APPENDIX J: HDD DESIGN SUMMARY REPORT CASE 10-T-0139

Champlain Hudson Power Express

Trenchless Design Summary Report
Crossings HDD 124 to HDD 132
in Segment 12 – Package 7B

Stony Point to Haverstraw
Rockland County, New York

TTR Project Number: 204-3701

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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. Tetra Tech Rooney, Inc. (TTR) is designing 12 Horizontal Directional Drills (HDD) and 1 Trenchless Auger Bore crossing in Segment 12 – Package 7B near Stony Point. Trenchless methods will be used to route the crossings below congested areas, railroads, under/around obstructions (e.g., existing infrastructure or utilities), and below wetlands and bodies of water to minimize impacts to the environment. This Design Summary Report (DSR) addresses the design for the Trenchless crossings in Segment 12 - Package 7B from Stony Point to Clarkstown. These crossings are designated HDD 124 through HDD 132 and Trenchless 12-294.9-2.7.

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

- Review of the existing geological, hydrogeological, and geotechnical conditions for HDD 124 through HDD 132 (2 per site) and Trenchless crossing 12-294.9-2.7 for total of 13 crossings in Segment 12 – Package 7B.
- Provide a descriptive narrative of the Trenchless 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 338 miles in length, extending from the south end of Lake Champlain to Astoria, NY. Segment 12 - Package 7B is located in approximately a 7.5-mile section of the route in Rockland County, New York.

A Project Overview Map and a plan showing the locations of the HDD 124 through HDD 132 and Trenchless crossing 12-294.9-2.7 are presented in Appendix A.

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

Table 1: Trenchless Locations, Lengths, and Description

Trenchless #	Start Station	End Station	Length, ft	Obstruction Crossed
124	72497+41	72503+46	647	Utility
124.2	72497+38	72504+13	738	Utility
126	72561+18	72582+63	2145	Utility
126.2	72561+12	72582+82	2170	Utility
12-294.9-2.7	72609+27	72609+54	27	Historic Wall
127	72611+05	72625+45	1440	Utility
127.2	72611+05	72625+45	1440	Utility
129	72635+68	72654+33	1865	Utility
129.2	72635+52	72654+35	1883	Utility
131	72655+24	72675+60	2036	Road
131.2	72655+22	72675+72	2050	Road
132	72679+11	72697+19	1808	Road
132.2	72679+11	72697+26	1815	Road

3.0 BACKGROUND

The underground construction of two HVDC electrical transmission cables is proposed to be housed in individual 8-inch FPVC SDR 17 or 10-inch diameter DR 9 HDPE casings respectively and are spaced approximately 12 to 15 feet apart. A third, 3-inch diameter DR 9 casing will be bundled with one of the 8 or 10-inch diameter casings for a telecommunications line. The casings are to be installed in 13 to 21-inch final ream diameter drill 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 drill alignment, minimal ground surface impacts above the alignment, and to minimize the potential of inadvertent releases of drilling fluids while drilling. The goal for using HDD methods is to install the conduits while controlling and minimizing the amount of

impact to congested areas, existing underground obstructions, and to the adjacent wetlands to the extent possible.

4.0 SITE CONDITIONS

4.1 TRENCHLESS DESIGN DESCRIPTIONS

4.1.1 HDD #124

HDD #124 runs underneath Battlefield Rd. at the point where it intersects with Park Rd. traveling approximately 740 feet. The drill path is straight horizontally and is covered by a surface terrain that descends gradually reaching a low point near the center of the drill before ascending again to create a bowl shape. The entry point begins at El. 26 feet and exits into a 7-foot-deep pit at El. 17 feet (reference datum NAVD 1988).

4.1.2 HDD #126

HDD #126 is a long drill beginning in the Patriot Square Shopping Center parking lot and traveling under Route 9W, exiting to the south of Battalion Dr., near station 72583+00. The total length of the HDD is 2145 feet with a long 1145-foot horizontal curve in the center of the drill path. The HDD traverses underneath a relatively flat and consistent grade that begins ascending only slightly over the last 400 feet of the path. The entry point begins at El. 101 feet and the drill exits at El. 104 feet (reference datum NAVD 1988). The 3" DR 9 HDPE pipe will be required to be installed with ballast as the stress calculations for this drill yielded an unacceptable result for tensile stress with the standard 3" DR 9 HDPE pipe size and no ballast during pipe installation.

4.1.3 Trenchless 12-294.9-2.7

Trenchless crossing 12-294.9-2.7 will be installed via a cased Auger Bore. The bore launching pit will be in the grassy area adjacent to the Helen Hays Hospital entrance off Route 9W and extend a total length of 27 feet under the historic wall. The bore will exit in the receiving pit adjacent to Route 9W near station 72609+50. The bore path is straight and a 24" steel casing will be installed as the auger progresses along the bore path. The casing will be installed a minimum of 6 feet under the road.

4.1.4 HDD #127

HDD #127 begins in the grassy area adjacent to the Helen Hays Hospital entrance off Route 9W and extends for a total length of 1440 feet under Route 9W exiting near station 72625+00 in Route 9W. The drill path is straight and proceeds under a relatively flat existing grade which ascends slightly towards the end of the drill. The HDD begins at El. 116 feet and terminates at El. 110 feet (reference datum NAVD 1988).

4.1.5 HDD #129

HDD #129 is a long drill beginning in the Samsondale Plaza parking lot. The HDD travels under Route 9W and Minisceongo Creek, exiting in the parking lot to the north of Wendy's near station 72654+50. The total length of the HDD is 1865 feet with a short 145-foot horizontal curve in the center of the drill path and a short 140-foot horizontal curve towards the end. The drill path begins at El. 98 feet and proceeds through an oscillatory landscape concluding at El. 111 feet (reference datum NAVD 1988).

4.1.6 HDD #131

HDD #131 begins near station 72655+00, in the parking lot to the north of Wendy's. The HDD travels under Route 9W, passing under the Gurnee Ave. intersection, exiting in the VGMJ Tire parking lot near station 72675+50. The total length of the HDD is 2036 feet with a long 650-foot horizontal curve in the center of the drill path. The road grade gradually ascends from the entry point at El. 111 to the exit point at El. 131 feet (reference datum NAVD 1988).

4.1.7 HDD #132

HDD #132 begins near station 72697+00, adjacent to St. Peter's Cemetery. The HDD takes a curved path along Route 9W, passing under the Westside Ave. intersection where it exits near station 72679+00, adjacent to Route 9W. The total length of the HDD is 1808 feet with a long 471-foot horizontal curve in the center of the drill path. The existing grade at the entry point begins at El. 116 feet sloping downward reaching a minimum near the middle of the drill before gradually sloping upwards back to the exit point at El. 131 feet (reference datum NAVD 1988).

4.2 GEOTECHNICAL DATA

4.2.1 HDD #124

Two Geotechnical bores (BL-1, and K-294.9-0.7) are located along the proposed HDD #124 alignment. After reviewing and comparing these samples, geotechnical boring K-294.9-0.7 was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment. Consideration was taken for the other Geotechnical boring in the design of the HDD. K-294.9-0.7 was drilled on 04/26/2022 and terminated at 30 feet deep. Down to 8 feet deep the soil consisted of silty gravel which transitioned into a silt layer that persisted for an additional 4 feet. After exiting the silt layer at a depth of 12 feet the bore entered conglomerate gravel which continued for the remaining 18 feet of the bore. It should be noted that at a depth of 9ft Geotechnical boring BL-1 experienced "strong, intensely fractured rock (0% RQD) and there was loss of water during the coring phase of the bore". Below this layer the rock exhibited Fair to Good RQD values. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #124 BoreAid analyses will be divided into three [3] layers: Gravel (GM), Silt (ML), and Conglomerate (Sedimentary Rock). The chosen test bore did not reach the full depth of the drill path however, the other test hole corroborated that the sedimentary rock layer continued for the full depth of the HDD profile thus a final layer of sedimentary rock was added to complete the soil strata used in the IR analysis. The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.2 HDD #126

Three Geotechnical bores (BL-4, K-294.9-2.0, and K-294.9-2.1) are located along the proposed HDD #126 alignment. After reviewing and comparing these samples, geotechnical boring K-294.9-2.0 was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. K-294.9-2.0 was drilled on 4/13/2022 and terminated at 35 feet deep. Down to 33 feet the soil consisted of variations on silty sand before finally transitioning into a silt layer which accounted for the remaining 2 feet of drill depth. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #126 BoreAid analyses will be divided into four [4] layers: Silty Sand (SM), Silty Sand (SM), Silty Sand (SM), and Silt (ML). The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.3 Trenchless 12-294.9-2.7

At this time, no geotechnical borings are available for Trenchless crossing 12-294.9-2.7. There is one planned Geotechnical boring that will be completed once landowner access permissions have been granted.

4.2.4 HDD #127

Four Geotechnical bores (K-294.9-2.8, K-294.9-2.9A, K-294.9-2.9B, and K-294.9-3.0) are located along the proposed HDD #127 alignment. After reviewing and comparing these samples, geotechnical boring K-294.9-2.8 was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. K-294.9-2.8 was drilled on 4/27/2022 and terminated at 59 feet deep. Down to 13 feet deep the soil analysis revealed a silt and sand mixture at which point the mixture gained an element of clay. The clay, silt and sand mix continued until 28 feet at which point it reverted to a silt and sand mix for 21 feet when the composition switched to glacial till for the remainder of the bore path. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #127 BoreAid analyses will be divided into five [5] layers: Silty Sand (SM), Silt (ML), Clayey Sand (SC), Silt (ML), Silty Sand (SM). The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.5 HDD #129

Six Geotechnical bores (K-294.9-3.3, K-294.9-3.3R, K-294.9-3.4A, K-294.9-3.4B, BL-7, and K-294.9-3.6) are located along the proposed HDD #129 alignment. After reviewing and comparing these samples, geotechnical boring K-294.9-3.3R was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of

the HDD. K-294.9-3.3R was drilled on 4/27/2022 and terminated at 70 feet deep. Down to 10 feet deep the soil composition was silty gravel, after which it became silty sand and continued as such until reaching a depth of 33 feet. The silty sand zone was followed by a 17-foot-thick layer of lean clay which transitioned into siltstone at 50 feet deep and persisted through the remainder of the bore. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #129 BoreAid analyses will be divided into four [4] layers: Silty Gravel (GM), Silty Sand (SM), Lean Clay (CL), and Silt Stone (Sedimentary Rock). The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.6 HDD #131

Four Geotechnical bores (K-294.9-3.6, K-294.9-3.7, K-294.9-3.8R, and K-294.9-3.8) are located along the proposed HDD #131 alignment. After reviewing and comparing these samples, geotechnical boring K-294.9-3.8R was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. K-294.9-3.8R was drilled on 05/02/2022 and terminated at 50.2 feet deep. The first 18 inches of the bore hole consisted of asphalt which was followed by silty sand down to a depth of 30 feet where the composition switched to gravel. The gravel layer was 5 feet thick, followed by a siltstone layer beginning at 35 feet and extending the remainder of the drill path. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #131 BoreAid analyses will be divided into four [4] layers: Silty Sand (SM), Silty Sand (SM), Gravel with Silt (GP-GM), and Siltstone (Sedimentary Rock). The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.7 HDD #132

Four Geotechnical bores (K-294.9-4.1, K-294.9-4.2A, K-294.9-4.2B, and BL-8) are located along the proposed HDD #132 alignment. After reviewing and comparing these samples, geotechnical boring K-294.9-4.2B was selected to be used in the BoreAid analysis as it best

represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. K-294.9-4.2B was drilled on 4/21/2022 and terminated at 45 feet deep. After passing through the first 18 inches of asphalt, the bore entered a silt zone which persisted to a total depth of 8 feet. Following the silt layer was a layer of silty sand which transitioned into siltstone at a depth of 30 feet. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #132 BoreAid analyses will be divided into three [3] layers: Silt (ML), Silty Sand (SM), and Siltstone (Sedimentary Rock). The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

5.0 DESIGN SUMMARY

5.1 HDD SEQUENCE

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

Step 1: Drill a small diameter (approximately 2 to 9 inches diameter) pilot hole along the preplanned drill path. During the pilot hole boring, the location of the drill bit is tracked to confirm that it is following the planned path. If the drilling is observed to start to deviate from the planned path, corrections are made using a "bent" lead drilling section and controlled rotation of drill pipe string. The drill bit is designed to cut through the soil in combination with pressurized drilling fluid assisting the cutting of the soil, and transport of the cuttings to the entry pit for removal. The drilling fluid is generally a combination of bentonite (a clay mineral) and water, combined with inert biodegradable additives to support sides of the drillhole 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 BMP's state "NSF certified". Once the pilot drill 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 is typically referred to as reaming. This is accomplished by using successively larger reaming bits pulled or pushed through the pilot hole to gradually enlarge the drill from the smaller diameter pilot hole

to a size able to accommodate the HDPE conduits. We estimate that one and possibly a second reaming pass will be used to create the 16 to 24 inch-diameter reamed drill hole.

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, de-beaded, and arranged for the pullback into the drillhole. 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 drill in one, continuous, smooth, around the clock, operation. However, depending on work area and access constraints, sometimes the pipe is assembled in 2 or 3 lengths that are then joined (welded), "on the fly" as the conduit (bundle) is slowly pulled into the drillhole. 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.

5.2 HDD 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 drill 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 into several smaller segments. Those pre-assembled segments will then have to be welded together during the pullback. HDD specific work areas at the entry and exit ends of the drills 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 drills in soft/weak ground conditions, the intersection drill method may be used to better control the risk of inadvertent drilling fluid releases.

5.3 HDD SUBSURFACE MODEL DEVELOPMENT

A subsurface model was developed based on the boring logs as approximate representation of subsurface conditions along the proposed HDD alignment. BoreAid Version 5.1.08 (2017) modeling software (a product of Vermeer) was used to model the HDD. Geotechnical soil input parameters reflect the default BoreAid values for each soil type. These soil properties were found to be conservative assumptions for the selected soil types and were in the typical published ranges. Values for all soil properties are listed in in the BoreAid HDD simulation outputs in Appendix C.

5.3.1 BoreAid Analysis

For the BoreAid analyses, the below conduit configurations will be used:

1) The following section is assumed to not be ballasted with water during pullback.

a. An individual 10-inch diameter DR 9 HDPE casing or 8-inch diameter SDR 18 FPVC casing

Note: The actual FPVC pipe that will be used is an 8-inch diameter SDR 17 FPVC casing. BoreAid does not provide the option to select SDR 17, so SDR 18 was used in the BoreAid analysis as it is the next closest dimension ratio available and provides a conservative analysis for the SDR 17 that will be installed.

2) The following bundled pull is assumed to be ballasted with water during pullback to create a near neutral buoyancy.

a. A bundle consisting of a 10-inch diameter DR 9 or 8-inch diameter SDR 18 FPVC casing and a 3-inch diameter DR 9 HDPE casing

The stresses and deflections of the pipe are evaluated and compared to allowable values as shown on the BoreAid calculations presented in Appendix C. In addition to analyzing each individual casing being installed, for all bundled pull sections, a secondary calculation was completed to evaluate a single "equivalent" pipe that is representative of the bundle diameter and stiffness. The BoreAid analyses for the single "equivalent" pipe concluded that all bundled pull sections would need to be ballasted with water during pullback to bring the Unconstrained Collapse buckling pressure within allowable limits. As a result, a note has been added to the HDD drawings stating, "Drill Contractor shall utilize buoyancy control measures (internal water used for ballast) during pullback for all bundled casings".

Note: No BoreAid analysis was performed for Trenchless crossing 12-294.9-2.7 as there is no risk of IR with an Auger Bore.

5.3.2 HDD Inadvertent Return and Hydraulic Fracture Analysis

BoreAid modeling software was used to perform inadvertent return analyses for each HDD alignment. The drill path alignment was selected and checked so that the allowable drill 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 drill hole, and the strength of the ground. The Limiting Formation Pressure Figures,

indicate a generally acceptable factor of safety against the potential for inadvertent return along the proposed drill paths except at the ends.

Based on the drill 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 and thus potential for road settlement. As a result, it is recommended that a surface/conductor casing be used for all 7B HDDs to reduce the potential for these types of events. The depth of the entry/exit pits should also be considered by the Contractor to increase the effective soil stress and provide a storage volume for returns to and near the entry and exit points. Note that while the potential for inadvertent return has been reduced through the design process, inadvertent returns are still possible through existing fissures in the soil or rock, shrinkage cracks, weak soils, or porous deposits of coarse gravel.

Fractures within and/or hydraulic fracturing (frac-out) of the surrounding soils may cause loss of drilling fluid pressures or inadvertent return of drilling fluid into the wetlands. The areas of greatest concern are reduced soil cover over the drill 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 hydraulic fracture 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.

5.4 HDD ANALYSIS LIMITATIONS

The structural analysis and inadvertent return mitigation analysis were performed using the proposed design drill paths and typically anticipated equipment and means and methods. The HDD subcontractor must submit structural and inadvertent return mitigation calculations and analysis for each drill path, including their final drill 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.

5.5 AUGER BORE SEQUENCE

Auger bores are a motor powered, pit launched, non-steerable (e.g. conventional auger bore, jack and bore, cradle bore, etc.) or steerable (e.g. guided auger bore) method for the installation of pipes, conduits, and cables. The bore unit assembly is guided by rails or tracks inside an entry/launch pit. The cutting tool is installed at the front of a screw auger in front of and inside a casing as a composite unit. The cutter and auger are "pushed" by the drive motor while simultaneously turning the cutter head and screw auger inside the casing. The cuttings are returned to the entry pit through the casing by the screw auger. The cutter is cooled by water injection (if necessary). The exterior casing of the auger bore is lubricated during operations by water, or a bentonite/water slurry to prevent binding or sticking to the surrounding subsurface. Conventional auger bores are subject to deflection by rock geology, rocks in the subsurface, or other unknown hard objects in the bore path. There is no risk of inadvertent return with an Auger bore as no pressurized drill fluids are used to return cuttings to the entry pit.

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 drill path and electromagnetic effects of the HDD steering equipment from nearby high voltage power lines.

6.2 SITE ANALYSIS

What does the site look like and what considerations might need to be taken for site access, construction of HDD entry and exit pits, and layout area for equipment and supplies. Careful consideration of all necessary jobsite activities should be analyzed from the perspective of the site conditions, terrain, and nearby structures.

6.3 EROSION CONTROL

The proposed drill paths cross 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. 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 drill alignment for indications of potential inadvertent returns 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

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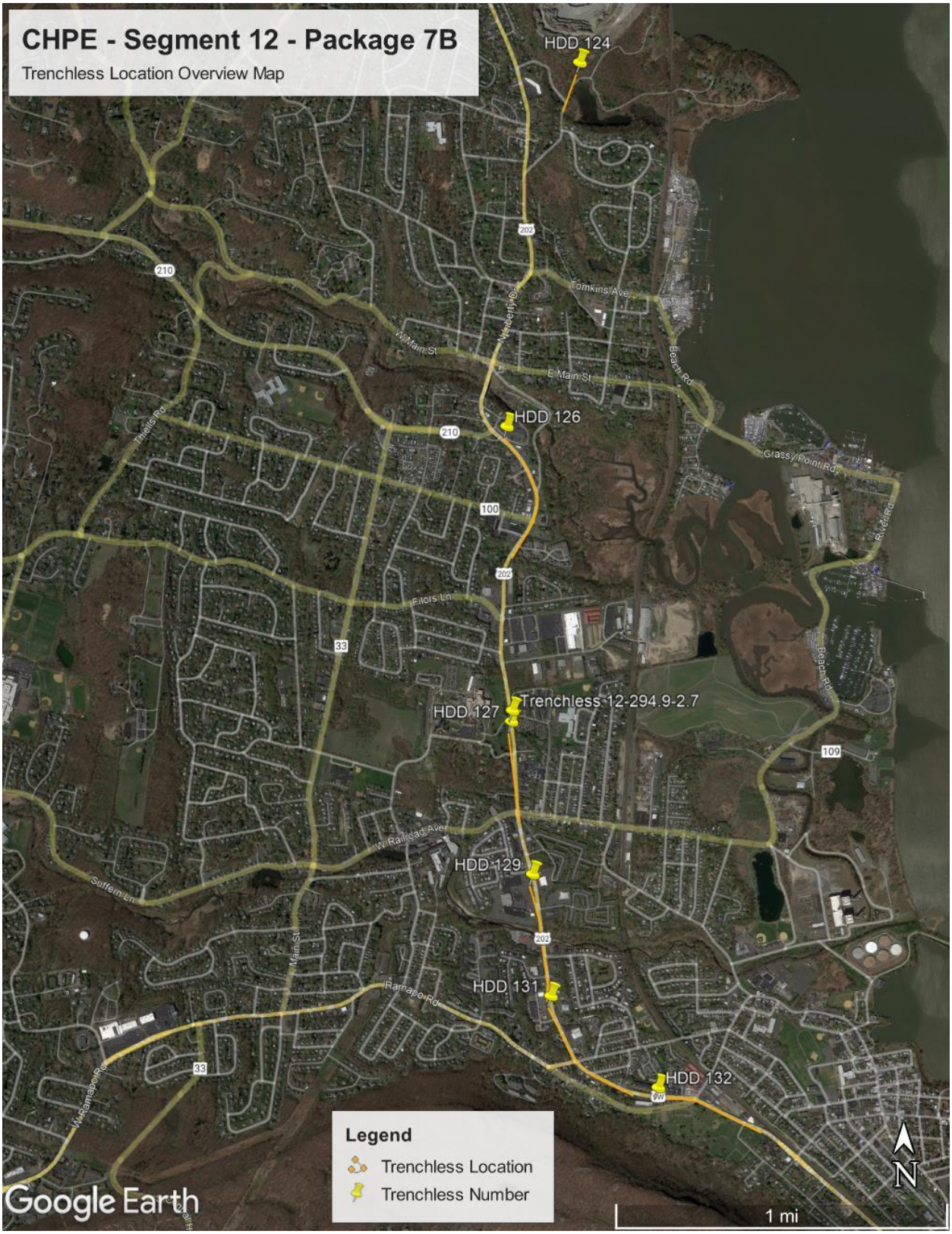
Appendix A

Overview Map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E Main St
Newbery Rd
Beach Rd
Grassy Point Rd
River Rd
Trails Rd
Filors Ln
W Railroad Ave
Suffern Ln
Main St
Ramapo Rd
W Ramapo Rd
210
202
100
33
109
Legend
Trenchless Location
Trenchless Number
Google Earth
1 mi
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Appendix B

Geotechnical Reports

Kiewit

MEMORANDUM

DATE: July 14, 2022

TO: Zachary Bauer; Tetra Tech Rooney

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

SUBJECT: Geotechnical Data: Segment 12 - Package 7B - HDD Crossing 124
Champlain Hudson Power Express Project
Stony Point, New York

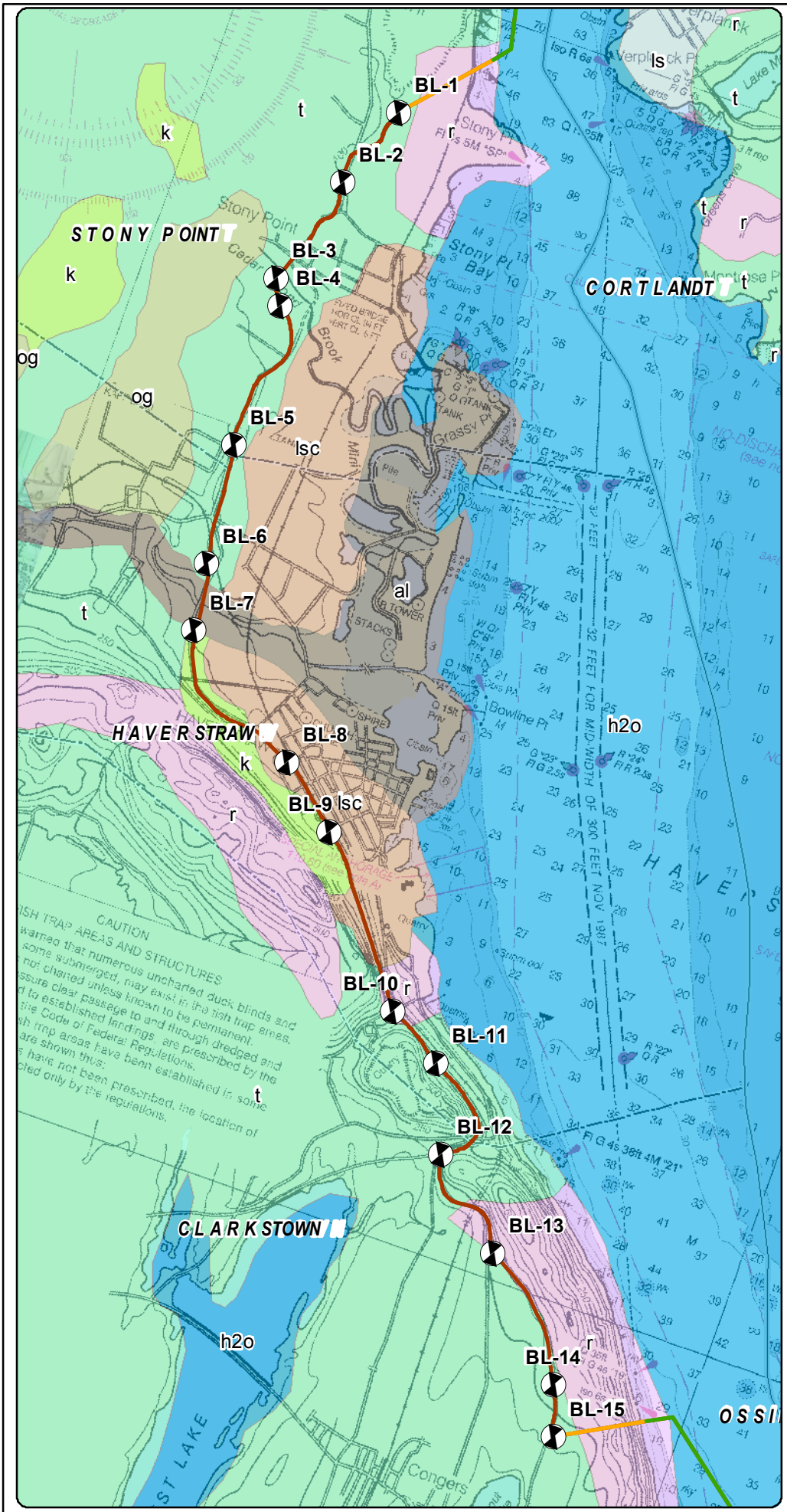
Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located in Stony Point, New York. The approximate station for the start of HDD crossing number 124 is STA 72500+00 (41.2413° N, 73.9824° W).

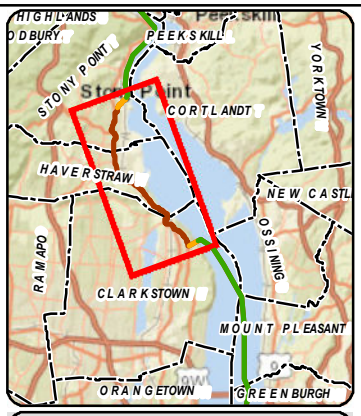
The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigation by AECOM and data from a recent investigation by Kiewit, referenced below.

- AECOM, Geotechnical Data Report, Upland Segment, Rockland County, NY, Champlain Hudson Power Express, dated September 18, 2020.
- Kiewit Engineering (NY) Corp., Segment 12 Package 7B HDD Borings - Rockland, Champlain-Hudson Power Express, dated July 5, 2022.

Contact us if you have questions or require additional information.

HDD 124
Borings BL-1, K-294.9-0.7
Segment 12 - Design Package 7B





LEGEND

Approximate Boring Locations

- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location

Surficial Geology

- af- Artificial fill
- al- Recent alluvium, fine sand to gravel
- alf- Alluvial fan
- b- Beach, sand and gravel deposit at marine shorelines
- bi- Barier island, sand and gravel deposit as barrier islands
- h2o- Water
- k- Kame deposits, coarse to fine gravel and/or sand
- km- Kame moraine, variable texture from boulders to sand
- ld- Lacustrine delta, coarse to fine gravel and sand
- ls- Lacustrine sand, generally quartz sand, well sorted, stratified
- lsc, Lacustrine silt and clay, generally laminated silt and clay
- og- Outwash sand and gravel, coarse to fine gravel with sand
- pm- Swamp deposits, peat-muck, organic silt and sand in poorly drained area
- r- Bedrock, exposed or generally within 1 meter of surface
- t- Till, variable texture (boulders to silt)
- tm-Till moraine, variable texture (size and sorting)

Town Boundary

County Boundary

N

0.35 0.175 0 0.35 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

FIGURE 3

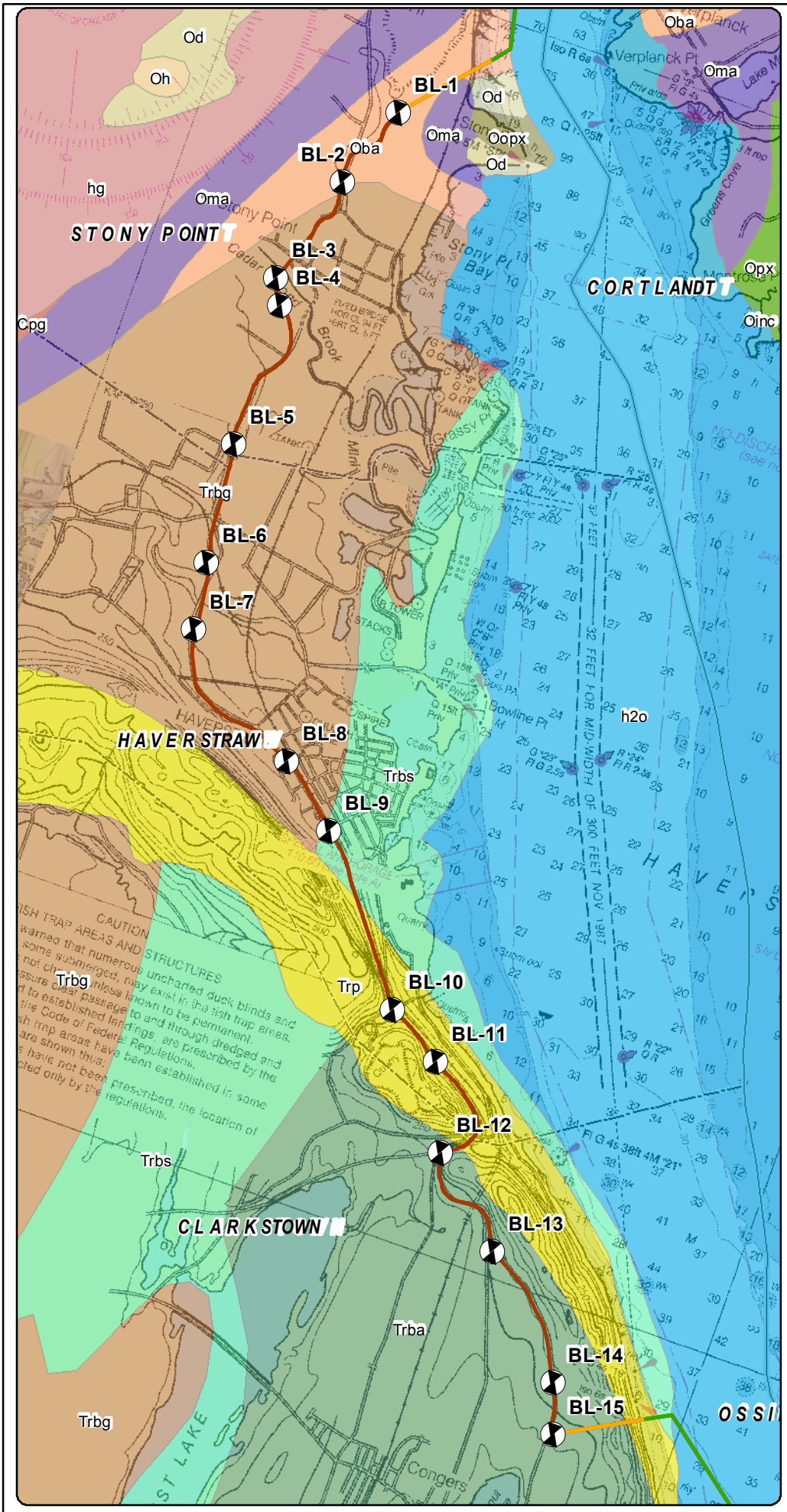
Surficial Geology and Geotechnical Borings

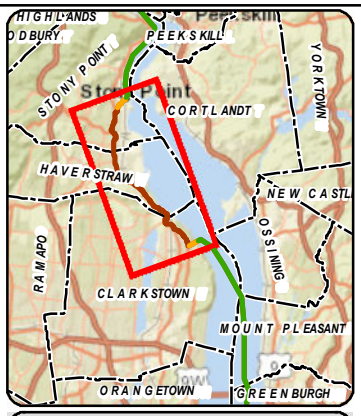
Prepared on 8/25/2020

by: AECOM

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

Y:\Projects\CHPE\Rockland_Co_Geology_Figures\Boring_location_Map_082520.mxd





LEGEND

- Approximate Boring Locations
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location

Bedrock Geology

- Other
- Cg- Germantown Formation
- Cpg- Poughquag Quartzite
- Oba- Balville Limestone
- Ocs- Cambrian thru Middle Ordovician carbonate rock
- Od- Diorite with hornblend and/or biotite
- Oh- Hornblende norite
- Oma- Manhattan Formation (A Member)
- Oopx- Olivine pyroxenite
- Trb-Brunswick Formation, undivided
- Trba- Brunswick Formation
- Trbg- Groveton Member of the Bull Run Formation
- Trbs- Triassic Brunswick Formation
- Trl- Ladentown diabase & baslatic lava
- Trp- Palisade Diabase
- Trs- Stockton Formation
- h2o- Water
- hg- Hornblende granite and granite gneiss
- Town Boundary
- County Boundary

N

0.35 0.175 0 0.35 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

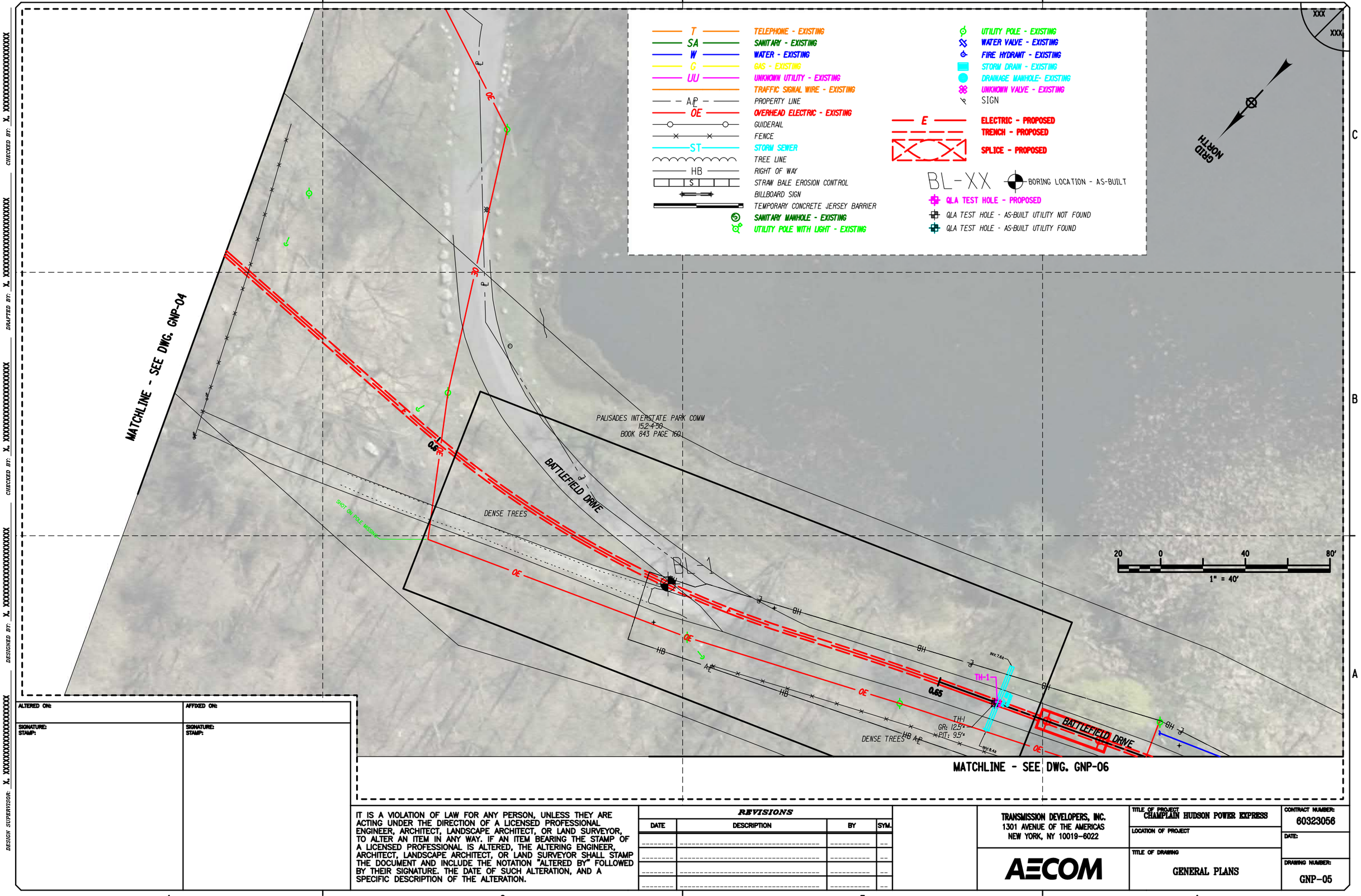
FIGURE 4

Bedrock Geology and Geotechnical Borings

Prepared on 8/26/2020
by: AECOM

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

Y:\Projects\CHPE\Rockland_Co_Geology_Figures\Boring_location_Bedrock_Map_082520.mxd



DESIGN SUPERVISOR: X. XXXXXXXXXXXXXXXX
DESIGNED BY: X. XXXXXXXXXXXXXXXX
DRAFTED BY: X. XXXXXXXXXXXXXXXX
CHECKED BY: X. XXXXXXXXXXXXXXXX
CHECKED BY: X. XXXXXXXXXXXXXXXX

ALTERED ON:	AFFIXED ON:
SIGNATURE: STAMP:	SIGNATURE: STAMP:

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR, TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE. THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

REVISIONS

DATE	DESCRIPTION	BY	SYM.

TRANSMISSION DEVELOPERS, INC.
1301 AVENUE OF THE AMERICAS
NEW YORK, NY 10019-6022

AECOM

TITLE OF PROJECT: CHAMPLAIN HUDSON POWER EXPRESS
LOCATION OF PROJECT:
TITLE OF DRAWING: GENERAL PLANS

CONTRACT NUMBER: 60323056
DATE:
DRAWING NUMBER: GNP-05

BORING CONTRACTOR: ADT

DRILLER: Chris Chaillou

SOILS ENGINEER: Roberto Lucidi

LOCATION: Battlefield Road, Stony Point, NY

AECOM

BORING LOG

SHEET 1 OF 3

PROJECT NAME: CHPE - Rockland Co. Borings

PROJECT NO.: 60323056

HOLE NO.: BL-1

START DATE: 7/6/2020

FINISH DATE: 7/6/2020

OFFSET: N/A

DRILL RIG: Geoprobe

BORING TYPE: SPT/Rock coring

BORING O.D.: 3.5"

SURFACE ELEV.: 16.537

NORTHING 877579.553

EASTING 634487.801

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL
Not Encountered	TYPE	Flush joint Steel	SPLIT SPOON[1]	2-7/8" TRICONE	NQ
	SIZE I.D.	3.0"	2.4"	-	1.88"
	SIZE O.D.	3.5"	3.0"	-	2.97"
	HAMMER WT.	SPUN	140 lb	-	-
	HAMMER FALL	-	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
1.0												Sandy Fill	Grass Area
		Hand Cleared									SM		Light brown, f-m SAND, little f-m-c gravel, little silt, dry
2.0		0.0 - 3.0											TR[3]-1 (1.0'-3.0')
3.0													Too hard to hand clear at 3.0'
		3.0 - 3.3	S-1	3.0	3.0	50/3"	-	-	-	-	SM		S-1: Light brown, f-m SAND, little f-m-c gravel, little silt, dry
4.0												Fractured Limestone	Could not install casing at 3.3'; drilled with tricone rollerbit to 6.0'
5.0													
6.0													Installed casing at 6.0'
	7.0												Started coring from 6.0'
7.0		6.0 - 11.0	R-1	60.0	28.0	RQD =	0"/60"=						From 6.0' to 11.0': Light gray, LIMESTONE, fine grained, slightly weathered (II), strong (R4), intensely fractured. Loss of drilling water.
	4.0				47%	=	0%						
8.0													
	4.0												
9.0													
	7.0												
10.0													
	7.5												
11.0													Casing advanced to 11.0'
	3.0												
12.0		11.0 - 16.0	R-2	60.0	47.0	RQD =	26.5"/60"					Limestone (Balmville Fm.)	
	3.0				78%	=	44%						TR-2 (12.1'-12.6')
13.0													No recovery from 12.6' to 13.6' (drop of drill rods)
	3.0												
14.0													From 11.0' to 20.0': Light gray, LIMESTONE, fine grained, slightly weathered (II), strong (R4), highly fractured. Sealed microfractures (including microfaults) throughout. Loss of drilling water.
	4.0												
15.0													
	5.0												
16.0													
	5.0												
17.0		16.0 - 21.0	R-3	60.0	59.0	RQD =	29"/60"						TR-3 (16.3'-17.1')
	5.0				98%	=	48%						
18.0													
	6.0												
19.0													
	6.0												
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: $N_{corr}=N*(2.0^2-1.375^2)in./(3.0^2-2.4^2)in. = N*0.65$.

(3) TR = sample for thermal resistivity testing.

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: Roberto Lucidi

LOCATION: Battlefield Road, Stony Point, NY

AECOM

BORING LOG

SHEET 2 OF 3

PROJECT NAME: CHPE - Rockland Co. Borings

PROJECT NO.: 60323056

HOLE NO.: BL-1

START DATE: 7/6/2020

FINISH DATE: 7/6/2020

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
	9.0									
21.0										From 20.0' to 45.0': Light gray, LIMESTONE, fine grained, slightly weathered (II), strong (R4), highly fractured. Sealed microfractures (including microfaults) throughout. Loss of drilling water.
	3.5									
22.0		21.0 - 25.0	R-4	48.0	48.0	RQD = 29.5"/48"				
	4.0				100%	= 61%				
23.0										
	4.0									
24.0										TR-4 (21.5'-22.2')
	11.0									Heavily jointed at 24'
25.0										
	5.0									Brecciated from 25.0' to 26.0'
26.0		25.0 - 29.0	R-5	48.0	48.0	RQD = 28"/48"				
	7.0				100%	= 58%				Heavily jointed at 26'
27.0										
	6.0									
28.0										
	5.0									
29.0										
	5.0									Heavily jointed at 29'
30.0		29.0 - 30.8	R-6	22.0	22.0	RQD = 5"/22"				
	12.0				100%	= 23%				
31.0										
	4.5									TR-5 (31.7'-32.1')
32.0		30.8 - 35.0	R-7	50.0	50.0	RQD = 19"/50"				
	4.5				100%	= 38%				
33.0										
	8.0									
34.0										
	6.5									Heavily jointed at 34'
35.0										
	5.5									
36.0		35.0 - 40.0	R-8	60.0	60.0	RQD = 29"/60"				
	5.5				100%	= 48%				
37.0										
	5.0									
38.0										
	12.0									
39.0										
	4.0									
40.0										
	4.0									
41.0		40.0 - 45.0	R-9	60.0	60.0	RQD = 46"/60"				
	4.0				100%	= 77%				
42.0										
	4.0									
43.0										
	5.0									Heavily jointed at 43'
44.0										
	4.0									Change of lithology at 44.5'
45.0										

Limestone (Balmville Fm.)

NOTES:

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

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

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

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

BORING CONTRACTOR: ADT

DRILLER: Chris Chaillou

SOILS ENGINEER: Roberto Lucidi

LOCATION: Battlefield Road, Stony Point, NY

AECOM

BORING LOG

SHEET 3 OF 3

PROJECT NAME: CHPE - Rockland Co. Borings

PROJECT NO.: 60323056

HOLE NO.: BL-1

START DATE: 7/6/2020

FINISH DATE: 7/6/2020

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
	4.5											Quartzite (silicified zone)	From 44.5' to 49.7': yellowish white, QUARTZITE, very fine grained, slightly weathered (II), very strong (R5), highly to moderately fractured. Sealed microfractures (including microfaults) throughout. Slickensided joint planes. Loss of drilling water.
46.0		45.0 - 50.2	R-10	62.0	62.0	RQD =	52"/62"						TR-6 (46.2'-46.9')
	4.5				100%	=	84%						Change of lithology at 49.7'
47.0													
	6.0												
48.0													
	5.5												
49.0													
	6.0												
50.0													
	6.0											Limestone (Balmville Fm.)	Brecciated from 50.0' to 52.0'
51.0		50.2 - 55.0	R-11	58.0	58.0	RQD =	49"/58"						From 49.7' to 55.0': gray, LIMESTONE, fine grained, slightly weathered (II), strong to very strong (R4-R5), moderately fractured.
	5.0				100%	=	84%						
52.0													
	4.0												
53.0													
	5.0												
54.0													
	5.0												
55.0													
	5.0												From 55.0' to 60.0': gray, LIMESTONE, fine grained, slightly weathered (II), strong to very strong (R4-R5), highly fractured.
56.0		55.0 - 60.0	R-12	60.0	60.0	RQD =	21"/60"						
	5.5				100%	=	35%						
57.0													
	5.0												
58.0													TR-7 (58.7'-59.2')
	6.0												
59.0													
	5.0												
60.0													End of boring at 60.0' below grade
													Borehole grouted
61.0													
62.0													
63.0													
64.0													
65.0													
66.0													
67.0													
68.0													
69.0													
70.0													

NOTES:

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

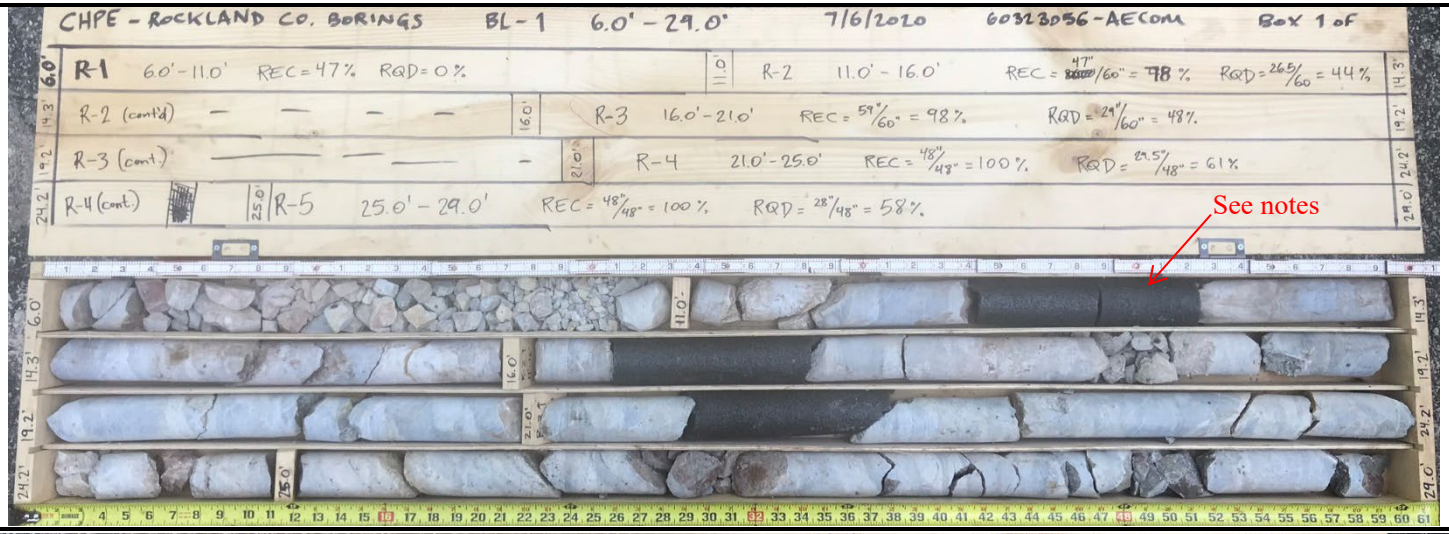
The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against DMJM Harris AECOM if he finds that the actual conditions do not conform to those indicated by this log.

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

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

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **Upland Segment, Rockland County, NY, Champlain-Hudson Power Express**
Location: **Rockland County, NY**

Boring No.	Depth (ft.)	
BL-1 (dry)	6.0 to 29.0	

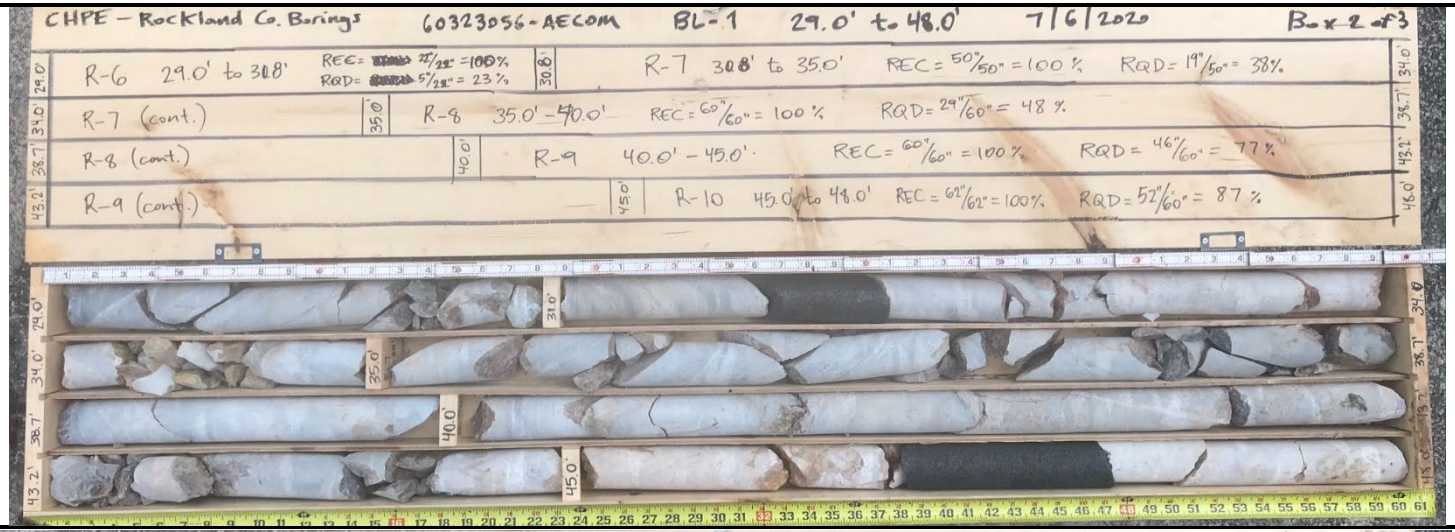
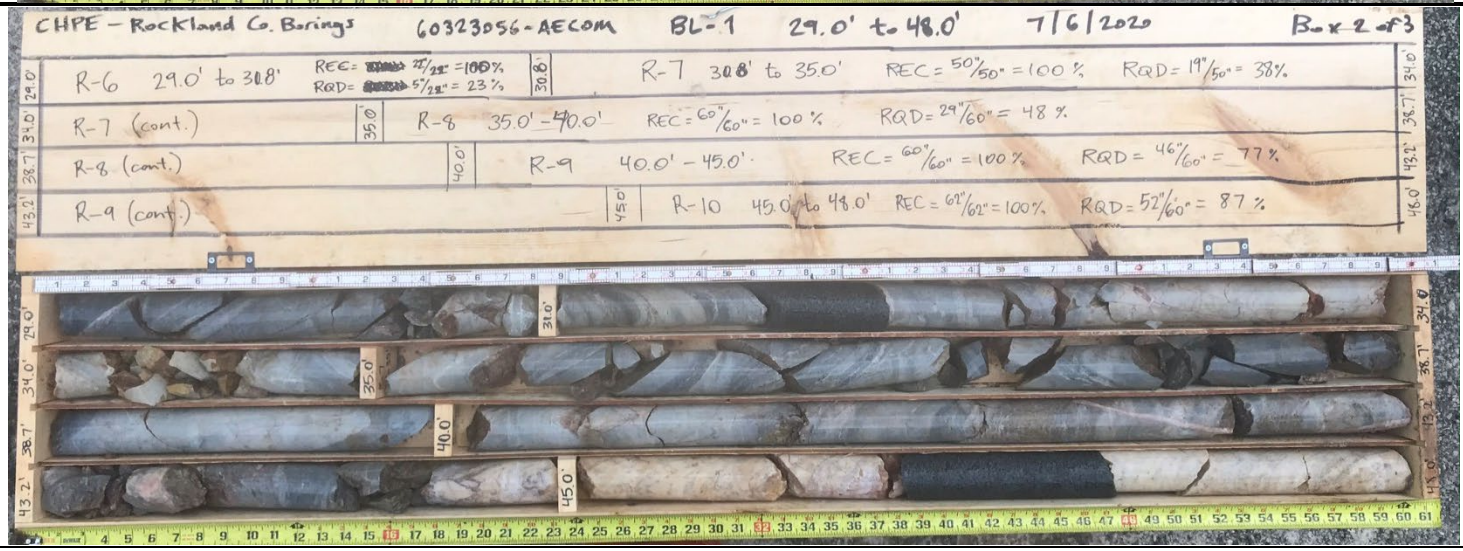
Boring No.	Depth (ft.)	
BL-1 (wet)	6.0 to 29.0	

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

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **Upland Segment, Rockland County, NY, Champlain-Hudson Power Express**
Location: **Rockland County, NY**

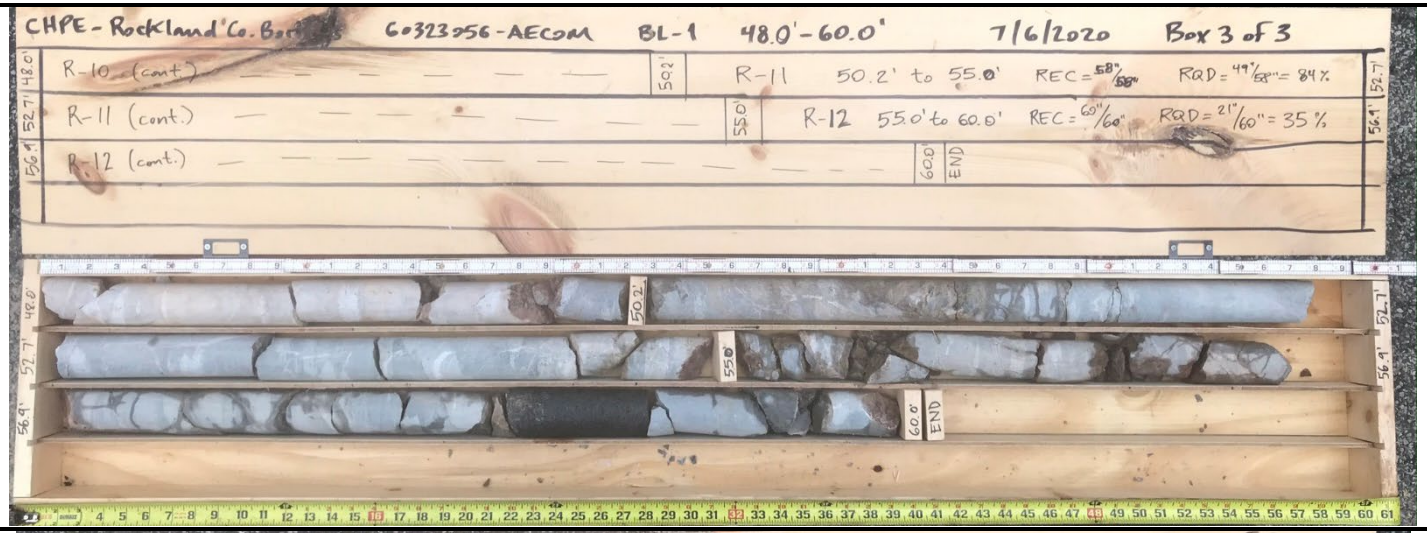
AECOM

Boring No.	Depth (ft.)	
BL-1 (dry)	29.0 to 48.0	
BL-1 (wet)	29.0 to 48.0	

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

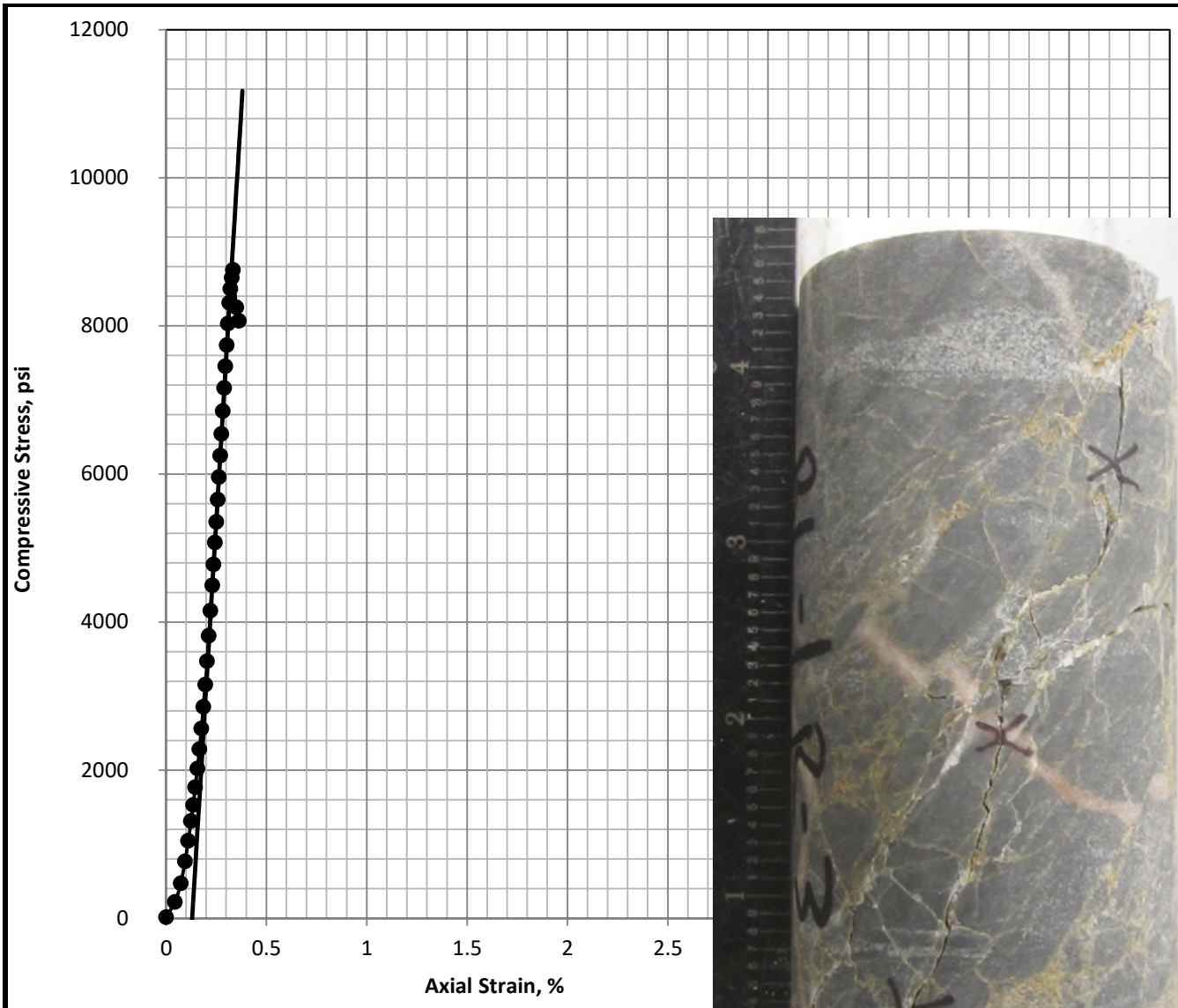
ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **Upland Segment, Rockland County, NY, Champlain-Hudson Power Express**
Location: **Rockland County, NY**

Boring No.	Depth (ft.)	
BL-1 (dry)	48.0 to 60.0	

Boring No.	Depth (ft.)	
BL-1 (wet)	48.0 to 60.0	

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



FAILURE PHOTO

Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.15	176	176	4.420	1.960

Specimen meets ASTM D4543 shape tolerances

Test Summary

Strain Rate (%/min)	Corrected Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.10	0.20	8760	4E+06

Test by: DM
Test Date: Aug-17-20
Reviewed by: GET

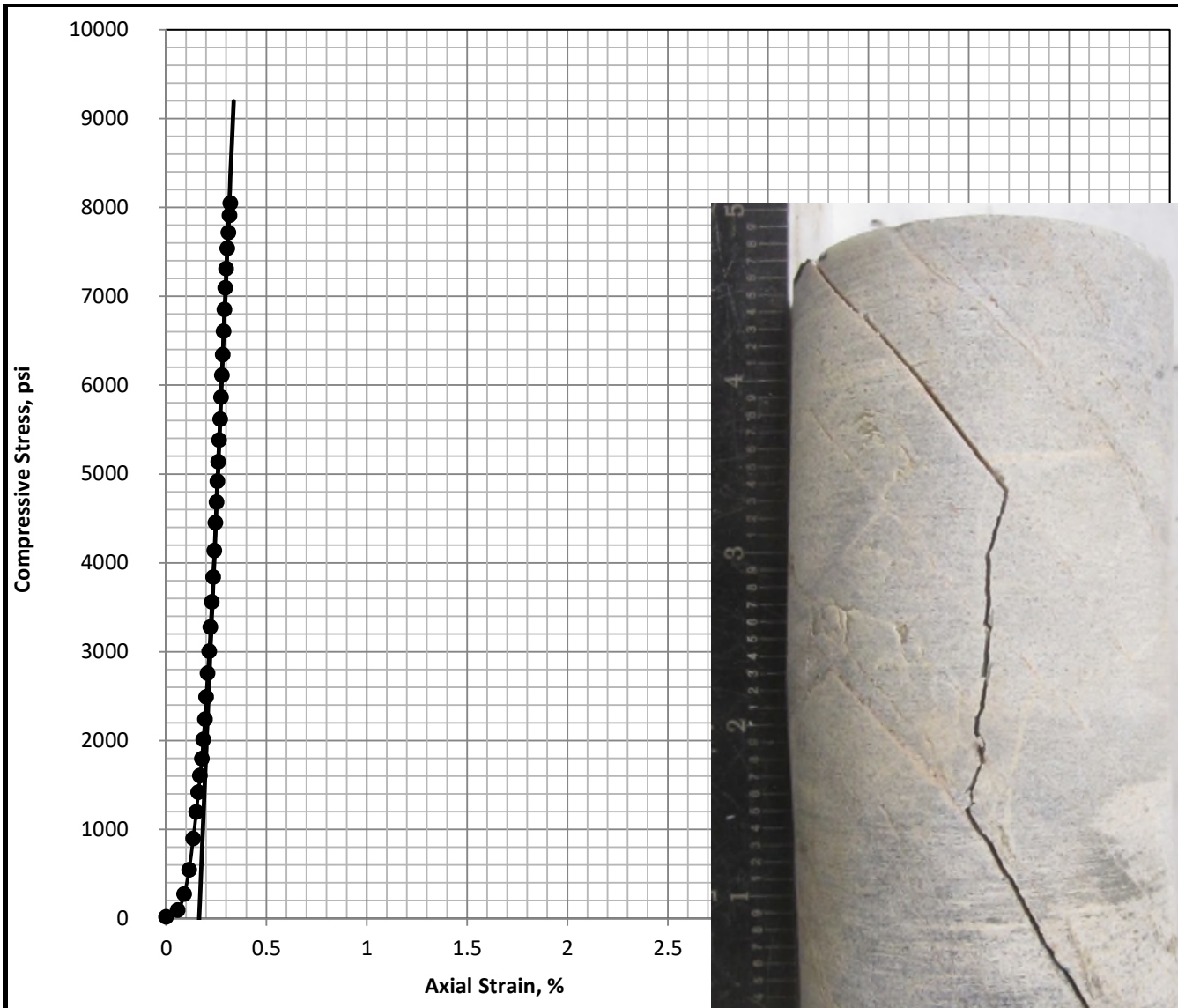
Aquifer
Project # PO 309907

TerraSense, LLC
Project # 7853-20003

CHPE - Rockland County Borings

COMPRESSIVE STRESS VS STRAIN
UNCONFINED COMPRESSIVE STRENGTH TEST

Boring: BL-1 Run: R-3
Depth 19.3-19.7 ft.



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.11	176	175	4.520	1.966

Specimen does not meet ASTM D4543 shape tolerances for side straightness

FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.09	0.16	8050	5E+06

Test by: DM
Test Date: Aug-17-20
Reviewed by: GET

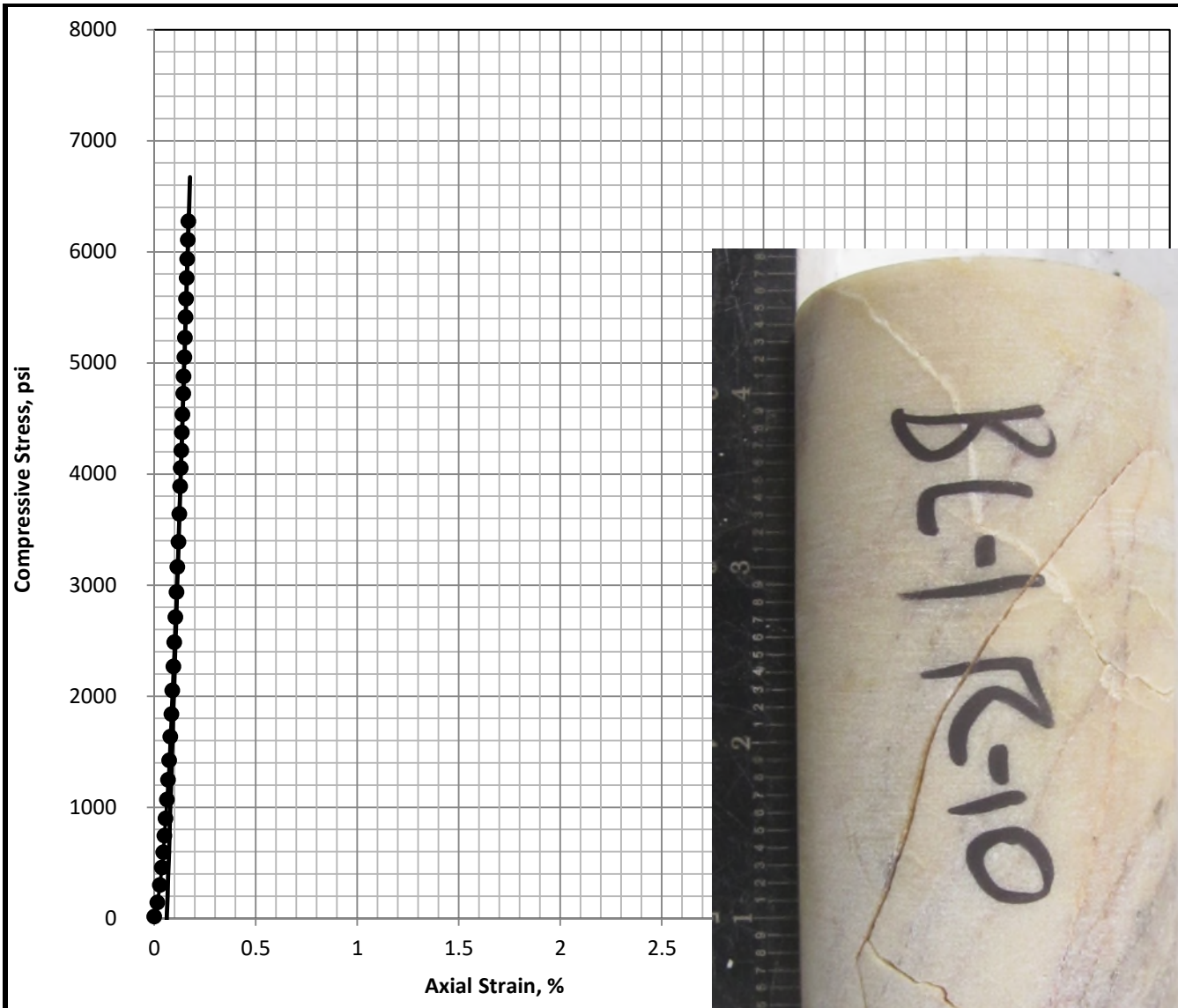
Aquifer
Project # PO 309907

TerraSense, LLC
Project # 7853-20003

CHPE - Rockland County Borings

COMPRESSIVE STRESS VS STRAIN
UNCONFINED COMPRESSIVE STRENGTH TEST

Boring: BL-1 Run: R-7
Depth 31.1-31.5 ft.



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.08	177	176	4.347	1.970

Specimen meets ASTM D4543 shape tolerances

FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.09	0.11	6280	6E+06

Test by: DM
Test Date: Aug-17-20
Reviewed by: GET

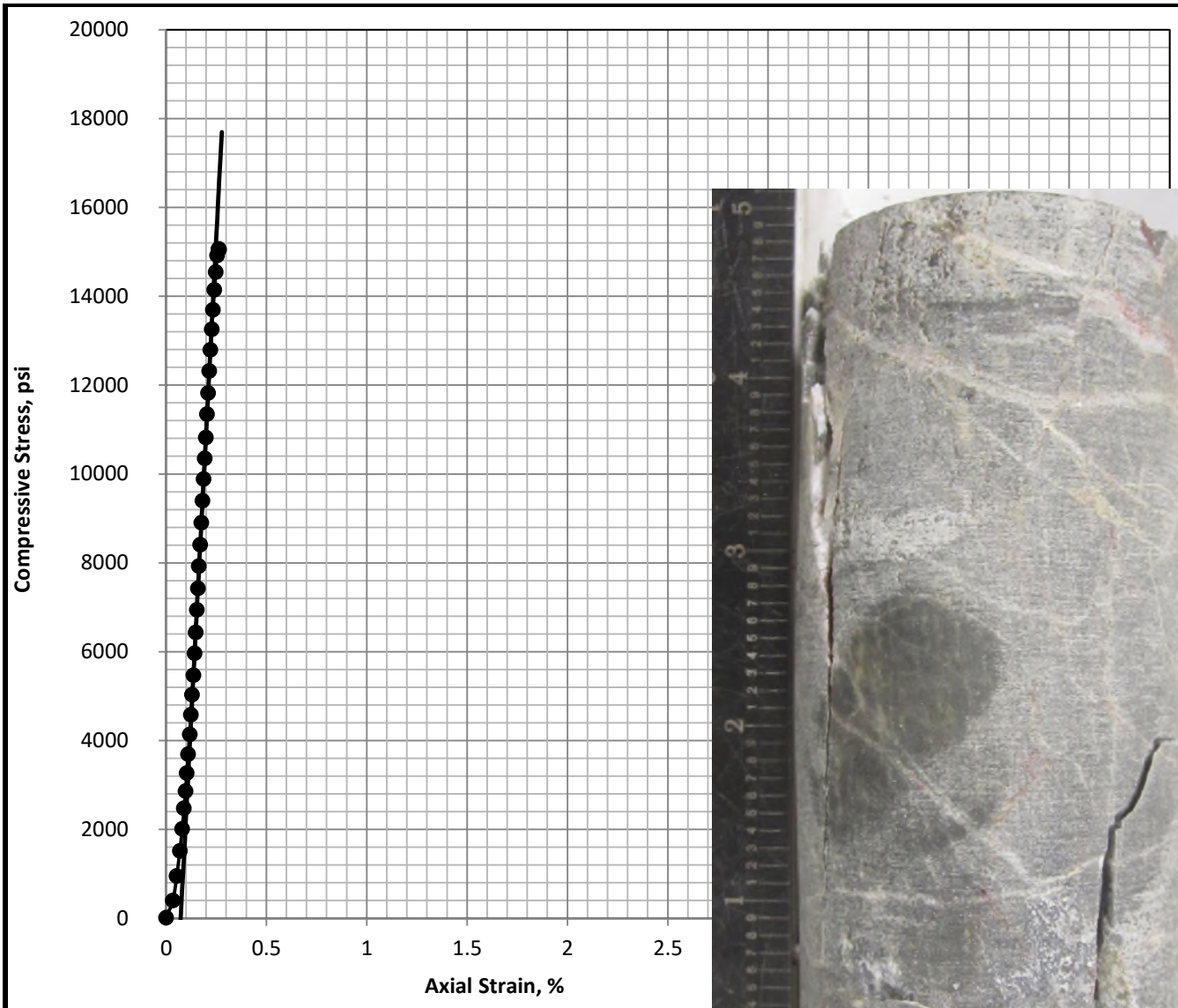
Aquifer
Project # PO 309907

TerraSense, LLC
Project # 7853-20003

CHPE - Rockland County Borings

COMPRESSIVE STRESS VS STRAIN
UNCONFINED COMPRESSIVE STRENGTH TEST

Boring: BL-1 Run: R-10
Depth 48.3-48.7 ft.



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.13	174	174	4.601	1.967

Specimen does not meet ASTM D4543 shape tolerances for side straightness

FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.07	0.19	15070	9E+06

Test by: DM
Test Date: Aug-17-20
Reviewed by: GET

Aquifer
Project # PO 309907

TerraSense, LLC
Project # 7853-20003

CHPE - Rockland County Borings

COMPRESSIVE STRESS VS STRAIN
UNCONFINED COMPRESSIVE STRENGTH TEST

Boring: BL-1 Run: R-11
Depth 53.9-54.3 ft.

Segment 12 Package 7B HDD Borings - Rockland

Champlain Hudson Power Express

New York

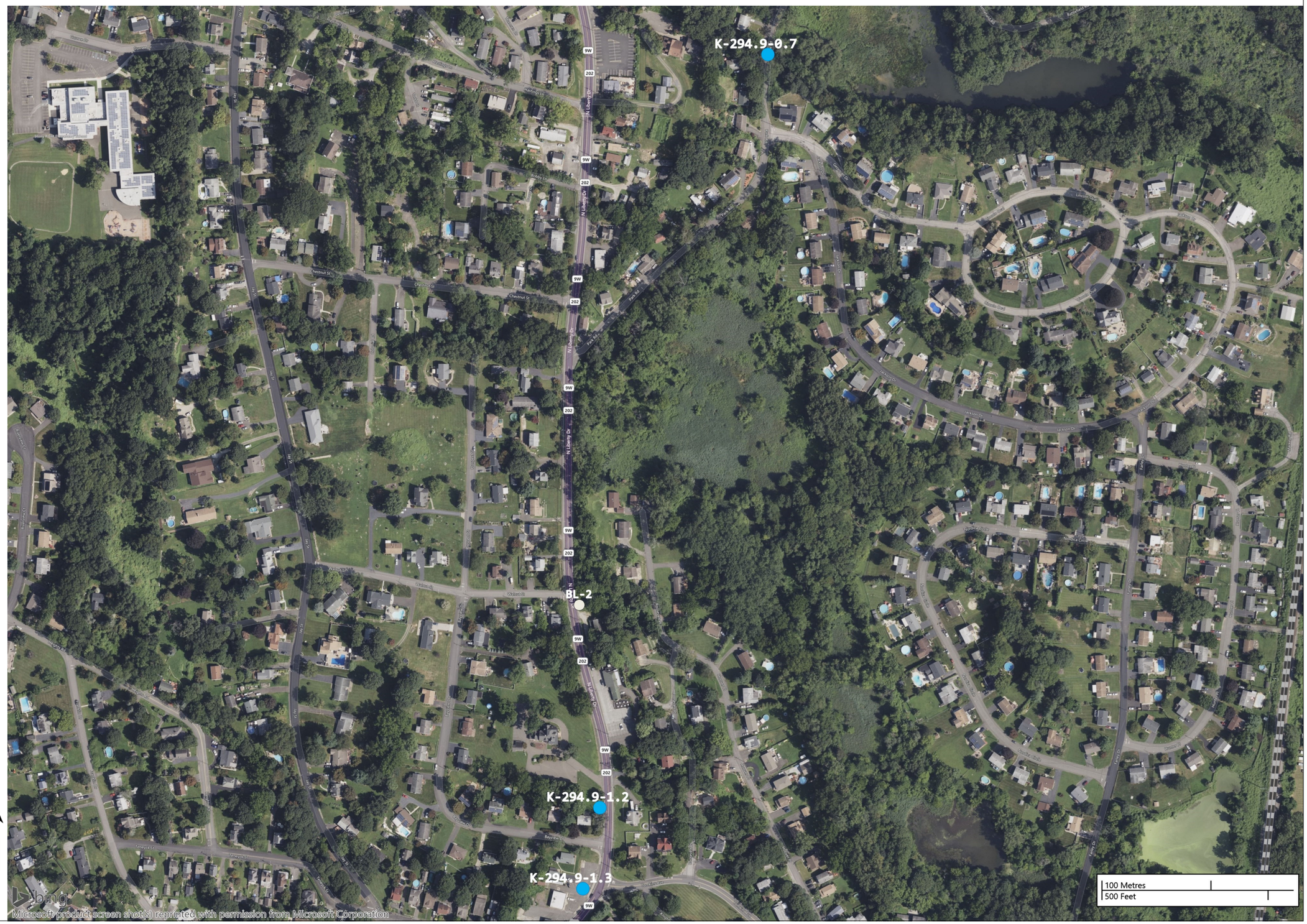
PROJECT NUMBER 20001480

CREATED BY Kiewit

DATE 07/05/2022

Legend Key

- Kiewit Borings (2022)
- Borings by Others



EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-0.7

PROJECT NUMBER	20001480	**LOGGED BY**	Rafael Salas	**COORDINATES**	N 877078.91 E 634313.79
START DATE	04/25/2022	**DRILLER/RIG**	Corey B. / CME 550	**GROUND ELEV.**	20.7 ft
FINISH DATE	04/26/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
0	20.7		Silty GRAVEL, (GM), with cobbles and Boulders (based on observation of excavated materials) 0 - 7 ft was excavated by air knife and vacuum truck						Boring advanced with 3.25" ID HSA
5									
	12.7		SILT (ML), cemented, hard, red, dry	☒		54%		50/6"	
10			Boring advanced without sampling to refusal at 12 ft						
	8.7		Conglomerate, medium to coarse gravel, with small cobbles, red, moderately spaced to closely spaced fractures, very strong		1	88% 86			
15									
			Approximately 1 ft void encountered at 18 ft		2	66% 65			
20			Calcite healed fractures between 20 and 21 ft						
					3	100% 85			
25			1.5 ft void at 27 ft						
					4	62% 36			
30	-9.3		Boring Terminated at 30 ft						

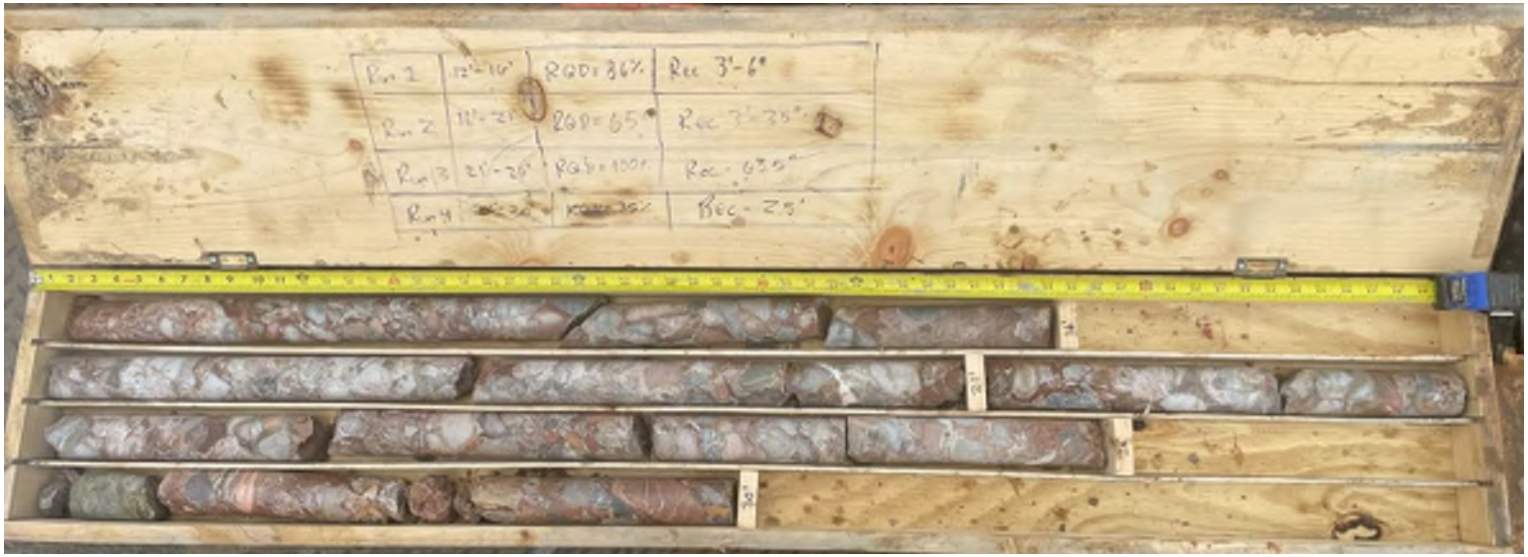
Legend

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

20 40 60 80

Champlain Hudson Power Express
Kiewit Engineering (NY) Corp.

K-294.9-0.7 - Runs 1 through 4



K-294.9-1.2 - Runs 1 through 3

ADVANCED TERRA TESTING

CERCHAR Abrasiveness
ASTM D7625

CLIENT	Fairway Testing Company	JOB NO.	3151-001
PROJECT	Champlain Hudson Power Express	LOCATION	New York
PROJECT NO.	K-294.9		

BORING NO.	RC3
DEPTH	21.0-26.0
SAMPLE NO.	0.7
DATE SAMPLED	
DATE TESTED	
TECHNICIAN	HN
ROCK TYPE	6/16/22

Surface Type:	Saw Cut
Moisture Condition	As Received
Reading A.1 (in):	0.00890
Reading A.2 (in):	0.00900
Reading A.3 (in):	0.00890
Reading A.4 (in):	0.00500
Reading A.5 (in):	0.00680
Reading B.1 (in):	0.00800
Reading B.2 (in):	0.00940
Reading B.3 (in):	0.00700
Reading B.4 (in):	0.00630
Reading B.5 (in):	0.00860
Average Reading (in):	0.00779
Average Reading (mm):	0.1979
Uncorrected CAI or CAI_s:	**1.98**
Corrected CAI:	**2.44**

NOTES

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

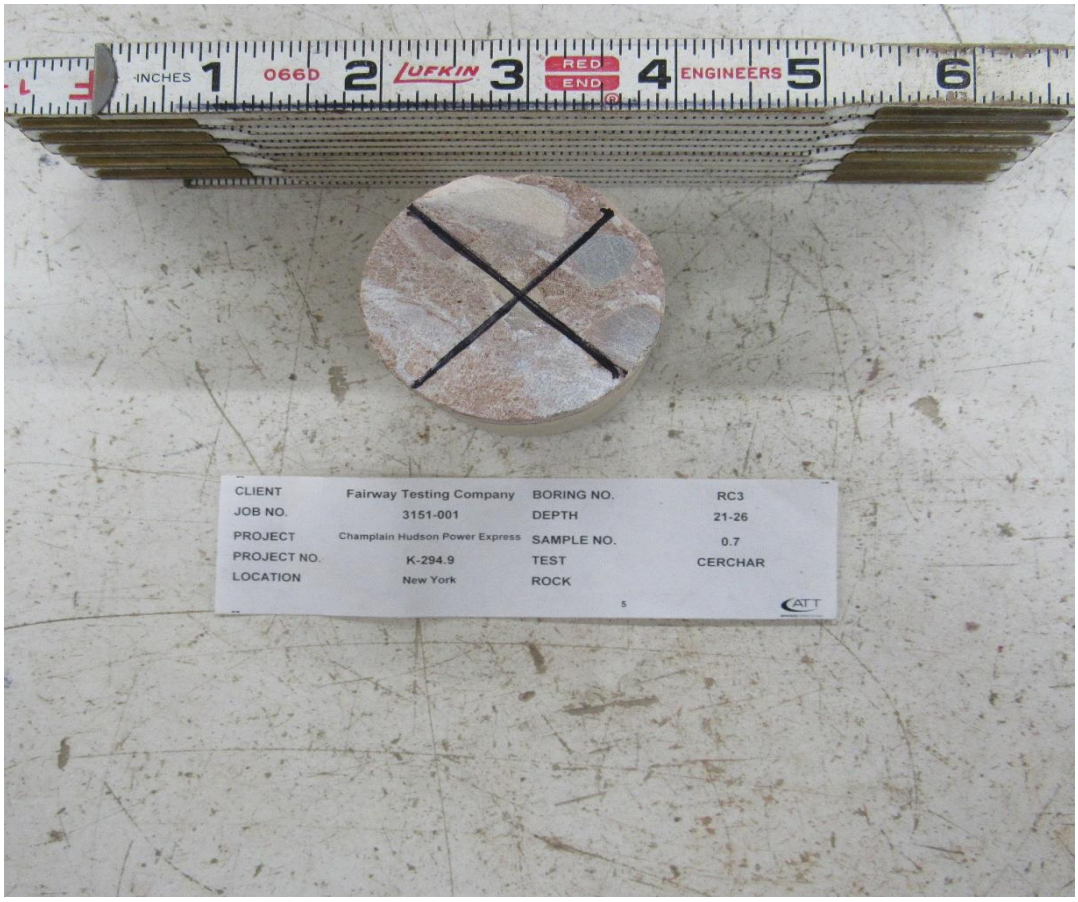
Data entry by:	HN	Date:	06/17/22
Checked by:	DL	Date:	06/17/22
File name:	3151001__CHERCHAR ASTM D7625_1.xlsm		

ADVANCED TERRA TESTING

CHERCHAR Abrasiveness
ASTM D7625

CLIENT	Fairway Testing Company	BORING NO.	RC3
JOB NO.	3151-001	DEPTH	21.0-26.0
PROJECT	Champlain Hudson Power Express	SAMPLE NO.	0.7
PROJECT NO.	K-294.9	DATE SAMPLED	--
LOCATION	New York	DATE TESTED	06/16/22
		TECHNICIAN	HN
		ROCK TYPE	

Before Picture



NOTES

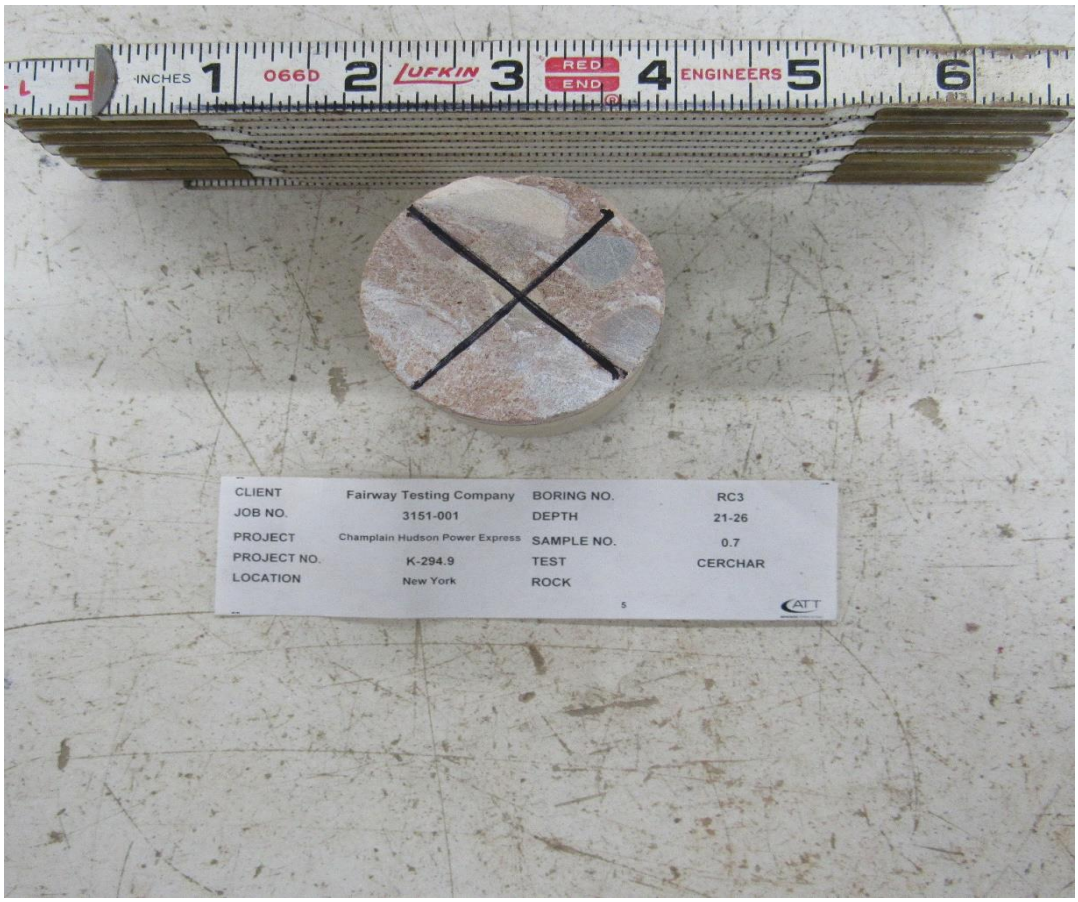
Picture File: 5.JPG
File name: 3151001__CHERCHAR ASTM D7625_1.xlsm

ADVANCED TERRA TESTING

CHERCHAR Abrasiveness
ASTM D7625

CLIENT	Fairway Testing Company	BORING NO.	RC3
JOB NO.	3151-001	DEPTH	21.0-26.0
PROJECT	Champlain Hudson Power Express	SAMPLE NO.	0.7
PROJECT NO.	K-294.9	DATE SAMPLED	--
LOCATION	New York	DATE TESTED	06/16/22
		TECHNICIAN	HN
		ROCK TYPE	

After Picture



NOTES

Picture File: 5.JPG
File name: 3151001__CHERCHAR ASTM D7625_1.xlsm

ADVANCED TERRA TESTING

Splitting Tensile Strength
ASTM D3967

CLIENT	Fairway Testing Company	JOB NO.	3151-001
PROJECT	Champlain Hudson Power Express	LOCATION	New York
PROJECT NO.	K-294.9		

BORING NO.	RC3
DEPTH	21-26
SAMPLE NO.	0.7
DATE SAMPLED	
DATE TESTED	06/16/22
TECHNICIAN	DL
ROCK TYPE	
Diameter (in):	1.989
Height (in):	1.036
Mass of Wet Rock (g):	138.20
Wet Density (lbs/ft³):	163.6
Wet Density (g/cm³):	2.620
Peak Load (lbs):	4536
Splitting Tensile Strength (psi):	1401
Splitting Tensile Strength (kPa):	9662
Failure Type:	Single Plane

BORING NO.	
DEPTH	
SAMPLE NO.	
DATE SAMPLED	
DATE TESTED	
TECHNICIAN	
ROCK TYPE	
Diameter (in):	
Height (in):	
Mass of Wet Rock (g):	
Wet Density (lbs/ft³):	
Wet Density (g/cm³):	
Peak Load (lbs):	
Splitting Tensile Strength (psi):	
Splitting Tensile Strength (kPa):	
Failure Type:	

NOTES

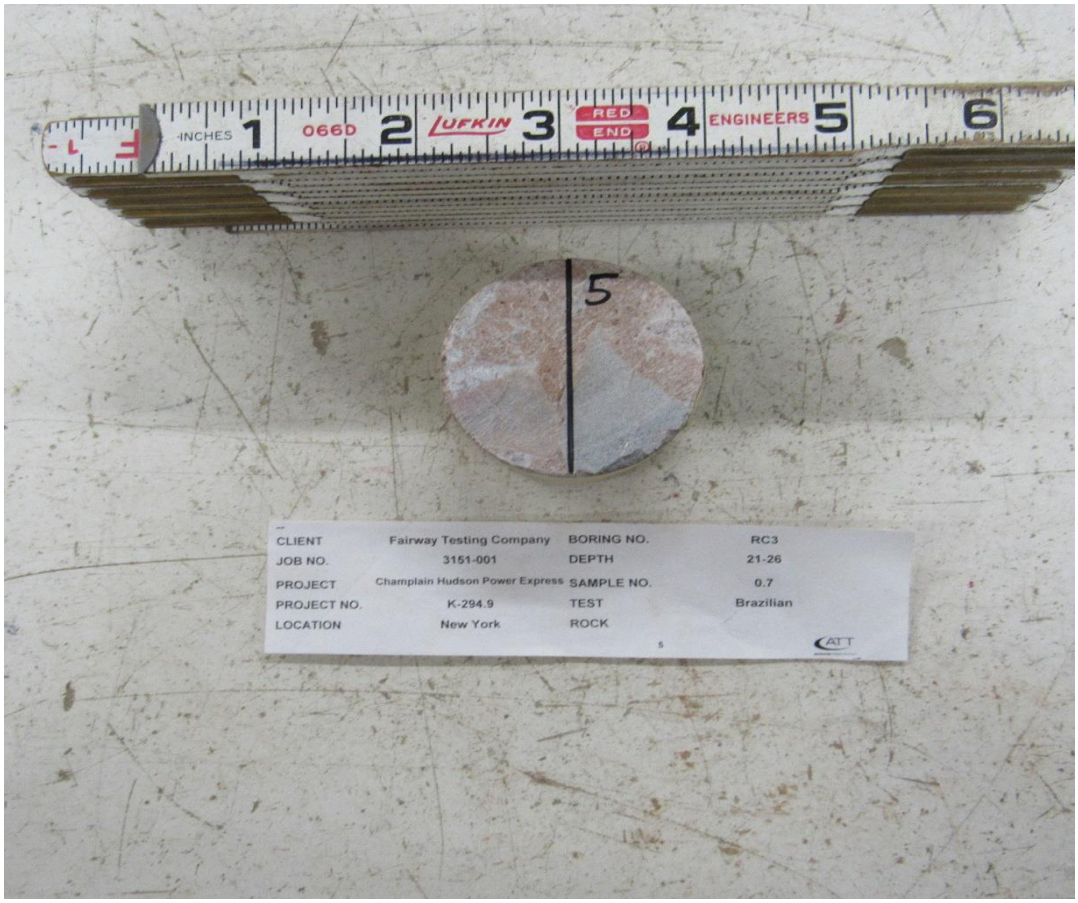
Data entry by:	DL	Date:	06/16/22
Checked by:	HN	Date:	06/17/22
File name:	3151001__Brazilian ASTM D3967_0.xlsm		

ADVANCED TERRA TESTING

Splitting Tensile
ASTM D3967

CLIENT	Fairway Testing Company	BORING NO.	RC3
JOB NO.	3151-001	DEPTH	21-26
PROJECT	Champlain Hudson Power Express	SAMPLE NO.	0.7
PROJECT NO.	K-294.9	DATE SAMPLED	
LOCATION	New York	DATE TESTED	06/16/22
		TECHNICIAN	DL
		ROCK TYPE	

Before Picture



NOTES

Picture File: 5.JPG
File name: 3151001__Brazilian ASTM D3967_0.xlsm

ADVANCED TERRA TESTING

Splitting Tensile
ASTM D3967

CLIENT	Fairway Testing Company	BORING NO.	RC3
JOB NO.	3151-001	DEPTH	21-26
PROJECT	Champlain Hudson Power Express	SAMPLE NO.	0.7
PROJECT NO.	K-294.9	DATE SAMPLED	
LOCATION	New York	DATE TESTED	06/16/22
		TECHNICIAN	DL
		ROCK TYPE	

After Picture

NOTES

Picture File: 5a.JPG
File name: 3151001__Brazilian ASTM D3967_0.xlsm

ADVANCED TERRA TESTING

Unconfined Compressive Strength
ASTM D7012 Method C

CLIENT	Fairway Testing Company	JOB NO.	3151-001
PROJECT	Champlain Hudson Power Express	LOCATION	New York
PROJECT NO.	K-294.9		

BORING NO.	RC3
DEPTH	21-26
SAMPLE NO.	0.7
DATE SAMPLED	
DATE TESTED	06/17/22
TECHNICIAN	DL
ROCK TYPE	
Diameter (in):	1.982
Height (in):	3.977
Mass of Wet Rock (g):	542.30
Wet Density (lbs/ft³):	168.4
Wet Density (g/cm³):	2.70
Peak Load (lbs):	28043
Compressive Strength (psi)	9089
Compressive Strength (MPa)	63
Failure Type:	Fracture / Bedding

BORING NO.	
DEPTH	
SAMPLE NO.	
DATE SAMPLED	
DATE TESTED	
TECHNICIAN	
ROCK TYPE	
Diameter (in):	
Height (in):	
Mass of Wet Rock (g):	
Wet Density (lbs/ft³):	
Wet Density (g/cm³):	
Peak Load (lbs):	
Compressive Strength (psi)	
Compressive Strength (MPa)	
Failure Type:	

NOTES

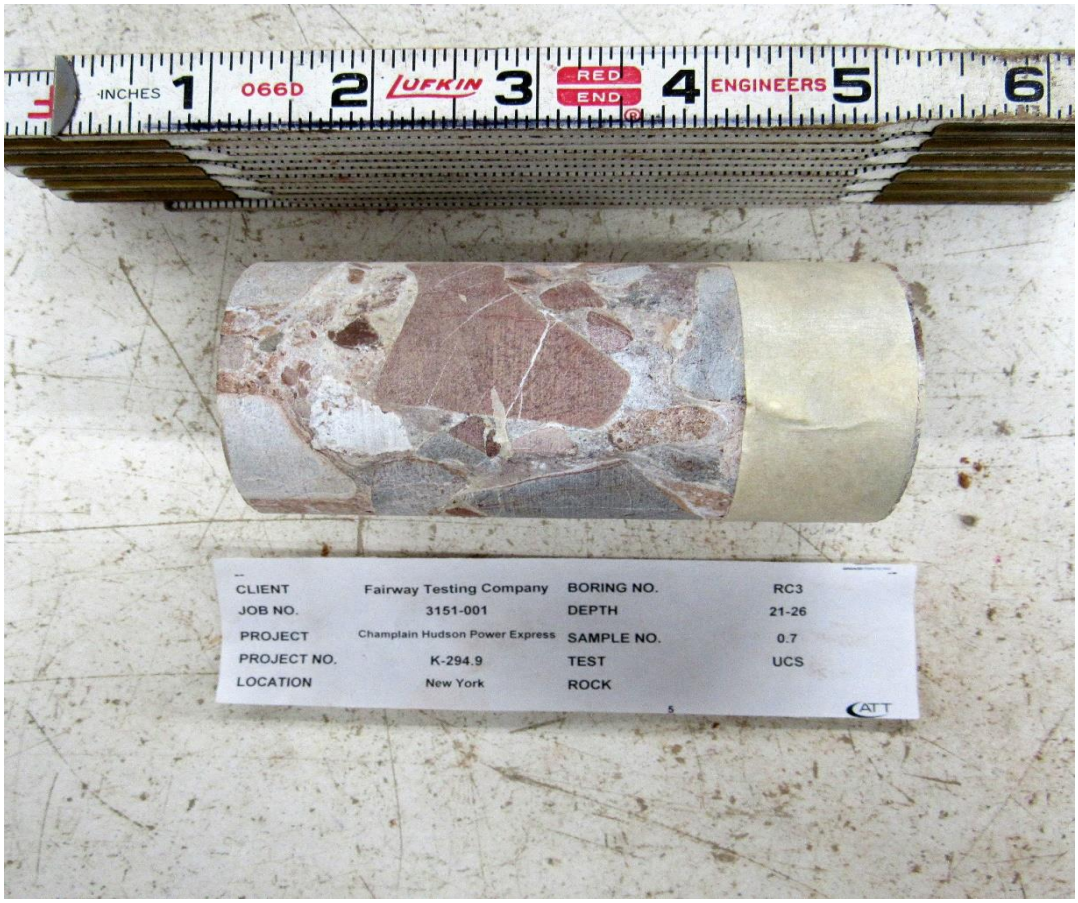
Data entry by:	DL	Date: 06/17/22
Checked by:	HN	Date: 06/17/22
File name:	3151001__Rock UCS-TCS ASTM D7012 Method A and C_0.xlsm	

ADVANCED TERRA TESTING

Unconfined Compressive Strength
ASTM D7012 Method C

CLIENT	Fairway Testing Company	BORING NO.	RC3
JOB NO.	3151-001	DEPTH	21-26
PROJECT	Champlain Hudson Power Express	SAMPLE NO.	0.7
PROJECT NO.	K-294.9	DATE SAMPLED	
LOCATION	New York	DATE TESTED	06/17/22
		TECHNICIAN	DL
		ROCK TYPE	

Before Picture



NOTES

Picture File: 5.JPG
File name: 3151001__Rock UCS-TCS ASTM D7012 Method A and C_0.xlsm

ADVANCED TERRA TESTING

Unconfined Compressive Strength
ASTM D7012 Method C

CLIENT	Fairway Testing Company	BORING NO.	RC3
JOB NO.	3151-001	DEPTH	21-26
PROJECT	Champlain Hudson Power Express	SAMPLE NO.	0.7
PROJECT NO.	K-294.9	DATE SAMPLED	
LOCATION	New York	DATE TESTED	06/17/22
		TECHNICIAN	DL
		ROCK TYPE	

After Picture

NOTES

Picture File: 5a.JPG
File name: 3151001__Rock UCS-TCS ASTM D7012 Method A and C_0.xlsm

Kiewit

MEMORANDUM

DATE: July 14, 2022

TO: Zachary Bauer; Tetra Tech Rooney

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

SUBJECT: Geotechnical Data: Segment 12 - Package 7B - HDD Crossing 126
Champlain Hudson Power Express Project
Stony Point, New York

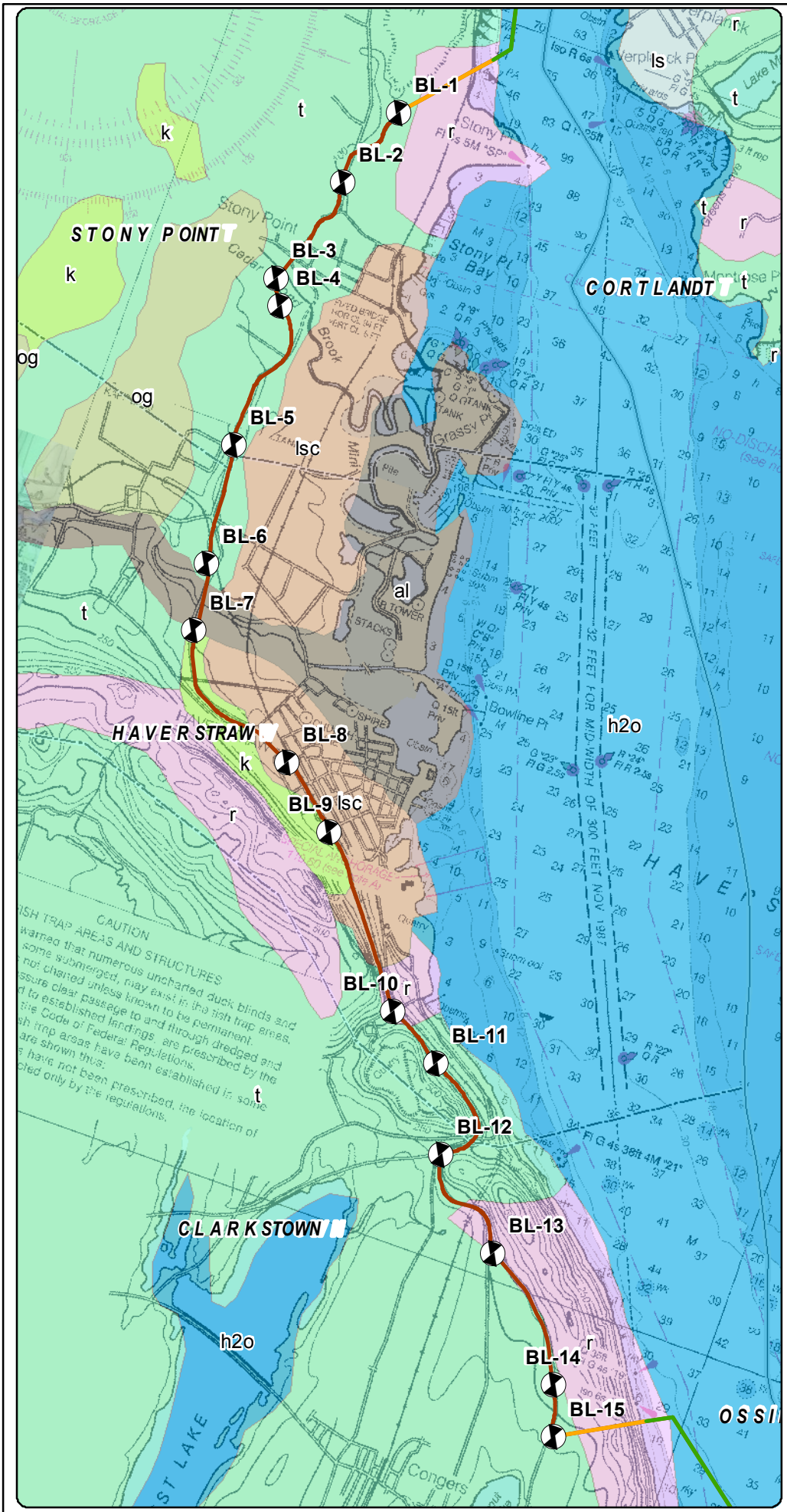
Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located in Stony Point, New York. The approximate station for the start of HDD crossing number 126 is STA 72563+00 (41.2256° N, 73.9859° W).

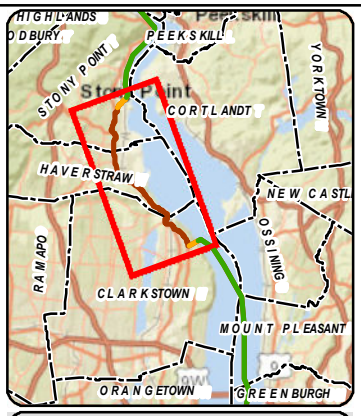
The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigation by AECOM and data from a recent investigation by Kiewit, referenced below.

- AECOM, Geotechnical Data Report, Upland Segment, Rockland County, NY, Champlain Hudson Power Express, dated September 18, 2020.
- Kiewit Engineering (NY) Corp., Segment 12 Package 7B HDD Borings - Rockland, Champlain-Hudson Power Express, dated July 5, 2022.

Contact us if you have questions or require additional information.

HDD 126
Borings BL-4, K-294.9-2.0, K-294.9-2.1
Segment 12 - Design Package 7B





LEGEND

Approximate Boring Locations

- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location

Surficial Geology

- af- Artificial fill
- al- Recent alluvium, fine sand to gravel
- alf- Alluvial fan
- b- Beach, sand and gravel deposit at marine shorelines
- bi- Barier island, sand and gravel deposit as barrier islands
- h2o- Water
- k- Kame deposits, coarse to fine gravel and/or sand
- km- Kame moraine, variable texture from boulders to sand
- ld- Lacustrine delta, coarse to fine gravel and sand
- ls- Lacustrine sand, generally quartz sand, well sorted, stratified
- lsc, Lacustrine silt and clay, generally laminated silt and clay
- og- Outwash sand and gravel, coarse to fine gravel with sand
- pm- Swamp deposits, peat-muck, organic silt and sand in poorly drained area
- r- Bedrock, exposed or generally within 1 meter of surface
- t- Till, variable texture (boulders to silt)
- tm-Till moraine, variable texture (size and sorting)

Town Boundary

County Boundary

N

0.35 0.175 0 0.35 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

FIGURE 3

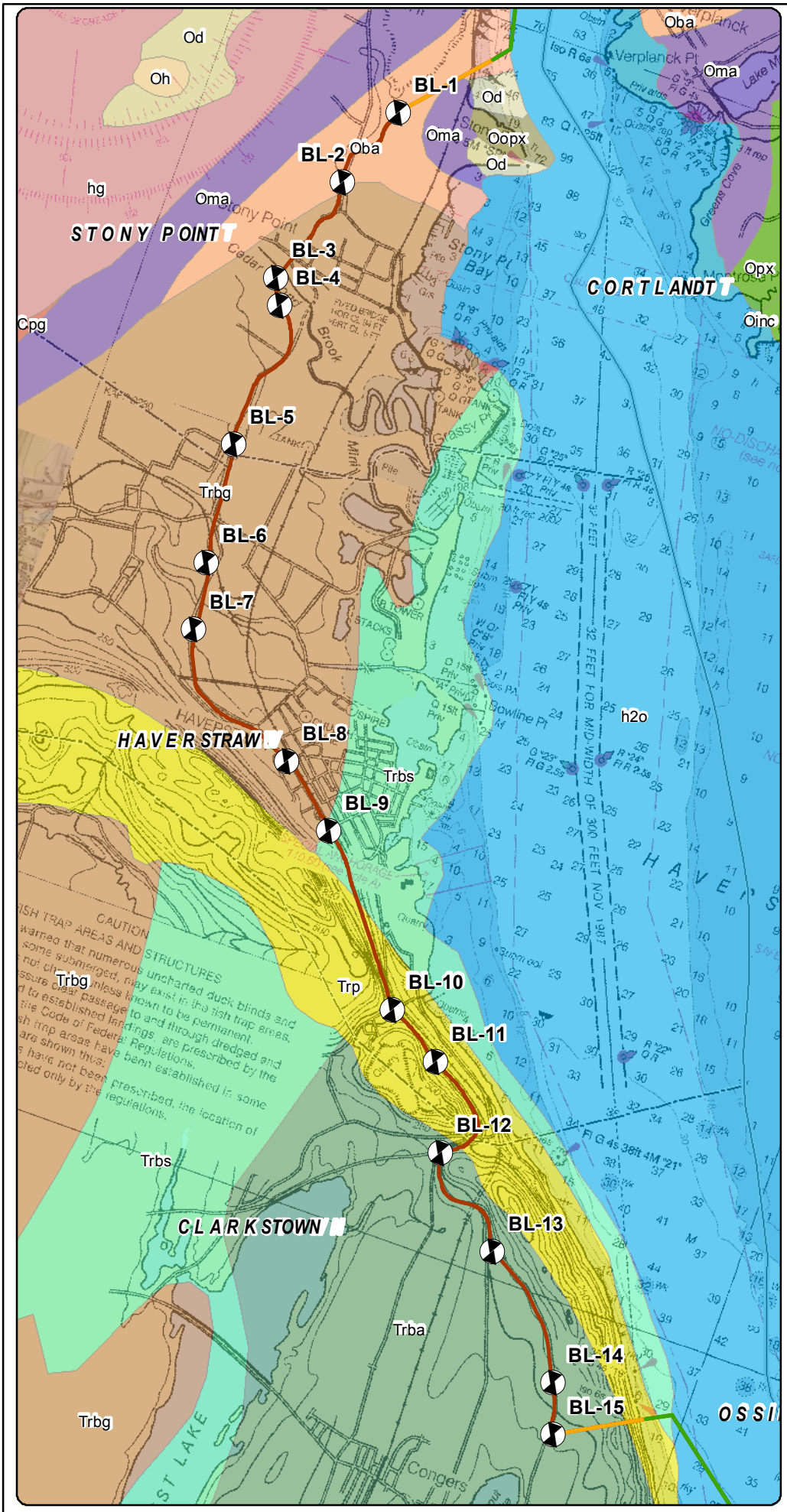
Surficial Geology and Geotechnical Borings

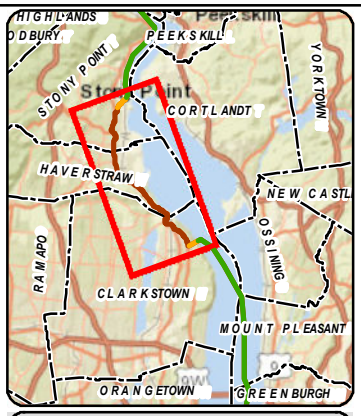
Prepared on 8/25/2020

by: AECOM

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

Y:\Projects\CHPE\Rockland_Co_Geology_Figures\Boring_location_Map_082520.mxd





LEGEND

- Approximate Boring Locations
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location

Bedrock Geology

- Other
- Cg- Germantown Formation
- Cpg- Poughquag Quartzite
- Oba- Balville Limestone
- Ocs- Cambrian thru Middle Ordovician carbonate rock
- Od- Diorite with hornblend and/or biotite
- Oh- Hornblende norite
- Oma- Manhattan Formation (A Member)
- Oopx- Olivine pyroxenite
- Trb-Brunswick Formation, undivided
- Trba- Brunswick Formation
- Trbg- Groveton Member of the Bull Run Formation
- Trbs- Triassic Brunswick Formation
- Trl- Ladentown diabase & baslatic lava
- Trp- Palisade Diabase
- Trs- Stockton Formation
- h2o- Water
- hg- Hornblende granite and granite gneiss
- Town Boundary
- County Boundary

N

0.35 0.175 0 0.35 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

FIGURE 4

Bedrock Geology and Geotechnical Borings

Prepared on 8/26/2020
by: AECOM

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

Y:\Projects\CHPE\Rockland_Co_Geology_Figures\Boring_location_Bedrock_Map_082520.mxd

BORING CONTRACTOR: ADT	AECOM		SHEET 1 OF 1
DRILLER: Chris Chaillou			PROJECT NAME: CHPE - Rockland Co. Borings
SOILS ENGINEER: Roberto Lucidi			PROJECT NO.: 60323056
			HOLE NO.: BL-4
	BORING LOG		START DATE: 7/7/2020
			FINISH DATE: 7/7/2020
LOCATION: Central Drive and Route 9W, Stony Point, NY			OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: Geoprobe
Not Encountered	TYPE	Flush joint Steel	SPLIT SPOON[1]	3-7/8" TRICONE	NQ	BORING TYPE: SPT/Rock coring
	SIZE I.D.	4.0"	2.4"	-	1.88"	BORING O.D.: 4.5"
	SIZE O.D.	4.5"	3.0"	-	2.97"	SURFACE ELEV.: 108.145
	HAMMER WT.	140 lb (AUTO)	140 lb	-	-	NORTHING 871905.948
	HAMMER FALL	30"	30"	-	-	EASTING 633323.295

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
													8" Asphalt
1.0												Decomposed Siltstone	
		Hand Cleared									ML		Red-brown, SILT & CLAY, trace fine gravel, dry
2.0		0.0 - 4.0											TR[3]-1 (2.0'-4.0')
3.0													
4.0													Too hard to hand clear at 4.0'
		4.0 - 4.5	S-1	6.0	6.0	60	50/0"	-	-		ML		S-1: Red, sandy SILT, some fine gravel,
5.0		4.5 - 4.8	S-2	3.0	3.0	Direct Push[4]					ML		moist, hard
													S-2: Same as above, moist, hard
6.0													Drilled with tricone rollerbit to 6.0'
												Sandstone-Siltstone (Bull Run Fm.)	Installed casing at 6.5'; Started coring from 6.0'
7.0		6.0 - 11.0	R-1	60.0	40.0	RQD =	0"/60"=						From 6.0' to 11.0': Red-brown,
					67%	=	0%						SILTSTONE/SANDSTONE, fine grained,
8.0													slightly weathered (II), medium weak (R2),
9.0													highly to intensely fractured.
10.0													
11.0													
12.0		11.0 - 16.0	R-2	60.0	60.0	RQD =	9"/60"						From 11.0' to 16.0': Red-brown,
					100%	=	15%						SANDSTONE, fine grained, slightly
13.0													weathered (II), medium weak (R2), highly
14.0													to intensely fractured.
15.0													TR-2 (14.7'-15.1')
16.0													TR-3 (Composite: 4.4'-4.7', 11.5'-11.8', 15.1'-15.4')
17.0													End of boring at 16.0' below grade
													Borehole grouted
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.

(3) TR = sample for thermal resistivity testing.

(4) SPT sampler driven by Geoprobe direct push device to attempt recovery of high density soil.

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

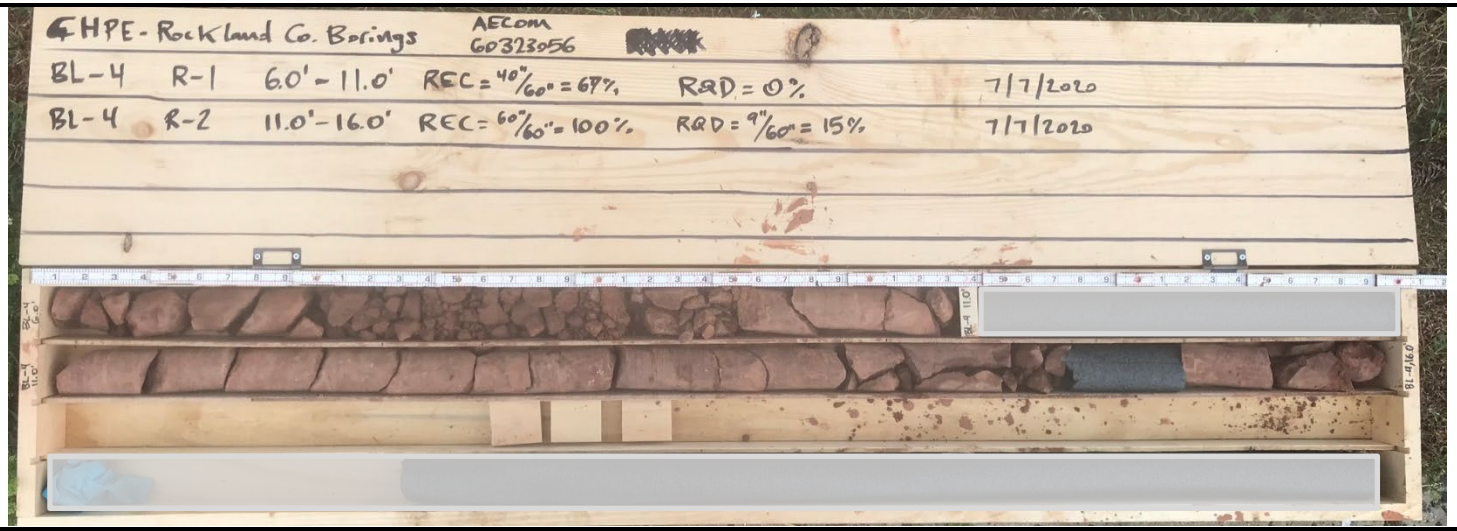
SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

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

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **Upland Segment, Rockland County, NY, Champlain-Hudson Power Express**
Location: **Rockland County, NY**

AECOM

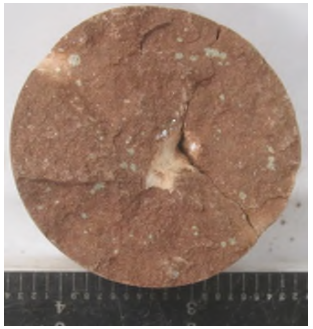
Boring No.	Depth (ft.)	
BL-4 (dry)	6.0 to 11.0	
BL-4 (wet)	6.0 to 11.0	

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

Aquifer
CHPE - Rockland County Borings
SUMMARY OF ROCK TESTING

SAMPLE IDENTIFICATION			STATE PROPERTIES			ENGINEERING PROPERTY TESTS								REMARKS
Boring	Run/ Sample	Depth	WATER CONTENT (1)	TOTAL UNIT WGT.	DRY UNIT WGT.	TEST TYPE (2)	ORIENTATION	HARDNESS TESTS Mohs HARDNESS	POINT LOAD TEST (ASTM D5731)		UNCONFINED COMPRESSION TESTS (ASTM D7012)			
									STRENGTH INDEX Is(50)	ESTIMATED (4) COMPRESSIVE STRENGTH	COMPRESSIVE STRENGTH	AXIAL STRAIN @ FAILURE	ESTIMATED (5) ELASTIC MODULUS	
			(%)	(pcf)	(pcf)		(3)	(-)	(psi)	(psi)	(psi)	(%)	(psi)	
BL-1	R-3	19.2-20.2				M		4-5						
BL-1	R-3	19.3-19.7	0.15	176	176	UC					8760	0.20	4E+06	
BL-1	R-7	31.0-31.7				M		5-6						
BL-1	R-7	31.1-31.5	0.11	176	175	UC					8050	0.16	5E+06	
BL-1	R-10	48.2-48.9				M		4-5						
BL-1	R-10	48.3-48.7	0.08	177	176	UC					6280	0.11	6E+06	
BL-1	R-11	54-55				M		3-4						
BL-1	R-11	53.9-54.3	0.13	174	174	UC					15070	0.19	9E+06	
BL-4	R-1	11.3-11.6				M		2-3						
BL-4	R-1	11.3-11.6	1.00			PL	Diametral		190	4393				
BL-4	R-1	11.3-11.6				PL	Axial		200	4405				
BL-4	R-2	12.2-12.5				M		2-3						
BL-4	R-2	12.2-12.5	1.18			PL	Diametral		90	2081				
BL-4	R-2	12.2-12.5				PL	Axial		170	3464				
BL-10	Outcrop (A)	-				M		5-6						
BL-10	Outcrop (A)	-	1.08	181	179	UC					23820	0.41	7E+06	
BL-10	Outcrop (B)	-				M		5-6						
BL-10	Outcrop (B)	-	0.67	180	179	UC					21640	0.50	5E+06	
BL-10	Outcrop (C)	-				M		5-6						
BL-10	Outcrop (C)	-	0.71	183	182	UC					25120	0.44	7E+06	
BL-15	R-1 (A)	80.35-80.7	1.09	158	156	UC					6830	0.51	1E+06	
BL-15	R-1 (B)	83.2-83.55	0.68	156	155	UC					7940	0.45	2E+06	
BL-15A	R-1(A)	81.5-82.1				M		3-4						
BL-15A	R-1(B)	83.0-83.6				M		3-4						

Notes: (1) Water contents determined after trimming and shearing.
(2) Test Type Abbreviations: M: Mohs Hardness, PL: Point Load, UC: Unconfined Compression test with estimated elastic moduli determination
(3) Diametral orientation across core along bedding/foliation plane, axial perpendicular to bedding/foliation plane, as applicable.
(4) Compressive Strength determined using generalized "K" factor in ASTM D5731
(5) Modulus estimated based on corrected gross deformations.

Load Orientation:	Diametral	Axial
Length to nearest free end, L (mm)	29.0	26.7
Specimen Width, W1 (mm)		49.5
Specimen Width, W2 (mm)		49.5
11.3-11.6	50.0	39.0
D' (mm)	50.0	32.0
D_e (mm)	50.0	44.9
Failure Load, P (lb)	729	650
Point Load (N)	3243	2891
Point Load (Mpa)	**1.30**	**1.37**
Index, Is50 (psi)	**190**	**200**
Unconfined Compressive Strength (psi)	**4393**	**4405**
Specimen /Failure Sketch		
Tare No.	M30	
Wet + Tare (gm)	217.77	
Dry + Tare (gm)	216.11	
Tare (gm)	49.46	
Water Content%	**1.00**	
Comments		

Test by: RT Test Date: 8/14/2020 Reviewed by: GET

CHPE - Rockland County Borings		**POINT LOAD STRENGTH INDEX OF ROCK ASTM D5731**
Aquifer	PO 309907	**Boring: BL-4 Run: R-1**
TerraSense, LLC	7853-20003	**Depth: 11.3-11.6**

Load Orientation:	Diametral	Axial
Length to nearest free end, L (mm)	28.8	24.8
Specimen Width, W1 (mm)		49.8
Specimen Width, W2 (mm)		49.8
D (mm)	50.0	22.0
D' (mm)	50.0	22.0
D_e (mm)	50.0	37.3
Failure Load, P (lb)	363	416
Point Load (N)	1615	1850
Point Load (Mpa)	**0.65**	**1.16**
Index, Is50 (psi)	**90**	**170**
Unconfined Compressive Strength (psi)	**2081**	**3464**
Specimen /Failure Sketch		
Tare No.	M23	
Wet + Tare (gm)	184.27	
Dry + Tare (gm)	182.71	
Tare (gm)	50.94	
Water Content%	**1.18**	
Comments		

Test by: RT Test Date: 8/14/2020 Reviewed by: GET

CHPE - Rockland County Borings		**POINT LOAD STRENGTH INDEX OF ROCK ASTM D5731**
Aquifer	PO 309907	**Boring: BL-4 Run: R-2**
TerraSense, LLC	7853-20003	**Depth: 12.2-12.5**

Segment 12 Package 7B HDD Borings - Rockland

Champlain Hudson Power Express

New York

PROJECT NUMBER 20001480

CREATED BY Kiewit

DATE 07/05/2022

Legend Key

- Kiewit Borings (2022)
- Borings by Others

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.0

PROJECT NUMBER	20001480	**LOGGED BY**	Rafael Salas	**COORDINATES**	N 871223.01 E 633864.03
START DATE	04/13/2022	**DRILLER/RIG**	Rick / Diedrich D-90	**GROUND ELEV.**	87.9 ft
FINISH DATE	04/13/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
0			Silty SAND (SM) (based on observations of excavated materials) 0 - 7 ft was excavated by air knife and vacuum truck						Boring advanced with 3.5" ID HSA
5	80.9		Silty SAND (SM), with some fine gravel, fine to medium coarse, subrounded, light brown, loose to dense, dry						
10						33%		3-4-5-4 (9)	
15						54%		4-4-5-6 (9)	
20						33%		7-14-16-10 (30)	
25	64.9		Silty SAND (SM), with gravel, fine to coarse sand, fine to coarse gravel, angular to subangular, light brown to gray, dry			92%		32-70-67-42	3-inch ring sampler
						96%		30-19-15-20	
30						50%		38-37-26-50/ 2"	

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.0

PROJECT NUMBER	20001480	**LOGGED BY**	Rafael Salas	**COORDINATES**	N 871223.01 E 633864.03
START DATE	04/13/2022	**DRILLER/RIG**	Rick / Diedrich D-90	**GROUND ELEV.**	87.9 ft
FINISH DATE	04/13/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			Silty SAND (SM), with gravel, fine to coarse sand, fine to coarse gravel, angular to subangular, light brown to gray, dry						
	54.9		SILT (ML), with gravel, fine to coarse, angular to subangular, brown, hard, dry	⊠		100%		50/2"	
35	52.9		Boring Terminated at 35 ft						
40									
45									
50									
55									
60									

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.1

PROJECT NUMBER	20001480	**LOGGED BY**	Jialin Li	**COORDINATES**	N 870835.45 E 633906.63
START DATE	04/11/2022	**DRILLER/RIG**	Corey Brown / CME 550	**GROUND ELEV.**	88.3 ft
FINISH DATE	04/12/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
0	87.8	6" Asphalt						Boring advanced with 3.5" ID HSA
		Clayey SAND (SC), grayish brown, loose, dry			50%		3-3-4 (7)	
	86.3	Silty SAND (SM), reddish brown to brown, loose to dense, dry			50%		16-8-9-6 (17)	
								pH = 6.9
5					33%		3-3-5-5 (8)	
					50%		18-23-25-22 (48)	
					60%		6-11-26-50/2" (37)	
10								
		Same with weathered sandstone fragments, medium dense			25%		8-14-8-6 (22)	
15								
					50%		3-3-8-10 (11)	
20								
								3-inch ring sampler
					50%		19-25-35-33	
25					75%		25-25-26-46	
					75%		8-11-11-13 (22)	
30								

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.1

PROJECT NUMBER	20001480	**LOGGED BY**	Jialin Li	**COORDINATES**	N 870835.45 E 633906.63
START DATE	04/11/2022	**DRILLER/RIG**	Corey Brown / CME 550	**GROUND ELEV.**	88.3 ft
FINISH DATE	04/12/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
35	53.3		Boring Terminated at 35 ft			75%		8-7-8-10 (15)	

Legend

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

20 40 60 80

f.t.
FAIRWAY TESTING

22 North Liberty Drive
P.O. Box 578
Stony Point, NY 10980
Telephone 845.942.2088
Fax 845.942.0995

Report Date: 6/20/22
Project: Champlain Hudson Power Express

Client: Kiewit Engineering (NY) Corp.
REPORT: Soil Analysis

See attached reports for testing requested by the client as per attached submittals for locations K.294.9-2.0. Moisture content test results are listed below.

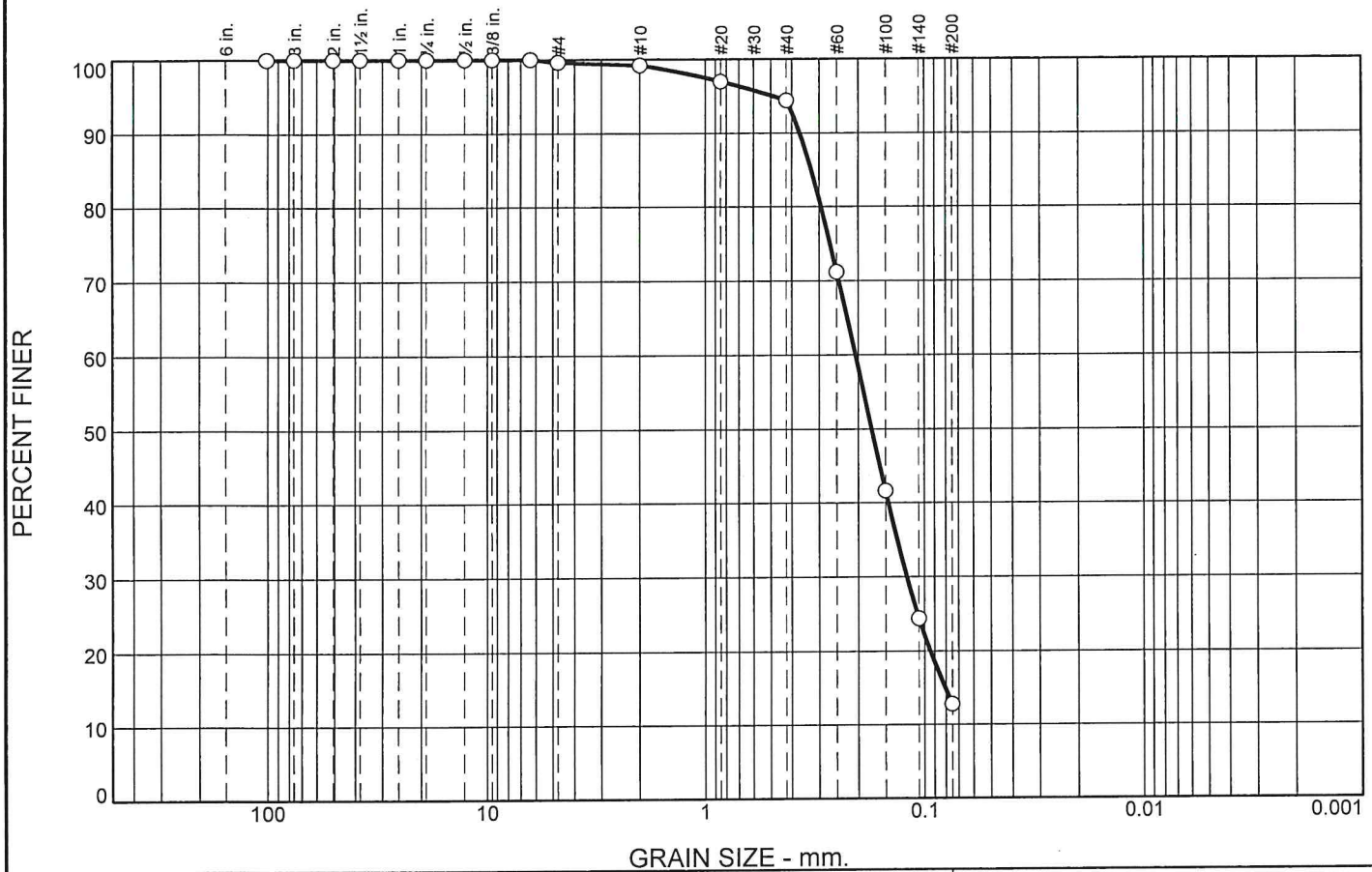
Sample ID (sample depth, ft.)	Moisture Content
SS-3 (13'- 15')	9.9%
SS-9 (33'- 35')	2.5%

Respectfully Submitted,
Fairway Testing

Gabriel J. O'Connell

Gabriel J. O'Connell, P.E.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.4	4.8	81.6	12.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
1/4	100.0		
#4	99.6		
#10	99.2		
#20	97.0		
#40	94.4		
#60	71.2		
#100	41.6		
#140	24.4		
#200	12.8		

* (no specification provided)

Material Description

SS-1

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3684 D_{85}= 0.3265 D_{60}= 0.2060
D_{50}= 0.1737 D_{30}= 0.1202 D_{15}= 0.0807
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D6913
Moisture Content- 8.9%

Source of Sample: 2.0 **Depth:** 8'-10'
Sample Number: 01-042022

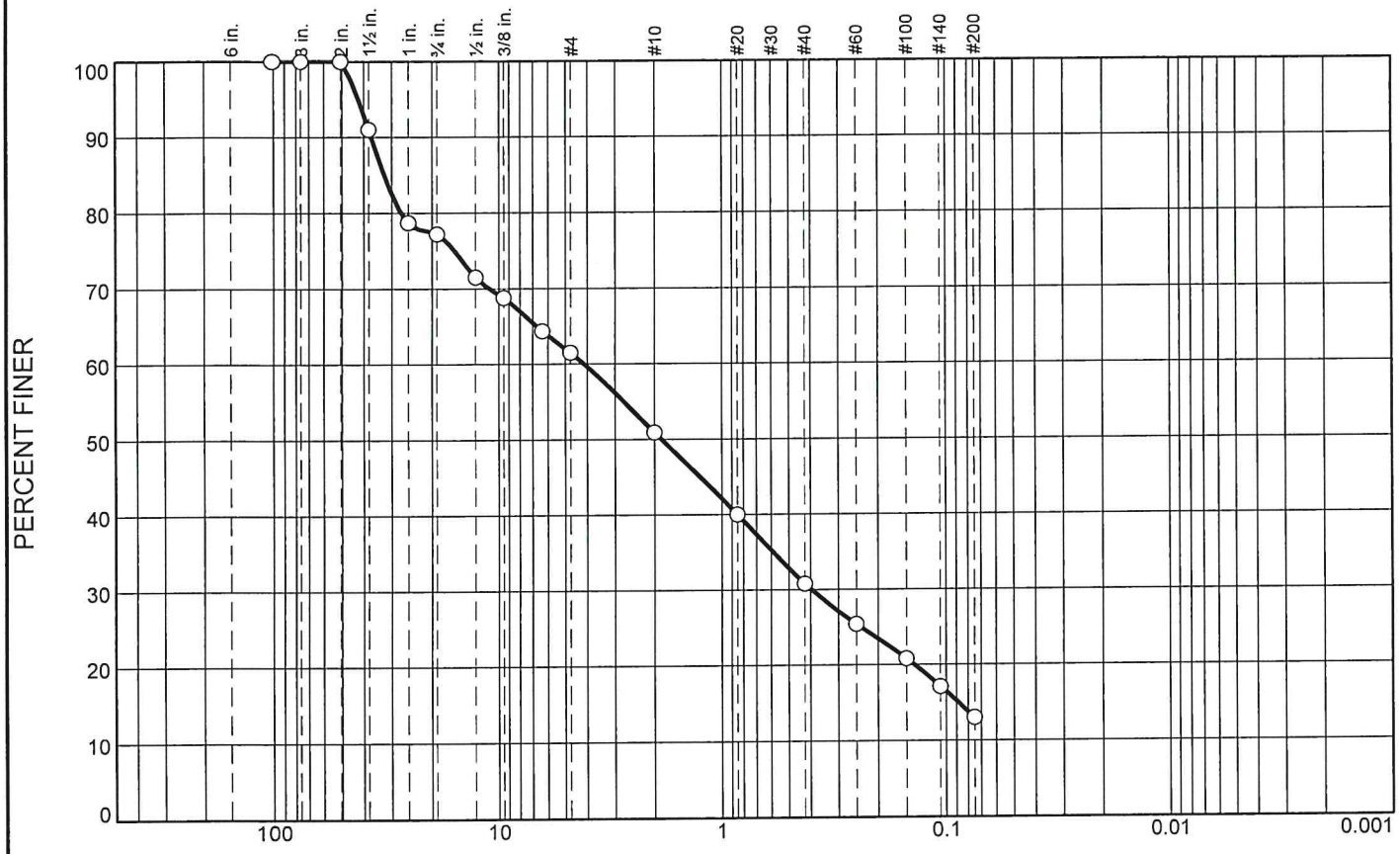
Date: 04-20-22

FAIRWAY TESTING CO., INC.

Client: Kiewit Engineering (NY) Corp.
Project: Champlain Hudson Power Express

Project No: K-294.9 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	22.8	15.7	10.6	20.1	17.8	13.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	91.0		
1	78.7		
3/4	77.2		
1/2	71.5		
3/8	68.8		
1/4	64.4		
#4	61.5		
#10	50.9		
#20	40.0		
#40	30.8		
#60	25.4		
#100	20.8		
#140	17.1		
#200	13.0		

* (no specification provided)

Material Description

MC-6

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 37.1242 D_{85}= 32.4469 D_{60}= 4.1316
D_{50}= 1.8639 D_{30}= 0.3966 D_{15}= 0.0886
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D6913
Moisture Content- 3.3%

Source of Sample: 2.0 **Depth:** 23'-25'
Sample Number: 01-042022

Date: 04-20-22

FAIRWAY TESTING CO., INC.

Client: Kiewit Engineering (NY) Corp.
Project: Champlain Hudson Power Express

Project No: K-294.9 **Figure**

f.t.
FAIRWAY TESTING

22 North Liberty Drive
P.O. Box 578
Stony Point, NY 10980
Telephone 845.942.2088
Fax 845.942.0995

Report Date: 6/20/22
Project: Champlain Hudson Power Express

Client: Kiewit Engineering (NY) Corp.
REPORT: Soil Analysis

See attached reports for testing requested by the client as per attached submittals for locations K.294.9-2.1. Moisture content test results are listed below.

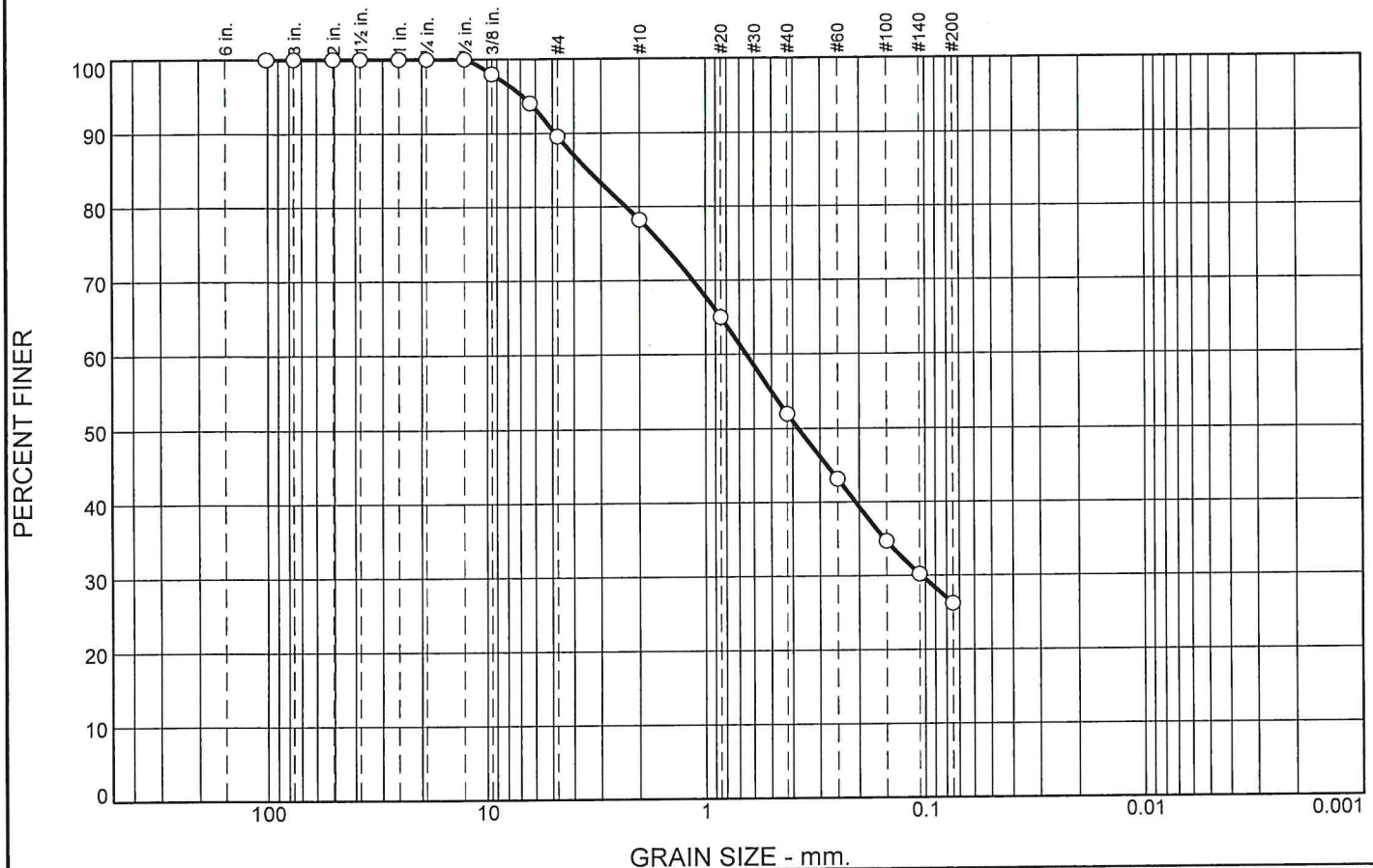
Sample ID (sample depth, ft.)	Moisture Content	pH
S-6 (4'- 6')	11.6%	6.9

Respectfully Submitted,
Fairway Testing

Gabriel J. O'Connell

Gabriel J. O'Connell, P.E.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.4	11.4	26.2	25.8	26.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	98.0		
1/4	94.1		
#4	89.6		
#10	78.2		
#20	65.0		
#40	52.0		
#60	43.1		
#100	34.7		
#140	30.2		
#200	26.2		

* (no specification provided)

Material Description

SS-2

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.8709 D_{85}= 3.4390 D_{60}= 0.6509
D_{50}= 0.3788 D_{30}= 0.1042 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D6913, D1140
Moisture Content- 8.0%

Source of Sample: 2.1 **Depth:** 0'-2'
Sample Number: 01-042022

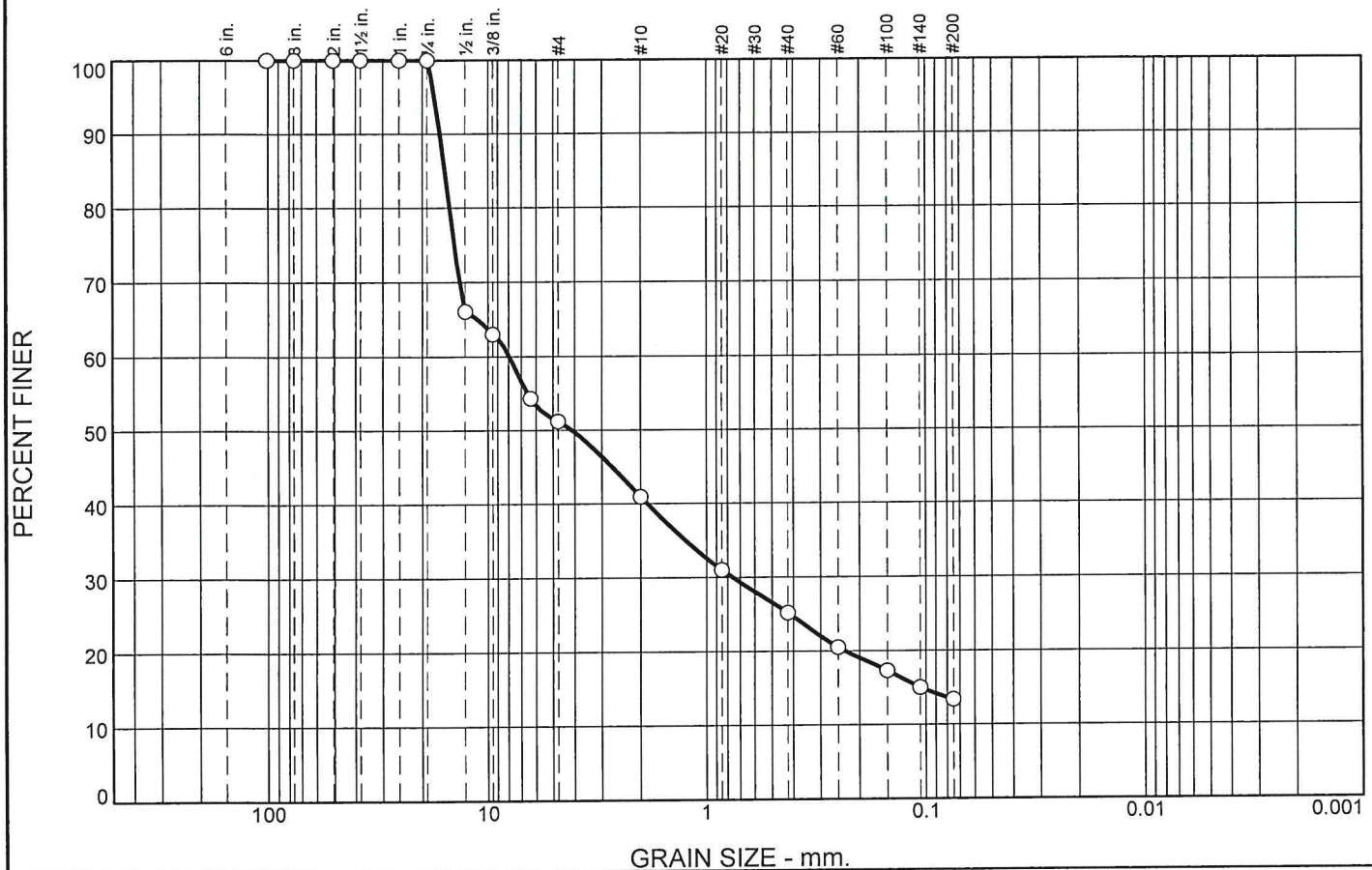
Date: 04-20-22

FAIRWAY TESTING CO., INC.

Client: Kiewit Engineering (NY) Corp.
Project: Champlain Hudson Power Express

Project No: K-294.9 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	48.8	10.3	15.7	11.8	13.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	66.1		
3/8	63.0		
1/4	54.3		
#4	51.2		
#10	40.9		
#20	31.0		
#40	25.2		
#60	20.5		
#100	17.3		
#140	15.0		
#200	13.4		

* (no specification provided)

Material Description

SS-11

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 16.6411 D_{85}= 15.8147 D_{60}= 7.9409
D_{50}= 4.1258 D_{30}= 0.7599 D_{15}= 0.1060
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D6913, D1140
Moisture Content- 5.5%

Source of Sample: 2.1 **Depth:** 13'-15'
Sample Number: 02-042022

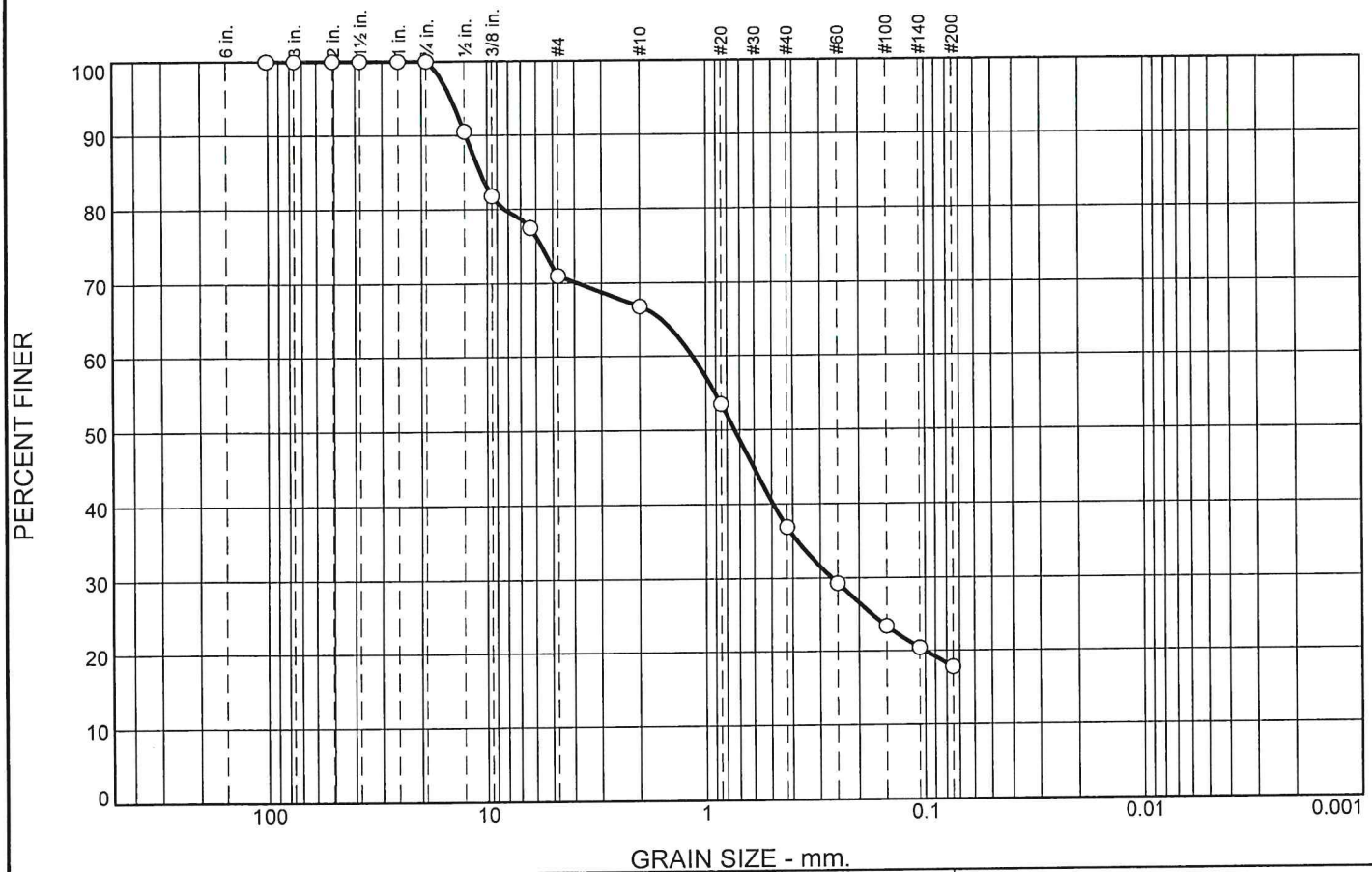
Date: 04-20-22

FAIRWAY TESTING CO., INC.

Client: Kiewit Engineering (NY) Corp.
Project: Champlain Hudson Power Express

Project No: K-294.9 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	29.0	4.2	29.9	19.1	17.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	90.5		
3/8	81.8		
1/4	77.5		
#4	71.0		
#10	66.8		
#20	53.5		
#40	36.9		
#60	29.3		
#100	23.4		
#140	20.4		
#200	17.8		

* (no specification provided)

Material Description

SS-16

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 12.5130 D_{85}= 10.7691 D_{60}= 1.1465
D_{50}= 0.7382 D_{30}= 0.2648 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D6913, D1140
Moisture Content- 7.3%

Source of Sample: 2.1 **Depth:** 25'-27'
Sample Number: 03-042022

Date: 04-20-22

FAIRWAY TESTING CO., INC.

Client: Kiewit Engineering (NY) Corp.
Project: Champlain Hudson Power Express

Project No: K-294.9 **Figure**

Kiewit

MEMORANDUM

DATE: July 14, 2022

TO: Zachary Bauer; Tetra Tech Rooney

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

SUBJECT: Geotechnical Data: Segment 12 - Package 7B - HDD Crossing 127/128
Champlain Hudson Power Express Project
West Haverstraw, 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 West Haverstraw, New York. The approximate station for the start of HDD crossing number 127/128 is STA 72611+00 (41.21322° N, 73.98586° W).

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

- Kiewit Engineering (NY) Corp., Segment 12 Package 7B HDD Borings - Rockland, Champlain-Hudson Power Express, dated July 5, 2022.

Contact us if you have questions or require additional information.

HDD 127/128
Borings K-294.9-2.8, K-294.9-2.9A,
K-294.9-2.9B, K-294.9-3.0
Segment 12 - Design Package 7B

Segment 12 Package 7B HDD Borings - Rockland

Champlain Hudson Power Express

New York

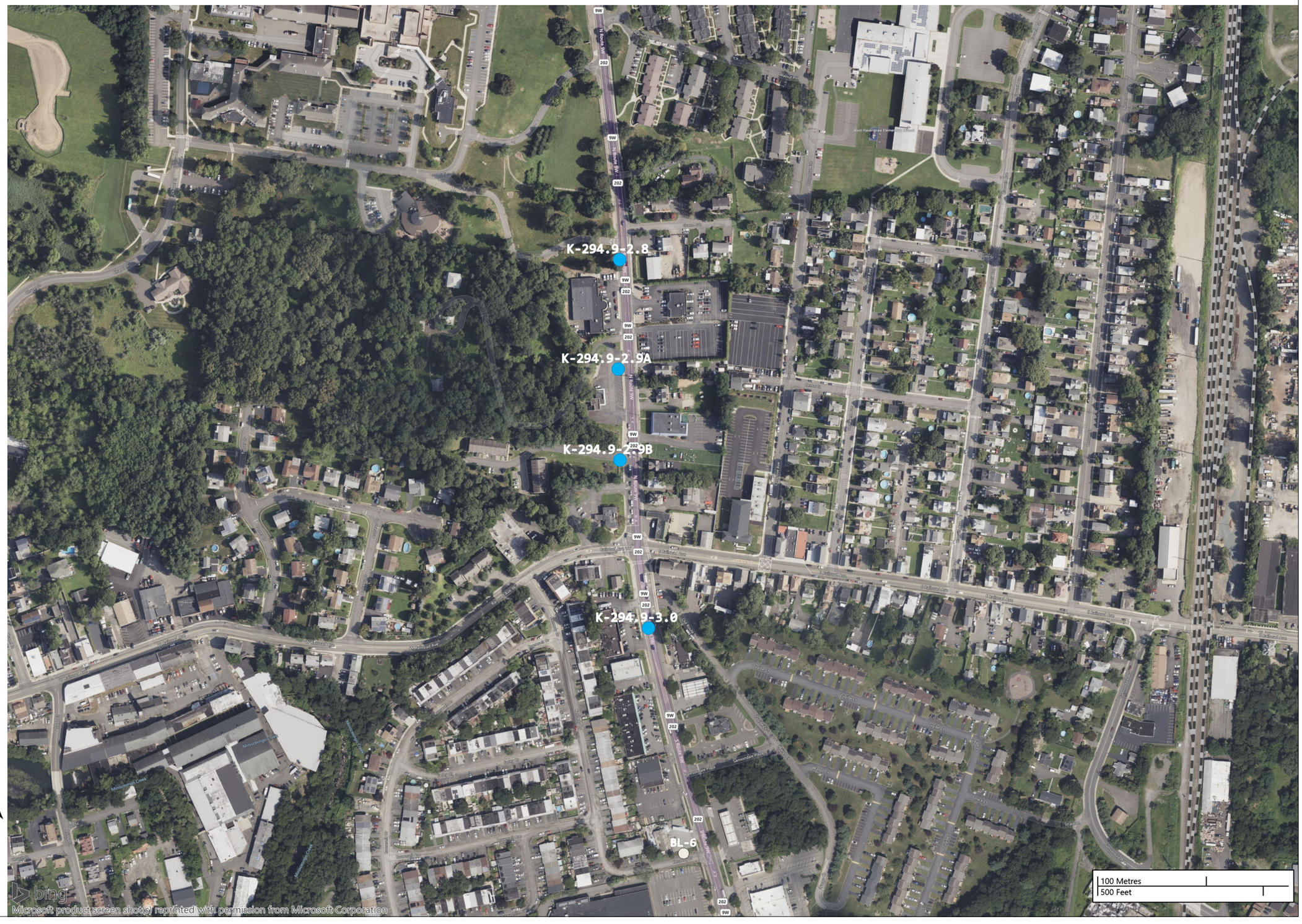
PROJECT NUMBER 20001480

CREATED BY Kiewit

DATE 07/05/2022

Legend Key

- Kiewit Borings (2022)
- Borings by Others



EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.8

PROJECT NUMBER	20001480	**LOGGED BY**	Rafael Salas	**COORDINATES**	N 866893.46 E 633611.44
START DATE	04/21/2022	**DRILLER/RIG**	Corey B. / CME 550	**GROUND ELEV.**	98.1 ft
FINISH DATE	04/27/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
0		Silty SAND, with gravel (based on observation of excavated materials) 0 - 7 ft was excavated by air knife and vacuum truck						Boring advanced with 3.25" ID HSA
5	91.1	Sandy SILT (ML), with fine gravel, fine to coarse sand, dark brown, soft, moist						
10					25%		6-2-2-5 (4)	
15	85.1	Clayey and Silty SAND (SC-SM), with gravel, fine, subrounded, brown, medium dense to dense, moist			66%		6-8-11-11 (19)	
20					75%		17-16-21-21 (37)	
25					71%		13-16-26-38 (42)	
					100%		22-45-48-50/ 3"	3-inch ring sampler
30	70.1	Sandy SILT (ML), with fine to coarse gravel, subangular to subrounded, coarse sand, brown, hard, moist			90%		9-60/5"	

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.8

PROJECT NUMBER	20001480	**LOGGED BY**	Rafael Salas	**COORDINATES**	N 866893.46 E 633611.44
START DATE	04/21/2022	**DRILLER/RIG**	Corey B. / CME 550	**GROUND ELEV.**	98.1 ft
FINISH DATE	04/27/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			Sandy SILT (ML), with fine to coarse gravel, subangular to subrounded, coarse sand, brown, hard, moist Encountered large boulder at 31 ft, moved boring location approximately 3 ft south and continued drilling and sampling from this depth			100%		50/2"	
35									
	60.1		Silty SAND (SM), with gravel, medium coarse to coarse sand, fine to coarse gravel, subrounded, brown, very dense, moist			75%		23-49-35-45 (84)	
40						100%		40-46-50/4"	
			Cobble at 43.8 ft			100%		40-50/2"	
45						68%		33-46-50/6"	
						85%		4-10-50/2"	
	48.9		Auger Refusal at 49.2 ft, switched to rock core for 2 runs (49.2 ft-54 ft, 54 ft-59 ft) with no recovery, possible glacial till			0%		0	
55	43.1					0%		0	
			Boring Terminated at 59 ft						
60									

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.9A

PROJECT NUMBER	20001480	**LOGGED BY**	Rafael Salas	**COORDINATES**	N 866562.06 E 633609.17
START DATE	04/18/2022	**DRILLER/RIG**	Corey B. / CME 550	**GROUND ELEV.**	97.9 ft
FINISH DATE	04/18/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
0	97.3	7" Asphalt						Boring advanced with 3.5" ID HSA
		Sandy SILT (ML) (based on observations of excavated materials) 0 - 7 ft was excavated by air knife and vacuum truck						
5	90.9	SAND with SILT (SP-SM), with gravel, fine to coarse grained, fine, brown, medium dense to dense, moist			42%		5-10-8-9 (18)	
10					75%		10-17-16-35 (33)	
15					75%		29-27-20-16 (47)	
20	74.9	Clayey and Silty SAND (SC-SM), with gravel, fine to coarse, gray to brown, dry			75%		14-21-27-37 (48)	
25					79%		30-43-50/3"	3-inch ring sampler
30					92% 100%		29-36-50/1" 50/2"	

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.9A

PROJECT NUMBER	20001480	**LOGGED BY**	Rafael Salas	**COORDINATES**	N 866562.06 E 633609.17
START DATE	04/18/2022	**DRILLER/RIG**	Corey B. / CME 550	**GROUND ELEV.**	97.9 ft
FINISH DATE	04/18/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			Clayey and Silty SAND (SC-SM), with gravel, fine to coarse, gray to brown, dry						
	64.9		Silty GRAVEL (GM), coarse grained, brown, very dense, moist	☒		79%		50/5"	
35	62.9		Boring Terminated at 35 ft						

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.9B

PROJECT NUMBER	20001480	**LOGGED BY**	Rafael Salas	**COORDINATES**	N 866286.60 E 633616.01
START DATE	04/21/2022	**DRILLER/RIG**	Corey B. / CME 550	**GROUND ELEV.**	100.6 ft
FINISH DATE	04/22/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
0	100.0	7" Asphalt						Boring advanced with 3.25" ID HSA
		Silty SAND (SM), with cobbles (based on observation of excavated materials) 0 - 7.58 ft was excavated by air knife and vacuum truck						
	93.0	SILT (ML), with fine to coarse sand and fine gravel, stiff to hard, dark gray to gray, moist to dry			54%		6-5-4-9 (9)	
					66%		20-33-33-35 (66)	
					100%		41-50/5"	
					75%		25-58-57-48	3-inch ring sampler
					100%		48-80-73-50/2"	
	72.6	Silty SAND (SM), with fine gravel, very dense, dark gray to gray, moist to dry			100%		50/4"	

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-2.9B

PROJECT NUMBER	20001480	**LOGGED BY**	Rafael Salas	**COORDINATES**	N 866286.60 E 633616.01
START DATE	04/21/2022	**DRILLER/RIG**	Corey B. / CME 550	**GROUND ELEV.**	100.6 ft
FINISH DATE	04/22/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			Silty SAND (SM), with fine gravel, very dense, dark gray to gray, moist to dry	⊠		0%		50/4"	
	66.1		SILT (ML), with gravel, fine to coarse, subrounded to subangular, with cobbles, gray, moist			57% 0			Grab samples taken with rock cores
						53% 0			
	56.1		Boring Terminated at 44.5 ft						

Legend

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

20 40 60 80

35 40 45 50 55 60

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-3.0

PROJECT NUMBER	20001480	**LOGGED BY**	Jialin Li	**COORDINATES**	N 865778.49 E 633705.72
START DATE	04/19/2022	**DRILLER/RIG**	Rick / Diedrich D-90	**GROUND ELEV.**	110.2 ft
FINISH DATE	04/19/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
0		18" Asphalt						Boring advanced with 3.5" ID HSA
	108.7	SILT (SM), with sand (based on observations of excavated materials) 0 - 6.83 ft was excavated by air knife and vacuum truck						
5								
	103.4	Silty SAND (SM), with fine to medium gravel and trace of clay, brown to gray, very loose to very dense, dry to moist						
10					12%		24-17-18-8 (35)	
					0%		100/4"	
15								
					2%		10-1-1-1 (2)	
20								
					50%		6-12-9-13 (21)	
25								
					10%		100/5"	3-inch ring sampler
					0%		170/3"	
30								

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-3.0

PROJECT NUMBER	20001480	**LOGGED BY**	Jialin Li	**COORDINATES**	N 865778.49 E 633705.72
START DATE	04/19/2022	**DRILLER/RIG**	Rick / Diedrich D-90	**GROUND ELEV.**	110.2 ft
FINISH DATE	04/19/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
	80.2		Refusal at 30 ft on boulder at depth of 30 ft. Sample recovered from coring was composed of: Silty CLAY (CL-ML), sandy with fine to medium gravel and conglomerate fragments, gray, moist			47%			
35	75.2		Silty SAND (SM), with trace of clay, gray, dense to very dense, moist			100%		45-70-100/3"	3-inch ring sampler
						66%		20-11-27-24 (38)	
40									
						70%		17-24-27-30 (51)	
45									
	62.2		SILT (ML), with sand, grayish tan, hard, slightly moist			88%		30-30-50/4"	
50									
						75%		18-27-30-37 (57)	
55						100%		30-51/5"	3-inch ring sample
						100%		150/4"	
						100%		33-100/3"	
60									

Legend

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

20 40 60 80

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: K-294.9-3.0

PROJECT NUMBER	20001480	**LOGGED BY**	Jialin Li	**COORDINATES**	N 865778.49 E 633705.72
START DATE	04/19/2022	**DRILLER/RIG**	Rick / Diedrich D-90	**GROUND ELEV.**	110.2 ft
FINISH DATE	04/19/2022	**DRILL CONTRACTOR**	Parratt Wolff	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
	49.2		SILT (ML), with sand, grayish tan, hard, slightly moist						
			Boring Terminated at 61 ft						

Legend

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

20 40 60 80

65 70 75 80 85 90

f.t.
FAIRWAY TESTING

22 North Liberty Drive
P.O. Box 578
Stony Point, NY 10980
Telephone 845.942.2088
Fax 845.942.0995

Report Date: 6/24/2022
Project: Champlain Hudson Power Express

Client: Kiewit Engineering (NY) Corp.
REPORT: Soil Analysis

See attached reports for testing requested by the client as per attached submittals for locations K.294.9-2.8. Moisture content test results are listed below.

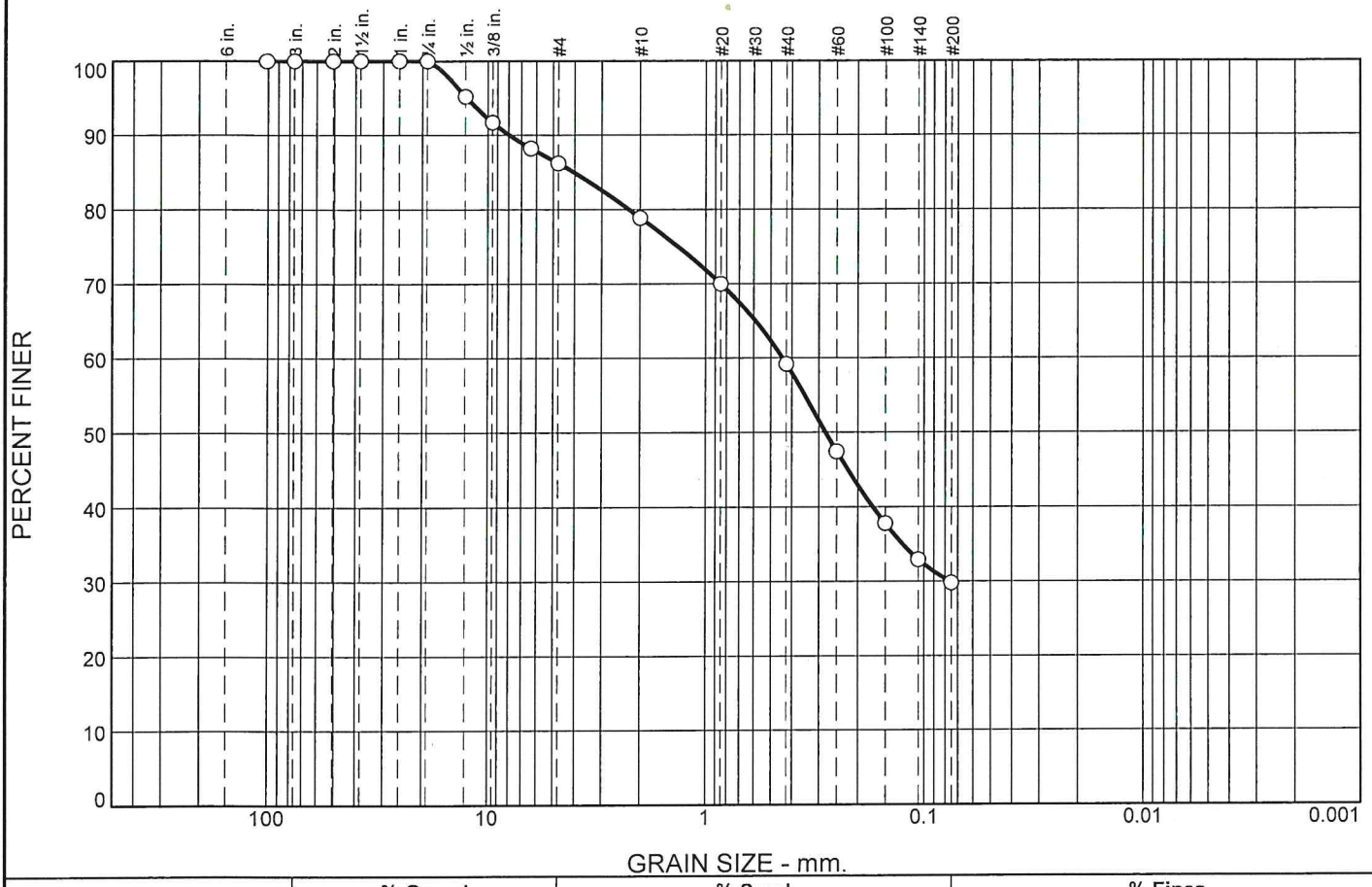
Sample ID (sample depth, ft.)	Moisture Content
SS-5 (18'- 20')	14.9%

Respectfully Submitted,
Fairway Testing

Gabriel J. O'Connell

Gabriel J. O'Connell, P.E.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.8	7.3	19.7	29.4	29.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	95.2		
3/8	91.7		
1/4	88.2		
#4	86.2		
#10	78.9		
#20	70.0		
#40	59.2		
#60	47.4		
#100	37.8		
#140	32.9		
#200	29.8		

* (no specification provided)

Material Description

SS-2
silty, clayey sand

Atterberg Limits

PL= 10 LL= 14 PI= 4

Coefficients

D_{90}= 7.9749 D_{85}= 4.0385 D_{60}= 0.4424
D_{50}= 0.2810 D_{30}= 0.0769 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

ASTM D6913, D4318, D2216
Moisture Content- 13.0%

Source of Sample: 2.8 **Depth:** 13'-15'
Sample Number: 01-050422

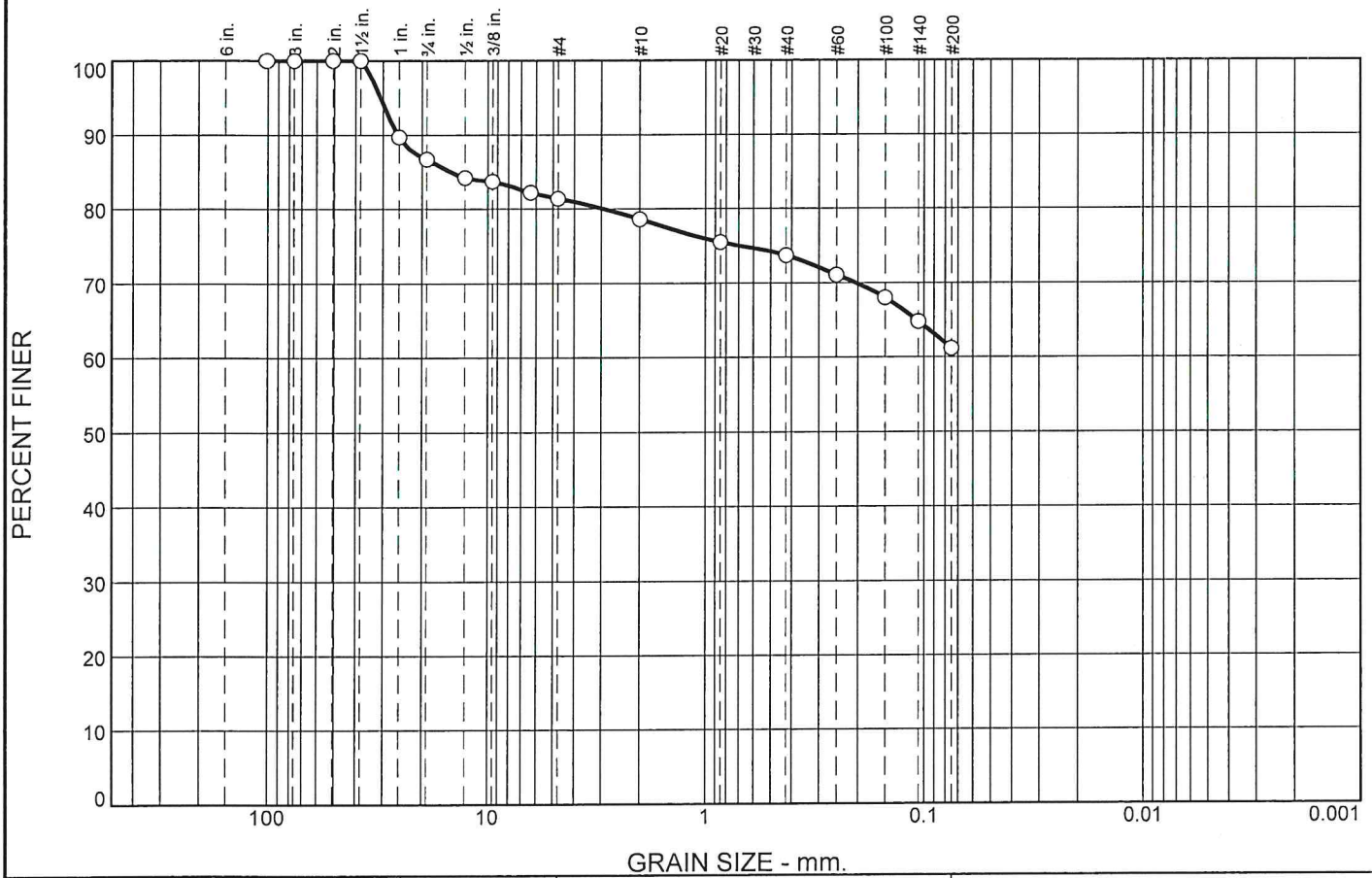
Date: 05-04-22

FAIRWAY TESTING CO., INC.

Client: Kiewit Engineering (NY) Corp.
Project: Champlain Hudson Power Express

Project No: K-294.9 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.3	5.3	2.8	4.9	12.5	61.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	89.7		
3/4	86.7		
1/2	84.2		
3/8	83.7		
1/4	82.2		
#4	81.4		
#10	78.6		
#20	75.5		
#40	73.7		
#60	71.1		
#100	68.0		
#140	64.8		
#200	61.2		

* (no specification provided)

Material Description

MC-9

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 25.7611 D_{85}= 14.8500 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D6913, D2216
Moisture Content- 10.2%

Source of Sample: 2.8 **Depth:** 28'-30'
Sample Number: 02-050422

Date: 05-04-22

FAIRWAY TESTING CO., INC.

Client: Kiewit Engineering (NY) Corp.
Project: Champlain Hudson Power Express

Project No: K-294.9 **Figure**

f.t.
FAIRWAY TESTING

22 North Liberty Drive
P.O. Box 578
Stony Point, NY 10980
Telephone 845.942.2088
Fax 845.942.0995

Report Date: 6/20/22
Project: Champlain Hudson Power Express

Client: Kiewit Engineering (NY) Corp.
REPORT: Soil Analysis

See attached reports for testing requested by the client as per attached submittals for locations K.294.9-2.9A. Moisture content test results are listed below.

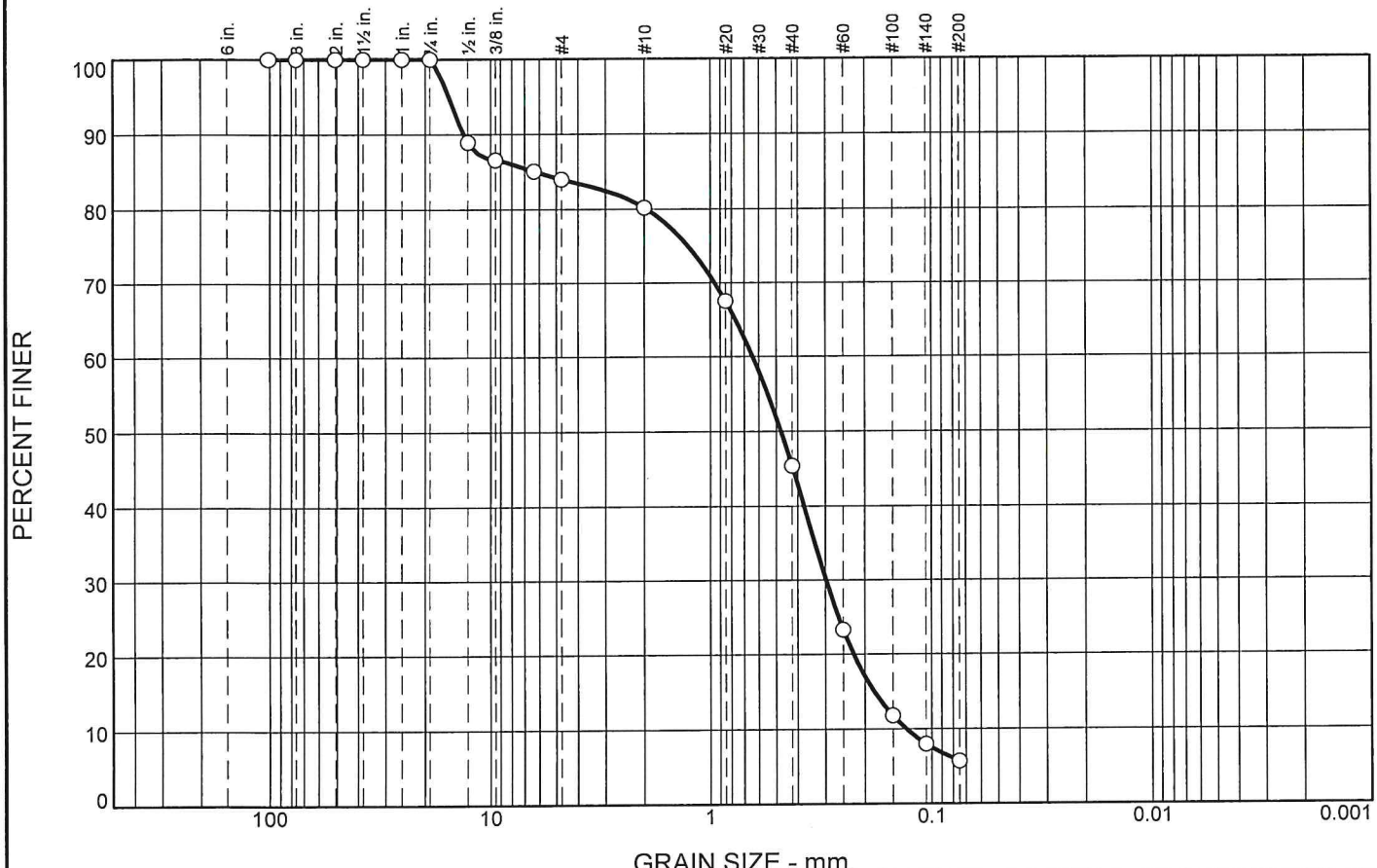
Sample ID (sample depth, ft.)	Moisture Content
SS-5 (18'- 20')	17.4%

Respectfully Submitted,
Fairway Testing

Gabriel J. O'Connell

Gabriel J. O'Connell, P.E.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	16.0	3.8	34.8	39.7	5.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	88.9		
3/8	86.6		
1/4	85.1		
#4	84.0		
#10	80.2		
#20	67.5		
#40	45.4		
#60	23.3		
#100	11.8		
#140	8.0		
#200	5.7		

* (no specification provided)

Material Description

SS-2

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 13.3138 D_{85}= 6.1969 D_{60}= 0.6407
D_{50}= 0.4772 D_{30}= 0.2978 D_{15}= 0.1820
D_{10}= 0.1302 C_u= 4.92 C_c= 1.06

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

ASTM D6913
Moisture Content- 14.6%

Source of Sample: 2.9A **Depth:** 8'-10'
Sample Number: 01-042022

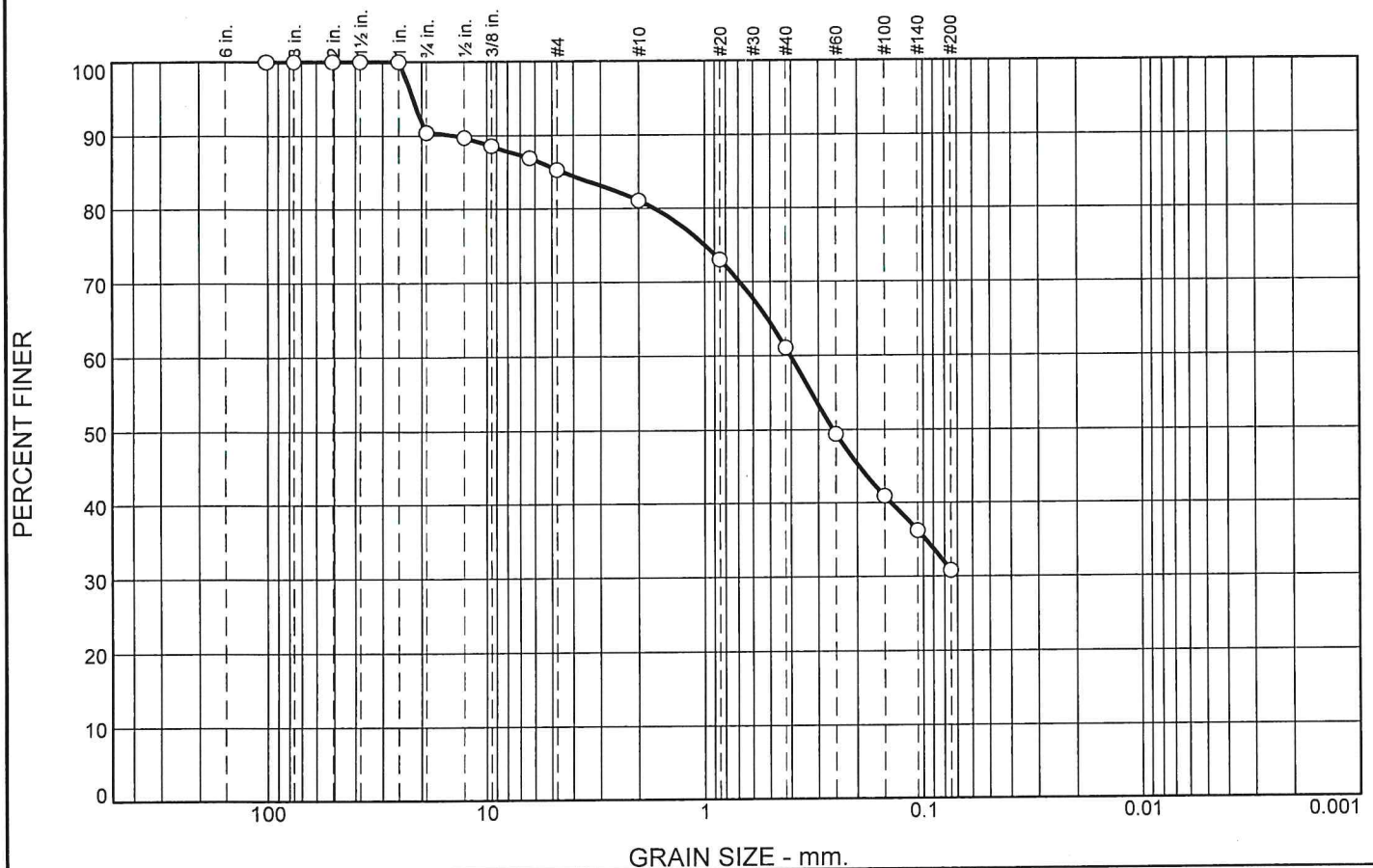
Date: 04-20-22

FAIRWAY TESTING CO., INC.

Client: Kiewit Engineering (NY) Corp.
Project: Champlain Hudson Power Express

Project No: K-294.9 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.6	5.1	4.2	20.0	30.3	30.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	90.4		
1/2	89.7		
3/8	88.6		
1/4	86.9		
#4	85.3		
#10	81.1		
#20	73.0		
#40	61.1		
#60	49.4		
#100	40.9		
#140	36.2		
#200	30.8		

* (no specification provided)

Material Description

MC-9
silty, clayey sand

Atterberg Limits

PL= 10 LL= 16 PI= 6

Coefficients

D_{90}= 14.2503 D_{85}= 4.4917 D_{60}= 0.4039
D_{50}= 0.2574 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

ASTM D6913, D4318
Moisture Content- 9.4%

Source of Sample: 2.9A **Depth:** 25'-27'
Sample Number: 02-042022

Date: 04-20-22

FAIRWAY TESTING CO., INC.

Client: Kiewit Engineering (NY) Corp.
Project: Champlain Hudson Power Express

Project No: K-294.9 **Figure**

f.t.
FAIRWAY TESTING

22 North Liberty Drive
P.O. Box 578
Stony Point, NY 10980
Telephone 845.942.2088
Fax 845.942.0995

Report Date: 6/24/2022
Project: Champlain Hudson Power Express

Client: Kiewit Engineering (NY) Corp.
REPORT: Soil Analysis

See attached reports for testing requested by the client as per attached submittals for locations K.294.9-2.9B. Moisture content test results are listed below.

Sample ID (sample depth, ft.)	Moisture Content
MC-7 (23'-25')	15.0%

Respectfully Submitted,
Fairway Testing

Gabriel J. O'Connell

Gabriel J. O'Connell, P.E.