Rock Core – Boring KB-163.1 Runs 3 and 4

Rock Core – Boring KB-163.2 runs 1 through 3

Rock Core – Boring KB-163.2 Run 3 (continued)

Rock Core – Boring KB-169.0-3.3

Summary of Laboratory Results

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

PROJECT: CHPE - Additional HDD Borings - Phase 3

SITE: Fort Ann to Coxsackie, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

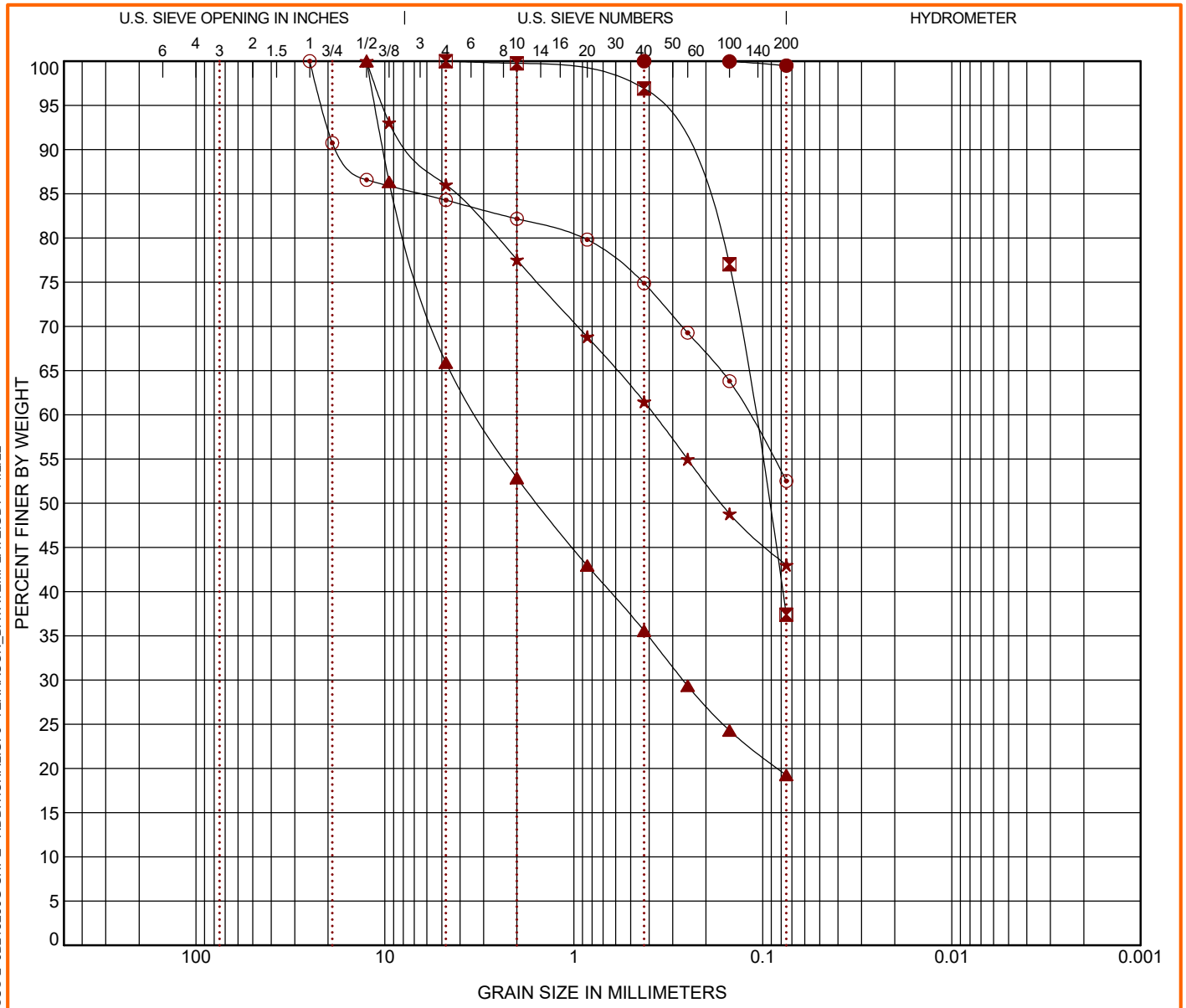
PROJECT NUMBER: JB215256G

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

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT JB215256G CHPE - ADDITIONAL.GPJ TERRACON_DATATEMPLATE.GDT 11/2/22

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

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

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

PROJECT: CHPE - Additional HDD Borings - Phase 3

SITE: Fort Ann to Coxsackie, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256G

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

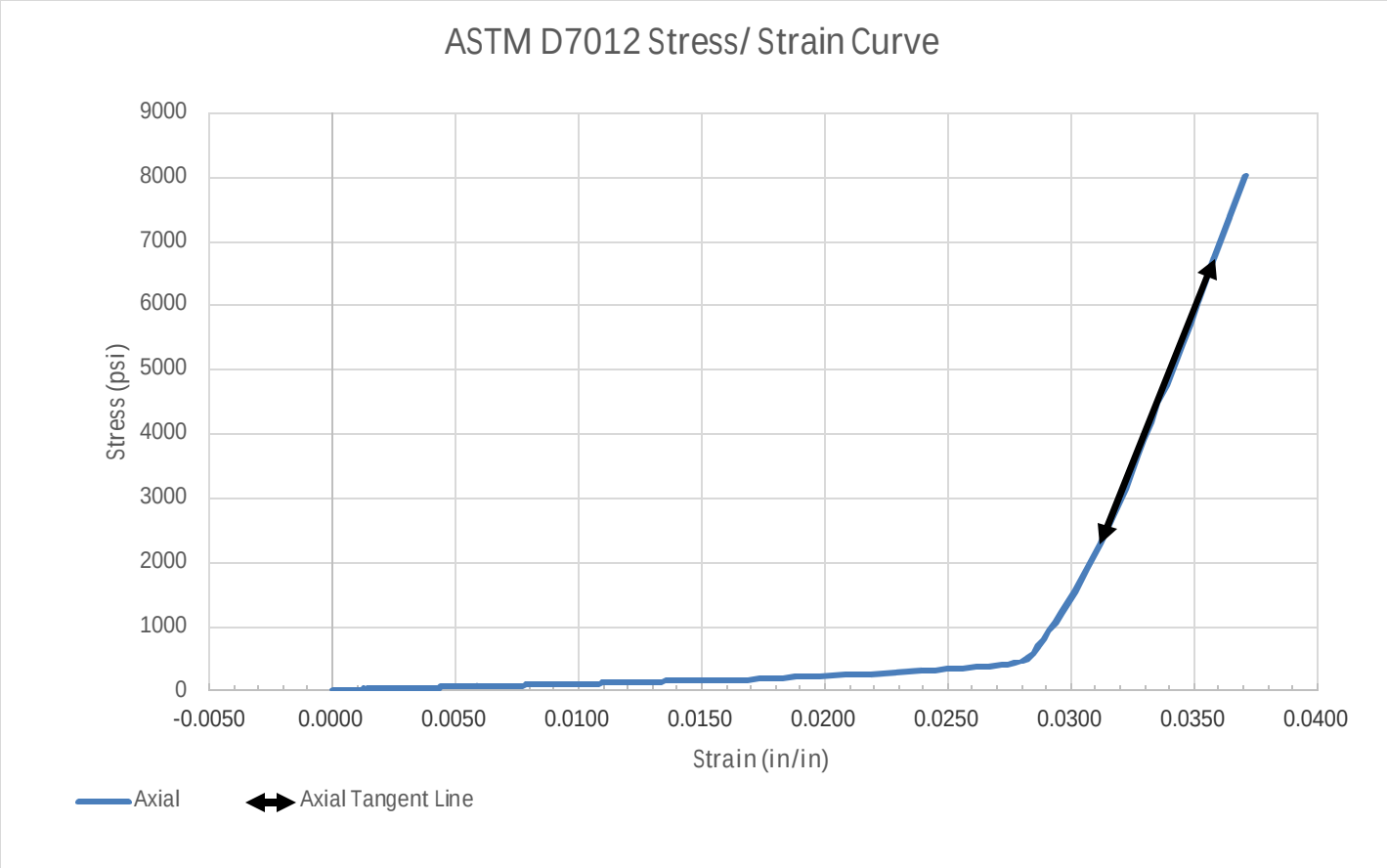
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256G CHPE - ADDITIONAL.GPJ TERRACON_DATATEMPLATE.GDT 11/2/22

Rock Core D7012 Method C

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JB215256



SAMPLE LOCATION			
Site:	Champlain-Hudson Power Express Project		
Description:	Shale		
Boring:	KB-163.1	Depth (feet):	28.0-38.0
SPECIMEN INFORMATION			
Sample No.:		Mass (g):	531.13
Length (in.):	3.90	Diameter (in.):	1.98
L/D Ratio:	1.970	Density (pcf):	168.497
TEST RESULTS			
Failure Load (lbs):			24705
Failure Strain (in/in):			0.040
Unconfined Compressive Strength (psi):			8,024
Elastic Modulus, E, (ksi):			958
Time of Failure (min):			02:26
Rate of Loading (in/sec):			0.04
Moisture Content Post-break:			0.79%

Rock Core D7012 Method C

Client	Project
Kiewit Engineering Corp	Champlain-Hudson Power Express Project
	Project No. JB215256

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

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

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25º.
Per ASTM D4543 and ASTM D7012, the desired specimen length to diameter are between 2.0:1 and 2.5:1.
Specimen lengths other than specified may differ from results obtained from a test specimen that meets the requirements.
Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
Per ASTM D4543 and ASTM D7012, the desired specimen length to diameter are between 2.0:1 and 2.5:1.

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

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JB215256

Splitting Tensile Strength of Intact Rock Core Specimens, ASTM D3967

Boring	KB-163.1	**Material Description**	Shale
Sample No		**Equipment Used**	Tinius Olsen (120,000lbs)
Depth (ft)	28.0-38.0	**TICCS ID/Serial No.**	C-48999, 118285
Lab No	8001	**Calibration Date**	11/2/2021

	TENSILE STRENGTH				
Lab No.	1	2	3	4	5
Diameter (in)	1.97	1.97	1.97	1.97	1.97
Length (in)	0.69	0.62	0.56	0.64	0.56
Length Diameter Ratio	0.35	0.31	0.28	0.32	0.28
Rate of Loading	0.069	0.062	0.056	0.064	0.056
Moisture Condition	0.71%	0.71%	0.71%	0.71%	0.71%
Maximum Applied Load (lbf)	3045	1501	1938	1419	1378
Splitting Tensile Strength (psi)	1426.8	782.8	1118.9	716.9	795.6

	TENSILE STRENGTH				
Lab No.	6	7	8	9	10
Diameter (in)	1.97	1.97	1.97	1.97	--
Length (in)	0.54	0.66	0.63	0.65	--
Length Diameter Ratio	0.27	0.34	0.32	0.33	--
Rate of Loading	0.054	0.066	0.063	0.065	--
Moisture Condition	0.71%	0.71%	0.71%	0.71%	--
Maximum Applied Load (lbf)	1366	1506	1256	1139	--
Splitting Tensile Strength (psi)	817.9	737.8	644.6	566.6	--

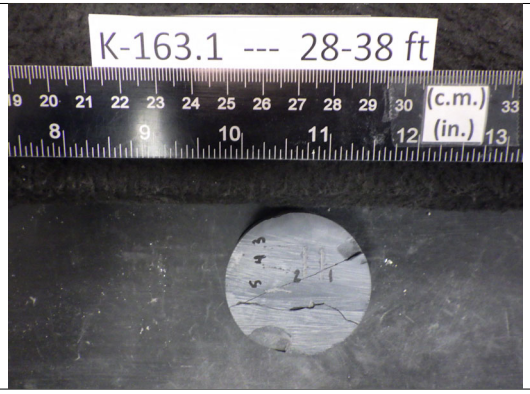
Client:	Terracon Consultants, Inc.		
Project:	Champlain-Hudson Power Express		
Location:		Project No:	GTX-315284
Boring ID: KB-163.1	Sample Type: cylinder	Tested By:	tlm
Sample ID: ---	Test Date: 09/15/22	Checked By:	smd
Depth : 28-38 ft	Test Id: 684382		
Test Comment: ---			
Visual Description: ---			
Sample Comment: ---			

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
K-163.1	---	28-38 ft	1	0.3	0.2	0.25	
			2	0.4	0.2	0.30	
			3	0.2	0.4	0.30	
			4	0.4	0.5	0.45	
			5	0.2	0.3	0.25	
			Average CAIs			0.31	
			Average CAI *			0.79	
					CERCHAR Abrasiveness Index Classification	**Low abrasiveness**	

Notes

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



Kiewit

MEMORANDUM

DATE: January 19, 2023

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

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

SUBJECT: Geotechnical Data: Segment 6 – Package 4A – HDD Crossing 54 – Revision 1
Champlain Hudson Power Express Project
Burnt Hills, 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 northeast of Burnt Hills, New York. The approximate station for the start of HDD crossing Number 54 is STA 40270+00 (42.9300°N, 73.8672°W).

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

- AECOM, Geotechnical Data Report, Upland Segments, Champlain Hudson Power Express, dated May 28, 2021.
- Terracon, Results of Field Exploration, Champlain Hudson Power Express, Ballston – Clifton Park – Glenville, NY, dated June 22, 2022

Contact us if you have questions or require additional information.

HDD 54
Borings K-164.1, BM-2B
Segment 6 - Design Package 4A

CHPE Segment 6 Package 4A
Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A162.1-1	1502786.734	664476.477	284.0
	B158.87-1	1519228.136	669050.444	288.3
	B159.1-1	1517722.124	668720.464	291.0
	B159.5-1	1516012.300	668217.400	295.8
	B160.3-1	1511903.990	667182.915	294.6
	B160.7-1	1509749.417	666636.945	295.0
	B161.4-1	1506284.600	665799.100	288.0
	B163.3-1	1496630.400	662351.700	280.2
	B164.4-1	1490795.529	661205.362	267.5
	B165.5-1	1485722.400	659432.900	277.6
	B165.8-1	1484324.089	658853.809	275.4
	B166.5-1	1480752.600	656954.600	263.5
	B166.9-1	1479253.700	655902.600	265.4
	B167.1-1	1478553.300	655364.300	261.0
	B168.0-1	1474529.400	653290.100	251.4
	B168.64-1	1471082.866	652655.655	245.2
	B168.86-1	1470035.900	652059.906	231.6
AECOM**	BM-1	1500593.800	663479.000	283.4
	BM-1B	1513675.554	667631.458	293.5
	BM-1C	1508115.700	666263.900	291.9
	BM-1D	1504574.200	665267.500	283.4
	BM-1E	1511220.853	667016.761	294.1
	BM-2	1494386.900	661852.400	271.4
	BM-2A	1498788.900	662752.200	279.1
	BM-2B	1492715.315	661511.300	269.7
	BM-3	1487269.097	659995.860	275.1
	BM-3A	1488755.829	660606.619	270.8
	BM-3B	1482501.900	658059.300	273.6
	BM-3C	1480192.269	656553.384	263.2
	BM-4	1477890.500	654882.600	260.5

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

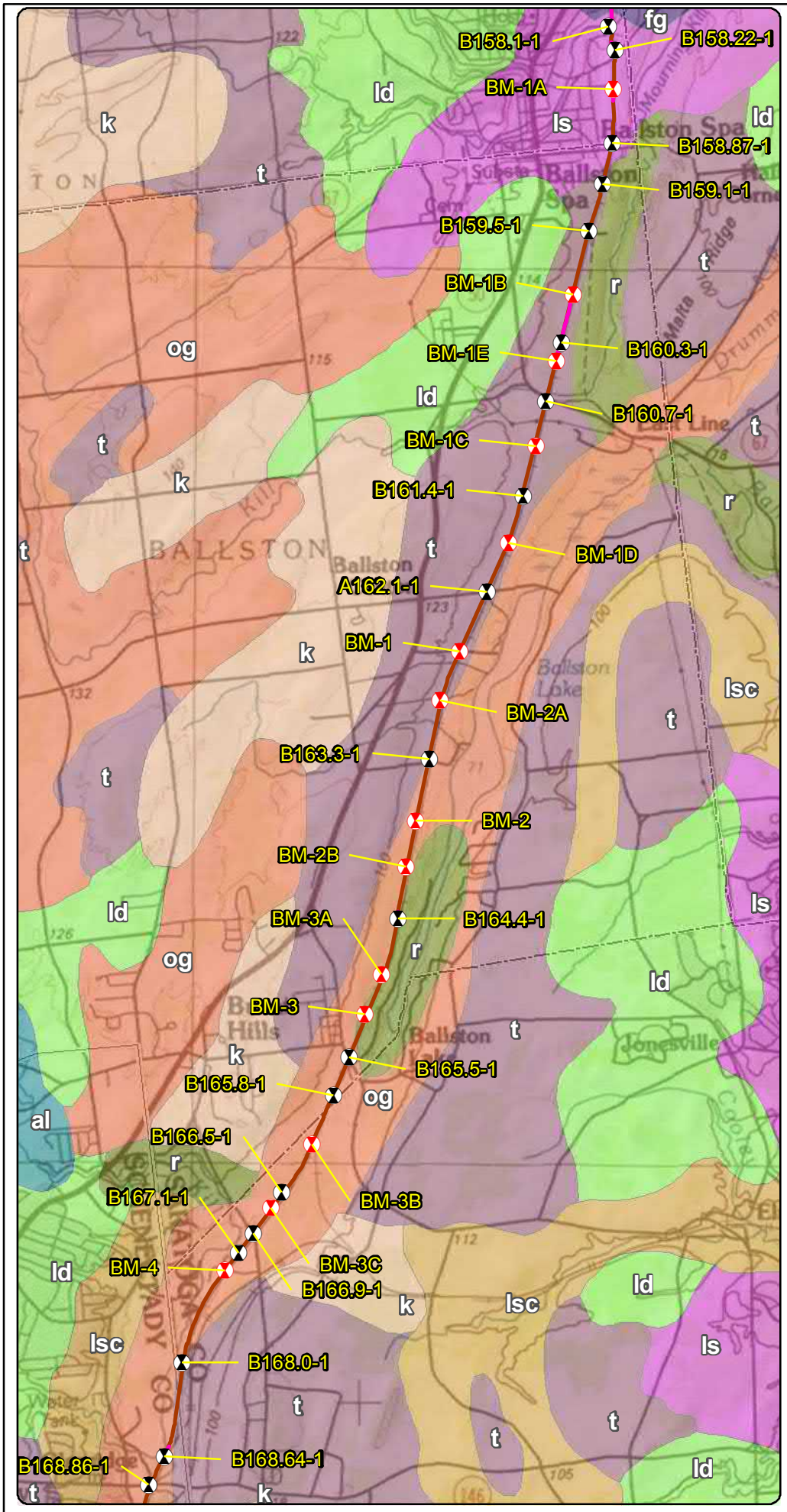
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

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

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

Reference:

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



LEGEND

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

Surficial Geology

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings Ballston to Mohawk River Figure 3-6

Prepared on 5/5/2021

by: AECOM

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

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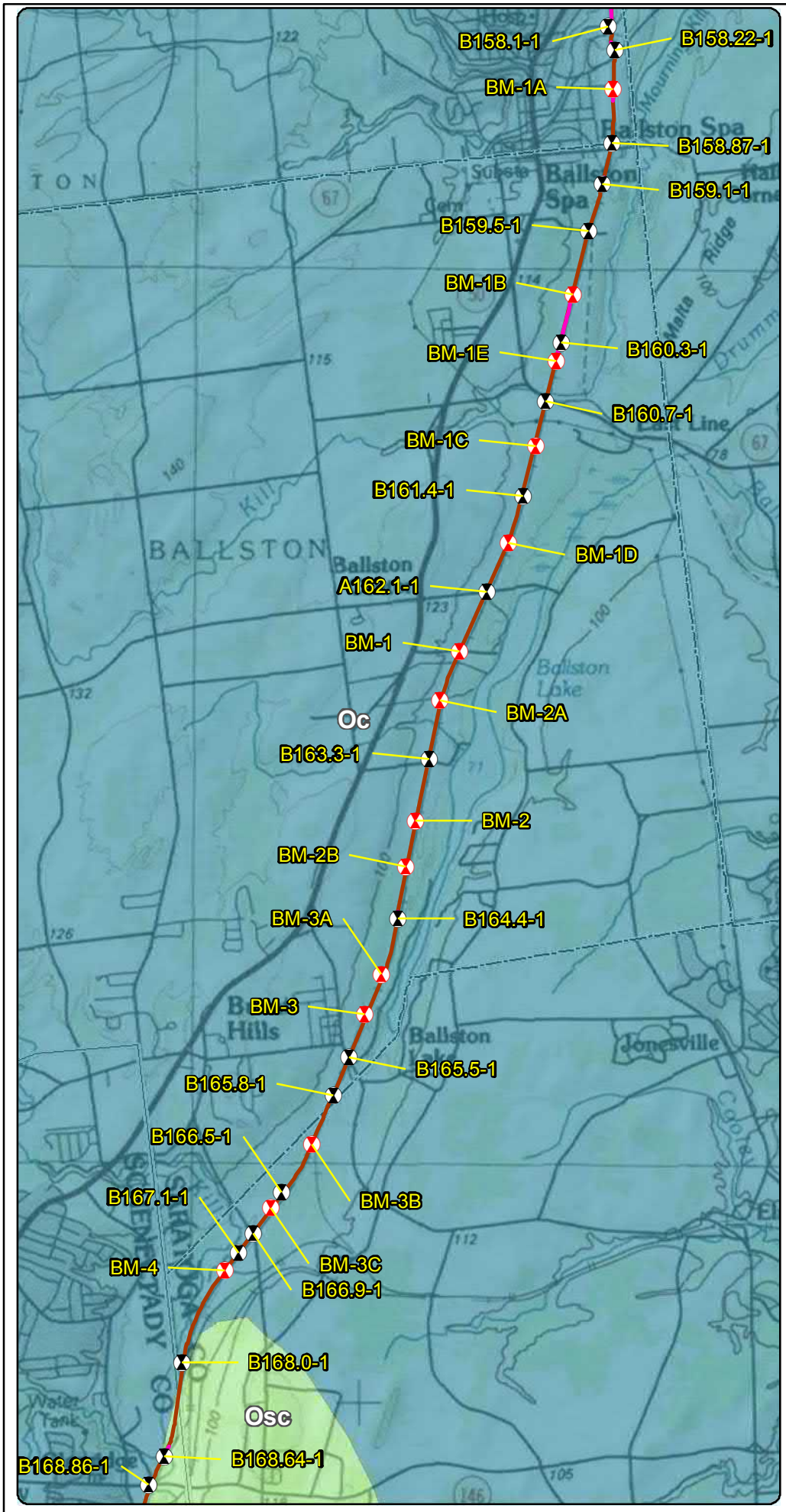

LEGEND

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

Bedrock Geology

- Oc - Canajoharie Shale
- Osc - Schenectady Formation

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Ballston to Mohawk River Figure 4-6

Prepared on 5/5/2021

by: AECOM

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

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BM-2A
163
163.1
163.2
163.3
B163.3-1
163.4
163.5
163.6
BALLSTON
163.7
BM-2
163.9
164
164.1
BM-2B

Saratoga Rd
Saunders Ln
Saunders Rd
Saratoga Rd
Saratoga Rd
Whites Beach Rd
Saratoga Rd
Whites Beach Rd
Lakeshore Ave
Lakeshore Ave
Hampton Rd
Manning Rd
Whites Beach Rd
Hickory Grove Ln
Zani Ln
Pearce Ln

0 1,000
Feet

LEGEND

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

Parcel Ownership: TOWN NAME

Road Name: Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Ballston to Mohawk River

Figure A-6

Sheet 5 of 9

Prepared by: AECOM 5/19/2021

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

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BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **BM-2B**
SOILS ENGINEER/GEOLOGIST: Chris French	**BORING LOG**	START DATE: 2/22/21
		FINISH DATE: 2/22/21
LOCATION: Ballston, NY (CP Rail) MP-164.12		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
Water at 2'	TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit	NQ	BORING TYPE: SPT/Core
	SIZE I.D.	4"	2.5"	- -	1 7/8"	BORING O.D.: 4.5"/3"
	SIZE O.D.	4.5"	3"	3 7/8"	3"	SURFACE ELEV.:
	HAMMER WT.	140 lbs	140 lbs			LONGITUDE:
	HAMMER FALL	30"	30"			LATITUDE:

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		0'-5'				Hand Cleared						SAND & GRAVEL	0.0': Brown fine-coarse SAND, some subrounded gravel, little cobbles, little silt; frozen
1.0													0.9': Gray-brown angular GRAVEL, some medium-fine sand, medium dense, moist, saturated at 2'
2.0													
3.0												SILT and CLAY	2.5': Brown SILT and clay, trace angular gravel; medium stiff, moist
		3'-5'	S-1										TR-1; (3.0'-5.0')
4.0													
5.0												GRAVEL	4.5': Brown/gray angular GRAVEL, trace fine-coarse sand, trace silt; medium dense, saturated
		5'-7'	S-2	9"	8"	46	82/3"	-	-	-			SAA, very dense
6.0												SHALE	Split spoon refusal at 5.6', set casing to 6.0', drill out to 8.0 ft.to begin core
7.0													
8.0	2.6	8'-13'	R-1	60"	56"	RQD: 35" = 58%							Gray shale, medium laminated to very thinly bedded, heavily jointed from 8.0'-10.0', very lightly jointed from 10.0'-13.0', joints oriented from 0°-10°,unweathered
9.0													
10.0													
11.0													
12.0													
13.0	1.85	13'-18'	R-2	60"	58.5"	RQD: 56" = 93%							SAA, very lightly jointed
14.0													TR-2; (16.6'-17.3')
15.0													
16.0													
17.0													
18.0	2.2	18'-23'	R-3	60"	60"	RQD: 60" = 100%							SAA, Very lightly jointed
19.0													
20.0													

NOTES:

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

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

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

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

SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE	
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35%	AND=35-50%

BORING CONTRACTOR: ADT	AECOM	SHEET 2 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **BM-2B**
SOILS ENGINEER: Chris French		START DATE: 2/22/21
	BORING LOG	FINISH DATE: 2/22/21
LOCATION: Ballston, NY (CP Rail) MP-164.12		OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
21.0										
22.0										
23.0										
	1.8	23'-28'	R-4	61"	61"	RQD: 61" = 100%				Gray shale, medium laminated to very thinly bedded, Very lightly jointed
24.0										
25.0										
26.0										
27.0										TR-3; (27.45'-28.0')
28.0										
	1.8	28'-33'	R-5	60"	58.5"	RQD: 50" = 83%				SAA, Unjointed 32.2': Heavily Jointed
29.0										
30.0									SHALE	
31.0										
32.0										
33.0										
	2.1	33'-38'	R-6	60"	59.5"	RQD: 56" = 93%				SAA, Very lightly jointed
34.0										
35.0										
36.0										
										TR-4; (36.0'-36.75')
37.0										
38.0										
	2.25	38'-40'	R-7	28"	28"	RQD: 17.5" = 60%				SAA, Moderately jointed, large 75°-80° fracture from 38.6'-39.65'
39.0										
40.0										
41.0										BM-2B terminated at 40.3', grouted to surface
42.0										
43.0										
44.0										
45.0										

NOTES:

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

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

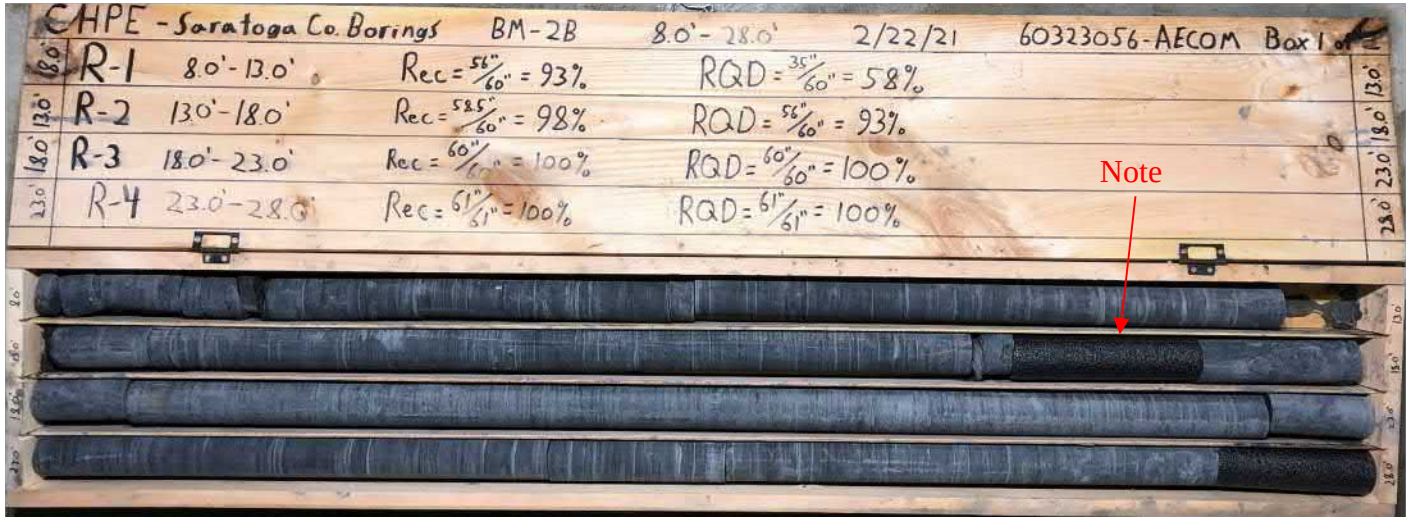
SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE	
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35%	AND=35-50%

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Ballston - Mohawk Segment**

AECOM

Boring No.	Depth (ft.)	
BM-1E	10.0 - 25.1	

Boring No.	Depth (ft.)	
BM-2B	8.0 – 28.0	

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

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Ballston - Mohawk Segment**

AECOM

Boring No.	Depth (ft.)
BM-2B	28.0 - 43.3

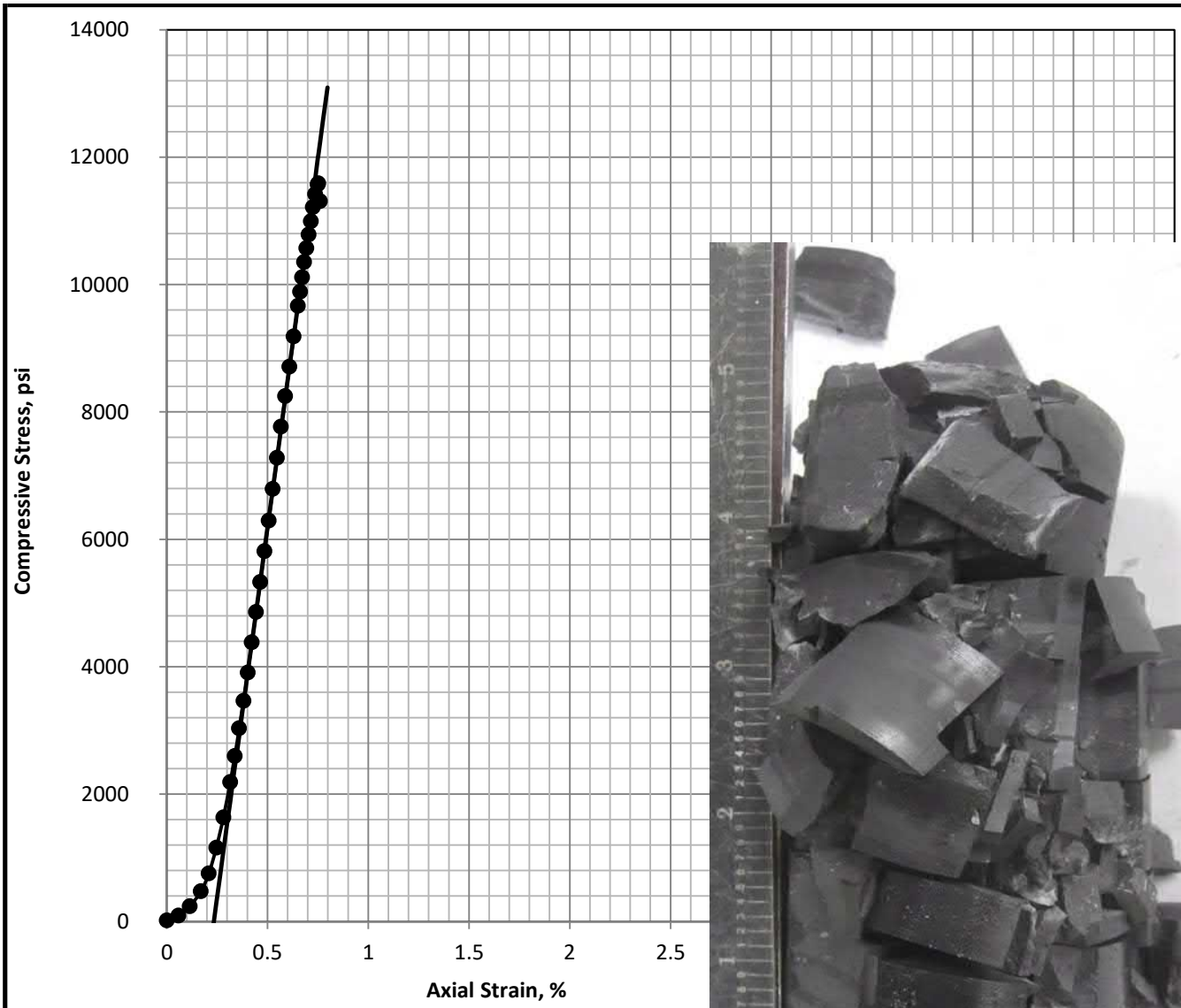
Boring No.	Depth (ft.)
BM-3	3.0 – 23.0

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

Aquifer
CHPE - Ballston-Mohawk River Borings
SUMMARY OF ROCK TESTING

SAMPLE IDENTIFICATION			STATE PROPERTIES			ENGINEERING PROPERTY TESTS				
Boring	Run	Depth	WATER CONTENT (1) (%)	TOTAL UNIT WGT. (pcf)	DRY UNIT WGT. (pcf)	TEST TYPE (2)	HARDNESS Mohs' HARDNESS (-)	UNCONFINED COMPRESSION TESTS (ASTM D7012) COMPRESSIVE STRENGTH (psi)	AXIAL STRAIN @ FAILURE (%)	ESTIMATED (5) ELASTIC MODULUS (psi)
BM-1B	R-2	20-25				M	3.0			
BM-1B	R-2	27.95-28.35	1.0	171	169	UC		13560	0.63	2E+06
BM-1D	R-1	11-16				M	3-4			
BM-1D	R-1	14-14.4	1.1	170	168	UC		12530	0.53	2E+06
BM-1E	R-3	20-25				M	4.0			
BM-1E	R-3	24.6-25	0.9	169	168	UC		15670	0.56	3E+06
BM-2B	R-1	8-13				M	3.0			
BM-2B	R-1	11.0-11.4	1.3	169	167	UC		11590	0.52	2E+06
BM-2B	R-4	23-28				M	3.0			
BM-2B	R-4	24.45-24.85	1.3	169	167	UC		11750	0.54	2E+06
BM-3	R-1	3-8				M	4.0			
BM-3	R-1	6.3-6.7	1.0	169	167	UC		14200	0.70	2E+06
BM-3	R-4	18-23				M	4.0			
BM-3	R-4	19.65-20.05	1.2	168	166	UC		14180	0.78	2E+06
BM-3A	R-3	8-13				M	3.0			
BM-3A	R-3	9-9.4	1.2	169	167	UC		13030	0.66	2E+06
BM-3A	R-5	18.1-23.1				M	3-4			
BM-3A	R-5	19.1-19.5	1.4	168	166	UC		12010	0.68	2E+06
BM-3B	R-2	10-15				M	4.0			
BM-3B	R-2	12.2-12.6	0.7	169	168	UC		16540	0.42	4E+06
BM-3C	R-2	14-19				M	4-5			
BM-3C	R-2	17.65-18.05	1.0	170	168	UC		15870	0.62	3E+06
BM-3C	R-4	24-29				M	3.0			
BM-3C	R-4	25.5-25.9	1.0	168	167	UC		14750	0.63	2E+06
BM-4	R-1	3-8				M	3.0			
BM-4	R-1	5.35-5.75	1.2	170	168	UC		12870	0.59	2E+06
BM-4	R-2	8-13				M	3.0			
BM-4	R-2	8.25-8.65	1.2	169	167	UC		6660	0.43	2E+06

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



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
1.33	169	167	4.493	1.971

Specimen meets ASTM D4543 shape tolerances

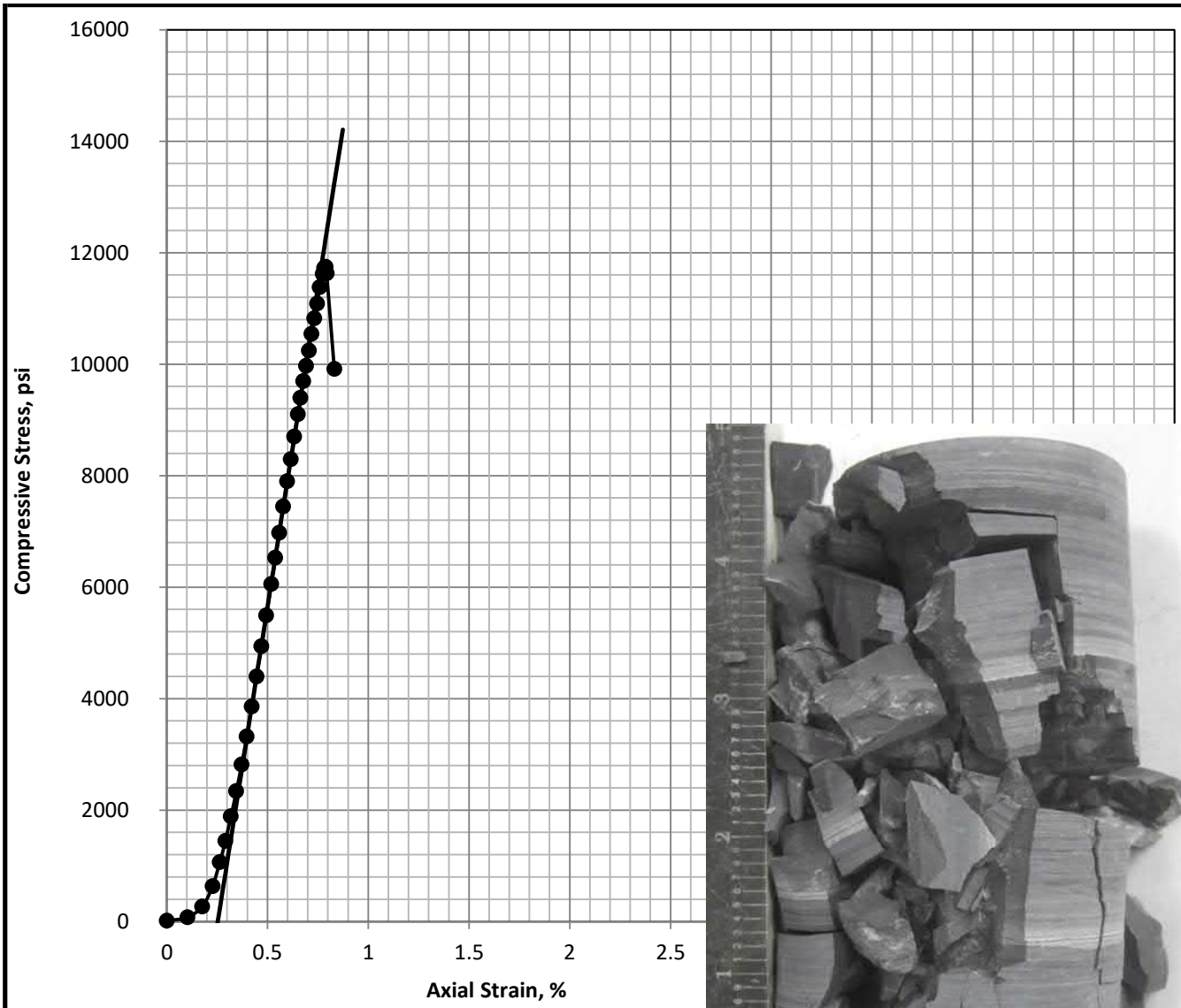
FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.12	0.52	11590	2E+06

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

Aquifer	**CHPE - Ballston-Mohawk River Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21004		**Boring: BM-2B Run: R-1 Depth 11.0-11.4 ft.**



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
1.26	169	167	4.121	1.972

Specimen meets ASTM D4543 shape tolerances

FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.13	0.54	11750	2E+06

Test by: DM
Test Date: Apr-06-21
Reviewed by: GET

Aquifer	**CHPE - Ballston-Mohawk River Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21004		**Boring: BM-2B Run: R-4 Depth 24.45-24.85 ft.**

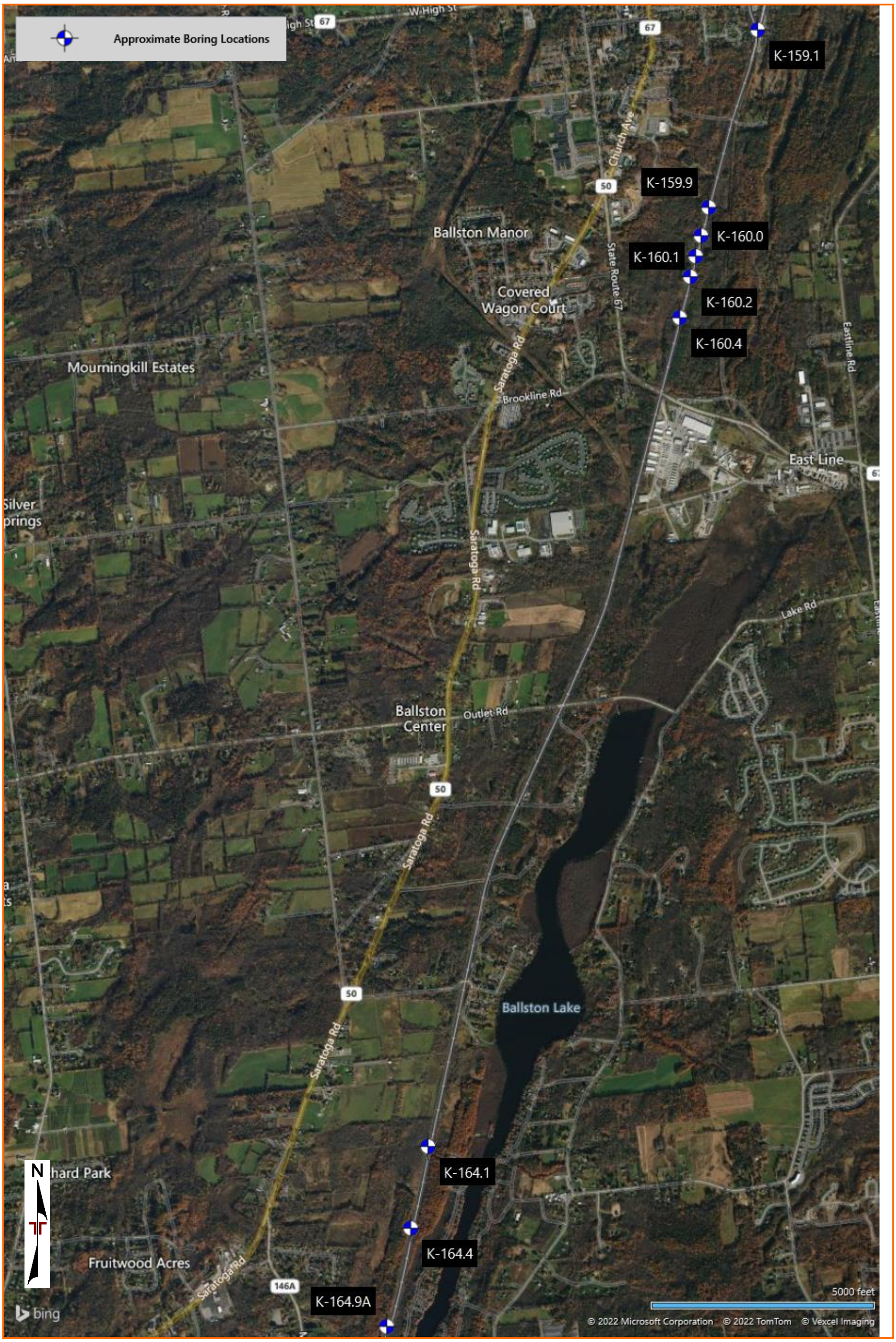


DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED
BY MICROSOFT BUNG MAPS

BORING LOG NO. K-164.1

PROJECT: Champlain-Hudson Power Express Design Package 4a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings Ballston - Clifton Park - Glenville, NY

LOCATION See Exploration Plan

Latitude: 42.9296° Longitude: -73.8673°

Surface Elev.: 269.76 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (In.)	FIELD TEST RESULTS
0.7	269	**TOPSOIL**		
1.0	269	**FILL - SILTY SAND WITH GRAVEL**, brown, loose	16	2-3-4-2 N=7
2.0	268	**FILL - SILTY GRAVEL WITH SAND**, brown, loose		
3.5	266.5	**SILT AND CLAY (CL-ML)**, gray, medium stiff	14	2-2-3-16 N=5
5.0	265	**WEATHERED ROCK**, black, very dense	9	47-50/4"
10.0	260	**SHALE**, slightly weathered, wide fractured, very poor RQD, gray		REC = 100% RQD = 0%
15.0	255	**SHALE**, slightly weathered, moderate fractured, good RQD, gray		REC = 100% RQD = 83%
20.0	250	**SHALE**, slightly weathered, moderate fractured, excellent RQD, gray		REC = 100% RQD = 92%
25.0	245	**SHALE**, slightly weathered, moderate fractured, excellent RQD, gray		REC = 100% RQD = 97%
		SHALE, slightly weathered, wide fractured, excellent RQD, gray		REC = 100% RQD = 93%

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by Kiewit

Notes:

Logged by SP
Hammer Efficiency Summary:
Energy Transfer Ratio: 77.4% +/-2.7%
Hammer Efficiency Correction (CE):1.29

WATER LEVEL OBSERVATIONS

At completion of drilling

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 04-19-2022 | Boring Completed: 04-19-2022

Drill Rig: CME 550x | Driller: S. Kahn

Project No.: JB215256A

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256A CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/20/22

BORING LOG NO. K-164.1

PROJECT: Champlain-Hudson Power Express Design Package 4a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings Ballston - Clifton Park - Glenville, NY

LOCATION See Exploration Plan

Latitude: 42.9296° Longitude: -73.8673°

Surface Elev.: 269.76 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SHALE, slightly weathered, wide fractured, excellent RQD, gray *(continued)*										
	30.0	240	30								
	Boring Terminated at 30 Feet										

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by Kiewit

Notes:

Logged by SP
Hammer Efficiency Summary:
Energy Transfer Ratio: 77.4% +/-2.7%
Hammer Efficiency Correction (CE):1.29

WATER LEVEL OBSERVATIONS

At completion of drilling

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 04-19-2022 | Boring Completed: 04-19-2022

Drill Rig: CME 550x | Driller: S. Kahn

Project No.: JB215256A

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256A CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/20/22

Rock Core – Boring K-164.1 (Runs 1 -4)

Rock Core – Boring K-164.1 (Run 5)

Client

Kiewit Engineering (NY) Corp
Lone Tree, CO

Project

Champlain-Hudson Power Express Project
JB215256

Date Received: 5/31/2022

Results from Corrosion Testing

Sample Location	K-164.1	K-165.1
Sample Depth (ft.)	2'-4'	4'-6'
pH Analysis, ASTM G 51	5.26	7.63
Water Soluble Sulfate (SO4), ASTM C 1580 (ppm)	12	8
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil
Chlorides, ASTM D 512, (ppm)	16	32
Red-Ox, ASTM G 200, (mV)	+543	+536
Total Salts, AWWA 2520 B, (mg/kg)	137	109
Resistivity (Saturated), ASTM G 57, (ohm-cm)	2440	5850

Analyzed By: Kyle Lemcke
Laboratory Supervisor

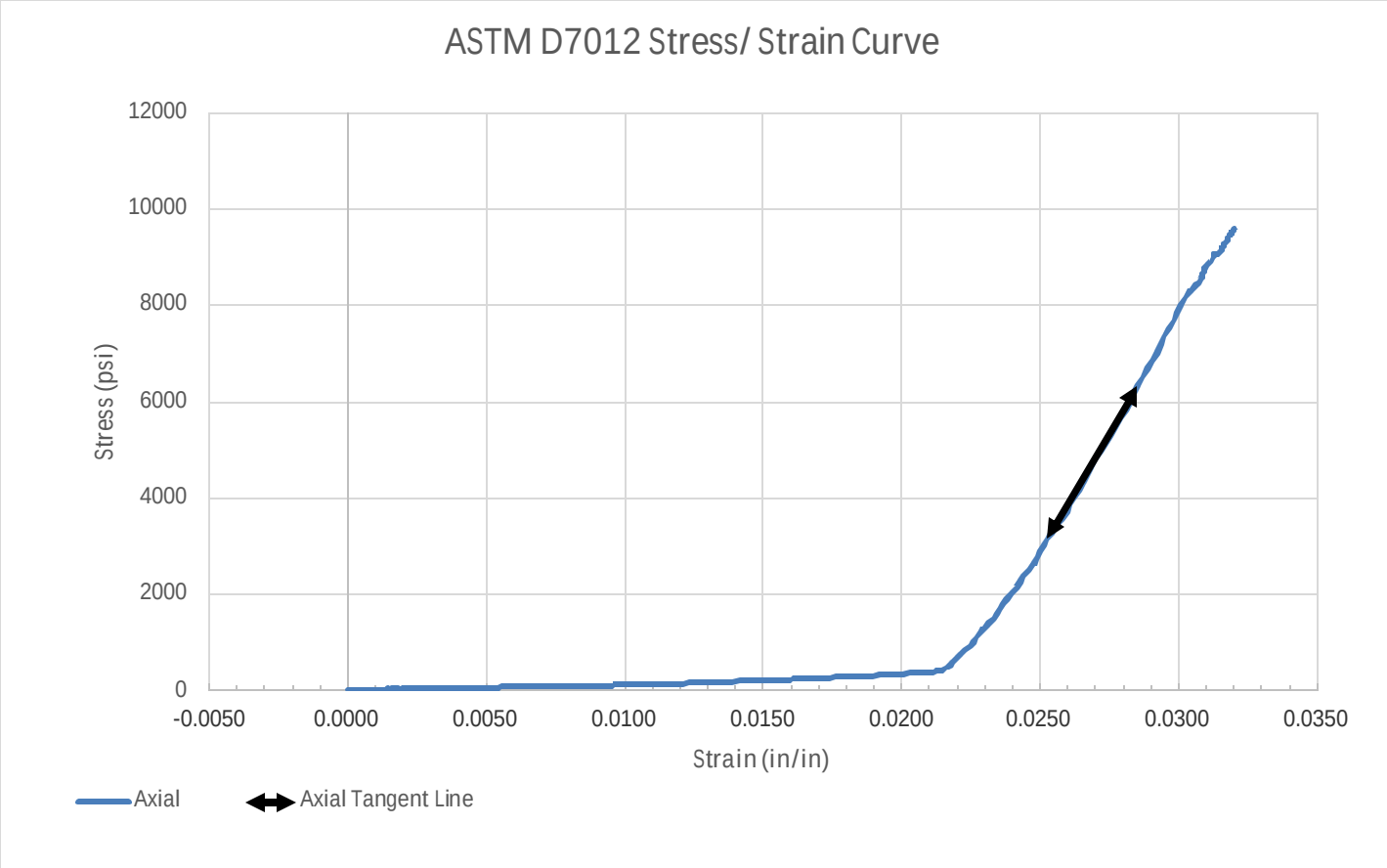
The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

Rock Core D7012 Method C

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JB215256



SAMPLE LOCATION

Site:	Kiewit Engineering Corp.		
Description:	Shale		
Boring:	K-164.1	Depth (feet):	20-25

SPECIMEN INFORMATION

Sample No.:	Lab: 5074	Mass (g):	575.17
Length (in.):	4.16	Diameter (in.):	2.01
L/D Ratio:	2.070	Density (pcf):	165.996

TEST RESULTS

Failure Load (lbs):	30167
Failure Strain (in/in):	0.033
Unconfined Compressive Strength (psi):	9,603
Elastic Modulus, E, (ksi):	979
Time of Failure (min):	04:16
Rate of Loading (in/sec):	0.04
Moisture Content Post-break:	1.17%

Rock Core D7012 Method C

Client	Project
Kiewit Engineering Corp	Champlain-Hudson Power Express Project
	Project No. JB215256

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

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

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

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

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JB215256

Splitting Tensile Strength of Intact Rock Core Specimens, ASTM D3967

Boring	K-164.1	**Material Description**	Shale
Sample No		**Equipment Used**	Tinius Olsen (120,000lbs)
Depth (ft)	20-25	**TICCS ID/Serial No.**	C-48999, 118285
Lab No	5074	**Calibration Date**	11/2/2021

	TENSILE STRENGTH				
Sample No.	1	2	3	4	5
Diameter (in)	1.98	1.98	1.98	1.98	1.98
Length (in)	0.65	0.7	0.67	0.62	0.61
Length Diameter Ratio	0.33	0.35	0.34	0.31	0.31
Rate of Loading	0.0065	0.007	0.0067	0.0062	0.0061
Moisture Condition	1.71%	1.71%	1.71%	1.71%	1.71%
Maximum Applied Load (lbf)	1990	2206	2713	1635	3810
Splitting Tensile Strength (psi)	984.9	1013.8	1302.6	848.3	2009.2

	TENSILE STRENGTH				
Sample No.	6	7	8	9	10
Diameter (in)	1.98	1.98	1.98	1.98	1.98
Length (in)	0.6	0.66	0.57	0.57	0.59
Length Diameter Ratio	0.30	0.33	0.29	0.29	0.30
Rate of Loading	0.006	0.0066	0.0057	0.0057	0.0059
Moisture Condition	1.71%	1.71%	1.71%	1.71%	1.71%
Maximum Applied Load (lbf)	2072	1349	3097	2200	1932
Splitting Tensile Strength (psi)	1110.9	657.5	1747.8	1241.6	1053.4

Client:	Terracon Consultants, Inc.		
Project:	Champlain-Hudson Power Express		
Location:		Project No:	GTX-315284
Boring ID: K-164.1	Sample Type: cylinder	Tested By:	tlm
Sample ID: ---	Test Date: 06/17/22	Checked By:	smd
Depth : 20-25 ft	Test Id: 670471		
Test Comment: ---			
Visual Description: ---			
Sample Comment: ---			

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
K-164.1	---	20-25 ft	1	1.5	1.5	1.50	
			2	1.2	2.0	1.60	
			3	1.6	1.4	1.50	
			4	0.5	0.9	0.70	
			5	1.3	0.9	1.10	
			Average CAIs			1.28	
			Average CAI *			1.75	
					CERCHAR Abrasiveness Index Classification	**Medium abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 40/42 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:

Kiewit

MEMORANDUM

DATE: April 3, 2023

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

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

SUBJECT: Geotechnical Data: Segment 6 – Package 4A – HDD Crossing 59 – Revision 1
Champlain Hudson Power Express Project
Burnt Hills, 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 Burnt Hills, New York. The approximate station for HDD crossing Number 59 is STA 40402+00 (42.8969°N, 73.8841°W).

The geotechnical data at this HDD crossing is attached. The available data is from the previous investigation by AECOM and from a recent investigation by Terracon and Kiewit, referenced below. This report will be updated when the final Kiewit boring logs are available.

- AECOM, Geotechnical Data Report, Upland Segments, Champlain Hudson Power Express, dated May 28, 2021.
- Terracon, Results of Field Exploration, Champlain Hudson Power Express, Ballston – Clifton Park – Glenville, NY, dated June 22, 2022.
- Kiewit Engineering (NY) Corp., Package 4A Phase 4 Borings, Champlain Hudson Power Express, New York, dated January 20, 2023.

Contact us if you have questions or require additional information.

HDD 59
Borings B166.5-1, BM-3C,
K-166.8, KB-166.5
Segment 6 - Design Package 4A

CHPE Segment 6 Package 4A
Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A162.1-1	1502786.734	664476.477	284.0
	B158.87-1	1519228.136	669050.444	288.3
	B159.1-1	1517722.124	668720.464	291.0
	B159.5-1	1516012.300	668217.400	295.8
	B160.3-1	1511903.990	667182.915	294.6
	B160.7-1	1509749.417	666636.945	295.0
	B161.4-1	1506284.600	665799.100	288.0
	B163.3-1	1496630.400	662351.700	280.2
	B164.4-1	1490795.529	661205.362	267.5
	B165.5-1	1485722.400	659432.900	277.6
	B165.8-1	1484324.089	658853.809	275.4
	B166.5-1	1480752.600	656954.600	263.5
	B166.9-1	1479253.700	655902.600	265.4
	B167.1-1	1478553.300	655364.300	261.0
	B168.0-1	1474529.400	653290.100	251.4
	B168.64-1	1471082.866	652655.655	245.2
	B168.86-1	1470035.900	652059.906	231.6
AECOM**	BM-1	1500593.800	663479.000	283.4
	BM-1B	1513675.554	667631.458	293.5
	BM-1C	1508115.700	666263.900	291.9
	BM-1D	1504574.200	665267.500	283.4
	BM-1E	1511220.853	667016.761	294.1
	BM-2	1494386.900	661852.400	271.4
	BM-2A	1498788.900	662752.200	279.1
	BM-2B	1492715.315	661511.300	269.7
	BM-3	1487269.097	659995.860	275.1
	BM-3A	1488755.829	660606.619	270.8
	BM-3B	1482501.900	658059.300	273.6
	BM-3C	1480192.269	656553.384	263.2
	BM-4	1477890.500	654882.600	260.5

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

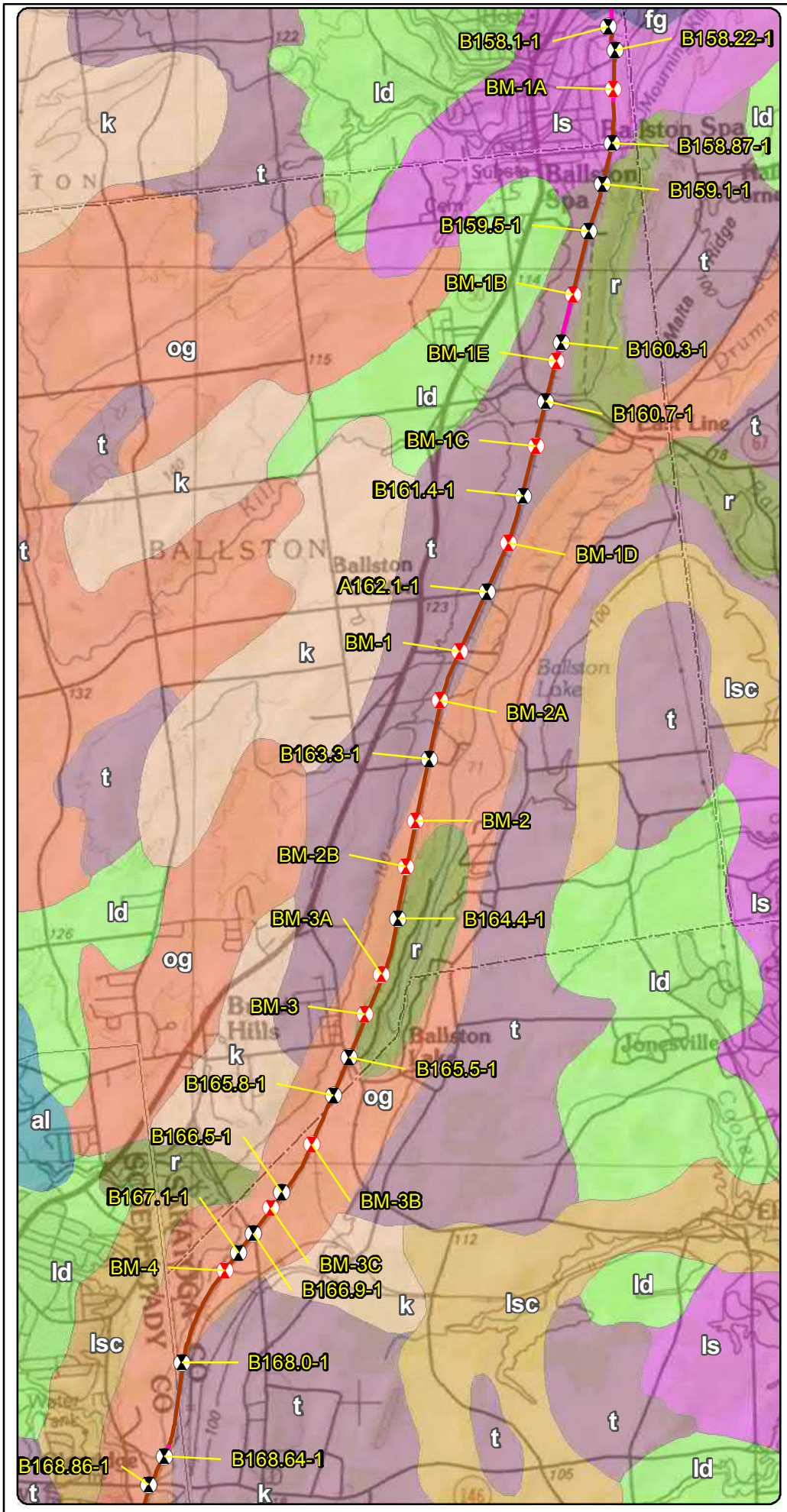
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

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

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

Reference:

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



LEGEND

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

Surficial Geology

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings Ballston to Mohawk River Figure 3-6

Prepared on 5/5/2021

by: AECOM

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

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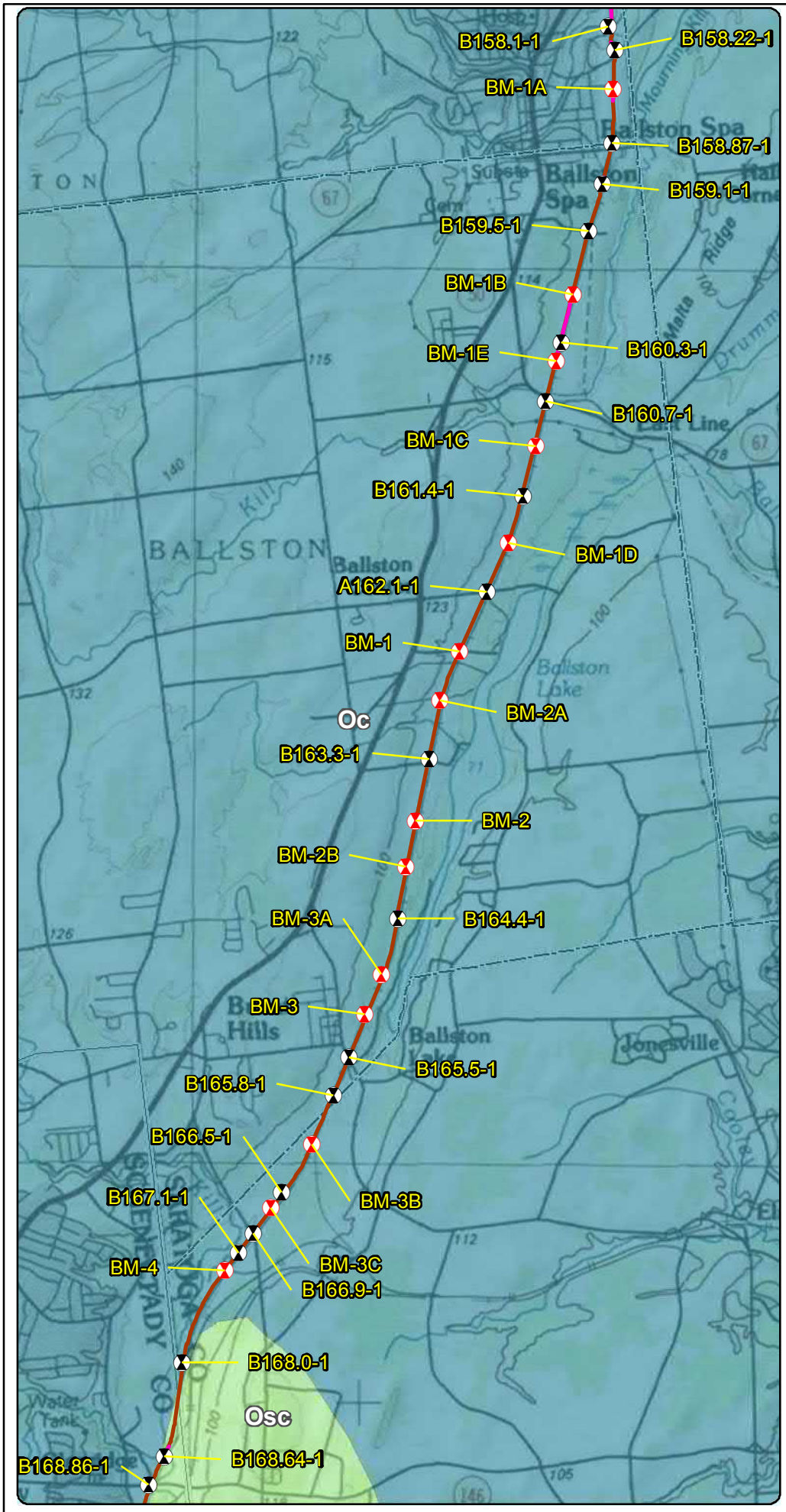

LEGEND

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

Bedrock Geology

- Oc - Canajoharie Shale
- Osc - Schenectady Formation

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Ballston to Mohawk River Figure 4-6

Prepared on 5/5/2021

by: AECOM

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

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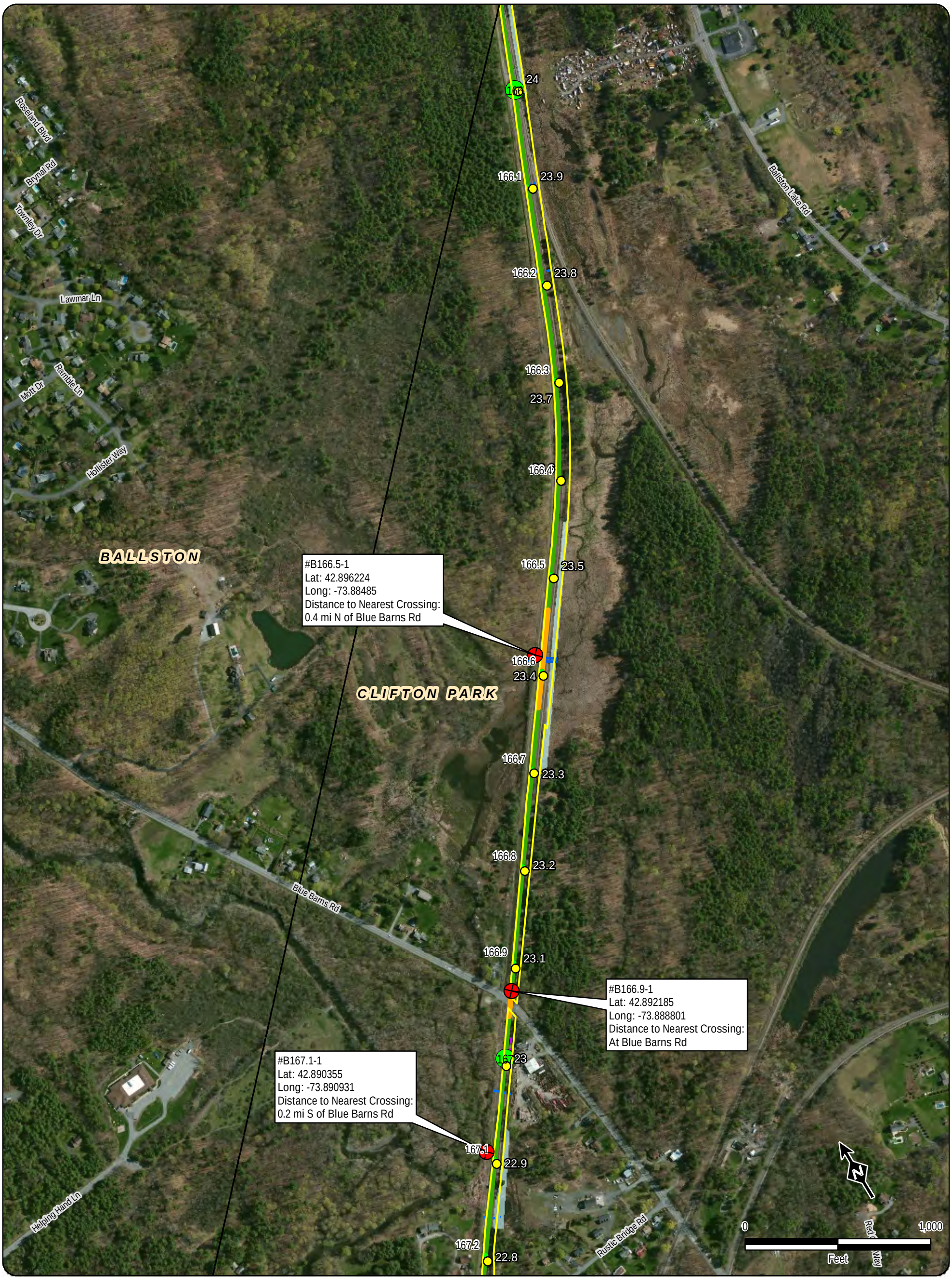

LEGEND

- 111.8 Milepost - Tenths
- 135 Milepost
- Terrestrial Route HVDC
- Submarine Route HVDC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Approximate RR Mileposts
- CP/CSX ROW
- DOT ROW
- Perennial Stream
- Intermittent Stream
- Ditch
- Surface Water
- Wetland
- Town Boundary
- Village Boundary

Geotechnical Borings

- Not Drilled
- As Built

Road Name

TOWN NAME

Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Geotechnical Boring Locations

Clifton Park - CP

Sheet 37 of 81

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

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

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TEST BORING LOG

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

BORING	**B166.5-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED DRY			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	4.0 '
d	FROM	4.0 '	TO	8.0 '
c_2	FROM	8.0 '	TO	13.0 '

DRILLER	T. FARRELL
HELPER	J. LANGDON
INSPECTOR	C. POPPE
DATE STARTED	03/04/2013
DATE COMPLETED	03/04/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	6 4 5 6		***BROWN SILTY F/M/C SAND, SM F/C GRAVEL (FILL)*** 2.0		
	S-2	11 6 4 4		***BROWN SILTY C/M/F SAND, SM F/C GRAVEL-SIZED ROCK FRAGMENTS, TR TO SM CLAY (FILL)*** 4.0	15.1	
5	S-3	10 40 50/0.2		***GRAY/BROWN SILT, TR TO SM F/ SAND*** 6.0		
	S-4	50/0.2				
				DARK GRAY F/C GRAVEL-SIZED ROCK FRAGMENTS 8.0		
10	R-1	REC =84% RQD =40%		***DARK GRAY MODERATELY WEATHERED, MEDIUM HARD SHALE, VERY CLOSE TO CLOSE 0 TO 15 DEGREE FRACTURING*** 13.0		
				END OF BORING AT 13'		
15						
20						
25						
30						
35						

DRN.	CMP
CKD.	PWK

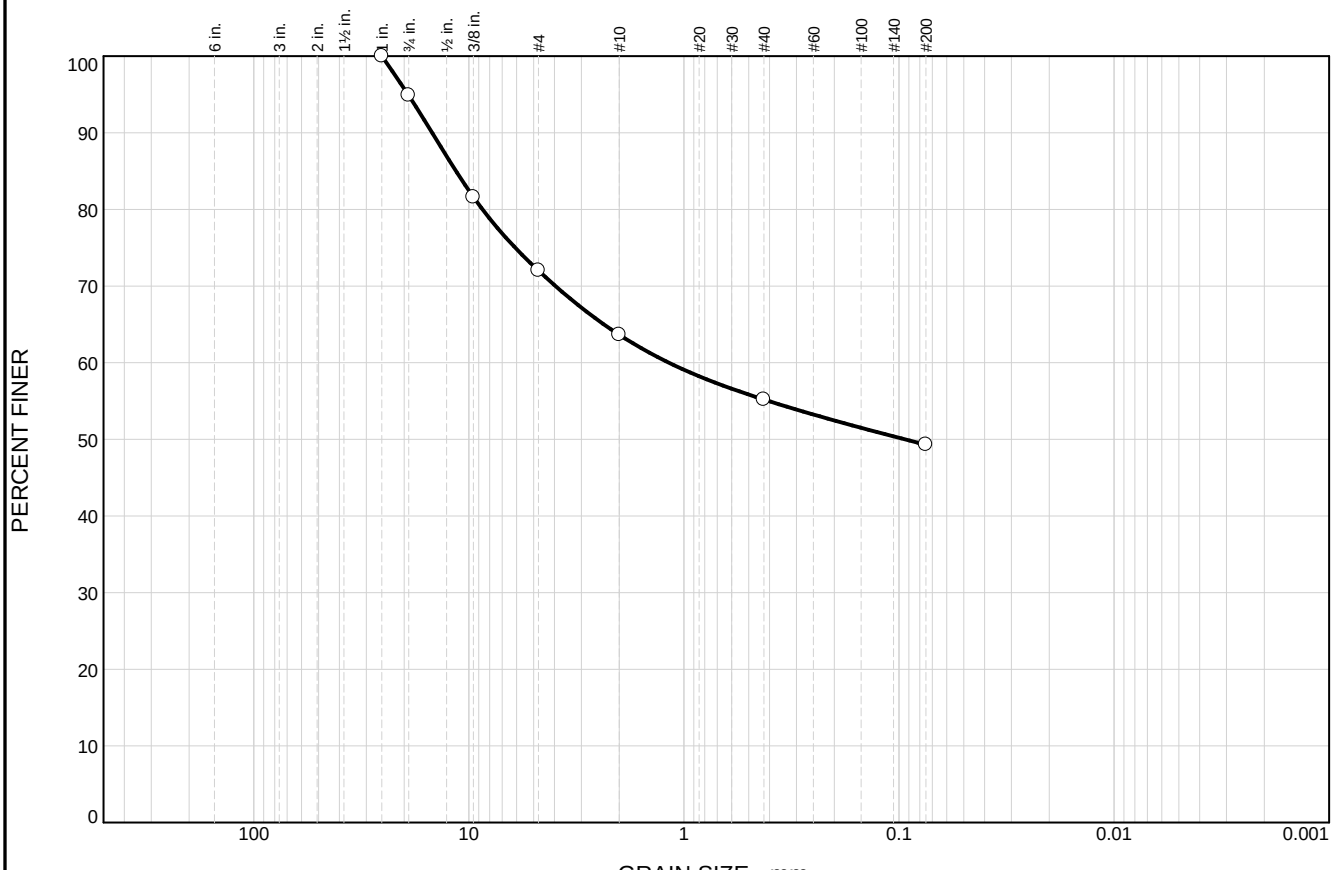
NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/27/13

SUMMARY OF LABORATORY TEST DATA

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

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
	R-2	10.0-10.5	-	-	-	-	-	-	-	-	-	-	-	165.3	700	-
B166.5-1	S-2	2.0-4.0	SM	28.0	22.7	49.3		-	-	-	-	-	15.1	-	-	-
	R-1	9.0-9.4	-	-	-	-		-	-	-	-	-	-	166.9	410	-
B166.9-1	S-1	0.0-2.0	GM	42.7	23.3	34.0		-	-	-	-	-	19.4	-	-	-
	S-2	2.0-4.0														
	R-1	8.0-8.4	-	-	-	-		-	-	-	-	-	-	171.6	385	-
	R-2	11.1-11.4	-	-	-	-		-	-	-	-	-	-	168.7	-	-
			-	-	-	-		-	-	-	-	-	-	162.5	-	-
B167.1-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	-	23.9	-	-	19.3
	S-5	8.0-9.3	-	-	-	-	-	-	-	-	-	-	7.0	-	-	-
	R-1	14.9-15.3	-	-	-	-	-	-	-	-	-	-	-	168.5	340	-
B168.0-1	S-2	2.0-4.0	SM	13.5	51.9	34.6		-	-	-	-	-	8.2	-	-	-
B168.64-1	S-4	6.0-8.0	SM	1.1	73.9	25.0		-	-	-	-	-	9.9	-	-	-

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	5.1	22.9	8.4	8.4	5.9	49.3	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			11.4766	1.1748	0.0938					

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

Project No. 195651 **Client:** TDI CHAMPLAIN HUDSON POWER EXPRESS - CP
Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B166.5-1 **Depth:** 2.0-4.0 FT **Sample Number:** S-2

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

TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 85

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

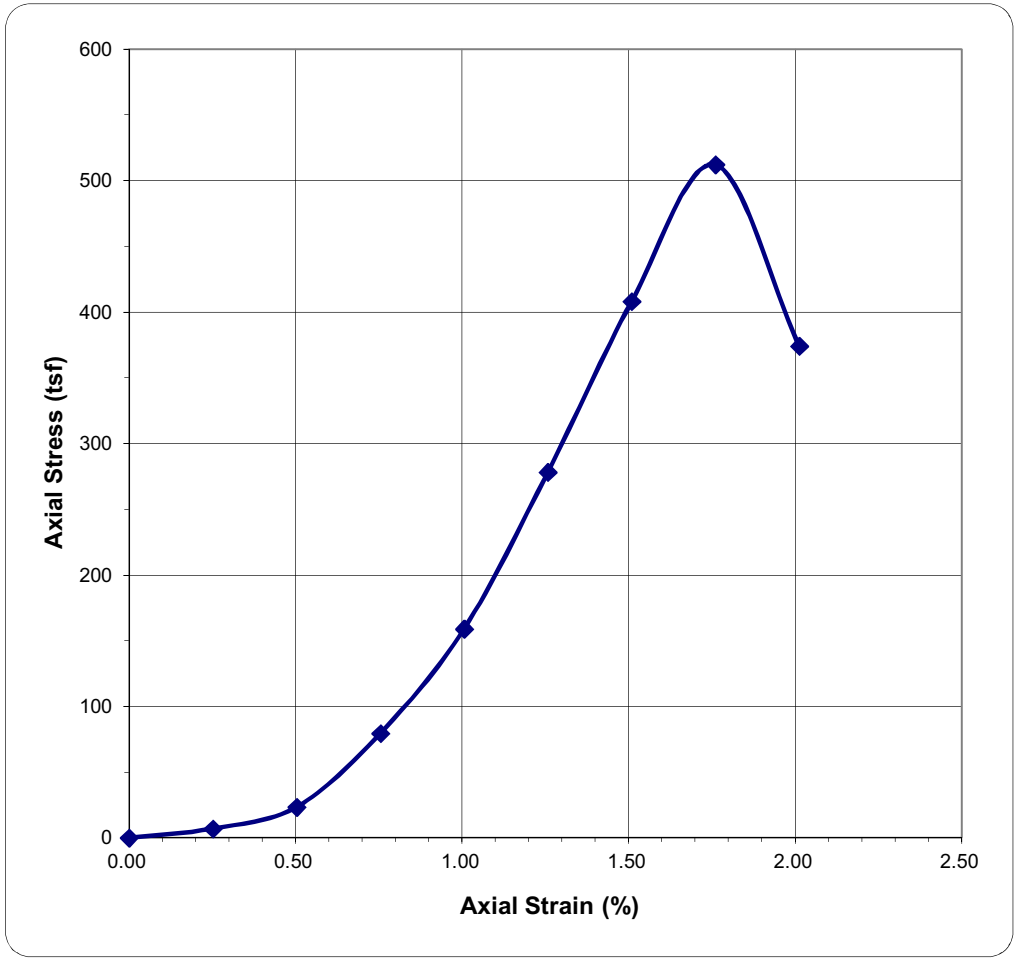
TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name:	TDI				
Project No.:	195651	**Average Sample Diameter (in.):**	1.980	**Sample Description:**	
Boring No.:	B166.5-1	**Cross Sectional Area (sq. in.)**	3.079		DARK GRAY SHALE
Sample No:	R-1	**Average Sample Height (in.):**	3.974		
Depth (ft):	9.0-9.4	**Sample Mass-Dry (g):**	536.08		
Elevation (ft):		**Unit Weight (PCF)**	166.9		

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	300	0.25	7
0.020	1000	0.50	23
0.030	3400	0.75	80
0.040	6800	1.01	159
0.050	11900	1.26	278
0.060	17450	1.51	408
0.070	21900	1.76	512
0.080	16000	2.01	374



Failure Conditions:

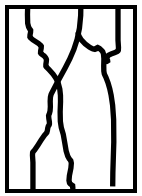
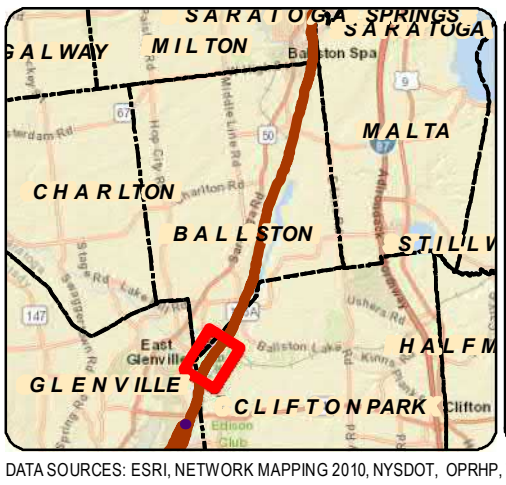


FIGURE: 130

B166.5-1
BM-3C
BALLSTON
Blue Barns Rd
166.8
166.9
B166.9-1
167
Blue Barns Rd
Delaware & Hudson
Springfield Terminal
B167.1-1
Helpinghand Ln
167.2
Rustic Bridge Rd
BM-4
CLIFTON PARK
Red Oak Way
167.3
Rustic Bridge Rd
Turner Park Ln
Blue Barns Rd
167.4
Park Ln
167.5
167.6
Turner Park Rd
Park Rd
Brant Rd
167.7
GLENVILLE
167.8
0
1,000
Feet



LEGEND

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

Parcel Ownership: TOWN NAME

Road Name: Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Ballston to Mohawk River

Figure A-6

Sheet 8 of 9

Prepared by: AECOM 5/19/2021

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

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BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **BM-3C**
SOILS ENGINEER/GEOLOGIST: Chris French		START DATE: 2/24/21
	BORING LOG	FINISH DATE: 2/24/21
LOCATION: MP - 166.7 (CP Rail)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
Water at 5.5' (inferred)	TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit	NQ	BORING TYPE: SPT/Core
	SIZE I.D.	4"	2.5"	- -	1 7/8"	BORING O.D.: 4.5"/3"
	SIZE O.D.	4.5"	3"	3 7/8"	3"	SURFACE ELEV.:
	HAMMER WT.	140 lbs	140 lbs			LONGITUDE:
	HAMMER FALL	30"	30"			LATITUDE:

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		0'-5'				Hand Cleared					SW	SAND	0': Brown fine-coarse SAND, little subrounded-rounded gravel, little silt, trace cobbles; frozen
1.0													1.5': SAA; medium dense, moist
2.0													
3.0													
		3'-5'	S-1								ML	Clayey SILT	2.9': Brown/light brown clayey SILT, trace fine sand, stiff, moist
4.0													TR-1; (3.0'-5.0')
5.0													
		5'-7'	S-2	24"	17"	9	12	21	35	21			5.0': Gray/brown clayey SILT, trace fine sand, very stiff, moist
6.0													
7.0													
		7'-9'	S-3	5.5"	6"	90/5.5"	-	-	-	-	GP	GRAVEL	7.0':Gray angular GRAVEL, trace fine sand, trace silt; very dense, moist (pulverized rock)
8.0													Split spoon refusal, transition to coring
9.0													Casing set at 8', begin coring at 9'
	3.4	9'-14'	R-1	60"	60"	RQD: 15.5" = 26%						SHALE	9.0': Gray shale, thinly laminated to thinly bedded, heavily jointed, joints parallel with bedding plane (0°-10°), unweathered
10.0													
11.0													TR-2; (11.4'-12.0')
12.0													
13.0													
14.0													
	1.4	14'-19'	R-2	60"	60"	RQD: 27.5" = 46%							14.0': SAA, highly jointed from 14.0'-17.5', unjointed from 19.0': fracture at 80°-85° from 15.5'-17.5'
15.0													
16.0													
17.0													
18.0													
19.0													
	1.8	19.0'-24.0'	R-3	60"	60"	RQD: 52.5" = 88%							19.0': SAA, lightly jointed
20.0													

NOTES:

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

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

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

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

SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE	
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35%	AND=35-50%

BORING CONTRACTOR: ADT	AECOM	SHEET 2 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **BM-3C**
SOILS ENGINEER: Chris French		START DATE: 2/24/21
	BORING LOG	FINISH DATE: 2/24/21
LOCATION: MP - 166.7 (CP Rail)		OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
21.0										
22.0										
23.0										
24.0										
	2.0	24.0'-29.0'	R-4	60"	59.5"	RQD: 58" = 97%				24.0': SAA, lightly jointed
25.0										
										TR-3; (24.7'-25.35')
26.0										
27.0										
28.0										
29.0										
	1.9	29.0'-34.0'	R-5	60"	57.5"	RQD: 53" = 88%				29.0': SAA, lightly jointed
30.0									SHALE	
31.0										
32.0										
33.0										
34.0										
	1.7	34.0'-39.0'	R-6	60"	60"	RQD: 58.5" = 98%				34.0': SAA, very lightly jointed
35.0										
36.0										
37.0										
38.0										
39.0										
	1.9	39.0'-40.3'	R-7	16"	16"	RQD: 15.5" = 97%				39.0': SAA, unjointed
40.0										TR-4; (39.0'-39.6')
										BM-3C terminated at 40.3' then grouted to surface
41.0										
42.0										
43.0										
44.0										
45.0										

NOTES:

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

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

SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE	
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35%	AND=35-50%

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Ballston - Mohawk Segment**

AECOM

Boring No.	Depth (ft.)
BM-3B	5.0 - 16.1

Boring No.	Depth (ft.)
BM-3C	9.0 - 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: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Ballston - Mohawk Segment**

AECOM

Boring No.	Depth (ft.)
BM-3C	29.0 - 40.3

Boring No.	Depth (ft.)
BM-4	3.0 – 16.0

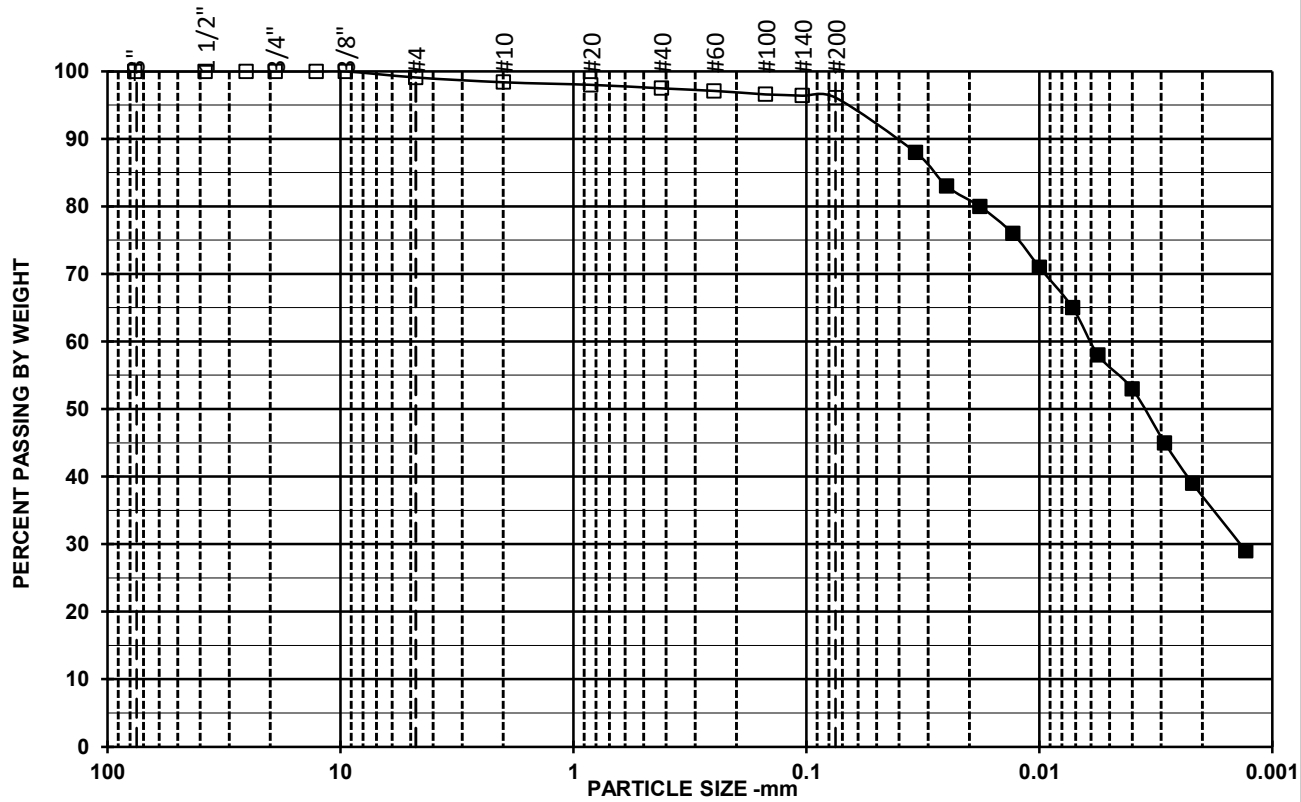
Note: Black foam inserts represent core pieces that were removed for geotechnical and/or thermal resistivity laboratory testing

Aquifer #602201207
CHPE - Ballston-Mohawk River Borings
LABORATORY SOIL TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
BM-1	S-2	5-7	8.6				SC	47	13	
BM-1D	S-3	7-9	14.1				SC	31	9	
BM-2A	S-2	5.5	11.5				GP-GM	8	3	
BM-2A	S-4	9-11	9.9				SC	34	10	
BM-3C	S-2	5-7	23.2				CH	96.1	37	

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

COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



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

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	23.2				CH		Grayish brown, Fat clay	04/06/21
◇								
○								

Symbol	□	◇	○
Boring	BM-3C		
Sample	S-2		
Depth	5-7		
% +3"	0		
% Gravel	0.9		
% SAND	3		
%C SAND	0.7		
%M SAND	0.9		
%F SAND	1.4		
% FINES	96.1		
D_{100} (mm)	9.53		
D_{60} (mm)	0.00602		
D_{30} (mm)	0.0014		
D_{10} (mm)			
Cc			
Cu			

Sieve Size/ID #	Percent Finer Data		
6"	100.0		
4"	100.0		
3"	100.0		
1 1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	99.1		
#10	98.4		
#20	98.0		
#40	97.5		
#60	97.1		
#100	96.6		
#140	96.4		
#200	96.1		
5μ m	56		
2μ m	37		
1μ m	24		

Aquifer #602201207

TerraSense, LLC #7853-21004

CHPE - Ballston-Mohawk River Borings

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

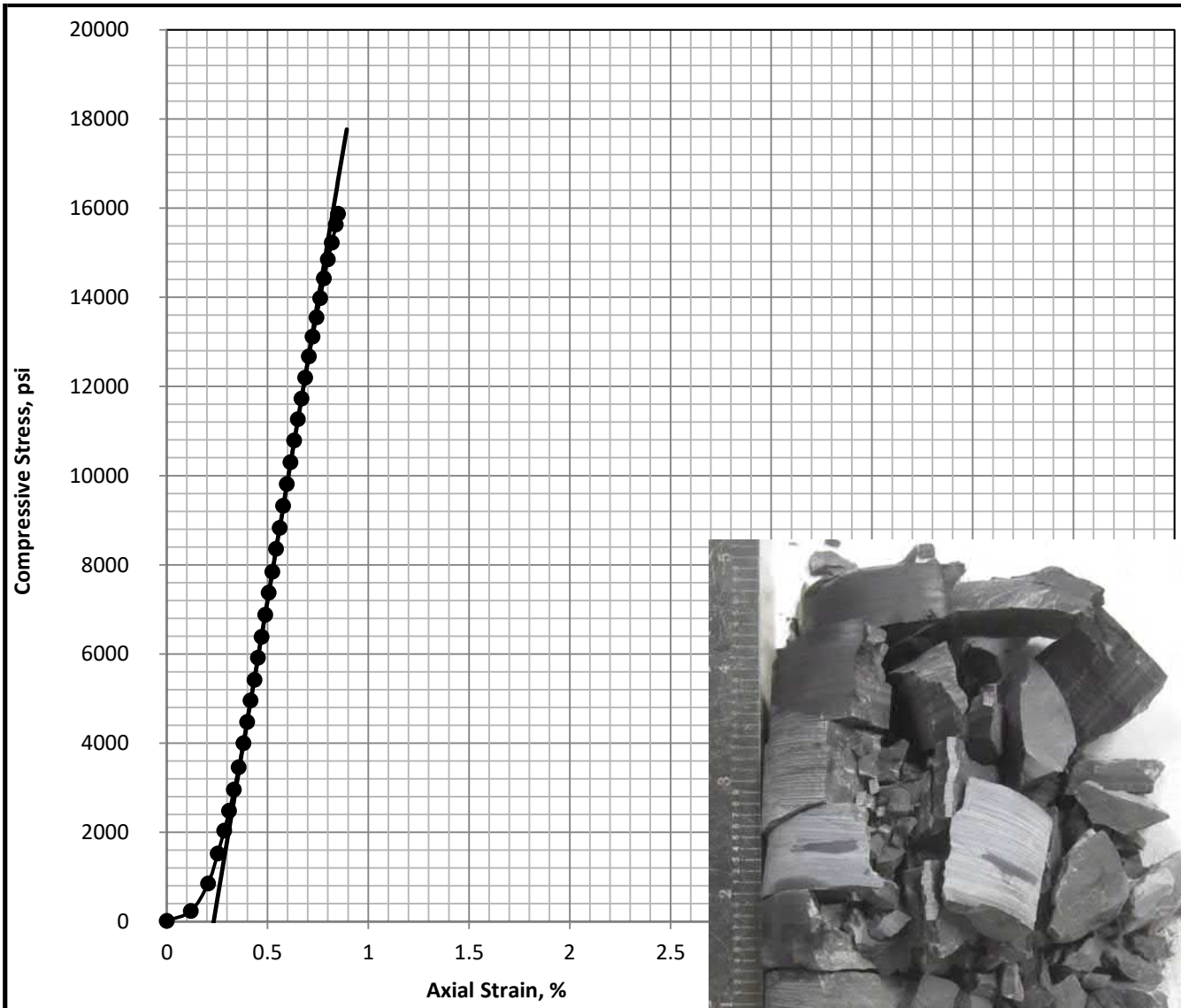
TerraSense Analysis File: GrainSizeV6Rev1a14

Siev4c 4/19/2021

Aquifer
CHPE - Ballston-Mohawk River Borings
SUMMARY OF ROCK TESTING

SAMPLE IDENTIFICATION			STATE PROPERTIES			ENGINEERING PROPERTY TESTS				
Boring	Run	Depth	WATER CONTENT (1) (%)	TOTAL UNIT WGT. (pcf)	DRY UNIT WGT. (pcf)	TEST TYPE (2)	HARDNESS Mohs' HARDNESS (-)	UNCONFINED COMPRESSION TESTS (ASTM D7012) COMPRESSIVE STRENGTH (psi)	AXIAL STRAIN @ FAILURE (%)	ESTIMATED (5) ELASTIC MODULUS (psi)
BM-1B	R-2	20-25				M	3.0			
BM-1B	R-2	27.95-28.35	1.0	171	169	UC		13560	0.63	2E+06
BM-1D	R-1	11-16				M	3-4			
BM-1D	R-1	14-14.4	1.1	170	168	UC		12530	0.53	2E+06
BM-1E	R-3	20-25				M	4.0			
BM-1E	R-3	24.6-25	0.9	169	168	UC		15670	0.56	3E+06
BM-2B	R-1	8-13				M	3.0			
BM-2B	R-1	11.0-11.4	1.3	169	167	UC		11590	0.52	2E+06
BM-2B	R-4	23-28				M	3.0			
BM-2B	R-4	24.45-24.85	1.3	169	167	UC		11750	0.54	2E+06
BM-3	R-1	3-8				M	4.0			
BM-3	R-1	6.3-6.7	1.0	169	167	UC		14200	0.70	2E+06
BM-3	R-4	18-23				M	4.0			
BM-3	R-4	19.65-20.05	1.2	168	166	UC		14180	0.78	2E+06
BM-3A	R-3	8-13				M	3.0			
BM-3A	R-3	9-9.4	1.2	169	167	UC		13030	0.66	2E+06
BM-3A	R-5	18.1-23.1				M	3-4			
BM-3A	R-5	19.1-19.5	1.4	168	166	UC		12010	0.68	2E+06
BM-3B	R-2	10-15				M	4.0			
BM-3B	R-2	12.2-12.6	0.7	169	168	UC		16540	0.42	4E+06
BM-3C	R-2	14-19				M	4-5			
BM-3C	R-2	17.65-18.05	1.0	170	168	UC		15870	0.62	3E+06
BM-3C	R-4	24-29				M	3.0			
BM-3C	R-4	25.5-25.9	1.0	168	167	UC		14750	0.63	2E+06
BM-4	R-1	3-8				M	3.0			
BM-4	R-1	5.35-5.75	1.2	170	168	UC		12870	0.59	2E+06
BM-4	R-2	8-13				M	3.0			
BM-4	R-2	8.25-8.65	1.2	169	167	UC		6660	0.43	2E+06

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



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
1.03	170	168	4.417	1.972

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)
0.12	0.62	15870	3E+06

Test by: DM
Test Date: Apr-05-21
Reviewed by: GET

Aquifer	**CHPE - Ballston-Mohawk River Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21004		**Boring: BM-3C Run: R-2 Depth 17.65-18.05 ft.**

Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.99	168	167	4.746	1.974

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)
0.12	0.63	14750	2E+06

Test by: DM
Test Date: Apr-05-21
Reviewed by: GET

Aquifer	**CHPE - Ballston-Mohawk River Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21004		**Boring: BM-3C Run: R-4 Depth 25.5-25.9 ft.**

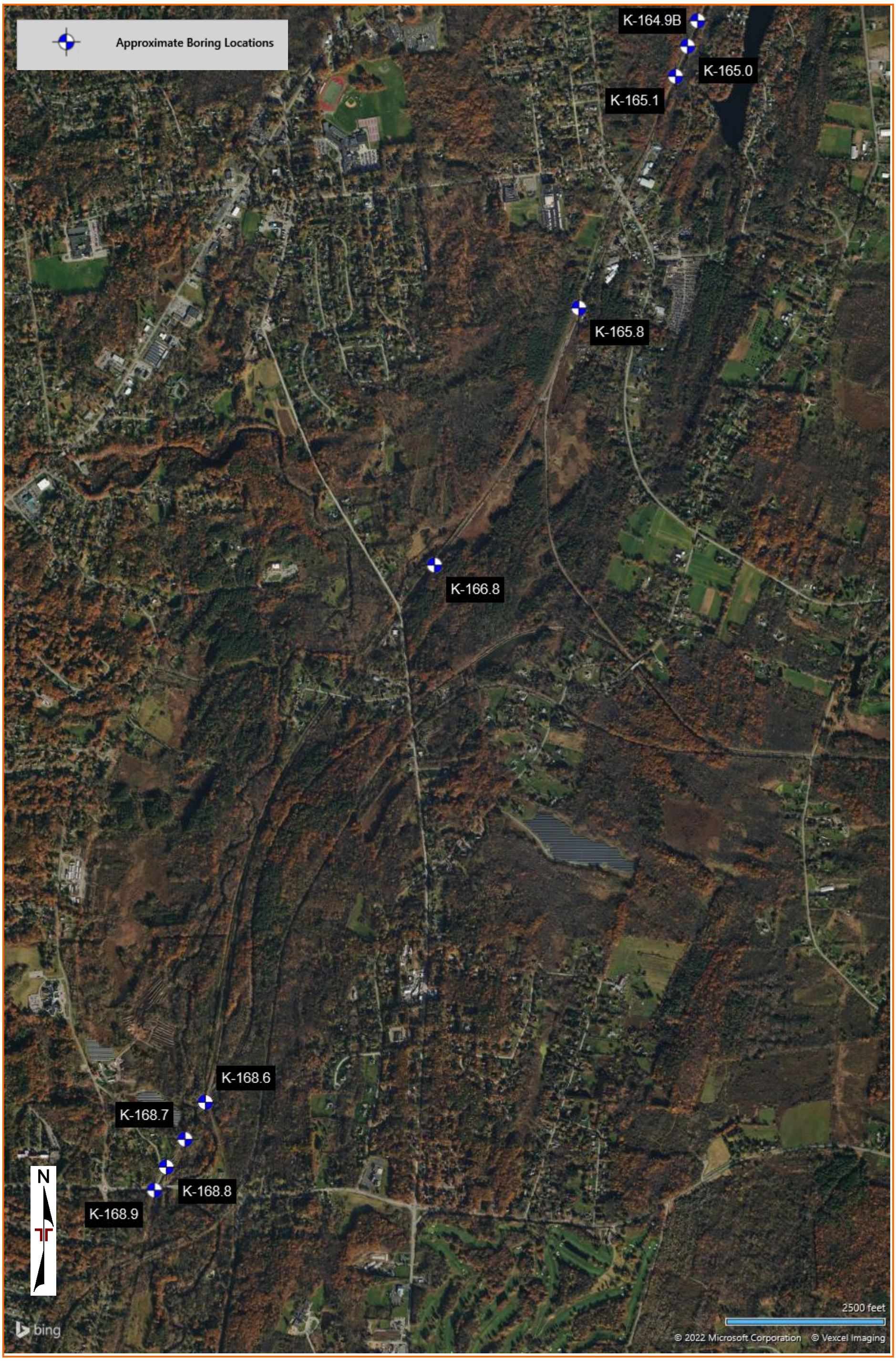


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. K-166.8

PROJECT: Champlain-Hudson Power Express Design Package 4a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings Ballston - Clifton Park - Glenville, NY

LOCATION See Exploration Plan

Latitude: 42.8940° Longitude: -73.8869°

Surface Elev.: 265.06 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (In.)	FIELD TEST RESULTS
0.5	264.5	**BALLAST**		
1.0	264	**FILL - SILTY SAND WITH GRAVEL**, black, medium dense	6	1-3-12-17 N=15
		WEATHERED ROCK, gray, very dense		20-50/5"
5.0	260	**SHALE**, slightly weathered, very close to moderate fractured, fair RQD, gray		REC = 91% RQD = 70%
10.0	255	**SHALE**, slightly weathered, close to moderate fractured, good RQD, gray		REC = 88% RQD = 86%
15.0	250	**SHALE**, slightly weathered, close to moderate fractured, good RQD, gray		REC = 88% RQD = 81%
20.0	245	***Boring Terminated at 20 Feet***		

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

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

Hammer Type: Automatic

Core barrel stuck. Boring terminated at 20 feet per Jaren with Kiewit

Advancement Method:
4 1/4 ID HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by Kiewit

Notes:

Logged by JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 84.7% +/-5.0%
Hammer Efficiency Correction (CE):1.41

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to coring

Terracon
30 Corporate Cir Ste 201
Albany, NY

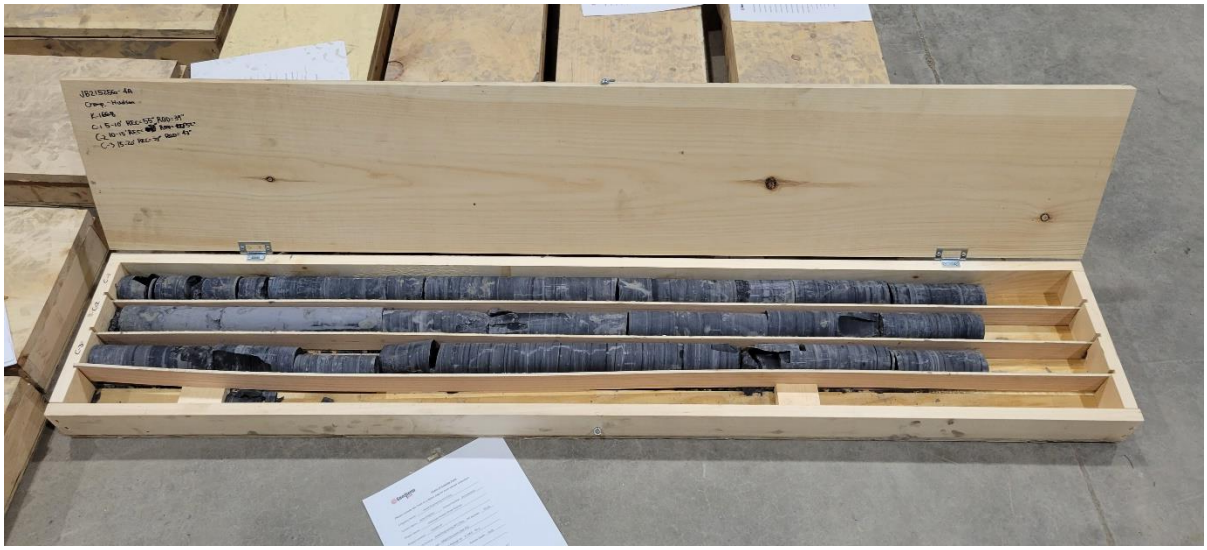
Boring Started: 04-13-2022 | Boring Completed: 04-14-2022

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

Project No.: JB215256A

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256A CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/20/22

Rock Core – Boring K-165.8 (Runs 4-6)



Rock Core – Boring K-166.8

Package 4A Phase 4 Borings

Champlain Hudson Power Express

New York

PROJECT NUMBER 20001480

CREATED BY Kiewit

DATE 01/20/2023

Legend Key

- Kiewit Borings

N

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

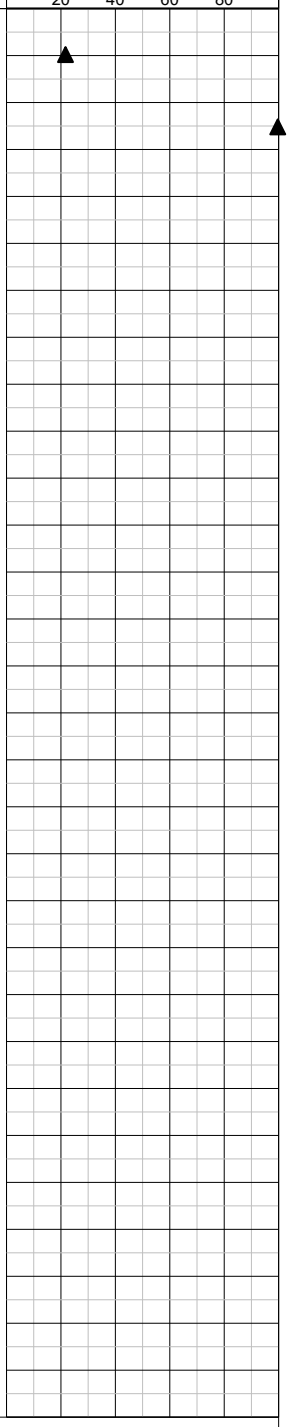
BORING NO: KB-166.5

PROJECT NUMBER	20001480	**LOGGED BY**	S. Ahmad	**COORDINATES**	N 1480974.78 E 657136.70
START DATE	12/13/2022	**DRILLER/RIG**	John / Geoprobe 7822DT	**GROUND ELEV.**	265.4 ft
FINISH DATE	12/13/2022	**DRILL CONTRACTOR**	ADT Inc.	**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
		FILL: SAND with Gravel (SP), brown, medium dense, moist		1	71%		7-9-13-15 (22)	Boring advanced with 4" ID Mud Rotary
	263.4	Sandy CLAY (SC), brown, very dense, moist		2	100%		22-50-50/1"	
	261.4	Shale, gray, laminated, very closely spaced discontinuities, very poor RQD, fresh						
5				1	68% / 24			15 minute rock core
10		closely spaced discontinuities, fair RQD		2	78% / 62			25 minute rock core
15				3	98% / 74			15 minute rock core
20		moderately spaced discontinuities, good RQD		4	85% / 75			15 minute rock core
25		widely spaced discontinuities, excellent RQD		5	100% / 100			25 minute rock core
30								

Legend

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



EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: KB-166.5

PROJECT NUMBER	20001480	**LOGGED BY**	S. Ahmad	**COORDINATES**	N 1480974.78 E 657136.70
START DATE	12/13/2022	**DRILLER/RIG**	John / Geoprobe 7822DT	**GROUND ELEV.**	265.4 ft
FINISH DATE	12/13/2022	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % / RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			Shale, gray, widely spaced, good RQD, laminated, fresh		6	96% / 80			25 minute rock core
35	230.4		Boring Terminated at 35ft						
40									
45									
50									
55									
60									

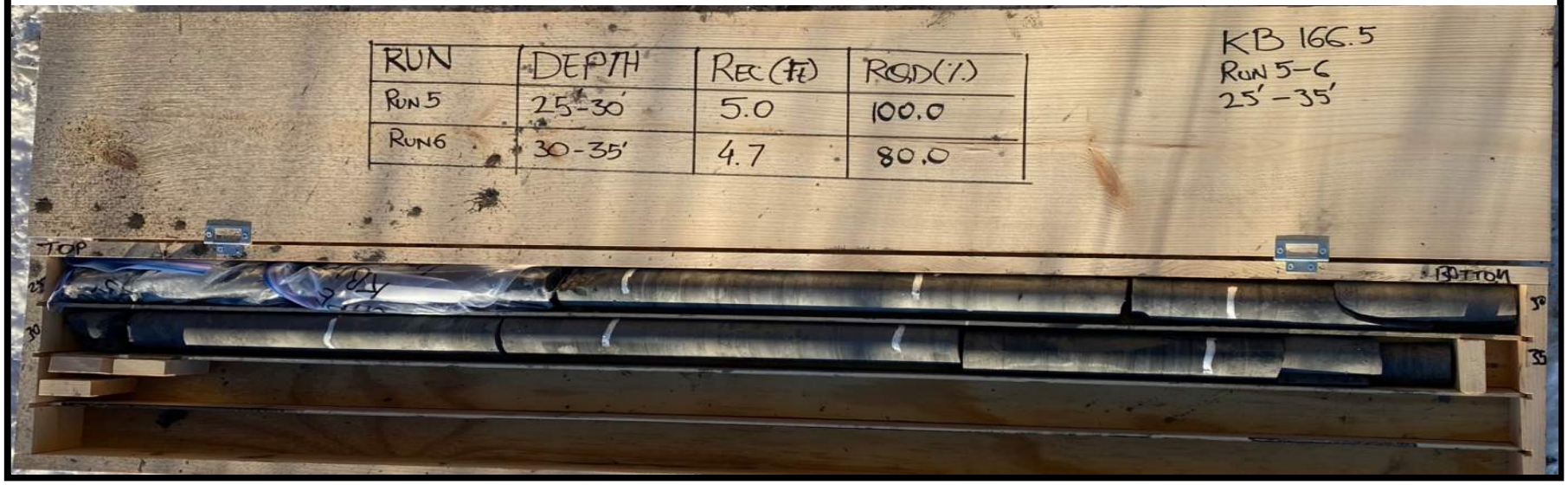
Legend
- ▲ SPT N Value
- ● MC (%)
- — PL & LL (%)
- ⊠ Fines Content (%)

20 40 60 80

Champlain Hudson Power Express
Kiewit Engineering (NY) Corp.

KB-166.5 - Runs 1 through 4

KB-166.5 - Runs 5 through 6



Kiewit

MEMORANDUM

DATE: April 3, 2023

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

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

SUBJECT: Geotechnical Data: Segment 6 – Package 4A – HDD Crossing 59A
Champlain Hudson Power Express Project
Burnt Hills, 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 Burnt Hills, New York. The approximate station for HDD crossing Number 59A is STA 40425+00 (42.8934°N, 73.8880°W).

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

- AECOM, Geotechnical Data Report, Upland Segments, Champlain Hudson Power Express, dated May 28, 2021.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 113.1-177.1, dated March 29, 2013.
- Terracon, Results of Field Exploration, Champlain Hudson Power Express, Ballston – Clifton Park – Glenville, NY, dated June 22, 2022.

Contact us if you have questions or require additional information.

HDD 59A
Borings BM-3C, K-166.8,
B166.9-1, B167.1-1, BM-4
Segment 6 - Design Package 4A

CHPE Segment 6 Package 4A
Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A162.1-1	1502786.734	664476.477	284.0
	B158.87-1	1519228.136	669050.444	288.3
	B159.1-1	1517722.124	668720.464	291.0
	B159.5-1	1516012.300	668217.400	295.8
	B160.3-1	1511903.990	667182.915	294.6
	B160.7-1	1509749.417	666636.945	295.0
	B161.4-1	1506284.600	665799.100	288.0
	B163.3-1	1496630.400	662351.700	280.2
	B164.4-1	1490795.529	661205.362	267.5
	B165.5-1	1485722.400	659432.900	277.6
	B165.8-1	1484324.089	658853.809	275.4
	B166.5-1	1480752.600	656954.600	263.5
	B166.9-1	1479253.700	655902.600	265.4
	B167.1-1	1478553.300	655364.300	261.0
	B168.0-1	1474529.400	653290.100	251.4
	B168.64-1	1471082.866	652655.655	245.2
	B168.86-1	1470035.900	652059.906	231.6
AECOM**	BM-1	1500593.800	663479.000	283.4
	BM-1B	1513675.554	667631.458	293.5
	BM-1C	1508115.700	666263.900	291.9
	BM-1D	1504574.200	665267.500	283.4
	BM-1E	1511220.853	667016.761	294.1
	BM-2	1494386.900	661852.400	271.4
	BM-2A	1498788.900	662752.200	279.1
	BM-2B	1492715.315	661511.300	269.7
	BM-3	1487269.097	659995.860	275.1
	BM-3A	1488755.829	660606.619	270.8
	BM-3B	1482501.900	658059.300	273.6
	BM-3C	1480192.269	656553.384	263.2
	BM-4	1477890.500	654882.600	260.5

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

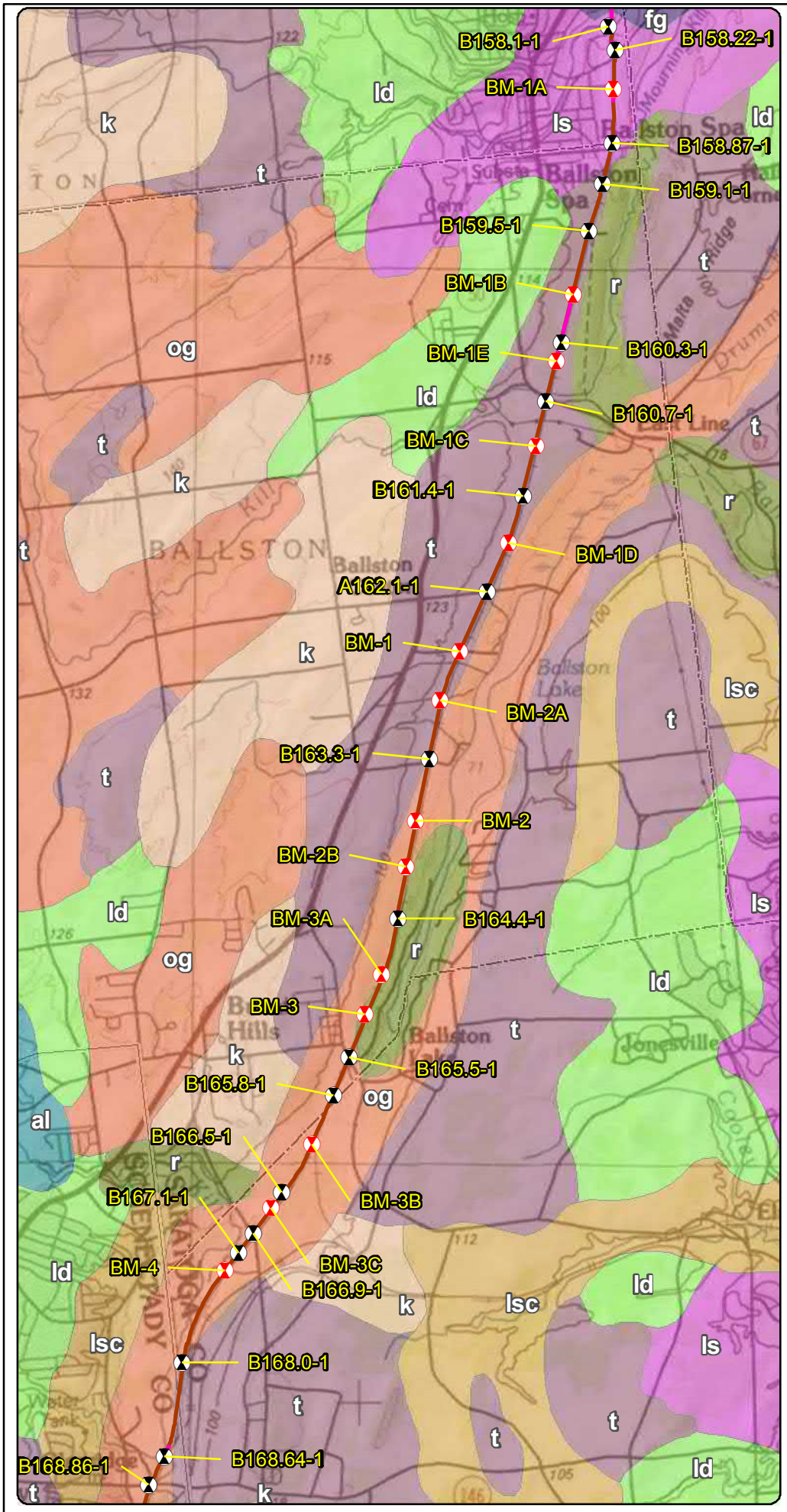
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

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

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

Reference:

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



LEGEND

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

Surficial Geology

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

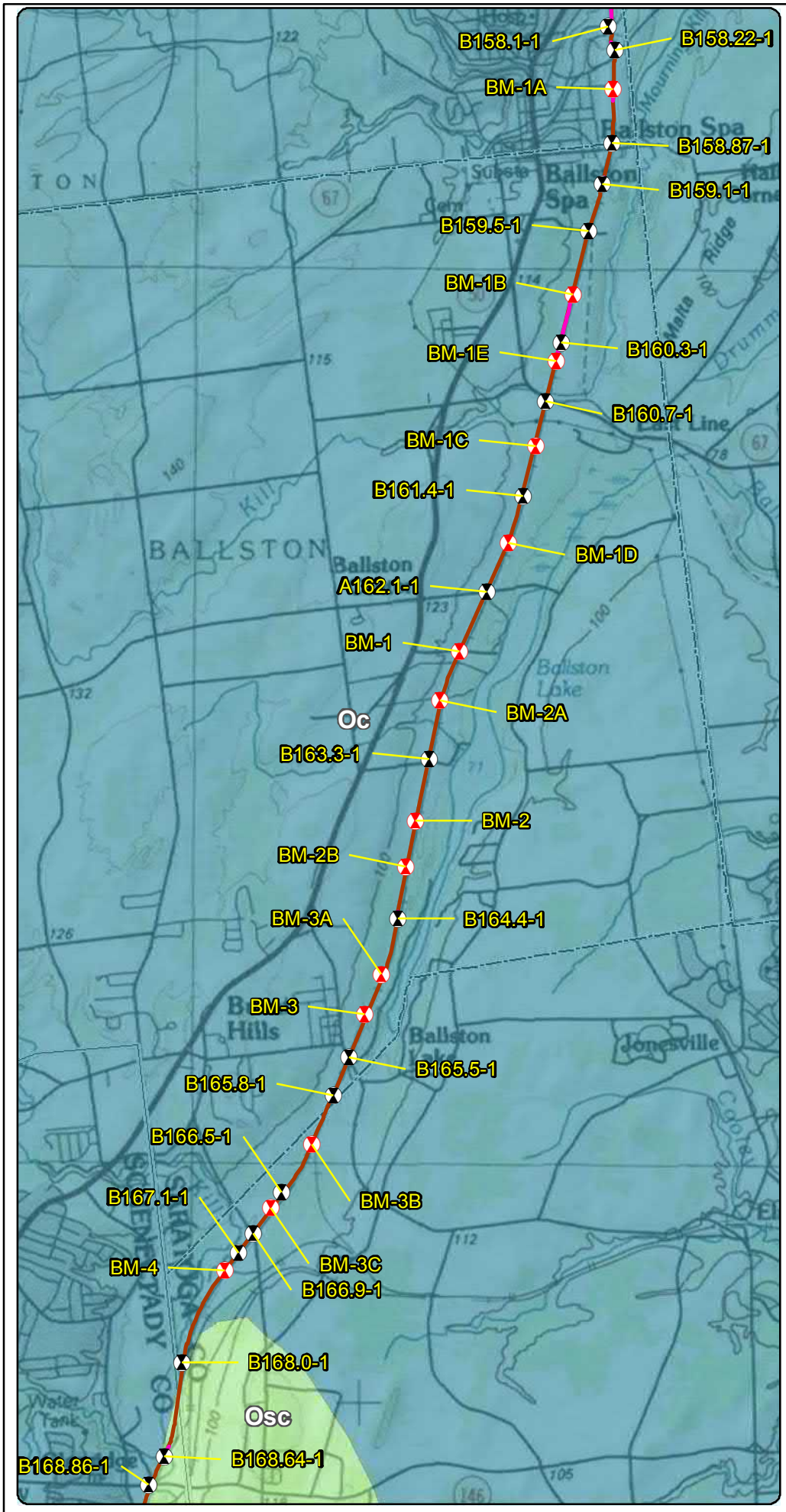
Surficial Geology and Geotechnical Borings Ballston to Mohawk River Figure 3-6

Prepared on 5/5/2021

by: AECOM

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

Y:\Projects\CHPE\\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Ballston_to_Mohawk_Boring_Locations_Surficial_May_2021_Report.mxd



LEGEND

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

Bedrock Geology

- Oc - Canajoharie Shale
- Osc - Schenectady Formation

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Ballston to Mohawk River Figure 4-6

Prepared on 5/5/2021

by: AECOM

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

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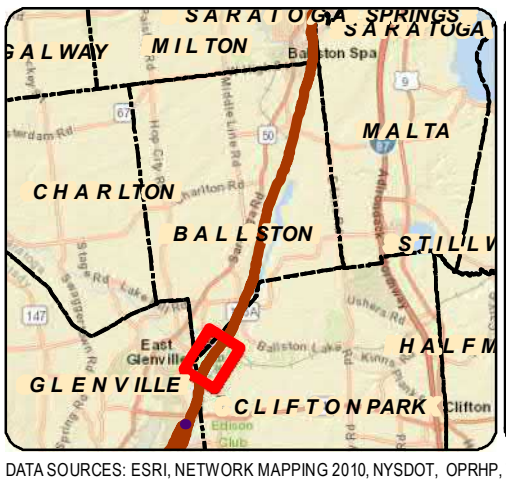
B166.5-1
BM-3C
BALLSTON
Blue Barns Rd
166.8
166.9
B166.9-1
167
Blue Barns Rd
Delaware & Hudson
Springfield Terminal
B167.1-1
Helpinghand Ln
167.2
Rustic Bridge Rd
BM-4
CLIFTON PARK
Red Oak Way
167.3
Rustic Bridge Rd
Turner Park Ln
Blue Barns Rd
167.4
Park Ln
167.5
167.6
Turner Park Rd
Park Rd
Brant Rd
167.7
GLENVILLE
167.8
0
1,000
Feet



LEGEND

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

Parcel Ownership: TOWN NAME

Road Name: Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Ballston to Mohawk River

Figure A-6

Sheet 8 of 9

Prepared by: AECOM 5/19/2021

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Ballston_to_Mohawk_Boring_Locations_Mapset_May_2021_Report.mxd

TEST BORING LOG

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

BORING	**B166.9-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
1.5'	NR	1/15	0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	3.2 '
d	FROM	3.2 '	TO	4.0 '
c_2	FROM	4.0 '	TO	14.0 '

DRILLER	J. MEHALICK
HELPER	M. KERLIN
INSPECTOR	N/A
DATE STARTED	01/15/2013
DATE COMPLETED	01/15/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	7 7 5 4		***BROWN SILTY F/C GRAVEL-SIZED ROCK FRAGMENTS, SM M/C/F SAND (FILL)***	19.4	
	S-2	4 1 50/0.2		4.0		
5				***GRAY MODERATELY WEATHERED, MEDIUM HARD TO SOFT SHALE, VERY CLOSE HORIZONTAL FRACTURING***		
	R-1	REC =96% RQD =26%		7.1		
10				***GRAY MODERATELY WEATHERED, MEDIUM HARD SHALE, CLOSE TO MODERATELY CLOSE HORIZONTAL FRACTURING***		
	R-2	REC =98% RQD =86%		14.0		
15				***END OF BORING AT 14'***		
20						
25						
30						
35						

DRN.	CMP
CKD.	PWK

NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/28/13

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

BORING	**B167.1-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED DRY			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	4.0 '
d	FROM	4.0 '	TO	13.0 '
c_2	FROM	13.0 '	TO	18.0 '

DRILLER	T. FARRELL
HELPER	J. LANGDON
INSPECTOR	C. POPPE
DATE STARTED	03/04/2013
DATE COMPLETED	03/04/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	6 11 9 8		***DARK BROWN SILT, SM F/M SAND, TR-SM F/ GRAVEL, TR GRASS (FILL)*** 2.0		
	S-2	4 2 4 3		***DARK BROWN F/ GRAVEL, SM SILT, SM F/M SAND, TR ORGANICS (FILL)*** 4.0	23.9	
5	S-3	4 3 8 15		***DARK BROWN SILT, TR-SM F/ SAND, TR F/ GRAVEL, TR ORGANICS (FILL)*** 6.0		
	S-4	20 38 50/0.2		***GRAY-BROWN CLAY, TR SILT*** 8.0		
	S-5	28 39 50/0.3			7.0	
10				***GRAY CLAY, TR SILT*** 13.0		
						AUGER REFUSAL
						VERTICAL FRACTURE
15				***DARK GRAY, MODERATELY WEATHERED, MEDIUM HARD SHALE, VERY CLOSE TO CLOSE HORIZONTAL FRACTURING***		
	R-1	REC =92% RQD =48%		18.0		SEVERELY WEATHERED BROKEN SEAM 17.5' TO 17.7'
				END OF BORING AT 18'		
20						
25						
30						
35						

DRN.	CMP
CKD.	PWK

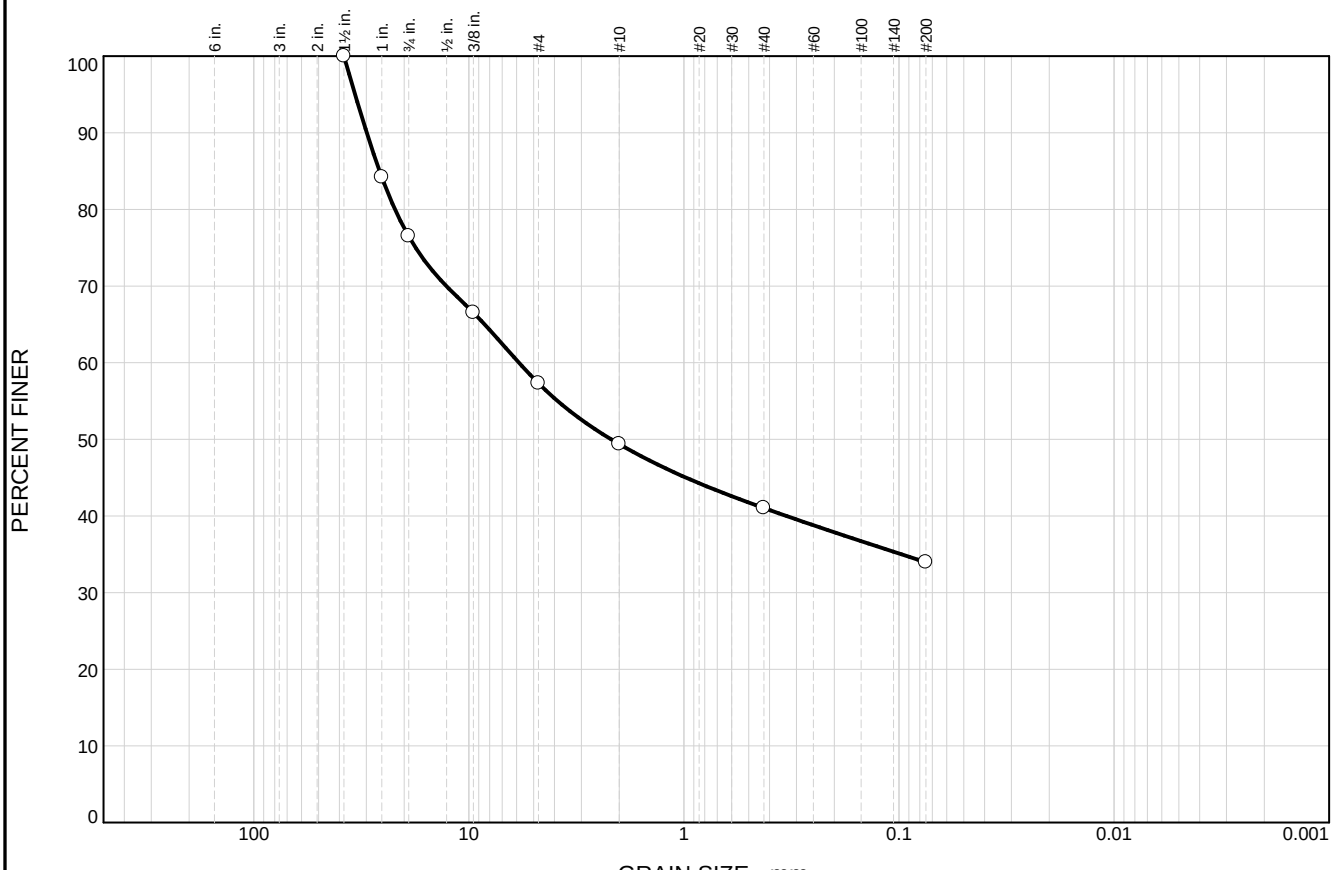
NEW PROJECTS TEST BORING LOG 195651_TDI_CP.GPJ SITE BLAUVELT.GDT 3/27/13

SUMMARY OF LABORATORY TEST DATA

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

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
	R-2	10.0-10.5	-	-	-	-	-	-	-	-	-	-	-	165.3	700	-
B166.5-1	S-2	2.0-4.0	SM	28.0	22.7	49.3		-	-	-	-	-	15.1	-	-	-
	R-1	9.0-9.4	-	-	-	-		-	-	-	-	-	-	166.9	410	-
B166.9-1	S-1	0.0-2.0	GM	42.7	23.3	34.0		-	-	-	-	-	19.4	-	-	-
	S-2	2.0-4.0														
	R-1	8.0-8.4	-	-	-	-		-	-	-	-	-	-	171.6	385	-
	R-2	11.1-11.4	-	-	-	-		-	-	-	-	-	-	168.7	-	-
			-	-	-	-		-	-	-	-	-	-	162.5	-	-
B167.1-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	-	23.9	-	-	19.3
	S-5	8.0-9.3	-	-	-	-	-	-	-	-	-	-	7.0	-	-	-
	R-1	14.9-15.3	-	-	-	-	-	-	-	-	-	-	-	168.5	340	-
B168.0-1	S-2	2.0-4.0	SM	13.5	51.9	34.6		-	-	-	-	-	8.2	-	-	-
B168.64-1	S-4	6.0-8.0	SM	1.1	73.9	25.0		-	-	-	-	-	9.9	-	-	-

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	23.5	19.2	7.9	8.4	7.0	34.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			26.0199	5.8483	2.1793					

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

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

Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B166.9-1 **Depth:** 0.0-4.0 FT **Sample Number:** S-1 & S-2

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

TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 86

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

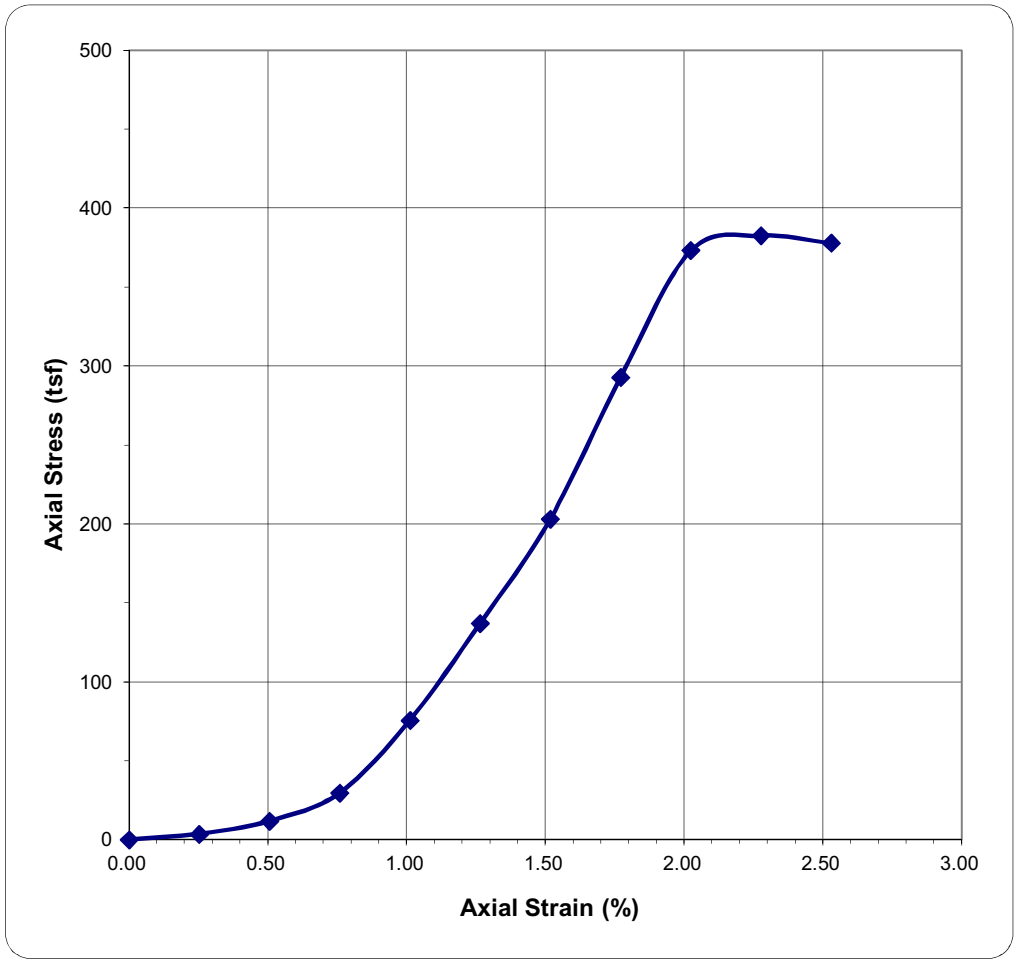
TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name:	TDI				
Project No.:	195651	**Average Sample Diameter (in.):**	1.970	**Sample Description:**	
Boring No.:	B166.9-1	**Cross Sectional Area (sq. in.)**	3.048		GRAY SHALE
Sample No:	R-1	**Average Sample Height (in.):**	3.953		
Depth (ft):	8.0-8.4	**Sample Mass-Dry (g):**	542.6		
Elevation (ft):		**Unit Weight (PCF)**	171.6		

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	150	0.25	4
0.020	500	0.51	12
0.030	1250	0.76	30
0.040	3200	1.01	76
0.050	5800	1.26	137
0.060	8600	1.52	203
0.070	12400	1.77	293
0.080	15800	2.02	373
0.090	16200	2.28	383
0.100	16000	2.53	378



Failure Conditions:

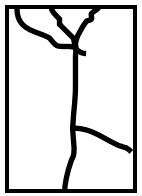


FIGURE: 131

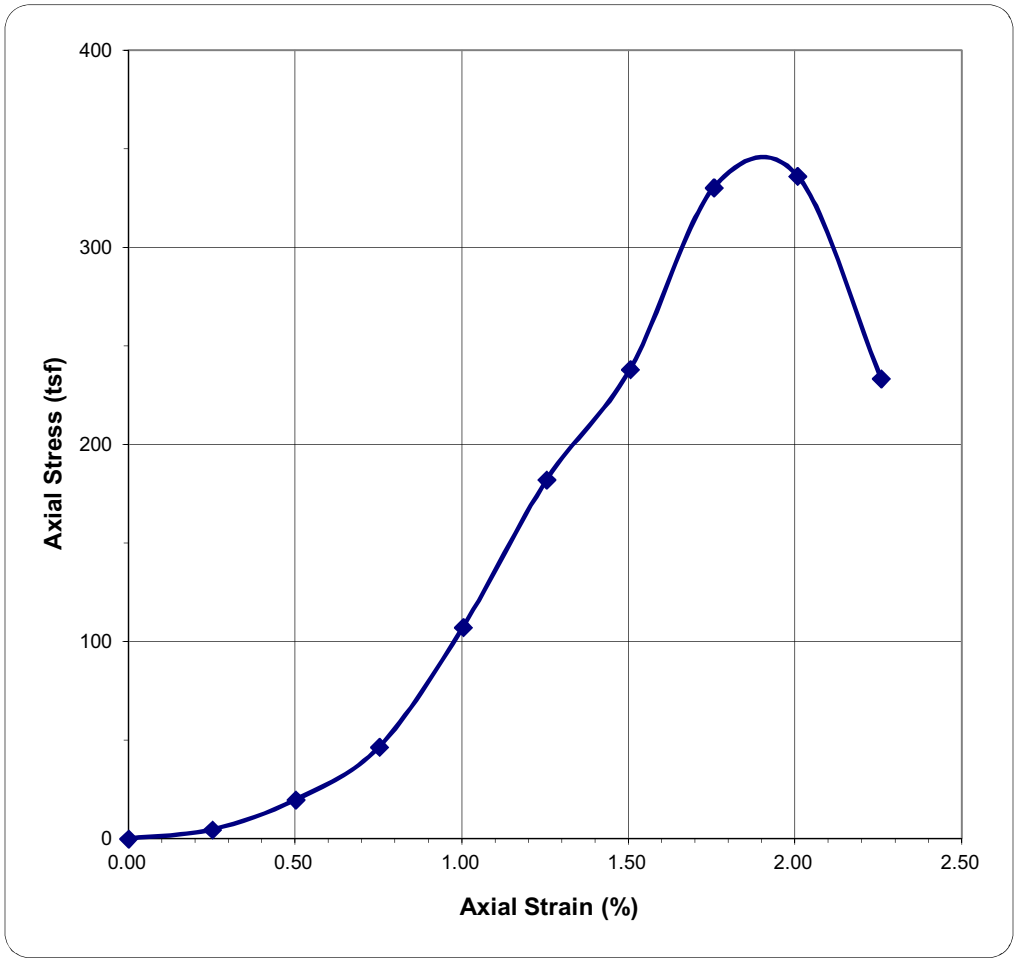
TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name:	TDI				
Project No.:	195651	**Average Sample Diameter (in.):**	1.982	**Sample Description:**	
Boring No.:	B167.1-1	**Cross Sectional Area (sq. in.)**	3.085	DARK GRAY SHALE	
Sample No:	R-1	**Average Sample Height (in.):**	3.985		
Depth (ft):	14.9-15.3	**Sample Mass-Dry (g):**	543.72		
Elevation (ft):		**Unit Weight (PCF)**	168.5		

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	200	0.25	5
0.020	850	0.50	20
0.030	2000	0.75	47
0.040	4600	1.00	107
0.050	7800	1.25	182
0.060	10200	1.51	238
0.070	14150	1.76	330
0.080	14400	2.01	336
0.090	10000	2.26	233



Failure Conditions:

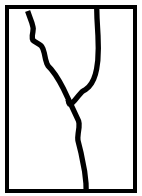


FIGURE: 132

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **BM-3C**
SOILS ENGINEER/GEOLOGIST: Chris French		START DATE: 2/24/21
	BORING LOG	FINISH DATE: 2/24/21
LOCATION: MP - 166.7 (CP Rail)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
Water at 5.5' (inferred)	TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit	NQ	BORING TYPE: SPT/Core
	SIZE I.D.	4"	2.5"	- -	1 7/8"	BORING O.D.: 4.5"/3"
	SIZE O.D.	4.5"	3"	3 7/8"	3"	SURFACE ELEV.:
	HAMMER WT.	140 lbs	140 lbs			LONGITUDE:
	HAMMER FALL	30"	30"			LATITUDE:

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		0'-5'				Hand Cleared					SW	SAND	0': Brown fine-coarse SAND, little subrounded-rounded gravel, little silt, trace cobbles; frozen
1.0													1.5': SAA; medium dense, moist
2.0													
3.0													
		3'-5'	S-1								ML	Clayey SILT	2.9': Brown/light brown clayey SILT, trace fine sand, stiff, moist
4.0													TR-1; (3.0'-5.0')
5.0													
		5'-7'	S-2	24"	17"	9	12	21	35	21			5.0': Gray/brown clayey SILT, trace fine sand, very stiff, moist
6.0													
7.0													
		7'-9'	S-3	5.5"	6"	90/5.5"	-	-	-	-	GP	GRAVEL	7.0':Gray angular GRAVEL, trace fine sand, trace silt; very dense, moist (pulverized rock)
8.0													Split spoon refusal, transition to coring
9.0													Casing set at 8', begin coring at 9'
	3.4	9'-14'	R-1	60"	60"	RQD: 15.5" = 26%						SHALE	9.0': Gray shale, thinly laminated to thinly bedded, heavily jointed, joints parallel with bedding plane (0°-10°), unweathered
10.0													
11.0													TR-2; (11.4'-12.0')
12.0													
13.0													
14.0													
	1.4	14'-19'	R-2	60"	60"	RQD: 27.5" = 46%							14.0': SAA, highly jointed from 14.0'-17.5', unjointed from 19.0': fracture at 80°-85° from 15.5'-17.5'
15.0													
16.0													
17.0													
18.0													
19.0													
	1.8	19.0'-24.0'	R-3	60"	60"	RQD: 52.5" = 88%							19.0': SAA, lightly jointed
20.0													

NOTES:

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

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

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

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

SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE	
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35%	AND=35-50%

BORING CONTRACTOR: ADT	AECOM	SHEET 2 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **BM-3C**
SOILS ENGINEER: Chris French		START DATE: 2/24/21
	BORING LOG	FINISH DATE: 2/24/21
LOCATION: MP - 166.7 (CP Rail)		OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
21.0										
22.0										
23.0										
24.0										
	2.0	24.0'-29.0'	R-4	60"	59.5"	RQD: 58" = 97%				24.0': SAA, lightly jointed
25.0										
										TR-3; (24.7'-25.35')
26.0										
27.0										
28.0										
29.0										
	1.9	29.0'-34.0'	R-5	60"	57.5"	RQD: 53" = 88%				29.0': SAA, lightly jointed
30.0									SHALE	
31.0										
32.0										
33.0										
34.0										
	1.7	34.0'-39.0'	R-6	60"	60"	RQD: 58.5" = 98%				34.0': SAA, very lightly jointed
35.0										
36.0										
37.0										
38.0										
39.0										
	1.9	39.0'-40.3'	R-7	16"	16"	RQD: 15.5" = 97%				39.0': SAA, unjointed
40.0										TR-4; (39.0'-39.6')
										BM-3C terminated at 40.3' then grouted to surface
41.0										
42.0										
43.0										
44.0										
45.0										

NOTES:

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

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

SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE	
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35%	AND=35-50%

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 1
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **BM-4**
SOILS ENGINEER/GEOLOGIST: Chris French	**BORING LOG**	START DATE: 2/17/21
		FINISH DATE: 2/17/21
LOCATION: Rexford, NY (CP Rail) MP-167.50		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
No water observed	TYPE	Flush Joint Steel	California Modified		NQ	BORING TYPE: Core
	SIZE I.D.	4"	2.5"		1 7/8"	BORING O.D.: 3"
	SIZE O.D.	4.5"	3"		3"	SURFACE ELEV.:
	HAMMER WT.	140 lbs	140 lbs			LONGITUDE:
	HAMMER FALL	30"	30"			LATITUDE:

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		0'-2'				Hand Cleared		SP/GP	SAND & GRAVEL	0.0': Brown fine-coarse SAND, some angular gravel, little silt; frozen, dense and moist starting at 0.8'
1.0										1.2': Gray angular GRAVEL, trace fine-coarse sand (weathered rock)
2.0										
3.0										Casing set at 3', begin coring at 3'
	2.9	3'-8'	R-1	60"	60"	RQD: 29" = 48%			SHALE	Gray shale, very thinly bedded to thickly laminated (alternating), heavily jointed from 3.0'-5.0', moderately jointed from 5.0'-8.0', joints at 0°, unweathered
4.0										
5.0										TR-1; (7.25'-7.75')
6.0										
7.0										
8.0										
	2.0	8'-13'	R-2	60"	59"	RQD: 58.5" = 98%				Same as Above (SAA), very lightly jointed
9.0										
10.0										
11.0										
12.0										TR-2; (11.3'-12.0')
13.0										
	2.4	13'-16'	R-3	36"	35.5"	RQD: 35.5" = 99%				SAA, very lightly jointed
14.0										
15.0										
16.0										TR-3; (15.3'-15.95')
17.0										BM-4 terminated at 16', grouted to surface
18.0										
19.0										
20.0										

NOTES:

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

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

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

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

SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE	
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35%	AND=35-50%

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Ballston - Mohawk Segment**

AECOM

Boring No.	Depth (ft.)
BM-3B	5.0 - 16.1

Boring No.	Depth (ft.)
BM-3C	9.0 - 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: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Ballston - Mohawk Segment**

AECOM

Boring No.	Depth (ft.)
BM-3C	29.0 - 40.3

Boring No.	Depth (ft.)
BM-4	3.0 – 16.0

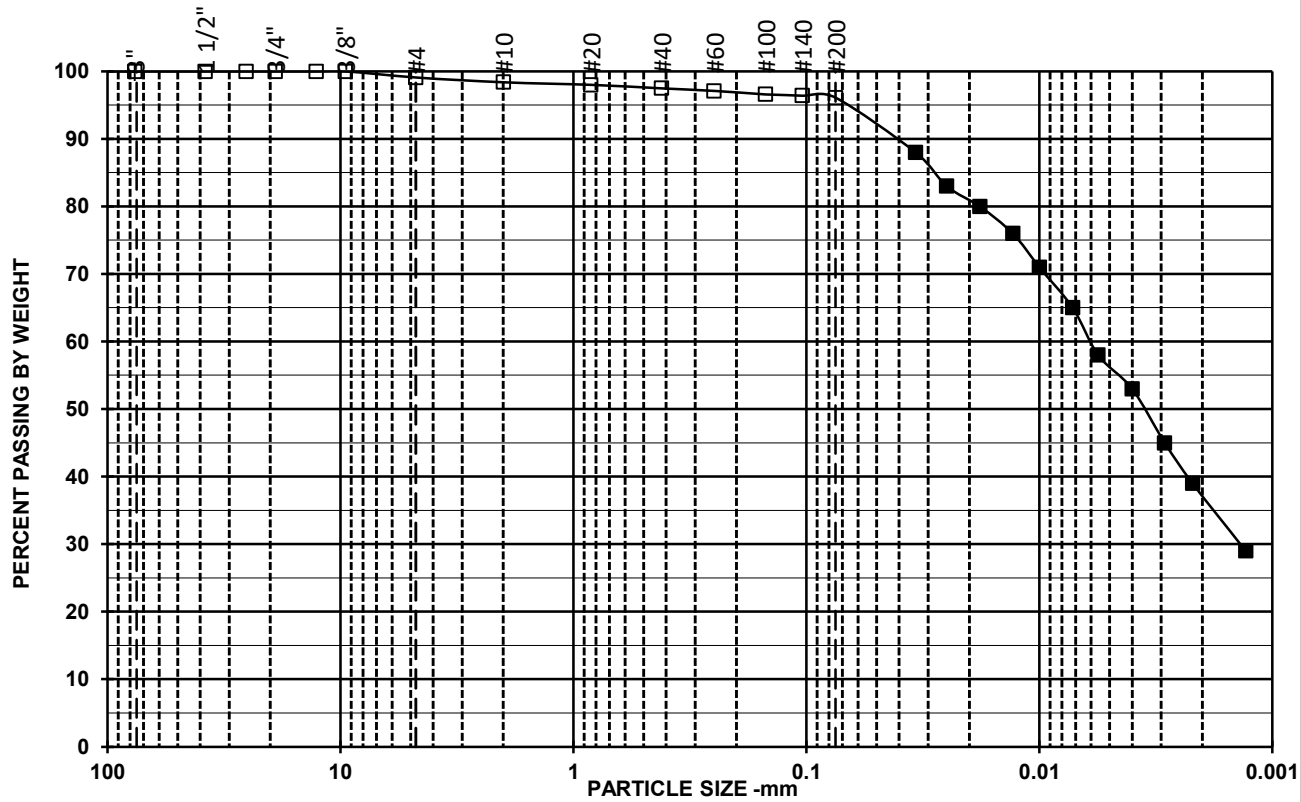
Note: Black foam inserts represent core pieces that were removed for geotechnical and/or thermal resistivity laboratory testing

Aquifer #602201207
CHPE - Ballston-Mohawk River Borings
LABORATORY SOIL TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
BM-1	S-2	5-7	8.6				SC	47	13	
BM-1D	S-3	7-9	14.1				SC	31	9	
BM-2A	S-2	5.5	11.5				GP-GM	8	3	
BM-2A	S-4	9-11	9.9				SC	34	10	
BM-3C	S-2	5-7	23.2				CH	96.1	37	

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

COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



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

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	23.2				CH		Grayish brown, Fat clay	04/06/21
◇								
○								

Symbol	□	◇	○
Boring	BM-3C		
Sample	S-2		
Depth	5-7		
% +3"	0		
% Gravel	0.9		
% SAND	3		
%C SAND	0.7		
%M SAND	0.9		
%F SAND	1.4		
% FINES	96.1		
D_{100} (mm)	9.53		
D_{60} (mm)	0.00602		
D_{30} (mm)	0.0014		
D_{10} (mm)			
Cc			
Cu			

Sieve Size/ID #	Percent Finer Data		
6"	100.0		
4"	100.0		
3"	100.0		
1 1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	99.1		
#10	98.4		
#20	98.0		
#40	97.5		
#60	97.1		
#100	96.6		
#140	96.4		
#200	96.1		
5μ m	56		
2μ m	37		
1μ m	24		

Aquifer #602201207

TerraSense, LLC #7853-21004

CHPE - Ballston-Mohawk River Borings

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

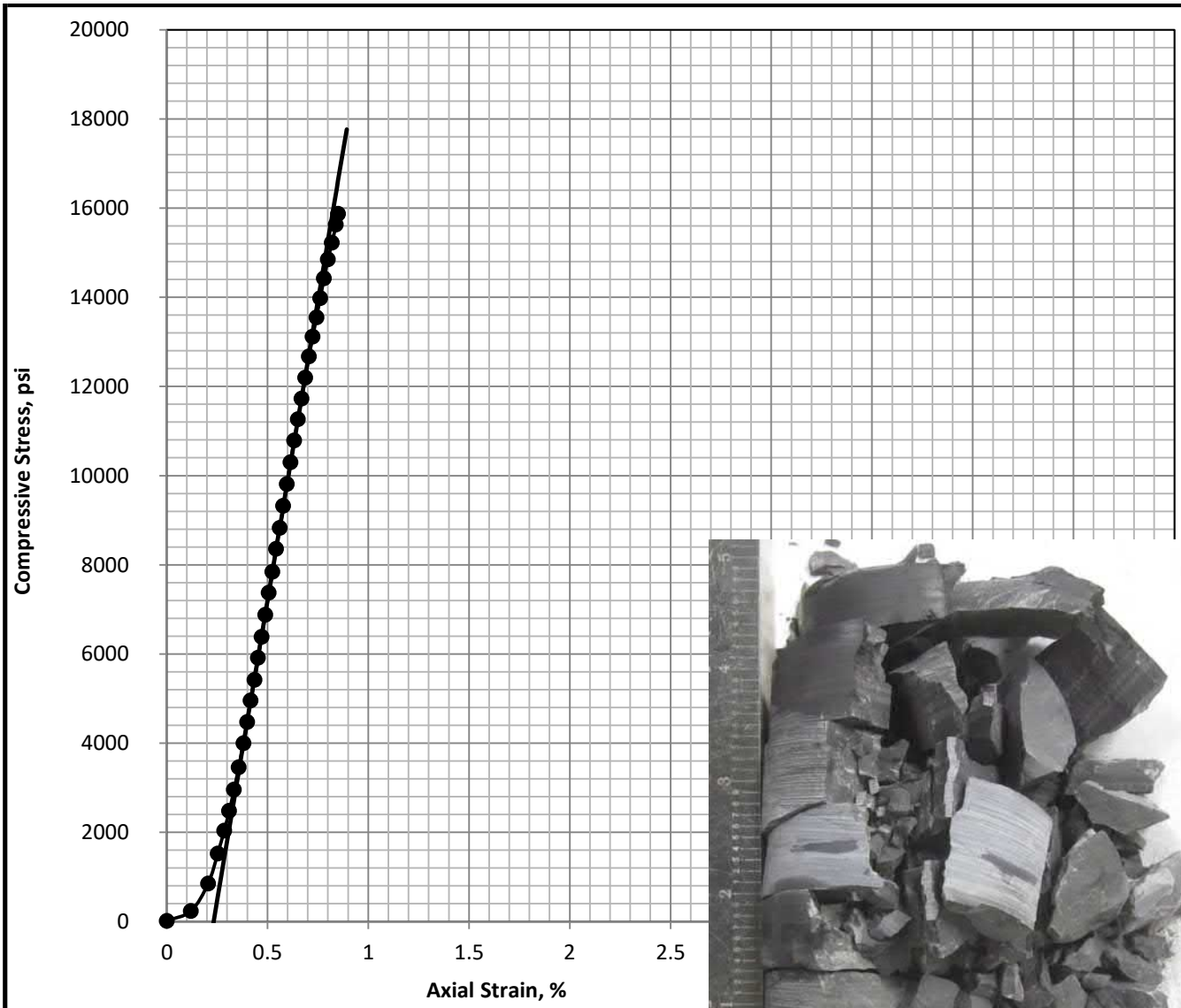
TerraSense Analysis File: GrainSizeV6Rev1a14

Siev4c 4/19/2021

Aquifer
CHPE - Ballston-Mohawk River Borings
SUMMARY OF ROCK TESTING

SAMPLE IDENTIFICATION			STATE PROPERTIES			ENGINEERING PROPERTY TESTS				
Boring	Run	Depth	WATER CONTENT (1) (%)	TOTAL UNIT WGT. (pcf)	DRY UNIT WGT. (pcf)	TEST TYPE (2)	HARDNESS Mohs' HARDNESS (-)	UNCONFINED COMPRESSION TESTS (ASTM D7012) COMPRESSIVE STRENGTH (psi)	AXIAL STRAIN @ FAILURE (%)	ESTIMATED (5) ELASTIC MODULUS (psi)
BM-1B	R-2	20-25				M	3.0			
BM-1B	R-2	27.95-28.35	1.0	171	169	UC		13560	0.63	2E+06
BM-1D	R-1	11-16				M	3-4			
BM-1D	R-1	14-14.4	1.1	170	168	UC		12530	0.53	2E+06
BM-1E	R-3	20-25				M	4.0			
BM-1E	R-3	24.6-25	0.9	169	168	UC		15670	0.56	3E+06
BM-2B	R-1	8-13				M	3.0			
BM-2B	R-1	11.0-11.4	1.3	169	167	UC		11590	0.52	2E+06
BM-2B	R-4	23-28				M	3.0			
BM-2B	R-4	24.45-24.85	1.3	169	167	UC		11750	0.54	2E+06
BM-3	R-1	3-8				M	4.0			
BM-3	R-1	6.3-6.7	1.0	169	167	UC		14200	0.70	2E+06
BM-3	R-4	18-23				M	4.0			
BM-3	R-4	19.65-20.05	1.2	168	166	UC		14180	0.78	2E+06
BM-3A	R-3	8-13				M	3.0			
BM-3A	R-3	9-9.4	1.2	169	167	UC		13030	0.66	2E+06
BM-3A	R-5	18.1-23.1				M	3-4			
BM-3A	R-5	19.1-19.5	1.4	168	166	UC		12010	0.68	2E+06
BM-3B	R-2	10-15				M	4.0			
BM-3B	R-2	12.2-12.6	0.7	169	168	UC		16540	0.42	4E+06
BM-3C	R-2	14-19				M	4-5			
BM-3C	R-2	17.65-18.05	1.0	170	168	UC		15870	0.62	3E+06
BM-3C	R-4	24-29				M	3.0			
BM-3C	R-4	25.5-25.9	1.0	168	167	UC		14750	0.63	2E+06
BM-4	R-1	3-8				M	3.0			
BM-4	R-1	5.35-5.75	1.2	170	168	UC		12870	0.59	2E+06
BM-4	R-2	8-13				M	3.0			
BM-4	R-2	8.25-8.65	1.2	169	167	UC		6660	0.43	2E+06

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



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
1.03	170	168	4.417	1.972

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)
0.12	0.62	15870	3E+06

Test by: DM
Test Date: Apr-05-21
Reviewed by: GET

Aquifer	**CHPE - Ballston-Mohawk River Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21004		**Boring: BM-3C Run: R-2 Depth 17.65-18.05 ft.**

Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.99	168	167	4.746	1.974

Specimen meets ASTM D4543 shape tolerances

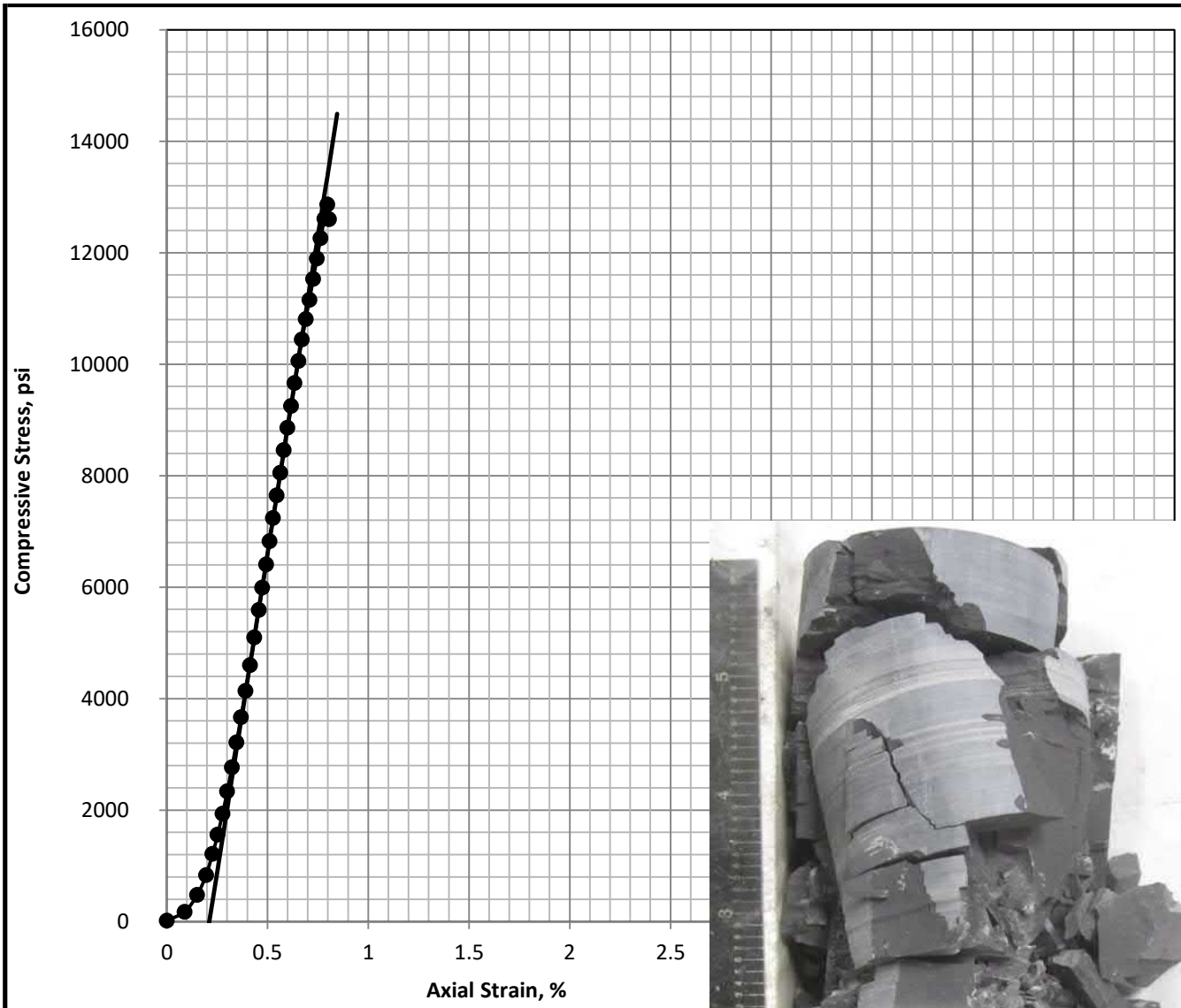
FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.12	0.63	14750	2E+06

Test by: DM
Test Date: Apr-05-21
Reviewed by: GET

Aquifer	**CHPE - Ballston-Mohawk River Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21004		**Boring: BM-3C Run: R-4 Depth 25.5-25.9 ft.**



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
1.19	170	168	4.406	1.970

Specimen meets ASTM D4543 shape tolerances

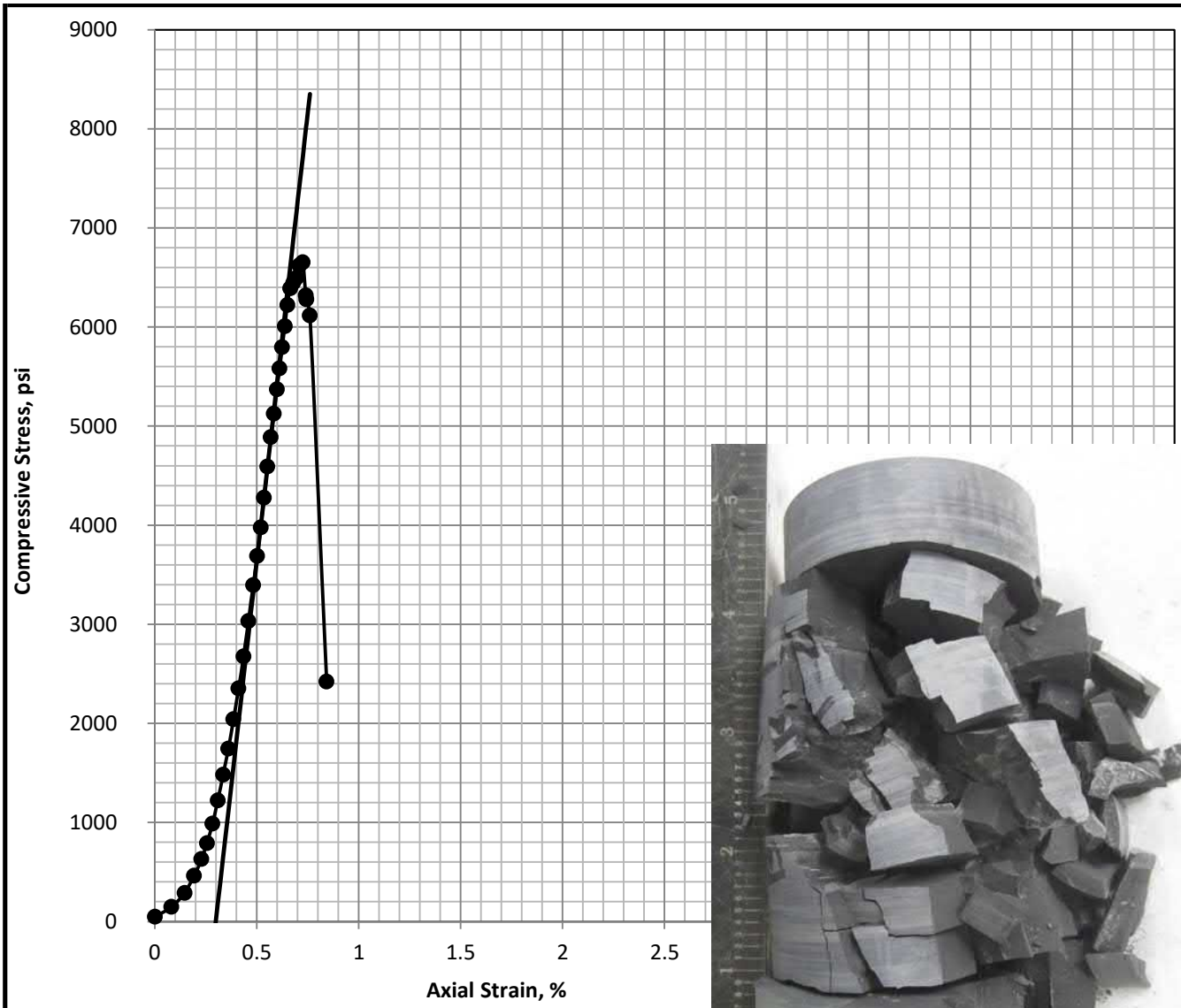
FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.12	0.59	12870	2E+06

Test by: DM
Test Date: Apr-02-21
Reviewed by: GET

Aquifer	**CHPE - Ballston-Mohawk River Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21004		**Boring: BM-4 Run: R-1 Depth 5.35-5.75 ft.**



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
1.17	169	167	4.494	1.971

Specimen meets ASTM D4543 shape tolerances

FAILURE PHOTO

Test Summary

Strain Rate (%/min)	Corrected Strain Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.13	0.43	6660	2E+06

Test by: DM
Test Date: Apr-02-21
Reviewed by: GET

Aquifer	**CHPE - Ballston-Mohawk River Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21004		**Boring: BM-4 Run: R-2 Depth 8.25-8.65 ft.**

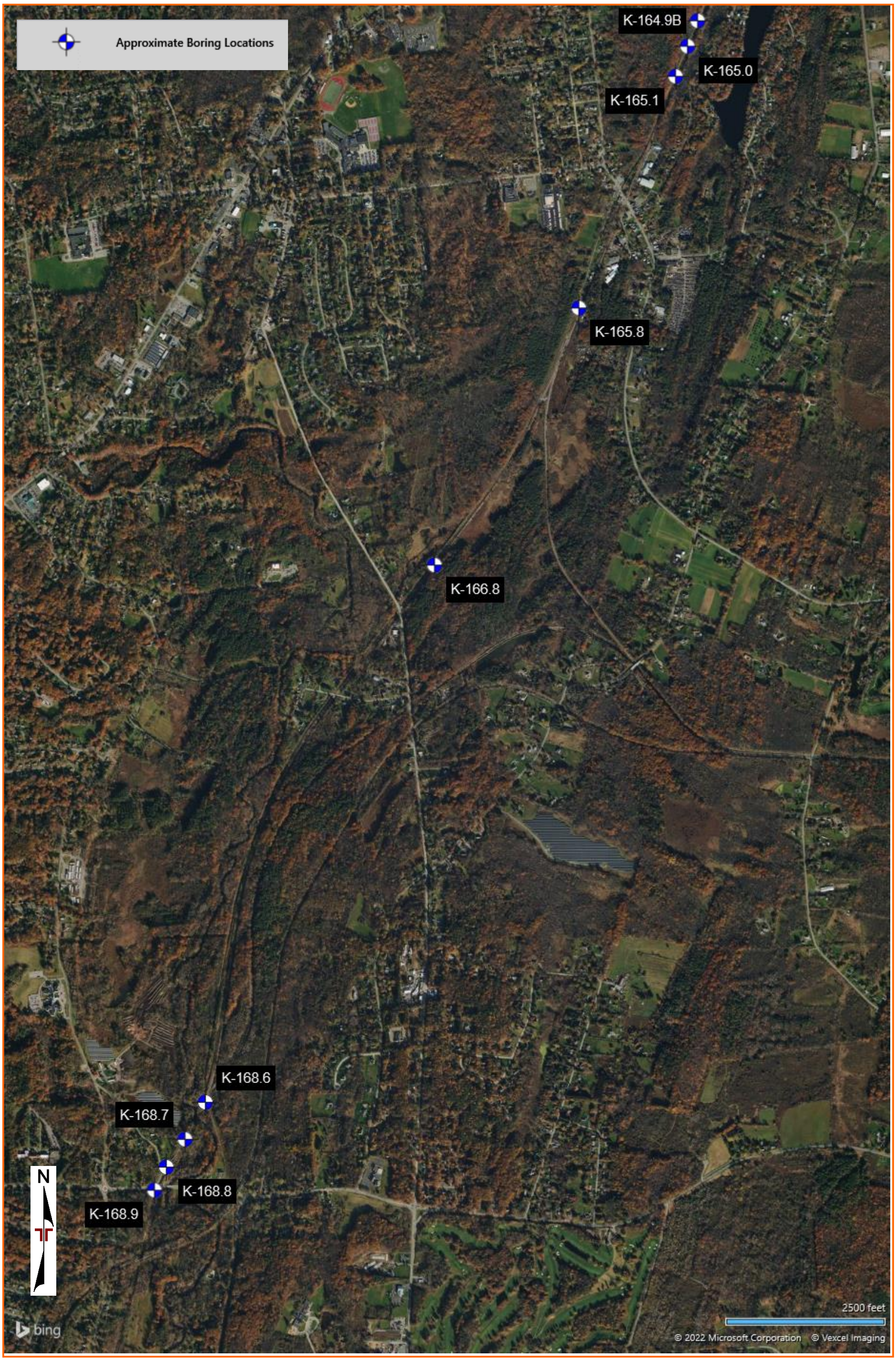


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. K-166.8

PROJECT: Champlain-Hudson Power Express Design Package 4a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings Ballston - Clifton Park - Glenville, NY

LOCATION See Exploration Plan

Latitude: 42.8940° Longitude: -73.8869°

Surface Elev.: 265.06 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (In.)	FIELD TEST RESULTS
0.5	264.5	**BALLAST**		
1.0	264	**FILL - SILTY SAND WITH GRAVEL**, black, medium dense	6	1-3-12-17 N=15
		WEATHERED ROCK, gray, very dense		20-50/5"
5.0	260	**SHALE**, slightly weathered, very close to moderate fractured, fair RQD, gray		REC = 91% RQD = 70%
10.0	255	**SHALE**, slightly weathered, close to moderate fractured, good RQD, gray		REC = 88% RQD = 86%
15.0	250	**SHALE**, slightly weathered, close to moderate fractured, good RQD, gray		REC = 88% RQD = 81%
20.0	245	***Boring Terminated at 20 Feet***		

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

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

Hammer Type: Automatic

Core barrel stuck. Boring terminated at 20 feet per Jaren with Kiewit

Advancement Method:
4 1/4 ID HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by Kiewit

Notes:

Logged by JCH
Hammer Efficiency Summary:
Energy Transfer Ratio: 84.7% +/-5.0%
Hammer Efficiency Correction (CE):1.41

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to coring

Terracon
30 Corporate Cir Ste 201
Albany, NY

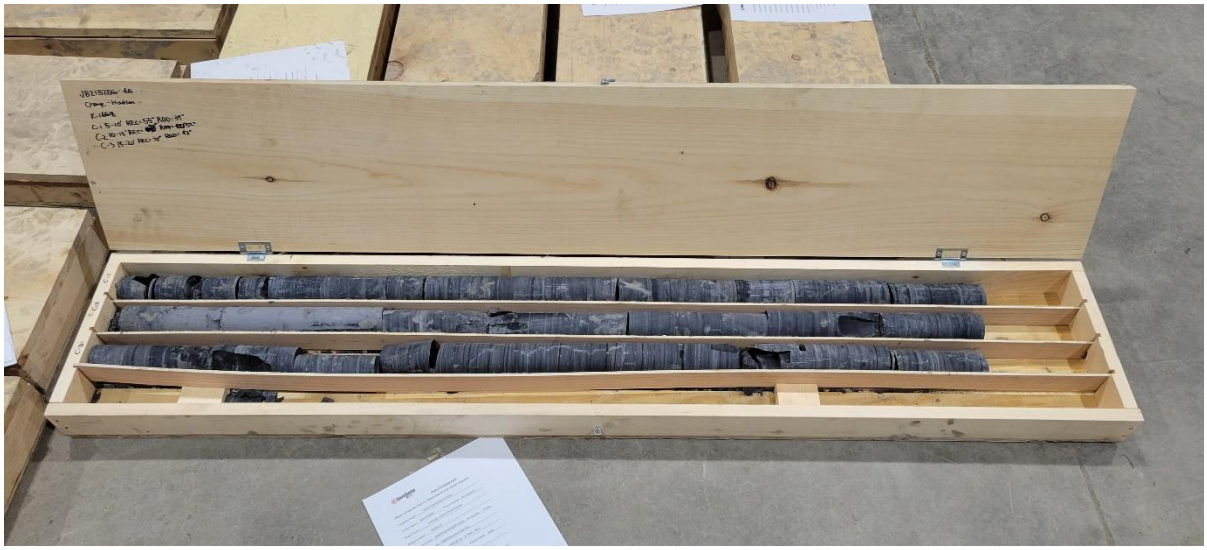
Boring Started: 04-13-2022 | Boring Completed: 04-14-2022

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

Project No.: JB215256A

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256A CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/20/22

Rock Core – Boring K-165.8 (Runs 4-6)



Rock Core – Boring K-166.8

Kiewit

MEMORANDUM

DATE: June 9, 2023

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

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

SUBJECT: Geotechnical Data: Segment 6 – Package 4A – HDD Crossing 59B
Champlain Hudson Power Express Project
Burnt Hills, New York

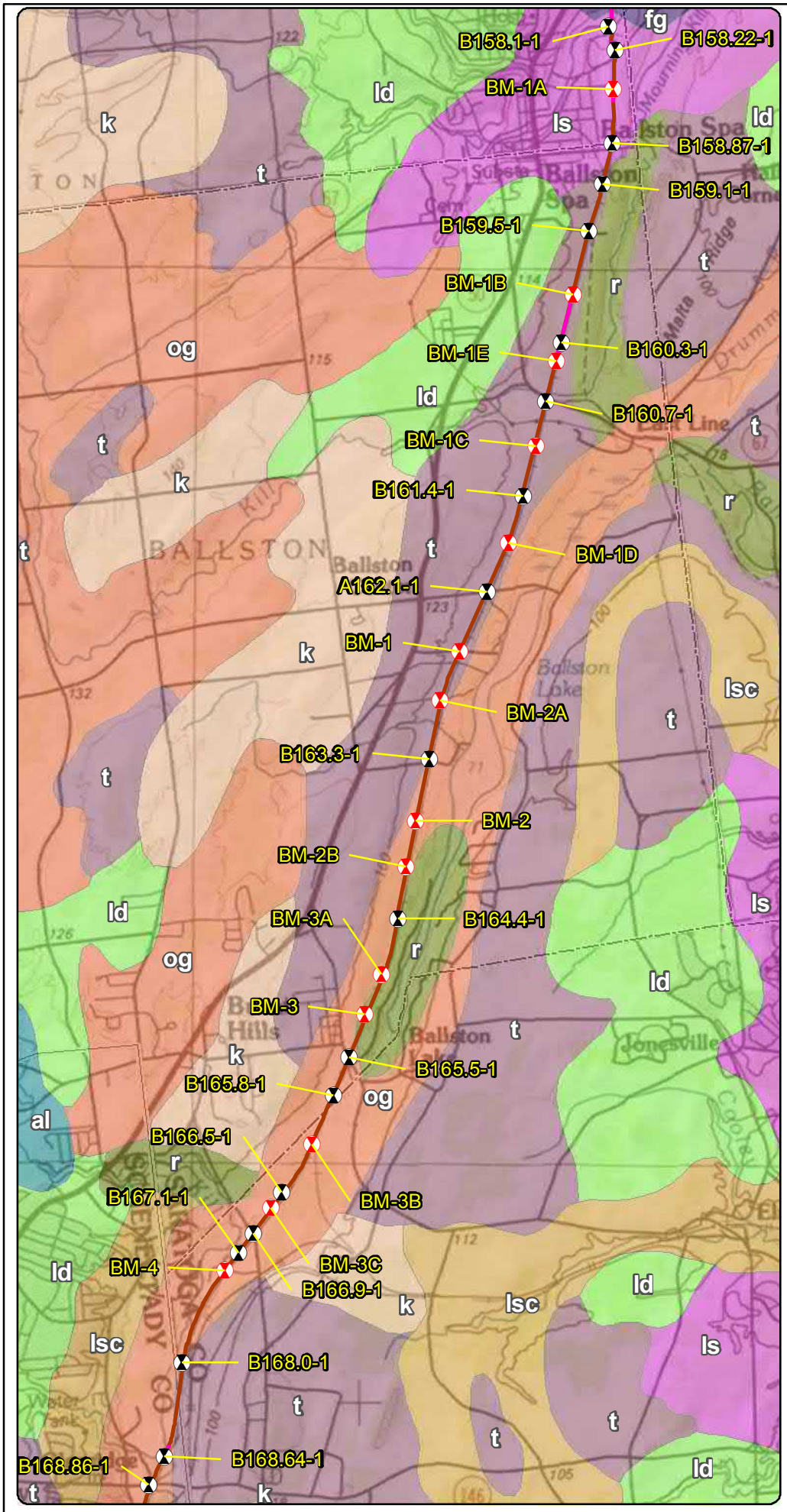
Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located in Burnt Hills, New York. The approximate station for HDD crossing Number 59B is STA 40490+00 (42.8779°N, 73.8985°W).

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

- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Packages 3, 4A and 4B Rev 1, Fort Edward to Schenectady, NY, dated May 31, 2023.

Contact us if you have questions or require additional information.

HDD 59B
Borings KB-168.1, KB-168.2
Segment 6 - Design Package 4A



LEGEND

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

Surficial Geology

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings Ballston to Mohawk River Figure 3-6

Prepared on 5/5/2021

by: AECOM

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

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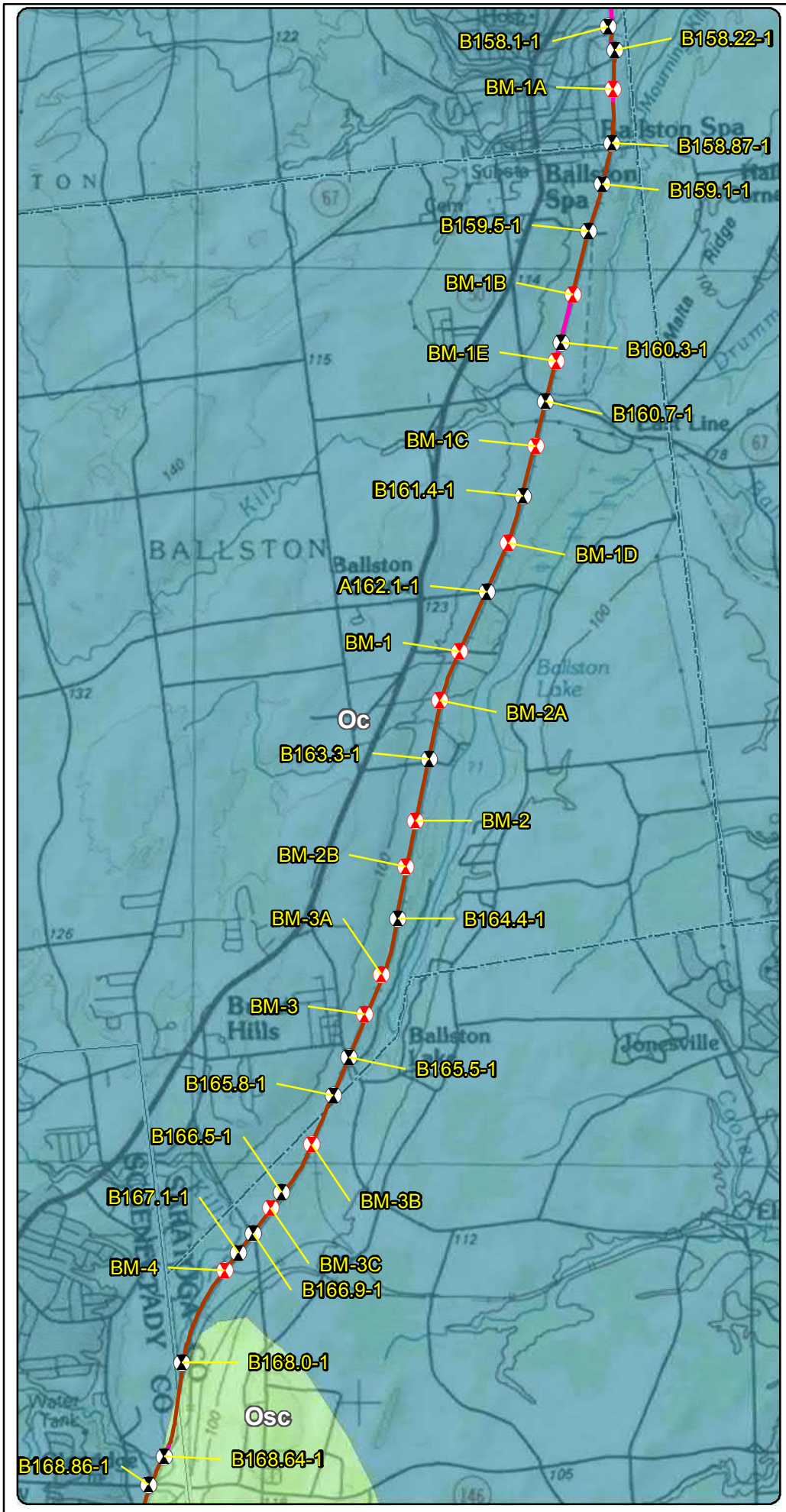


LEGEND

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

Bedrock Geology

- Oc - Canajoharie Shale
- Osc - Schenectady Formation

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Ballston to Mohawk River Figure 4-6

Prepared on 5/5/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Ballston_to_Mohawk_Boring_Locations_Bedrock_May_2021_Report.mxd

SITE LOCATION

Packages 3, 4A and 4B ■ Fort Edward to Schenectady, NY
May 31, 2023 ■ Terracon Project No. JB215256J

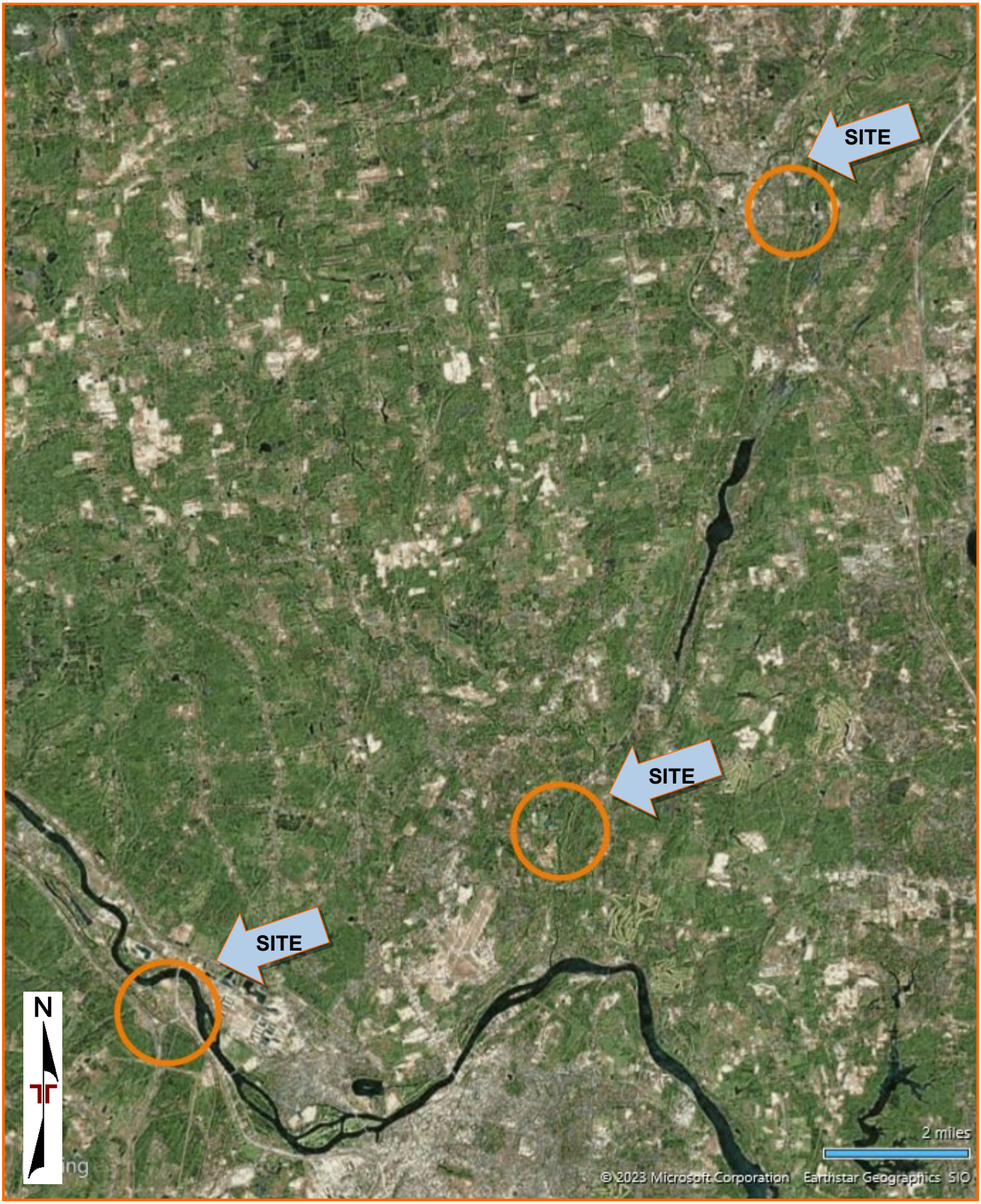


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: BURNT HILLS, NY (1/1/1980).

EXPLORATION PLAN

Packages 3, 4A and 4B ■ Fort Edward to Schenectady, NY

May 31, 2023 ■ Terracon Project No. JB215256J

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. KB-168.1

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8783° Longitude: -73.8990°

Surface Elev.: 249.831 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
0.3	249.5	**TOPSOIL**						
		SILTY SAND (SM), brown, loose to dense			12	2-3-3-4 N=6		
					12	6-6-9-12 N=15	18.1	22
			5		20	8-15-21-50/3" N=36		
5.8	244.1	**WEATHERED ROCK**, gray, very dense						
10.0	239.8	**SHALE**, weathered, close to moderate fractured, fair RQD, gray	10			REC=90% RQD=68%		
15.0	234.8	**SHALE**, slightly weathered, very close to moderate fractured, fair RQD, gray	15			REC=100% RQD=70%		
20.0	229.8	**SHALE**, slightly weathered, very close to wide fractured, fair RQD, gray	20			REC=91% RQD=52%		
25.0	224.8		25					

ATTERBERG LIMITS: LL-PL-PI

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

Hammer Type: Automatic

Advancement Method:
0-10' 4" casing
10-50 NX Core Barrel

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:
Logged by DOL

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 04-25-2023
Boring Completed: 04-25-2023
Drill Rig: Diedrich D-50
Driller: S. Morey
Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 5/31/23

BORING LOG NO. KB-168.1

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8783° Longitude: -73.8990°

Surface Elev.: 249.831 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	FIELD TEST RESULTS
		SHALE, slightly weathered, close to wide fractured, excellent RQD, gray	REC=100% RQD=93%
30.0	219.8	**SHALE**, slightly weathered, close to moderate fractured, fair RQD, gray	REC=91% RQD=73%
35.0	214.8	**SHALE**, slightly weathered, very close to moderate fractured, good RQD, gray	REC=98% RQD=90%
40.0	209.8	**SHALE**, slightly weathered, close to moderate fractured, excellent RQD, gray	REC=98% RQD=96%
45.0	204.8	**SHALE**, slightly weathered, moderate fractured, excellent RQD, gray	REC=100% RQD=100%
50.0	199.8	***Boring Terminated at 50 Feet***	

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

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

Hammer Type: Automatic

Advancement Method:
0-10' 4" casing
10-50 NX Core Barrel

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:
Logged by DOL

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 04-25-2023 | Boring Completed: 04-25-2023
Drill Rig: Diedrich D-50 | Driller: S. Morey
Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 5/31/23

BORING LOG NO. KB-168.2

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8757° Longitude: -73.8996°

Surface Elev.: 241.116 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
		SANDY TOPSOIL, organics noted, dark brown	3	2-4-3-3 N=7		
		Poor recovery	1	3-2-4-5 N=6		
4.0	237.1	**SANDY SILT (ML)**, trace gravel, brown, very stiff to hard	24	4-8-10-16 N=18	14.7	52
			24	9-15-20-34 N=35		
10.0	231.1		10	22-25-32-39 N=57		
		WEATHERED SHALE, gray, very dense		50/2"		
15.0	226.1	**SHALE**, weathered, close to moderate fractured, good RQD, gray		REC=87% RQD=80%		
20.0	221.1	**SHALE**, slightly weathered, very close to moderate fractured, good RQD, gray		REC=100% RQD=88%		
25.0	216.1					

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

Hammer Type: Automatic

Advancement Method:
0-10' 4" casing
10'-15' Mud rotary
15'-50' NX Core Barrel

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:
Logged by DOL

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 04-24-2023
Boring Completed: 04-24-2023
Drill Rig: Diedrich D-50
Driller: S. Morey
Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 5/31/23

BORING LOG NO. KB-168.2

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8757° Longitude: -73.8996°

Surface Elev.: 241.116 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	FIELD TEST RESULTS
		SHALE, slightly weathered, very close to wide fractured, excellent RQD, gray	REC=98% RQD=93%
30.0	211.1		
		SHALE, slightly weathered, very close to moderate fractured, excellent RQD, gray	REC=100% RQD=93%
35.0	206.1		
		SHALE, slightly weathered, close to wide fractured, fair RQD, gray	REC=60% RQD=60%
40.0	201.1		
		SHALE, slightly weathered, close to moderate fractured, fair RQD, gray	REC=100% RQD=58%
45.0	196.1		
		SHALE, slightly weathered, close to moderate fractured, good RQD, gray	REC=100% RQD=80%
50.0	191.1		
		Boring Terminated at 50 Feet	

DEPTH (Ft.): 30, 35, 40, 45, 50

WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

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

Hammer Type: Automatic

Advancement Method:
0-10' 4" casing
10'-15' Mud rotary
15'-50' NX Core Barrel

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:
Logged by DOL

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 04-24-2023 | Boring Completed: 04-24-2023
Drill Rig: Diedrich D-50 | Driller: S. Morey
Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 5/31/23

Summary of Laboratory Results

BORING ID	Depth (Ft.)	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Organic Content (%)
KB-149.9B	4-6	13.7				
KB-149.9B	25-27	28.1				
KB-149.9B	50-52	25.6				
KB-149.9B	70-72	33.8	37	22	15	
KB-168.1	2-4	18.1				
KB-168.2	4-6	14.7				1.2
KB-169.0-6.6A	65-67	11.5				
KB-169.0-6.6A	75-77	12.0				
KB-169.0-6.6A	90-92	21.2				
KB-169.0-6.7	5-7	9.3				
KB-169.0-6.7	30-32	12.3				
KB-169.0-6.8	2-3.9	14.8				

PROJECT: Phase 4 Borings

SITE: Champlain to Hudson HDD Crossings

Terracon
30 Corporate Cir Ste 201
Albany, NY

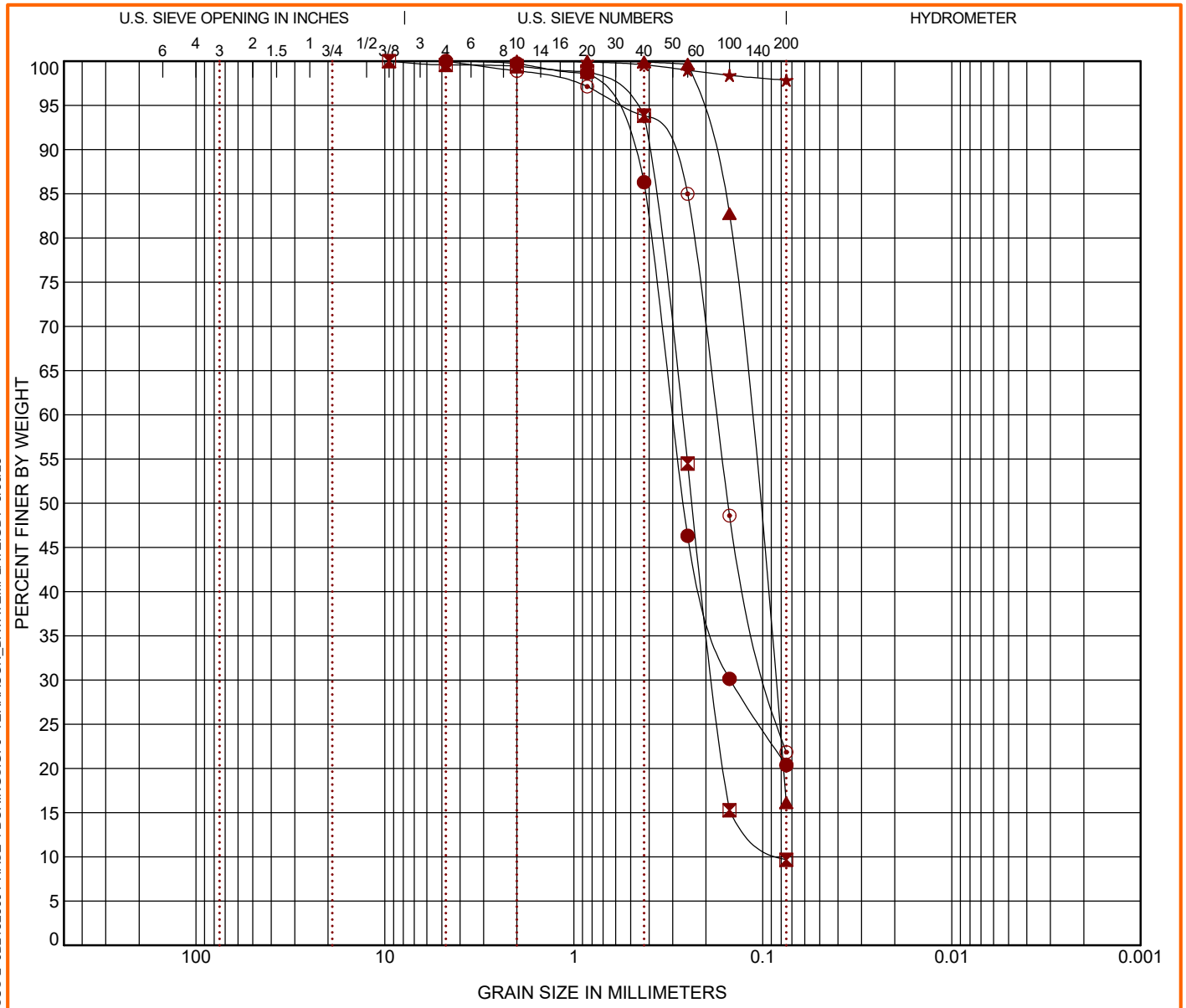
PROJECT NUMBER: JB215256J

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

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 5/31/23

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-149.9B	4 - 6	SILTY SAND (SM)	13.7					
⊠	KB-149.9B	25 - 27	POORLY GRADED SAND with SILT (SP-SM)	28.1				1.57	3.45
▲	KB-149.9B	50 - 52	SILTY SAND (SM)	25.6					
★	KB-149.9B	70 - 72	LEAN CLAY (CL)	33.8	37	22	15		
⊙	KB-168.1	2 - 4	SILTY SAND (SM)	18.1					

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-149.9B	4 - 6	4.75	0.3	0.149		0.0	0.0	79.6		20.4	
⊠	KB-149.9B	25 - 27	9.5	0.269	0.182	0.078	0.0	0.4	89.9		9.7	
▲	KB-149.9B	50 - 52	0.85	0.118	0.087		0.0	0.0	83.9		16.1	
★	KB-149.9B	70 - 72	2				0.0	0.0	2.1		97.9	
⊙	KB-168.1	2 - 4	4.75	0.176	0.093		0.0	0.0	78.2		21.8	

PROJECT: Phase 4 Borings

PROJECT NUMBER: JB215256J

SITE: Champlain to Hudson HDD Crossings

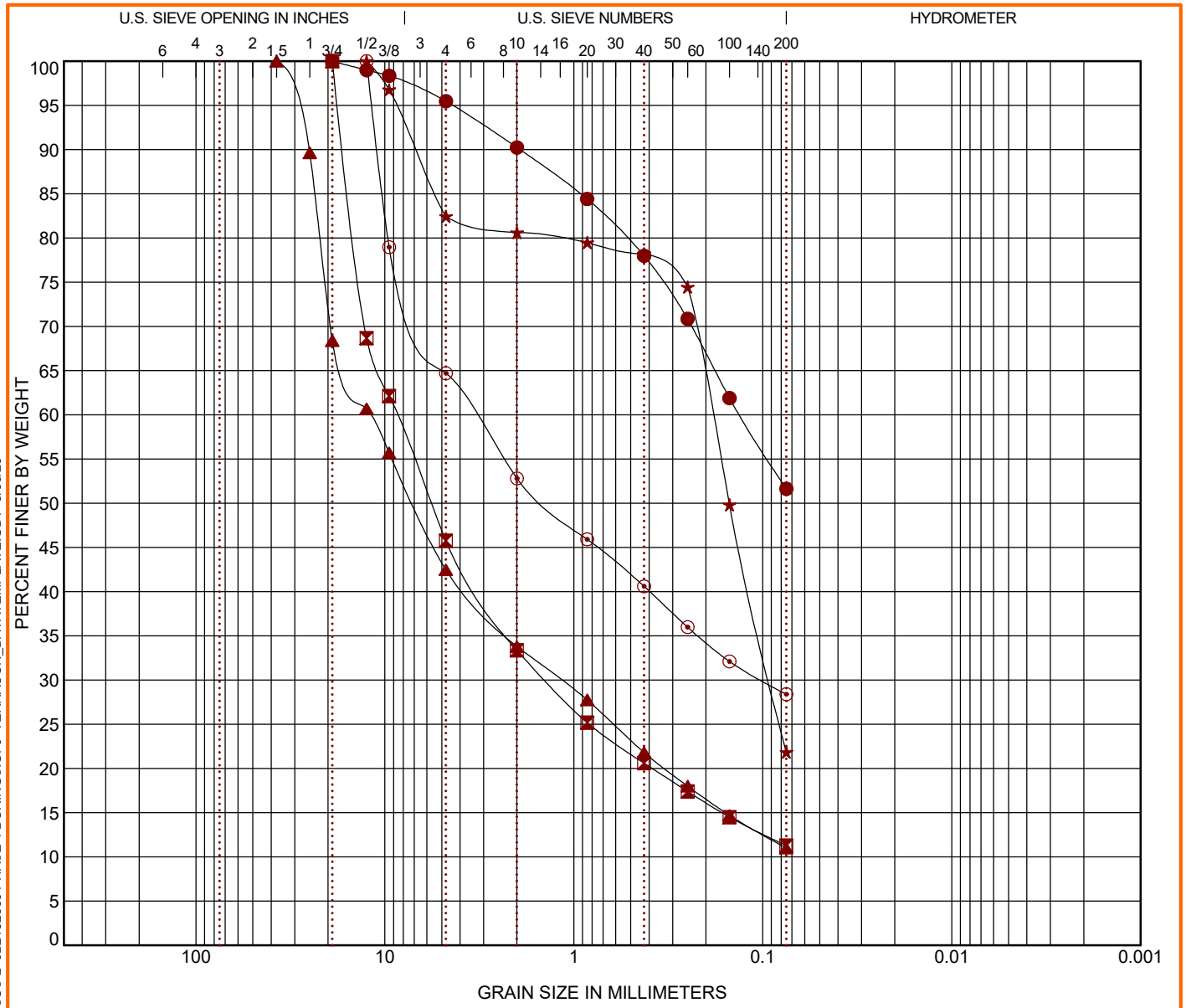
Terracon
30 Corporate Cir Ste 201
Albany, NY

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

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 5/30/23

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-168.2	4 - 6	SANDY SILT (ML)	14.7					
⊠	KB-169.0-6.6A	65 - 67	POORLY GRADED GRAVEL with SAND and SILT (GP-GM)	11.5				3.98	151.79
▲	KB-169.0-6.6A	75 - 77	WELL GRADED GRAVEL with SAND and SILT (GP-GM)	12.0				1.82	193.16
★	KB-169.0-6.6A	90 - 92	SILTY SAND with GRAVEL (SM)	21.2					
⊙	KB-169.0-6.7	5 - 7	SILTY SAND with GRAVEL (SM)	9.3					

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-168.2	4 - 6	19	0.132			0.0	4.5	43.8		51.6	
⊠	KB-169.0-6.6A	65 - 67	19	8.687	1.407		0.0	54.3	34.5		11.3	
▲	KB-169.0-6.6A	75 - 77	37.5	12.038	1.168		0.0	57.5	31.5		11.0	
★	KB-169.0-6.6A	90 - 92	12.5	0.185	0.092		0.0	17.6	60.6		21.8	
⊙	KB-169.0-6.7	5 - 7	12.5	3.376	0.101		0.0	35.3	36.3		28.4	

PROJECT: Phase 4 Borings

PROJECT NUMBER: JB215256J

SITE: Champlain to Hudson HDD Crossings

Terracon
30 Corporate Cir Ste 201
Albany, NY

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

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 5/30/23

PHOTOGRAPHY LOG

Rock Core – Boring KB-158.8

Rock Core -Boring KB-168.1 (Runs 1 to 4)

Rock Core -Boring KB-168.1 (Runs 5 to 8)

Rock Core -Boring KB-168.2 (Runs 1 to 4)

Rock Core -Boring KB-168.2 (Runs 5 to 8)

Rock Cores - Boring KB-169.0-6.7

Kiewit

MEMORANDUM

DATE: January 19, 2023

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

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

SUBJECT: Geotechnical Data: Segment 6 – Package 4A – HDD Crossing 60 – Revision 1
Champlain Hudson Power Express Project
East Glenville, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located in East Glenville, New York. The approximate station for the start of HDD crossing Number 60 is STA 40505+00 (42.8720°N, 73.9002°W).

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

- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 113.1-177.1, dated March 29, 2013.
- Terracon, Results of Field Exploration, Champlain Hudson Power Express, Ballston – Clifton Park – Glenville, NY, dated June 22, 2022

Contact us if you have questions or require additional information.

HDD 60
Borings K-168.6, B168.64-1,
K-168.7
Segment 6 - Design Package 4A

CHPE Segment 6 Package 4A
Soil Boring Coordinates and Elevations

Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	A162.1-1	1502786.734	664476.477	284.0
	B158.87-1	1519228.136	669050.444	288.3
	B159.1-1	1517722.124	668720.464	291.0
	B159.5-1	1516012.300	668217.400	295.8
	B160.3-1	1511903.990	667182.915	294.6
	B160.7-1	1509749.417	666636.945	295.0
	B161.4-1	1506284.600	665799.100	288.0
	B163.3-1	1496630.400	662351.700	280.2
	B164.4-1	1490795.529	661205.362	267.5
	B165.5-1	1485722.400	659432.900	277.6
	B165.8-1	1484324.089	658853.809	275.4
	B166.5-1	1480752.600	656954.600	263.5
	B166.9-1	1479253.700	655902.600	265.4
	B167.1-1	1478553.300	655364.300	261.0
	B168.0-1	1474529.400	653290.100	251.4
	B168.64-1	1471082.866	652655.655	245.2
	B168.86-1	1470035.900	652059.906	231.6
AECOM**	BM-1	1500593.800	663479.000	283.4
	BM-1B	1513675.554	667631.458	293.5
	BM-1C	1508115.700	666263.900	291.9
	BM-1D	1504574.200	665267.500	283.4
	BM-1E	1511220.853	667016.761	294.1
	BM-2	1494386.900	661852.400	271.4
	BM-2A	1498788.900	662752.200	279.1
	BM-2B	1492715.315	661511.300	269.7
	BM-3	1487269.097	659995.860	275.1
	BM-3A	1488755.829	660606.619	270.8
	BM-3B	1482501.900	658059.300	273.6
	BM-3C	1480192.269	656553.384	263.2
	BM-4	1477890.500	654882.600	260.5

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

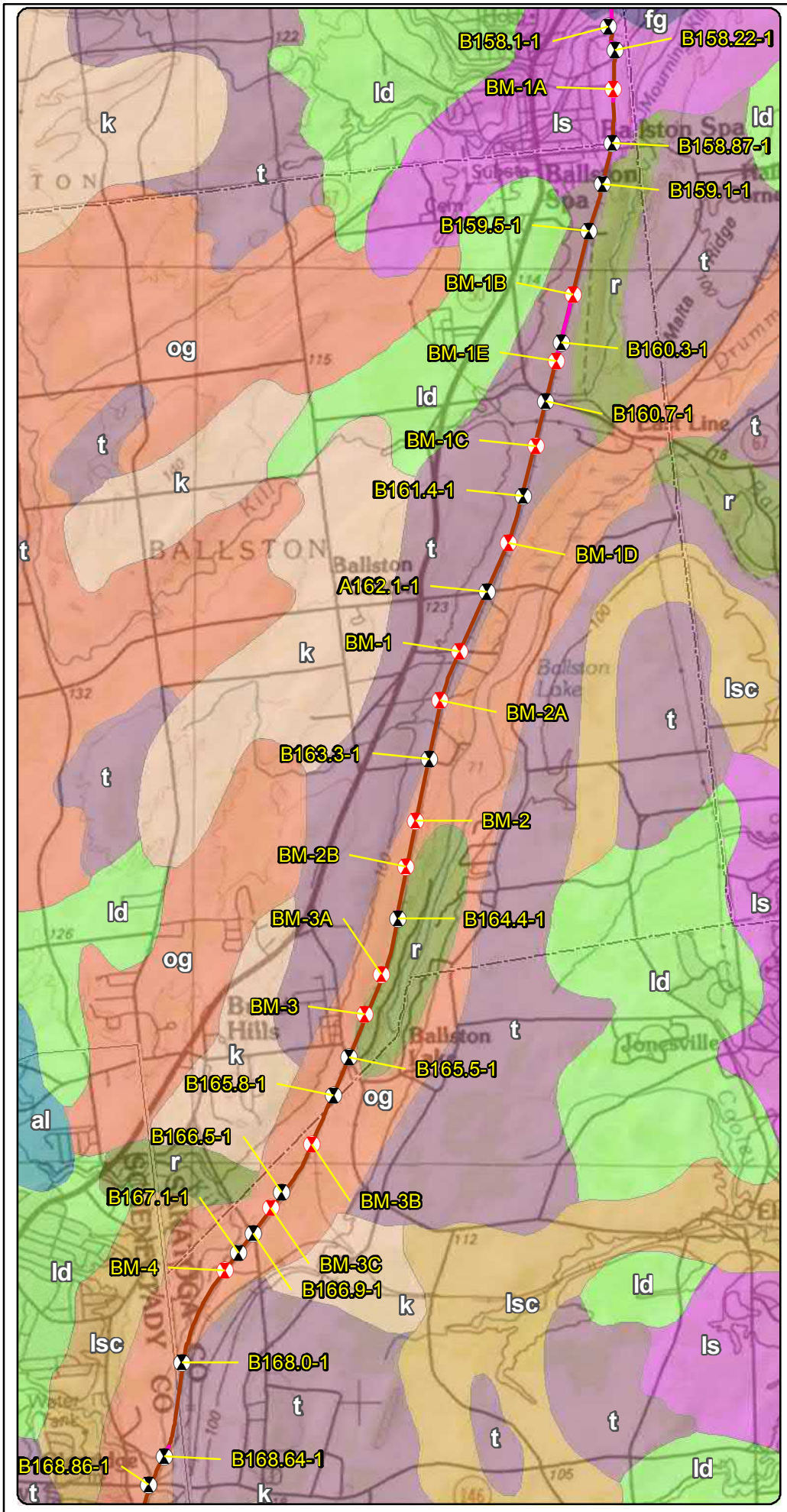
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

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

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

Reference:

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



LEGEND

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

Surficial Geology

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings Ballston to Mohawk River Figure 3-6

Prepared on 5/5/2021

by: AECOM

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

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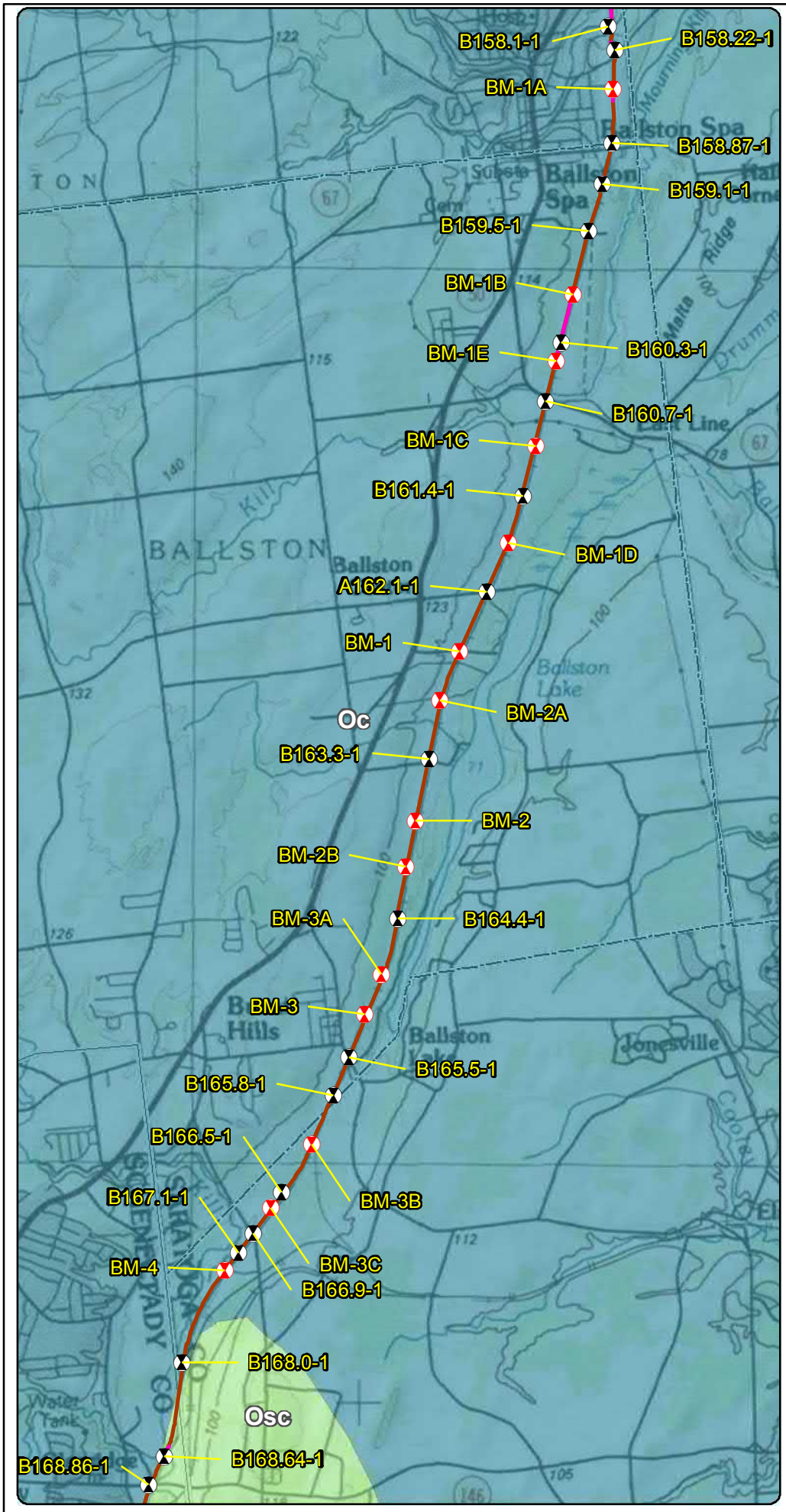


LEGEND

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

Bedrock Geology

- Oc - Canajoharie Shale
- Osc - Schenectady Formation

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

N

0.5 0.25 0 0.5 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Ballston to Mohawk River Figure 4-6

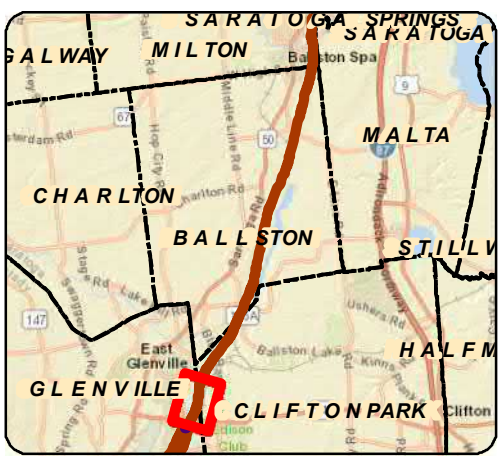
Prepared on 5/5/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Ballston_to_Mohawk_Boring_Locations_Bedrock_May_2021_Report.mxd

167.8
167.9
B168.0-1
168
168.1
168.2
CLIFTON PARK
168.3
168.4
GLENVILLE
168.5
168.6
B168.64-1
168.7
168.8
B168.86-1
169
Brady Rd
Hetcheltown Rd
Maple Ave
Glenridge Rd
Madison Ave
Bracket Ave
Bruce Dr
Deerfield Ct
Rail Systems
0
1,000
Feet



LEGEND

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

Parcel Ownership: TOWN NAME

Road Name: Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Ballston to Mohawk River

Figure A-6

Sheet 9 of 9

Prepared by: AECOM 5/19/2021

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Ballston_to_Mohawk_Boring_Locations_Mapset_May_2021_Report.mxd

TEST BORING LOG

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

BORING	**B168.64-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	1 OF 2

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
19.2'	15:34	2/21	0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	4.0 '
d	FROM	4.0 '	TO	17.5 '
c_2	FROM	17.5 '	TO	31.5 '
d	FROM	31.5 '	TO	50.0 '

DRILLER	G. SPIZZIRRI
HELPER	E. WARD
INSPECTOR	C. POPPE
DATE STARTED	02/21/2013
DATE COMPLETED	02/21/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	50/0.4		***GRAY/BROWN F/C GRAVEL-SIZED ROCK FRAGMENTS, TR TO SM F/M/C SAND, TR SILT (FILL)***		
	S-2	50/0.4		2.0 ***GRAY/BROWN F/M/C SAND, SM F/C GRAVEL-SIZED ROCK FRAGMENTS, TR SILT (FILL)***		
5	S-3	2 1 2 2		4.0 ***BROWN F/M/C SAND, SM SILT, TR F/ GRAVEL***		
	S-4	2 2 2 2		8.0	9.9	SAND DECREASING WITH DEPTH
10	S-5	1 1 1 2		***BROWN SILT, SM F/SAND, TR F/ GRAVEL-SIZED ROCK FRAGMENTS***		
	S-6	8 50/0.1		14.0	27.2	
15				***BROWN CLAY, SM SILT***		
				17.5		
20	R-1	REC =45% RQD =0%		***GRAVEL BOULDERS AND COBBLES (TILL)***		
				21.5		
25	R-2	REC =52% RQD =0%		***GRAY BOULDERS AND COBBLES, SM SAND, SM F/C GRAVEL, TR SILT (GLACIAL TILL)***		
30	R-3	REC =0% RQD =0%				
	S-7	50/0.4		33.8		
35				***GRAY F/M SAND, SM SILT, TR TO SM F/ GRAVEL-SIZED ROCK FRAGMENTS (GLACIAL TILL)***		

DRN.	JPB
CKD.	PWK

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

TEST BORING LOG

BORING	**B168.64-1**
G.S. ELEV.	N/A
FILE	195651
SHEET	2 OF 2

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

DEPTH		A	B	C	DESCRIPTION	Wn	REMARKS
		S-8	50/0.4		***GRAY F/M SAND, SM SILT, TR TO SM F/ GRAVEL-SIZED ROCK FRAGMENTS (GLACIAL TILL)***		
40					42.0		
		S-9	23 50/0.4		***GRAY SILT, SM F/ SAND, TR TO SM F/ GRAVEL-SIZED ROCK FRAGMENTS, TR CLAY (GLACIAL TILL)***		
45					48.5		
50		S-10	25 25 35		***DARK GRAY F/M SAND, TR SILT (GLACIAL TILL)*** 50.0		
					END OF BORING AT 50'		
55							
60							
65							
70							
75							

SUMMARY OF LABORATORY TEST DATA

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

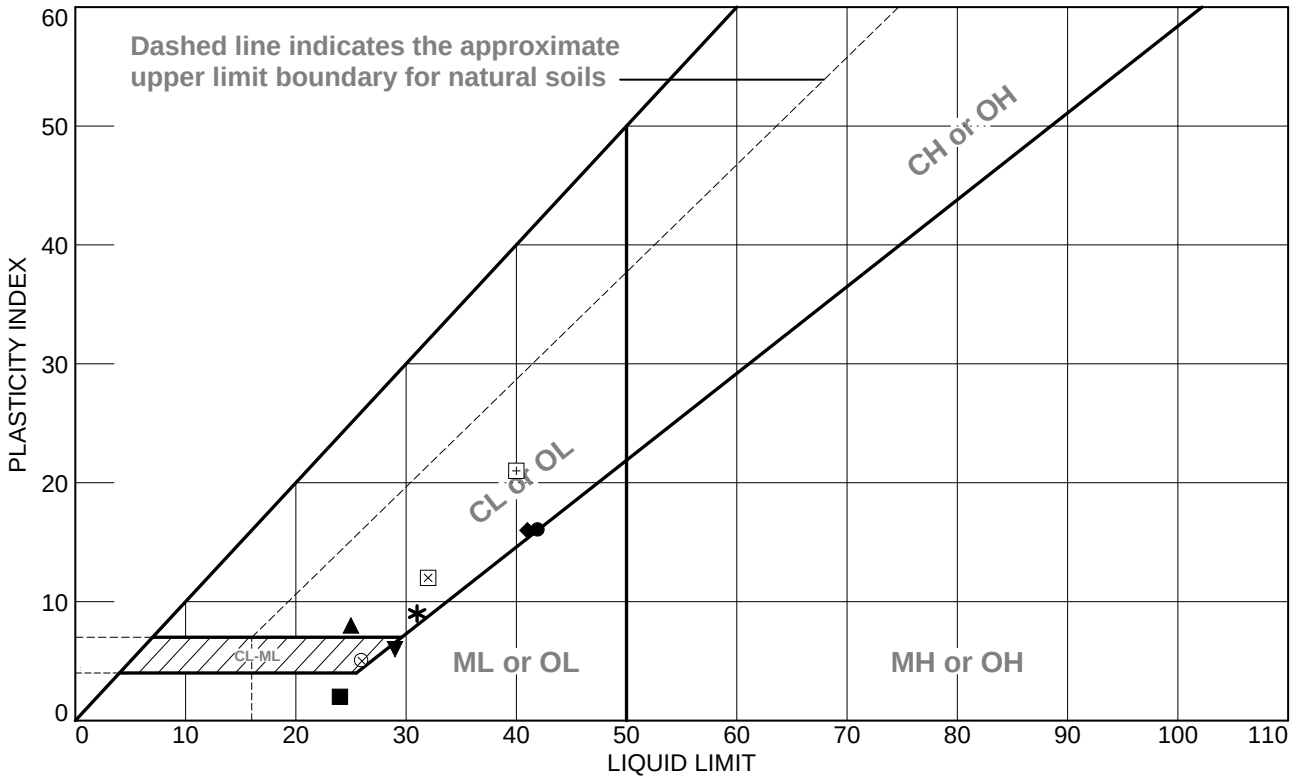
SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
	R-2	10.0-10.5	-	-	-	-	-	-	-	-	-	-	-	165.3	700	-
B166.5-1	S-2	2.0-4.0	SM	28.0	22.7	49.3		-	-	-	-	-	15.1	-	-	-
	R-1	9.0-9.4	-	-	-	-		-	-	-	-	-	-	166.9	410	-
B166.9-1	S-1	0.0-2.0	GM	42.7	23.3	34.0		-	-	-	-	-	19.4	-	-	-
	S-2	2.0-4.0														
	R-1	8.0-8.4	-	-	-	-		-	-	-	-	-	-	171.6	385	-
	R-2	11.1-11.4	-	-	-	-		-	-	-	-	-	-	168.7	-	-
			-	-	-	-		-	-	-	-	-	-	162.5	-	-
B167.1-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	-	23.9	-	-	19.3
	S-5	8.0-9.3	-	-	-	-	-	-	-	-	-	-	7.0	-	-	-
	R-1	14.9-15.3	-	-	-	-	-	-	-	-	-	-	-	168.5	340	-
B168.0-1	S-2	2.0-4.0	SM	13.5	51.9	34.6		-	-	-	-	-	8.2	-	-	-
B168.64-1	S-4	6.0-8.0	SM	1.1	73.9	25.0		-	-	-	-	-	9.9	-	-	-

SUMMARY OF LABORATORY TEST DATA

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

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index)					
	S-6	13.5-15.0	CL	-	-	-	-	41	25	16	0.1	-	27.2	-	-	-
B168.86-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	-	23.6	-	-	-
	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	-	25.8	-	-	-
	S-4	6.0-8.0	ML	-	-	-	-	29	23	6	0.6	-	26.6	-	-	-
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	-	34.7	-	-	-
	S-6	13.5-15.0	SP-SM	1.1	93.2	5.7		-	-	-	-	-	28.8	-	-	-
B169.1-1	S-7	18.5-20.0	SM	13.6	65.6	20.8		-	-	-	-	-	20.5	-	-	-
B169.65-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	-	24.9	-	-	-
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	37.3	90.7	-	-
	S-6	13.5-15.0	CL	-	-	-	-	31	22	9	0.9	-	30.1	-	-	-
B170.1-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	-	17.7	-	-	-
	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	-	29.0	-	-	-
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	21.9	105.7	-	-

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

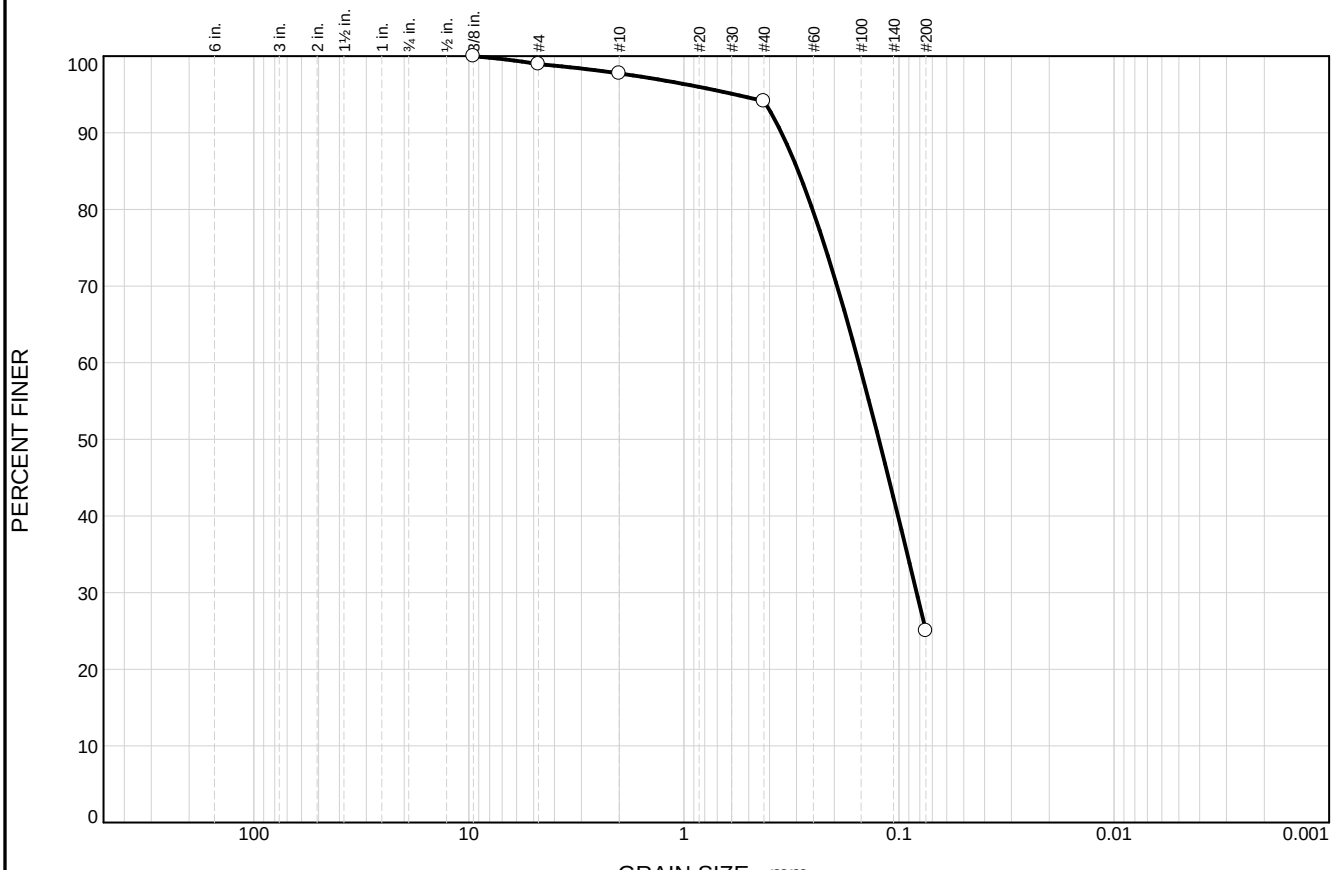
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B151.58-1	S-3	4.0-6.0 FT	32.5	26	42	16	CL/ML
■	B157.9-1	S-5	8.0-10.0 FT	19.5	22	24	2	ML
▲	B161.4-1	S-3	4.0-6.0 FT	14.3	17	25	8	CL
◆	B168.64-1	S-6	13.5-15.0 FT	27.2	25	41	16	CL
▼	B168.86-1	S-4	6.0-8.0 FT	26.6	23	29	6	ML
✱	B169.65-1	S-6	13.5-15.0 FT	30.1	22	31	9	CL
⊕	B172.8-1	S-6	13.5-15.0 FT	18.3	NP	NV	NP	
⊞	B173.1-1	S-7	18.5-20.0 FT	26.3	19	40	21	CL
⊗	B173.9-1	S-6	13.5-15.0 FT	27.4	21	26	5	CL-ML
⊠	B176.4-1	S-7	13.5-15.0 FT	31.2	20	32	12	CL

TRC
Engineers, Inc.
Mt. Laurel, NJ

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

Project No.: 195651 **Figure** 3

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.1	1.1	3.7	69.1	25.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2941	0.1538	0.1241	0.0828				

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

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

Project: TRANSMISSION DEVELOPERS, INC.

○ **Source of Sample:** B168.64-1 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

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

TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 88

Tested By: TBT 02/27/13 **Checked By:** _____