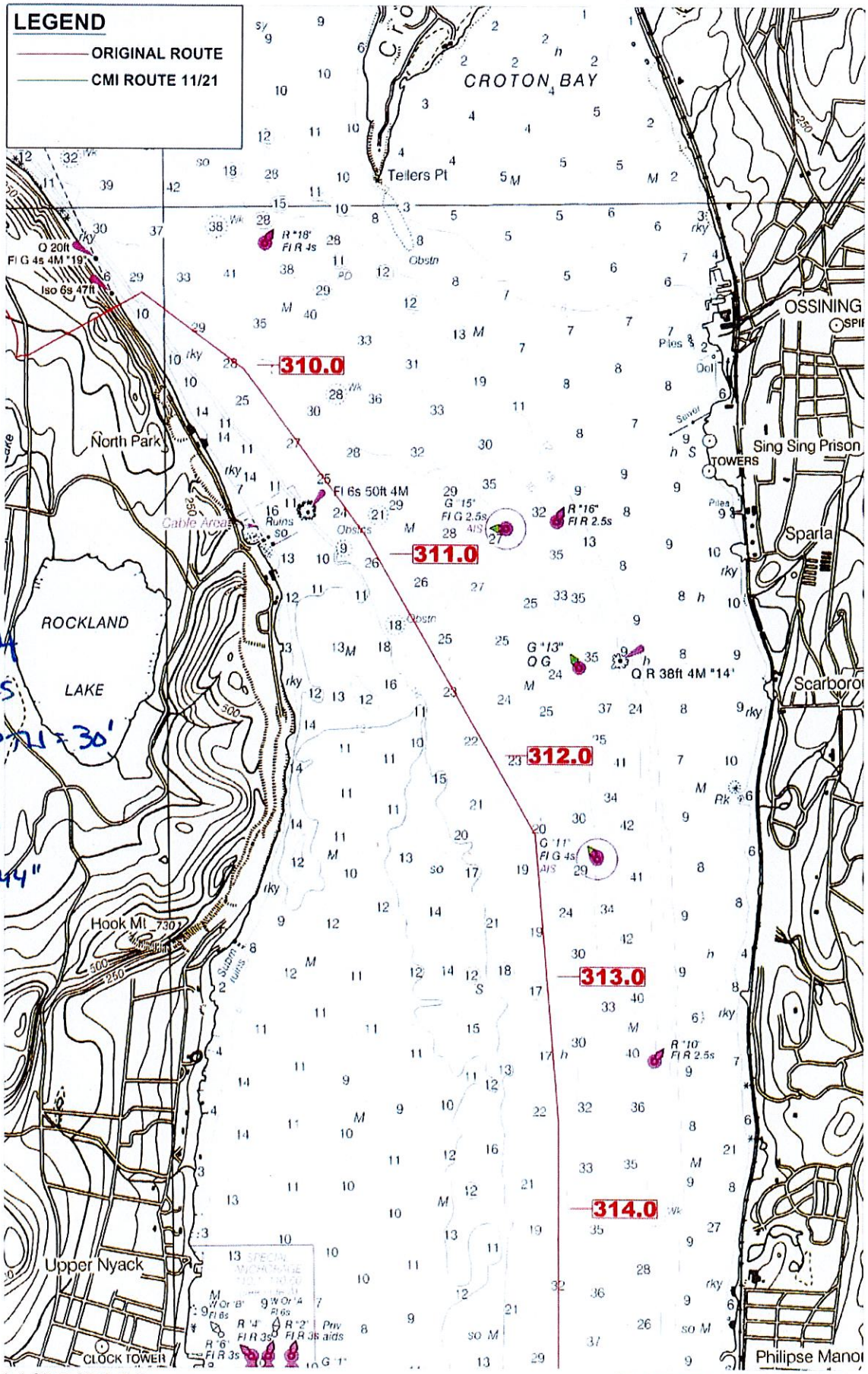
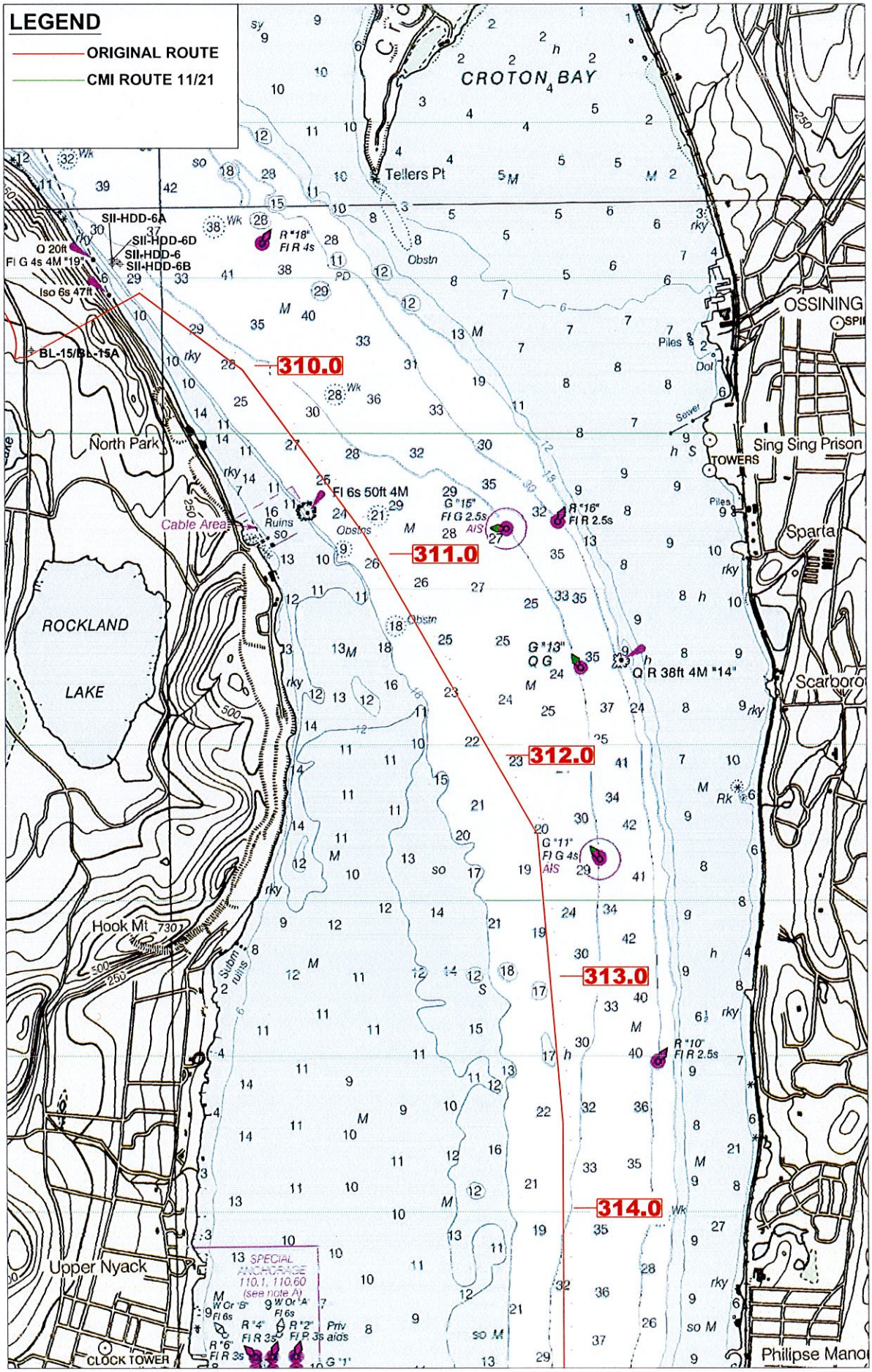
Appendix U – Previous Geotechnical Borings

CHPE - HUDSON RIVER CABLE ROUTE ADJUSTMENT

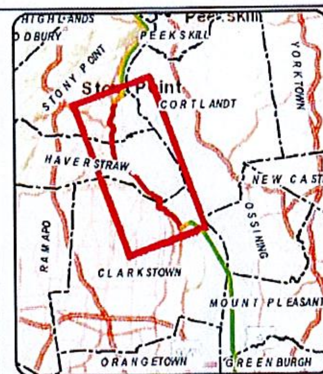


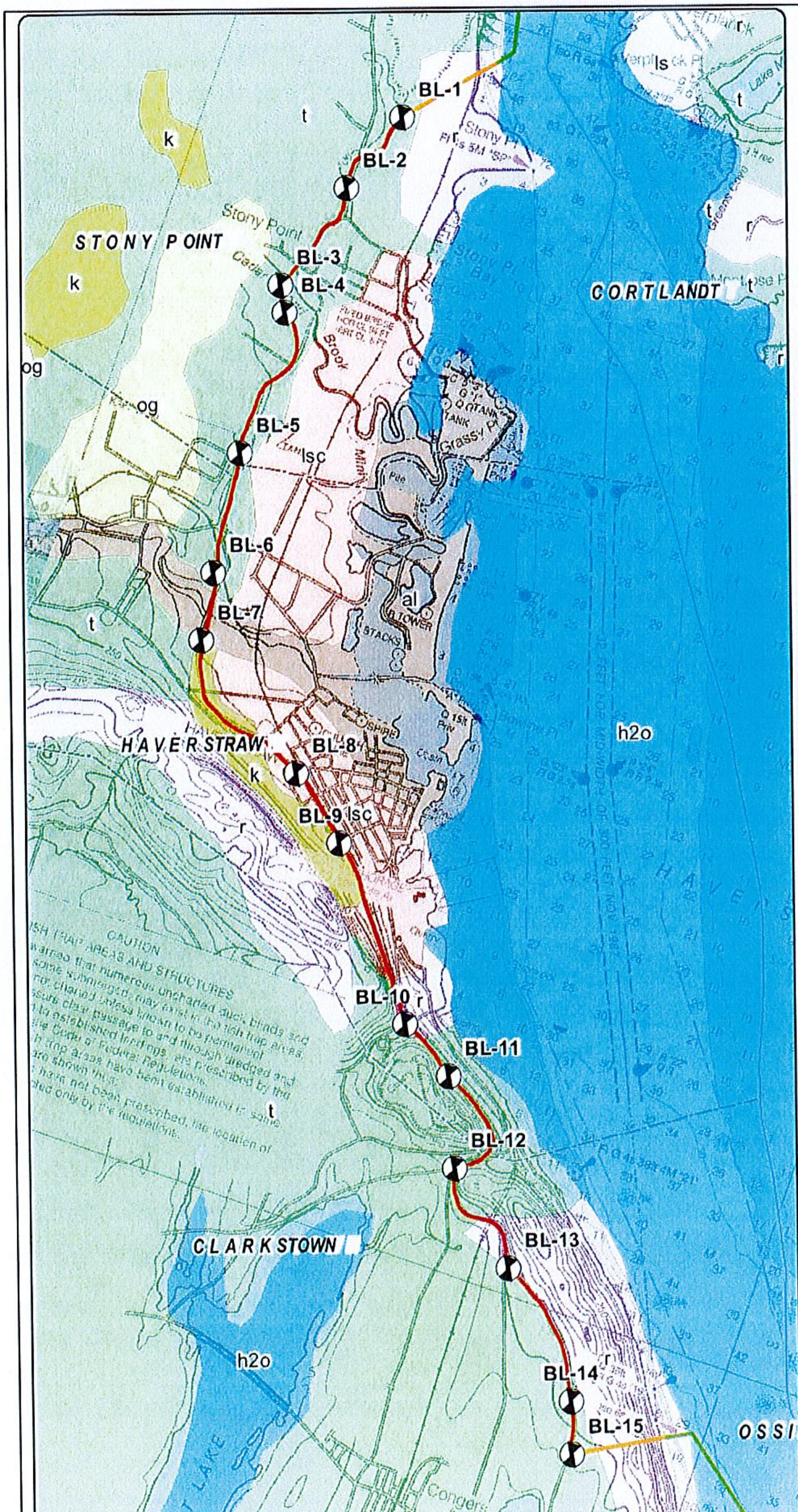
CHPE - HUDSON RIVER CABLE ROUTE ADJUSTMENT



11/03/2021

SHEET 13 OF 16





LEGEND

Approximate Boring Locations

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

Surficial Geology

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

- Town Boundary
- County Boundary

N

0.35 0.175 0 0.35 Miles

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

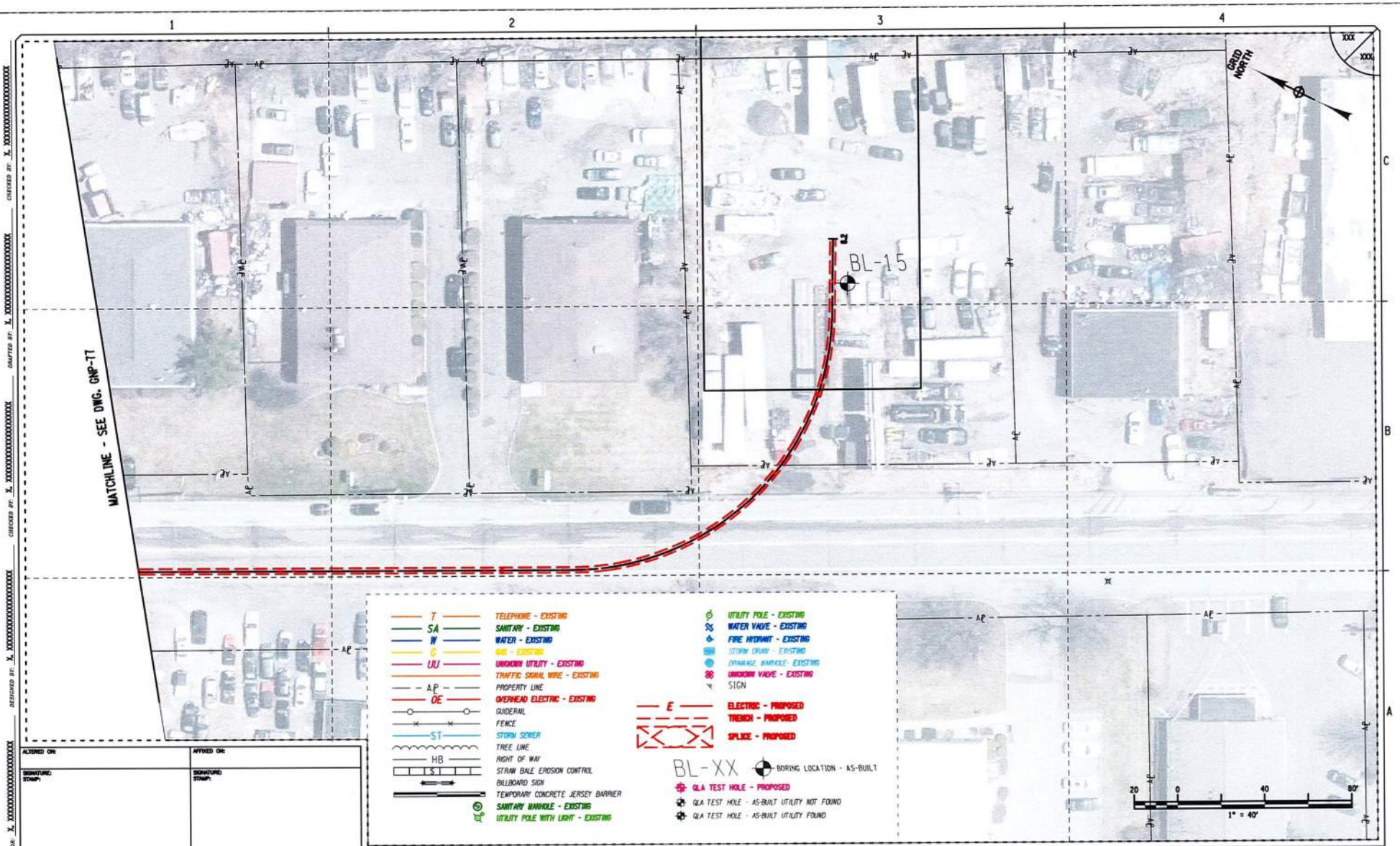
FIGURE 3

Surficial Geology and Geotechnical Borings

Prepared on 8/25/2020

by: AECOM

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



ALTERED ON: | AFFIXED ON:

SIGNATURE: STAMP: | SIGNATURE: STAMP:

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

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

REVISIONS

DATE	DESCRIPTION	BY	SYM.

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

AECOM

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

CONTRACT NUMBER: 60323056
DATE:
DRAWING NUMBER: GNP-78

Aquifer / AECOM #60323056
CHPE - Rockland County 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 (%)	HYDRO. % MINUS 2 μm (%)	SPECIFIC GRAVITY (-)	
BL-2	S-1b	7.2-8.0	22.1	28	19	9	CL	86	17		
BL-2	S-2	8-10	18.6	27	19	8	CL	75	13		
BL-3	S-1	6-8	12.5				ML	96.1	20		
BL-3	S-2	8-10	16.3				ML	93	14		
BL-3	S-3	10-10.7	12.4				ML	66	14		
BL-5	S-1	5-7	10.6				SM	40	8		
BL-5	S-3	9-11	7.0				SM	23	4	2.728	
BL-5	S-4	11-13	8.6				SM	24	4		
BL-5	S-6	15-17	8.2				SM	22	3		
BL-6	S-1	4-6	4.1				GW-GM	7	2		
BL-7	S-1	5-7	5.1				SP-SM	8	2		
BL-7	S-3	9-11	5.3				GW-GM	10	2		
BL-7	S-4	11-13	7.5				SM	25	4		
BL-7	S-6	15-17	6.0				SM	14	2		
BL-8	S-1	6-8	17.9	35	20	15	CL	51	11		
BL-8	S-3	10-12	10.2				SM	32	6		
BL-9	S-1	6-8	10.0				SP-SM	9	2		
BL-9	S-3	10-12	7.0				SM	14	3		
BL-9	S-5	14-16	4.9				SW-SM	11	3		
BL-11	S-4	11-13	10.1				SM	24	5		
BL-12	S-1	6-8	8.9				SM	24	6		
BL-13	S-1	4.5-6.5	9.3				SM	15	4	2.722	
BL-13	S-3	8.5-10.5	6.6				SM	13	3		
BL-13	S-4	10.5-12.5	9.9				SM	19	5		
BL-14	S-1	6-8	10.0				SM	27	6		
BL-14	S-2	8-10	8.1				SM	24	5		
BL-15	S-3	9-11	9.5				SM	32	8		
BL-15	S-9	21-23	7.9				SM	26	4		
BL-15	S-14	31-33	6.1				SM	33	4		
BL-15	S-17	45-47	11.9				SM	20	3		
BL-15	S-21	65-67	8.2				SP-SM	10	1		

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

proposed procedure does not necessarily produce laboratory samples that match field densities, GeothermUSA believes it will provide reasonable results.

3. Because GeothermUSA personnel were not in the field to select representative samples for laboratory testing, AECOM collected and shipped extra samples for potential laboratory TR testing and provided GeothermUSA field test boring logs with geologic sample descriptions. In this way, GeothermUSA was able to review the samples and select ones most appropriate for TR testing, discarding the excess.
4. Because field TR testing was not performed, no information is available regarding the ambient temperature in the ground at sample locations. Nevertheless, GeothermUSA indicated that the TR values obtained from the enhanced field sampling and laboratory TR testing program would provide reasonable and useful results, suitable for determining recommended TR design values for use by NKT to evaluate heat dissipation in cable system design.

An overview of the TR lab testing performed by GeothermUSA is presented in Table 2. Detailed results of laboratory TR testing are summarized on Table 5, including GeothermUSA's suggested design TR values for each sample tested.

GeothermUSA's summary report is attached as Appendix E. The GeothermUSA report includes suggested design TR values for each boring location, corresponding to the anticipated cable depth. These are reproduced below:

Boring ID	Milepost	Boring Depth (ft)	Cable Depth (ft)	Suggested TR (°C-cm/W)
BL-1	N/A	60.0	3.5	45
BL-2	1.08	12.0	9.80	90
BL-3	1.67	10.7	8.95	110
BL-4	1.81	16.0	9.74	45
BL-5	2.58	17.0	9.41	90
BL-6	3.18	11.0	8.66	90
BL-7	3.51	17.0	9.29	90
BL-8	4.38	12.0	7.92	90
BL-9	4.77	16.0	7.89	110
BL-10 & BL-10A	5.69	4.0	8.04	45
BL-11	6.02	13.0	6.36	90
BL-12	6.63	12.0	6.15	90
BL-13	7.24	12.5	6.57	90
BL-14	7.96	12.0	5.88	90
BL-15 & BL-15A	N/A	87.6	varies	100 or 45 depending if its in silty sand or rock

2.6 Geotechnical Laboratory Testing

Geotechnical laboratory testing was performed by TerraSense LLC. This included index testing to characterize soil, and strength and hardness tests to characterize rock. A summary of the testing is presented in Table 3.

Table 1. Summary of Test Borings

Boring ID	Completion Date	Total Depth of Boring (ft)	Depth to Top of Bedrock (ft)	Northing [1]	Easting [1]	Top of Boring Elevation [2]
BL-1	7/6/2020	60	3.3	877579.553	634487.801	16.537
BL-2	7/7/2020	12	>12	875415.701	633752.651	88.970
BL-3	7/7/2020	10.7	10.7	872536.075	632999.287	113.426
BL-4	7/7/2020	16	4.8	871905.948	633323.295	108.145
BL-5	7/8/2020	17	>17	868175.528	633428.855	128.013
BL-6	7/8/2020	11	>11	865097.101	633816.627	102.228
BL-7	7/8/2020	17	>17	863383.514	634098.781	106.175
BL-8	7/9/2020	12	>12	861016.248	637485.511	113.886
BL-9	7/9/2020	16	>16	859720.742	639084.310	116.995
BL-10 & BL-10A	7/13/2020	4	>4	855972.062	642193.725	173.236
BL-11	7/10/2020	13	>13	855114.602	643665.967	192.660
BL-12	7/13/2020	12	>12	852960.555	644583.631	233.585
BL-13	7/10/2020	12.5	>12.5	851046.588	646695.547	264.744
BL-14	7/14/2020	12	>12	848431.817	649278.128	278.475
BL-15 & BL-15A	7/23/2020	87.6	77.1	847189.449	649740.851	213.397

Notes:
(1) Coordinates in New York State Plane, NAD83
(2) Elevations in NAVD88

Table 4. Summary of Rock Parameters from Field and Laboratory Testing

Rock Type	Age	RQD (%)	Dry Unit Weight (pcf)	Mohs Hardness	Compressive Strength (psi)	Thermal Resistivity (°C-cm/W)	
						Wet	Dry
Limestone	Middle Ordovician	0 - 84	174 - 176	3 - 6	8050 - 15070	33	51
Quartzite	Middle Ordovician	84	176	4 - 5	6280	--	--
Sandstone/ Siltstone	Upper Triassic	0 - 66	155 - 162	2 - 4	2081[1] - 7940	37 - 44	56 - 64
Diabase	Upper Triassic	N/A	179 - 182	5 - 6	21640 - 25120	42	58

Notes:
(1) Estimated value from point load test

Table 7. Summary of Geotechnical Laboratory Test Results of Rock Samples

Boring ID	Sample Type	Depth (ft)	Rock Type	Water Content (%)	Dry Unit Weight (pcf)	Mohs Hardness	Unconfined Compressive Strength Test			Point Load Test		
							Compressive Strength (psi)	Axial Strain (%)	Estimated Elastic Modulus (psi)	Sample Orientation	Strength Index (Is50) (psi)	Estimated Compressive Strength (psi)
BL-1	Core	19.2 – 20.2	Limestone	0.15	176	4-5	8760	0.20	4E+06	--	--	--
	Core	31.0 – 31.7	Limestone	0.11	175	5-6	8050	0.16	5E+06	--	--	--
	Core	48.2 – 48.9	Quartzite	0.08	176	4-5	6280	0.11	6E+06	--	--	--
	Core	54.0 – 55.0	Limestone	0.13	174	3-4	15070	0.19	9E+06	--	--	--
BL-4	Core	11.3 – 11.6	Sandstone/ Siltstone	1.00	--	2-3	--	--	--	Diametral	190.0	4393
										Axial	200	4405
	Core	12.2 – 12.5	Sandstone	1.18	--	2-3	--	--	--	Diametral	90	2081
										Axial	170	3464
BL-10	Core	Outcrop[1]	Diabase	1.08	179	5-6	23820	0.41	7E+06	--	--	--
	Core	Outcrop[1]	Diabase	0.67	179	5-6	21640	0.50	5E+06	--	--	--
	Core	Outcrop[1]	Diabase	0.71	182	5-6	25120	0.44	7E+06	--	--	--
BL-15A	Core	80.4 – 80.7	Sandstone	1.09	156	--	6830	0.51	1E+06	--	--	--
	Core	81.5 – 82.1	Sandstone	--	--	3-4	--	--	--	--	--	--

Boring ID	Sample Type	Depth (ft)	Rock Type	Water Content (%)	Dry Unit Weight (pcf)	Mohs Hardness	Unconfined Compressive Strength Test			Point Load Test		
							Compressive Strength (psi)	Axial Strain (%)	Estimated Elastic Modulus (psi)	Sample Orientation	Strength Index (Is50) (psi)	Estimated Compressive Strength (psi)
	Core	83.0 – 83.6	Sandstone	0.68	155	3-4	7940	0.45	2E+06	--	--	--

Notes:
(1) Outcrop block samples cored by the geotechnical laboratory prior to testing

BORING CONTRACTOR: ADT

DRILLER: Tim Van Ness

SOILS ENGINEER: Roberto Lucidi

LOCATION: 152 Route 9W, Congers, NY

AECOM

BORING LOG

SHEET 1 OF 3

PROJECT NAME: CHPE - Rockland Co. Borings

PROJECT NO.: 60323056

HOLE NO.: BL-15

START DATE: 7/14/2020

FINISH DATE: 7/17/2020

OFFSET: N/A

DRILL RIG: Geoprobe

BORING TYPE: SPT

BORING O.D.: 4.5"

SURFACE ELEV.: 213.397

NORTHING 847189.449

EASTING 649740.851

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL
3.5' below grade on 7/14/20 at 2 pm	TYPE	Flush joint Steel	SPLIT SPOON[1]	3-7/8" TRICONE	-
Artesian water at approx. 45' below grade	SIZE I.D.	4.0"	2.4"	-	-
(head >13.0' above grade) on 7/16/2020	SIZE O.D.	4.5"	3.0"	-	-
at 1:30 pm	HAMMER WT.	SPUN	140 lb	-	-
	HAMMER FALL	-	30"	-	-

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.[2]	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
1.0												Sandy Fill	Gravel pavement
		Hand Cleared									SM		Brown, f-m SAND, some f-m-c gravel, some
2.0		0.0 - 5.0											silt, with cobbles and boulders, moist
3.0													
													TR[3]-1 (3.0'-5.0')
4.0													Water at 3.5'
													Brown, f-m SAND, some f-m-c gravel, some
5.0													silt, with cobbles and boulders, wet
6.0		5.0 - 7.0	S-1	24.0	8.0	15	16	12	11	18	SM		S-1: Brown, f-m SAND, some silt, little f-m
													gravel, wet, medium dense
7.0													
8.0		7.0 - 9.0	S-2	24.0	5	6	4	6	7	7	SM		S-2: Brown, f-m SAND, some silt, little f-m
													gravel, wet, loose
9.0													Casing installed at 9.0'
10.0		9.0 - 11.0	S-3	24.0	12.0	43	17	12	14	19	SM		S-3: Same as above, wet, medium dense
													TR-2 (10.5'-11.0')
11.0													
12.0		11.0 - 13.0	S-4	24.0	16.0	15	23	24	27	31	SM		S-4: Same as above, wet, dense
13.0													
14.0		13.0 - 15.0	S-5	15.0	8.0	20	40	65/3"	-	-	SM	Glacial Till	S-5: Brown, f-m SAND, some silt, trace f-m
													gravel, moist, very dense
15.0													Boulder from 14.3' to 15.0'
													Casing advanced to 15.0'
16.0		15.0 - 17.0	S-6	24.0	16.0	45	63	92	93	101	SM		S-6: Brown, f-m SAND, some silt, little f-m-c
													gravel, moist, very dense
17.0													TR-3 (16.0'-16.5')
18.0		17.0 - 19.0	S-7	24.0	14.0	36	56	66	58	79	SM		S-7: Brown, f-m SAND, some silt, trace fine
													gravel, moist, very dense
19.0													
20.0		19.0 - 21.0	S-8	18.0	15.0	78	104	102	50/0"	134	SM		S-8: Same as above, moist, very dense

NOTES:

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

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

(3) TR = sample for thermal resistivity testing.

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

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

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

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

BORING CONTRACTOR: ADT

DRILLER: Tim Van Ness

SOILS ENGINEER: Roberto Lucidi

LOCATION: 152 Route 9W, Congers, NY

AECOM

BORING LOG

SHEET 2 OF 3

PROJECT NAME: CHPE - Rockland Co. Borings

PROJECT NO.: 60323056

HOLE NO.: BL-15

START DATE: 7/14/2020

FINISH DATE: 7/17/2020

OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
21.0													
22.0		21.0 - 23.0	S-9	24.0	20.0	3	48	67	66	75	SM		S-9: Brown, f-m SAND, some silt, little fine gravel, moist, very dense
23.0													
24.0		23.0 - 25.0	S-10	24.0	20.0	30	81	73	104	100	SM		S-10: Same as above, moist, very dense
25.0													
26.0		25.0 - 27.0	S-11	10.0	10.0	56	100/4"	-	-	-	SM		S-11: Same as above, moist, very dense
27.0													
28.0		27.0 - 29.0	S-12	24.0	9.0	40	91	60	69	98	SM		S-12: Brown, f-m SAND, little f-m-c gravel, little silt, moist, very dense TR-4 (28.5'-29.0') Casing advanced to 29.0'
29.0													
30.0		29.0 - 31.0	S-13	24.0	12.0	90	71	60	104	85	SM		S-13: Same as above, moist, very dense
31.0													
32.0		31.0 - 33.0	S-14	21.0	12.0	67	91	108	100/3"	129	SM	Glacial Till	S-14: Brown, f-m SAND, some silt, some f-m-c gravel, moist, very dense
33.0													
34.0													
35.0													
36.0		35.0 - 37.0	S-15	19.0	15.0	60	78	99	50/1"	115	SM		S-15: Brown, f-m SAND, some f-m-c gravel, some silt, moist, very dense
37.0													
38.0													
39.0													
40.0													
41.0		40.0 - 42.0	S-16	24.0	10.0	27	79	85	46	107	SM		S-16: Brown, f-m SAND, little f-m gravel, little silt, moist, very dense TR-5 (41.5'-42.0')
42.0													
43.0													
44.0												Outwash	
45.0													

NOTES:

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

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

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

BORING CONTRACTOR: ADT

DRILLER: Tim Van Ness

SOILS ENGINEER: Roberto Lucidi

LOCATION: 152 Route 9W, Congers, NY

AECOM

BORING LOG

SHEET 3 OF 3

PROJECT NAME: CHPE - Rockland Co. Borings

PROJECT NO.: 60323056

HOLE NO.: BL-15

START DATE: 7/14/2020

FINISH DATE: 7/17/2020

OFFSET: N/A

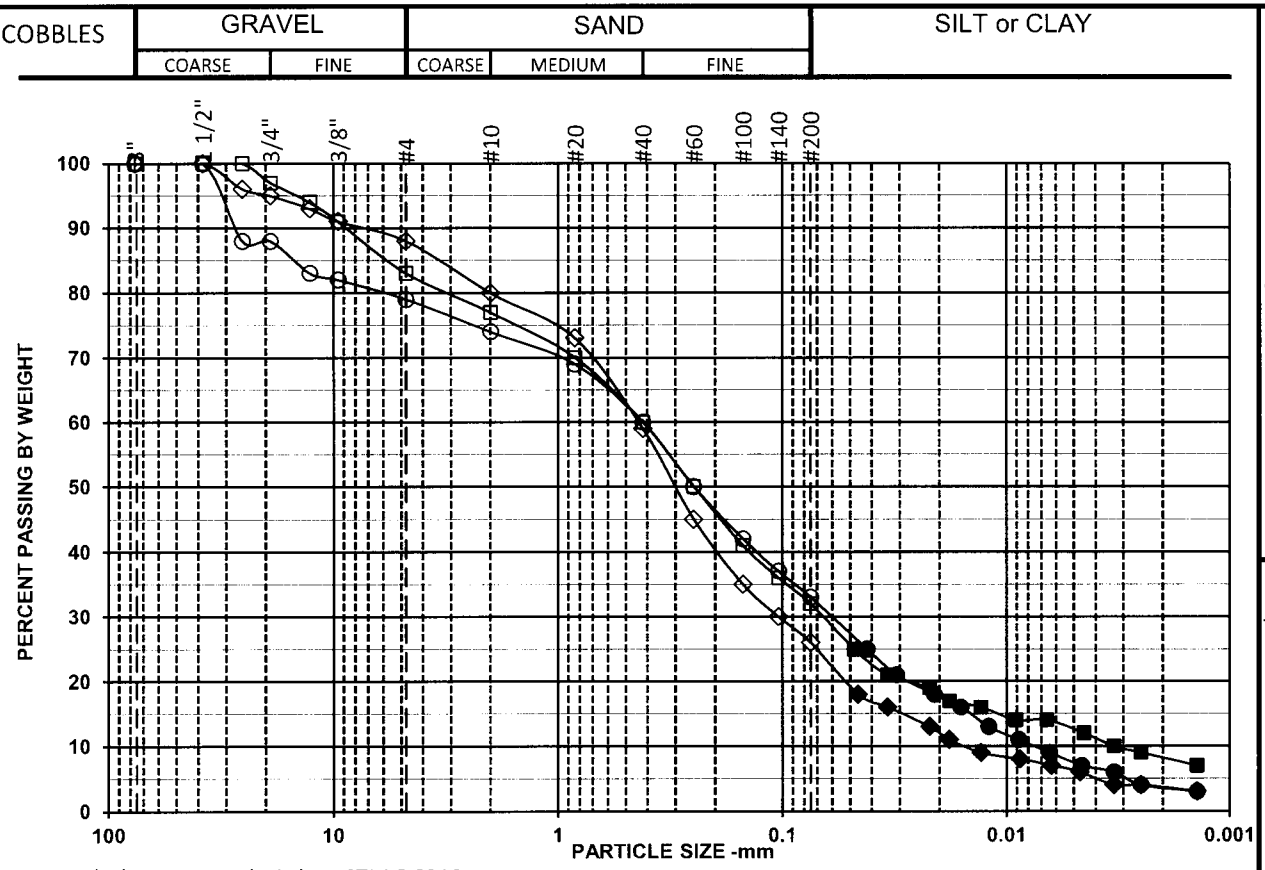
DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
46.0		45.0 - 47.0	S-17	24.0	18.0	19	43	54	48	63	SM	Outwash	S-17: Brown, f-m SAND, some silt, trace fine gravel, wet, very dense
47.0													
48.0													
49.0													
50.0													Casing advanced to 50.0'
51.0		50.0 - 52.0	S-18	9.0	5.0	49	80/3"	-	-	-	SM	Glacial Till	Artesian water flowing out from top of casing S-18: Brown, f-m SAND, some silt, little f-m gravel, moist, very dense
52.0													Casing advanced to 52.0'
53.0													Drilling mud used to advance borehole from 52.0'
54.0													Hard drilling from 50.0' to 55.0'
55.0													
56.0		55.0 - 57.0	S-19	4.0	4.0	150/4"	-	-	-	-	SM		S-19: Same as above, moist, extremely dense
57.0													
58.0													Hard drilling and rig chattering from 55.0' to 60.0'
59.0												Outwash	
60.0													
61.0		60.0 - 62.0	S-20	8.0	5.0	52	100/2"	-	-	-	SP		S-20a (60.0'-60.4'): Brown, f-m SAND, trace fine gravel, trace silt, wet, v. dense S-20b (60.4'-60.8'): Brown, f-m SAND, some f-m-c gravel, some silt, moist, extremely dense
62.0												Glacial Till	
63.0													Hard drilling from 60.0' to 65.0'
64.0													
65.0													
66.0		65.0 - 67.0	S-21	24.0	16.0	41	79	88	110	109	SP-SM	Outwash	S-21: Brown, f-m SAND, some fine gravel, little silt, wet, very dense TR-6 (66.0'-66.5') TR-7 (Composite: 35.0'-37.0', 40.0'-42.0', 50.0'-52.0', 60.0'-62.0') Artesian water flowing out from interface between casing and borehole Boring abandoned at 70.0' below grade Borehole grouted
67.0													
68.0													
69.0													
70.0													

NOTES:

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

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

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



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

Symbol	□	◇	○
Boring	BL-15	BL-15	BL-15
Sample	S-3	S-9	S-14
Depth	9-11	21-23	31-33
% +3"	0	0	0
% Gravel	17	12	21
% SAND	51	62	46
%C SAND	6	8	5
%M SAND	17	21	14
%F SAND	28	33	27
% FINES	32	26	33
D_{100} (mm)	25.4	38.1	38.1
D_{60} (mm)	0.419	0.44	0.419
D_{30} (mm)	0.066	0.1	0.06
D_{10} (mm)	0.0033	0.015	0.0075
Cc	3.2	1.5	1.1
Cu	127	29.3	55.9

Sieve Size/ID #	Percent Finer Data		
6"	100	100	100
4"	100	100	100
3"	100	100	100
1 1/2"	100	100	100
1"	100	96	88
3/4"	97	95	88
1/2"	94	93	83
3/8"	91	91	82
#4	83	88	79
#10	77	80	74
#20	70	73	69
#40	60	59	60
#60	50	45	50
#100	41	35	42
#140	36	30	37
#200	32	26	33
5μ m	13	6	8
2μ m	8	4	4
1μ m	6	2	2

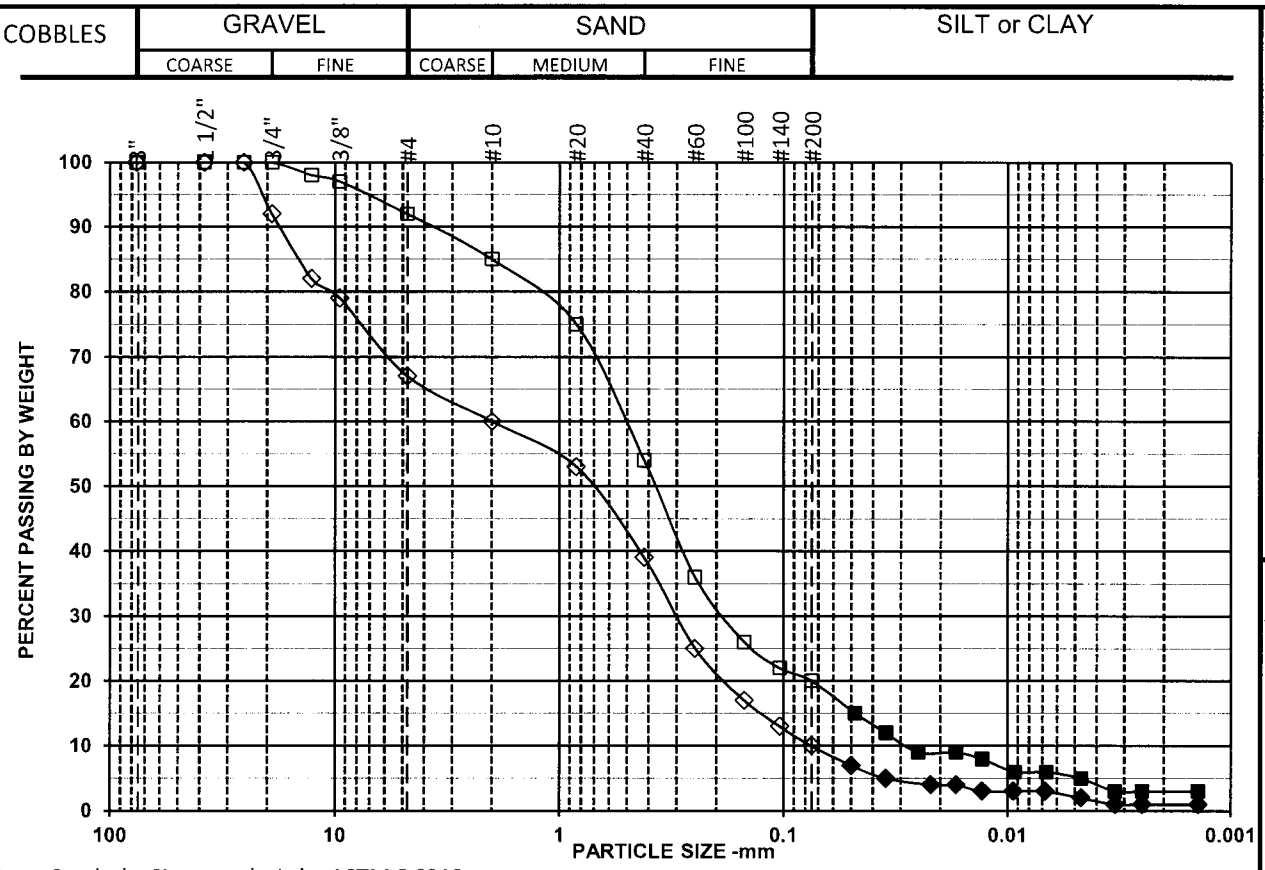
PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	9.5				SM		Brown, Silty sand with gravel	08/05/20
◇	7.9				SM		Brown, Silty sand	08/05/20
○	6.1				SM		Brown, Silty sand with gravel	08/05/20

Aquifer / AECOM #60323056

TerraSense, LLC #7853-20003

CHPE - Rockland County Borings



Open Symbols: Sieve analysis by ASTM D6913

Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	11.9				SM		Brown, Silty sand	08/10/20
◇	8.2				SP-SM		Brown, Poorly graded sand with silt and gravel	08/10/20
○								

Aquifer / AECOM #60323056

TerraSense, LLC #7853-20003

CHPE - Rockland County Borings

Symbol	□	◇	○
Boring	BL-15	BL-15	
Sample	S-17	S-21	
Depth	45-47	65-67	
% +3"	0	0	
% Gravel	8	33	
% SAND	72	57	
%C SAND	7	7	
%M SAND	31	21	
%F SAND	34	29	
% FINES	20	10	
D_{100} (mm)	19.1	25.4	
D_{60} (mm)	0.511	2	
D_{30} (mm)	0.18	0.3	
D_{10} (mm)	0.028	0.075	
Cc	2.3	0.6	
Cu	18.3	26.7	

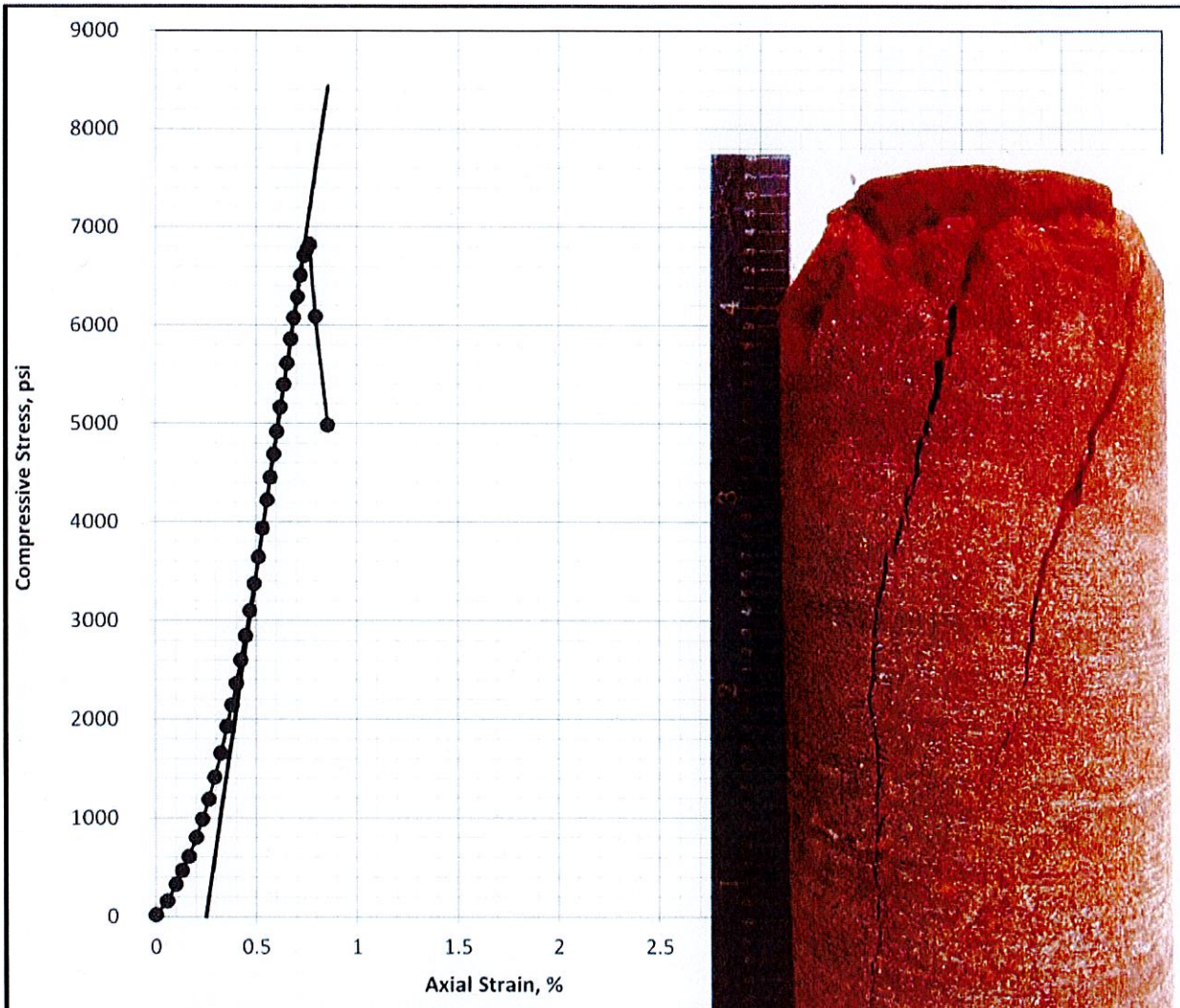
Sieve Size/ID #	Percent Finer Data		
6"	100	100	
4"	100	100	
3"	100	100	
1 1/2"	100	100	
1"	100	100	
3/4"	100	92	
1/2"	98	82	
3/8"	97	79	
#4	92	67	
#10	85	60	
#20	75	53	
#40	54	39	
#60	36	25	
#100	26	17	
#140	22	13	
#200	20	10	
5μ m	5	2	
2μ m	3	1	
1μ m	3	1	

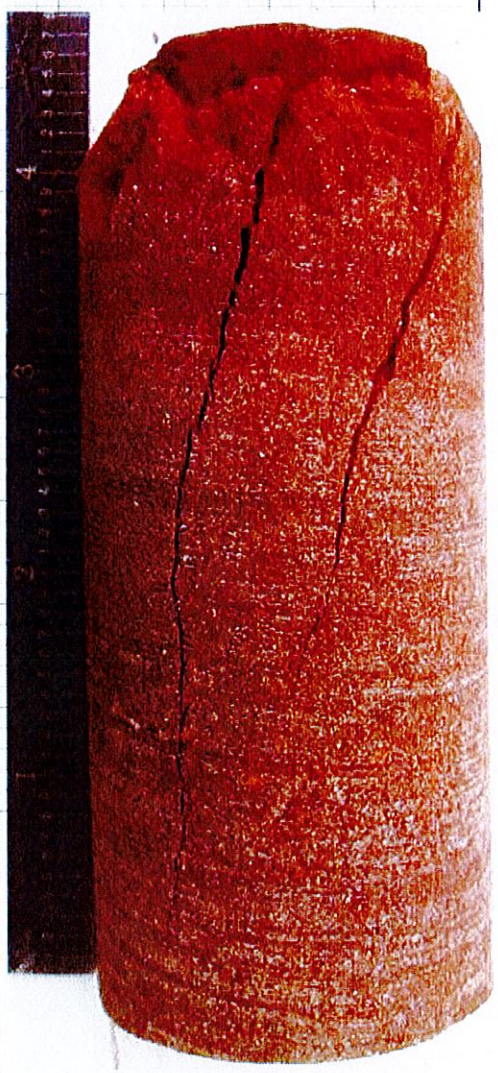
PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

Aquifer
CHPE - Rockland County Borings
SUMMARY OF ROCK TESTING

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

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





FAILURE PHOTO

Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
1.09	158	156	4.341	1.765

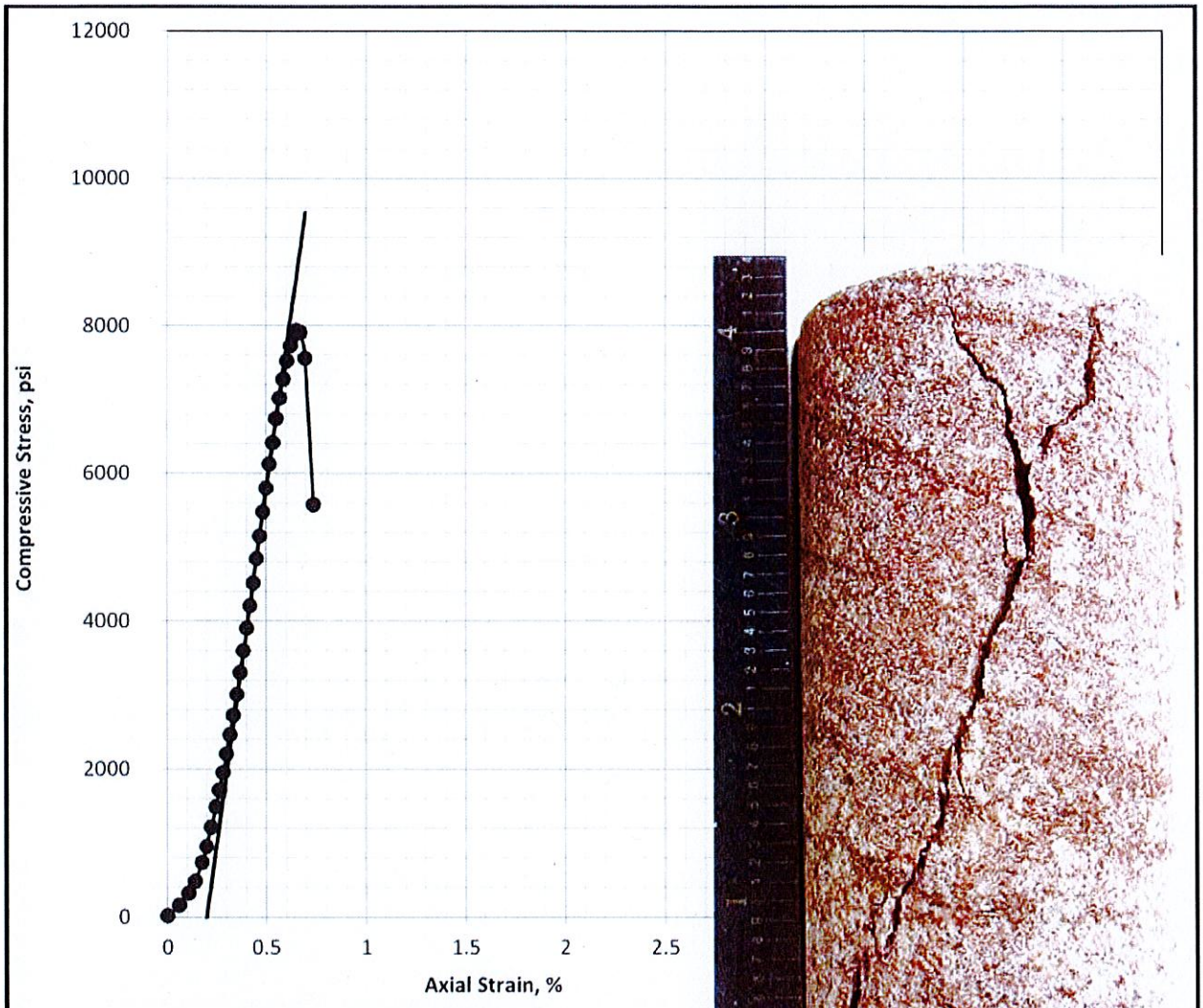
Specimen meets ASTM D4543 shape tolerances

Test Summary

Strain Rate (%/min)	Corrected Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.14	0.51	6830	1E+06

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

Aquifer **Project # PO 309907**	**CHPE - Rockland County Borings**	**COMPRESSIVE STRESS VS STRAIN** **UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC **Project # 7853-20003**		**Boring: BL-15 Run: R-1 (A)** **Depth 80.35-80.7 ft.**



FAILURE PHOTO

Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.68	156	155	4.026	1.768

Specimen meets ASTM D4543 shape tolerances

Test Summary

Strain Rate (%/min)	Corrected Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.14	0.45	7940	2E+06

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

Aquifer **Project # PO 309907**	**CHPE - Rockland County Borings**	**COMPRESSIVE STRESS VS STRAIN** **UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC **Project # 7853-20003**		**Boring: BL-15 Run: R-1 (B)** **Depth 83.2-83.55 ft.**

BL-15A not shown on AECOM LOC MAPS. Coodinates shown on BL-15 A match BL-1 Coordinates. Street address shown on BL-15 A match BL-15 street address. It is unclear where BL-15A was performed.

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 4
DRILLER: Tim Van Ness		PROJECT NAME: CHPE - Rockland Co. Borings
SOILS ENGINEER: Roberto Lucidi		PROJECT NO.: 60323056
		HOLE NO.: BL-15A
	BORING LOG	START DATE: 7/20/2020
		FINISH DATE: 7/23/2020
LOCATION: 152 Route 9W, Congers, NY		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	
4.5' below grade on 7/20/2020 at 9 am	TYPE	Flush joint Steel	SPLIT SPOON(1)	3-7/8" TRICONE	NQ-3	DRILL RIG: Geoprobe
Artesian water at approx. 45' below grade	SIZE I.D.	6.0", 5.0", 4.0", 3.0"	2.4"	-	1.78	BORING TYPE: SPT
(head >13.0' above grade) on 7/22/2020	SIZE O.D.	6.5", 5.5", 4.5", 3.5"	3.0"	-	2.97	BORING O.D.: 4.5"
at 2:30 pm	HAMMER WT.	140 lb, Spun	140 lb	-	-	SURFACE ELEV.: 16.537
	HAMMER FALL	30"	30"	-	-	NORTHING 877579.553
						EASTING 634487.801

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	SAMPLE TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
1.0										Gravel pavement
		Hand Cleared						SM		Brown, f-m SAND, some f-c gravel, some silt, with cobbles and boulders, with asphalt fragments, moist
2.0		0.0 - 5.0								
3.0										
4.0										
5.0										Water at 4.5'
										Drilled continuously from 5.0' to 20.0' (no sampling)
6.0										Drilling mud used to advance borehole from 5.0'
7.0										
8.0										
9.0										
10.0										
11.0										
12.0										
13.0									Sandy Fill	
14.0										Hard drilling from approximately 13.0'
15.0										6" Casing installed at 14.0'
16.0										
17.0										
18.0										
19.0									Glacial Till	
20.0										5" Casing installed at 19.0'

NOTES:

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

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

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

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

BORING CONTRACTOR: ADT

DRILLER: Tim Van Ness

SOILS ENGINEER: Roberto Lucidi

LOCATION: 152 Route 9W, Congers, NY

AECOM

BORING LOG

SHEET 2 OF 4

PROJECT NAME: CHPE - Rockland Co. Borings

PROJECT NO.: 60323056

HOLE NO.: BL-15A

START DATE: 7/20/2020

FINISH DATE: 7/23/2020

OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
21.0										Drilled continuously from 20.0' to 45.0' (no sampling)
22.0										Rig chattering from 20.0' to 45.0'
23.0										
24.0										
25.0										
26.0										
27.0										
28.0										
29.0										
30.0										
31.0										
32.0										
33.0										
34.0										
35.0										
36.0										
37.0										
38.0										
39.0										
40.0										
41.0										
42.0										
43.0										
44.0										
45.0									Glacial Till	

NOTES:

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

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

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

BORING CONTRACTOR: ADT

DRILLER: Tim Van Ness

SOILS ENGINEER: Roberto Lucidi

LOCATION: 152 Route 9W, Congers, NY

AECOM

BORING LOG

SHEET 3 OF 4

PROJECT NAME: CHPE - Rockland Co. Borings

PROJECT NO.: 60323056

HOLE NO.: BL-15A

START DATE: 7/20/2020

FINISH DATE: 7/23/2020

OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)	N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
46.0										Drilled continuously from 45.0' to 70.0' (no sampling)
47.0										Rig chattering from 45.0' to 70.0'
48.0										
49.0										
50.0										Hard drilling from approximately 50.0'
51.0										
52.0										
53.0										
54.0										
55.0										
56.0										
57.0										Glacial Till
58.0										
59.0										
60.0										
61.0										
62.0										
63.0										
64.0										
65.0										
66.0										
67.0										
68.0										
69.0										
70.0										

NOTES:

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

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 4 OF 4
DRILLER: Tim Van Ness			PROJECT NAME: CHPE - Rockland Co. Borings
SOILS ENGINEER: Roberto Lucidi	**BORING LOG**		PROJECT NO.: 60323056
LOCATION: 152 Route 9W, Congers, NY			HOLE NO.: BL-15A
			START DATE: 7/20/2020
			FINISH DATE: 7/23/2020
			OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
71.0		70.0 - 72.0	S-1	5.0	5.0	100/5"	-	-	-	-	SM	Glacial Till	S-1: Brown, f-m SAND, some silt, trace fine gravel, moist, extremely dense
72.0													
73.0													
74.0													
75.0													
76.0												Decomposed Sandstone	Very hard drilling from 75.0'
77.0													Drilled to 77.0' to confirm that it is not a boulder
													Installed 4" casing to 77.0' and 5" casing to 77.5'
		77.0' - 77.1'	S-2	1.0	1.0	100/1"	-	-	-	-	SM		S-2: Red-brown, fine SAND, and silt, moist, very dense
78.0	6.0											Sandstone (Brunswick Fm.)	Started coring from 77.6'
		77.6 - 87.6	R-1	120.0	115.0	RQD =	79"/120"						From 77.6' to 81.1': Red-brown, SANDSTONE, fine grained, slightly weathered (II), medium strong (R3), highly fractured, thinly bedded. Drill spin over sub-horizontal fractures.
79.0	6.0				96%	=	66%						
80.0	2.5												From 81.1' to 87.6': Red-brown, SANDSTONE, medium-coarse grained, slightly weathered (II), strong (R4), moderately fractured, laminated (dip<1C°). Discontinuities: <10° slightly rough bedding 60° & sub-vertical, rough, undulating joints.
81.0	2.5												
82.0	3.0												TR(1)-1 (79.4'-79.8')
83.0	3.0												TR-2 (82.6'-83.0')
84.0	2.5												TR-3 (84.5'-85.0')
85.0	2.5												
86.0	2.5												
87.0	2.5												
88.0													End of boring at 87.6' below grade
89.0													Borehole grouted
90.0													
91.0													
92.0													
93.0													
94.0													
95.0													

NOTES:

(1) TR = sample for thermal resistivity testing.

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

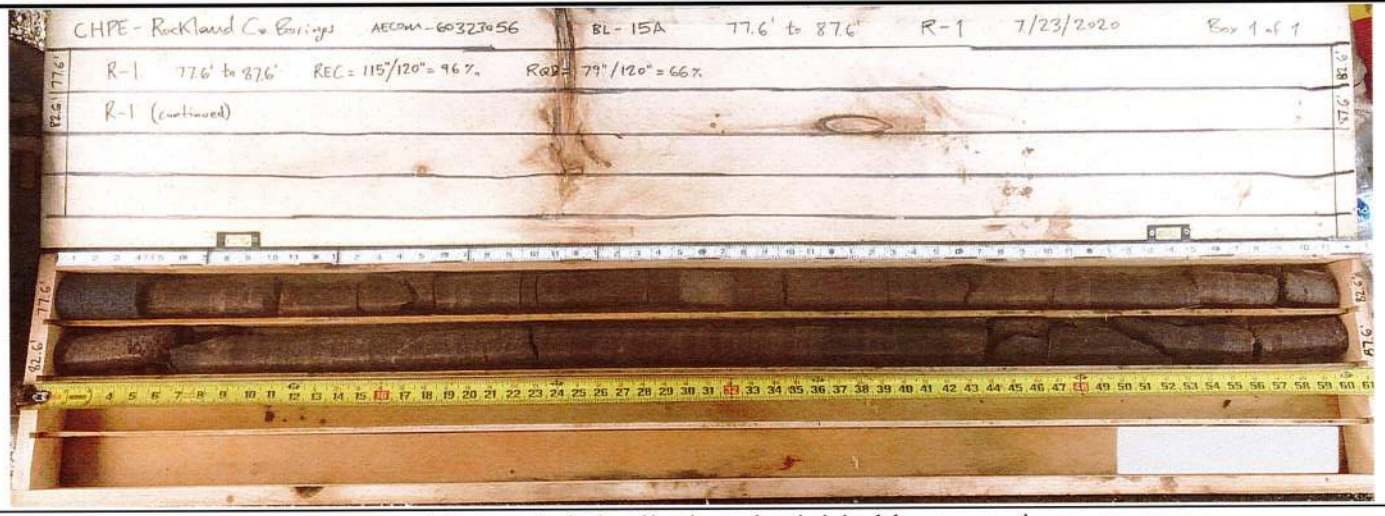
SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

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

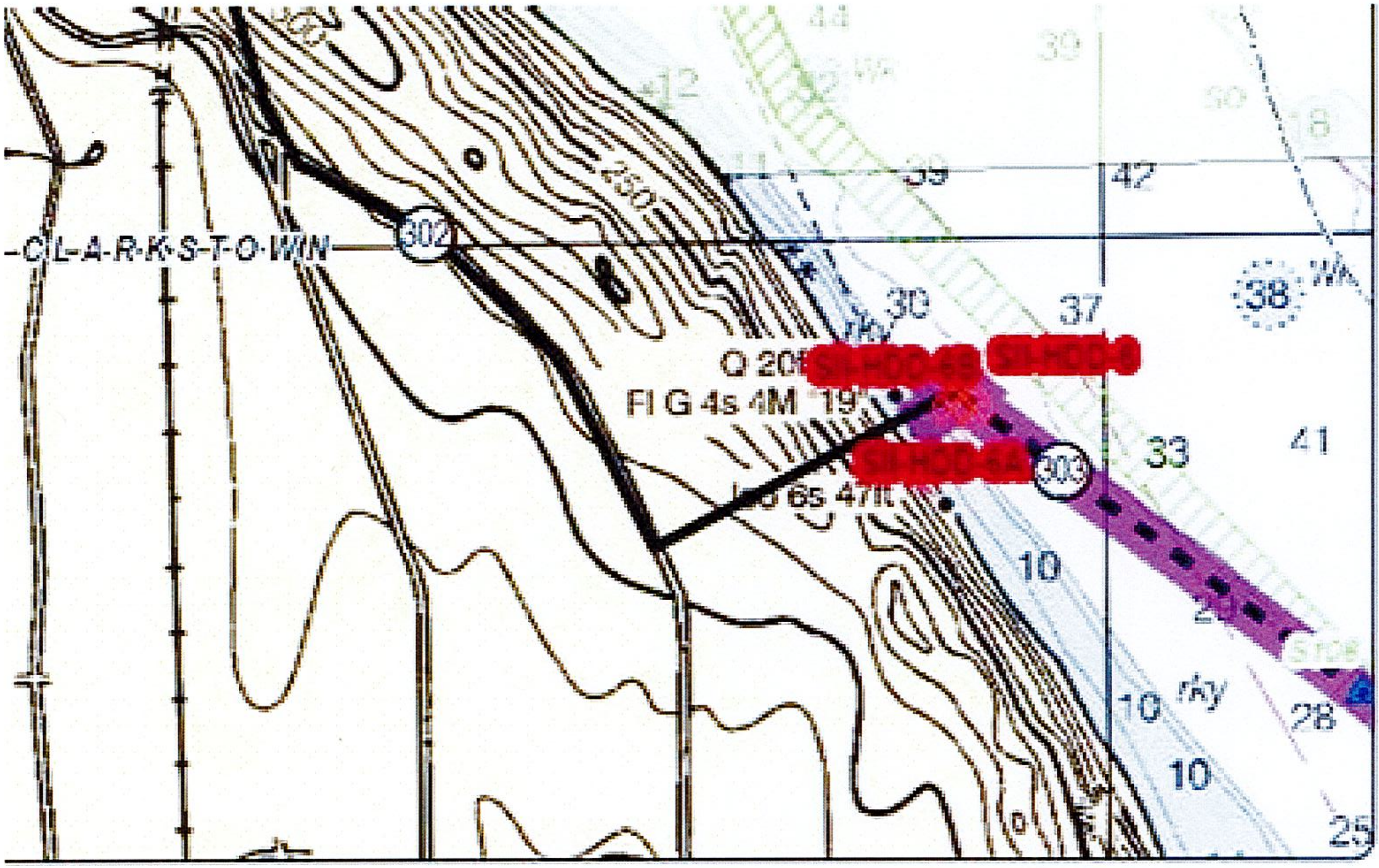
ROCK CORE PHOTOGRAPHIC LOG

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

AECOM

Boring No.	Depth (ft.)	
BL-15A (dry)	77.6 to 87.6	
Boring No.	**Depth (ft.)**	
BL-15A (wet)	77.6 to 87.6	

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



Note: Soundings are in feet

0 1,000 2,000

Feet

Note for Lake Champlain (Maps 1-28): The depth soundings in the report were referenced to North American Vertical Datum 1988 and therefore required a depth adjustment using a water surface elevation of 95.5 feet based on the USGS average for Lake Champlain.

source: http://waterdata.usgs.gov/usa/nwis/uv?04271500

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

Appendix A

2012 MRS

Sheet 46 of 54

Prepared on 04/23/2013

CONGERS

Hole No. SII-HDD-6D

DRILLING LOG	DIVISION: HDR CHPE	INSTALLATION: MRS Phase 2 Cable Route Survey	SHEET 1 OF 1 SHEETS

1. PROJECT: CHPE
2. LOCATION (Coordinates or Station): Hudson River N 14,952,282.5 E 1,937,486.2
3. DRILLING AGENCY: ADT
4. HOLE NO. *(As shown on drawing title and file number)*: SII-HDD-6D
5. NAME OF DRILLER: J. Philbin
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ---- DEG. FROM VERT.
7. Penetration, ft: 52.0
8. Recovery, ft: 52.0
9. Total Recovery, %: 100.0
10. SIZE AND TYPE OF BIT: Split Spoon
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: NAVD88
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 11; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: 0
15. WATER DEPTH:
16. DATE HOLE: STARTED 11/18/2012; COMPLETED 11/18/2012
17. ELEVATION TOP OF HOLE: -29.4
18. TOTAL CORE RECOVERY FOR BORING: 100 %
19. GEOLOGIST: S. Miller

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
-29.4	0.0		Dark brown silt with trace shell fragments and trace wood fragments	100	SedBox6 0.0 2.0	WOR
-31.4	2.0		No Data			
-34.4	5.0					
-36.4	7.0		Dark brown, high-plasticity clay with a layer of brown coarse-grained sand at 6.8'	100	SedBox6 5.0 7.0	WOR
-39.4	10.0		No Data			
-41.4	12.0		Dark brown elastic silt	100	SedBox6 10.0 12.0	WOR
-44.4	15.0		No Data			
-46.4	17.0		Dark brown, high-plasticity clay with a layer of organic silt and wood fragments @16.9'	100	SedBox6 15.0 17.0	WOR
-49.4	20.0		No Data			
-51.4	22.0		Dark brown clayey-sand with wood fragments and shell layer near 21', and with coarse-grained sands below	100	SedBox6 20.0 22.0	WOR
-54.4	25.0		No Data			
			Dark brown, high-plasticity clay with trace shell fragments, sand lenses, and with a distinct layer of pebbles and cobbles at approximately 50'	100	SedBox6 25.0 27.0	WOR
				100	SedBox6 30.0 32.0	WOR
				100	SedBox6 35.0 37.0	WOR
				100	SedBox6 40.0 42.0	WOR
				100	SedBox6 45.0 47.0	WOR
-81.4	52.0			100	SedBox6 50.0 52.0	WOR

Hole No. SII-HDD-6

DRILLING LOG	DIVISION	INSTALLATION	SHEET / OF
	HDR CHPE	MRS Phase 2 Cable Route Survey	1 OF 1 SHEETS

1. PROJECT	CHPE
2. LOCATION (Coordinates or Station)	HUDSON RIVER N 14,952,245.6 E 1,937,589.7
3. DRILLING AGENCY	AOSS
4. HOLE NO. *(As shown on drawing title and file number)*	SII-HDD-6
5. NAME OF DRILLER	M.Telesco
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. Penetration, ft	9.3
8. Recovery, ft	6.9
9. Total Recovery, %	74.0
10. SIZE AND TYPE OF BIT	3.5 in
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*	NAVD88
12. MANUFACTURER'S DESIGNATION OF DRILL	Vibracore
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 1 / UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES	N/A
15. WATER DEPTH	-29.9
16. DATE HOLE	STARTED 10/9/2012 / COMPLETED 10/9/2012
17. ELEVATION TOP OF HOLE	-29.9
18. TOTAL CORE RECOVERY FOR BORING	74.0 %
19. GEOLOGIST	M.Kwasek

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling time, water loss, depth weathering, etc., if significant)* g
-29.9	0.0		Grey elastic silt with black organic bands between 0.3' to 1.7'. Bivalve shell fragments found throughout.	100	BS1 0.0 6.9	Bagged Sample (0-6.9') @0.0' Tor=.03 T/sq.ft Pen=.05 T/sq.ft @1.0' Tor=.02 T/sq.ft Pen=.03 T/sq.ft @2.0' Tor=.02 T/sq.ft Pen=.03 T/sq.ft @3.0' Tor=.02 T/sq.ft Pen=.03 T/sq.ft @4.0' Tor=.02 T/sq.ft Pen=.01 T/sq.ft @5.0' Tor=.03 T/sq.ft Pen=.02 T/sq.ft @6.0' Tor=.02 T/sq.ft Pen=.03 T/sq.ft
-36.8	6.9					@7.0' Tor=.02 T/sq.ft Pen=.01 T/sq.ft

DRILLING LOG

DIVISION: HDR CHPE

INSTALLATION: MRS Phase 2 Cable Route Survey

SHEET 1 OF 1 SHEETS

1. PROJECT: CHPE
2. LOCATION (Coordinates or Station): HUDSON RIVER N 14,952,177.8 E 1,937,480.9
3. DRILLING AGENCY: AOSS
4. HOLE NO. *(As shown on drawing title and file number)*: SII-HDD-6A
5. NAME OF DRILLER: M.Telesco
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. Penetration, ft: 8.6
8. Recovery, ft: 6.7
9. Total Recovery, %: 77.7
10. SIZE AND TYPE OF BIT: 3.5 in
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: NAVD88
12. MANUFACTURER'S DESIGNATION OF DRILL: Vibracore
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: N/A
15. WATER DEPTH: -28.2
16. DATE HOLE: STARTED 10/9/2012; COMPLETED 10/9/2012
17. ELEVATION TOP OF HOLE: -28.2
18. TOTAL CORE RECOVERY FOR BORING: 77.7 %
19. GEOLOGIST: D.Whitesell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling time, water loss, depth weathering, etc., if significant)* g
-28.2	0.0		Grey elastic silt Small bivalve shells throughout	100	BS1 0.0 6.7	Bagged Sample (0-6.7')
-34.9	6.7					

DRILLING LOG

DIVISION: HDR CHPE

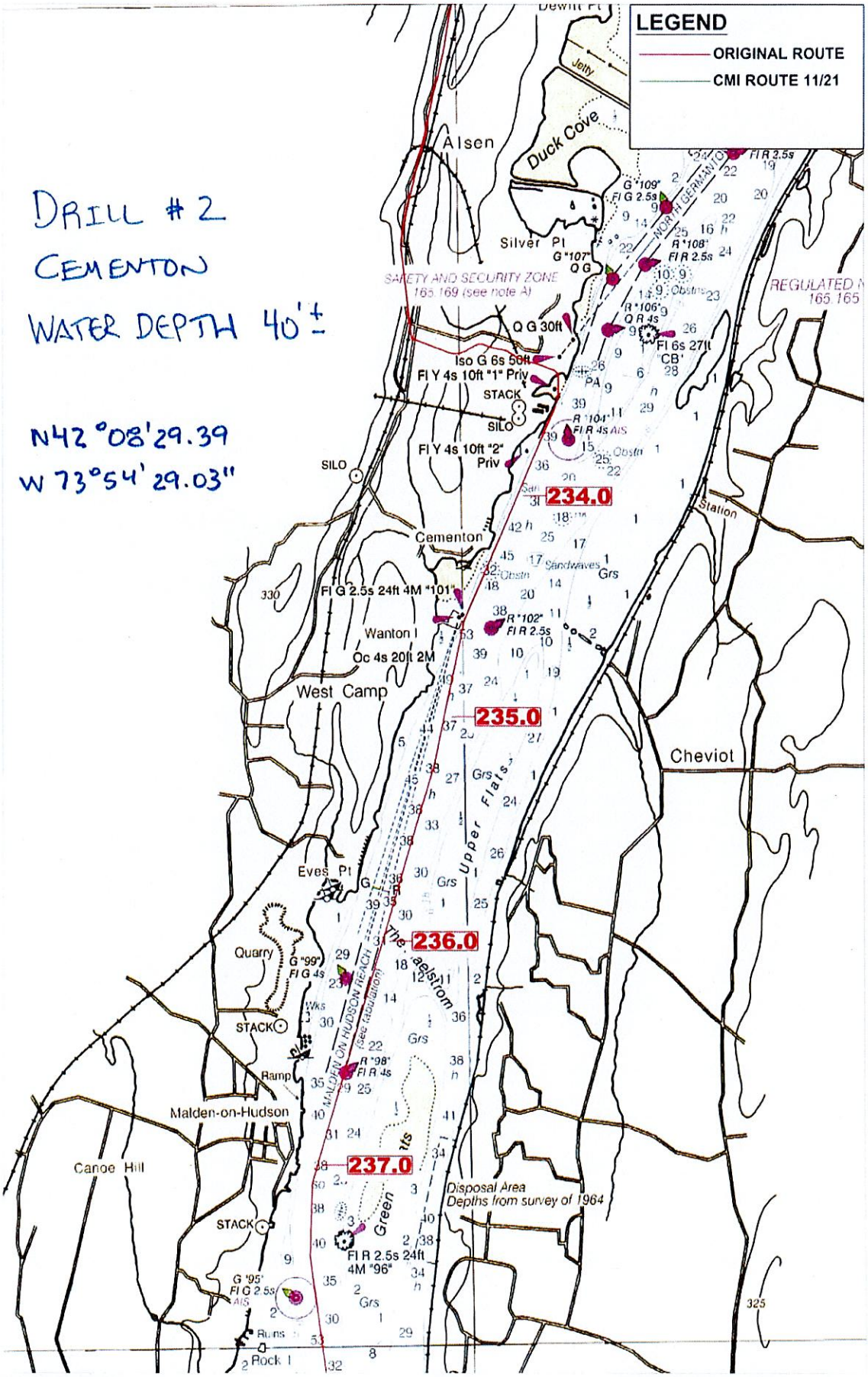
INSTALLATION: MRS Phase 2 Cable Route Survey

SHEET 1 OF 1 SHEETS

1. PROJECT: CHPE
2. LOCATION (Coordinates or Station): HUDSON RIVER N 14,952,174.2 E 1,937,661.9
3. DRILLING AGENCY: AOSS
4. HOLE NO. *(As shown on drawing title and file number)*: SII-HDD-6B
5. NAME OF DRILLER: M. Telesco
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. Penetration, ft: 9.7
8. Recovery, ft: 8.1
9. Total Recovery, %: 82.9
10. SIZE AND TYPE OF BIT: 3.5 in
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: NAVD88
12. MANUFACTURER'S DESIGNATION OF DRILL: Vibracore
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: N/A
15. WATER DEPTH: -30.6
16. DATE HOLE: STARTED 10/9/2012; COMPLETED 10/9/2012
17. ELEVATION TOP OF HOLE: -30.6
18. TOTAL CORE RECOVERY FOR BORING: 82.9 %
19. GEOLOGIST: D.Whitesell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
-30.6	0.0		Dark grey, high-plasticity organic clay with common bands of black organic silt/clay	100	BS1 0.0 8.0	Bagged Sample (0-8.0') @0.0' Tor=.01 T/sq.ft Pen=.01 T/sq.ft
						@1.0' Tor=.01 T/sq.ft Pen=.02 T/sq.ft
						@2.0' Tor=.03 T/sq.ft Pen=.02 T/sq.ft
						@3.0' Tor=.03 T/sq.ft Pen=.03 T/sq.ft
						@4.0' Tor=.03 T/sq.ft Pen=.02 T/sq.ft
						@5.0' Tor=.03 T/sq.ft Pen=.02 T/sq.ft
						@6.0' Tor=.03 T/sq.ft Pen=.02 T/sq.ft
						@7.0' Tor=.04 T/sq.ft Pen=.03 T/sq.ft
-38.6	8.0					@8.0' Tor=.04 T/sq.ft Pen=.03 T/sq.ft

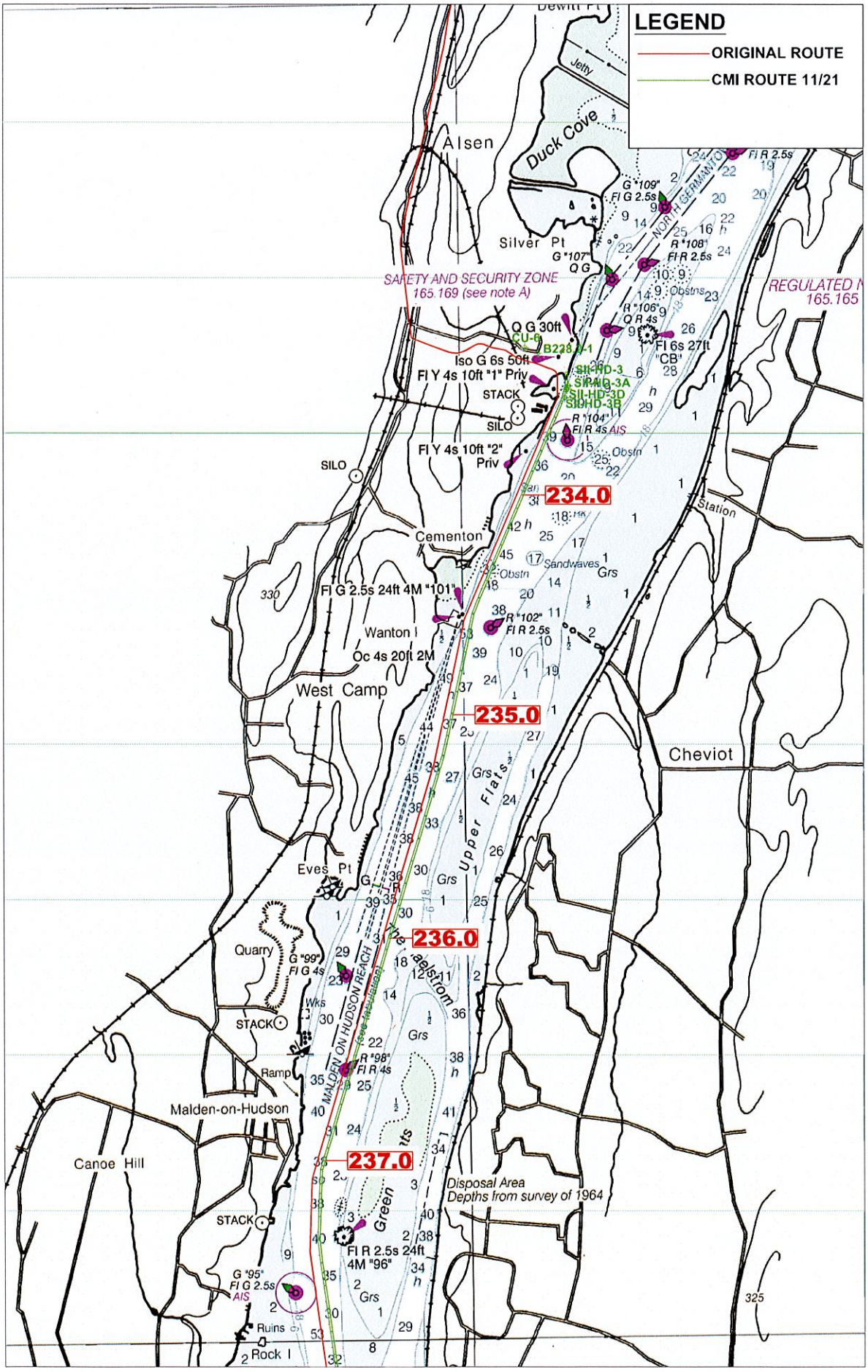
CHPE - HUDSON RIVER CABLE ROUTE ADJUSTMENT



11/03/2021

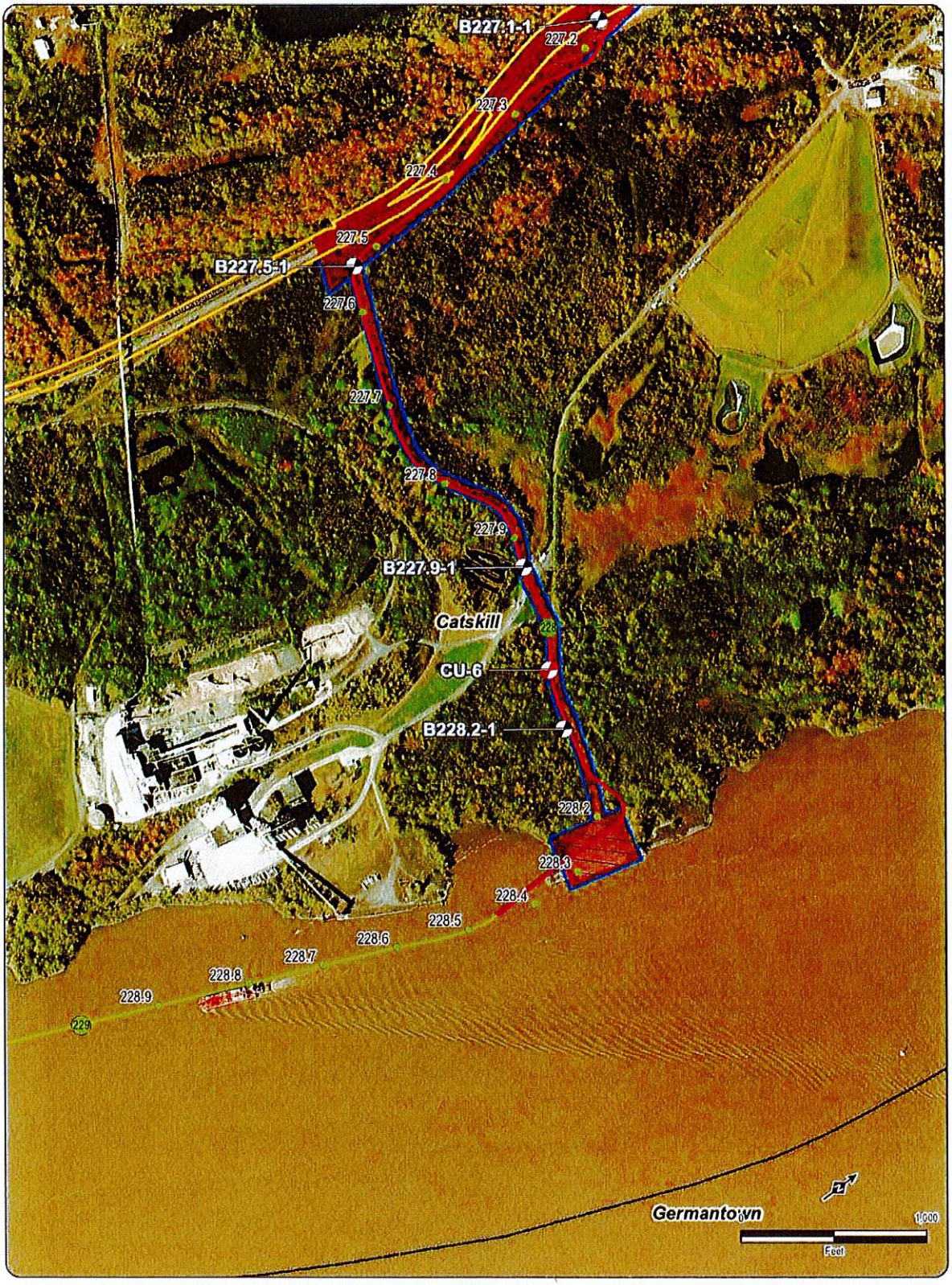
SHEET 1 OF 16

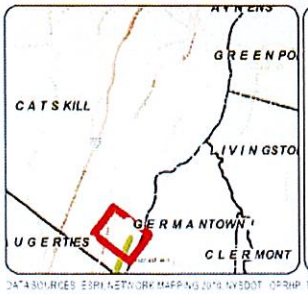
CHPE - HUDSON RIVER CABLE ROUTE ADJUSTMENT



11/03/2021

SHEET 1 OF 16





LEGEND

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

Parcel Ownership

Road Name

TOWN NAME

DATA SOURCES: ESRI, NETWORK MAPPING 2019, NYSDOT, OPRHP, TDI, TRC

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc

BORING LOCATION PLAN

Catskill to Upland

Figure A-11

Sheet 6 of 6

Prepared by: AECOM 5/20/2021

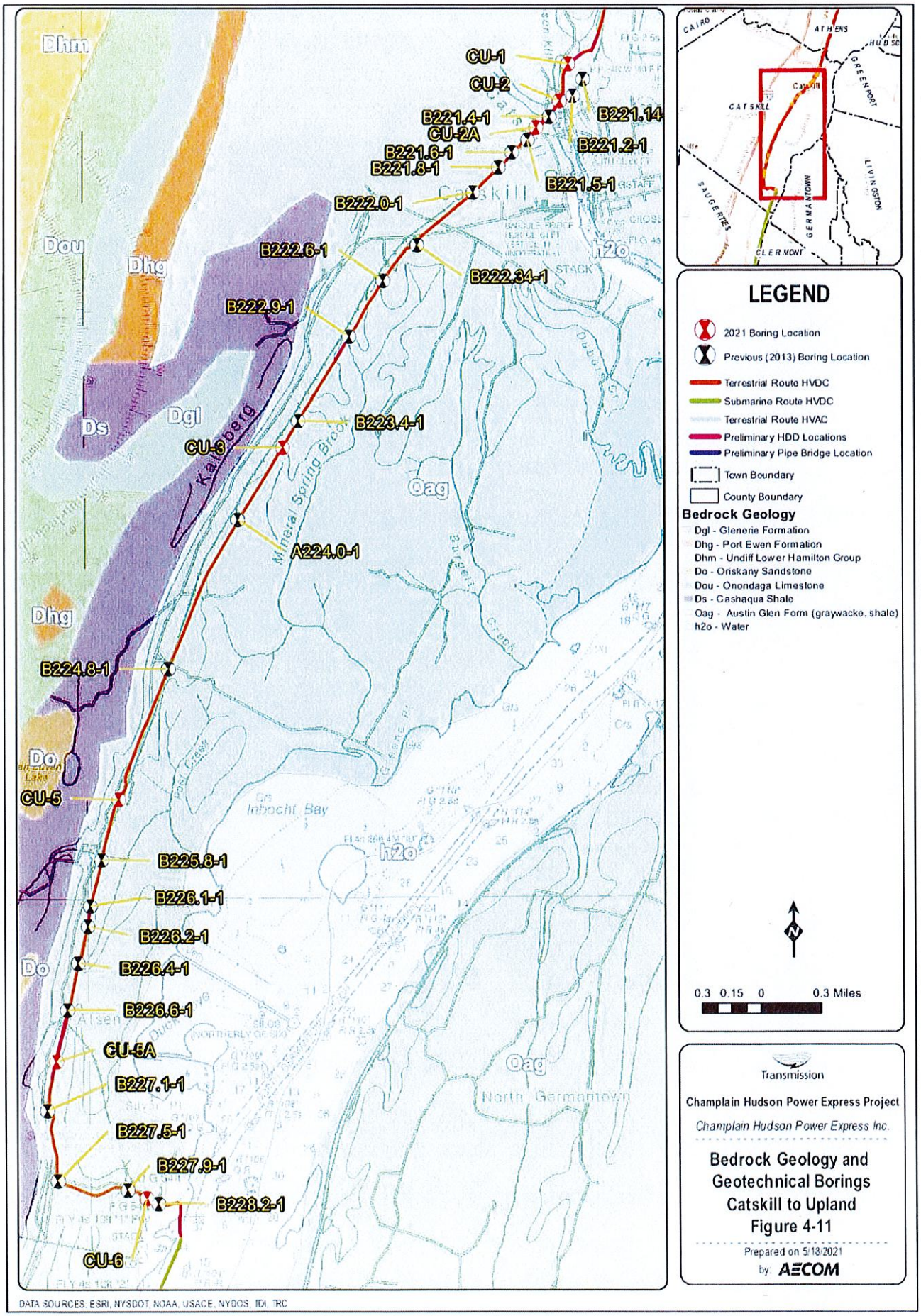

CU-1
CU-2
B221.4-1
CU-2A
B221.14
B221.2-1
B221.6-1
B221.8-1
B221.5-1
B222.0-1
B222.6-1
B222.34-1
B222.9-1
B223.4-1
CU-3
A224.0-1
B224.8-1
CU-5
B225.8-1
B226.1-1
B226.2-1
B226.4-1
B226.6-1
CU-5A
B227.1-1
B227.5-1
B227.9-1
B228.2-1
CU-6
Dhm
Dou
Dhg
Ds
Dgl
Do
Oag
h2o
Catskill
Kaaterskill Creek
Mineral Spring Brook
Inbocht Bay
North Germantown
CAIRO
ATHENS
CATSKILL
GREENPORT
GERMANTOWN
LIVINGSTON
SAUGERTIES
CLERMONT
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
Dgl - Glenerie Formation
Dhg - Port Ewen Formation
Dhm - Undiff Lower Hamilton Group
Do - Oriskany Sandstone
Dou - Onondaga Limestone
Ds - Cashaqua Shale
Oag - Austin Glen Form (graywacke, shale)
h2o - Water
N
0.3 0.15 0 0.3 Miles
Transmission
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.
Bedrock Geology and Geotechnical Borings
Catskill to Upland
Figure 4-11
Prepared on 5/18/2021
by: AECOM
DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, IDI, TRC

Table 1-11: Summary of Test Borings
Catskill - Upland Segment (CU)

Boring No.	Location	Approx. Mile Post	Total Depth of Boring (ft.)	Predominant Soil Type (0'-16')	Depth to Top of Bedrock (ft)	Type of Rock	Remarks	Depth to Water (ft.)	Northing (2)	Easting (2)	Top of Boring Elevation (1)
B226.6-1		226.65	25	SILTY CLAY	-	-	-	18.7	1211894.746	649689.666	-
CU-5A	CSXT ROW - East shoulder of rail siding	226.91	40	SILT & CLAY	-	-	-	25	1210523.689	649411.754	118.4
B227.1-1		227.16	30	CLAY, SILT & SAND	-	-	-	No water observed	1209233.087	649170.737	-
B227.5-1		227.53	30	CLAY, SILT & SAND	-	-	-	No water observed	1207372.399	649439.476	-
B227.9-1		227.93	25	SILTY SAND OVER SILTY CLAY	-	-	-	No water observed	1207125.886	651285.97	-
CU-6	South shoulder dirt private road	228.05	16	SAND, SILT, GRAVEL (WITH COBBLES?)	12.7	SILTSTONE	-	No water observed	1206902.296	651809.144	25.6
B228.2-1		228.1	60	SANDY GRAVEL (FILL)	-	-	-	No water observed	1206774.242	652109.492	-

Notes:
(1) Elevations refer to NAVD88
(2) Northing and Easting in NYS Plane East (ft.)
(3) Drilled by AECOM in 2021
(4) Drilled by TRC in 2013

BORING CONTRACTOR: ADT														SHEET 1 OF 1
DRILLER: Francisco M.														PROJECT NAME: CHPE -
SOILS ENGINEER/GEOLOGIST: Alexandra Golden														PROJECT NO.: 60323056
														HOLE NO.: **CU-6**
														START DATE: 2/16/21
														FINISH DATE: 2/16/21
LOCATION: MP - 228.05 Catskill, NY														OFFSET: N/A
GROUND WATER OBSERVATIONS					CASING		SAMPLER		DRILL BIT		CORE BARREL			DRILL RIG: Geoprobe 7822DT
No water observed			TYPE		Flush Joint Steel		California Modified		Tricone Roller Bit		NQ			BORING TYPE: SPT/Core
			SIZE I.D.		4"		2.5"		- -		1 7/8"			BORING O.D.: 4.5"/3"
			SIZE O.D.		4.5"		3"		3 7/8"		3"			SURFACE ELEV.:
			HAMMER WT.		140 lbs		140 lbs							LONGITUDE:
			HAMMER FALL		30"		30"							LATITUDE:
DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.(2)	USCS CLASS.	STRAT. CHNG. DEPTH		FIELD IDENTIFICATION OF SOILS
		0'-5'				Hand Cleared					SP			0.0'-3.0'; Brown medium-coarse SAND, little gravel, trace organics; loose, dry
1.0														
											SW			3.0'-5.0'; Dark brown fine-medium SAND, some silt, little gravel; medium stiff, dry
2.0														
3.0														
		3'-5'	S-1											TR-1; 3.0'-5.0'
4.0														
5.0														
		5'-7'	S-2	24"	24"	12	17	18	27	23	SW			Brown fine-medium SAND, some silt, some gravel, little subangular cobbles (3"); medium stiff, dry
6.0														TR-2; (5.5'-6.17')
7.0												Silty SAND		
		7'-9'	S-3	24"	24"	21	20	30	39	20	SW			SAA; moist
8.0														
9.0														
		9'-11'	S-4	24"	24"	45	40	48	50	57	SW			SAA
10.0														TR-3; (9.0'-9.5')
11.0														
		11'-'13'	S-5	19"	19"	9	25	33	50/3"	38	SW			SAA, moist
12.0														Rock encountered at 12.8', drill to 13'
13.0														
	3 min	13'-16'	R-1	36"	36"	RQD: 18" = 50%						SILTSTONE		Gray SILTSTONE, trace calcite veins, moderately weathered, 50 pieces
14.0														TR-4; (14'-14.5')
	2 min													
15.0														
	4 min													
16.0														
														CU-6 terminated at 16', backilled and grouted to surface
17.0														
18.0														
19.0														
20.0														

NOTES:

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

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

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

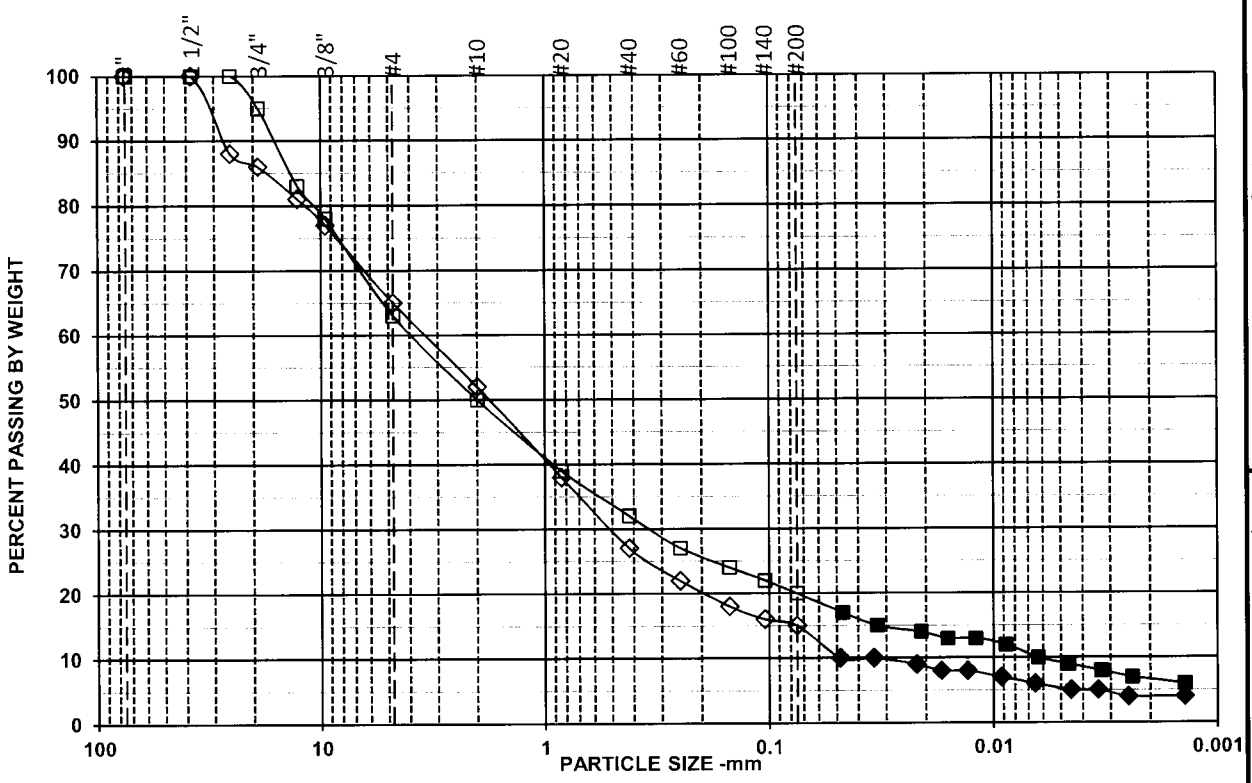
SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

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

Aquifer
CHPE - Catskill Upland 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 (%)	
CU-1	S-3	7-9	7.5				SM	33	9	
CU-1	S-6	13-15	9.0				SM	16	4	
CU-2	S-2	5-7	22.1				SM	14	3	
CU-2	S-6	13-15	20.6	34	20	14	SC	45	14	
CU-2	S-11	35-37	7.0				SM	23	5	
CU-2A	S-6	15-17	59.4	53	23	30	CH	99	87	
CU-2A	S-9	30-32	35.4	37	20	17	CL	99.6	46	
CU-2A	S-14	55-57	25.1	28	17	11	CL	85	28	
CU-4	S-2	5-7	28.9	60	26	34	CH	95.7	77	
CU-4	S-4	9-11	33.0				GC	31	22	
CU-5A	S-4	9-11	33.7	64	25	39	CH	99	90	
CU-5A	S-8	20-22	29.8	59	25	34	CH	99.4	58	
CU-5A	S-11	35-37	37.8	48	23	25	CL	100	68	
CU-6	S-2	5-5.5	9.4				SM	20	7	
CU-6	S-5	11-13	9.8				SM	15	4	

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



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

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	9.4				SM		Brown, Silty sand with gravel, Insufficient sample size	04/30/21
◇	9.8				SM		Brown, Silty sand with gravel, Insufficient sample size	04/30/21
○								

Aquifer

TerraSense, LLC #7853-21007

CHPE - Catskill Upland Borings

Symbol	□	◇	○
Boring	CU-6	CU-6	
Sample	S-2	S-5	
Depth	5-5.5	11-13	
% +3"	0	0	
% Gravel	37	35	
% SAND	43	50	
%C SAND	13	13	
%M SAND	18	25	
%F SAND	12	12	
% FINES	20	15	
D_{100} (mm)	25.4	38.1	
D_{60} (mm)	3.89	3.4	
D_{30} (mm)	0.34	0.51	
D_{10} (mm)	0.006	0.048	
Cc	4.7	1.6	
Cu	617.5	70.8	

Sieve Size/ID #	Percent Finer Data		
6"	100	100	
4"	100	100	
3"	100	100	
1 1/2"	100	100	
1"	100	88	
3/4"	95	86	
1/2"	83	81	
3/8"	78	77	
#4	63	65	
#10	50	52	
#20	39	38	
#40	32	27	
#60	27	22	
#100	24	18	
#140	22	16	
#200	20	15	
5μ m	9	5	
2μ m	7	4	
1μ m	5	4	

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

Aquifer
CHPE - Catskill Upland Borings
SUMMARY OF ROCK TESTING

SAMPLE IDENTIFICATION			STATE PROPERTIES			ENGINEERING PROPERTY TESTS					REMARKS
Boring	Run	Depth	WATER CONTENT (1) (%)	TOTAL UNIT WGT. (pcf)	DRY UNIT WGT. (pcf)	TEST TYPE (2)	Mohs HARDNESS (-)	UNCONFINED COMPRESSION TESTS (ASTM D7012)			
								COMPRESSIVE STRENGTH (psi)	AXIAL STRAIN @ FAILURE (%)	ESTIMATED (5) ELASTIC MODULUS (psi)	
CU-1	R-1	20.5-20.9				M	4				
CU-1	R-1	20.95-21.35	0.4	169	168	UC		21660	0.41	6E+06	
CU-1	R-3	32.4-32.6				M	3				
CU-1	R-3	32.7-33.1	0.6	169	168	UC		11100	0.30	4E+06	
CU-2	R-1	53				M	7				
CU-2	R-1	53.7-54.1	0.5	169	168	UC		8100	0.28	4E+06	
CU-6	R-1	13.6-13.9				M	5				
CU-6	R-1	13.1-13.5	0.3	169	168	UC		20750	0.36	6E+06	

(2) Test Type Abbreviations: M: Mohs Hardness, UC: UC Compression test with estimated elastic moduli

(3) Diametral orientation across core along bedding/foliation plane, axial perpendicular to bedding/foliation plane, as applicable.

(4) Compressive Strength determined using generalized "K" factor in ASTM D5731

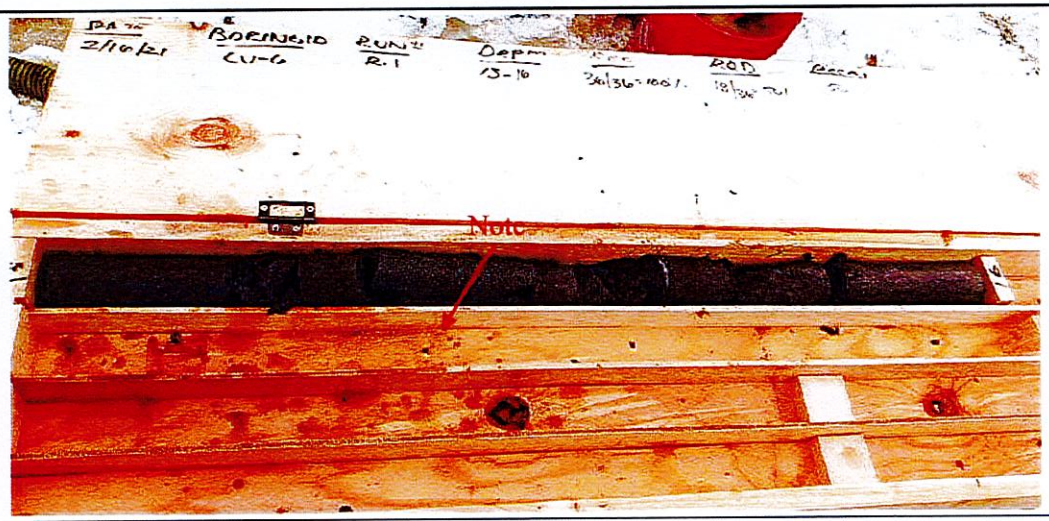
(5) Modulus estimated based on corrected gross deformations.

ROCK CORE PHOTOGRAPHIC LOG

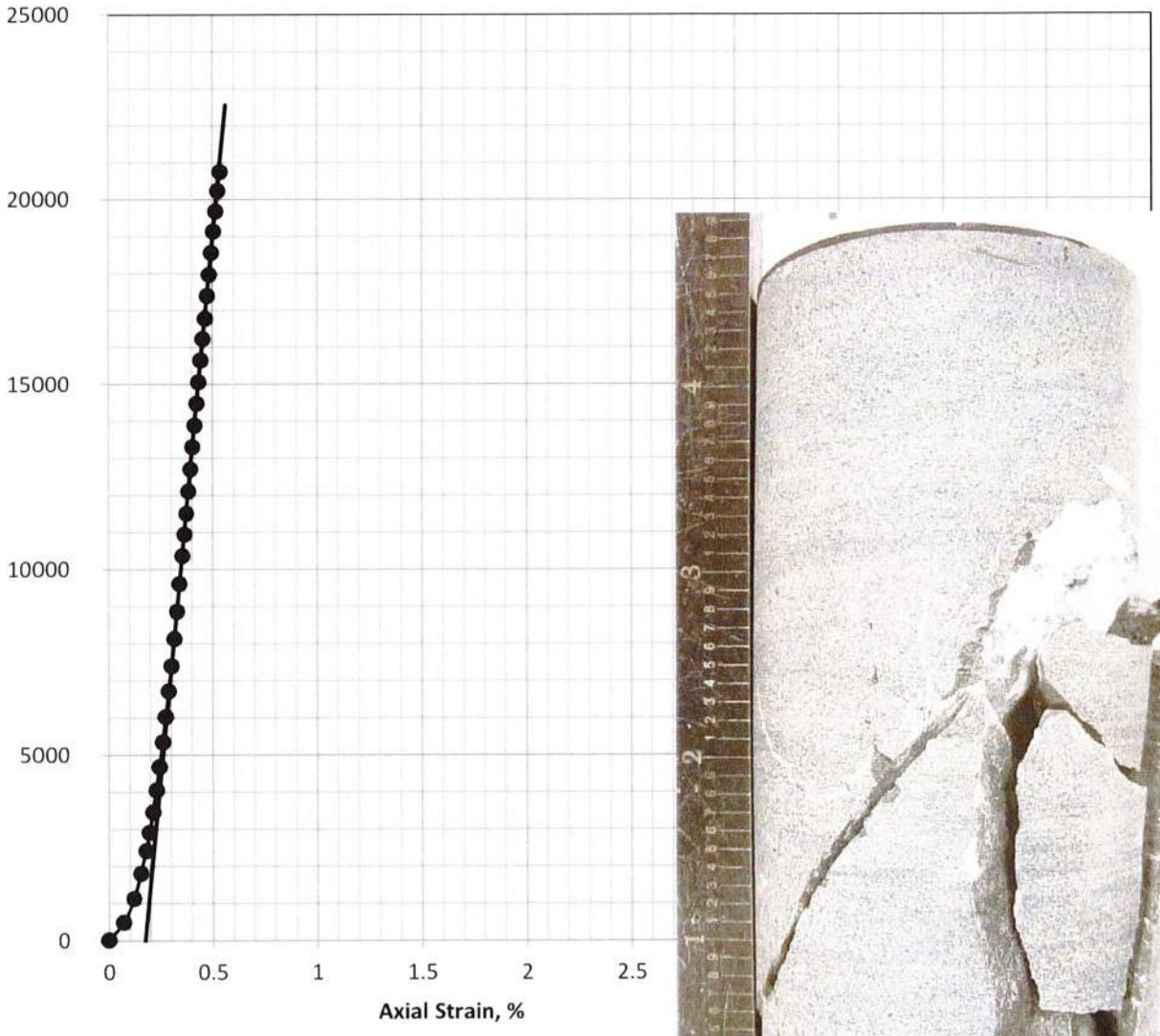
AECOM Project No: **60323056**
Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
Location: **Catskill - Upland Segment**

AECOM

Boring No.	Depth (ft.)
CU-6	20.0-40.0



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



FAILURE PHOTO

Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.35	169	168	4.404	1.973

Specimen meets ASTM D4543 shape tolerances

Test Summary

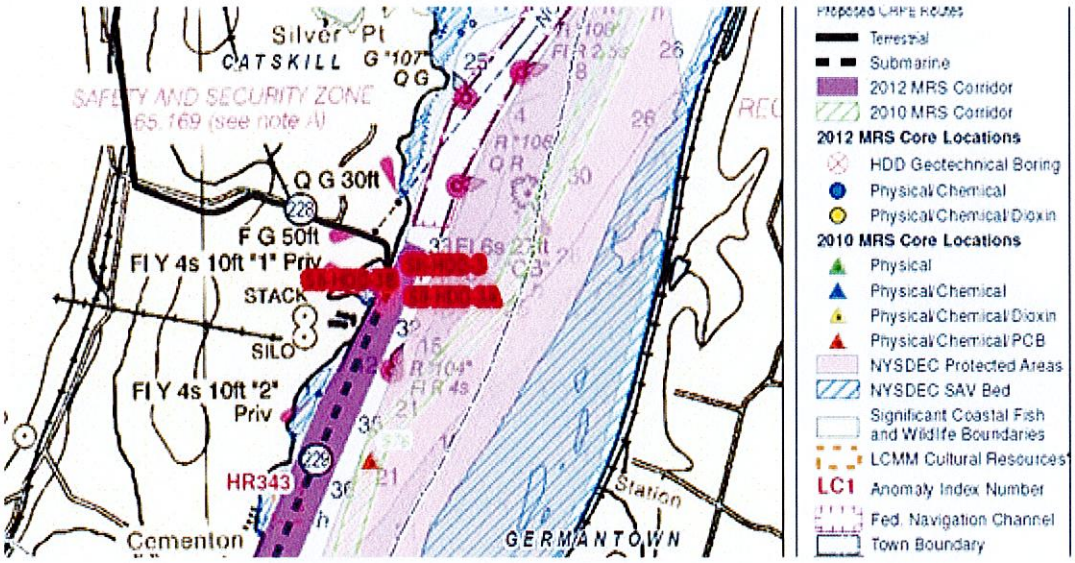
Strain Rate (%/min)	Corrected Strain to Peak (%)	q_u (psi)	Estimated (shown) Elastic Modulus (psi)
0.09	0.36	20750	6E+06

Test by: DM
Test Date: Apr-07-21
Reviewed by: GET

Aquifer	**CHPE - Catskill Upland Borings**	**COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST**
TerraSense, LLC Project # 7853-21007		**Boring: CU-6 Run: R-1 Depth 13.1-13.5 ft.**

Table 6-11 Bedrock Conditions at HDD Locations						
Catskill - Upland Segment (CU)						
Approximate HDD MP		**Approximate Length (feet)**	**Boring No.**	**Boring Depth (feet)**	**Depth to Bedrock (feet)**	**Type of Rock**
Certified Route MP	**Alternative Route MP**					
221.2	0.1	430	CU-1	40	**19.7**	**LIMESTONE**
-	0.3	600	CU-2	60	**50.1**	**SHALE & SANDSTONE**
			B221.4-1	24.7	**13.6**	**GRAYWACKE**
-	0.45	388	CU-2A	60	>60	-
222.0	-	500	B222.0-1	25	>25	-
222.3	-	250	B222.34-1	25	>25	-
222.6	-	190	B222.6-1	30.5	>30.5	-
223.0	-	450	B222.9-1	30	>30	-
225.8	-	300	B225.8-1	30	>30	-
226.1	-	640	B226.1-1	30	>30	-
			B226.2-1	25	>25	-
226.7	-	1845	B226.6-1	30	>30	-
			CU-5A	40	>40	-
228.3	-	-	B228.2-1	60	>60	-

Note: This table represents AECOM's understanding of the HDD locations and lengths in this project Segment as of the start of the field investigation on December 10, 2020. HDD's that may have been added, or HDD locations or lengths that may have been modified since that date, as reflected in the Boring Location Plan (Appendix A) are not included.


Silver Pt
CATSKILL
G "107"
Q G
SAFETY AND SECURITY ZONE
Q G 30ft
F G 50ft
Fl Y 4s 10ft "1" Priv
STACK
SILO
Fl Y 4s 10ft "2"
Priv
HR343
Cementon
GERMANTOWN
Station
Proposed CPPE Routes
Terrestrial
Submarine
2012 MRS Corridor
2010 MRS Corridor
2012 MRS Core Locations
HDD Geotechnical Boring
Physical/Chemical
Physical/Chemical/Dioxin
2010 MRS Core Locations
Physical
Physical/Chemical
Physical/Chemical/Dioxin
Physical/Chemical/PCB
NYSDEC Protected Areas
NYSDEC SAV Bed
Significant Coastal Fish and Wildlife Boundaries
LCMM Cultural Resources*
LC1
Anomaly Index Number
Fed. Navigation Channel
Town Boundary

CEMENTON

Hole No. SII-HDD-3D

DRILLING LOG

DIVISION: HDR CHPE

INSTALLATION: MRS Phase 2 Cable Route Survey

SHEET 1 OF 1 SHEETS

1. PROJECT: CHPE
2. LOCATION (Coordinates or Station): Hudson River N 15,308,914.0 E 1,936,568.3
3. DRILLING AGENCY: ADT
4. HOLE NO. *(As shown on drawing title and file number)*: SII-HDD-3D
5. NAME OF DRILLER: J. Philbin
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. Penetration, ft: 43.0
8. Recovery, ft: 43.0
9. Total Recovery, %: 100.0
10. SIZE AND TYPE OF BIT: Split Spoon/Rotary Drill
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: NAVD88
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 11; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: 2
15. WATER DEPTH:
16. DATE HOLE: STARTED 11/14/2012; COMPLETED 11/15/2012
17. ELEVATION TOP OF HOLE: -44.1
18. TOTAL CORE RECOVERY FOR BORING: 100 %
19. GEOLOGIST: S. Miller

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling time, water loss, depth weathering, etc., if significant)* g
-44.1	0.0		Dark brown to black, fine to medium-grained, poorly-sorted sand with gravel	30	SedBox3 0.0 2.0	Blows 2-2-1-3
-49.1	5.0					
-49.3	5.2		Dark brown, medium-grained sand with shell hash; red rock/brick at 5.2'	100	SedBox3 5.0 7.0	Blows 1-1-3-6
-54.1	10.0		Dark brown, low-plasticity clay			
-55.1	11.0		Dark brown, fine to medium-grained sand with shell and brick fragments	30	SedBox3 10.0 12.0	Blows 5-6-10-10
-59.1	15.0		Dark brown silt with trace sand			
-59.9	15.8		Dark brown, medium to coarse-grained, silty-sand with pebbles and shell fragments; trace 1" rock	70	SedBox3 15.0 17.0	Blows 12-13-43-60
-61.1	17.0		Dark brown silty-sand	100	RockBox1 17.0 18.0	Drill Time 00:27:33 RQD=67%
			Gray to black low-grade metamorphic slate Diagonal fracturing	58	RockBox1 18.0 23.0	Drill Time 00:29:22 RQD=42%
				75	RockBox1 23.0 26.0	Drill Time 00:34:25 RQD=69%
				80	RockBox1 26.0 28.0	Drill Time 00:30:40 RQD=52%
-73.1	29.0			84	RockBox1 28.0 33.0	Drill Time 00:46:39 RQD=46%
			Low-grade metamorphosed sedimentary rocks (possibly slate or dense limestone) Diagonal and horizontal fracturing	98	RockBox1 33.0 38.0	Drill Time 00:24:35 RQD=93%
-84.1	40.0			94	RockBox2 38.0 43.0	Drill Time 00:28:19 RQD=86%

DRILLING LOG

DIVISION: HDR CHPE

INSTALLATION: MRS Phase 2 Cable Route Survey

SHEET 1 OF 1 SHEETS

1. PROJECT: CHPE
2. LOCATION (Coordinates or Station): HUDSON RIVER N 15,308,900.2 E 1,936,575.0
3. DRILLING AGENCY: AOSS
4. HOLE NO. *(As shown on drawing title and file number)*: SII-HDD-3
5. NAME OF DRILLER: P.Morton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. Penetration, ft: 7.0
8. Recovery, ft: 2.4
9. Total Recovery, %: 34.5
10. SIZE AND TYPE OF BIT: 3.5 in
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: NAVD88
12. MANUFACTURER'S DESIGNATION OF DRILL: Vibracore
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: N/A
15. WATER DEPTH: -47.5
16. DATE HOLE: STARTED 9/29/2012; COMPLETED 9/29/2012
17. ELEVATION TOP OF HOLE: -47.5
18. TOTAL CORE RECOVERY FOR BORING: 34.5 %
19. GEOLOGIST: P.Morton

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling time, water loss, depth weathering, etc., if significant)* g
-47.5	0.0		Dark grey silty-sand with pieces of gravel (2" round) near the bottom of the unit	100	BS1 0.0 2.4	Bagged Sample (0-2.4')
-49.9	2.4					

DRILLING LOG

DIVISION: HDR CHPE

INSTALLATION: MRS Phase 2 Cable Route Survey

SHEET 1 OF 1 SHEETS

1. PROJECT	CHPE
2. LOCATION (Coordinates or Station)	HUDSON RIVER N 15,308,983.5 E 1,936,602.6
3. DRILLING AGENCY	AOSS
4. HOLE NO. *(As shown on drawing title and file number)*	SII-HDD-3A
5. NAME OF DRILLER	P.Morton
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. Penetration, ft	7.6
8. Recovery, ft	6.7
9. Total Recovery, %	88.5
10. SIZE AND TYPE OF BIT	3.5 in
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*	NAVD88
12. MANUFACTURER'S DESIGNATION OF DRILL	Vibracore
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED 2 / UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES	N/A
15. WATER DEPTH	-45.3
16. DATE HOLE	STARTED 10/30/2012 / COMPLETED 10/30/2012
17. ELEVATION TOP OF HOLE	-45.3
18. TOTAL CORE RECOVERY FOR BORING	88.5 %
19. GEOLOGIST	P.Morton

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS *(Drilling time, water loss, depth weathering, etc., if significant)* g
-45.3	0.0		Dark brown grey silty-sand with gravel	100	BS1 0.0 3.2	Bagged Sample (0-3.2')
-48.5	3.2		Shell Layer (@ 3.2')			
			Dark grey, low-plasticity clay	100	BS2 3.2 6.7	Bagged Sample (3.2-6.7')
-52.0	6.7					

DRILLING LOG

DIVISION: HDR CHPE

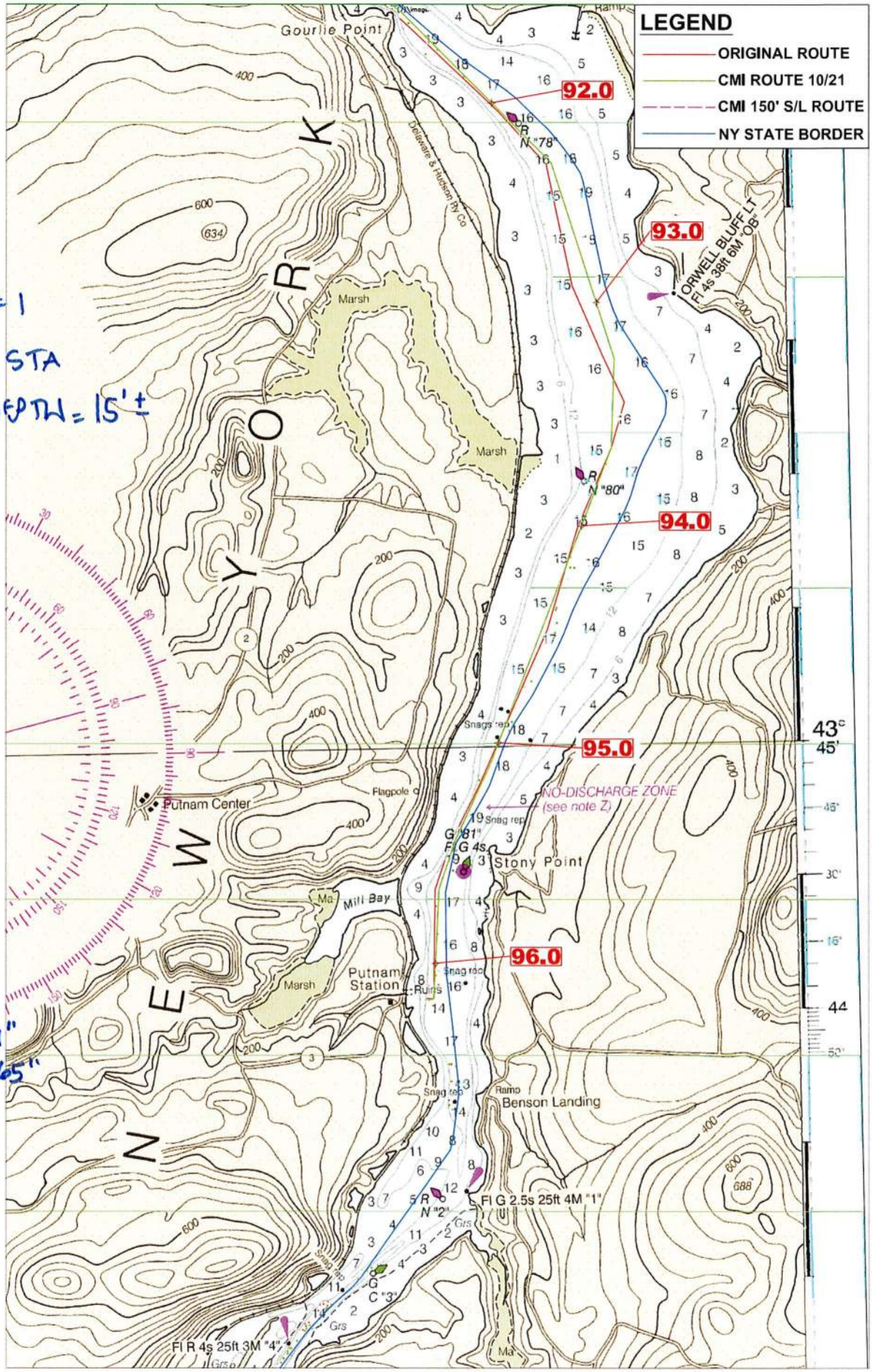
INSTALLATION: MRS Phase 2 Cable Route Survey

SHEET 1 OF 1 SHEETS

1. PROJECT: CHPE
2. LOCATION (Coordinates or Station): HUDSON RIVER N 15,308,713.9 E 1,936,524.7
3. DRILLING AGENCY: AOSS
4. HOLE NO. *(As shown on drawing title and file number)*: SII-HDD-3B
5. NAME OF DRILLER: P.Morton
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. Penetration, ft: 6.4
8. Recovery, ft: 3.4
9. Total Recovery, %: 53.0
10. SIZE AND TYPE OF BIT: 3.5 in
11. DATUM FOR ELEVATION SHOWN *(TBM or MSL)*: NAVD88
12. MANUFACTURER'S DESIGNATION OF DRILL: Vibracore
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 2 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: N/A
15. WATER DEPTH: -53.9
16. DATE HOLE: STARTED 9/29/2012 | COMPLETED 9/29/2012
17. ELEVATION TOP OF HOLE: -53.9
18. TOTAL CORE RECOVERY FOR BORING: 53.0 %
19. GEOLOGIST: S.Ebersole

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
-53.9	0.0		Brown fine-grained to medium-grained silty-sands (tree fragments common)	100	BS1 0.0 1.0	Bagged Sample (0-1.0') @0.0' Tor=N/A Pen=N/A
-54.9	1.0					@1.0' Tor=.50 T/sq.ft Pen=.08 T/sq.ft
			Dark grey to black silty-sand (fine-grain to medium-grain) with common organics and high silt component (tree fragments common)	100	BS2 1.0 3.4	Bagged Sample (1.0-3.4') @2.0' Tor=.40 T/sq.ft Pen=1.25 T/sq.ft @3.0' Tor=.30 T/sq.ft Pen=1.00 T/sq.ft
-57.3	3.4					

CHPE - LAKE CHAMPLAIN CABLE ROUTE ADJUSTMENT



DRILL #1

PUTNAM STA

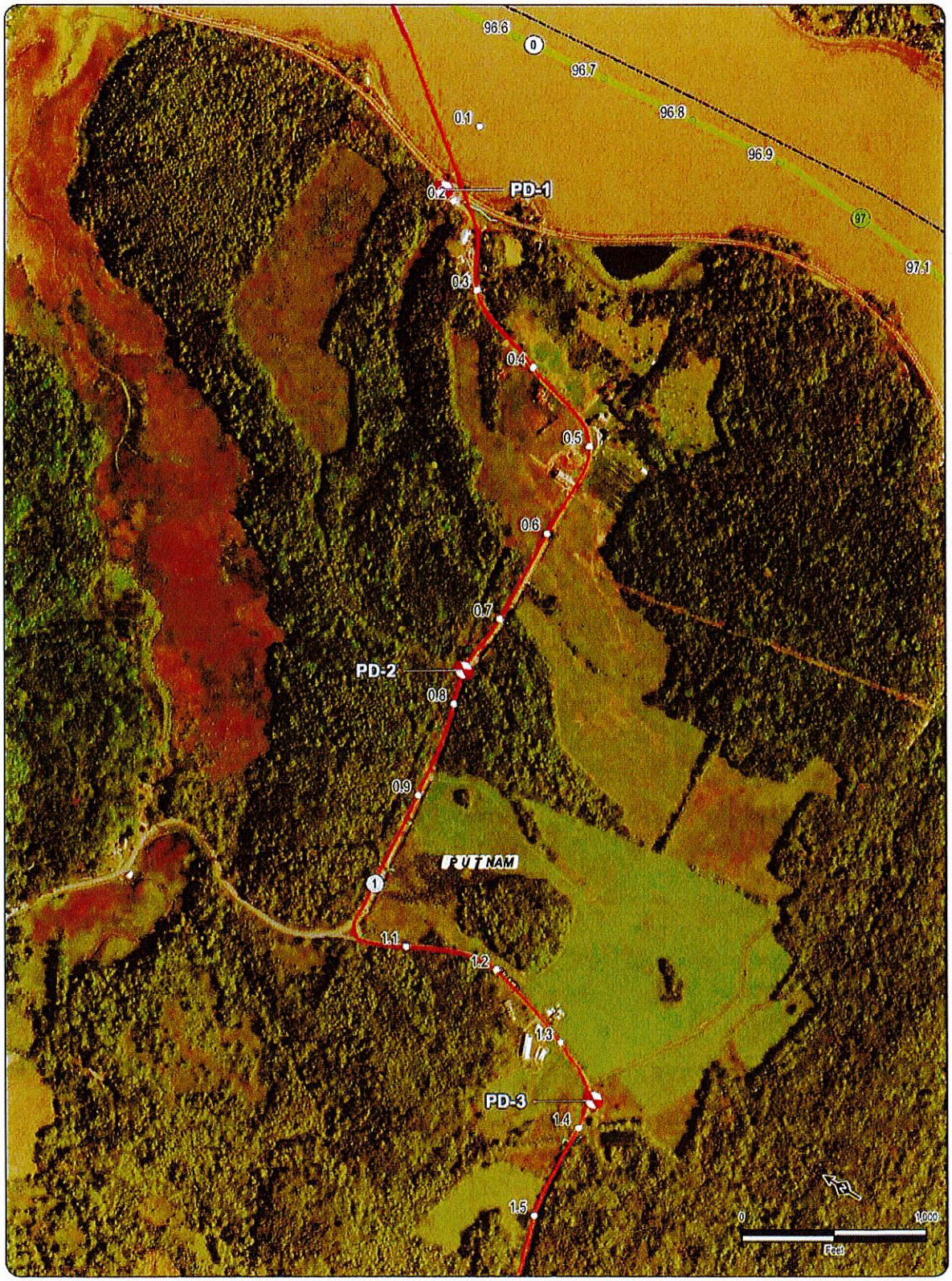
WATER DEPTH = 15' ±

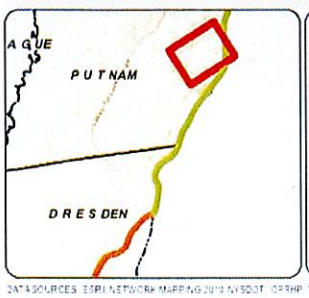
N43°44'12.51"

W 73°22'18.65"

10/19/2021 R10/26/2021

SHEET 17 OF 17





LEGEND

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

Parcel Ownership — Road Name

TOWN NAME

Transmission

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc

BORING LOCATION PLAN

Putnam to Dresden

Figure A-1

Sheet 1 of 6

Prepared by AECOM 5/18/2021

DATA SOURCES: ESRI, NETWORK MAPPING 2019, NYSDOT, OPRHP, TDI, TRC

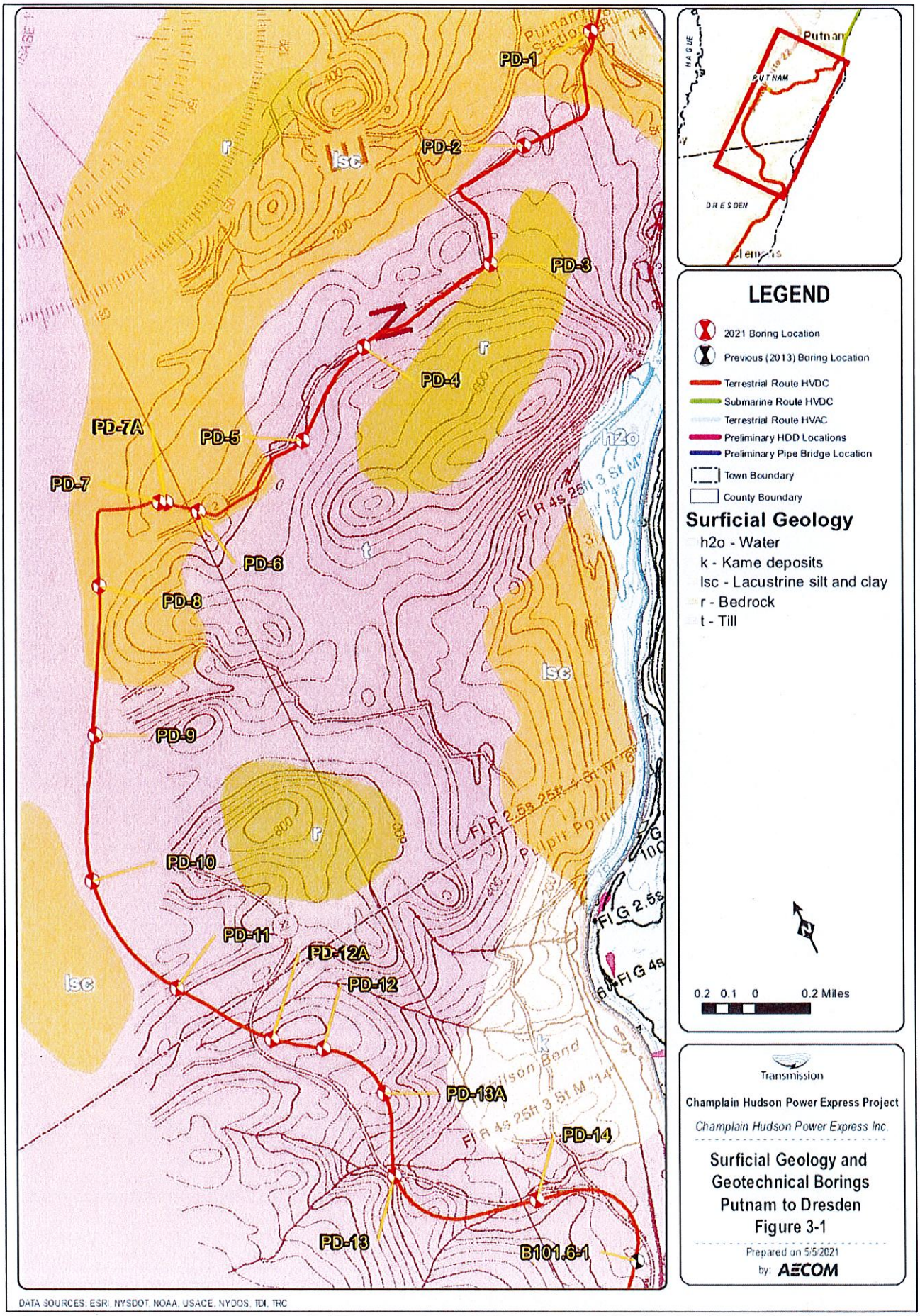

PD-1
PD-2
PD-3
PD-4
PD-5
PD-6
PD-7
PD-7A
PD-8
PD-9
PD-10
PD-11
PD-12A
PD-12
PD-13A
PD-14
PD-13
B101.6-1
r
lsc
h2o
k
t
Fl R 4s 25ft 3 St M
Fl R 2.5s 25ft 6t M
Fl G 2.5s
Fl G 4s
Pulpit Point
Wilson Bend
Putnam
PUTNAM
DRESDEN
HAGUE
LEGEND
2021 Boring Location
Previous (2013) Boring Location
Terrestrial Route HVDC
Submarine Route HVDC
Terrestrial Route HVAC
Preliminary HDD Locations
Preliminary Pipe Bridge Location
Town Boundary
County Boundary
Surficial Geology
h2o - Water
k - Kame deposits
lsc - Lacustrine silt and clay
r - Bedrock
t - Till
N
0.2 0.1 0 0.2 Miles
Transmission
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.
Surficial Geology and Geotechnical Borings
Putnam to Dresden
Figure 3-1
Prepared on 5/5/2021
by: AECOM
DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

Table 1-1: Summary of Test Borings
Putnam to Dresden Segment (PD)

Boring No.	Approx. Mile Post	Total Depth of Boring (ft.)	Predominant Soil Type (0'-16')	Depth to Top of Bedrock (ft)	Type of Rock	Remarks	Depth to Water (ft.)	Northing (2)	Easting (2)	Top of Boring Elevation (1)
PD-1	0.19	60	FINE SAND	-	-	HDD to Lake Champlain	5	1787808.9	789619.3	105.7
PD-2	0.76	16.3	FINE SAND	6.3	SANDSTONE	-	2.5	1786326.7	787486.3	243.4
PD-3	1.37	17	CLAYEY SILT	-	-	-	No water observed	1784498.2	785906.2	335.1
PD-4	1.95	14.6	CLAY	14.6	SANDSTONE	-	No water observed	1784080.3	782956.5	365.7
PD-5	2.36	16	CLAYEY SILT	11	SANDSTONE	-	No water observed	1782925.2	781099.0	387.5
PD-6	2.87	17	SILTY CLAY	-	-	-	No water observed	1782539.0	778649.3	299.7
PD-7A	2.99	50	SILT & CLAY	-	-	HDD under Mill Creek	15	1782960.9	778149.9	269.5
PD-7	3.03	50	CLAYEY SILT	-	-		20	1783019.4	778020.6	266.4
PD-8	3.50	17	SILT & CLAY	-	-	-	No water observed	1782042.5	776254.4	286.1
PD-9	4.06	17	CLAY	-	-	-	No water observed	1779444.6	774945.9	301.5
PD-10	4.60	15.25	SAND & GRAVEL, WITH BOULDERS	-	-	-	No water observed	1776880.3	773692.7	428.9

BORING CONTRACTOR: ADT	**AECOM**	SHEET 1 OF 3
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
SOILS ENGINEER/GEOLOGIST: Chris French		PROJECT NO.: 60323056
		HOLE NO.: **PD-1**
		START DATE: 12/23/2020
	BORING LOG	FINISH DATE: 12/23/2020
LOCATION: MP 0.19 (Washington County Rt. 3)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: Geoprobe 7822 DT
Water at 5' (inferred)	TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit		BORING TYPE: SPT
	SIZE I.D.	4"	2.5"	- -		BORING O.D.: 4.5"
	SIZE O.D.	4.5"	3"	3 7/8 "		SURFACE ELEV.:
	HAMMER WT.	140 lbs	140 lbs			LONGITUDE:
	HAMMER FALL	30"	30"			LATITUDE:

DEPTH	CORING RATE MIN/FT	SAMPLE DEPTHS FROM - TO (FEET)	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'									SP		0'-1.5'; Dark Brown fine-coarse SAND, little silt, little subangular-subrounded gravel,trace sub angular cobbles, organics (root materials), loose, moist
1.0		(Hand Cleared)											
2.0													
											SP		1.5'-5'; Lt Br fine SAND, some silt, trace sub rounded gravel, loose, moist
3.0		3'-5'	S-1										TR-1; (3.0'-5.0')
4.0													
5.0													
		5'-7'	S-2	24"	6"	WOH/3"	1/15"		2	-	SM		Light Brown fine SAND, some silt, very loose, saturated
6.0													
7.0													
		7'-9'	S-3	24"	18"	4	2	2	2	3	SM		Gray fine SAND, some silt, very loose, saturated, mild petroleum odor, TR-2; (8.0'-8.5')
8.0													
9.0													
		9'-11'	S-4	24"	16"	2	5	8	10	8	SP/SM		Gray Brown fine SAND, little silt, loose, moist
10.0												SAND	
11.0													
		11'-13'	S-5	24"	24"	10	10	17	17	18	SP		Brown fine SAND, trace silt, slight petroleum odor, medium dense, moist
12.0													
13.0													
		13'-15'	S-6	24"	24"	8	13	18	23	20	SP		SAA TR-3; (14.0'-14.5')
14.0													
15.0													
		15'-17'	S-7	24"	20"	19	32	22	18	35	SP		Brown fine SAND, trace silt, very slight petroleum odor, dense, moist
16.0													
17.0													
18.0													
19.0													
20.0													

NOTES:

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

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

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

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

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

BORING CONTRACTOR: ADT	AECOM		SHEET 2 OF 3
DRILLER: Chris Chaillou			PROJECT NAME: CHPE -
SOILS ENGINEER/Geologist: Chris French			PROJECT NO.: 60323056
	BORING LOG		HOLE NO.: **PD-1**
			START DATE: 12/23/2020
LOCATION: MP 0.19 (Washington County Rt. 3)			FINISH DATE: 12/23/2020
			OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		20'-22'	S-8	24"	18"	16	27	25	16	34	SP		SAA TR-4; (21.0'-21.5')
21.0													
22.0													
23.0													
24.0													
25.0													
		25'-27'	S-9	24"	14"	12	15	12	18	18	SP/SM		Br f-m SAND, little silt, occasional silty clay lenses, medium dense, moist
26.0													
27.0													
28.0													
29.0													
30.0													
		30'-32'	S-10	24"	18"	7	18	19	19	24	SP/SM		Br fine SAND, little silt, medium dense, moist
31.0													
32.0													
33.0												SAND	
34.0													
35.0													
		35'-37'	S-11	24"	20"	20	21	20	19	27	SP/SM		SAA
36.0													
37.0													
38.0													
39.0													
40.0													
		40'-42'	S-12	24"	14"	14	17	20	21	24	SP/SM		Br f-m SAND, little silt, medium dense, moist-wet. TR-5; (41.0'-41.5')
41.0													
42.0													
43.0													
44.0													
45.0													

NOTES:

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

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

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

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

BORING CONTRACTOR: ADT

DRILLER: Chris Chailtou

SOILS ENGINEER: Chris French

LOCATION: MP 0.19 (Washington County Rt. 3)

AECOM

BORING LOG

SHEET 3 OF 3

PROJECT NAME: CHPE -

PROJECT NO.: 60323056

HOLE NO.: **PD-1**

START DATE: 12/23/2020

FINISH DATE: 12/23/2020

OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		45'-47'	S-13	24"	16"	12	19	19	19	25	SP/SM		Br f-m SAND, little silt, medium dense, moist
46.0													
47.0													
48.0													
49.0													
50.0													
		50'-52'	S-14	24"	15"	14	21	20	23	27	SP/SM		Br fine SAND, little silt, medium dense, moist
51.0													
52.0													
53.0												SAND	
54.0													
55.0													
		55'-57'	S-15	24"	16"	14	20	25	25	29	SP/SM		Br f-m SAND, little silt, medium dense, moist
56.0													
57.0													
58.0													
		58'-60'	S-16	24"	18"	20	36	34	38	46	SP/SM		Br f-m SAND, little silt, dense, moist, TR-6; (59.0'-59.5')
59.0													
60.0													
													Boring terminated at 60' then grouted to surface.
61.0													
62.0													
63.0													
64.0													
65.0													
66.0													
67.0													
68.0													
69.0													
70.0													

NOTES:

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

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

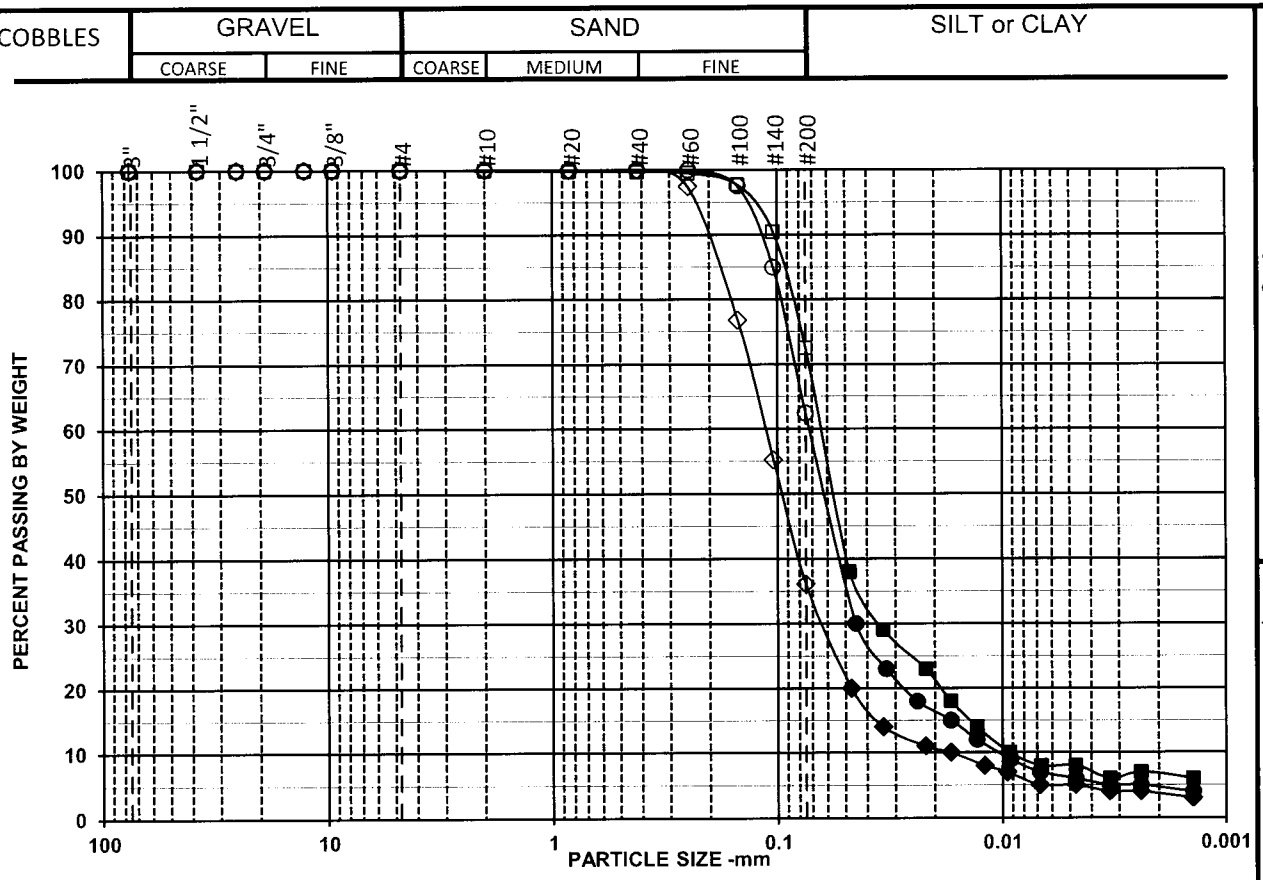
SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE

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

Aquifer #602201207
CHPE - Putnam-Dresden 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 (%)	
PD-1	S-4	9-11	19.2				ML	72.5	7	
PD-1	S-8	20-22	18.8				SM	36.1	4	
PD-1	S-10	30-32	18.0				ML	62.4	5	
PD-1	S-12	40-42	18.6				SM	16.2	3	
PD-2	S-2	5-7	18.5				ML	97.7	15	
PD-4	S-2	5-7	42.2	81	30	51	CH	88	74	
PD-4	S-3	7-9	37.8	72	24	48	CH	94.3	75	
PD-4	S-5	11-13	33.1	60	21	39	CH	87	47	
PD-5	S-3	7-9	7.2	12	12	NP	SM	40	8	
PD-7	S-4	9-11	34.4	59	20	39	CH	99.7	55	
PD-7	S-8	20-22	68.4	50	19	31	OH	100	70	
PD-7	S-10	30-32	37.3	63	20	43	OH	100	70	
PD-7	S-12	40-42	61.7	70	22	48	OH	100	72	
PD-9	S-1	5-7	30.7	70	23	47	CH	99.9	80	
PD-9	S-3	9-11	44.0	66	23	43	CH	100	79	
PD-9	S-5	13-15	43.8	75	24	51	CH	100	92	
PD-10	S-1	6-8	8.5				GW	4	1	
PD-10	S-2	8-10	8.7				SM	38	5	
PD-13	S-1	5-7	4.2				SM	37	9	
PD-13	S-2	7-8	4.6				SM	36	9	
PD-14	S-1	5-7	24.1				ML	92.8	7	
PD-14	S-3	9-11	24.2				ML	77	5	
PD-14	S-5	13-15	22.7				ML	84.7	4	

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



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

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	19.2				ML		Brown, Silt with sand	3/15/2021
◇	18.8				SM		Brown, Silty sand	03/16/21
○	18.0				ML		Brown, Sandy silt	03/16/21

Aquifer #602201207

TerraSense, LLC #7853-21001

CHPE - Putnam-Dresden Borings

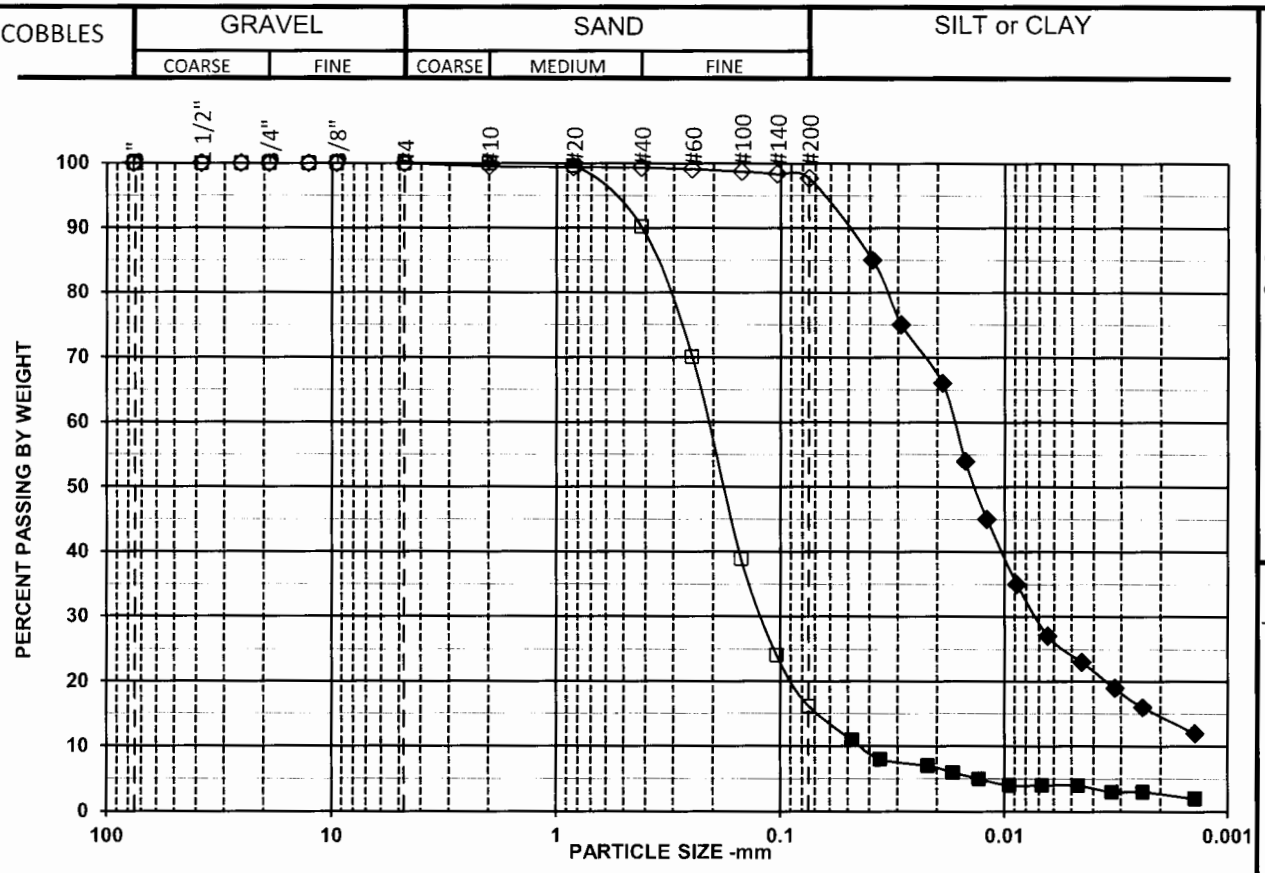
Symbol	□	◇	○
Boring	PD-1	PD-1	PD-1
Sample	S-4	S-8	S-10
Depth	9-11	20-22	30-32
% +3"	0	0	0
% Gravel	0	0	0
% SAND	27.5	63.9	37.6
%C SAND	0.1	0	0
%M SAND	0.2	0	0
%F SAND	27.2	63.9	37.6
% FINES	72.5	36.1	62.4
D_{100} (mm)	4.75	2	0.419
D_{60} (mm)	0.064	0.113	0.072
D_{30} (mm)	0.035	0.063	0.045
D_{10} (mm)	0.009	0.017	0.01
Cc	2.1	2.1	2.8
Cu	6.9	6.6	7.2

Sieve Size/ID #	Percent Finer Data		
6"	100.0	100.0	100.0
4"	100.0	100.0	100.0
3"	100.0	100.0	100.0
1 1/2"	100.0	100.0	100.0
1"	100.0	100.0	100.0
3/4"	100.0	100.0	100.0
1/2"	100.0	100.0	100.0
3/8"	100.0	100.0	100.0
#4	100.0	100.0	100.0
#10	99.9	100.0	100.0
#20	99.8	100.0	100.0
#40	99.7	100.0	100.0
#60	99.5	97.4	100.0
#100	97.7	76.8	97.5
#140	90.4	55.2	84.9
#200	72.5	36.1	62.4
5μ m	8	5	6
2μ m	7	4	5
1μ m	5	2	3

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

TerraSense Analysis File: GrainSizeV6Rev1a14

Siev1e.xlsx 4/5/2021



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

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	18.6				SM		Brown, Silty sand	3/15/2021
◇	18.5				ML		Brown, Silt	03/15/21
○								

Symbol	□	◇	○
Boring	PD-1	PD-2	
Sample	S-12	S-2	
Depth	40-42	5-7	
% +3"	0	0	
% Gravel	0	0	
% SAND	83.8	2.3	
%C SAND	0	0.5	
%M SAND	9.8	0.2	
%F SAND	74	1.6	
% FINES	16.2	97.7	
D_{100} (mm)	2	4.75	
D_{60} (mm)	0.211	0.017	
D_{30} (mm)	0.12	0.007	
D_{10} (mm)	0.044		
Cc	1.6		
Cu	4.8		

Sieve Size/ID #	Percent Finer Data		
6"	100.0	100.0	
4"	100.0	100.0	
3"	100.0	100.0	
1 1/2"	100.0	100.0	
1"	100.0	100.0	
3/4"	100.0	100.0	
1/2"	100.0	100.0	
3/8"	100.0	100.0	
#4	100.0	100.0	
#10	100.0	99.5	
#20	99.6	99.4	
#40	90.2	99.3	
#60	70.1	99.1	
#100	38.9	98.7	
#140	24.1	98.3	
#200	16.2	97.7	
5μ m	4	24	
2μ m	3	15	
1μ m	1	10	

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

Aquifer #602201207

TerraSense, LLC #7853-21001

CHPE - Putnam-Dresden Borings

TerraSense Analysis File: GrainSizeV6Rev1a14

Appendix V – Time of Year Narrative for HDD

HDD: In-water work to establish steel conductor casing riser pipe

Condition 11 of the New York State Public Service Commission (NYSPSC) 401 Water Quality Certification (attached) states "The following in-water activities may be undertaken at any time: physical, biological, geotechnical and cultural resource sampling, surveying and testing, marine surveys, mobilization and demobilization of vessels and equipment used for cable installation and cofferdam construction; **cofferdam and steel casing rise pipe construction**; dredging of cofferdams provided that the walls of the cofferdam extend above mean high water during dredging; **HDD associated with either of the two foregoing items**; post-installation surveys and sampling; locating and marking utility crossings and work to effect utility crossings; and, with prior notice to the DPS, the New York State Department of Environmental Conservation ("NYSDEC"), and the New York State Department of Health ("NYSDOH") emergency maintenance work."

US Army Corps of Engineers Permit NAN-2009-01089 Special Condition R states "All regulated work shall be performed in accordance with dated permit drawings, the attached New York State-issued Section 401 of the Clean Water Act Water Quality Certificate dated 18 January 2013; and Special Conditions (A) through (OO) below which are all hereby made part of this permit."

Based on the above, steel casing rise pipe construction and the HDD associated with same can be undertaken at any time. This is consistent with Article VII BMP Section 26.2 which includes the statement "All in-water work will be conducted within the construction windows specified in the Certificate Conditions and the Water Quality Certificate."

CHPE Work in Water Window Permit Matrix

11/29/2022

Segment	Water Body	Mile Post (referenced to 2012 route)	HDD Site	Art VII CC93 Work in Water Window	Army Corps of Engineers Permit Work in Water Window	Planned Start of Construction	Planned Completion
Segment 7	Lower Lake Champlain	MP 73-101	Putnam Station	9/1 to 12/31	Null	4/29/2023	7/8/2023
Segment 9	Upper Hudson	MP 230-269	Cementon	8/1 to 10/15	7/1 to 1/14	6/11/2023*	9/5/2023
Segment 10	Mid-Upper Hudson	MP 269-296	Stony Point	9/15 to 11/30	7/1 to 1/14	7/8/2023	10/28/2023
Segment 11	Lower Hudson	MP 305-324	Congers	7/1 to 10/31	7/1 to 1/14	9/5/2023	12/23/2023

* Land work to commence. HDD not to cross water line until 7/1.

NEW YORK STATE PUBLIC SERVICE COMMISSION
401 WATER QUALITY CERTIFICATION

Pursuant to:	Section 401 of the Federal Water Pollution Control Act, 33 U.S.C. § 1341, and Article VII of the New York Public Service Law
Certification Issued to:	Champlain Hudson Power Express, Inc. CHPE Properties, Inc. Pieter Schuyler Bldg. 600 Broadway Albany, New York 12207

Location of Facility

Champlain Hudson Power Express, Inc. and CHPE Properties, Inc. (collectively, "CHPE") proposes to construct, operate, and maintain a new 1,000 megawatt ("MW") high-voltage direct current ("HVDC") underwater/underground electric transmission facility ("HVDC Transmission System"). The HVDC Transmission System will interconnect with the transmission system of Hydro Quebec and will run from the Canadian border east of the Town of Champlain, New York to Astoria, Queens, New York ("Astoria"). The approximately three hundred thirty two (332) mile HVDC Transmission System will connect with an HVDC converter station at Astoria to be owned by CHPE. From the converter station will be connected by an underground 345 kV HVAC circuit to a gas insulated switchgear substation owned or to be owned by the New York Power Authority on property owned by the Consolidated Edison Company of New York, Inc. at Astoria. A 345 kV HVAC circuit will extend from the GIS Substation to Con Edison's 345 kV Rainey Substation located on the corner of 36th Avenue and Vernon Boulevard in Queens, New York (the "Astoria-Rainey Cable"). The HVDC Transmission System and the Astoria-Rainey Cable are referred to collectively herein as the "Facility." The details and justification for the Facility are contained in the administrative record in Case 10-T-0139.

Facility Description

The record in the proceeding on CHPE's application, as supplemented, for a Certificate of Environmental Compatibility and Public Need under Article VII of the New York Public Service Law ("PSL") has fulfilled the requirements necessary to determine whether the Facility will qualify for issuance of a Water Quality Certification ("Certification") pursuant to § 401 of the Clean Water Act (33 U.S.C. §§ 1251-1387). The Facility cables will be located primarily underwater within the lake- and riverbeds of New York waterways, including Lake Champlain and the Hudson, Harlem and East Rivers, with some segments of the Facility route being sited overland. Overland Facility segments will consist primarily of cable installations buried along: (a) existing railroad rights-of-way; and (b) existing roadway rights-of-way. In addition, to cross the Hudson

River at Fort Edward, the Mohawk River at Schenectady and Catskill Creek, the cables will be located in conduits to be attached to existing railroad bridge structures.

For the overland segments of the Facility, the cables will be buried via excavated trenches or Horizontal Directional Drilling ("HDD") methods. For underwater cable installation, the primary methods for installation will be jet plowing and/or shear plowing. Underwater cable installation techniques will vary based on a number of factors, including, but not limited to, sediment type, bathymetry, and existing infrastructure crossings.

Where the overland segments of the Facility route encounter streams and/or wetlands, the following methods may be used to minimize impacts: (a) flume crossing; (b) dam and pump; (c) HDD or Jack and Bore ("J&B"); and (d) open cut. The waterbody crossing methods are further described in the Facility's Best Management Practices documentation, which is used in the preparation of the Environmental Management and Construction Plan ("EM&CP"). Adherence to the EM&CP, required to be filed for approval by the New York State Public Service Commission ("Commission") as a condition of the Public Service Law Article VII Certificate of Environmental Compatibility and Public Need ("Article VII Certificate") in Case 10-T-0139, will serve to protect these resources.

Construction of the Facility will be in accordance with the Article VII Certificate and approved EM&CP.

Certification

The Commission hereby certifies, pursuant to § 401 of the Clean Water Act (33 U.S.C. § 1341(a)(1)) and Article VII of the PSL, that the Facility, as conditioned herein, complies with applicable requirements of §§ 301, 302, 303, 306 and 307 of the Clean Water Act as amended, and applicable New York State water quality standards, limitations, criteria, and other requirements set forth in 6 NYCRR § 608.9(a) and Parts 701 through 704, provided that all of the conditions listed herein are met. This Certification is issued in conjunction with the Article VII Certificate sought by CHPE in, and based on the record of, Case 10-T-0139.

Conditions

1. No in-water work shall commence until all pre-construction conditions related to such work contained in the Article VII Certificate and any Order approving the EM&CP for each affected Segment EM&CP have been met to the satisfaction of the New York State Department of Public Service ("DPS").

2. Construction and operation of the Facility shall at all times be in conformance with: (a) the Application (as amended and supplemented) and Joint Proposal of Settlement filed in Case 10-T-0139 to the degree not superseded by the Article VII Certificate, (b) all conditions of approval contained in the Article VII

Certificate, (c) the EM&CP, and (d) all conditions incorporated in any Order approving the EM&CP in Case 10-T-0139, to the extent such documents referenced in (c) and (d) above pertain to CHPE's compliance with New York State Water Quality Standards necessary and appropriate for issuance of, and compliance with, this Certification.

3. CHPE shall provide a copy of this Certification to the United States Army Corps of Engineers ("USACE"), as well as a copy of the Application, Joint Proposal, Article VII Certificate (when issued) EM&CP and Order(s) approving the EM&CP (when issued) in Case 10-T-0139, so that the USACE will have a complete record of the conditions that apply hereto.

4. CHPE shall provide all construction contractors performing work on the Facility complete copies of this Certification, the Article VII Certificate, the approved EM&CP, and Orders(s) approving the EM&CP for each Facility segment.

Classified Streams and Wetland Crossings Installation

5. For overland installation, no site preparation work shall be undertaken until all required erosion control measures have been installed.

6. During overland cable installation in all waters of the State, including classified streams and wetlands, there shall be no visible increase in turbidity that causes a visible contrast to background conditions forty (40) feet downstream of the installed cable centerline.

7. CHPE shall employ measures sufficient to prevent contamination of the waters of the State by silt, sediment, fuels, drilling fluids, concrete, leachate or any other pollutant associated with the installation of the Facility.

8. All in-stream work, as well as any work that may result in the suspension of sediments, is prohibited in all streams designated as "C(T)" and "C(TS)" streams during the trout spawning and incubation period commencing October 1 and ending May 31st.

9. Any debris or excess materials caused by the construction of the Facility shall be immediately and completely removed from the bed and banks of all water areas and transported to an appropriate upland area for disposal.

Lake and River Installation

10. Underwater construction in Lake Champlain and the Hudson, Harlem and East Rivers (including jet-plow and shear-plow trials) and pre-installation route clearing activities (including pre-lay grapnel run and associated obstruction and debris removal) shall occur within the construction windows set forth in Table 1 in the Article VII Certificate.

11. The following in-water activities may be undertaken at any time: physical, biological, geotechnical and cultural resource sampling, surveying and testing; marine surveys, mobilization and demobilization of vessels and equipment used for cable installation and cofferdam construction; cofferdam and steel casing rise pipe construction; dredging of cofferdams provided that the walls of the cofferdam extend above mean high water during dredging; HDD associated with either of the two foregoing items; post-installation surveys and sampling; locating and marking utility crossings and work to effect utility crossings; and, with prior notice to the DPS, the New York State Department of Environmental Conservation ("NYSDEC"), and the New York State Department of Health ("NYSDOH") emergency maintenance work.

12. During the jet plow and shear plow trials and underwater cable installation, CHPE shall implement the Suspended Sediment/Water Quality Monitoring Plan (hereinafter the "Water Quality Monitoring Plan"), to be developed pursuant to the approved Suspended Sediment / Water Quality Monitoring Plan Scope of Study included as Attachment 1 to the Article VII Certificate . CHPE shall operate the jet plow and shear plow in accordance with the operating conditions determined through the jet plow and shear plow trials described in the Water Quality Monitoring Plan to minimize suspension of *in situ* sediment, subject to the limitation of Condition 14(c), below.

13. If the jet plow trials demonstrate that the preferred operating conditions result in real-time, total suspended solids ("TSS") concentrations, measured five hundred (500) feet down-current of the jet plow, exceeding the TSS concentrations at an up-current background station by more than two hundred (200) milligrams per liter ("mg/L"), CHPE shall report such conditions to the Aquatic Inspector and work with DPS and NYSDEC to evaluate and implement modifications to the plow operating conditions to further reduce *in-situ* sediment suspension associated with the single pass installation procedure. If the shear plow trials demonstrate that the preferred operating conditions result in real-time TSS concentrations, measured five hundred (500) feet down-current of the shear-plow in the southern portion of Lake Champlain (south of Crown Point), exceeding the TSS concentrations at an up-current background station by more than one hundred (100) mg/L, CHPE shall report such conditions to the Aquatic Inspector and work with DPS and NYSDEC to evaluate and implement modifications to the plow operating conditions to further reduce in-situ sediment suspension associated with the single pass installation procedure. CHPE shall not utilize the jet plow or shear plow until they have demonstrated to the satisfaction of DPS staff their ability to achieve the TSS standards established herein through test trials.

14. Water Quality

    a. During jet plow and shear plow cable installation, CHPE shall sample and

measure turbidity (in units of Nephelometric Turbidity Units ("NTU")), TSS, hardness, and the concentrations of the chemical constituents identified in the table provided in Condition 14(d) below, within the water column of Lake Champlain and the Hudson, Harlem and East Rivers outside the effects of the installation event (the up-current background station) and down-current of the operating jet plow and shear plow described in the Water Quality Monitoring Plan. Up-current samples shall be collected at a location five hundred (500) feet up-current of the cable installation outside the effect of the jet plowing and shear plowing. Down-current samples shall be collected five hundred (500) feet down-current of the jet plow and shear plow. Samples shall be collected at near-surface, mid-depth, and near-bottom at each sampling location. Measured levels of metals shall be reported both as totals and as dissolved fractions, except mercury, which shall be reported as total mercury.

b. Suspended sediment plume monitoring and water quality monitoring shall be conducted at the locations and frequency set forth in the Water Quality Monitoring Plan.

c. If, during underwater cable installation, TSS concentrations monitored or measured at five hundred (500) feet down-current of the installation exceed TSS concentrations at an up-current background station by more than two hundred (200) mg/L or more than one hundred (100) mg/L in the southern portion of Lake Champlain (south of Crown Point), the Aquatic Inspector shall be immediately notified. CHPE also must attempt to notify the NYSDEC and DPS within twenty four (24) hours of any such TSS exceedance. CHPE shall immediately employ one or more of the following environmental protection measures: changing the rate of advancement of the jet plow or shear plow, modifying hydraulic pressures, or implementing other reasonable operational controls that may reduce suspension of *in-situ sediments*. If CHPE proposes to employ mitigation measures not otherwise provided for in this paragraph, they must first consult with the DPS, NYSDEC, and the Aquatic Inspector. In the event that DPS determines that the mitigation techniques are unable to reduce TSS concentrations below the maximum allowable threshold, underwater cable installation shall be suspended and CHPE shall consult with DPS and NYSDEC regarding alternative cable installation techniques. Nothing in this subsection is intended to require that cable installation methods be modified to prevent burial of the cables in a single trench to the depths specified in the Article VII Certificate through a single installation pass.

d. During underwater cable installation, the concentrations of the chemical constituents listed below (Table 1), as measured in the samples collected five hundred (500) feet down-current of the cable installation activities, shall not exceed the greater of: (A) the levels set forth below or (B) 1.3 times the highest ambient background level measured during the prior twenty four

(24) -hour sampling period up-current of the installation at the same depth as the down-current sample.

Table 1. Underwater Cable Installation Water Quality Standards

Route Mile	Water Body Class	Contaminant	Standard	Unit	Method	Reporting Limit
0-73.5	AA	Dissolved Arsenic	340	ug/l	EPA 200.7	10
		Dissolved Copper	calculate using measured hardness and (0.96) exp(0.9422 [ln (ppm hardness)] - 1.7)	ug/l	EPA 200.7	2
		Dissolved Zinc	calculate using measured hardness and 0.978 exp(0.8473 [ln(ppm hardness)] + 0.884)	ug/l	EPA 200.7	2
73.5-101.7	B	Dissolved Arsenic	340	ug/l	EPA 200.7	10
		Dissolved Copper	calculate using measured hardness and (0.96) exp(0.9422 [ln (ppm hardness)] - 1.7)	ug/l	EPA 200.7	0.1*
		Dissolved Zinc	calculate using measured hardness and 0.978 exp(0.8473 [ln(ppm hardness)] + 0.884)	ug/l	EPA 200.7	2
228.5-272.3	A	Phenanthrene*	45	ug/l	EPA 8270C	0.02
		Dissolved Cadmium	5	ug/l	EPA 200.7	0.02*
		Dissolved Copper	200	ug/l	EPA 200.7	0.1*
		Dissolved Lead	50	ug/l	EPA 200.7	0.02*
		Total Mercury	0.7	ug/l	EPA 1669	0.001
		Total PCBs	0.09	ug/l	EPA 8082	0.005*
272.3-290.3	B	Dissolved Arsenic	340	ug/l	EPA 0.7	10
		Dissolved Cadmium	calculate using measured hardness and (0.85) exp(1.128 [ln (ppm hardness)] - 3.6867)	ug/l	EPA 200.7	0.02*
		Dissolved Copper	calculate based on measured hardness using (0.96) exp(0.9422 [ln (ppm hardness)] - 1.7)	ug/l	EPA 200.7	0.1*

		Dissolved Lead	calculate using measured hardness and {1.46203 - [ln (hardness) (0.145712)]} exp (1.273 [ln (hardness)] - 1.052)	ug/l		0.02*
		Phenanthrene*	45	ug/l	EPA 8270C	0.02
		Dissolved Mercury	1.4	ug/l	EPA 1669	0.001
		Total PCBs	0.2 per aroclor	ug/l	EPA 8082	0.005*
290.3-324.0	SB	Dissolved Arsenic	63	ug/l	EPA 200.7	10
		Dissolved Cadmium	7.7	ug/l	EPA 200.7	0.02*
		Dissolved Copper	7.9	ug/l	EPA 200.7	0.1*
		Dissolved Lead	204	ug/l	EPA 200.7	0.02*
		Phenanthrene*	14	ug/l	EPA 8270C	0.02
		Total Mercury	0.05***	ug/l	EPA 1669	0.001
		Total PCBs	0.2 per aroclor	ug/l	EPA 8082	0.005*
324.1-332.5	I	Dissolved Arsenic	36	ug/l	EPA 200.7	10
		Dissolved Cadmium	7.7	ug/l	EPA 200.7	0.02*
		Dissolved Copper	7.9	ug/l	EPA 200.7	0.1*
		Dissolved Lead	204	ug/l	EPA 200.7	0.02*
		Phenanthrene*	14	ug/l	EPA 8270C	0.02
		Total Mercury	0.05***	ug/l	EPA 1669	0.001
		Total PCBs	0.2 per aroclor	ug/l	EPA 8082	0.005*

* Assumes low level analysis, compared to standard level
** Phenanthrene will be used as an indicator for the total concentration of Polycyclic Aromatic Hydrocarbons (PAHs).
*** Standard based on General Level Currently Achievable described in TOGS 1.3.10.

e. All water quality laboratory analyses required in this Certification must be conducted by a laboratory certified by the NYSDOH.

f. If the compliance criteria described in clause 14(d) above are exceeded at any time during the installation, additional water quality sampling shall take place at the location of the exceedance as described in the Water Quality Monitoring Plan.

g. Hardness shall be measured in each water quality sample collected. The analytical results for hardness shall be applied to calculate the standards for dissolved copper, dissolved zinc, dissolved cadmium, and dissolved lead where necessary, as described in clause 14(d) above.

15. Changes in the Conditions of the Water Quality Certification, if proposed by the date on which the proposed Environmental Management and Construction Plan (EM&CP) is filed, shall be reviewed together with the proposed EM&CP. Changes in the Conditions of the Water Quality Certification shall be governed by Condition 158 of the Article VII Certificate governing changes to the approved EM&CP.

16. Nothing in this Certification shall limit either (i) the authority of the DEC to monitor the environmental and health impacts resulting from the construction and operation of the Facility and to enforce applicable provisions of the Environmental Conservation Law (including those which provide for summary abatement authority) and applicable implementing regulations governing the environmental and health impacts resulting from such construction and operation, or (ii) any defenses to such enforcement that CHPE may be able to assert under applicable law.

Certified by:

1-18-2013
Date

Floyd E. Barwig, Director
Office of Energy Efficiency and the Environment
New York State Department of Public Service
Three Empire State Plaza
Albany, New York 12223

NYSDEC, the EPC Contractor, and others as deemed appropriate to discuss and review these measures including the location of the flagging of lupine and nectar patches of potential and occupied butterfly habitat. The flagging shall be maintained until construction has been completed and all disturbed areas have been restored to their final grade.

91. Within six (6) months after the commencement of commercial operations of the Facility, the Certificate Holders shall provide a ROW maintenance plan for the Facility ROW from Route Mile 145**,** south of Scout Road in the Town of Wilton, New York to Route Mile 180, north of County Line Road in the Town of Rotterdam, New York. This plan shall include but not be limited to methods of maintenance, access routes to the ROW, seasonal construction windows, and the education of all company employees and contractors regarding all measures to avoid occupied habitat associated with Karner blue butterfly and frosted elfin butterfly. The plan shall also provide requirements for notification of the DPS Staff and NYSDEC of any planned maintenance or repair work within, or in the vicinity of occupied habitat that requires excavation or ground disturbance.

N. Underwater Cable Installation

92. All of the terms and conditions of the WQC are incorporated by reference into this Certificate as though fully set out herein. Any changes to the WQC shall be governed by the provisions of Condition 158 of this Certificate.

93. Construction within navigable waters and pre-installation route clearing activities (pre-lay grapnel run and associated obstruction and debris removal) shall occur within the construction time frames set forth in Table 1 below. After consultation with DPS Staff, the New York State Department of State ("NYSDOS"), and NYSDEC, the Certificate

Holders may seek an appropriate modification of the time frames, either in the proposed EM&CP or subject to the provisions of Condition 158 of this Certificate.

Table 1: Underwater Construction Windows in Lake Champlain, The Hudson, Harlem, and East Rivers

River Mile	Route Mile	Location	Construction Windows
	Lake Champlain		
	0 to 73	US/Canada Border to Crown Point	May 1 to August 31
	73 to 101	Crown Point to Dresden	September 1 to December 31
	Hudson River, Harlem River, East River		
107-68	229 to 269	Cementon – New Hamburg	Aug 1 - Oct 15
68-41	269 to 296	New Hamburg – Stony Point	Sep 15 - Nov 30
41-33	296 to 303	Stony Point - Rockland Lake State Park	OVERLAND
33-14	303 to 324	Rockland Lake State Park – Harlem River	Jul 1 - Oct 31
all	324 to 330	Harlem River – East River	May 15 - Nov 30

94. Commencement of in-river work within one (1) mile south of the designated Significant Coastal Fish and Wildlife Habitats ("SCFWHs") at Haverstraw Bay shall occur during the high, or flood, tide condition in order to avoid and/or minimize impacts from resuspended sediments to the SCFWH habitat of Haverstraw Bay.

95. The Certificate Holders shall use installation techniques for underwater cable installation activities that are appropriate for the prevailing substrate conditions.

a. Cable installation in the Hudson, Harlem, and East Rivers shall be designed and installed to meet the following criteria:

(i) Where the cables shall be located within the limits of the maintained