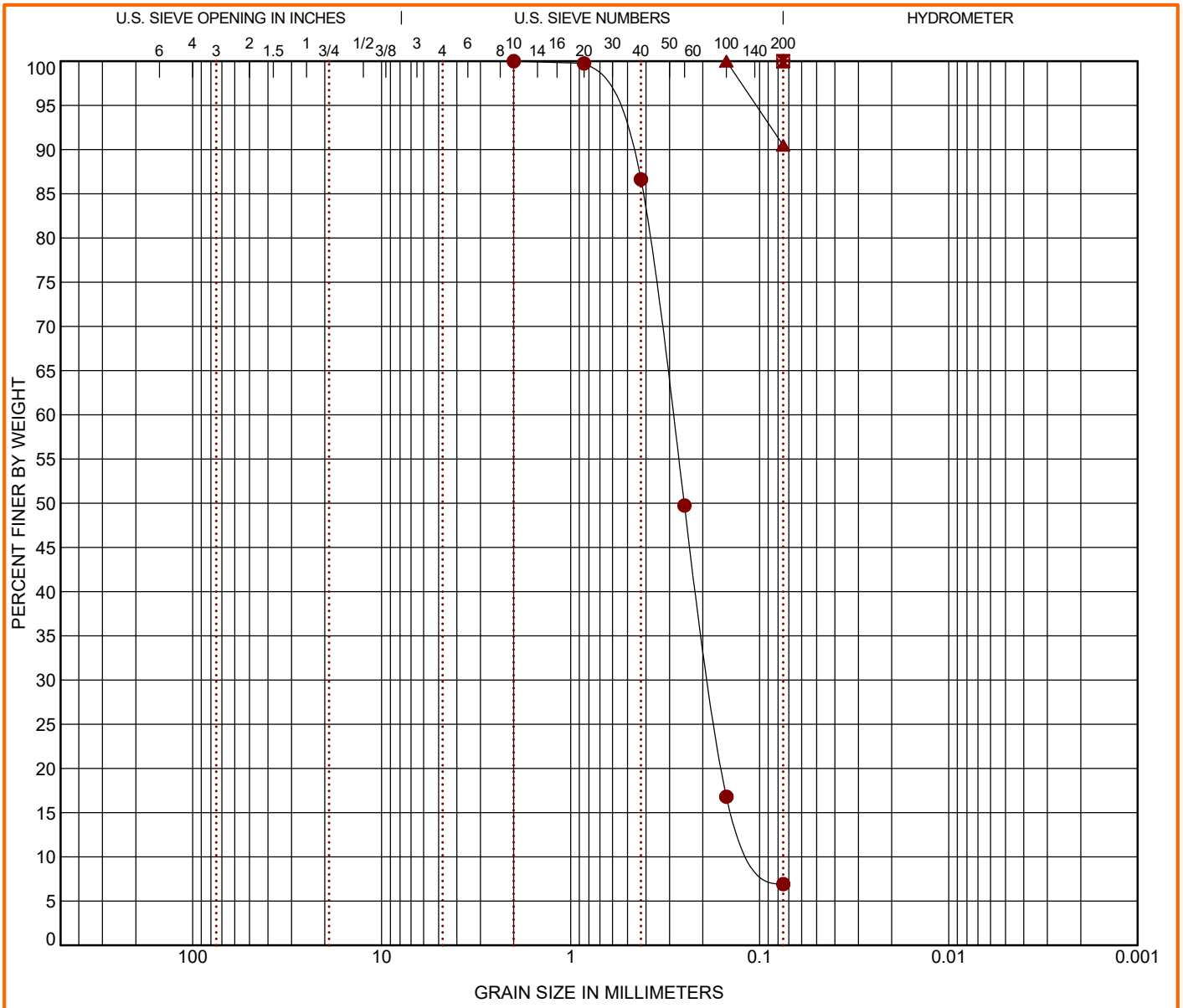
Terracon
30 Corporate Cir Ste 201
Albany, NY

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

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

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-200.6	45 - 47	POORLY GRADED SAND with SILT (SP-SM)	26.3				1.26	3.11
⊠	KB-200.6	55 - 57	LEAN CLAY (CL)	33.6	34	21	13		
▲	KB-200.8A	15 - 17	FAT CLAY (CH)	39.6	52	26	26		
★	KB-200.8A	35 - 36.5	LEAN CLAY (CL)	45.0	48	27	21		
⊙	KB-200.8A	60 - 61.5	SILT (ML)	44.6	45	28	17		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-200.6	45 - 47	2	0.29	0.184	0.093	0.0	0.0	93.1		6.9	
⊠	KB-200.6	55 - 57	0.075				0.0	0.0	0.0		100.0	
▲	KB-200.8A	15 - 17	0.15				0.0	0.0	9.5		90.5	
★	KB-200.8A	35 - 36.5	0.075				0.0	0.0	0.0		100.0	
⊙	KB-200.8A	60 - 61.5	0.075				0.0	0.0	0.0		100.0	

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

SITE: Fort Ann to Coxsackie, NY

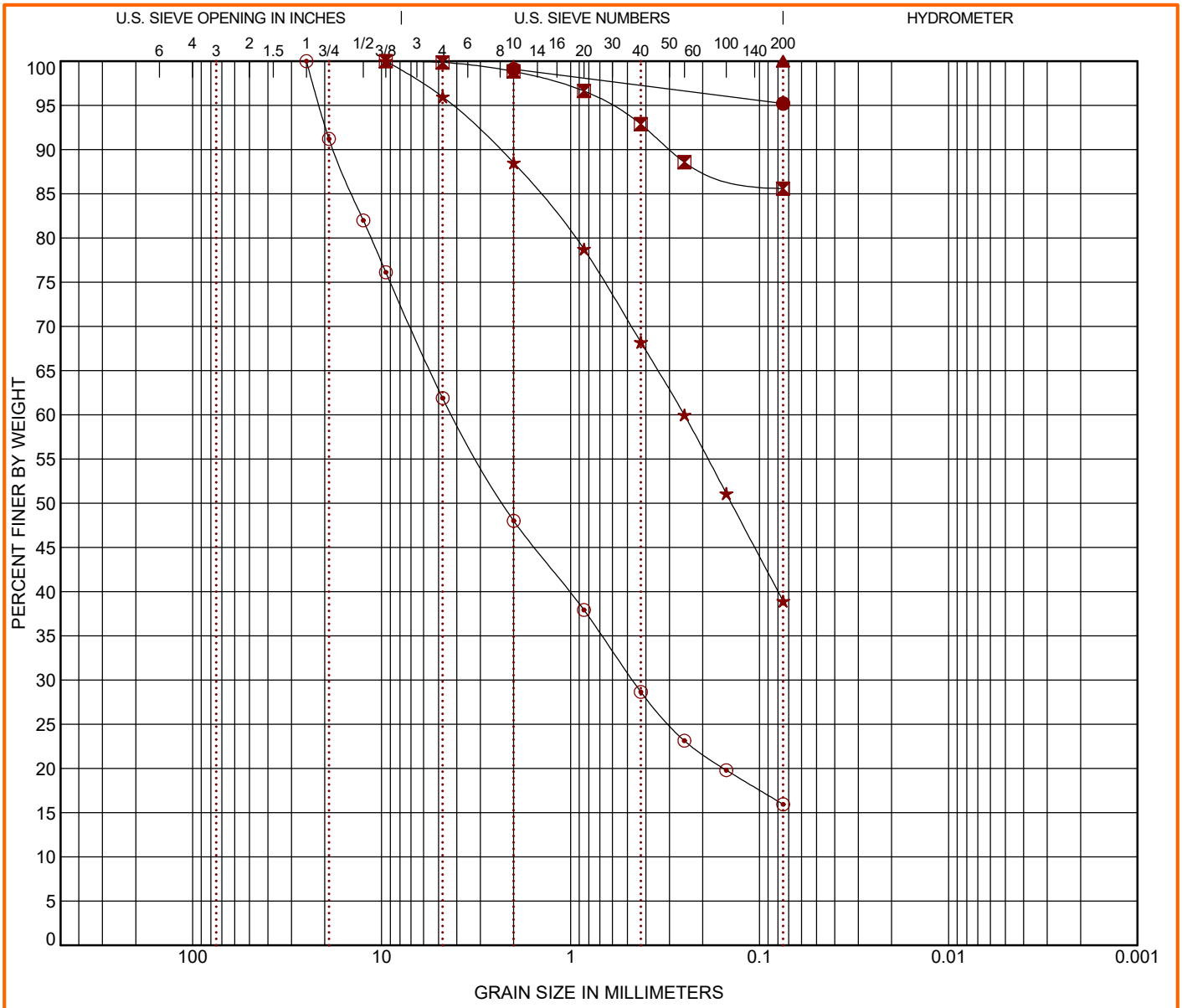
Terracon
30 Corporate Cir Ste 201
Albany, NY

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

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

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-200.8A	85 - 86.5	LEAN CLAY (CL)	32.4	24	16	8		
⊠	KB-200.8A	100 - 102	SILT (ML)	16.4	NP	NP	NP		
▲	KB-200.8A	120 - 122	LEAN CLAY (CL)	30.5	37	22	15		
★	KB-205.8	2 - 4	SILTY SAND (SM)	33.3					
⊙	KB-205.8	10 - 12	SILTY SAND with GRAVEL (SM)	7.9					

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-200.8A	85 - 86.5	2						3.9		95.2	
⊠	KB-200.8A	100 - 102	9.5				0.0	0.1	14.3		85.6	
▲	KB-200.8A	120 - 122	0.075				0.0	0.0	0.0		100.0	
★	KB-205.8	2 - 4	9.5	0.25			0.0	4.0	57.0		38.9	
⊙	KB-205.8	10 - 12	25	4.222	0.47		0.0	38.1	46.0		15.9	

PROJECT: CHPE - Additional HDD Borings - Phase 3

PROJECT NUMBER: JB215256G

SITE: Fort Ann to Coxsackie, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

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

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

Kiewit

MEMORANDUM

DATE: November 10, 2022

TO: Todd Kilduff; Kilduff Underground Engineering, Inc.

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

SUBJECT: Geotechnical Data: Segment 10 – Package 6 – HDD Crossing 93 – Revision 1
Champlain Hudson Power Express Project
Coeymans, 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 northwest of Coeymans, New York. The approximate station for the start of HDD crossing number 93 is STA 60155+00 (42.49694° N, 73.8191° W).

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

- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013.
- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Package 6, Selkirk to Catskill, Rev-1, dated June 28, 2022.

Contact us if you have questions or require additional information.

HDD 93
Borings B201.7-1, K-201.8,
K-201.9, B201.9-1
Segment 10 - Design Package 6

CHPE Segment 10 - Package 6
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A199.7-1	1344990.8	678939.9	159.0
	A205.2-1	1317487.9	677289.6	204.6
	A206.62-1	1310345.7	678496.2	186.8
	A207.0-1	1308517.7	677770.1	179.6
	A209.05-1	1298062.1	675944.3	148.6
	A219.05-1	1247052.0	666820.5	128.8
	B198.9-1	1348887.4	679090.7	173.5
	B200.6-1	1340723.0	677093.4	96.3
	B200.7-1	1340001.8	676794.4	128.5
	B201.7-1	1335310.5	675758.1	162.1
	B201.9-1	1334029.9	676014.8	173.3
	B202.1-1	1333294.3	676182.6	168.3
	B203.45-1	1326328.9	678471.9	171.2
	B203.5-1	1325831.2	678645.3	183.2
	B204.2-1	1322268.4	678463.0	198.8
	B204.7-1	1320048.9	677891.8	207.1
	B205.8-1	1314638.7	678588.0	141.5
	B205.9-2	1313866.7	678637.8	190.3
	B207.9-1	1303512.5	676338.7	156.2
	B208.2-1	1302277.3	676188.9	152.0
	B208.3-1	1301673.4	676120.2	150.0
	B208.5-1	1300907.6	675929.0	116.7
	B210.0-1	1293021.1	676353.2	109.9
	B210.4-1	1291223.1	676583.0	120.5
	B211.2-1	1286509.8	676960.2	132.6
	B211.5-1	1285068.8	677013.1	140.7
	B211.7-1	1284088.5	676965.4	141.5
	B212.0-1	1282469.0	676857.5	138.9
	B212.2-1	1281498.0	676590.5	130.8
	B214.6-1	1269721.4	672670.9	124.9
	B216.1-1	1262073.1	670916.0	127.0
	B216.4-1	1260344.1	670520.5	128.3
	B216.6-1	1259315.9	670290.2	129.8
	B219.5-1	1244816.4	666093.7	130.4
AECOM**	SC-1A	1348656.7	679220.0	176.4
	SC-2A	1326692.2	678361.5	178.9
	SC-2C	1305133.1	676877.4	160.6

Notes:

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

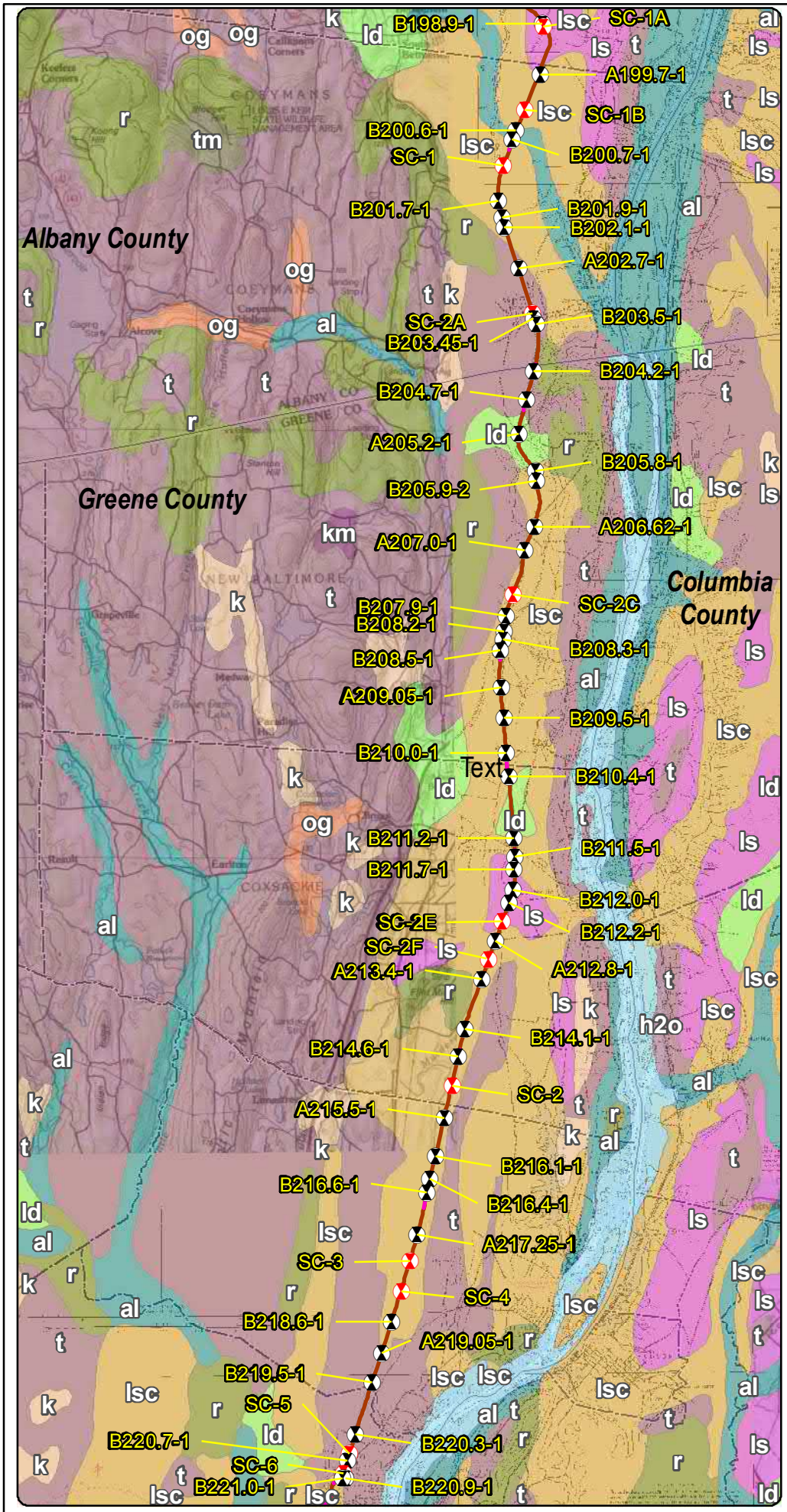
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

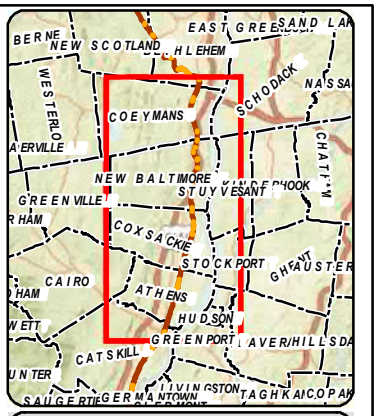
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.

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

Reference:

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





LEGEND

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

Surficial Geology

- al - Recent alluvium
- h2o - Water
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

1 0.5 0 1 Miles

Transmission Developments Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings Selkirk to Catskill Figure 3-10

Prepared on 5/3/2021

by: AECOM

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

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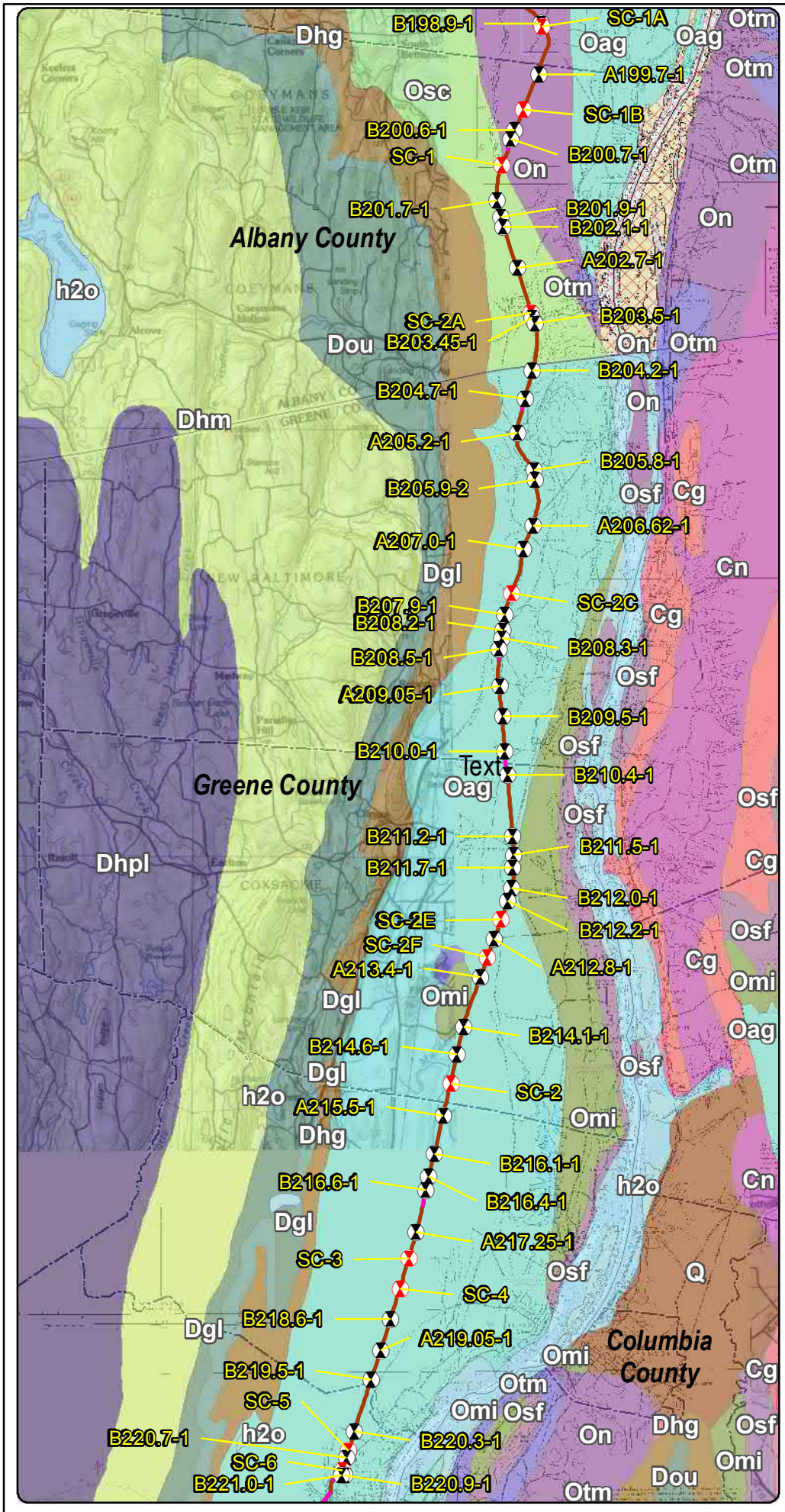

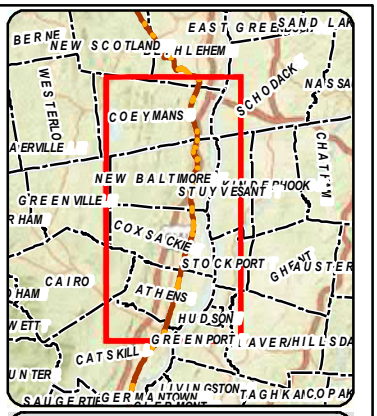

LEGEND

- 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

- Cg - Germantown Formation
- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhm - Undiff Lower Hamilton Group
- Dhpl - Plattekill Formation
- Dou - Onondaga Limestone
- No Label
- Oag - Austin Glen Form (graywacke, shale)
- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

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

N

1 0.5 0 1 Miles

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Selkirk to Catskill Figure 4-10

Prepared on 5/18/2021

by: AECOM

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

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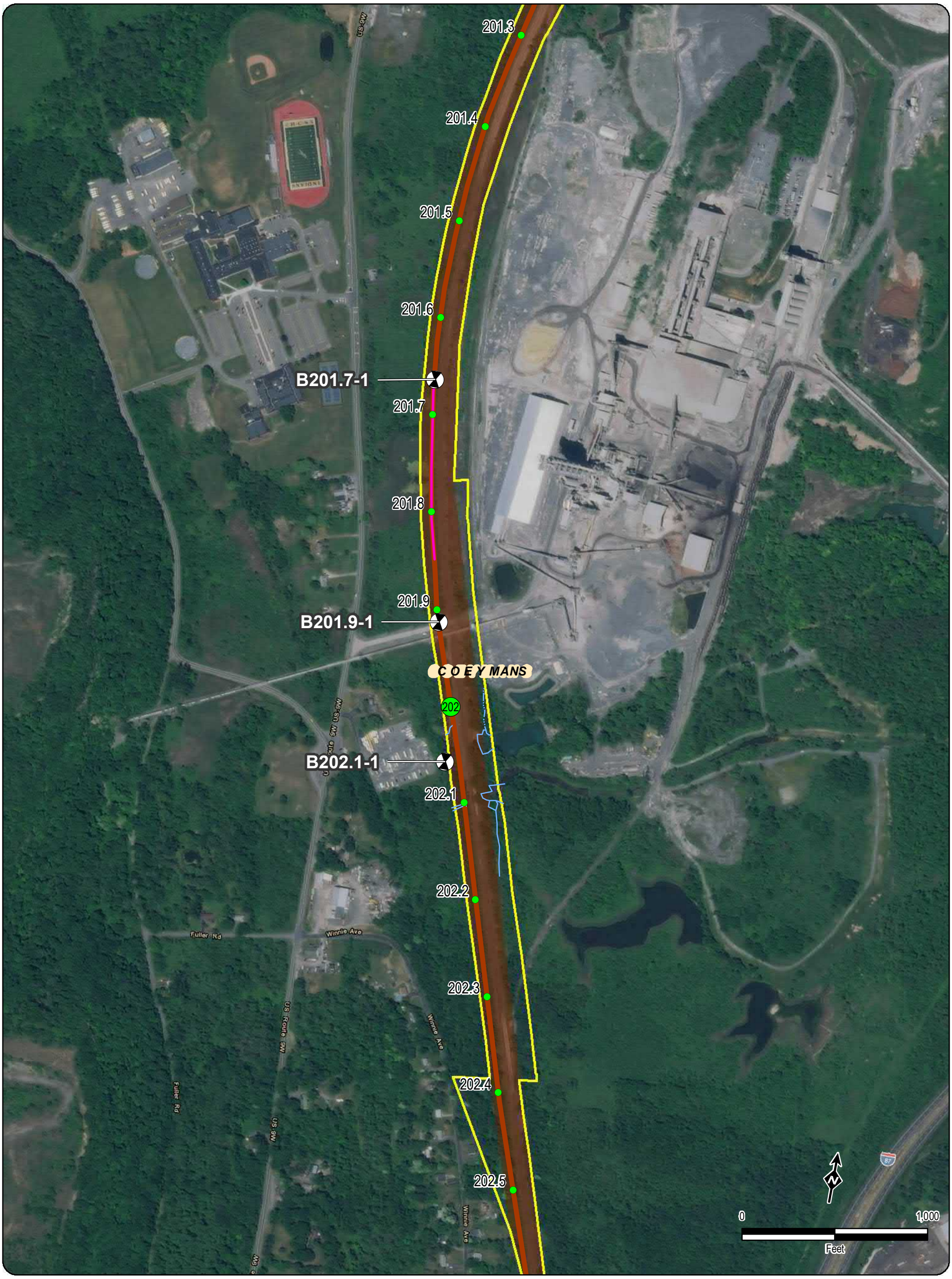
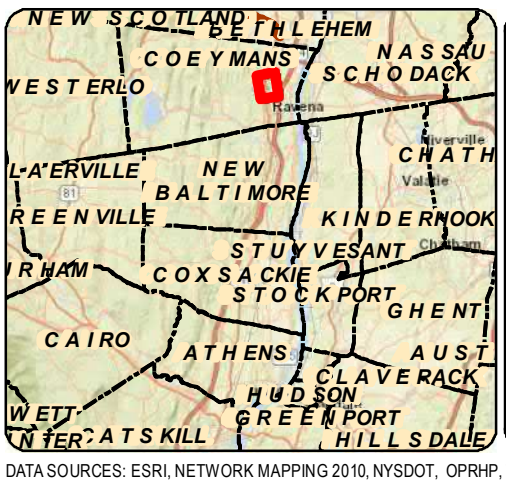




LEGEND

- 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

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

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Selkirk to Catskill

Figure A-10

Sheet 3 of 18

Prepared by: AECOM 5/19/2021

Y:\Projects\CHPEI\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Selkirk_to_Catskill_Boring_Locations_Mapset_May_2021_Report.mxd

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

BORING	**B201.7-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED 4.0 '			
DEPTH	HOUR	DATE	ELAPSED TIME

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

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	N/A
DATE STARTED	02/19/2013
DATE COMPLETED	02/19/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	7 5 5 4		***GRAY-BROWN SILT, TR C/ SAND, TR ROOTS (TOPSOIL)***		
				2.0		
	S-2	6 6 4 5		***LIGHT BROWN SILT, SM CLAY, TR F/ SAND***		
▽				4.0		
5	S-3	6 6 7 6			36.4	
	S-4	6 5 6 6				
	S-5	7 5 5 6				
10						
	S-6	6 6 6				
15				***BROWN TO GRAY CLAY, TR SILT***		
	S-7	3 4 3			29.5	
20						
	S-8	3 2 2				
25						
	S-9	2 2 2				
30				30.0		
				END OF BORING AT 30'		
35						

DRN.	JPB
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

BORING	**B201.9-1**
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	10.0 '
d	FROM	10.0 '	TO	25.0 '

DRILLER	R.CARUSO
HELPER	C. SMART
INSPECTOR	C. POPPE
DATE STARTED	11/14/2012
DATE COMPLETED	11/14/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	11 13 15 15		***BROWN F/M SAND, SM C/ GRAVEL-SIZED ROCK FRAGMENTS (FILL)***		
				2.0		
	S-2	11 8 8 8				
5				***BLACK GRAVELLY M/C/F SAND, SM SILT, (FILL)***	9.6	
▽	S-3	8 9 16 12				WATER TABLE DETERMINED FROM WETNESS OF SAMPLE
	S-4	11 9 8 10			8.6	
				8.0		
	S-5	9 10 14 13			5.0	
10						
					31.1	
15	S-6	10 13 16		***GRAY M/C/F SAND AND F/C GRAVEL, TR TO SM SILT***		
					27.5	
20	S-7	10 15 17				
				23.5		
				LIGHT BROWN SILT, SM C/ GRAVEL-SIZED ROCK FRAGMENTS, TR TO SM CLAY	23.0	
25	S-8	10 10 10		25.0		
				END OF BORING AT 25'		
30						
35						

DRN.	TBT
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

S.W.COLE ENGINEERING, INC.

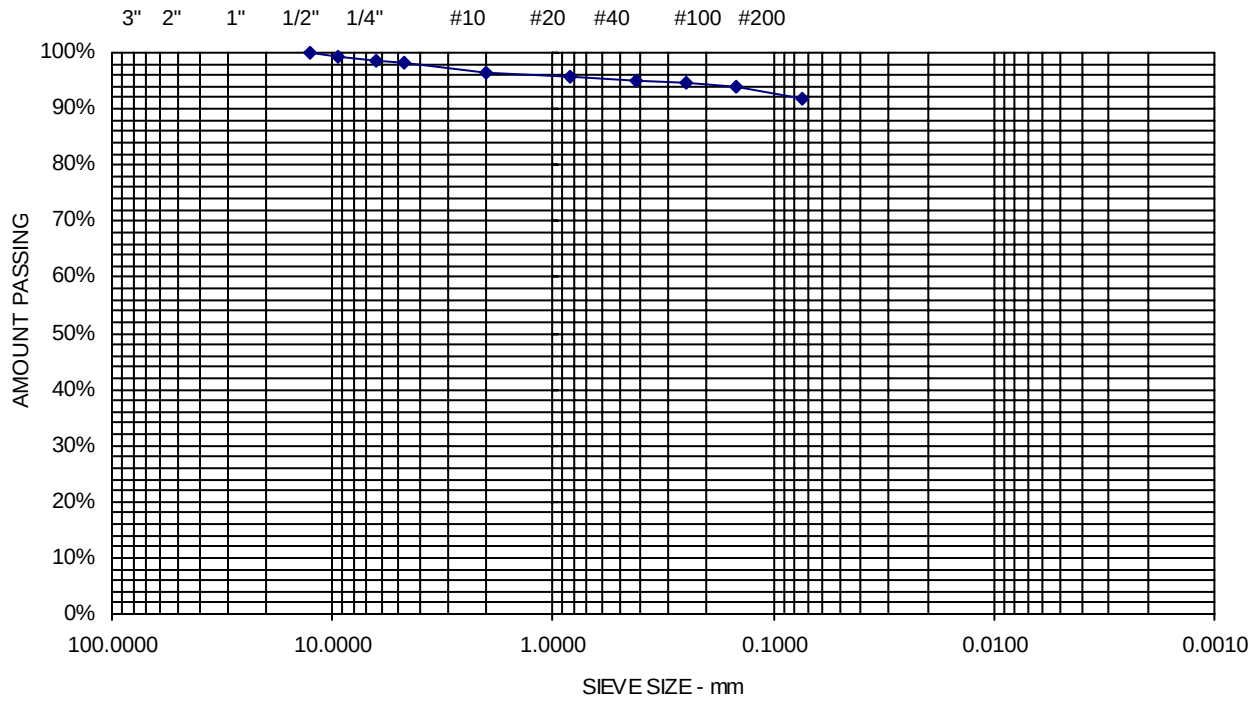
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10844S
		Date Received	3/1/2013
		Date Completed	3/5/2013
Material Source	**B201.7-1, 3.0' - 15.0'**	Tested By	SHAWN BENOIT

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
12.5 mm	**1/2"**	**100**	
9.5 mm	**3/8"**	**99**	
6.3 mm	**1/4"**	**99**	
4.75 mm	**No. 4**	**98**	1.9% Gravel
2.00 mm	**No. 10**	**97**	
850 um	**No. 20**	**96**	
425 um	**No. 40**	**95**	6.3% Sand
250 um	**No. 60**	**95**	
150 um	**No. 100**	**94**	
75 um	**No. 200**	**91.8**	91.8% Fines

BROWN CLAYEY SILT SOME SAND TRACE GRAVEL (ML)



Comments: MOISTURE CONTENT = 31.0%

Sheet

S.W.COLE ENGINEERING, INC.

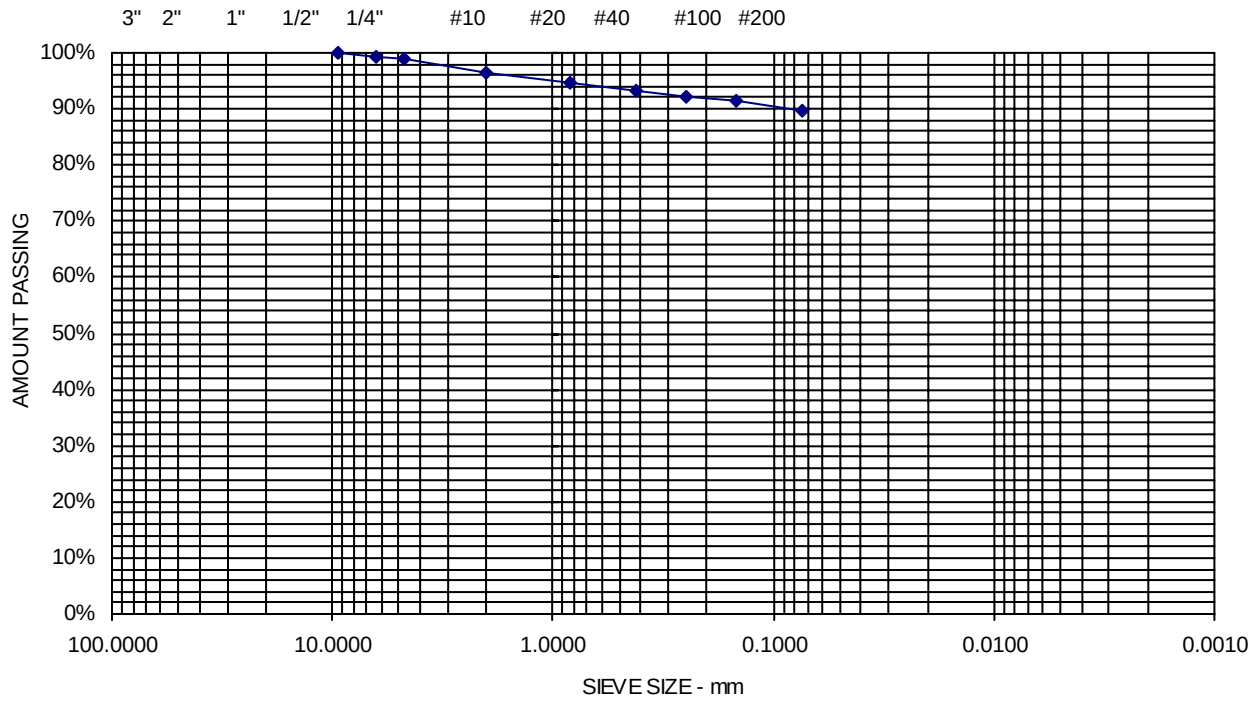
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10847S
		Date Received	3/1/2013
		Date Completed	3/6/2013
Material Source	**B201.7-1, 15.0' - 30.0'**	Tested By	SHAWN BENOIT

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
9.5 mm	**3/8"**	**100**	
6.3 mm	**1/4"**	**99**	
4.75 mm	**No. 4**	**99**	1.1% Gravel
2.00 mm	**No. 10**	**97**	
850 um	**No. 20**	**95**	
425 um	**No. 40**	**93**	9.2% Sand
250 um	**No. 60**	**92**	
150 um	**No. 100**	**91**	
75 um	**No. 200**	**89.7**	89.7% Fines

GRAY CLAYEY SILT SOME SAND TRACE GRAVEL (ML)



Comments: MOISTURE CONTENT = 39.9%

Sheet

S.W.COLE ENGINEERING, INC.

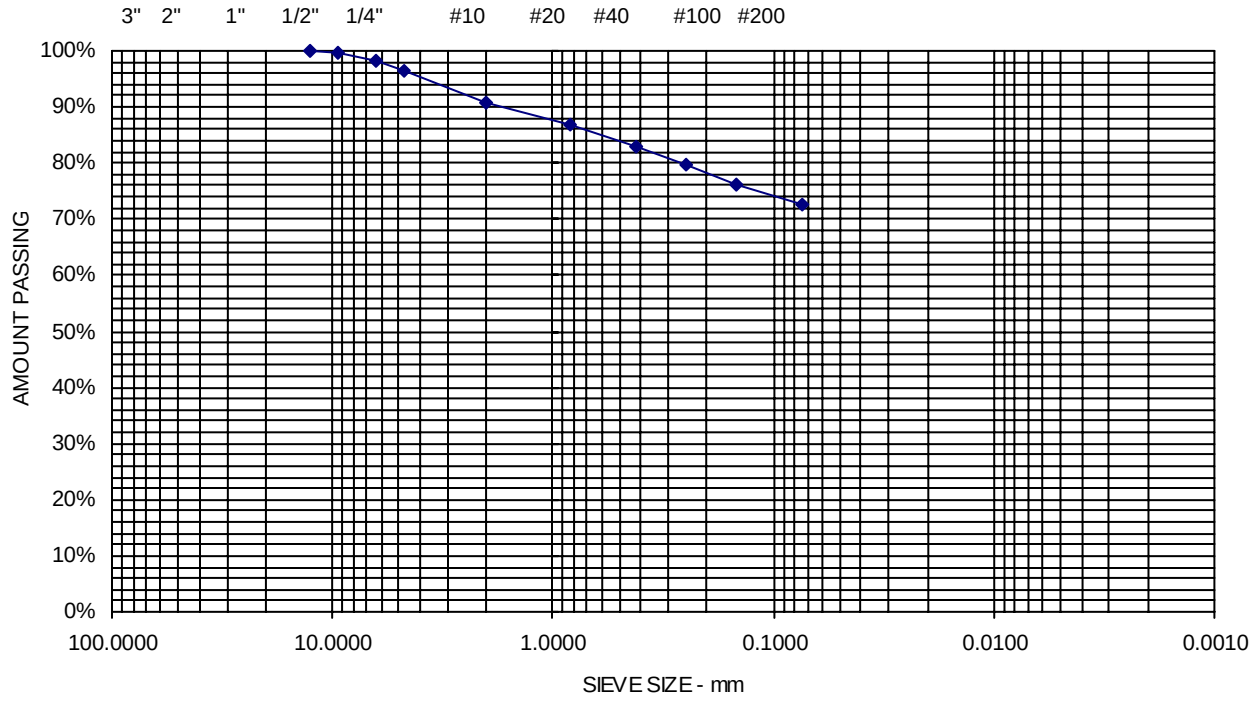
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10339S
Exploration	**B201.9-1**	Date Received	11/20/2012
Material Source	**S-6**	Date Completed	11/27/2012
		Tested By	MURRAY SWINDELL

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
12.5 mm	**1/2"**	**100**	
9.5 mm	**3/8"**	**100**	
6.3 mm	**1/4"**	**98**	
4.75 mm	**No. 4**	**96**	3.7% Gravel
2.00 mm	**No. 10**	**91**	
850 um	**No. 20**	**87**	
425 um	**No. 40**	**83**	23.7% Sand
250 um	**No. 60**	**80**	
150 um	**No. 100**	**76**	
75 um	**No. 200**	**72.6**	72.6% Fines

BROWN SANDY SILT AND CLAY TRACE GRAVEL (CL)



Comments: MOISTURE CONTENT = 32.4%

Sheet

SUMMARY OF LABORATORY TEST DATA

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

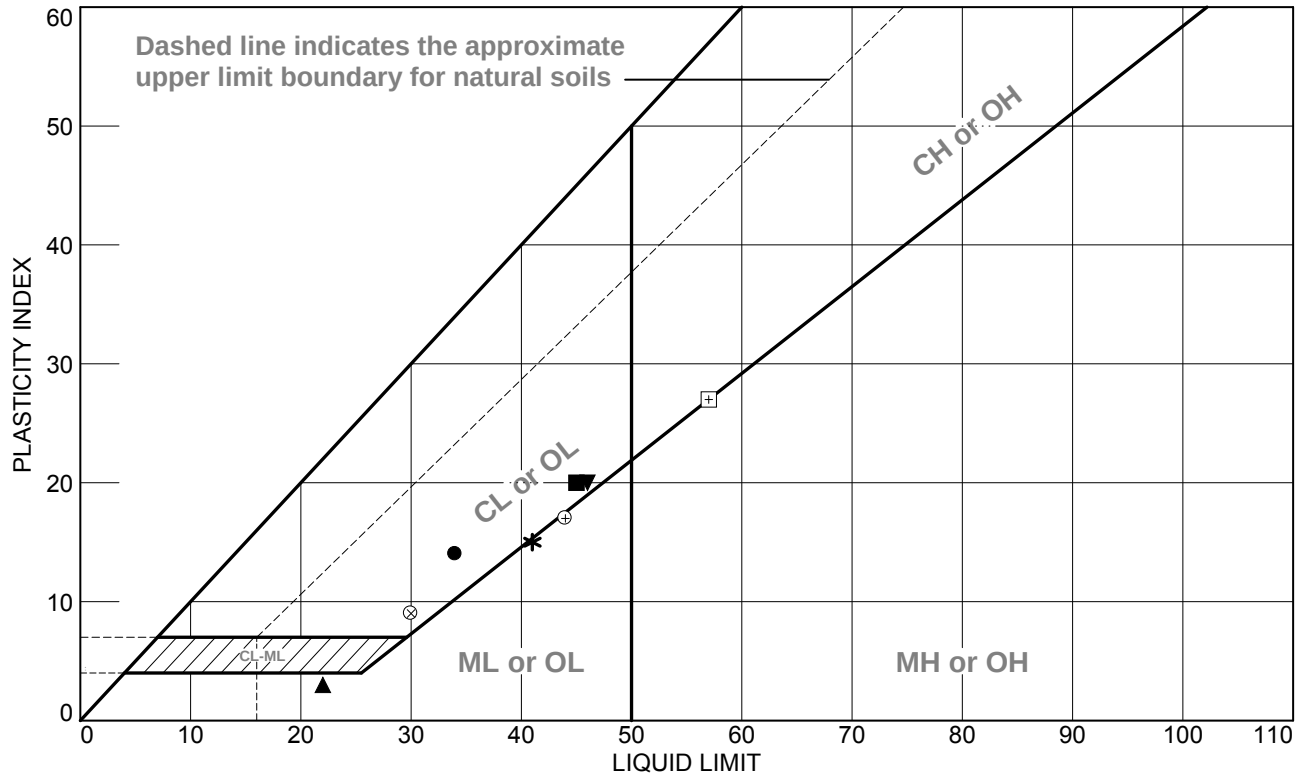
SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
B200.6-1	S-2	2.0-4.0	-	-	-	-		-	-	-	-	-	20.5	-	-	-
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	-	21.6	-	-	-
	S-5	8.0-10.0	CL	-	-	-		46	26	20	0.3	-	32.3	-	-	-
	S-6	13.5-15.0	-	-	-	-		-	-	-	-	-	32.4	-	-	-
	S-8	23.5-25.0	ML	-	-	-		41	26	15	0.6	-	35.4	-	-	-
B200.7-1	S-2	2.0-4.0	-	-	-	-		-	-	-	-	-	32.2	-	-	-
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	-	22.1	-	-	-
	S-6	13.5-15.0	-	-	-	-		-	-	-	-	-	33.9	-	-	-
	S-8	23.5-25.0	CL/ML	-	-	-		44	27	17	0.2	-	30.1	-	-	-
B201.7-1	S-3	4.0-6.0	CH	-	-	-		57	30	27	0.2	-	36.4	-	-	-
	S-7	18.5-20.0	CL	-	-	-		30	21	9	0.9	-	29.5	-	-	-

SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
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)					
B201.9-1	S-2	2.0-4.0	SM	33.1	49.8	17.1		-	-	-	-	-	9.6	-	-	-
	S-3	4.0-6.0														
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	-	8.6	-	-	-
	S-5	8.0-10.0	GW-GM	47.5	42.3	10.2		-	-	-	-	-	5.0	-	-	-
	S-6	13.5-15.0	-	-	-	-		-	-	-	-	-	31.1	90.9	-	-
	S-7	18.5-20.0	CL	-	-	-		43	26	17	0.1	-	27.5	-	-	-
	S-8	23.5-25.0	-	-	-	-		-	-	-	-	-	23.0	-	-	-
B202.1-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	22.4	-	-	-
	S-2	2.0-4.0	ML	0.0	8.7	63.3	28.0	-	-	-	-	2.77	19.3	-	-	-
	S-3	4.0-6.0												104.0	-	-
	S-5	8.0-10.0	-	0.0	6.7	93.3		-	-	-	-	-	28.2	-	-	-

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

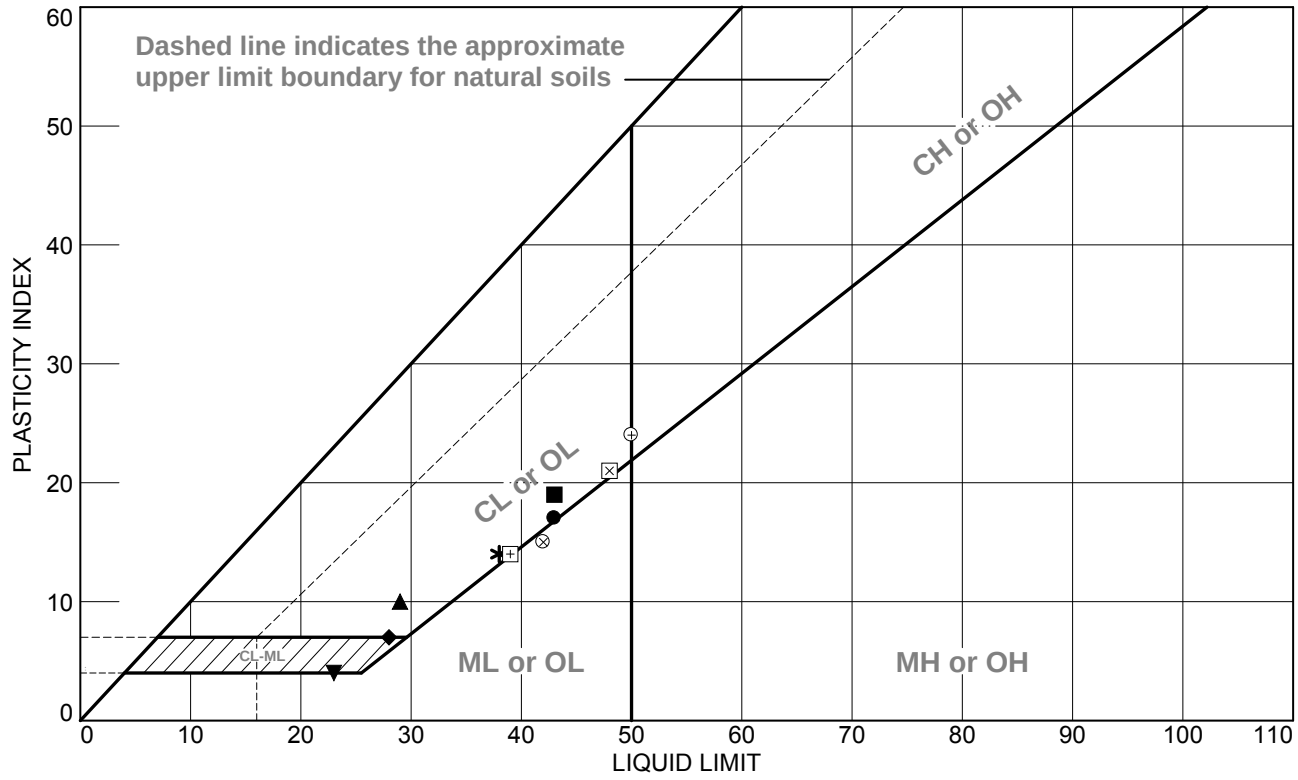
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B192.4-1	S-6	13.5-15.0 FT	28.4	20	34	14	CL
■	B193.5-1	S-7	18.5-20.0 FT	49.2	25	45	20	CL
▲	B198.7-1	S-5	8.0-10.0 FT	23.6	19	22	3	ML
◆	B198.9-1	S-7	18.5-20.0 FT	21.3	NP	NV	NP	ML
▼	B200.6-1	S-5	8.0-10.0 FT	32.3	26	46	20	CL
✱	B200.6-1	S-8	23.5-25.0 FT	35.4	26	41	15	ML
⊕	B200.7-1	S-8	23.5-25.0 FT	30.1	27	44	17	CL/ML
⊞	B201.7-1	S-3	4.0-6.0 FT	36.4	30	57	27	CH
⊗	B201.7-1	S-7	18.5-20.0 FT	29.5	21	30	9	CL

TRC
Engineers, Inc.
Mt. Laurel, NJ

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

Project No.: 195651 **Figure** 3

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

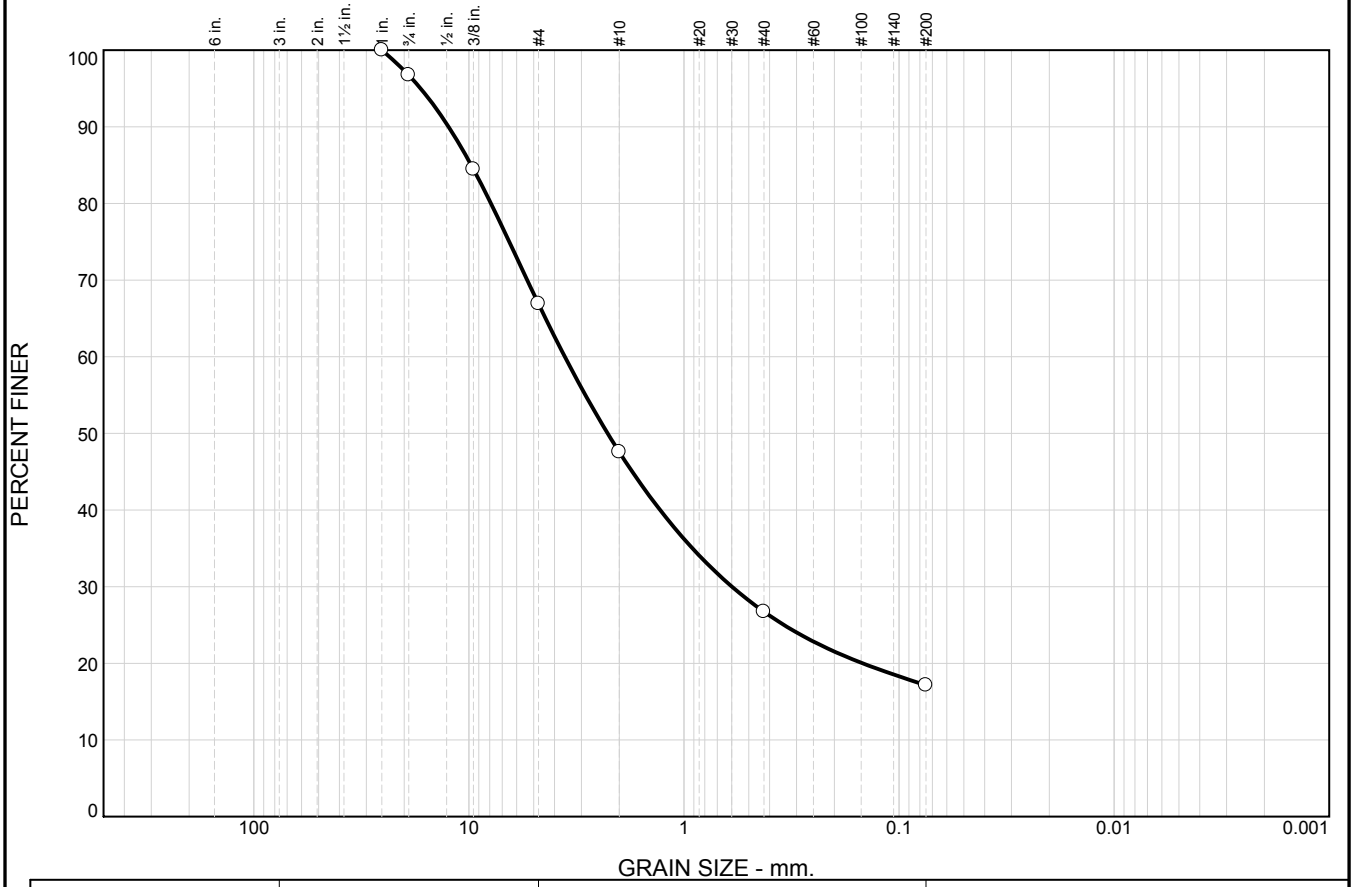
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B201.9-1	S-7	18.5-20.0 FT	27.5	26	43	17	CL
■	B202.1-1	S-7	18.5-20.0 FT	43.9	24	43	19	CL
▲	B203.45-1	S-6	13.5-15.0 FT	30.0	19	29	10	CL
◆	B203.5-1	S-2	2.0-4.0 FT	13.7	21	28	7	CL-ML
▼	B203.5-1	S-6	13.5-15.0 FT	16.7	19	23	4	CL-ML
✱	B204.2-1	S-4 & S-5	6.0-10.0 FT	22.9	24	38	14	CL
⊕	B204.7-1	S-3, S-4, & S-5	4.0-10.0 FT	30.5	26	50	24	CL/CH
⊞	B204.7-1	S-8	23.5-25.0 FT	24.3	25	39	14	CL
⊗	B207.9-1	S-6	13.5-15.0 FT	40.7	27	42	15	ML

TRC
Engineers, Inc.
Mt. Laurel, NJ

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

Project No.: 195651 **Figure** 4

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	3.2	29.9	19.3	20.9	9.6	17.1	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			9.7568	3.5805	2.2638	0.5985				

Material Description	USCS	AASHTO
○ BLACK F/C GRAVELLY M/C/F SAND, SM SILT (FILL)	SM	

Project No. 195651 **Client:** TRANSMISSION DEVELOPERS INC.

Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

○ **Source of Sample:** B201.9-1 **Depth:** 2.0-6.0 FT **Sample Number:** S-2 & S-3

TRC Engineers, Inc.

Mt. Laurel, NJ

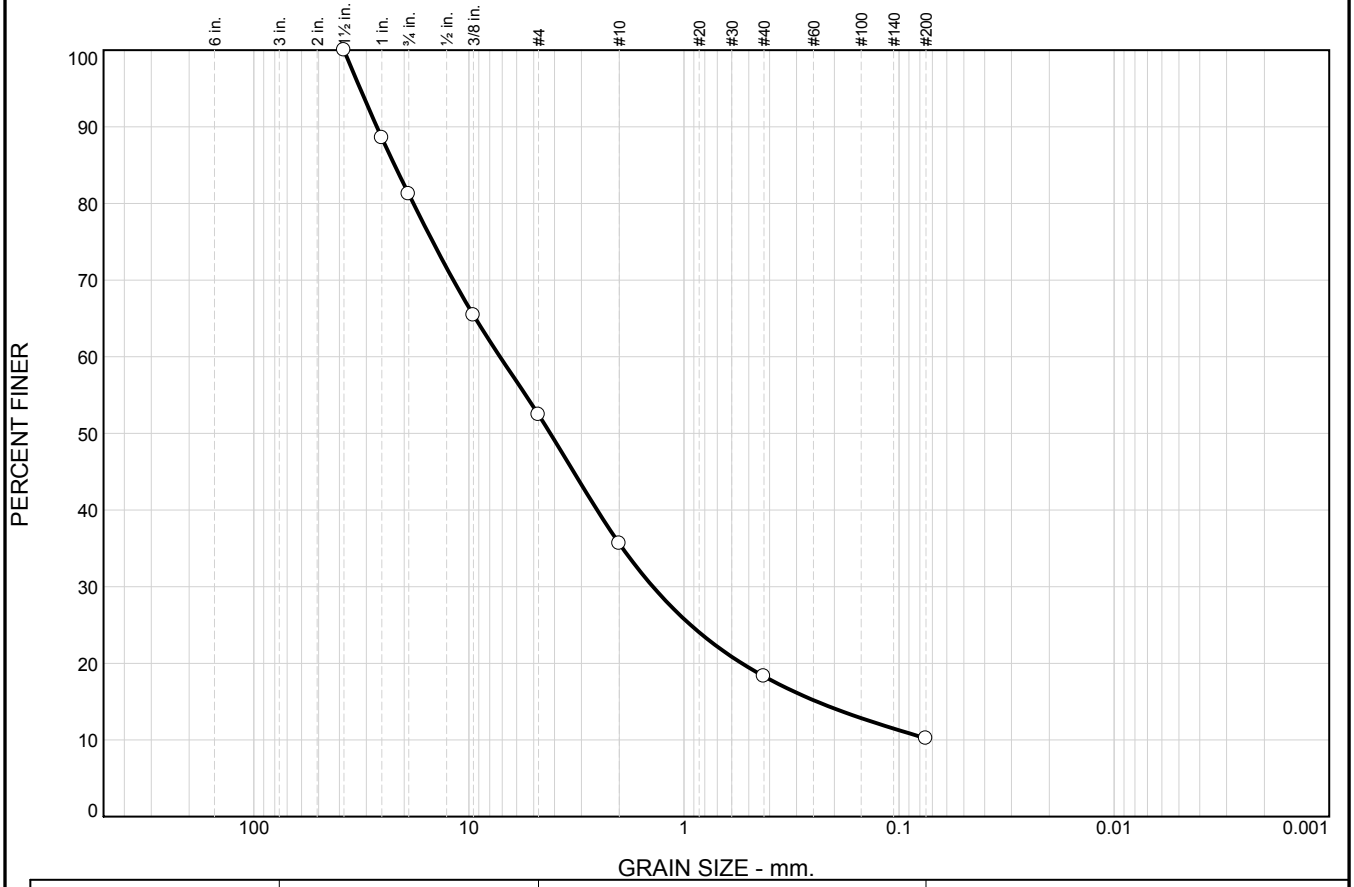
Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 74

Tested By: TBT 12/20/12 **Checked By:** JPB 03/12/13

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	18.8	28.7	16.9	17.3	8.1	10.2	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			22.1592	7.1674	4.1861	1.3956	0.2407			

Material Description	USCS	AASHTO
○ GRAY M/C/F SAND AND F/C GRAVEL, TR TO SM SILT	GW-GM	

Project No. 195651 **Client:** TRANSMISSION DEVELOPERS INC.

Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

○ **Source of Sample:** B201.9-1 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

TRC Engineers, Inc.

Mt. Laurel, NJ

Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 75

Tested By: TBT 12/20/12 **Checked By:** JPB 03/12/13

Terracon GeoReport

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. K-201.8

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4958° Longitude: -73.8186°

Surface Elev.: 166.0 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - LEAN CLAY WITH SILT, black, medium stiff	6	5-2-3-6 N=5			
		becomes gray and brown	2	4-7-6-7 N=13			
			2	5-3-4-7 N=7			
			0	8-7-8-8 N=15			
8.0	158	**SILTY SAND (SM)**, brown and gray, loose	10	2-4-5-6 N=9	40.5	49-30-19	38
10.0	156	**SILT AND CLAY (CL-ML)**, brown and gray, stiff	1	4-6-8-7 N=14			
			10	4-4-5-8 N=9			
			24	5-6-6-8 N=12	38.1		
23.0	143	**LEAN CLAY WITH SAND (CL)**, gray, very soft to soft	24	2-2-2-3 N=4			

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by LC
WOH = Weight of Hammer
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-08-2022 | Boring Completed: 03-08-2022

Drill Rig: Mobile B-57 | Driller: L. Spicher

Project No.: JB215256C

BORING LOG NO. K-201.8

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4958° Longitude: -73.8186°

Surface Elev.: 166.0 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY WITH SAND (CL), gray, very soft to soft *(continued)*								
		30			24	3-3-4-6 3" Split Spoon With RIng Samplers	40.7	44-24-20	75
		35			24	WOH-WOH-WOH-1			
					24	WOH-WOH-WOH-3			
40.0	126	40							
	Boring Terminated at 40 Feet								

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-08-2022 | Boring Completed: 03-08-2022

Drill Rig: Mobile B-57 | Driller: L. Spicher

Project No.: JB215256C

BORING LOG NO. K-201.9

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4935° Longitude: -73.8181°

Surface Elev.: 169.4 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.0	169.4	
2.0	167.5	**FILL - BALLAST**, black, loose
4.0	165.5	**FILL - BALLAST AND SILTY SAND WITH GRAVEL**, black and brown, loose
8.0	161.5	**SILT AND CLAY (CL-ML)**, brown and gray, medium stiff to stiff
10.0	159.5	**SILT AND CLAY (CL-ML)**, varved, with occasoinal sand partings, brown, stiff
		SILT WITH SAND (ML), varved, brown, very soft to very stiff grades gray

DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0	1	3-3-4-4 N=7			
	6	5-4-4-3 N=8			
5	14	2-2-4-5 N=6			
	16	6-6-5-4 N=11	32.1		
	18	3-5-8-12 N=13			
10	18	12-12-17-24 N=29	34.0	48-29-19	72
15	18	3-4-6 N=10			
20	18	2-4-6 N=10			
25	18	2-4-6 N=10			

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

While drilling

prior to grouting on 3/18

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-17-2022 | Boring Completed: 03-18-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

BORING LOG NO. K-201.9

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4935° Longitude: -73.8181°

Surface Elev.: 169.4 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILT WITH SAND (ML), varved, brown, very soft to very stiff *(continued)*	30	▽		24	4-11-15-16	20.7	23-17-6	97
						18	3" Split Spoon With Ring Samplers 3-4-8 N=12			
			35			18	WOH-WOH-1 N=1	42.1		
37.0	132.5									
		SILTY SAND WITH GRAVEL (SM), gray, (GLACIAL TILL)	40							
40.5	129									
41.3	128	**WEATHERED SHALE**, gray, very dense				12	28-36-50/4"			
		Boring Terminated at 41.3 Feet								

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by: JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 91.3% +/-2.7%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

▽ *While drilling*

▽ *prior to grouting on 3/18*

Terracon
30 Corporate Cir Ste 201
Albany, NY

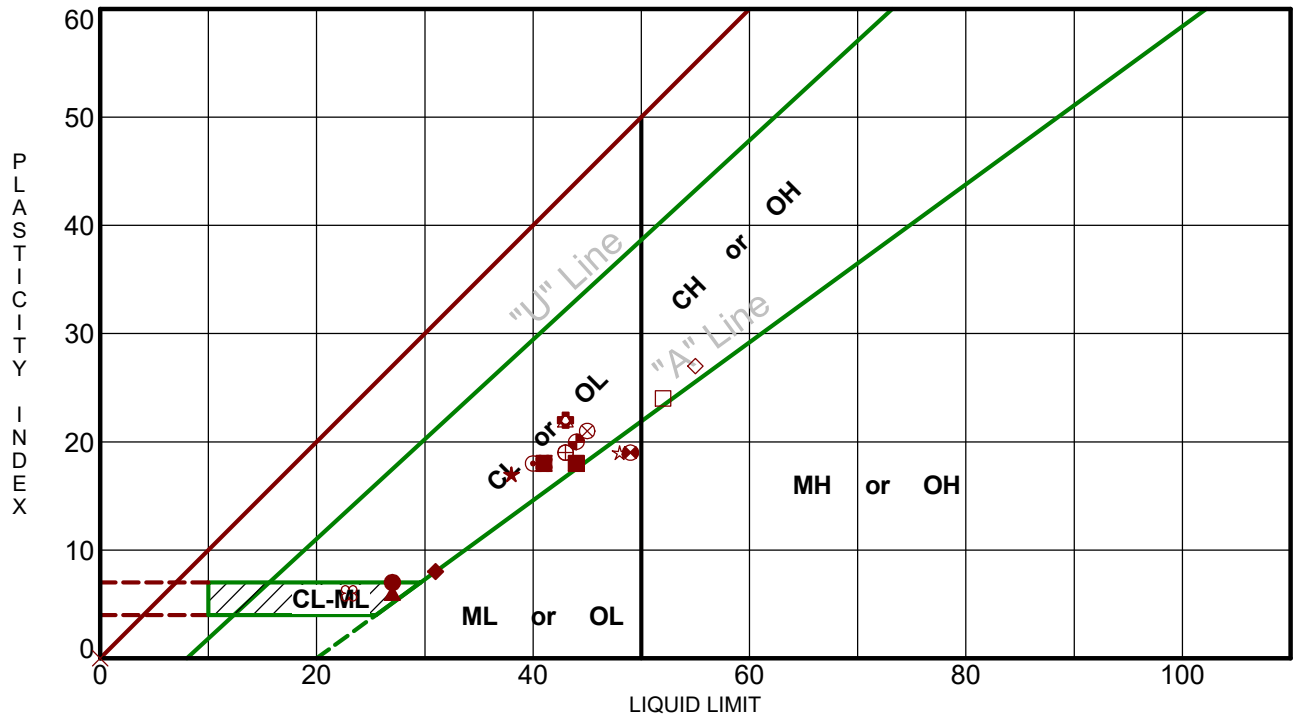
Boring Started: 03-17-2022 | Boring Completed: 03-18-2022

Drill Rig: CME 750x | Driller: J. Lamm

Project No.: JB215256C

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	K-199.6	15 - 17	27	20	7	98.7	CL-ML	SILTY CLAY
⊠	K-199.6	28 - 30	41	23	18	95.0	CL	LEAN CLAY
▲	K-199.7	15 - 17	27	21	6	99.7	CL-ML	SILTY CLAY
★	K-199.7	28 - 30	38	21	17	89.5	CL	LEAN CLAY
⊙	K-200.7	20 - 21.5	40	22	18	91.6	CL	LEAN CLAY
✿	K-200.7	73 - 75	43	21	22	86.9	CL	LEAN CLAY
○	K-200.8	6 - 8	43	24	19	89.6	CL	LEAN CLAY
△	K-200.8	25 - 27	43	21	22	93.8	CL	LEAN CLAY
⊗	K-200.9	6 - 8	45	24	21	70.4	CL	LEAN CLAY with SAND
⊕	K-200.9	21 - 23	43	24	19	81.3	CL	LEAN CLAY with SAND
□	K-200.9	35 - 36.5	52	28	24	70.4	CH	FAT CLAY with SAND
⊛	K-201.8	8 - 10	49	30	19	37.7	SM	SILTY SAND
◕	K-201.8	28 - 30	44	24	20	75.1	CL	LEAN CLAY with SAND
☆	K-201.9	10 - 12	48	29	19	72.4	ML	SILT with SAND
✿	K-201.9	28 - 30	23	17	6	96.8	CL-ML	SILTY CLAY
■	K-203.4	8 - 10	44	26	18	57.1	CL	SANDY LEAN CLAY
◆	K-203.4	20 - 22	31	23	8	92.9	ML	SILT
◇	K-203.5	22 - 24	55	28	27	57.6	CH	SANDY FAT CLAY
✕	K-203.5	33 - 35	NP	NP	NP	16.4	SM	SILTY SAND with GRAVEL
✖	K-203.6	10 - 12	41	23	18	83.2	CL	LEAN CLAY with SAND

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

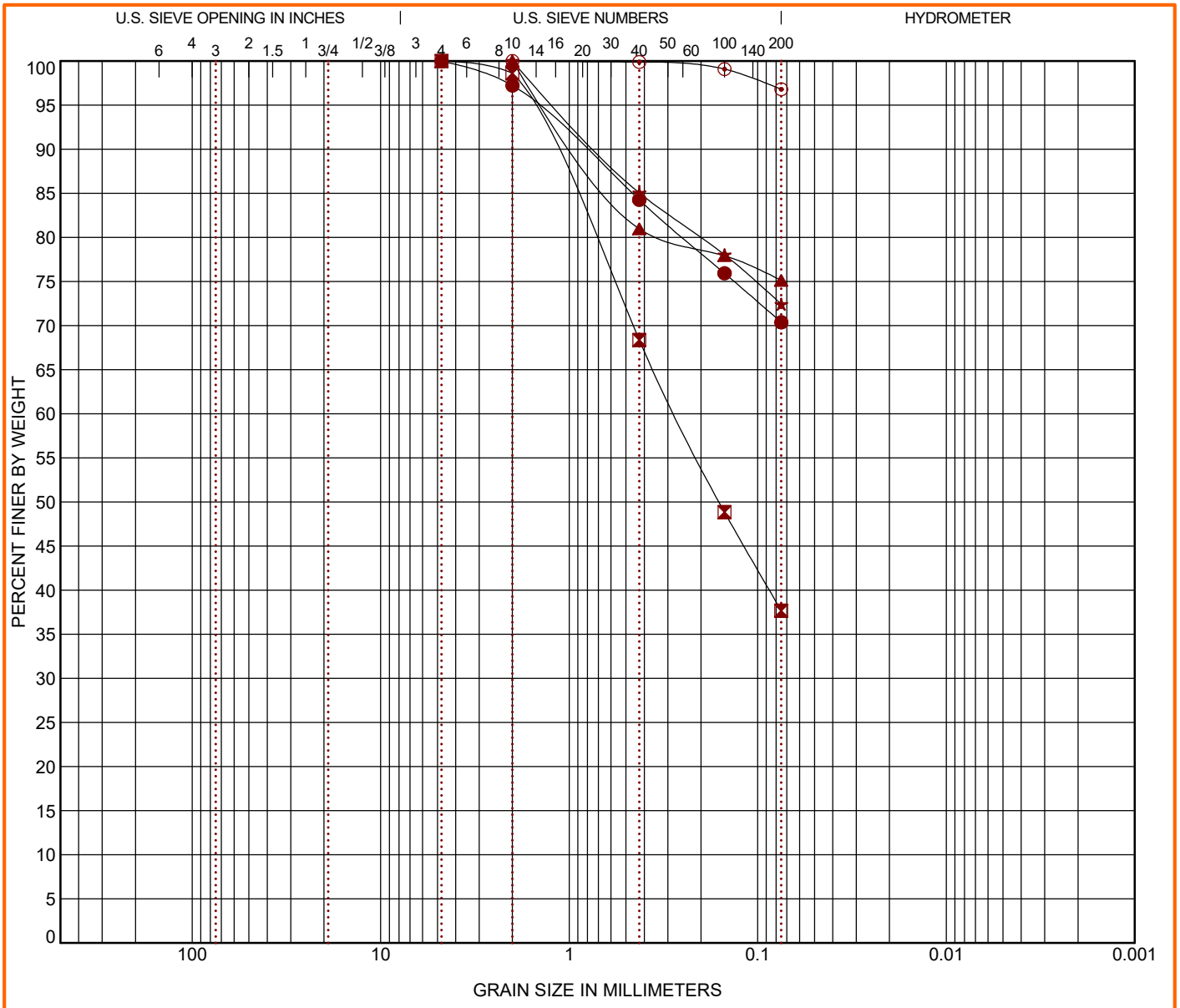
Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

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
●	K-200.9	35 - 36.5	FAT CLAY with SAND (CH)	46.7	52	28	24		
⊠	K-201.8	8 - 10	SILTY SAND (SM)	40.5	49	30	19		
▲	K-201.8	28 - 30	LEAN CLAY with SAND (CL)	40.7	44	24	20		
★	K-201.9	10 - 12	SILT with SAND (ML)	34.0	48	29	19		
⊙	K-201.9	28 - 30	SILTY CLAY (CL-ML)	20.7	23	17	6		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-200.9	35 - 36.5	4.75				0.0	0.0	29.6		70.4	
⊠	K-201.8	8 - 10	4.75	0.272			0.0	0.0	62.3		37.7	
▲	K-201.8	28 - 30	2				0.0	0.0	24.9		75.1	
★	K-201.9	10 - 12	2				0.0	0.0	27.6		72.4	
⊙	K-201.9	28 - 30	2				0.0	0.0	3.2		96.8	

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256C CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 4/12/22

Kiewit

MEMORANDUM

DATE: November 10, 2022

TO: Todd Kilduff; Kilduff Underground Engineering, Inc.

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

SUBJECT: Geotechnical Data: Segment 10 – Package 6 – HDD Crossing 93.A
Champlain Hudson Power Express Project
Coeymans, 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 northwest of Coeymans, New York. The approximate station for the start of HDD crossing number 93.A is STA 60171+00 (42.4927° N, 73.8181° W).

The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigation by TRC referenced below.

- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013.

Contact us if you have questions or require additional information.

HDD 93.A
Boring B202.1-1
Segment 10 - Design Package 6

CHPE Segment 10 - Package 6
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A199.7-1	1344990.8	678939.9	159.0
	A205.2-1	1317487.9	677289.6	204.6
	A206.62-1	1310345.7	678496.2	186.8
	A207.0-1	1308517.7	677770.1	179.6
	A209.05-1	1298062.1	675944.3	148.6
	A219.05-1	1247052.0	666820.5	128.8
	B198.9-1	1348887.4	679090.7	173.5
	B200.6-1	1340723.0	677093.4	96.3
	B200.7-1	1340001.8	676794.4	128.5
	B201.7-1	1335310.5	675758.1	162.1
	B201.9-1	1334029.9	676014.8	173.3
	B202.1-1	1333294.3	676182.6	168.3
	B203.45-1	1326328.9	678471.9	171.2
	B203.5-1	1325831.2	678645.3	183.2
	B204.2-1	1322268.4	678463.0	198.8
	B204.7-1	1320048.9	677891.8	207.1
	B205.8-1	1314638.7	678588.0	141.5
	B205.9-2	1313866.7	678637.8	190.3
	B207.9-1	1303512.5	676338.7	156.2
	B208.2-1	1302277.3	676188.9	152.0
	B208.3-1	1301673.4	676120.2	150.0
	B208.5-1	1300907.6	675929.0	116.7
	B210.0-1	1293021.1	676353.2	109.9
	B210.4-1	1291223.1	676583.0	120.5
	B211.2-1	1286509.8	676960.2	132.6
	B211.5-1	1285068.8	677013.1	140.7
	B211.7-1	1284088.5	676965.4	141.5
	B212.0-1	1282469.0	676857.5	138.9
	B212.2-1	1281498.0	676590.5	130.8
	B214.6-1	1269721.4	672670.9	124.9
	B216.1-1	1262073.1	670916.0	127.0
	B216.4-1	1260344.1	670520.5	128.3
	B216.6-1	1259315.9	670290.2	129.8
	B219.5-1	1244816.4	666093.7	130.4
AECOM**	SC-1A	1348656.7	679220.0	176.4
	SC-2A	1326692.2	678361.5	178.9
	SC-2C	1305133.1	676877.4	160.6

Notes:

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

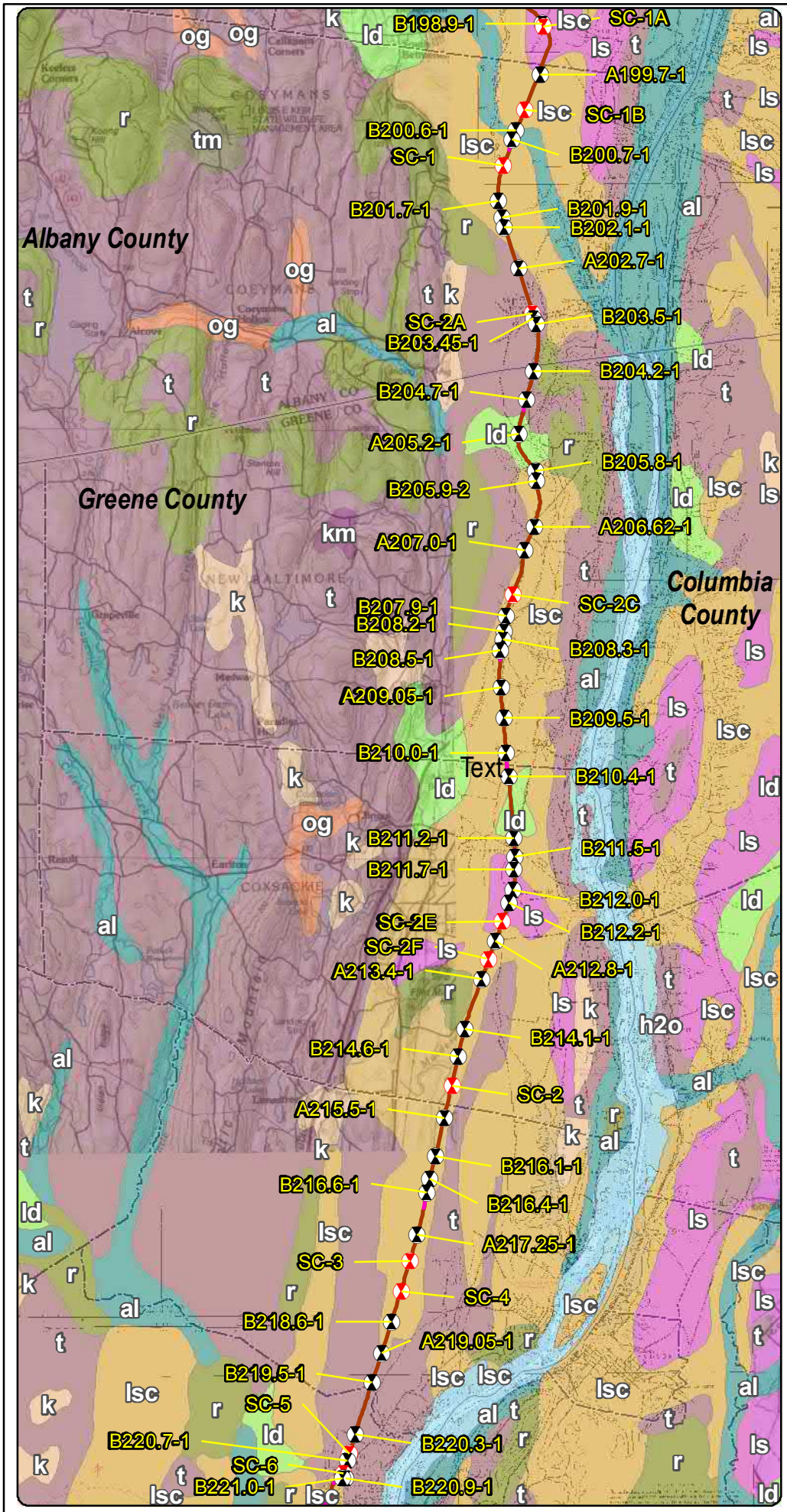
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

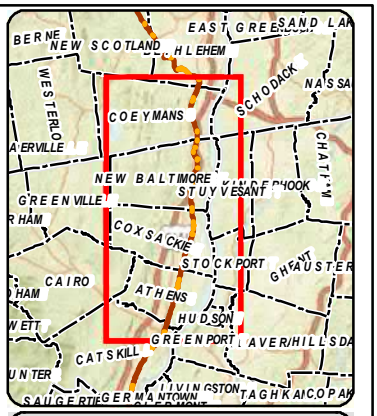
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.

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

Reference:

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





LEGEND

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

Surficial Geology

- al - Recent alluvium
- h2o - Water
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

1 0.5 0 1 Miles

Transmission Developments Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

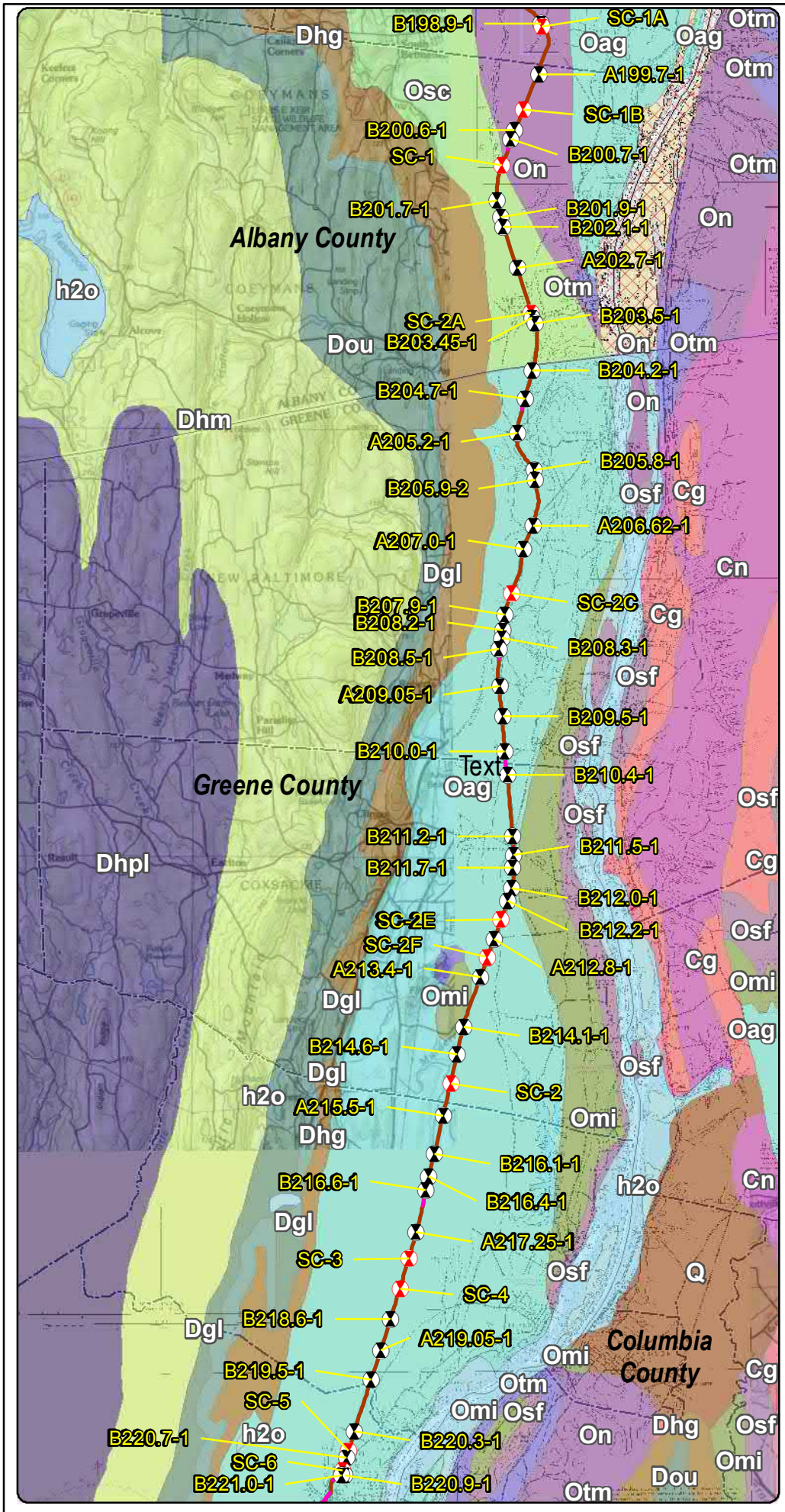
Surficial Geology and Geotechnical Borings Selkirk to Catskill Figure 3-10

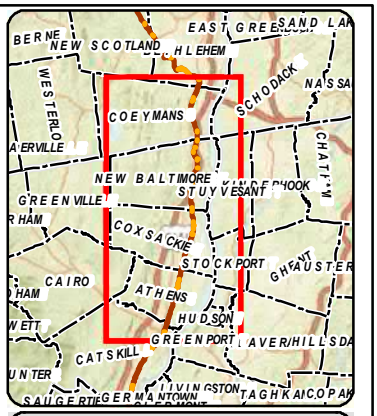
Prepared on 5/3/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190909Boring_Locations\Maps_for_May_2021_Report\Selkirk_to_Catskill_Boring_Locations_Surficial_May_2021_Report.mxd





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- County Boundary

Bedrock Geology

- Cg - Germantown Formation
- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhm - Undiff Lower Hamilton Group
- Dhpl - Plattekill Formation
- Dou - Onondaga Limestone
- No Label
- Oag - Austin Glen Form (graywacke, shale)
- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

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

N

1 0.5 0 1 Miles

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Selkirk to Catskill Figure 4-10

Prepared on 5/18/2021

by: AECOM

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

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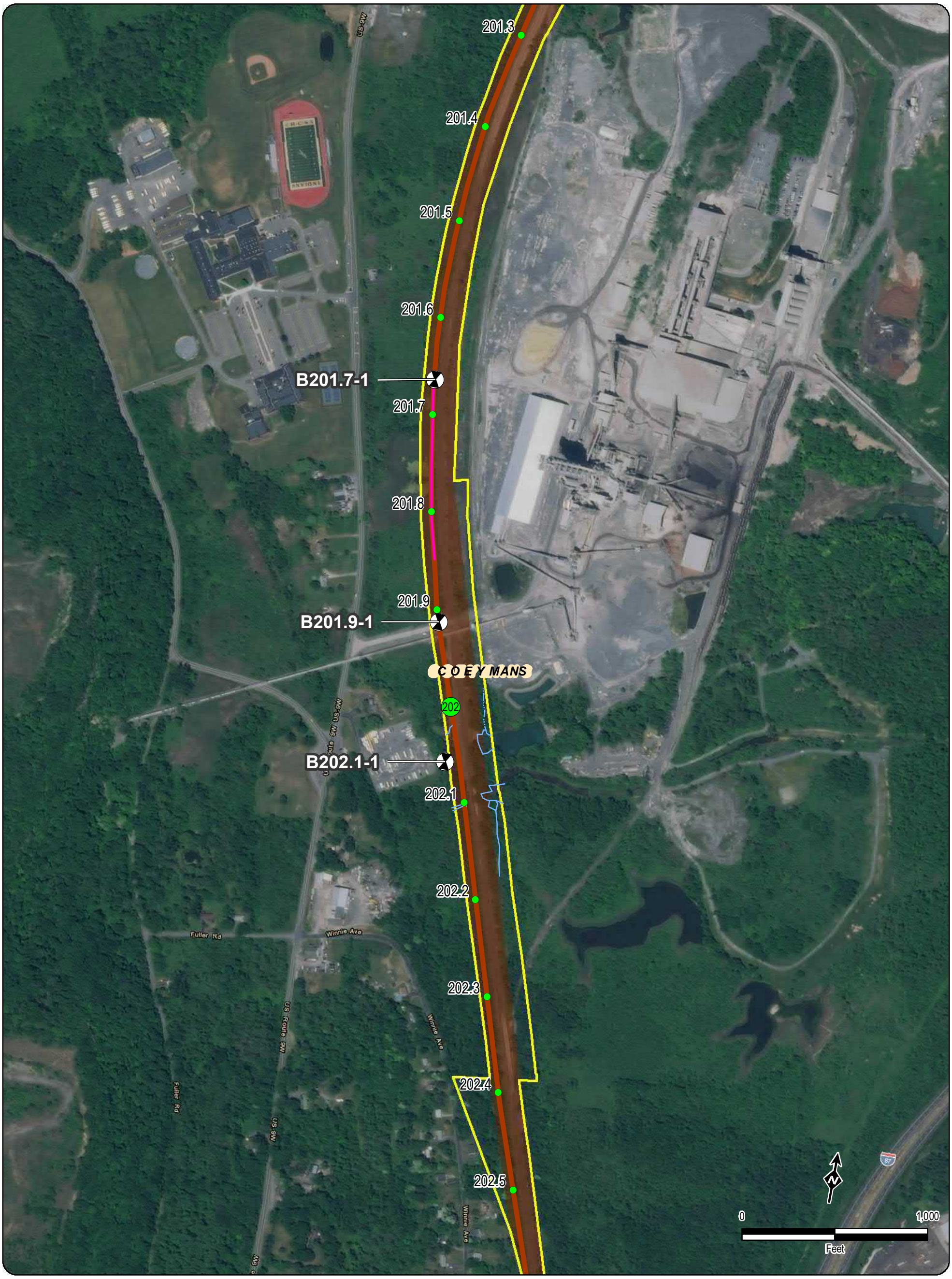

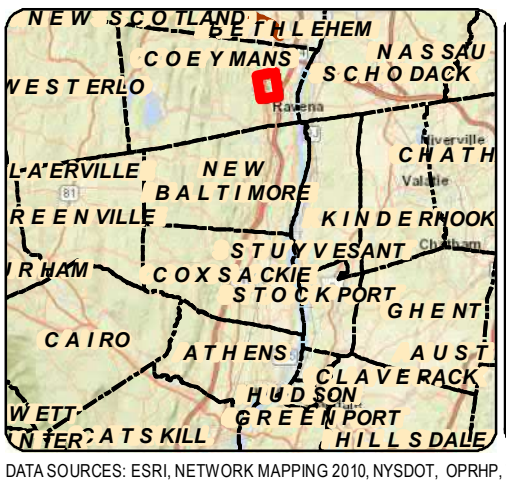

LEGEND

- 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

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

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Selkirk to Catskill

Figure A-10

Sheet 3 of 18

Prepared by: AECOM 5/19/2021

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TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

BORING	**B202.1-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
18.0'	NR	11/20	0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	25.0 '

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	N/A
DATE STARTED	11/20/2012
DATE COMPLETED	11/20/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	3 4 4 5			22.4	
	S-2	10 9 13 14		***LIGHT BROWN SILT, SM CLAY, TR F/ SAND***		
5	S-3	10 9 13 15		6.0	19.3	
	S-4	10 9 7 6		***BROWN SILT, TR TO SM F/ SAND, TR CLAY*** 8.0		
	S-5	7 6 6 5			28.2	
10				***BROWN SILT, SM CLAY, TR F/ SAND***		
				13.5		
15	S-6	6 5 6		***BROWN SILT, TR TO SM F/ SAND***		
▼				18.5		
	S-7	2 3 4			43.9	
20				***GRAY SILT, TR CLAY***		
25	S-8	2 3 2		25.0		
				END OF BORING AT 25'		
30						
35						

DRN.	TBT
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

SUMMARY OF LABORATORY TEST DATA

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

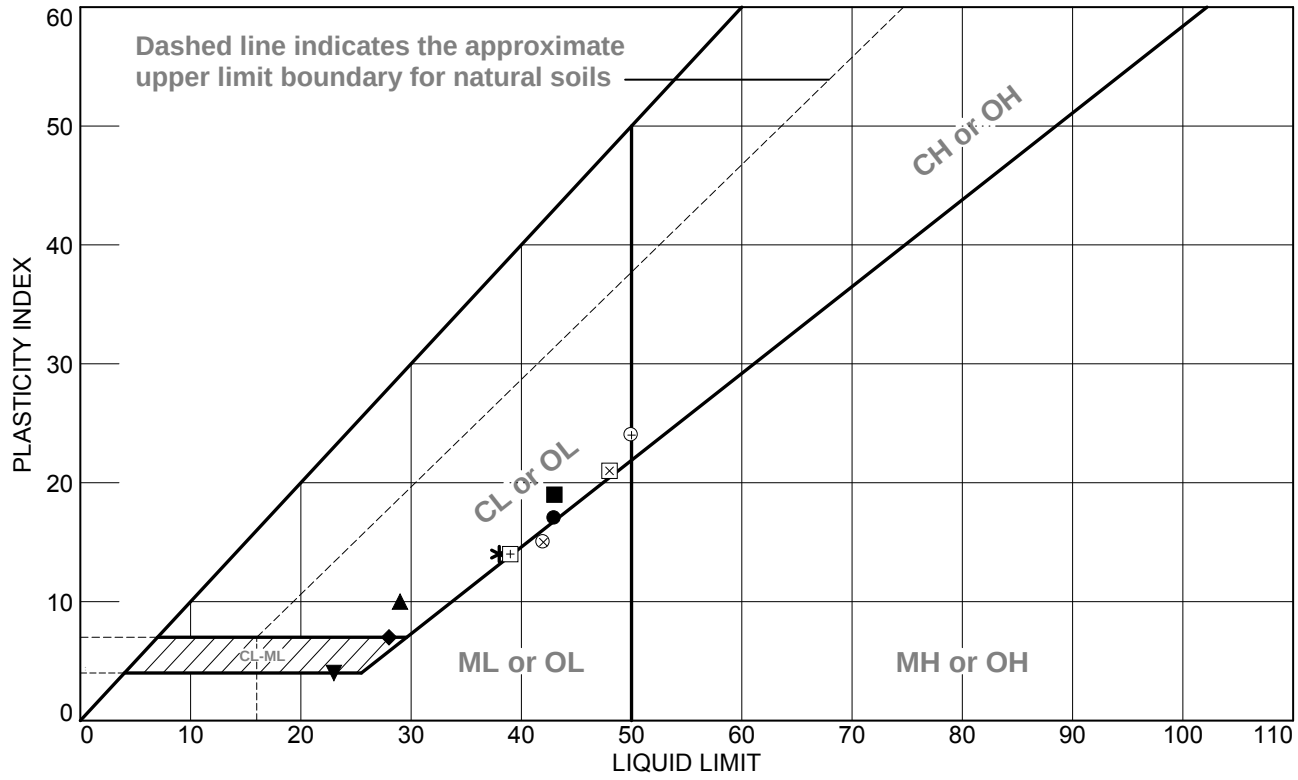
SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
B201.9-1	S-2	2.0-4.0	SM	33.1	49.8	17.1		-	-	-	-	-	9.6	-	-	-
	S-3	4.0-6.0														
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	-	8.6	-	-	-
	S-5	8.0-10.0	GW-GM	47.5	42.3	10.2		-	-	-	-	-	5.0	-	-	-
	S-6	13.5-15.0	-	-	-	-		-	-	-	-	-	31.1	90.9	-	-
	S-7	18.5-20.0	CL	-	-	-		43	26	17	0.1	-	27.5	-	-	-
	S-8	23.5-25.0	-	-	-	-		-	-	-	-	-	23.0	-	-	-
B202.1-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	22.4	-	-	-
	S-2	2.0-4.0	ML	0.0	8.7	63.3	28.0	-	-	-	-	2.77	19.3	-	-	-
	S-3	4.0-6.0												104.0	-	-
	S-5	8.0-10.0	-	0.0	6.7	93.3		-	-	-	-	-	28.2	-	-	-

SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
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-7	18.5-20.0	CL	-	-	-		43	24	19	1.0	-	43.9	-	-	-
A202.7-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	28.0	-	-	-
	S-2	2.0-4.0	SM	16.2	53.2	30.6		-	-	-	-	-	19.8	-	-	-
	S-3	4.0-6.0	SM	20.2	37.4	42.4		-	-	-	-	-	19.0	-	-	-
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	-	29.7	-	-	7.3
B203.45-1	S-3	4.0-6.0	-	-	-	-		-	-	-	-	-	37.3	85.6	-	-
	S-4	6.0-8.0	-	12.2	6.3	81.5		-	-	-	-	-	28.1	-	-	-
	S-5	8.0-10.0	-	-	-	-		-	-	-	-	-	38.8	-	-	-
	S-6	13.5-15.0	CL	-	-	-		29	19	10	1.1		30.0	-	-	-
B203.5-1	S-2	2.0-4.0	CL-ML	-	-	-		28	21	7	-1.0	-	13.7	-	-	-
	S-3	4.0-6.0	-	-	-	-		-	-	-	-	-	15.5	-	-	-

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

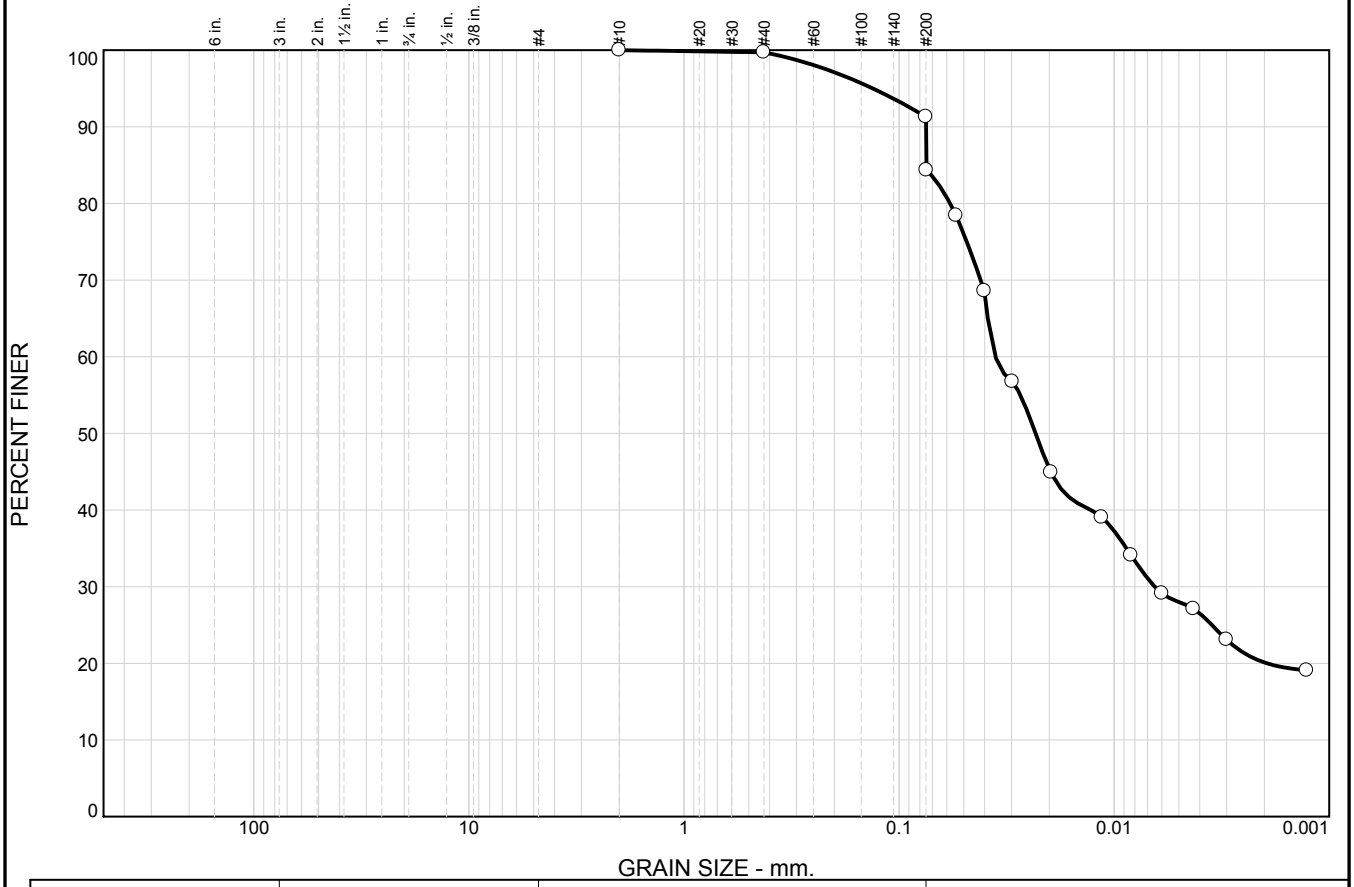
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B201.9-1	S-7	18.5-20.0 FT	27.5	26	43	17	CL
■	B202.1-1	S-7	18.5-20.0 FT	43.9	24	43	19	CL
▲	B203.45-1	S-6	13.5-15.0 FT	30.0	19	29	10	CL
◆	B203.5-1	S-2	2.0-4.0 FT	13.7	21	28	7	CL-ML
▼	B203.5-1	S-6	13.5-15.0 FT	16.7	19	23	4	CL-ML
✱	B204.2-1	S-4 & S-5	6.0-10.0 FT	22.9	24	38	14	CL
⊕	B204.7-1	S-3, S-4, & S-5	4.0-10.0 FT	30.5	26	50	24	CL/CH
⊞	B204.7-1	S-8	23.5-25.0 FT	24.3	25	39	14	CL
⊗	B207.9-1	S-6	13.5-15.0 FT	40.7	27	42	15	ML

TRC
Engineers, Inc.
Mt. Laurel, NJ

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

Project No.: 195651 **Figure** 4

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.3	8.4	63.3	28.0

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
○			0.0746	0.0356	0.0232	0.0065				

Material Description	USCS	AASHTO
○ LIGHT BROWN SILT, SM CLAY, TR F/ SAND	ML	

Project No. 195651 **Client:** TRANSMISSION DEVELOPERS INC.

Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

○ **Source of Sample:** B202.1-1 **Depth:** 2.0-6.0 FT **Sample Number:** S-2 & S-3

TRC Engineers, Inc.

Mt. Laurel, NJ

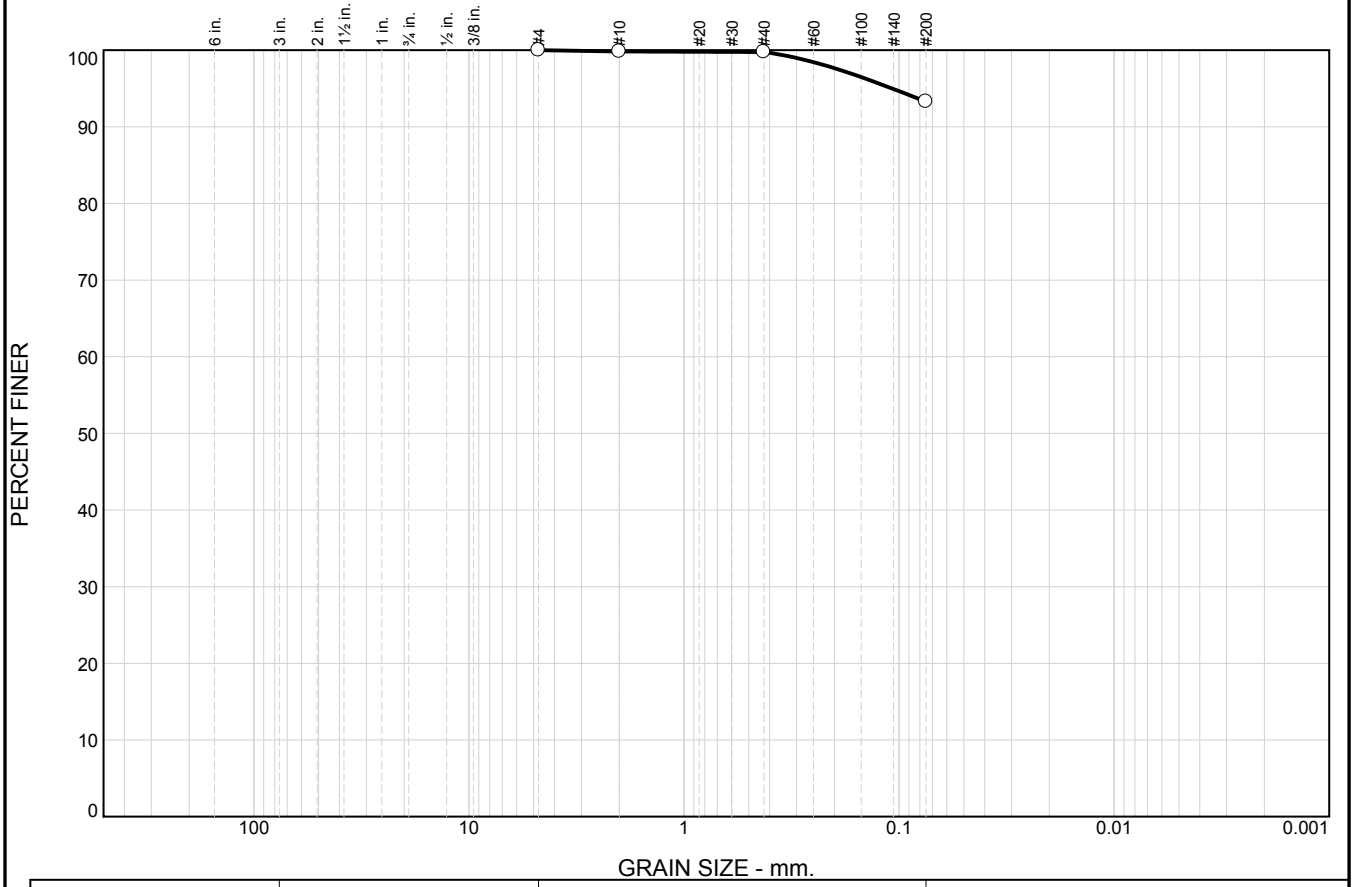
Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALAYSIS

Figure 76

Tested By: TBT 12/28/12 **Checked By:** JPB 03/12/13

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.2	0.0	6.5	93.3	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○										

Material Description	USCS	AASHTO
○ BROWN SILT, SM CLAY, TR F/ SAND		

Project No. 195651 **Client:** TRANSMISSION DEVELOPERS INC.

Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

○ **Source of Sample:** B202.1-1 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

TRC Engineers, Inc.

Mt. Laurel, NJ

Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 77

Tested By: TBT 12/20/12 **Checked By:** JPB 03/12/13

Kiewit

MEMORANDUM

DATE: November 10, 2022

TO: Todd Kilduff; Kilduff Underground Engineering, Inc.

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

SUBJECT: Geotechnical Data: Segment 10 – Package 6 – HDD Crossing 94 – Revision 1
Champlain Hudson Power Express Project
Coeymans, 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 Coeymans, New York. The approximate station for the start of HDD crossing number 94 is STA 60244+00 (42.4733° N, 73.8098° W).

The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigations by TRC and AECOM and from a recent investigation by Terracon, 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 Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Package 6, Selkirk to Catskill, Rev-1, dated June 28, 2022.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013.

Contact us if you have questions or require additional information.

HDD 94
Borings SC-2A, K-203.4, B203.45-1, K-203.5, B203.5-1, K-203.6
Segment 10 - Design Package 6

CHPE Segment 10 - Package 6
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A199.7-1	1344990.8	678939.9	159.0
	A205.2-1	1317487.9	677289.6	204.6
	A206.62-1	1310345.7	678496.2	186.8
	A207.0-1	1308517.7	677770.1	179.6
	A209.05-1	1298062.1	675944.3	148.6
	A219.05-1	1247052.0	666820.5	128.8
	B198.9-1	1348887.4	679090.7	173.5
	B200.6-1	1340723.0	677093.4	96.3
	B200.7-1	1340001.8	676794.4	128.5
	B201.7-1	1335310.5	675758.1	162.1
	B201.9-1	1334029.9	676014.8	173.3
	B202.1-1	1333294.3	676182.6	168.3
	B203.45-1	1326328.9	678471.9	171.2
	B203.5-1	1325831.2	678645.3	183.2
	B204.2-1	1322268.4	678463.0	198.8
	B204.7-1	1320048.9	677891.8	207.1
	B205.8-1	1314638.7	678588.0	141.5
	B205.9-2	1313866.7	678637.8	190.3
	B207.9-1	1303512.5	676338.7	156.2
	B208.2-1	1302277.3	676188.9	152.0
	B208.3-1	1301673.4	676120.2	150.0
	B208.5-1	1300907.6	675929.0	116.7
	B210.0-1	1293021.1	676353.2	109.9
	B210.4-1	1291223.1	676583.0	120.5
	B211.2-1	1286509.8	676960.2	132.6
	B211.5-1	1285068.8	677013.1	140.7
	B211.7-1	1284088.5	676965.4	141.5
	B212.0-1	1282469.0	676857.5	138.9
	B212.2-1	1281498.0	676590.5	130.8
	B214.6-1	1269721.4	672670.9	124.9
	B216.1-1	1262073.1	670916.0	127.0
	B216.4-1	1260344.1	670520.5	128.3
	B216.6-1	1259315.9	670290.2	129.8
	B219.5-1	1244816.4	666093.7	130.4
AECOM**	SC-1A	1348656.7	679220.0	176.4
	SC-2A	1326692.2	678361.5	178.9
	SC-2C	1305133.1	676877.4	160.6

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.

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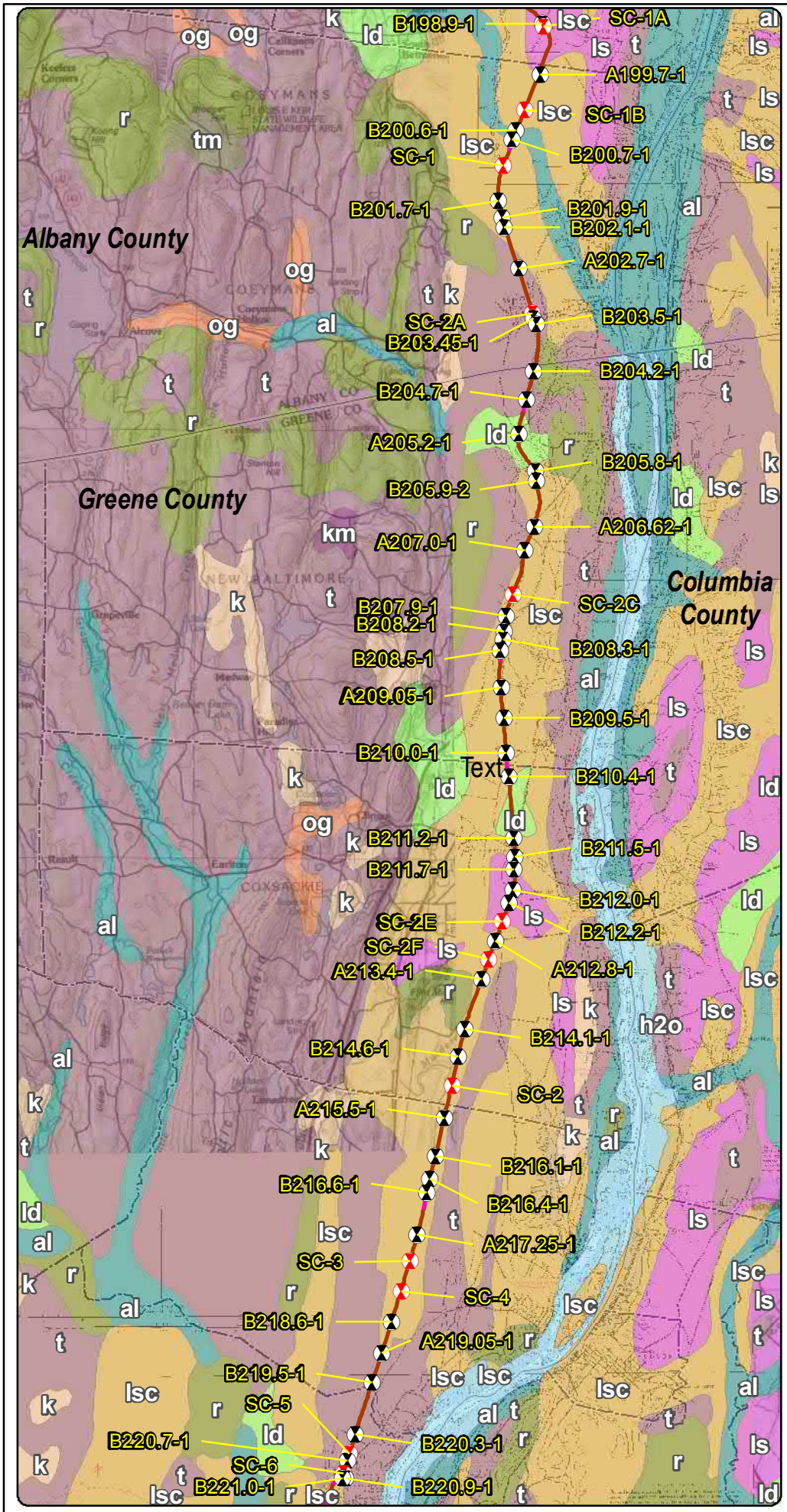

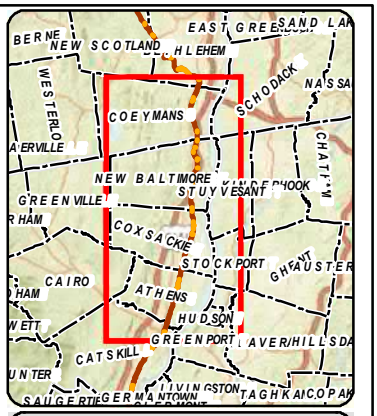

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- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

1 0.5 0 1 Miles

Transmission Developments Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

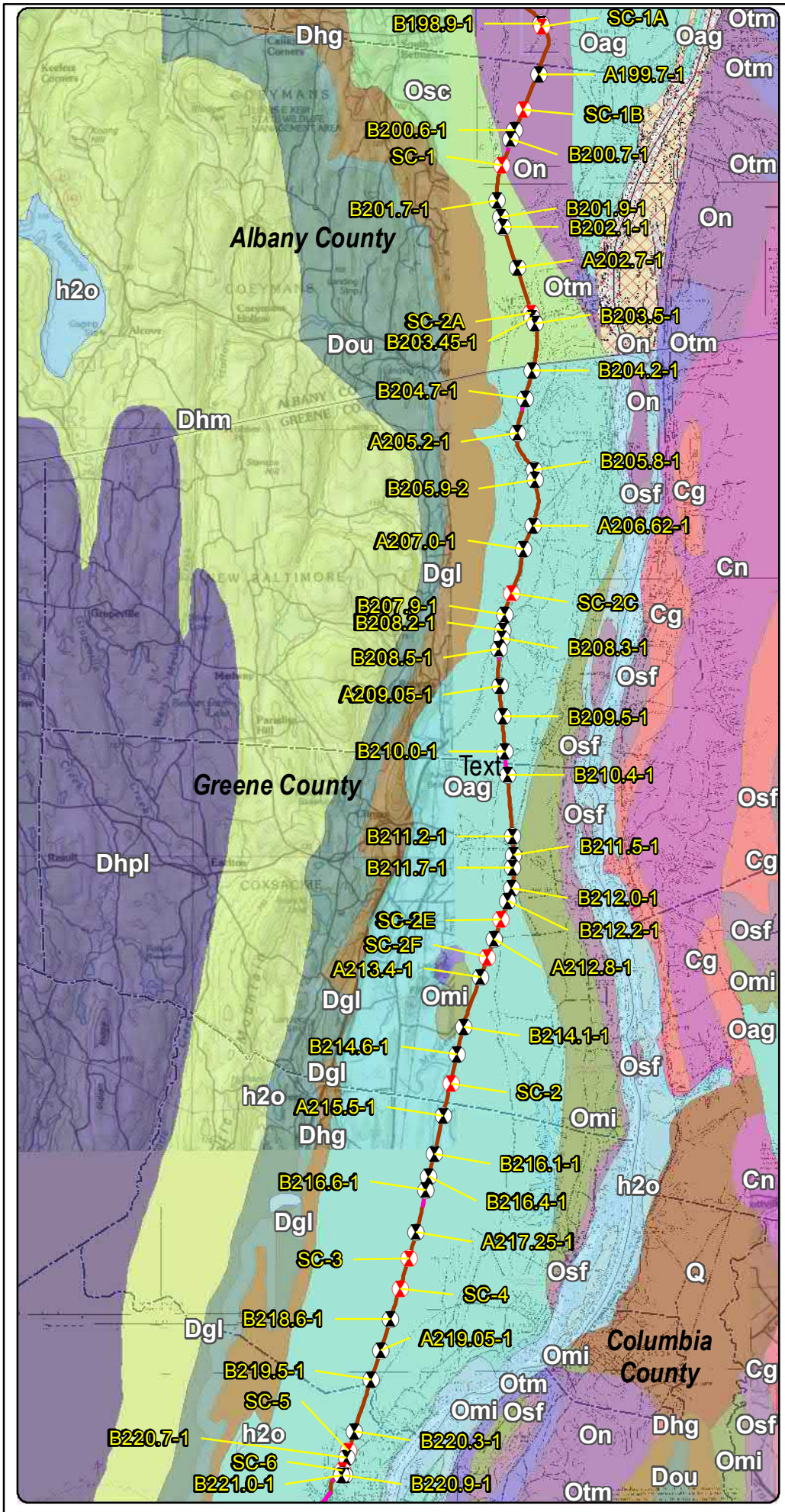
Surficial Geology and Geotechnical Borings Selkirk to Catskill Figure 3-10

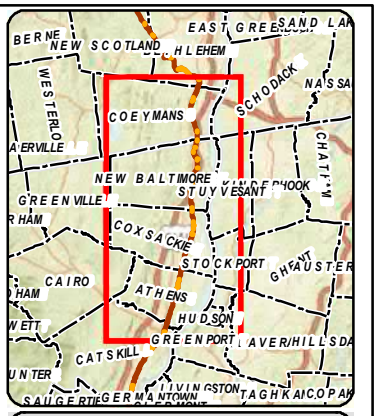
Prepared on 5/3/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190909Boring_Locations\Maps_for_May_2021_Report\Selkirk_to_Catskill_Boring_Locations_Surficial_May_2021_Report.mxd





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- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhm - Undiff Lower Hamilton Group
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- No Label
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- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

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

N

1 0.5 0 1 Miles

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Selkirk to Catskill Figure 4-10

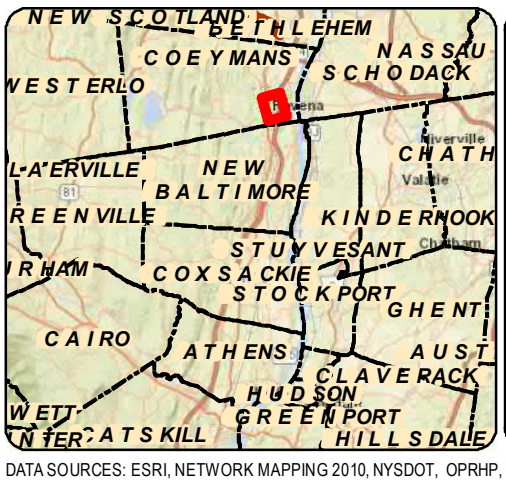
Prepared on 5/18/2021

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\Selkirk_to_Catskill_Boring_Locations_Bedrock_May_2021_Report.mxd

202.6
A202.7-1
202.8
202.9
203
203.1
203.2
COEYMANS
203.3
SC-2A
B203.45-1
203.5
B203.5-1
203.6
203.7
203.8
0
1,000
Feet
N



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

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

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Selkirk to Catskill

Figure A-10

Sheet 4 of 18

Prepared by: AECOM 5/19/2021

Y:\Projects\CHPEI\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_LocationsMaps_for_May_2021_Report\Selkirk_to_Catskill_Boring_Locations_Mapset_May_2021_Report.mxd

BORING CONTRACTOR: ADT	**AECOM**	SHEET 1 OF 1
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
SOILS ENGINEER/GEOLOGIST: Chris French		PROJECT NO.: 60323056
		HOLE NO.: **SC-2A**
		START DATE: 1/25/21
	BORING LOG	FINISH DATE: 1/25/21
LOCATION: Selkirk, NY MP - 203.38 (CSX Rail)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
No water observed	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					ML		0.0': Brown clayey SILT; frozen
1.0											ML		0.8'; Brown clayey SILT, trace subangular-subrounded cobbles; medium stiff, moist
2.0													
3.0													TR-1; (3.0'-5.0')
		3'-5'	S-1										
4.0													
5.0													
		5'-7'	S-2	24"	17"	6	7	8	11	10	ML		Brown clayey SILT; medium stiff, moist
6.0													
7.0													
		7'-9'	S-3	24"	24"	13	15	21	23	14	ML	Clayey SILT	Brown and gray clayey SILT, trace fine sand; medium stiff-stiff, moist
8.0													TR-3; (8.0'-8.5')
9.0													
		9'-11'	S-4	24"	18"	15	18	29	33	31	ML		SAA
10.0													
11.0													
		11'-'13'	S-5	24"	21"	14	20	16	16	23	ML		Brown and Gray SILT and CLAY; very stiff, moist
12.0													
13.0													TR-3; (12.0'-12.5')
		13'-15'	S-6	24"	24"	23	26	23	19	32	ML		SAA
14.0													
15.0													
		15'-16'	S-7	12"	12"	16	20	-	-	-	ML		Brown and Gray clayey SILT; very stiff, moist
16.0													TR-4; (15.5'-16.0')
													SC-2A terminated at 16', grouted to surface
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: $Ncorr=N*(2.0^2-1.375^2)in./(3.0^2-2.4^2)in. = N*0.65$.

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%

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

BORING	**B203.45-1**
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	24.2 '

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	N/A
DATE STARTED	02/14/2013
DATE COMPLETED	02/14/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	12 11 9 7		***DARK GRAY GRAVEL-SIZED ROCK FRAGMENTS, TR TO SM M/C SAND, TR SILT (FILL)***		
				2.0		
	S-2	7 8 8 7				
5				***GRAY-BROWN CLAY, SM GRAVEL-SIZED ROCK FRAGMENTS, TR TO SM SAND***	37.3	
▽	S-3	7 6 8 6				
	S-4	4 7 7 4			28.1	
				8.0		
10	S-5	4 6 6 6			38.8	
				GRAY CLAY, TR TO SM SILT		
15	S-6	6 4 6			30.0	
20	S-7	13 16 31		20.0		
				GRAY SILT, SM ROCK FRAGMENTS, TR CLAY (GLACIAL TILL)		
	S-8	41 50/0.2		24.4		
25				***END OF BORING AT 24.2'***		
30						
35						

DRN.	JPB
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

BORING	**B203.5-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR	11/20	0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	8.0 '
d	FROM	8.0 '	TO	25.0 '

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	N/A
DATE STARTED	11/20/2012
DATE COMPLETED	11/26/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	5 4 5				
	S-2	6 6 6			13.7	
5	S-3	6 4 6			15.5	
	S-4	10 17 38		***BROWN SILT, SM F/C GRAVEL, TR F/ SAND***		
	S-5	50/0.0				
10						
				13.5		
	S-6	27 23 24			16.7	
15						
				GRAY SILT, TR CLAY	22.8	
20	S-7	14 16 13				
	S-8	16 14 16		25.0	30.9	
25				***END OF BORING AT 25'***		
30						
35						

DRN.	TBT
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

S.W.COLE ENGINEERING, INC.

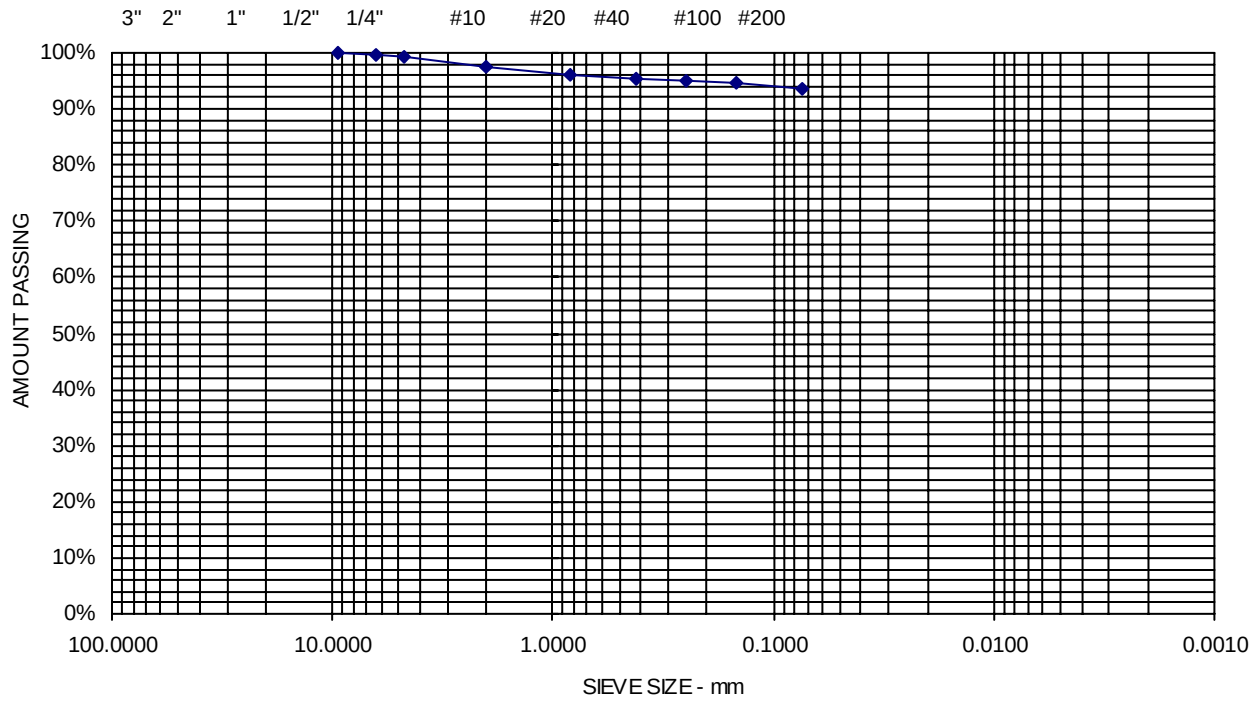
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10797S
Exploration	**B203.45-1**	Date Received	2/15/2013
Material Source	**15-25 FEET**	Date Completed	2/20/2013
		Tested By	SHAWN BENOIT

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
9.5 mm	**3/8"**	**100**	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**99**	0.6% Gravel
2.00 mm	**No. 10**	**98**	
850 um	**No. 20**	**96**	
425 um	**No. 40**	**96**	5.8% Sand
250 um	**No. 60**	**95**	
150 um	**No. 100**	**95**	
75 um	**No. 200**	**93.6**	93.6% Fines

GRAY SILTY CLAY SOME SAND TRACE GRAVEL (CL)



Comments: MOISTURE CONTENT = 37.9%

Sheet

S.W.COLE ENGINEERING, INC.

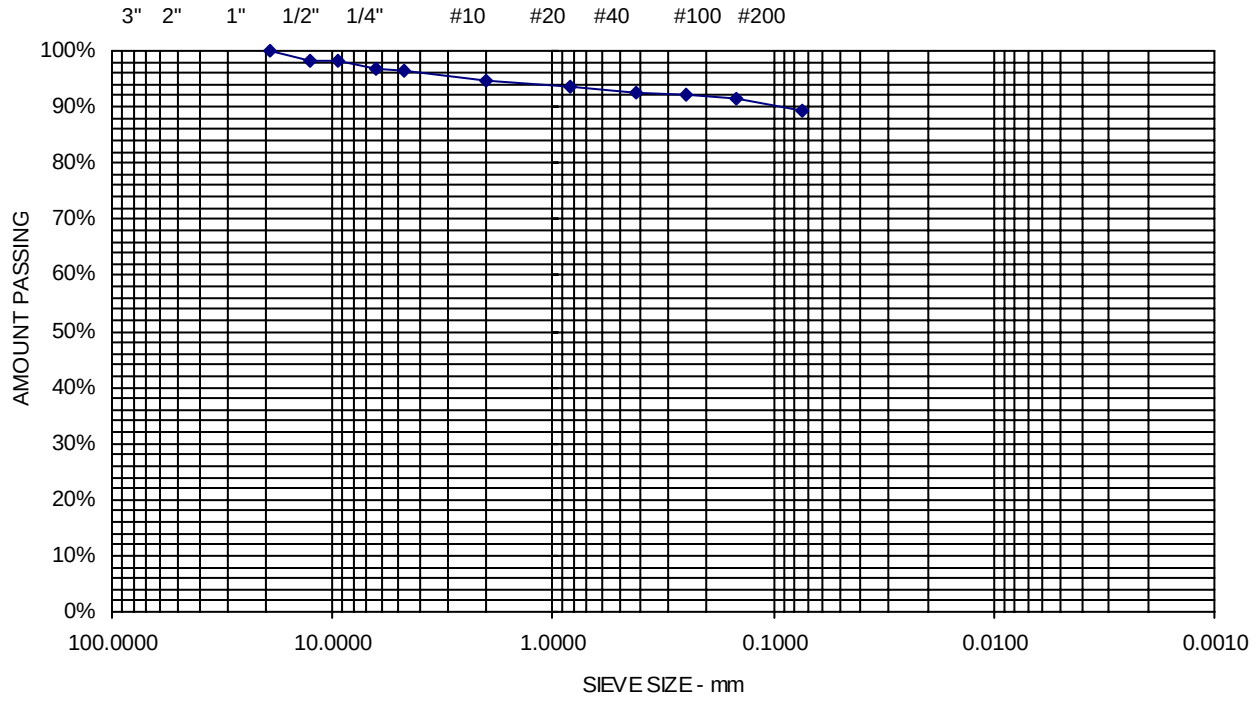
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10798S
Exploration	**B203.45-1**	Date Received	2/15/2013
Material Source	**UNKNOWN**	Date Completed	2/20/2013
		Tested By	SHAWN BENOIT

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**98**	
9.5 mm	**3/8"**	**98**	
6.3 mm	**1/4"**	**97**	
4.75 mm	**No. 4**	**96**	3.5% Gravel
2.00 mm	**No. 10**	**95**	
850 um	**No. 20**	**93**	
425 um	**No. 40**	**93**	7% Sand
250 um	**No. 60**	**92**	
150 um	**No. 100**	**92**	
75 um	**No. 200**	**89.5**	89.5% Fines

BROWN SILTY CLAY SOME SAND TRACE GRAVEL (CL)



Comments: MOISTURE CONTENT = 30.6%

Sheet

S.W.COLE ENGINEERING, INC.

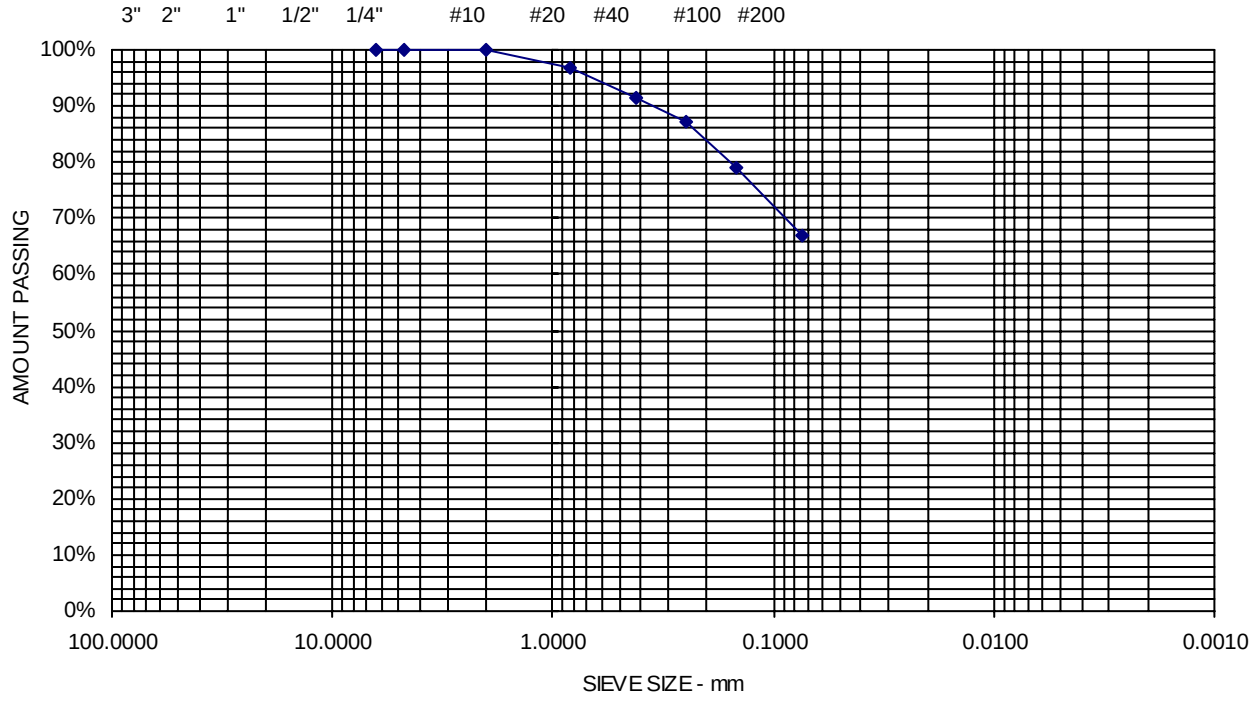
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10397S
Exploration	**B203.5-1**	Date Received	11/29/2012
Material Source	**BULK SAMPLE FROM 10-15 FEET**	Date Completed	12/4/2012
		Tested By	SHAWN BENOIT

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0% Gravel
2.00 mm	**No. 10**	**100**	
850 um	**No. 20**	**97**	
425 um	**No. 40**	**91**	33.2% Sand
250 um	**No. 60**	**87**	
150 um	**No. 100**	**79**	
75 um	**No. 200**	**66.8**	66.8% Fines

BROWN SANDY SILT AND CLAY (CL)



Comments: MOISTURE CONTENT = 28.3%

Sheet

S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D-422

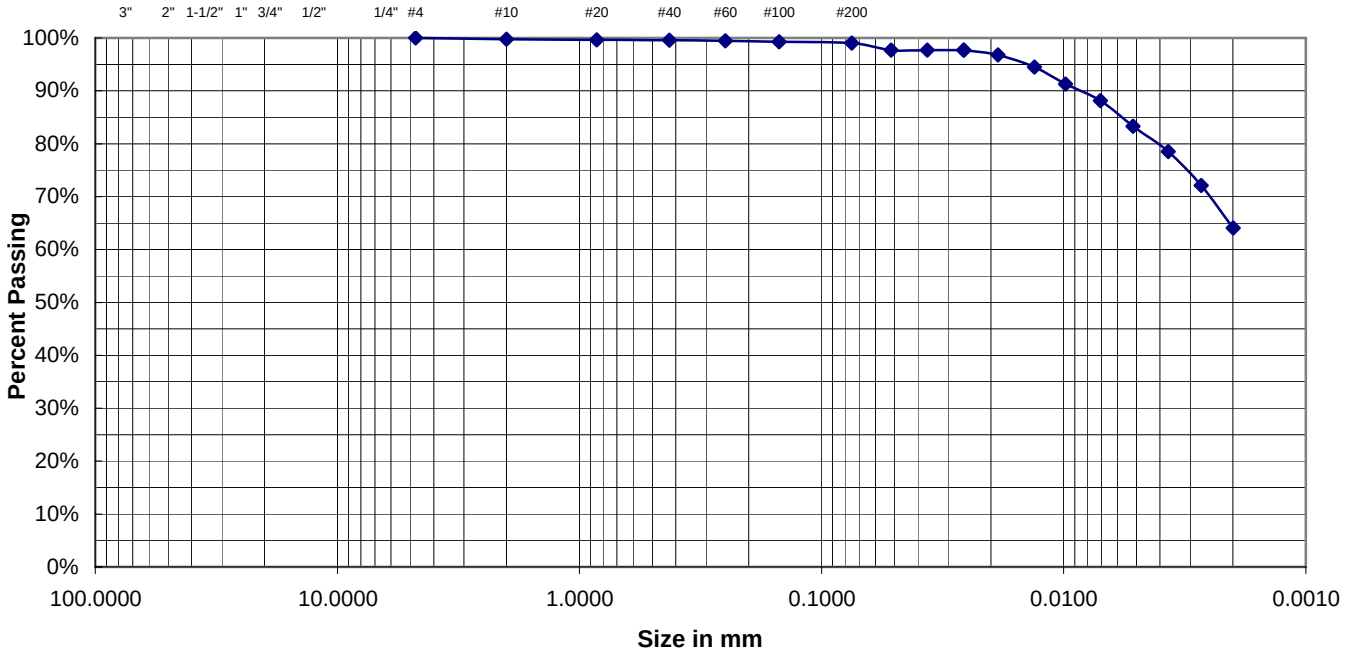
Project Name	CHAMPLAIN HUDSON POWER EXPRESS PROJECT	Project Number	10-1256
Client	TRC COMPANIES, INC	Lab ID	10398S
Material Type	BROWN SILTY CLAY TRACE SAND (CH)	Date Received	11/29/2012
Material Source	15'-25'	Date Completed	12/7/2012
Exploration	B-203.5-1	Tested By	MJS

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	**100**
2"	50	**100**
1-1/2"	37.5	**100**
1"	25	**100**
3/4"	19	**100**
1/2"	12.5	**100**
1/4"	6.3	**100**
No. 4	4.75	**100**
No. 10	2	**100**
No. 20	0.85	**100**
No. 40	0.425	**100**
No. 60	0.25	**99**
No. 100	0.15	**99**
No. 200	0.075	**99.1**

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.052	97.7
0.037	97.7
0.026	97.7
0.019	96.8
0.013	94.5
0.010	91.3
0.007	88.1
0.005	83.3
0.004	78.5
0.003	72.1
0.002	64.1



Particle Distribution	
Gravel, retained on #4	0.0%
Sand, passing #4 and retained on #200	0.9%
Fines, 0.074 to 0.005	16.3%
Clay Fraction, <0.005	82.8%

Comments: MOISTURE CONTENT = 34.5%

Chad B. Michaud
Reviewed By

S.W.COLE ENGINEERING, INC. • Geotechnical Engineering • Field & Lab Testing • Scientific & Environmental Consulting

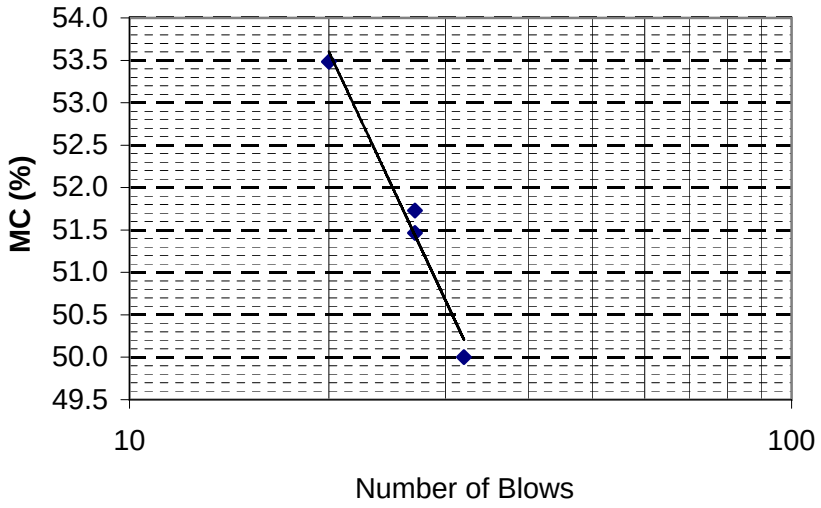
REPORT OF ATTERBERG LIMITS
ASTM D4318

Project Name	CHAMPLAIN HUDSON POWER EXPRESS	Project Number	10-1256
Client	TRC COMPANIES, INC	Laboratory ID	10398S
Soil Description	BROWN SILTY CLAY TRACE SAND (CH)	Date Received	11/26/2012
Soil Source	B-203.5-1, BULK SAMPLE 15'-25'	Date Completed	12/3/2012
		Tested By	TKM

TEST RESULTS

Estimate of Material Retained On the No. 40 Sieve	Liquid Limit	Plastic Limit	Plasticity Index
0%	52	27	25

LIQUID LIMIT CURVE



SUMMARY OF LABORATORY TEST DATA

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

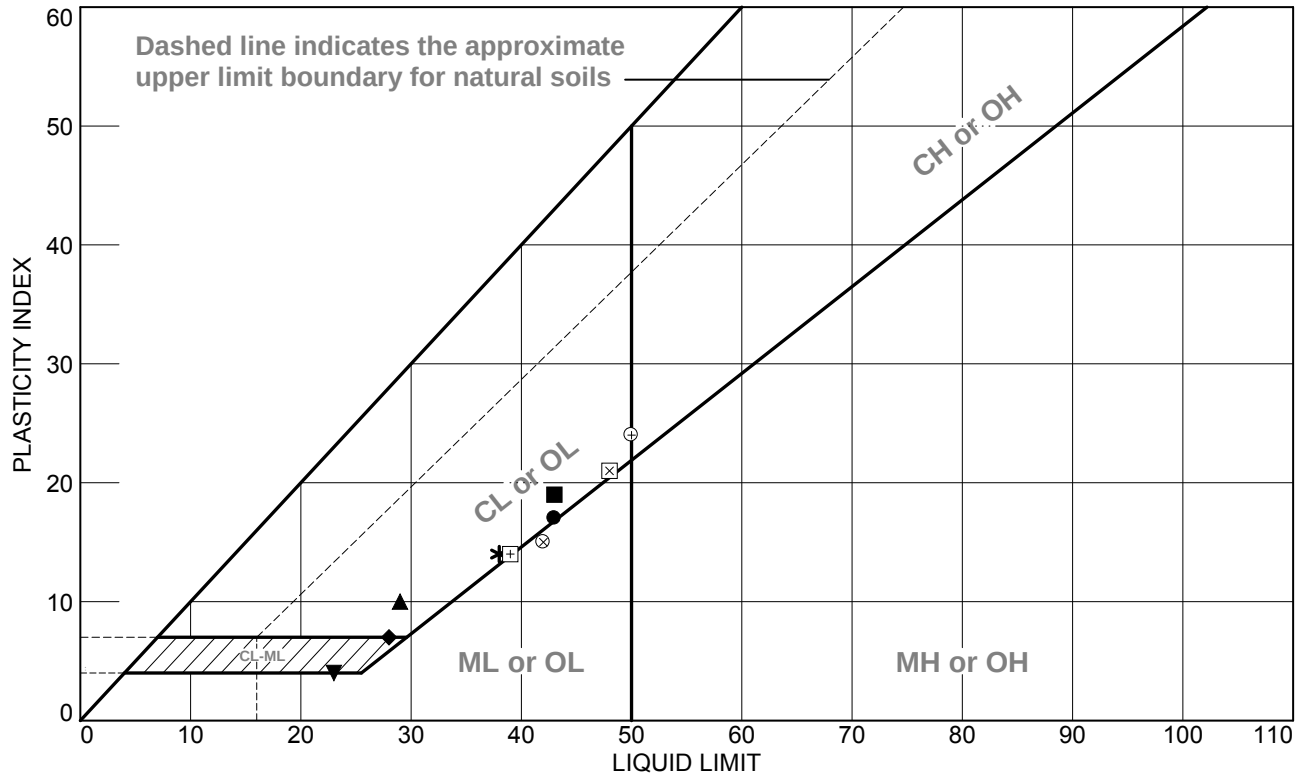
SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
	S-7	18.5-20.0	CL	-	-	-		43	24	19	1.0	-	43.9	-	-	-
A202.7-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	28.0	-	-	-
	S-2	2.0-4.0	SM	16.2	53.2	30.6		-	-	-	-	-	19.8	-	-	-
	S-3	4.0-6.0	SM	20.2	37.4	42.4		-	-	-	-	-	19.0	-	-	-
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	-	29.7	-	-	7.3
B203.45-1	S-3	4.0-6.0	-	-	-	-		-	-	-	-	-	37.3	85.6	-	-
	S-4	6.0-8.0	-	12.2	6.3	81.5		-	-	-	-	-	28.1	-	-	-
	S-5	8.0-10.0	-	-	-	-		-	-	-	-	-	38.8	-	-	-
	S-6	13.5-15.0	CL	-	-	-		29	19	10	1.1		30.0	-	-	-
B203.5-1	S-2	2.0-4.0	CL-ML	-	-	-		28	21	7	-1.0	-	13.7	-	-	-
	S-3	4.0-6.0	-	-	-	-		-	-	-	-	-	15.5	-	-	-

SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
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-ML	-	-	-		23	19	4	-0.6	-	16.7	-	-	-
	S-7	18.5-20.0	-	-	-	-		-	-	-	-	-	22.8	-	-	-
	S-8	23.5-25.0	-	-	-	-		-	-	-	-	-	30.9	-	-	-
B204.2-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	9.9	-	-	-
	S-4	6.0-8.0	CL	0.0	7.9	33.4	58.7	38	24	14	-0.1	2.77	22.9	-	-	-
	S-5	8.0-10.0														
	S-6	13.5-15.0	GM	33.6	28.0	38.4		-	-	-	-	-	14.9	-	-	-
	S-7	18.5-20.0														
B204.7-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	27.5	-	-	-
	S-3	4.0-6.0	CL/CH	-	-			50	26	24	0.2	-	30.5	94.1	-	-
	S-4	6.0-8.0												-		

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

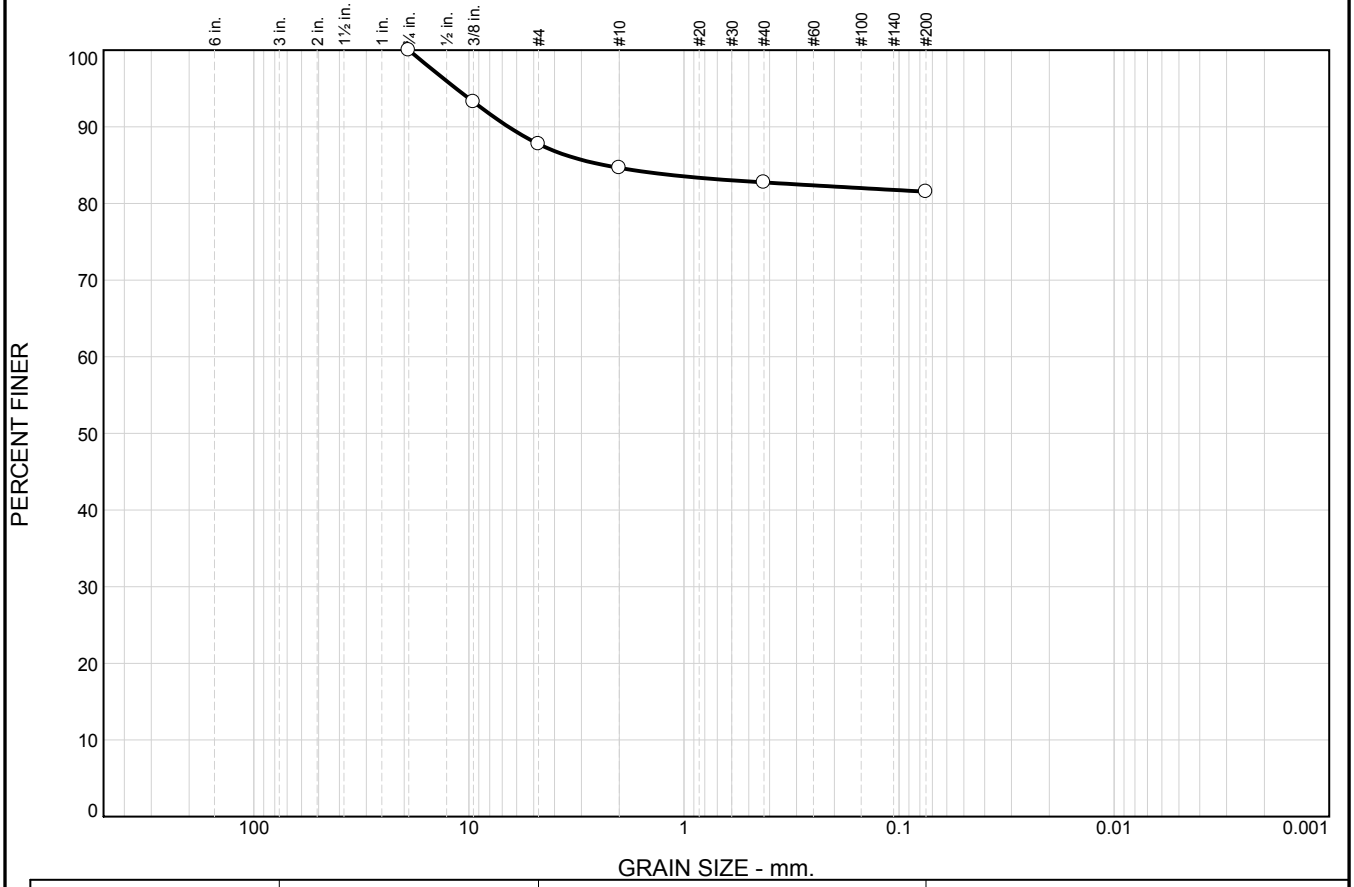
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B201.9-1	S-7	18.5-20.0 FT	27.5	26	43	17	CL
■	B202.1-1	S-7	18.5-20.0 FT	43.9	24	43	19	CL
▲	B203.45-1	S-6	13.5-15.0 FT	30.0	19	29	10	CL
◆	B203.5-1	S-2	2.0-4.0 FT	13.7	21	28	7	CL-ML
▼	B203.5-1	S-6	13.5-15.0 FT	16.7	19	23	4	CL-ML
✱	B204.2-1	S-4 & S-5	6.0-10.0 FT	22.9	24	38	14	CL
⊕	B204.7-1	S-3, S-4, & S-5	4.0-10.0 FT	30.5	26	50	24	CL/CH
⊞	B204.7-1	S-8	23.5-25.0 FT	24.3	25	39	14	CL
⊗	B207.9-1	S-6	13.5-15.0 FT	40.7	27	42	15	ML

TRC
Engineers, Inc.
Mt. Laurel, NJ

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

Project No.: 195651 **Figure** 4

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	12.2	3.2	1.9	1.2	81.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			2.3469							

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

Project No. 195651 **Client:** TRANSMISSION DEVELOPERS INC.

Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

○ **Source of Sample:** B203.45-1 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

TRC Engineers, Inc.

Mt. Laurel, NJ

Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 80

Tested By: BMH 02/21/13 **Checked By:** JPB 03/12/13

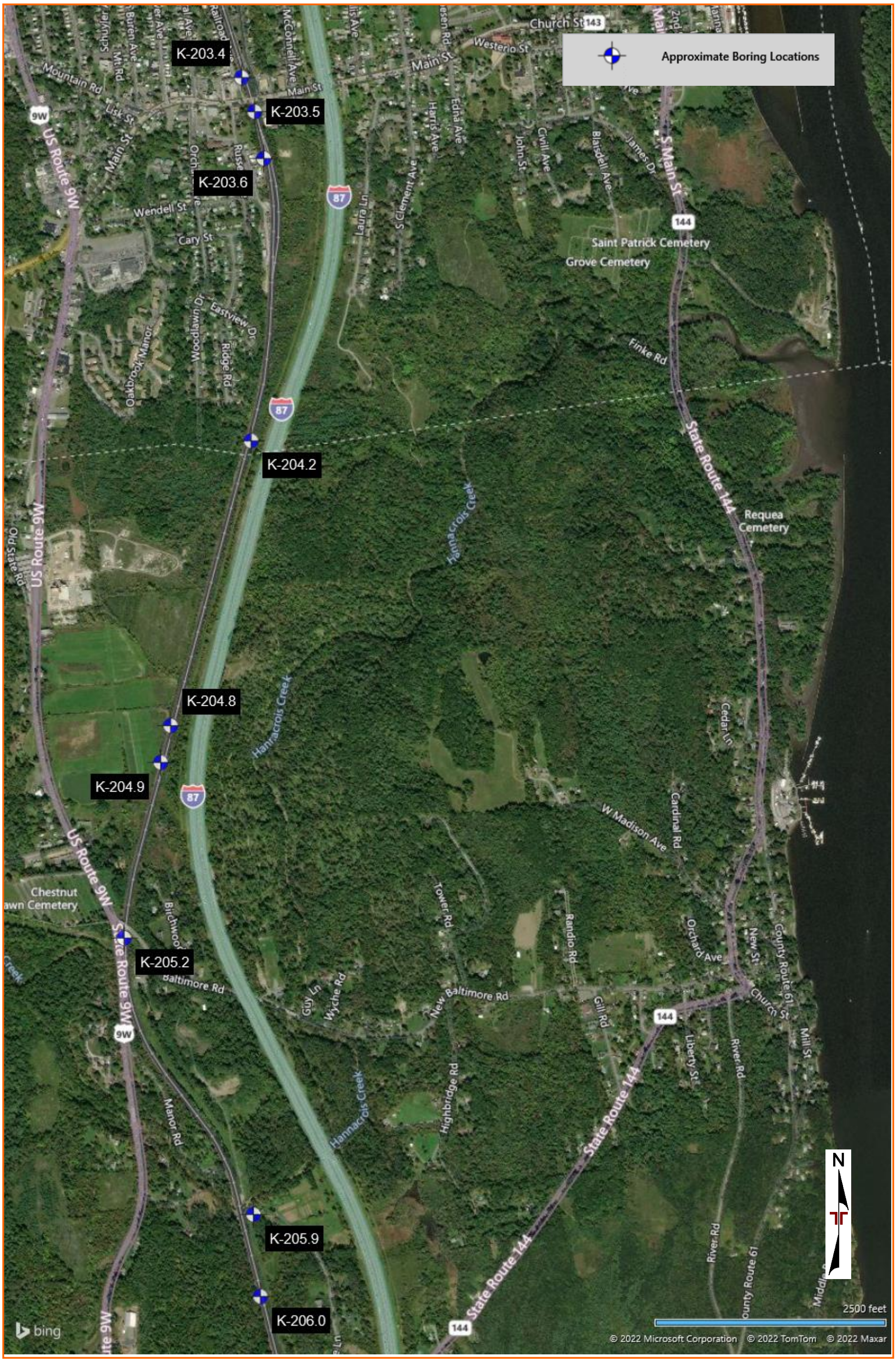


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. K-203.4

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4727° Longitude: -73.8094°

Surface Elev.: 182.5 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.0	182.5	**FILL - BALLAST, WITH CINDERS, ASH, SILT AND CLAY**, black, medium dense to dense
4.0	178.5	**FILL - WELL GRADED SAND**, brown, loose
6.0	176.5	**SANDY LEAN CLAY (CL)**, brown, stiff to very stiff
20.0	162.5	**SILT (ML)**, gray, soft to stiff
27.5	155	**WEATHERED ROCK**, gray, very dense

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0		21	9-18-19-8 N=37			
		10	4-8-7-3 N=15			
5		15	3-5-3-3 N=8			
		13	5-4-5-4 N=9			
		19	5-7-8-10 N=15	27.6	44-26-18	57
10		21	2-4-9-11 N=13			
15		23	2-5-6-5 N=11			
20		18	5-5-5-7 N=10	30.1	31-23-8	93
25		24	2-2-1-1 N=3			

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 provided by Kiewit

Notes:

Logged by: MO
Hammer Efficiency Summary:
Energy Transfer Ratio: 86.9 +/- 2.2%
Hammer Efficiency Correction (CE):1.52

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-22-2022 | Boring Completed: 02-23-2022

Drill Rig: Mobile B-57 | Driller: B. Duffy

Project No.: JB215256C

BORING LOG NO. K-203.4

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4727° Longitude: -73.8094°

Surface Elev.: 182.5 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
		WEATHERED ROCK, gray, very dense *(continued)*	30			
					0	50-50/1"
35.0	147.5		35			
		GRAYWACKE, with occasional calcite veins and weathered shale layers, moderately weathered, very close to moderate fractured, poor RQD, gray				REC = 80% RQD = 43%
40.0	142.5		40			
		Boring Terminated at 40 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 provided by Kiewit

Notes:

Logged by: MO
Hammer Efficiency Summary:
Energy Transfer Ratio: 86.9 +/- 2.2%
Hammer Efficiency Correction (CE):1.52

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-22-2022 | Boring Completed: 02-23-2022

Drill Rig: Mobile B-57 | Driller: B. Duffy

Project No.: JB215256C

BORING LOG NO. K-203.5

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4713° Longitude: -73.8088°

Surface Elev.: 181.8 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.0	181.8	
2.0	180	**FILL - ASH AND CINDERS**, black, loose
4.0	178	**FILL - SILT AND CLAY**, brown, stiff
10.0	172	**FILL - POORLY GRADED GRAVEL**, brick fragments noted throughout, brown, loose to dense
12.0	170	**FILL - SILTY GRAVEL WITH SAND**, brick fragments noted, brown, medium dense
18.0	164	**FILL - POORLY GRADED GRAVEL**, brick fragments noted, brown, loose
20.0	162	**SILT AND CLAY (CL-ML)**, brown and gray, stiff
		SANDY FAT CLAY (CH), gray, soft

DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0	3	5-4-3-22 N=7			
	3	7-5-5-7 N=10			
5	0.5	7-5-9-5 N=14			
	5	4-4-4-5 N=8			
	6	12-18-14-11 N=32			
10	5	8-9-14-16 N=23	9.3		16
	1	18-5-4-4 N=9			
15					
	12	2-4-6-8 N=10	25.9		
20	12	10-11-10-14			
	24	3" Split Spoon With Ring Samplers 10-8-12-13	39.2	55-28-27	58
25		3" Split Spoon With Ring Samplers			

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-22-2022 | Boring Completed: 02-22-2022

Drill Rig: Mobile B-57 | Driller: L. Spicher

Project No.: JB215256C

BORING LOG NO. K-203.5

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4713° Longitude: -73.8088°

Surface Elev.: 181.8 (Ft.)

DEPTH	ELEVATION (Ft.)	DESCRIPTION	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDY FAT CLAY (CH), gray, soft *(continued)*					
			24	1-2-2-1 N=4			
33.0	149						
		SILTY SAND WITH GRAVEL (SM), gray, dense, (GLACIAL TILL)	21	10-18-15-21 N=33	5.3		16
38.0	144						
		WEATHERED ROCK, gray, very dense	6	4-50/2"			
		Augered to 45 feet through weathered rock per direction of Kiewit Engineer					
45.0	137						
		Boring Terminated at 45 Feet					

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-22-2022 | Boring Completed: 02-22-2022

Drill Rig: Mobile B-57 | Driller: L. Spicher

Project No.: JB215256C

BORING LOG NO. K-203.6

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4703° Longitude: -73.8085°

Surface Elev.: 185.9 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.0	184	**FILL - ASH AND CINDERS**, black, medium dense
2.0	182	**FILL - POORLY GRADED GRAVEL**, brick fragments noted, brown, medium dense
4.0		**LEAN CLAY WITH SAND (CL)**, brown, medium stiff to stiff
18.0	168	**SILTY SAND WITH GRAVEL (SM)**, gray, dense (GLACIAL TILL)

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			12	12-10-6-5 N=16			
			10	8-6-6-7 N=12			
5			8	3-5-4-4 N=9			
			4	3-3-3-1 N=6	27.7		
			16	3-3-3-4 N=6			
10			24	6-8-7-8 N=15	29.1	41-23-18	83
			20	5-3-4-5 N=7			
15							
	▽		16	9-16-19-23 N=35			
20			14	7-16-19-40 N=35	9.6	NP	15
25							

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-23-2022 | Boring Completed: 02-23-2022

Drill Rig: Mobile B-57 | Driller: L. Spicher

Project No.: JB215256C

BORING LOG NO. K-203.6

PROJECT: Champlain-Hudson Power Express Package 6

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Selkrik to Catskill, NY

LOCATION See Exploration Plan

Latitude: 42.4703° Longitude: -73.8085°

Surface Elev.: 185.9 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND WITH GRAVEL (SM), gray, dense (GLACIAL TILL) *(continued)*				9	30-50/4" 3" Split Spoon No Rings			
30.0	156	30							
	WEATHERED SHALE, gray, very dense				0	50/2"			
35.0	151	35							
	SHALE, slightly weathered, very close to close fractured, fair RQD, gray					REC = 100% RQD = 66%			
40.0	146	40							
	Boring Terminated at 40 Feet								

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

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

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 provided by Kiewit

Notes:

Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49

WATER LEVEL OBSERVATIONS

While drilling

Terracon
30 Corporate Cir Ste 201
Albany, NY

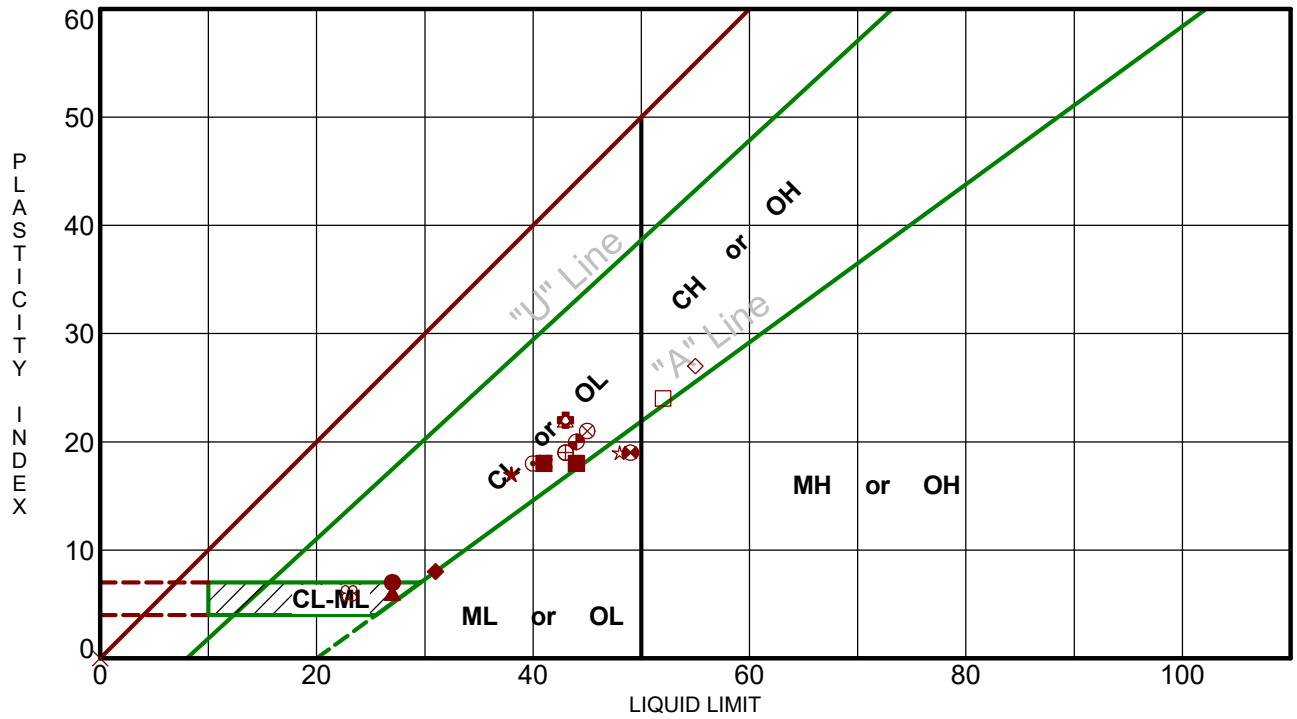
Boring Started: 02-23-2022 | Boring Completed: 02-23-2022

Drill Rig: Mobile B-57 | Driller: L. Spicher

Project No.: JB215256C

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	K-199.6	15 - 17	27	20	7	98.7	CL-ML	SILTY CLAY
⊠	K-199.6	28 - 30	41	23	18	95.0	CL	LEAN CLAY
▲	K-199.7	15 - 17	27	21	6	99.7	CL-ML	SILTY CLAY
★	K-199.7	28 - 30	38	21	17	89.5	CL	LEAN CLAY
⊙	K-200.7	20 - 21.5	40	22	18	91.6	CL	LEAN CLAY
✿	K-200.7	73 - 75	43	21	22	86.9	CL	LEAN CLAY
○	K-200.8	6 - 8	43	24	19	89.6	CL	LEAN CLAY
△	K-200.8	25 - 27	43	21	22	93.8	CL	LEAN CLAY
⊗	K-200.9	6 - 8	45	24	21	70.4	CL	LEAN CLAY with SAND
⊕	K-200.9	21 - 23	43	24	19	81.3	CL	LEAN CLAY with SAND
□	K-200.9	35 - 36.5	52	28	24	70.4	CH	FAT CLAY with SAND
⊛	K-201.8	8 - 10	49	30	19	37.7	SM	SILTY SAND
◕	K-201.8	28 - 30	44	24	20	75.1	CL	LEAN CLAY with SAND
☆	K-201.9	10 - 12	48	29	19	72.4	ML	SILT with SAND
✿	K-201.9	28 - 30	23	17	6	96.8	CL-ML	SILTY CLAY
■	K-203.4	8 - 10	44	26	18	57.1	CL	SANDY LEAN CLAY
◆	K-203.4	20 - 22	31	23	8	92.9	ML	SILT
◇	K-203.5	22 - 24	55	28	27	57.6	CH	SANDY FAT CLAY
✕	K-203.5	33 - 35	NP	NP	NP	16.4	SM	SILTY SAND with GRAVEL
✖	K-203.6	10 - 12	41	23	18	83.2	CL	LEAN CLAY with SAND

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

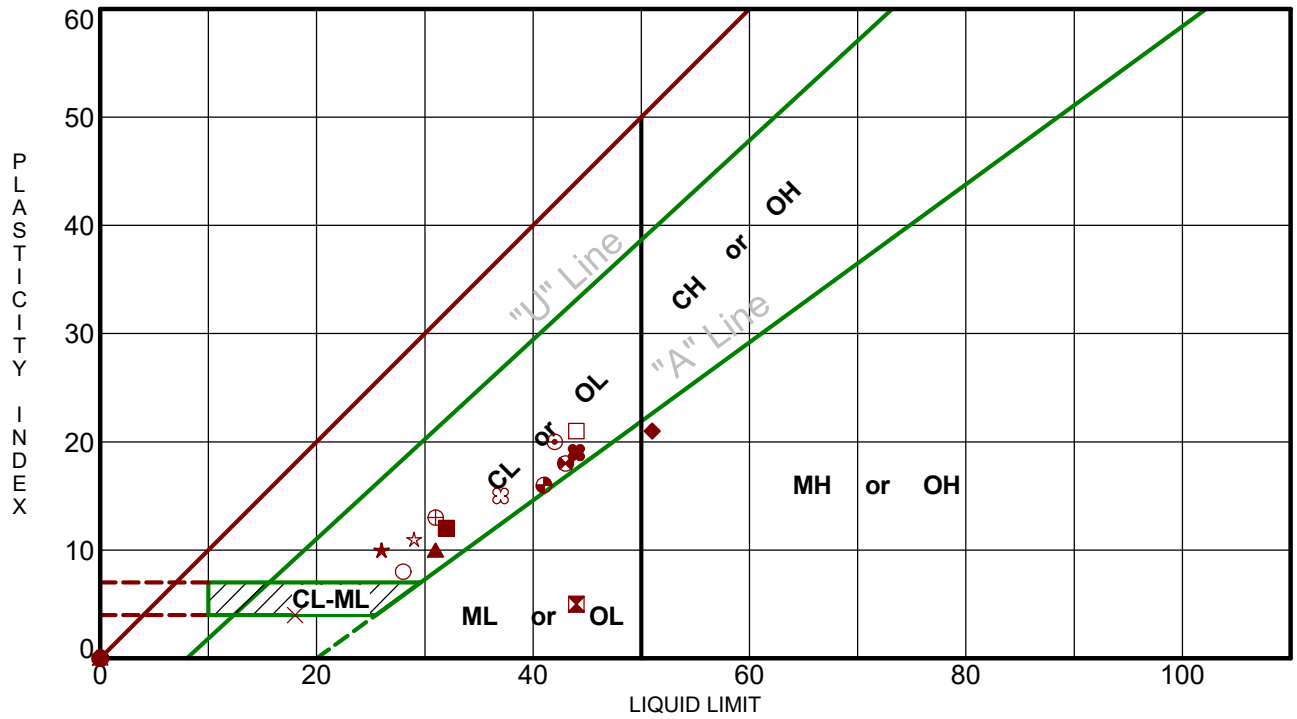
Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	K-203.6	20 - 22	NP	NP	NP	14.7	SM	SILTY SAND with GRAVEL
⊠	K-204.2	10 - 12	44	39	5	74.5	ML	SILT with SAND
▲	K-204.2	25 - 27	31	21	10	89.4	CL	LEAN CLAY
★	K-204.8	10 - 12	26	16	10	90.2	CL	LEAN CLAY
⊙	K-204.8	23 - 25	42	22	20	93.8	CL	LEAN CLAY
✿	K-204.9	10 - 12	NP	NP	NP	97.2	ML	SILT
○	K-204.9	18 - 20	28	20	8	95.8	CL	LEAN CLAY
△	K-205.2	20 - 22	NP	NP	NP	41.6	SM	SILTY SAND
⊗	K-205.2	30 - 32	NP	NP	NP	39.8	SM	SILTY SAND
⊕	K-205.9	8 - 10	31	18	13	86.6	CL	LEAN CLAY
□	K-205.9	25 - 26.5	44	23	21	84.5	CL	LEAN CLAY with SAND
⊛	K-206.0	8 - 10	43	25	18	45.2	GC	CLAYEY GRAVEL with SAND
◕	K-206.5	8 - 10	41	25	16	70.6	CL	LEAN CLAY with SAND
☆	K-206.5	15 - 17	29	18	11	97.5	CL	LEAN CLAY
❀	K-206.6	13 - 15	37	22	15	87.0	CL	LEAN CLAY
■	K-206.6	23 - 25	32	20	12	98.5	CL	LEAN CLAY
◆	K-207.6	6 - 8	51	30	21	69.8	MH	SANDY ELASTIC SILT
◇	K-207.6	15 - 17	NP	NP	NP	8.2	GW-GM	WELL-GRADED GRAVEL with SILT and SAND
×	K-207.6	24.7 - 26.3	18	14	4	26.6	SC-SM	SILTY, CLAYEY SAND with GRAVEL
✖	K-207.7	15 - 17	44	25	19	93.0	CL	LEAN CLAY

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

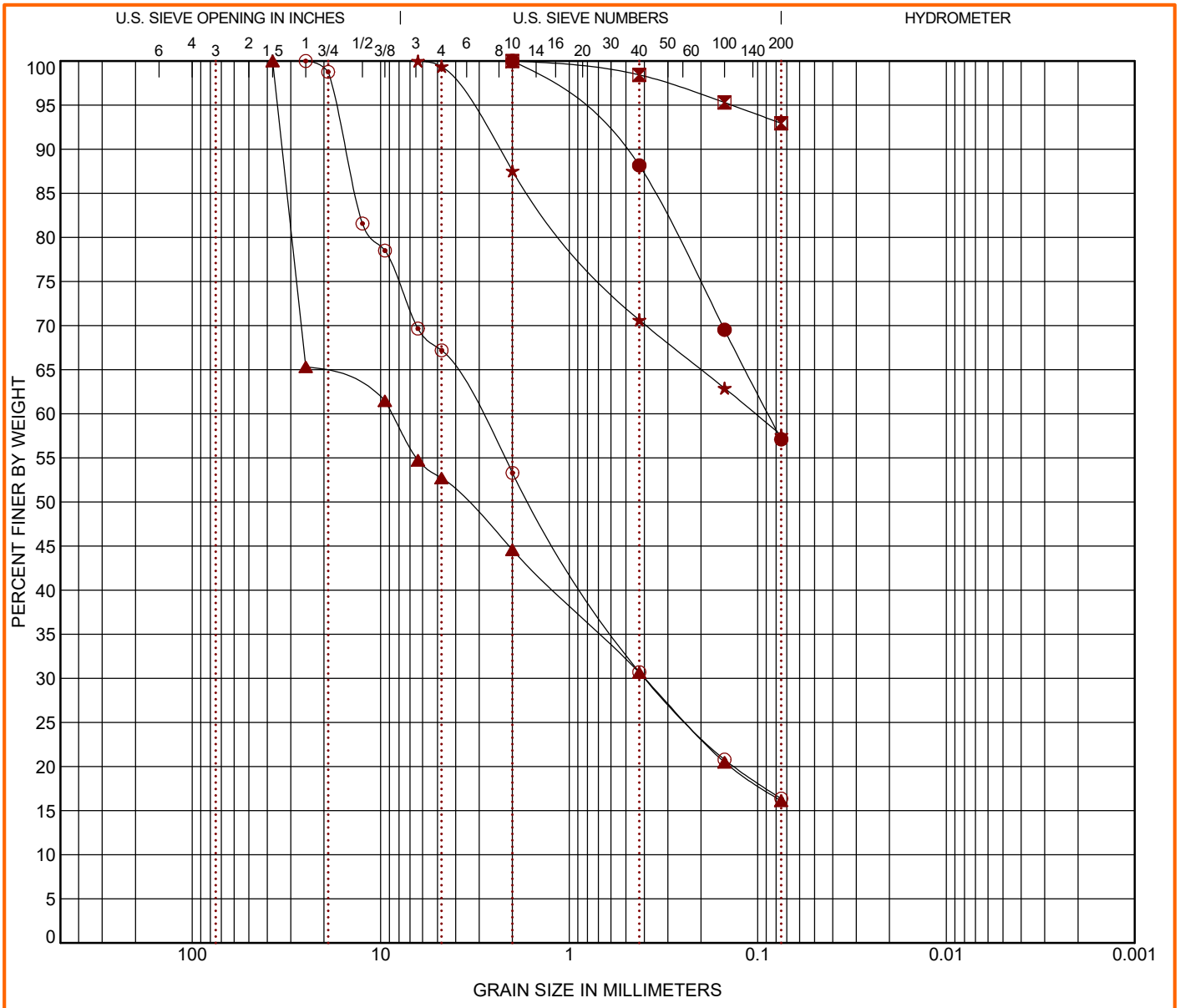
Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256C

CLIENT: Kiewit Engineering (NY) Corp.

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
●	K-203.4	8 - 10	SANDY LEAN CLAY (CL)	27.6	44	26	18		
⊠	K-203.4	20 - 22	SILT (ML)	30.1	31	23	8		
▲	K-203.5	10 - 12	SILTY GRAVEL with SAND (GM)	9.3					
★	K-203.5	22 - 24	SANDY FAT CLAY (CH)	39.2	55	28	27		
⊙	K-203.5	33 - 35	SILTY SAND with GRAVEL (SM)	5.3					

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-203.4	8 - 10	2	0.088			0.0	0.0	42.9		57.1	
⊠	K-203.4	20 - 22	2				0.0	0.0	7.1		92.9	
▲	K-203.5	10 - 12	37.5	8.701	0.398		0.0	47.3	36.6		16.1	
★	K-203.5	22 - 24	6.35	0.103			0.0	0.6	41.8		57.6	
⊙	K-203.5	33 - 35	25	3.036	0.394		0.0	32.8	50.8		16.4	

PROJECT: Champlain-Hudson Power Express Package 6

PROJECT NUMBER: JB215256C

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

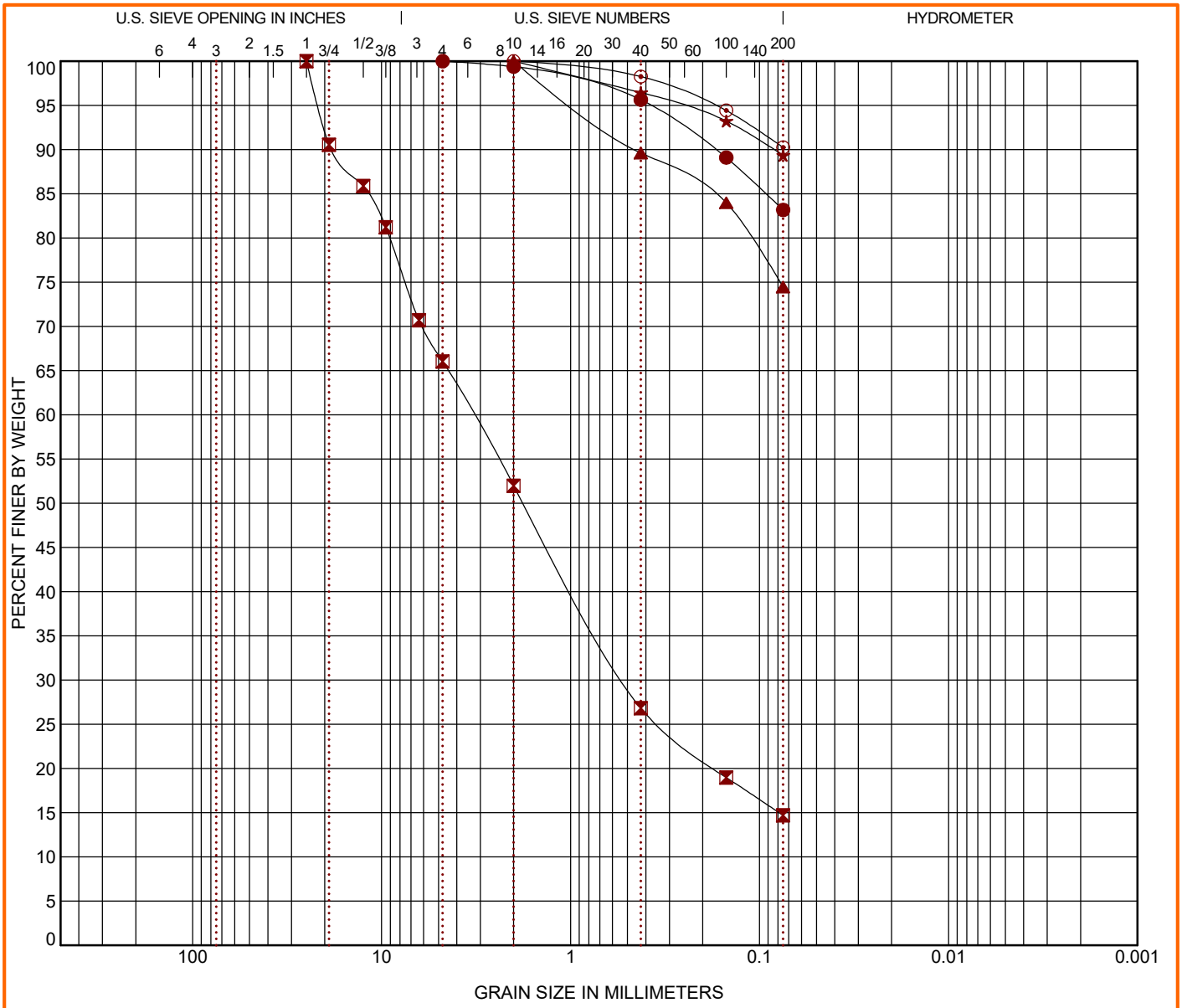
Terracon
30 Corporate Cir Ste 201
Albany, NY

CLIENT: Kiewit Engineering (NY) Corp.

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256C CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 4/12/22

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	K-203.6	10 - 12	LEAN CLAY with SAND (CL)	29.1	41	23	18		
⊠	K-203.6	20 - 22	SILTY SAND with GRAVEL (SM)	9.6	NP	NP	NP		
▲	K-204.2	10 - 12	SILT with SAND (ML)	28.0	44	39	5		
★	K-204.2	25 - 27	LEAN CLAY (CL)	34.6	31	21	10		
⊙	K-204.8	10 - 12	LEAN CLAY (CL)	37.8	26	16	10		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-203.6	10 - 12	4.75				0.0	0.0	16.8		83.2	
⊠	K-203.6	20 - 22	25	3.277	0.517		0.0	34.0	51.3		14.7	
▲	K-204.2	10 - 12	2				0.0	0.0	25.5		74.5	
★	K-204.2	25 - 27	2				0.0	0.0	10.6		89.4	
⊙	K-204.8	10 - 12	2				0.0	0.0	9.8		90.2	

PROJECT: Champlain-Hudson Power Express Package 6

SITE: Champlain to Hudson HDD Crossings Selkirk to Catskill, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

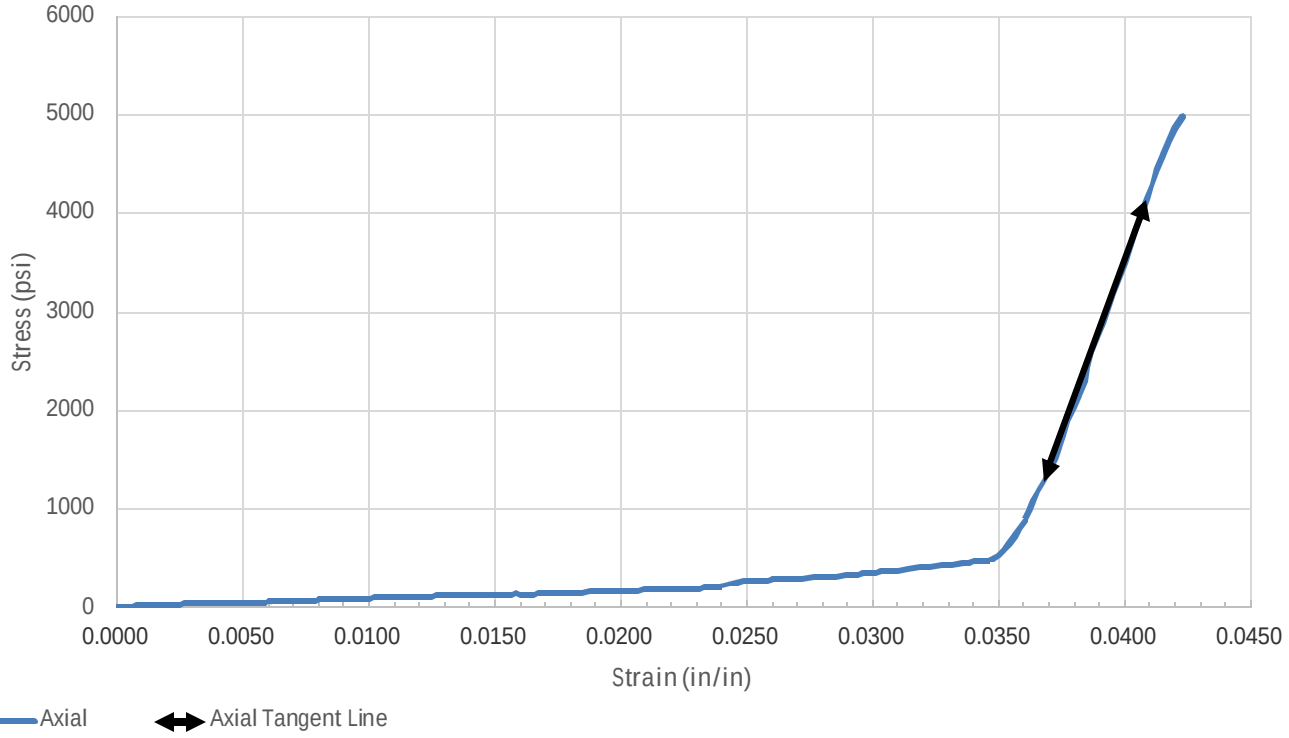
PROJECT NUMBER: JB215256C

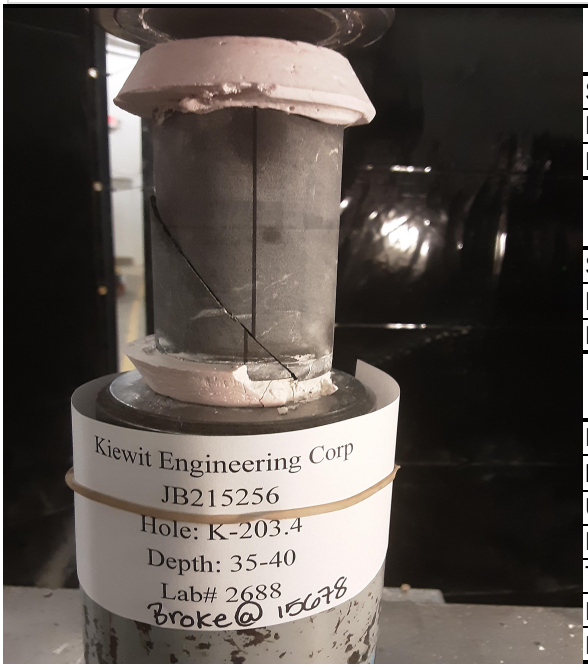
CLIENT: Kiewit Engineering (NY) Corp.

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JD215256





SAMPLE LOCATION

Site:	Kiewit Engineering Corp		
Description:	Graywacke		
Boring:	K-203.4	Depth (feet):	35-40

SPECIMEN INFORMATION

Sample No.:		Mass (g):	480.64
Length (in.):	3.46	Diameter (in.):	2
L/D Ratio:	1.730	Density (pcf):	168.450

TEST RESULTS

Failure Load (lbs):	15678
Failure Strain (in/in):	0.046
Unconfined Compressive Strength (psi):	4,991
Elastic Modulus, E, (ksi):	702
Time of Failure (min):	03:14
Rate of Loading (in/sec):	0.03
Moisture Content Post-break:	0.31%

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JD215256

Equipment:	TICCS ID:
Calipers	W-44049
Scale	B-71466
Dial Indicator	C-70608
Compression (spherically seated)	C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below:
Notes:

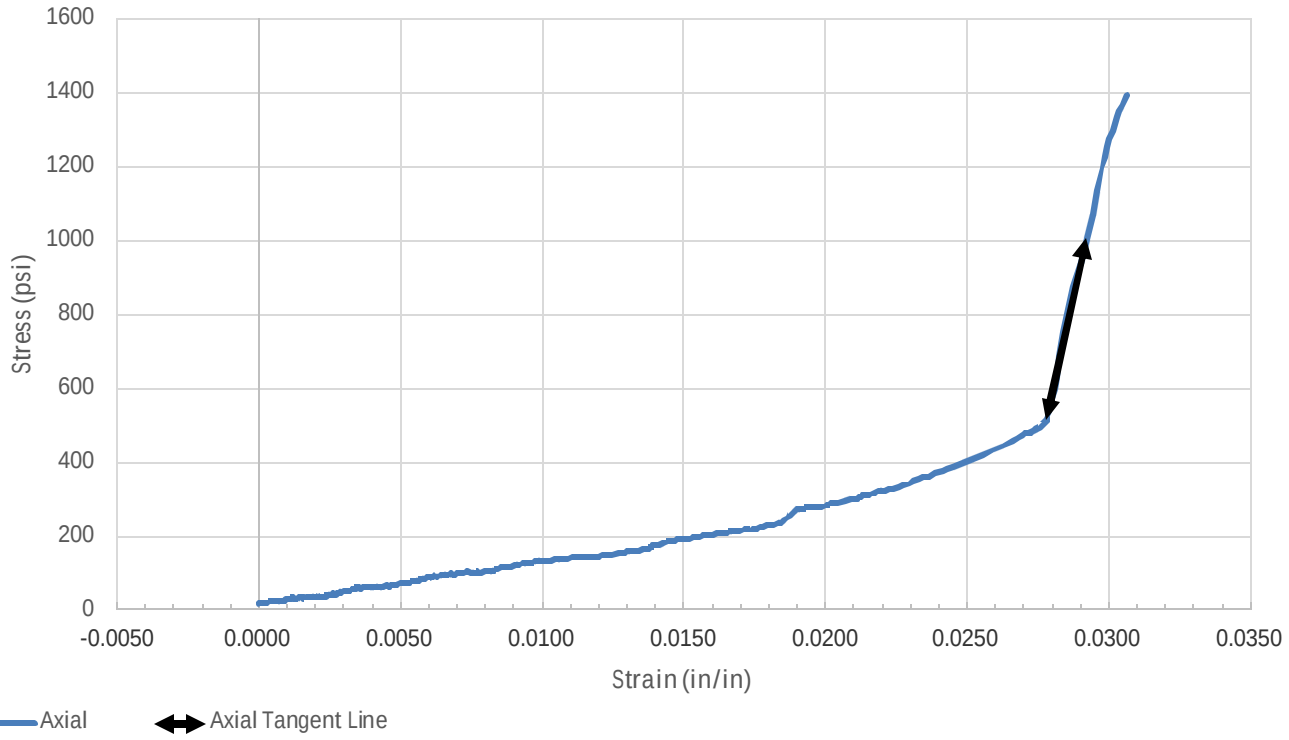
Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25º.
Per ASTM D4543 and ASTM D7012, the desired specimen length to diameter are between 2.0:1 and 2.5:1.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JD215256



SAMPLE LOCATION

Site:	Kiewit Engineering Corp		
Description:	Shale		
Boring:	K-203.6	Depth (feet):	30-40

SPECIMEN INFORMATION

Sample No.:		Mass (g):	572.22
Length (in.):	4.22	Diameter (in.):	1.98
L/D Ratio:	2.131	Density (pcf):	167.767

TEST RESULTS

Failure Load (lbs):	4247
Failure Strain (in/in):	0.035
Unconfined Compressive Strength (psi):	1,393
Elastic Modulus, E, (ksi):	343
Time of Failure (min):	03:16
Rate of Loading (in/sec):	0.04
Moisture Content Post-break:	0.98%

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JD215256

Equipment:	TICCS ID:
Calipers	W-44049
Scale	B-71466
Dial Indicator	C-70608
Compression (spherically seated)	C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below:
Notes:

Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250º.
Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25º.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

GeoTesting EXPRESS

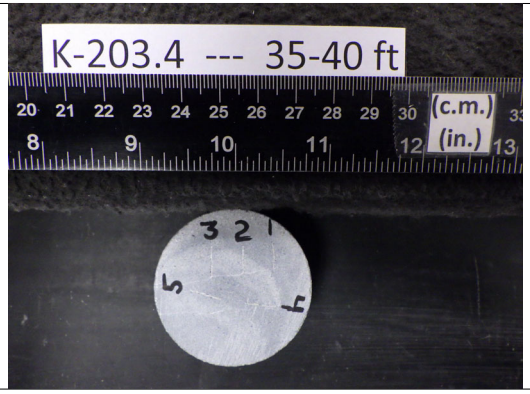
Client:	Terracon Consultants, Inc.				
Project:	Champlain-Hudson Power Express				
Location:				Project No:	GTX-315284
Boring ID:	K-203.4	Sample Type:	cylinder	Tested By:	tlm
Sample ID:	---	Test Date:	04/28/22	Checked By:	smd
Depth :	35-40 ft	Test Id:	663633		
Test Comment:	---				
Visual Description:	---				
Sample Comment:	---				

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
K-203.4	---	35-40 ft	1	3.9	2.0	2.95	
			2	3.0	5.0	4.00	
			3	4.1	3.2	3.65	
			4	1.9	4.2	3.05	
			5	2.3	4.1	3.20	
			Average CAIs			3.37	
			Average CAI *			3.82	
				CERCHAR Abrasiveness Index Classification		**High abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



CHEMICAL LABORATORY TEST REPORT

Project Number: JB215256
Service Date: 04/05/22
Report Date: 04/06/22

Terracon
10400 State Highway 191
Midland, Texas 79707
432-684-9600

Client

Kiewit Engineering (NY) Corp
1055 Trainstation Cicle
Lone Tree, CO 80124

Project

Champlain-Hudson Power Express Project
Champlain to Hudson HDD Crossings
Schenectady, NY

Sample Location	K-203.6	K-216.8
Sample Depth (ft.)	2-6	2-6
pH Analysis, ASTM - G51-18	7.6	7.7
Water Soluble Sulfate (SO4), ASTM C 1580 (mg/kg)	7	335
Sulfides, ASTM - D4658-15, (mg/kg)	nil	nil
Chlorides, ASTM D 512 , (mg/kg)	31	50
RedOx, ASTM D-1498, (mV)	+490	+430
Total Salts, ASTM D1125-14, (mg/kg)	340	1,270
Resistivity, ASTM G187, (ohm-cm)	6,505	1,755

Analyzed By: Zach Robertson

Zach Robertson
Engineering Technician III

Kiewit

MEMORANDUM

DATE: November 10, 2022

TO: Todd Kilduff; Kilduff Underground Engineering, Inc.

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

SUBJECT: Geotechnical Data: Segment 10 – Package 6 – HDD Crossing 95 – Revision 1
Champlain Hudson Power Express Project
Coeymans, 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 Coeymans, New York. The approximate station for the start of HDD crossing number 95 is STA 60287+00 (42.4621° N, 73.8085° W).

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

- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013.
- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Package 6, Selkirk to Catskill, Rev-1, dated June 28, 2022.

Contact us if you have questions or require additional information.

HDD 95
Borings K-204.2, B204.2-1
Segment 10 - Design Package 6

CHPE Segment 10 - Package 6
HDD Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A199.7-1	1344990.8	678939.9	159.0
	A205.2-1	1317487.9	677289.6	204.6
	A206.62-1	1310345.7	678496.2	186.8
	A207.0-1	1308517.7	677770.1	179.6
	A209.05-1	1298062.1	675944.3	148.6
	A219.05-1	1247052.0	666820.5	128.8
	B198.9-1	1348887.4	679090.7	173.5
	B200.6-1	1340723.0	677093.4	96.3
	B200.7-1	1340001.8	676794.4	128.5
	B201.7-1	1335310.5	675758.1	162.1
	B201.9-1	1334029.9	676014.8	173.3
	B202.1-1	1333294.3	676182.6	168.3
	B203.45-1	1326328.9	678471.9	171.2
	B203.5-1	1325831.2	678645.3	183.2
	B204.2-1	1322268.4	678463.0	198.8
	B204.7-1	1320048.9	677891.8	207.1
	B205.8-1	1314638.7	678588.0	141.5
	B205.9-2	1313866.7	678637.8	190.3
	B207.9-1	1303512.5	676338.7	156.2
	B208.2-1	1302277.3	676188.9	152.0
	B208.3-1	1301673.4	676120.2	150.0
	B208.5-1	1300907.6	675929.0	116.7
	B210.0-1	1293021.1	676353.2	109.9
	B210.4-1	1291223.1	676583.0	120.5
	B211.2-1	1286509.8	676960.2	132.6
	B211.5-1	1285068.8	677013.1	140.7
	B211.7-1	1284088.5	676965.4	141.5
	B212.0-1	1282469.0	676857.5	138.9
	B212.2-1	1281498.0	676590.5	130.8
	B214.6-1	1269721.4	672670.9	124.9
	B216.1-1	1262073.1	670916.0	127.0
	B216.4-1	1260344.1	670520.5	128.3
	B216.6-1	1259315.9	670290.2	129.8
	B219.5-1	1244816.4	666093.7	130.4
AECOM**	SC-1A	1348656.7	679220.0	176.4
	SC-2A	1326692.2	678361.5	178.9
	SC-2C	1305133.1	676877.4	160.6

Notes:

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

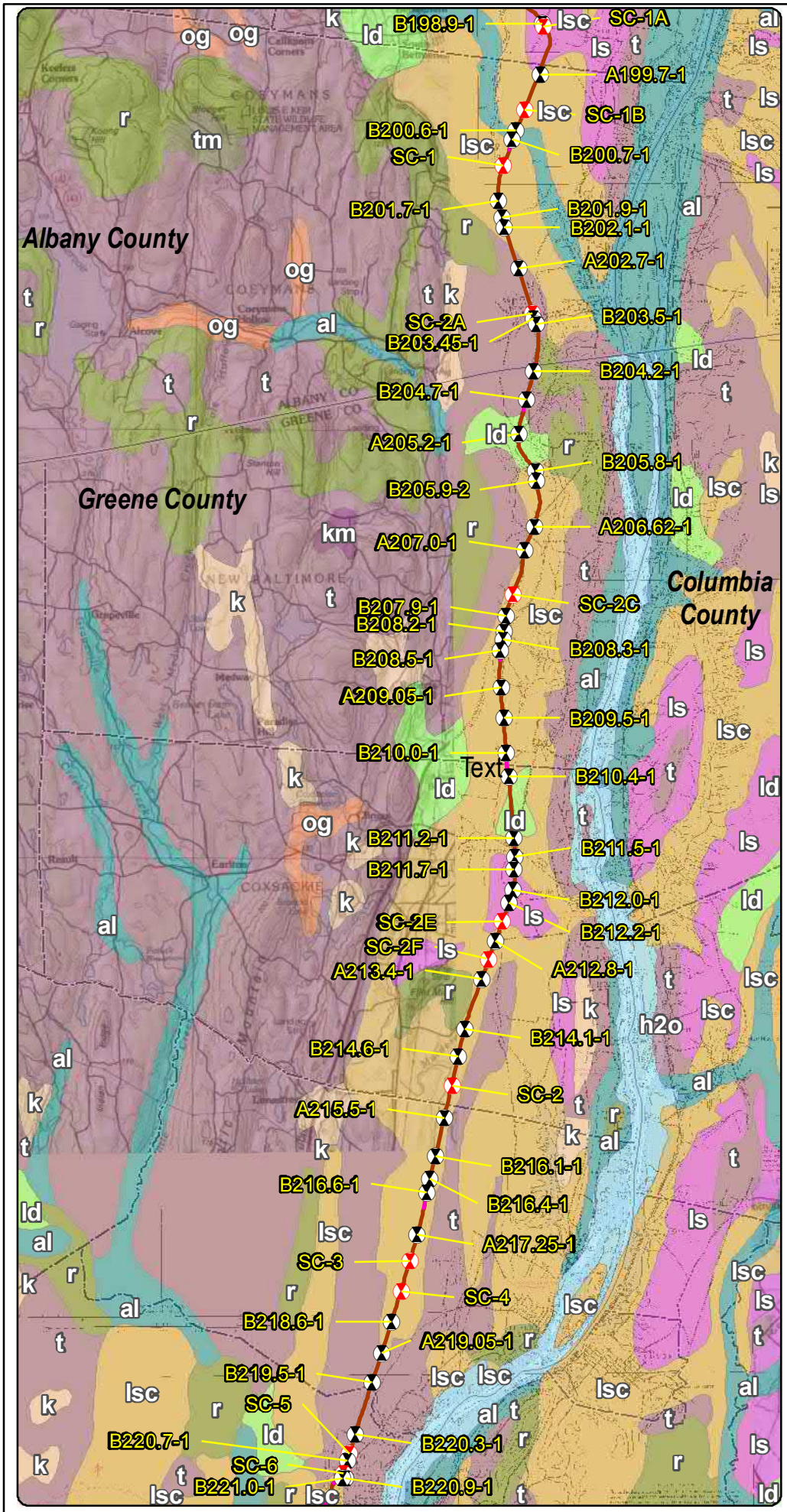
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

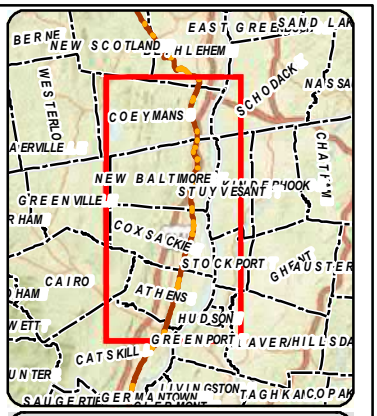
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.

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

Reference:

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





LEGEND

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

Surficial Geology

- al - Recent alluvium
- h2o - Water
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

N

1 0.5 0 1 Miles

Transmission Developments Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings Selkirk to Catskill Figure 3-10

Prepared on 5/3/2021

by: AECOM

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

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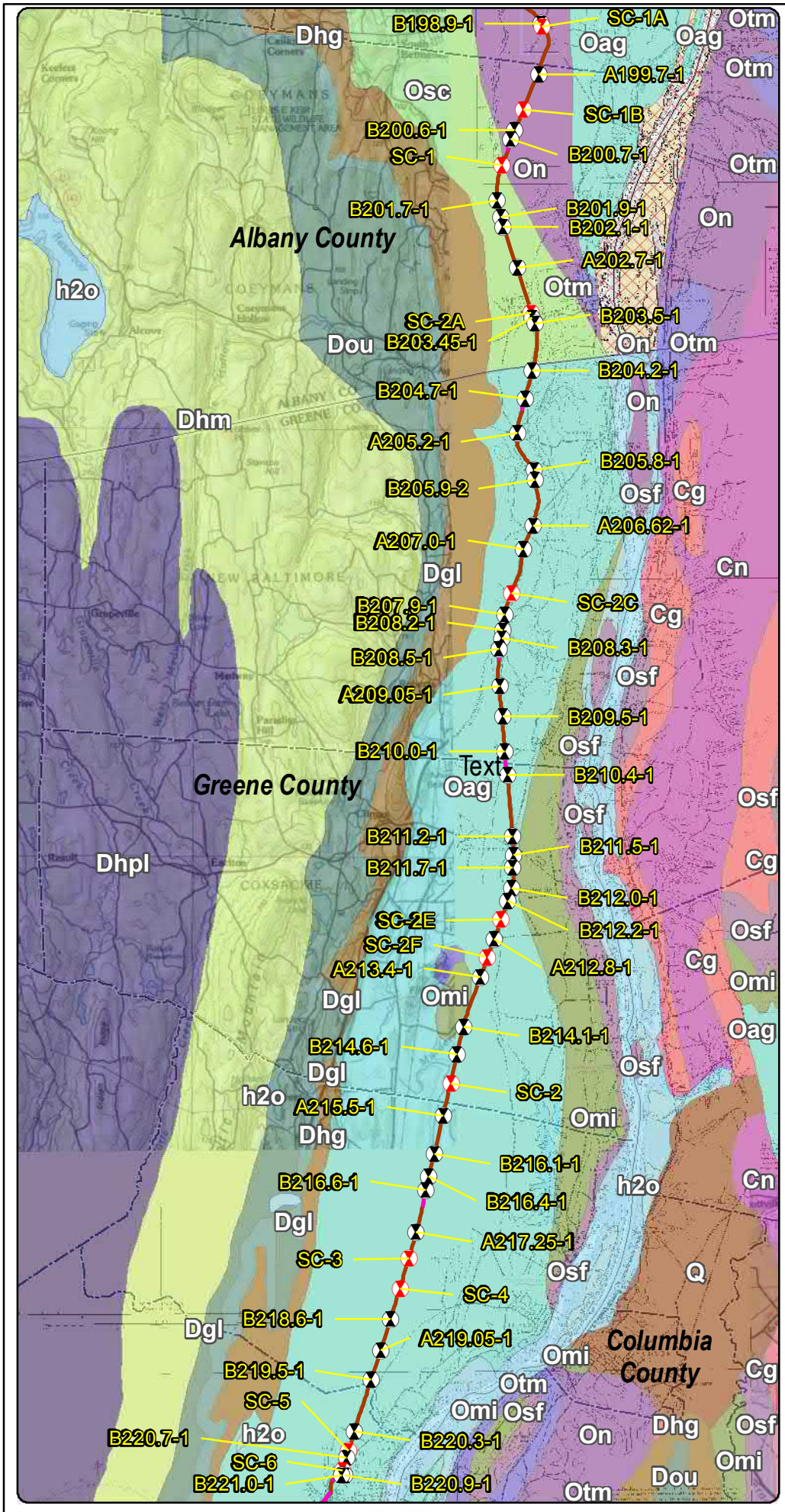

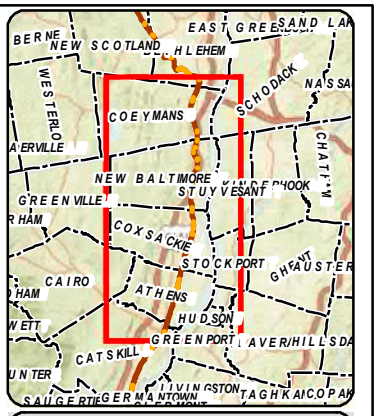

LEGEND

- 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

- Cg - Germantown Formation
- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhm - Undiff Lower Hamilton Group
- Dhpl - Plattekill Formation
- Dou - Onondaga Limestone
- No Label
- Oag - Austin Glen Form (graywacke, shale)
- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

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

N

1 0.5 0 1 Miles

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Selkirk to Catskill Figure 4-10

Prepared on 5/18/2021

by: AECOM

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

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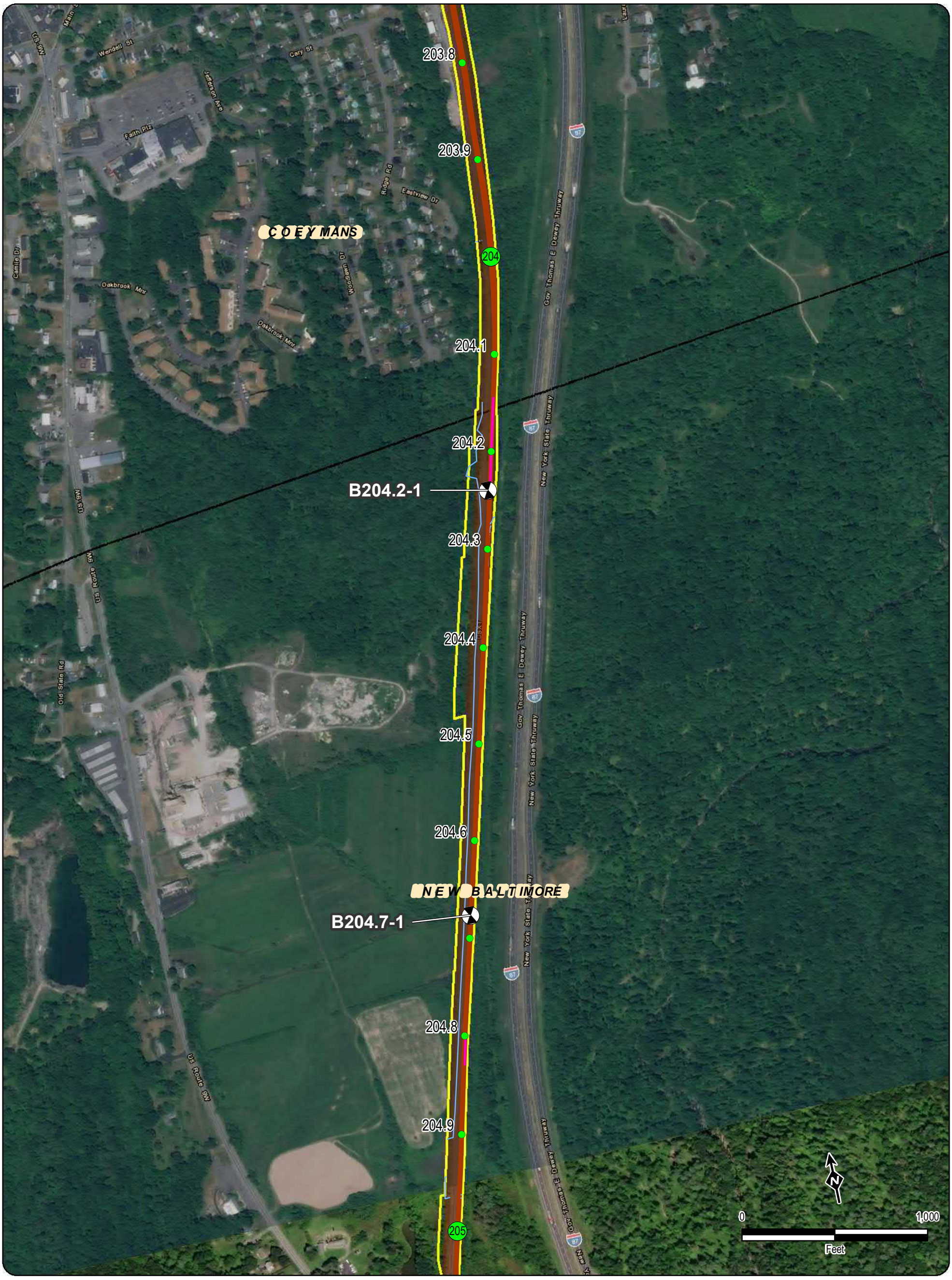
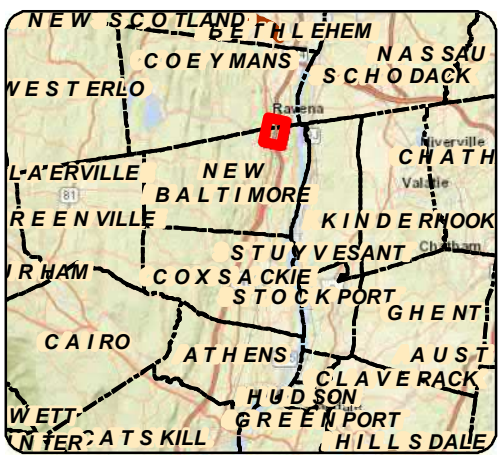




LEGEND

- 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

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

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Selkirk to Catskill

Figure A-10

Sheet 5 of 18

Prepared by: AECOM 5/19/2021

Y:\Projects\CHPEI\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Selkirk_to_Catskill_Boring_L

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

BORING	**B204.2-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR	11/27	0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	25.0 '

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	N/A
DATE STARTED	11/27/2012
DATE COMPLETED	11/27/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	4 3 4 5		***BLACK M/C SAND, SM F/C GRAVEL-SIZED ROCK FRAGMENTS, TR SILT (FILL)***	9.9	
	S-2	4 5 5 6		4.0		
5	S-3	6 6 5 6		***GRAY SILT, SM CLAY, TR TO SM F/ SAND*** 6.0		
	S-4	5 4 4 5				
10	S-5	6 7 7 5		***LIGHT BROWN SILTY CLAY, TR F/M/C SAND***	22.9	
				13.5		
15	S-6	7 4 6				
				BROWN TO DARK BROWN SILTY C/F GRAVEL, SM F/M SAND (GLACIAL TILL)		
20	S-7	9 8 9			14.9	
				23.5		
25	S-8	9 12 14		***BROWN SILT, SM F/ GRAVEL, TR TO SM CLAY, TR F/ SAND (GLACIAL TILL)*** 25.0		
				END OF BORING AT 25'		
30						
35						

DRN.	TBT
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

S.W.COLE ENGINEERING, INC.

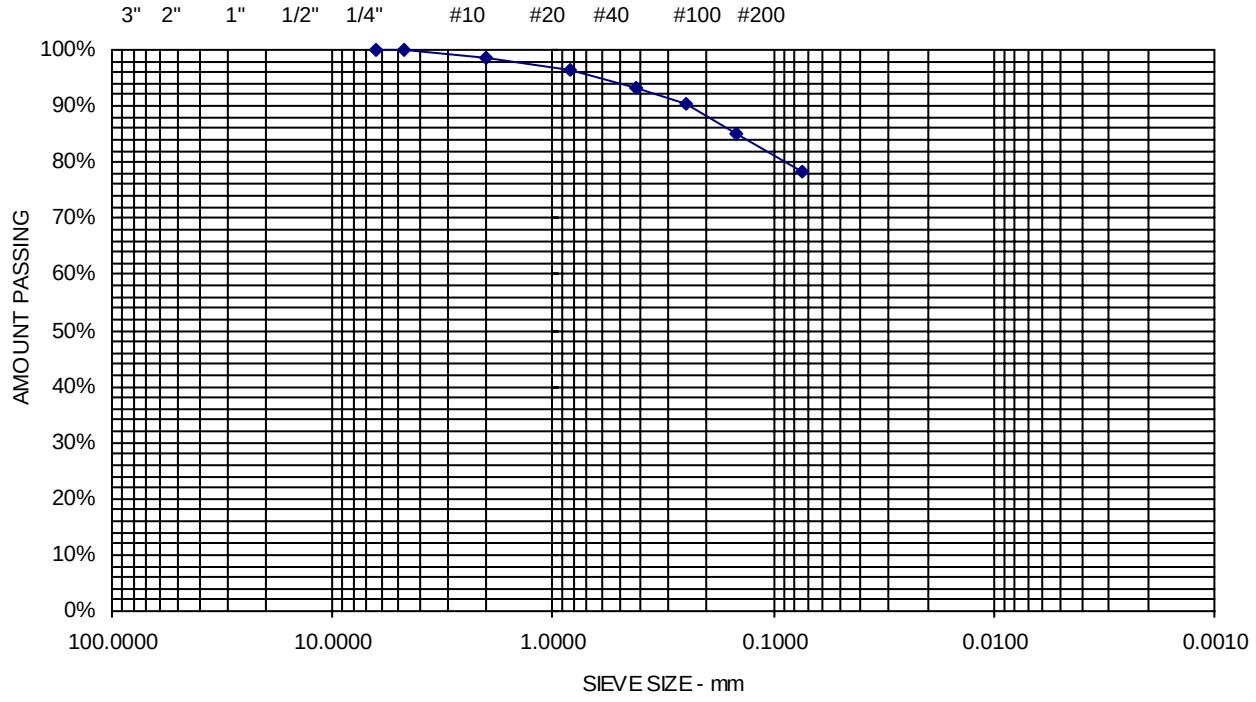
Report of Gradation

ASTM C-117 & C-136

Project Name	EASTERN NY - CHAMPLAIN HUDSON POWER EXPRESS PROJECT - GEOTECHNICAL EXPLORATIONS, SOIL THERMAL CONDUCTIVITY,	Project Number	10-1256
Client	TRC COMPANIES, INC.	Lab ID	10399S
Exploration	**B204.2-1**	Date Received	11/29/2012
Material Source	**BULK SAMPLE FROM 0-5 FEET**	Date Completed	12/4/2012
		Tested By	SHAWN BENOIT

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0% Gravel
2.00 mm	**No. 10**	**99**	
850 um	**No. 20**	**96**	
425 um	**No. 40**	**93**	21.7% Sand
250 um	**No. 60**	**90**	
150 um	**No. 100**	**85**	
75 um	**No. 200**	**78.3**	78.3% Fines

BROWN SANDY SILT AND CLAY (CL)



Comments: MOISTURE CONTENT = 22.7%

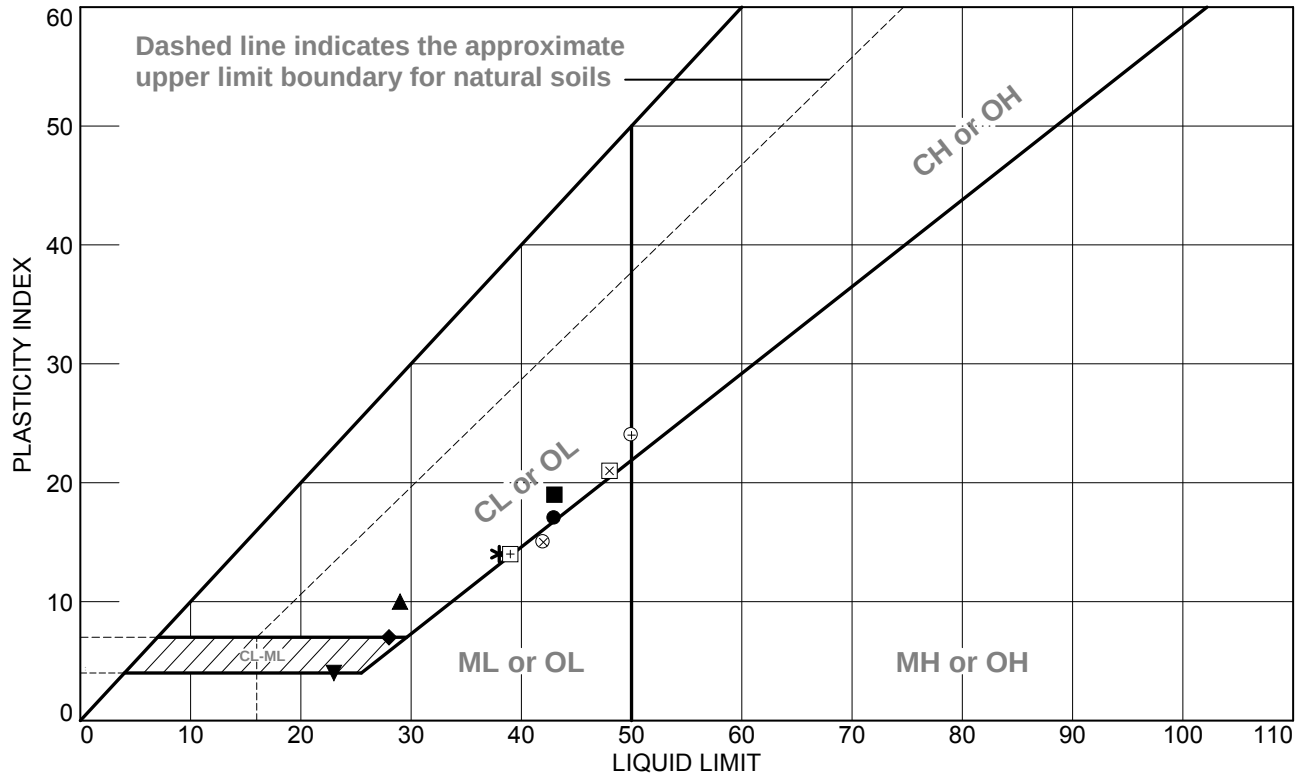
Sheet

SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
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-ML	-	-	-		23	19	4	-0.6	-	16.7	-	-	-
	S-7	18.5-20.0	-	-	-	-		-	-	-	-	-	22.8	-	-	-
	S-8	23.5-25.0	-	-	-	-		-	-	-	-	-	30.9	-	-	-
B204.2-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	9.9	-	-	-
	S-4	6.0-8.0	CL	0.0	7.9	33.4	58.7	38	24	14	-0.1	2.77	22.9	-	-	-
	S-5	8.0-10.0														
	S-6	13.5-15.0	GM	33.6	28.0	38.4		-	-	-	-	-	14.9	-	-	-
	S-7	18.5-20.0														
B204.7-1	S-1	0.0-2.0	-	-	-	-		-	-	-	-	-	27.5	-	-	-
	S-3	4.0-6.0	CL/CH	-	-			50	26	24	0.2	-	30.5	94.1	-	-
	S-4	6.0-8.0												-		

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

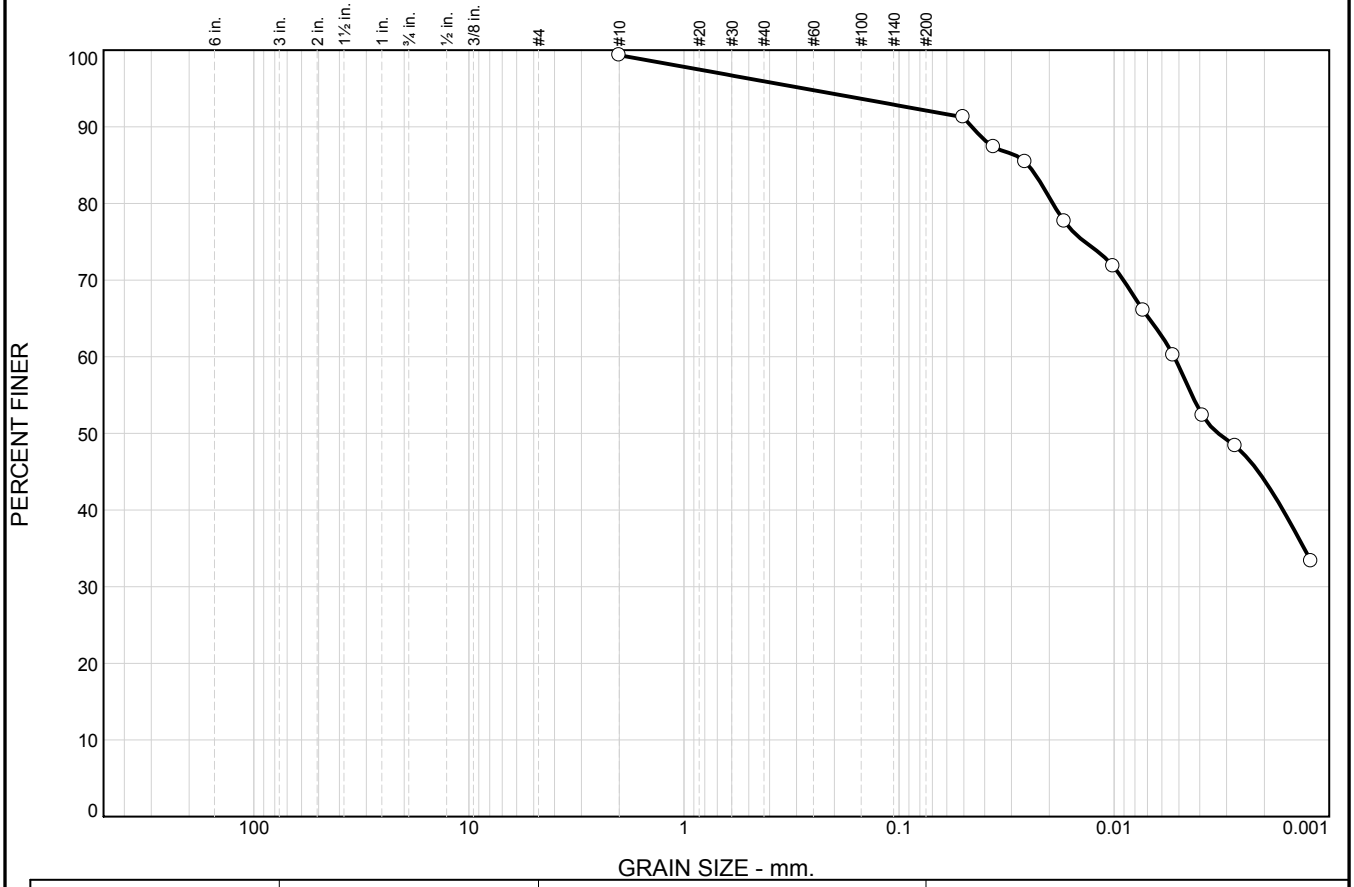
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B201.9-1	S-7	18.5-20.0 FT	27.5	26	43	17	CL
■	B202.1-1	S-7	18.5-20.0 FT	43.9	24	43	19	CL
▲	B203.45-1	S-6	13.5-15.0 FT	30.0	19	29	10	CL
◆	B203.5-1	S-2	2.0-4.0 FT	13.7	21	28	7	CL-ML
▼	B203.5-1	S-6	13.5-15.0 FT	16.7	19	23	4	CL-ML
✱	B204.2-1	S-4 & S-5	6.0-10.0 FT	22.9	24	38	14	CL
⊕	B204.7-1	S-3, S-4, & S-5	4.0-10.0 FT	30.5	26	50	24	CL/CH
⊞	B204.7-1	S-8	23.5-25.0 FT	24.3	25	39	14	CL
⊗	B207.9-1	S-6	13.5-15.0 FT	40.7	27	42	15	ML

TRC
Engineers, Inc.
Mt. Laurel, NJ

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

Project No.: 195651 **Figure** 4

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○					3.4	3.8	33.4	58.7

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○	38	24	0.0251	0.0053	0.0033					

Material Description	USCS	AASHTO
○ LIGHT BROWN SILTY CLAY, TR F/M/C SAND	CL	A-6(14)

Project No. 195651 **Client:** TRANSMISSION DEVELOPERS INC.

Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

○ **Sample Source:** B204.2-1 **Depth:** 6.0-10.0 FT **Sample No.:** S-4 & S-5

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

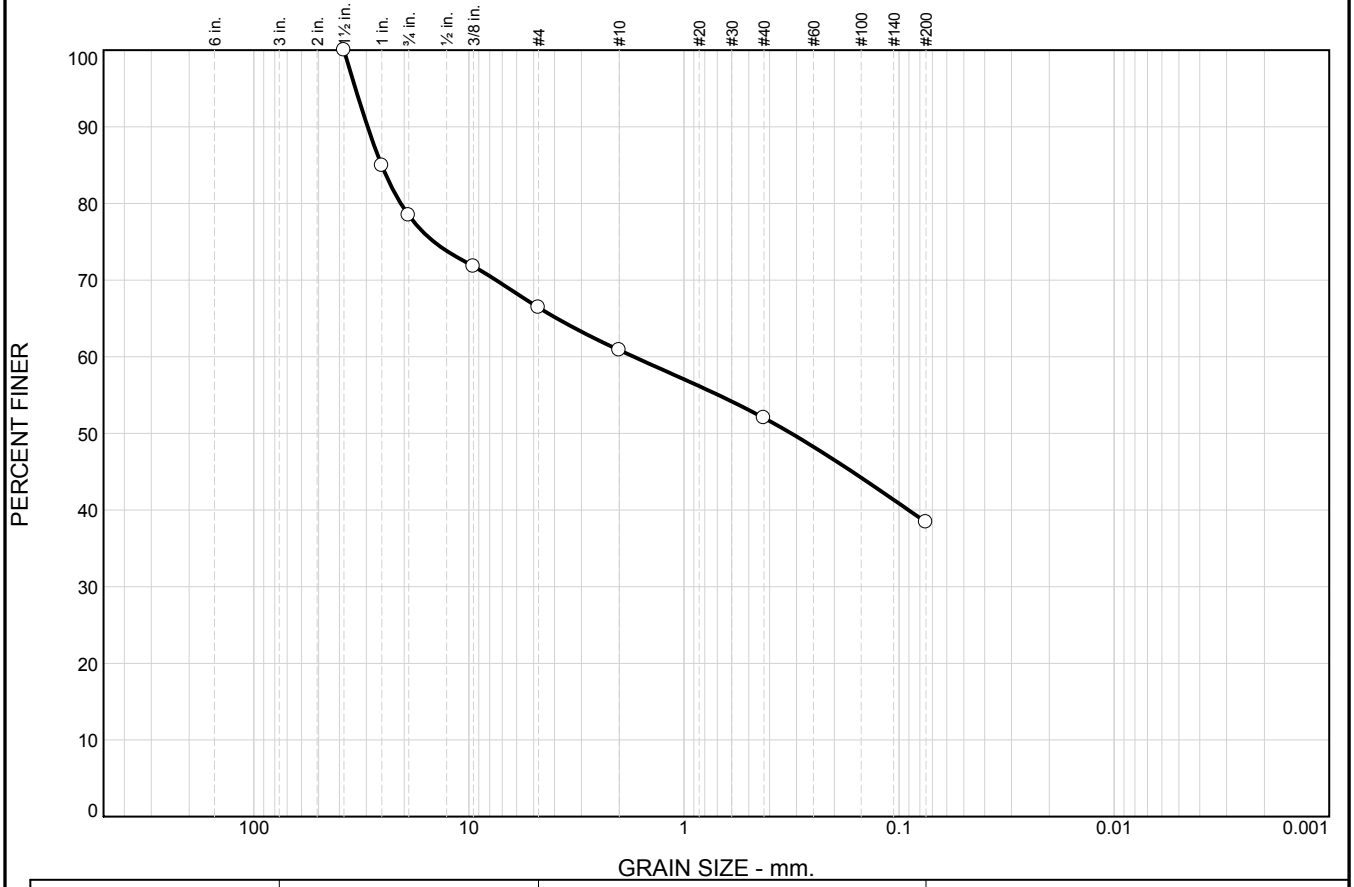
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 81

Tested By: TBT 01/07/13 **Checked By:** JPB 03/12/13

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	21.5	12.1	5.5	8.9	13.6	38.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			25.4656	1.7136	0.3170					

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

Project No. 195651 **Client:** TRANSMISSION DEVELOPERS INC.

Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

○ **Sample Source:** B204.2-1 **Depth:** 13.5-20.0 FT **Sample No.:** S-6 & S-7

TRC Engineers, Inc.

Mt. Laurel, NJ

Remarks:

○SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS

Figure 82

Tested By: TBT 01/10/13 **Checked By:** JPB 03/12/13