K-169.0-6.9- Runs 6 and 7

K-169.0-7.4 Runs 1-4

SITE LOCATIONS

Packages 3, 4A and 4B ■ Fort Edward to Schenectady, NY
April 11, 2023 ■ Terracon Project No. JB215256J

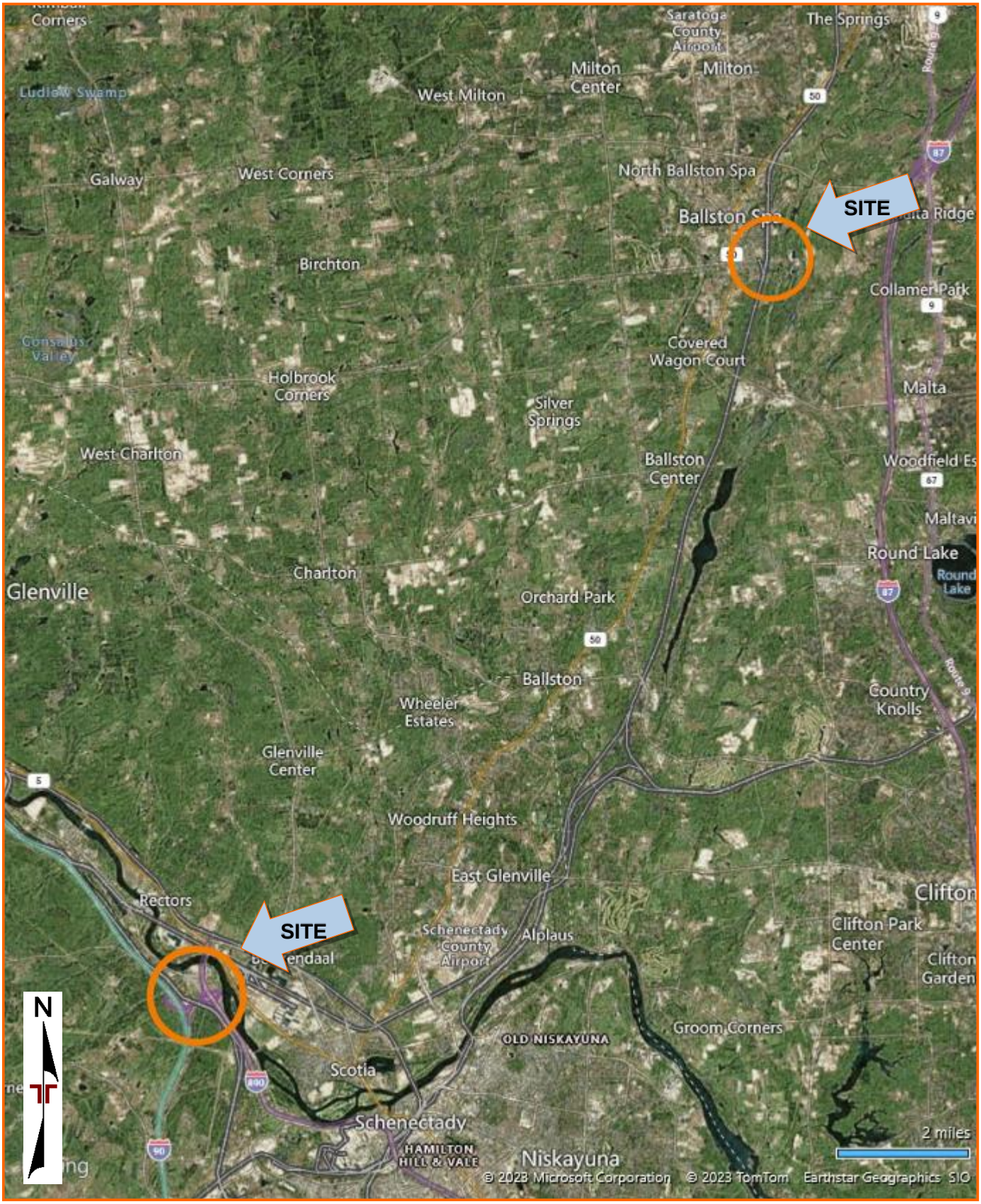


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY QUADRANGLES INCLUDE: SARATOGA SPRINGS, NY (1/1/1967) and ROUND LAKE, NY (1/1/1980).

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. KB-169.0-6.6A

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8420° Longitude: -74.0063°

Surface Elev.: 282.44 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Augered to 65 feet and began sampling		5, 10, 15, 20, 25							

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

Hammer Type: Automatic

Advancement Method:
0-70' 4" Casing
70'-100 3 7/8" Tricone Drill Bit

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

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

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-02-2023 | Boring Completed: 03-09-2023
Drill Rig: Mobil B-57 | Driller: J. Swope
Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

BORING LOG NO. KB-169.0-6.6A

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8420° Longitude: -74.0063°

Surface Elev.: 282.44 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Augered to 65 feet and began sampling *(continued)*									
			30							
			35							
			40							
			45							
			50							

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

Hammer Type: Automatic

Advancement Method:
0-70' 4" Casing
70'-100 3 7/8" Tricone Drill Bit

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

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

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-02-2023 | Boring Completed: 03-09-2023
Drill Rig: Mobil B-57 | Driller: J. Swope
Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

BORING LOG NO. KB-169.0-6.6A

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8420° Longitude: -74.0063°

Surface Elev.: 282.44 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Augered to 65 feet and began sampling *(continued)*	55, 60						
65.0	217.4	65						
	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), containing occasinal cobbles, brown and gray, medium dense to very dense			6	14-7-10-11 N=17	11.5		11
		70		6	10-26-49-50/5" N=75			
75.0	207.4	75						

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

Hammer Type: Automatic

Advancement Method:
0-70' 4" Casing
70'-100 3 7/8" Tricone Drill Bit

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

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

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-02-2023 | Boring Completed: 03-09-2023
Drill Rig: Mobil B-57 | Driller: J. Swope
Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

BORING LOG NO. KB-169.0-6.6A

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8420° Longitude: -74.0063°

Surface Elev.: 282.44 (Ft.)

DEPTH	ELEVATION (Ft.)	DESCRIPTION	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
		WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), containing occasinal cobbles, brown and gray, medium dense to dense			4	20-18-15-15 N=33	12.0	11
			80		24	39-60-50-54 3" Split Spoon Bulk Sample		
					24	11-11-18-30 3" Split Spoon Bulk Sample		
			85		24	9-10-15-22 N=25		
90.0	192.4		90		2	14-16-19-23 N=35	21.2	22
		SILTY SAND WITH GRAVEL (SM), containing occasinal cobbles, brown and gray, dense						
			95		19	15-17-20-24 N=37		
			100					

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

Hammer Type: Automatic

Advancement Method:
0-70' 4" Casing
70'-100 3 7/8" Tricone Drill Bit

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

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

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-02-2023	Boring Completed: 03-09-2023
Drill Rig: Mobil B-57	Driller: J. Swope
Project No.: JB215256J	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

BORING LOG NO. KB-169.0-6.6A

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8420° Longitude: -74.0063°

Surface Elev.: 282.44 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND WITH GRAVEL (SM), containing occasinal cobbles, brown and gray, dense *(continued)*					10	16-21-23-25 N=44			
	102.0	180.4								
	Boring Terminated at 102 Feet									

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

Hammer Type: Automatic

Advancement Method:
0-70' 4" Casing
70'-100 3 7/8" Tricone Drill Bit

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

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

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-02-2023 | Boring Completed: 03-09-2023

Drill Rig: Mobil B-57 | Driller: J. Swope

Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

BORING LOG NO. KB-169.0-6.7

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8405° Longitude: -74.0060°

Surface Elev.: 294.82 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
0.3 **TOPSOIL**	294.5						
SILTY SAND WITH GRAVEL (SM), occasinal cobbles and boulders, brown, medium dense to dense, (GLACIAL TILL)				18	5-25-23-34 N=48		
		5		10	11-13-14-15 N=27	9.3	28
		10		10	5-6-10-16 N=16		
grades gray		20		20	19-16-17-26 N=33		
		25					

GRAPHIC LOG

WATER LEVEL OBSERVATIONS

ATTERBERG LIMITS: LL-PL-PI

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

Hammer Type: Automatic

Advancement Method:
0-40' 4" Casing with 3 7/8" tricone Drill Bit
40'-50' 3 7/8" tricone drill bit

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

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

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-09-2023 | Boring Completed: 03-10-2023

Drill Rig: Mobil B-57 | Driller: J. Swope

Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

BORING LOG NO. KB-169.0-6.7

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8405° Longitude: -74.0060°

Surface Elev.: 294.82 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
SILTY SAND WITH GRAVEL (SM), occasinal cobbles and boulders, gray, medium dense to dense, (GLACIAL TILL) *(continued)*							
30.0	264.8	30					
SANDY SILT WITH GRAVEL (ML), occasinal cobbles and boulders, gray, very stiff, (GLACIAL TILL)				20	12-12-15-21 N=27	12.3	52
		35					
		40		18	6-10-15-25 N=25		
		45					
50.0	244.8	50					

GRAPHIC LOG | WATER LEVEL OBSERVATIONS | ATTERBERG LIMITS (LL-PL-PI)

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

Hammer Type: Automatic

Advancement Method:
0-40' 4" Casing with 3 7/8" tricone Drill Bit
40'-50' 3 7/8" tricone drill bit

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

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

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-09-2023 | Boring Completed: 03-10-2023
Drill Rig: Mobil B-57 | Driller: J. Swope
Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

BORING LOG NO. KB-169.0-6.7

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8405° Longitude: -74.0060°

Surface Elev.: 294.82 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	FIELD TEST RESULTS
		SHALE, slightly weathered, very close to close fractured, exellent RQD	REC=100% RQD=90%
55.0	239.8		
		SHALE, slightly weathered, close to wide fractured, excellent RQD	REC=100% RQD=100%
60.0	234.8		
		SHALE, slightly weathered, very wide fractured, excellent RQD	REC=100% RQD=100%
65.0	229.8		
		Boring Terminated at 65 Feet	

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

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

Hammer Type: Automatic

Advancement Method:
0-40' 4" Casing with 3 7/8" tricone Drill Bit
40'-50' 3 7/8" tricone drill bit

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

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

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-09-2023	Boring Completed: 03-10-2023
Drill Rig: Mobil B-57	Driller: J. Swope
Project No.: JB215256J	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

PHOTOGRAPHY LOG

Rock Core – Boring KB-158.8

Rock Cores - Boring KB-169.0-6.7

BORING LOG NO. KB-169.0-6.8

PROJECT: Phase 4 Borings

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

SITE: Champlain to Hudson HDD Crossings

LOCATION See Exploration Plan

Latitude: 42.8384° Longitude: -74.0056°

Surface Elev.: 351.85 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	351.6	**TOPSOIL**				
		SANDY SILT (ML), occasional cobbles and boulders, gray, very stiff to hard, (GLACIAL TILL)	WH-3-16-8 N=19			
3.6	348.3		13-18-33-50/5" N=51	14.8		69
		WEATHERED SHALE, gray, very dense	50/5"			
7.0	344.9					
		SHALE, slightly weathered, close fractured, fair RQD, gray	REC=100% RQD=50%			
12.0	339.9					
		SHALE, occasional sandstone seams, slightly weathered, very close to moderate fractured, poor RQD, gray	REC=100% RQD=30%			
		occasional weathered seams between 15 and 17 feet				
17.0	334.9					
		SANDSTONE, occasional shale seams, slightly weathered, extremely close to wide fractured with near vertical fractures, fair RQD, gray	REC=100% RQD=58%			
22.0	329.9					
		Boring Terminated at 22 Feet				

DEPTH (Ft.): 5, 10, 15, 20

WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.)

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

Hammer Type: Automatic

Advancement Method:
0-4' 4" Casing
0-7' 3 7/8" Tricone Drill Bit
7'-22' NQ Core Barrel

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

Notes:

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

WATER LEVEL OBSERVATIONS

No free water encountered

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 02-14-2023	Boring Completed: 02-14-2023
Drill Rig: Mobil B-57	Driller: J. Swope
Project No.: JB215256J	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

Rock Cores – Boring KB-169.0-6.8

Summary of Laboratory Results

BORING ID	Depth (Ft.)	Water Content (%)	% Fines
KB-169.0-6.6A	65-67	11.5	11.3
KB-169.0-6.6A	75-77	12.0	11.0
KB-169.0-6.6A	90-92	21.2	21.8
KB-169.0-6.7	5-7	9.3	28.4
KB-169.0-6.7	30-32	12.3	51.7
KB-169.0-6.8	2-3.9	14.8	69.3

PROJECT: Phase 4 Borings

SITE: Champlain to Hudson HDD Crossings

Terracon
30 Corporate Cir Ste 201
Albany, NY

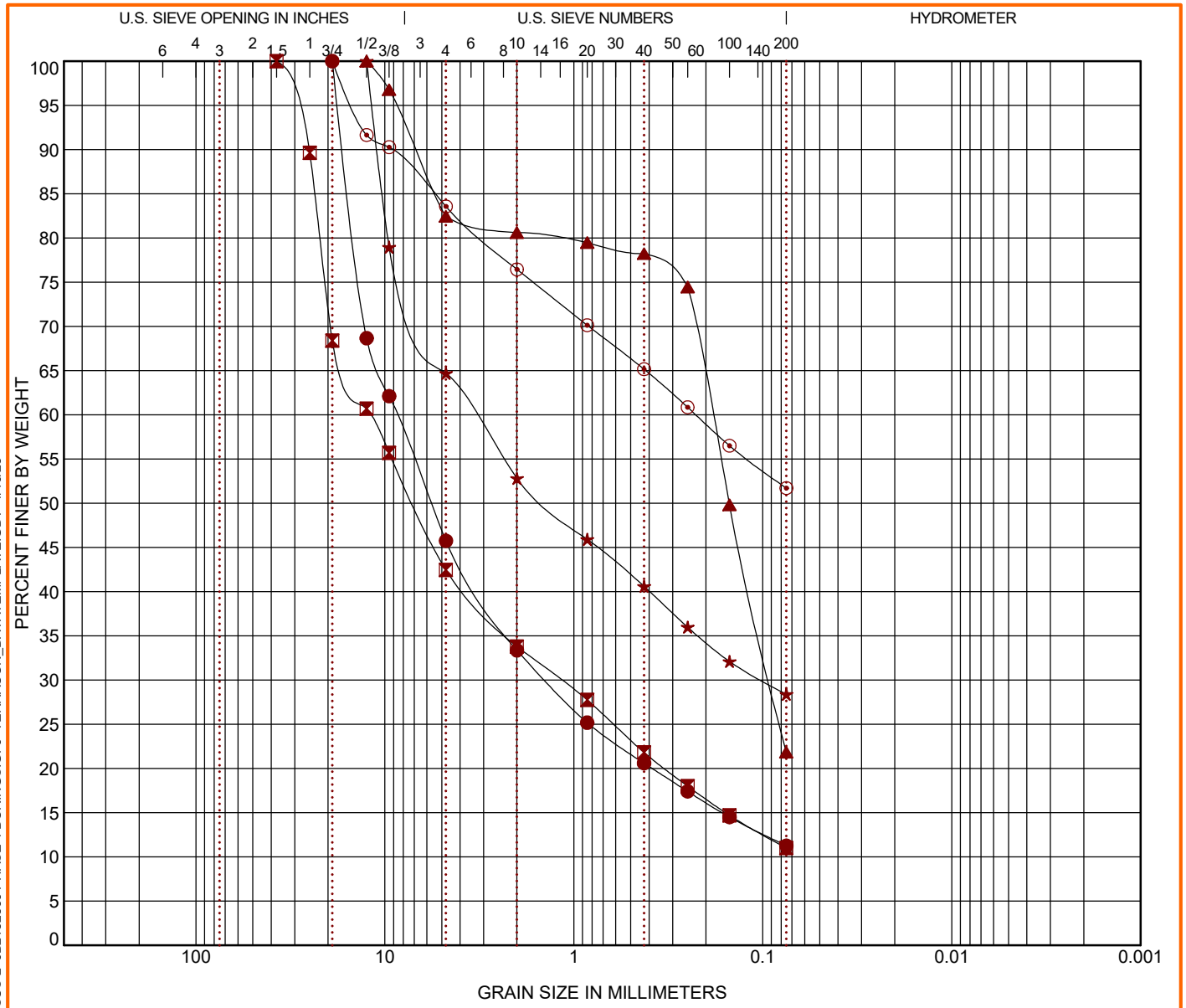
PROJECT NUMBER: JB215256J

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

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-169.0-6.6A	65 - 67	POORLY GRADED GRAVEL with SILT and SAND (GP-GM)	11.5				3.98	151.79
⊠	KB-169.0-6.6A	75 - 77	WELL GRADED GRAVEL with SILT and SAND (GW-GM)	12.0				1.82	193.16
▲	KB-169.0-6.6A	90 - 92	SILTY SAND with GRAVEL (SM)	21.2					
★	KB-169.0-6.7	5 - 7	SILTY SAND with GRAVEL (SM)	9.3					
⊙	KB-169.0-6.7	30 - 32	SANDY SILT with GRAVEL (ML)	12.3					

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-169.0-6.6A	65 - 67	19	8.687	1.407		0.0	54.3	34.5		11.3	
⊠	KB-169.0-6.6A	75 - 77	37.5	12.038	1.168		0.0	57.5	31.5		11.0	
▲	KB-169.0-6.6A	90 - 92	12.5	0.185	0.092		0.0	17.6	60.6		21.8	
★	KB-169.0-6.7	5 - 7	12.5	3.376	0.101		0.0	35.3	36.3		28.4	
⊙	KB-169.0-6.7	30 - 32	19	0.226			0.0	16.4	31.9		51.7	

PROJECT: Phase 4 Borings

SITE: Champlain to Hudson HDD Crossings

Terracon
30 Corporate Cir Ste 201
Albany, NY

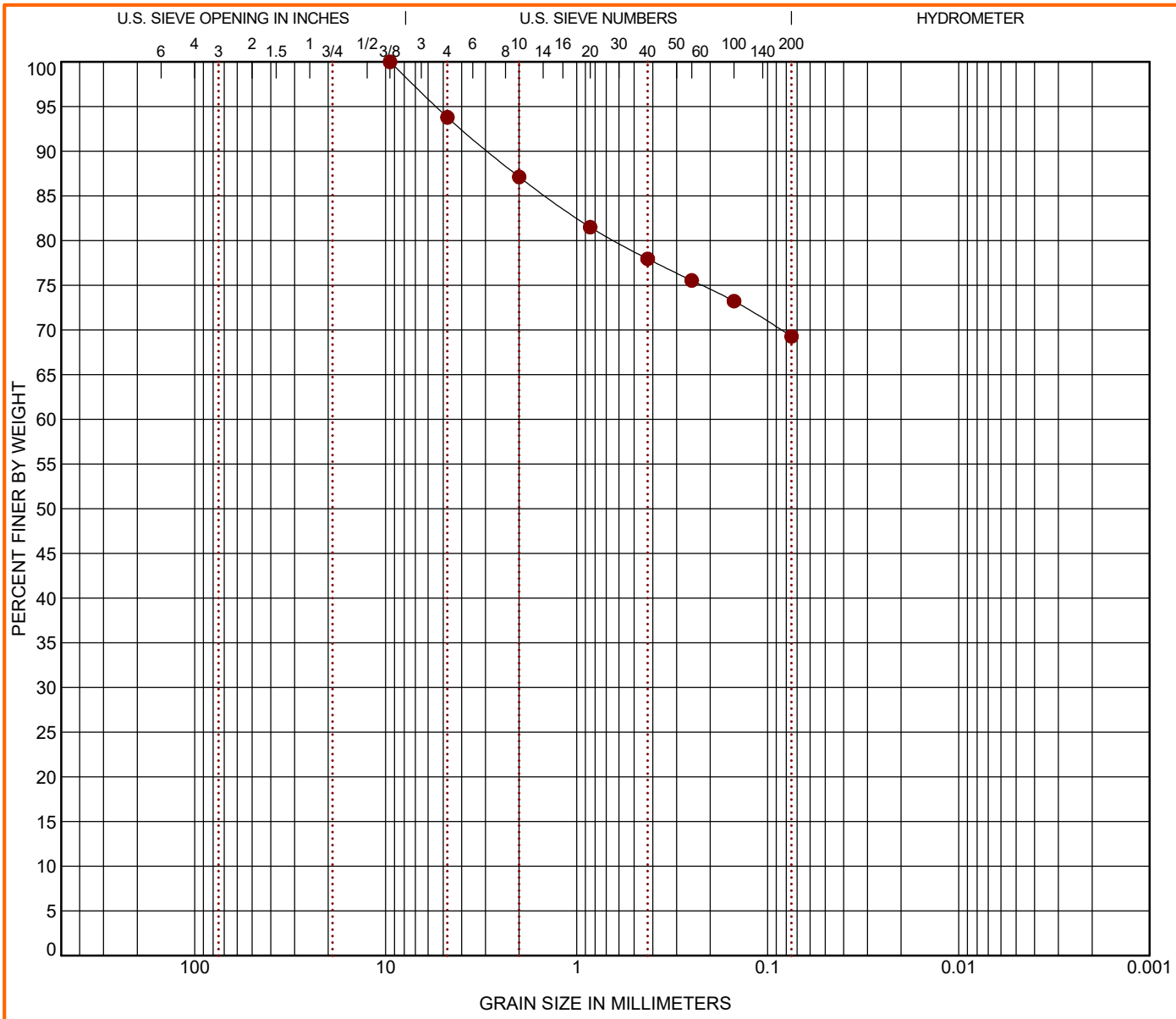
PROJECT NUMBER: JB215256J

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

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-169.0-6.8	2 - 3.9	SANDY SILT (ML)	14.8					

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-169.0-6.8	2 - 3.9	9.5				0.0	6.2	24.5		69.3	

PROJECT: Phase 4 Borings

SITE: Champlain to Hudson HDD Crossings

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256J

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

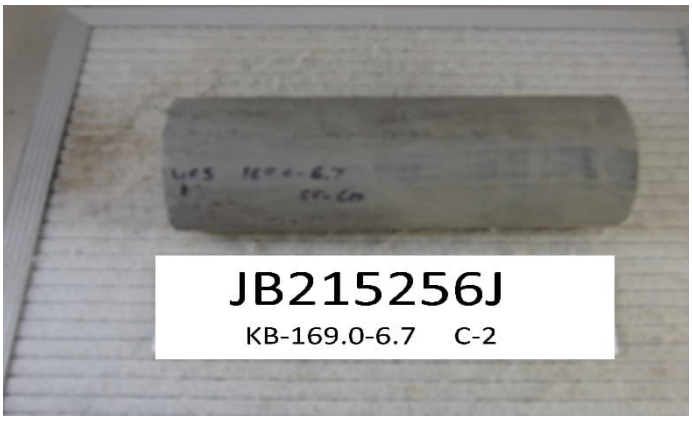
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 4/10/23

ASTM D7012 (Method C) Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens

Boring No.:	KB-169.0-6.7	Lithology:	Shale
Sample No.:	C-2	Moisture Content:	As received
Sample Depth:	55'-60'	Lab Temperature:	68 F
Sampling Date:	NA	Loading Rate:	93 psi/s
		Time to Failure:	1.8 min

Diameter:	1.982 in	Maximum Axial Load at Failure:	29,720 lb
Length:	4.56 in	Compressive Strength:	9,633 psi
L/D:	2.3	Compressive Strength:	66.42 Mpa
End Area:	3.09 in^2	Unit Weight:	168.3 pcf

Before the Test



After the Test

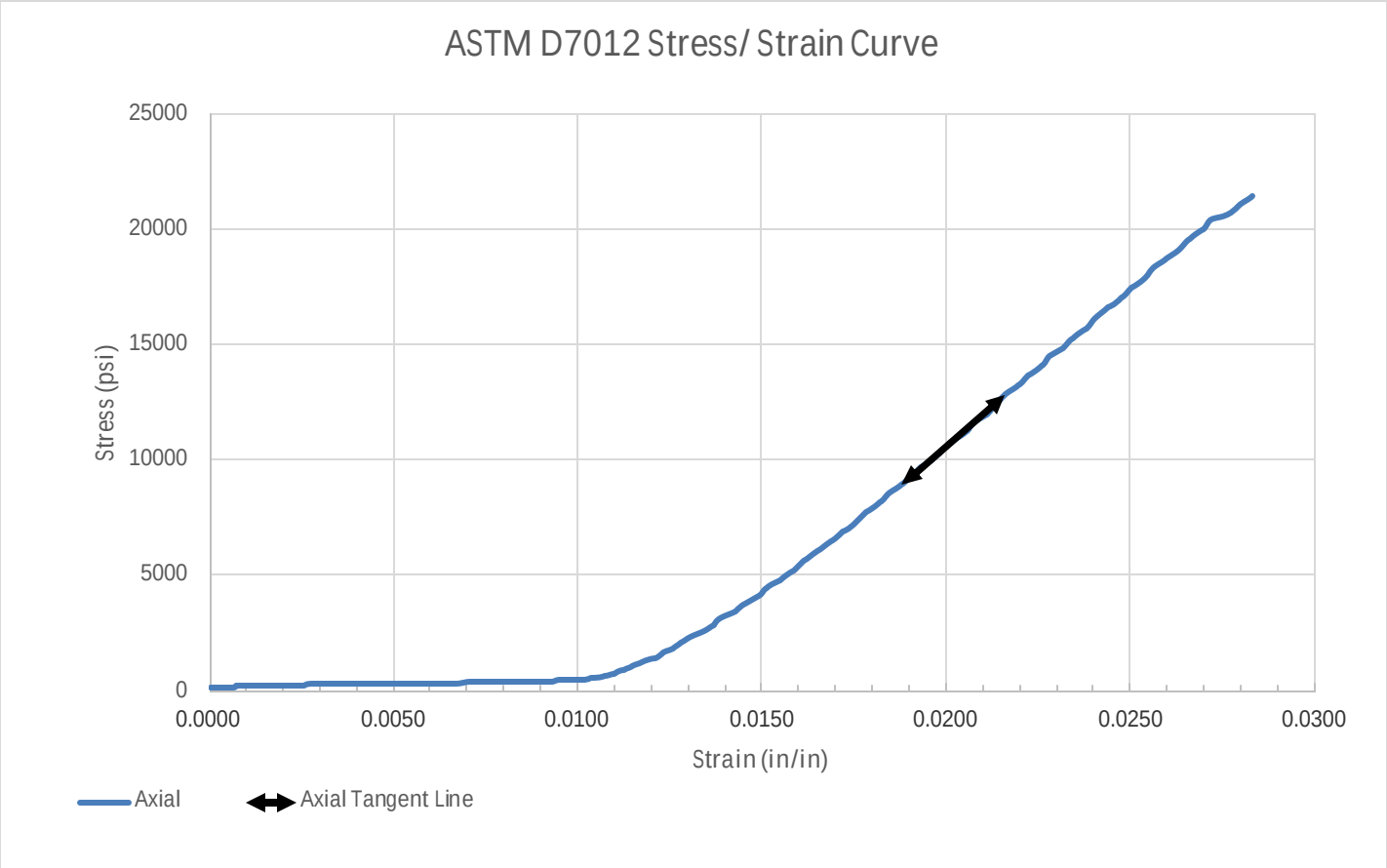
Project:	Phase 4 Borings	Terracon Explore with us	Technician:	A. Mendez
Project No.	JB215256J		Test Date:	3/30/2023
Location:	Champlain to Hudson HD		Reviewed By:	D. Kumarappa
Client:	Kiewit Engineering Corp	77 Sundial Ave., Suite 401 W Manchester, New Hampshire	Review Date:	3/30/2023

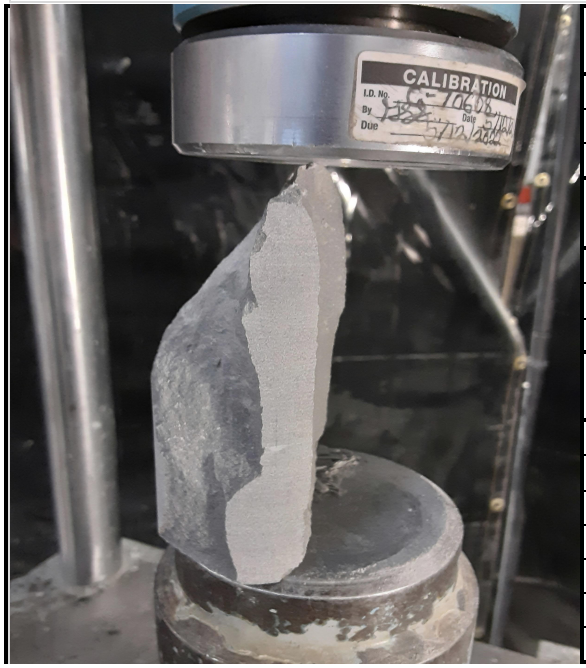
The information contained in this report may not be reproduced except in its entirety without the express written consent of Terracon, Inc. Reports are relevant only to the items tested and may not be attributed to other work. Testing was performed in general accordance with the stated ASTM test method.

Rock Core D7012 Method C

Client	Project
Kiewit Engineering	Phase 4 Borings

Project No. JB215256J





SAMPLE LOCATION

Site:	Phase 4 Borings		
Description:	Sandstone		
Boring:	KB-169.0-6.8	Depth (feet):	17.0-22.0

SPECIMEN INFORMATION

Sample No.:	S-6	Mass (g):	551.53
Length (in.):	4.12	Diameter (in.):	1.97
L/D Ratio:	2.09	Density (pcf):	167.31

TEST RESULTS

Failure Load (lbs):	70769
Failure Strain (in/in):	0.033
Unconfined Compressive Strength (psi):	21,441
Elastic Modulus, E, (ksi):	1387
Time of Failure (min):	02:03
Rate of Loading (in/sec):	0.04
Moisture Content Post-break:	0.40%

Rock Core D7012 Method C

Client	Project
Kiewit Engineering	Phase 4 Borings
	Project No. JB215256J

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

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

Notes:

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25º.
Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
Per ASTM D4543 and ASTM D7012, the desired specimen length to diameter are between 2.0:1 and 2.5:1.
According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

Package 4B Phase 4 Borings Rev 1

Champlain Hudson Power Express

New York

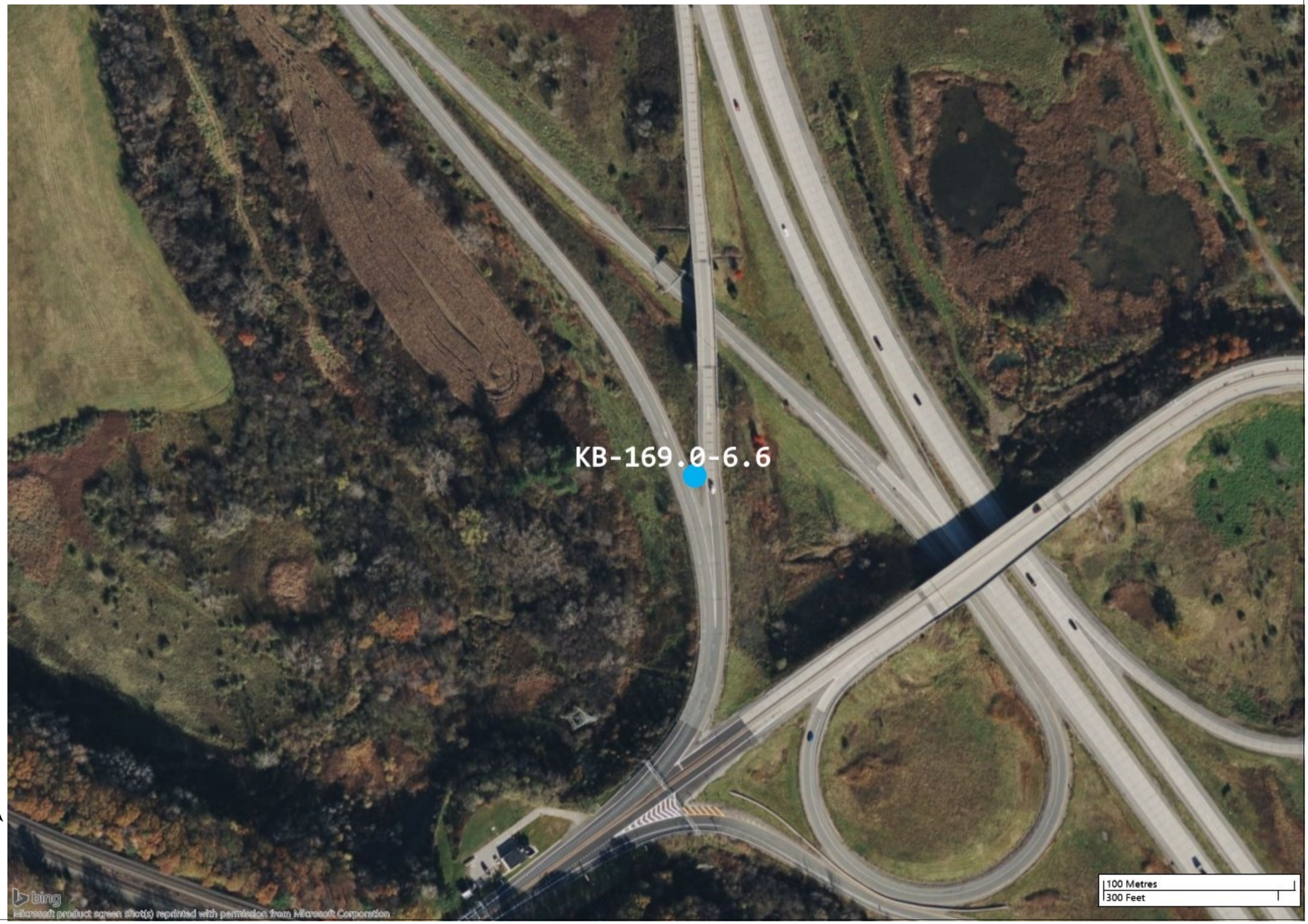
PROJECT NUMBER 20001480

CREATED BY Kiewit

DATE 03/31/2023

Legend Key

- Kiewit Borings



N

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

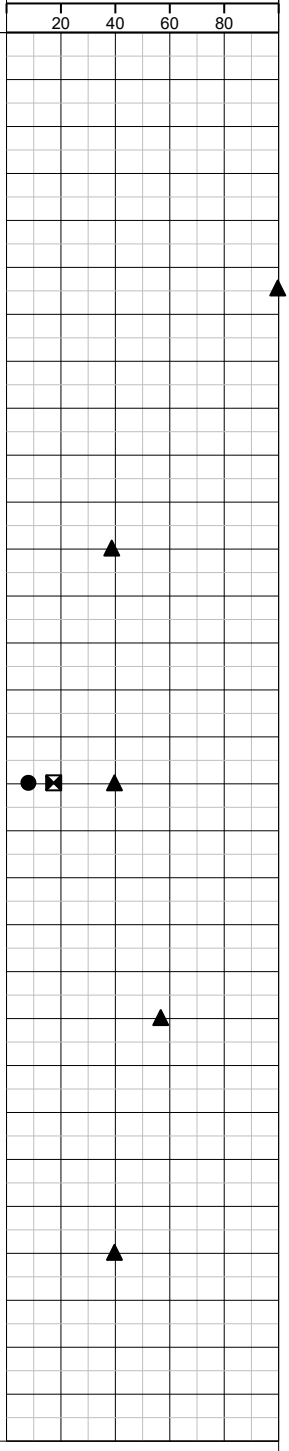
BORING NO: KB-169.0-6.6

PROJECT NUMBER	20001480	**LOGGED BY**	Tim Smith	**COORDINATES**	N 1460758.29 E 624535.80
START DATE	02/07/2023	**DRILLER/RIG**	Eric / CME-75	**GROUND ELEV.**	282.4 ft
FINISH DATE	02/22/2023	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			FILL: Clayey SAND (SC), with gravel, some cobbles, gravel surfacing 4"						Boring Advanced with a 4.5" dia. Mud Rotary
5					1	100%		10-50/5"	
	275.4		FILL: Silty SAND with Gravel (SM), dense, moist, fine-grained, medium to coarse gravel						
10					2	92%		12-19-20-24 (39)	
15			shale fragments present		3	88%		16-19-21-32 (40)	
20					4	88%		12-28-29-24 (57)	
25			increased clay content with depth		5	96%		19-23-17-35 (40)	
30									

Legend

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



EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

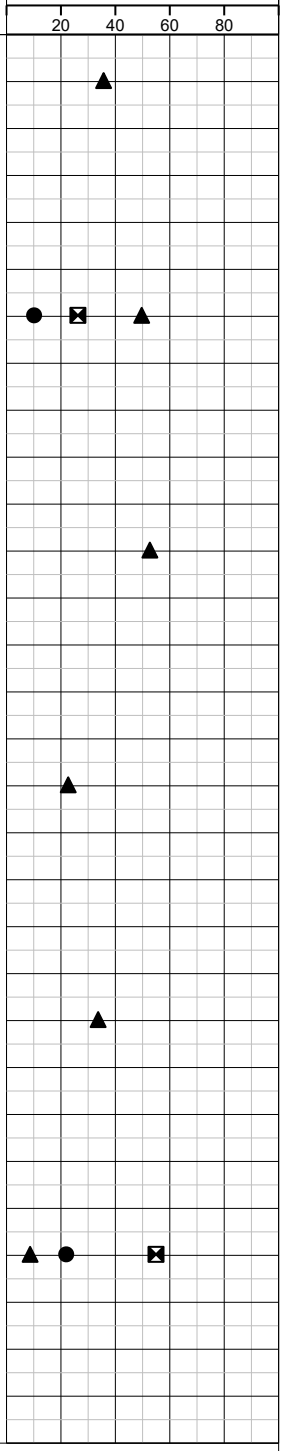
BORING NO: KB-169.0-6.6

PROJECT NUMBER	20001480	**LOGGED BY**	Tim Smith	**COORDINATES**	N 1460758.29 E 624535.80
START DATE	02/07/2023	**DRILLER/RIG**	Eric / CME-75	**GROUND ELEV.**	282.4 ft
FINISH DATE	02/22/2023	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			FILL: Silty SAND with Gravel (SM), dense, moist, fine-grained, medium to coarse gravel		6	54%		10-16-20-16 (36)	
35					7	79%		21-25-25-20 (50)	
40	242.4		Silty SAND (SM), gray-brown, dense, moist, fine-grained		8	84%		11-23-30-27 (53)	
	239.4		CLAY (CL), gray, stiff, moist, trace sand						
45					9	79%	3.5	9-10-13-25 (23)	
50			4-8" thick sand seams/layers		10	84%		10-16-18-23 (34)	
55	227.4		Sandy SILT (ML), gray, stiff, moist, fine-grained sand		11	75%		3-4-5-11 (9)	
60									

Legend

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



EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

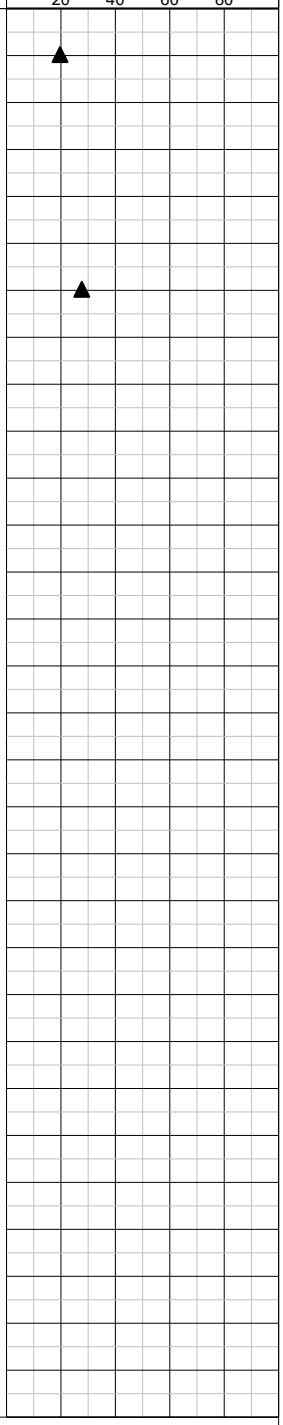
BORING NO: KB-169.0-6.6

PROJECT NUMBER	20001480	**LOGGED BY**	Tim Smith	**COORDINATES**	N 1460758.29 E 624535.80
START DATE	02/07/2023	**DRILLER/RIG**	Eric / CME-75	**GROUND ELEV.**	282.4 ft
FINISH DATE	02/22/2023	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			Sandy SILT (ML), gray, stiff, moist, fine-grained sand		12	21%		7-11-9-10 (20)	
65					13	0%		5-19-9-9 (28)	
	215.4		Boring Terminated at 67 ft						Boring was abandoned due to rig break down
70									
75									
80									
85									
90									

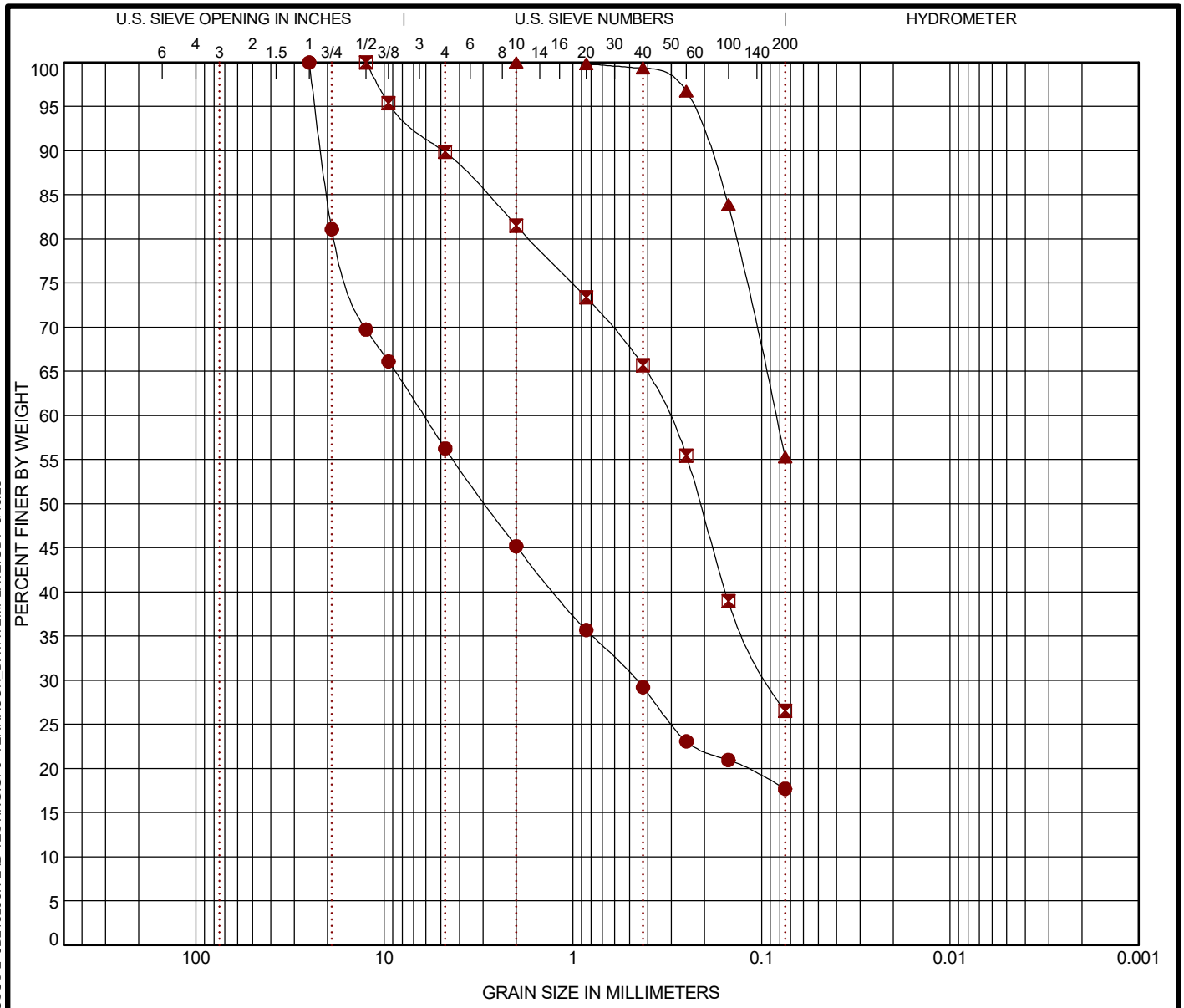
Legend

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



GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-169.0-6.6	15 - 17	SILTY GRAVEL with SAND (GM)	8.4					
⊠	KB-169.0-6.6	35 - 37	SILTY SAND (SM)	10.5					
▲	KB-169.0-6.6	55 - 57	SANDY SILT (ML)	22.3					

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-169.0-6.6	15 - 17	25	6.175	0.462		0.0	43.7	38.6		17.7	
⊠	KB-169.0-6.6	35 - 37	12.5	0.317	0.091		0.0	10.1	63.3		26.6	
▲	KB-169.0-6.6	55 - 57	2	0.084			0.0	0.0	44.7		55.3	

PROJECT: Lab Testing

SITE: Champlain to Hudsdon Power Express

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256H

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

EXHIBIT: B-1

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 3/13/23

Kiewit

MEMORANDUM

DATE: April 10, 2023

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

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

SUBJECT: Geotechnical Data: Segment 7 – Design Package 4B – HDD Crossing 69A
Champlain Hudson Power Express Project
Schenectady, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located northwest of Schenectady, New York. The approximate station for the start of HDD crossing Number 69A is STA 45383+00 (42.8337°N, 73.9990°W).

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

- AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.
- Terracon, Field Exploration and Laboratory Testing Results, Champlain-Hudson Power Express Project-Package 4b, Schenectady, dated June 24, 2022.

Contact us if you have questions or require additional information.

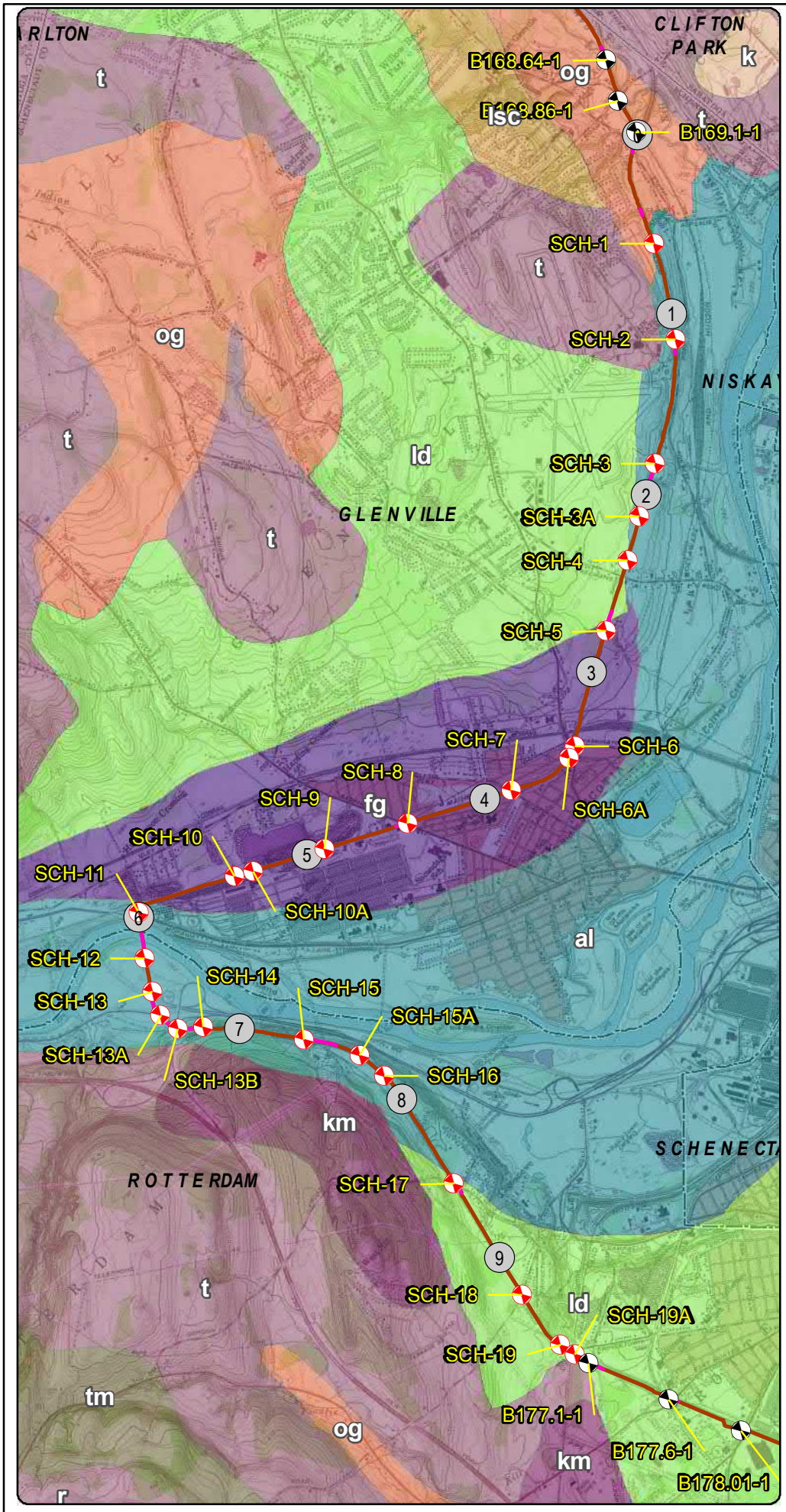
HDD 69A
Borings SCH-15, K-169.0-7.4, K-169.0-7.5
Segment 7 - Design Package 4B

CHPE Segment 7 Package 4B
Soil Boring Coordinates and Elevations

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

Notes:
- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.
*** NYS DOT boring coordinates and elevations are approximated from drawing D257014 Sheet 170 "GENERAL SUBSURFACE PROFILE, STRUCTURE #3 - RAMP TWY OVER I-890"
**** Kiewit boring coordinates and elevations are noted on the boring logs.

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



LEGEND

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

Surficial Geology

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

N

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

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

Prepared on 4/27/2021

by: AECOM

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

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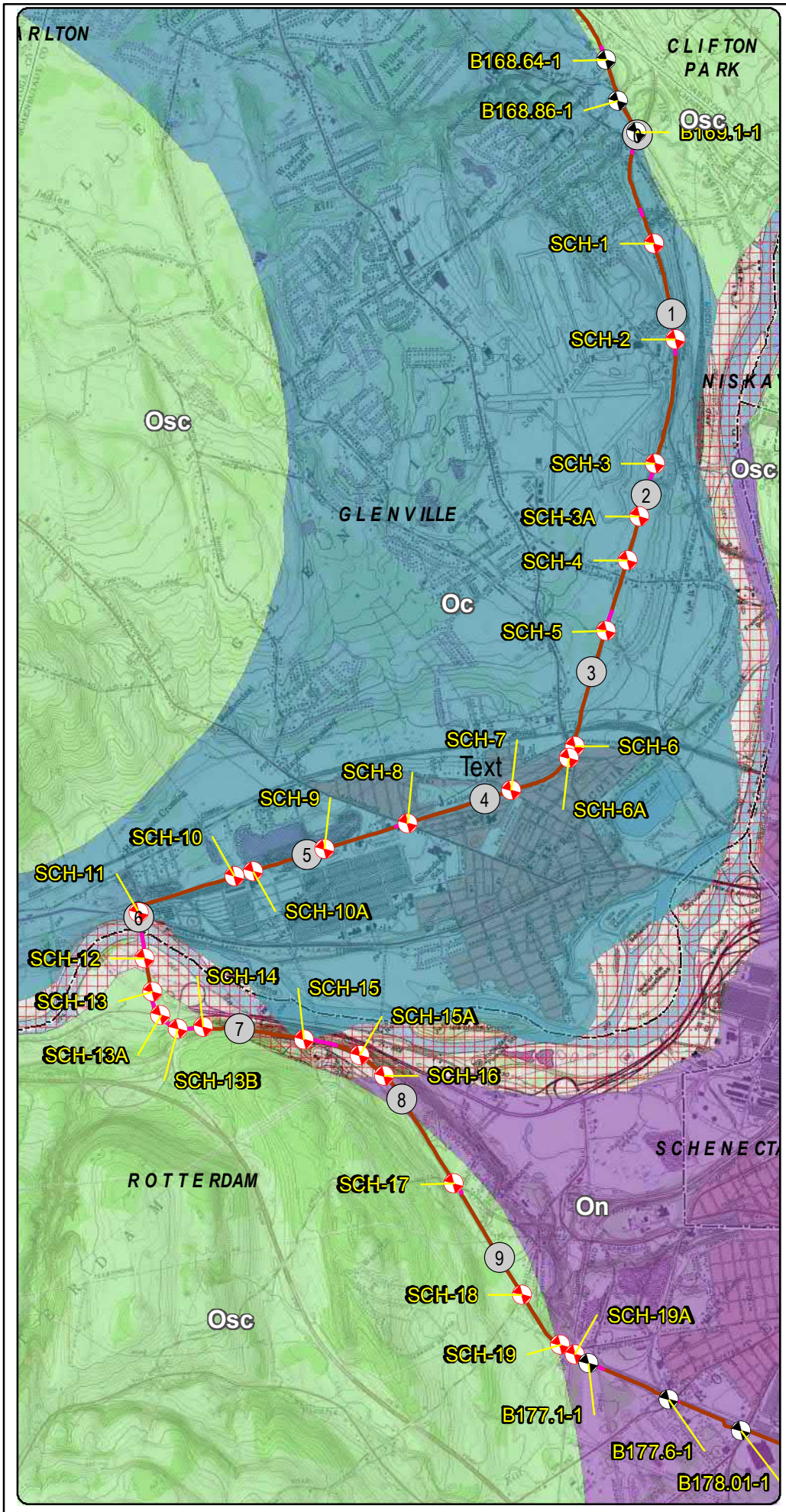


LEGEND

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

Bedrock Geology

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

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

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

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

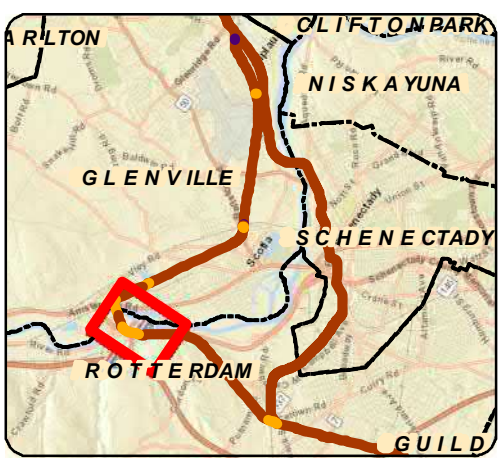
Prepared on 4/29/2021

by: AECOM

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

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

SCH-11
5.9
6
5.8
5.7
5.6
6.1
6.2
SCH-12
6.3
GLENVILLE
SCH-13
6.5
SCH-13A
6.6
SCH-13B
ROTTERDAM
6.8
SCH-14
6.9
7
7.1
7.2
7.3
SCH-15
7.4
0
1,000
Feet



LEGEND

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

Parcel Ownership: TOWN NAME

Road Name: Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Schenectady Preferred Alternative

Figure A-7

Sheet 6 of 8

Prepared by: AECOM 4/27/2021

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

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

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 1
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
SOILS ENGINEER: Chris French		PROJECT NO.: 60323056
		HOLE NO.: **SCH-15**
		START DATE: 3/10/21
	BORING LOG	FINISH DATE: 3/10/21
LOCATION: MP - 7.35 (CSX Rail)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
WT at 6.5' (observed)	TYPE	Flush Joint Steel	California Modified	Tricone Roller Bit		BORING TYPE: SPT
	SIZE I.D.	4"	2.5"	- -		BORING O.D.: 4.5"
	SIZE O.D.	4.5"	3"	3 7/8"		SURFACE ELEV.:
	HAMMER WT.	140 lbs	140 lbs			NORTHING
	HAMMER FALL	30"	30"			EASTING

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	
		0'-5'				Hand Cleared					OL	SAND	0'-0.4' Black SILT, some fine to medium Sand, trace sub-angular to angular Gravel, frozen
1.0											SP		0.4'-5' Brown to light Brown fine to medium SAND, trace, sub-rounded Gravel, trace Silt, loose, moist
2.0													
3.0													
		3'-5'	S-1										TR-1; (3.0'-5.0')
4.0													
5.0													
		5'-7'	S-2	24"	12"	5	8	9	11	11	SP		Brown fine to medium SAND, trace Silt, loose, moist, saturated at 6.5'
6.0													
7.0													
		7'-9'	S-3	24"	12"	8	12	9	11	14	SP		
8.0													Brown fine to medium SAND, trace Silt, medium dense, moist to wet TR-2; (8.0-8.5')
9.0													
		9'-11'	S-4	24"	11"	15	14	10	8	16	SP		Brown fine SAND, trace Silt, occaisonal Clayey Silt lenses, from 10.5'-11.0', med dense, moist
10.0													
11.0													
		11'-13'	S-5	24"	10"	7	8	7	7	10	SP		Brown fine to course SAND, trace Silt, saturated, loose
12.0													
13.0													
		13'-15'	S-6	24"	11"	8	10	9	10	12	SW		Brown fine to course SAND, little Silt, little subrounded-rounded Gravel, trace Silt, medium dense, saturated. TR-3; (14.0'-14.5')
14.0													
15.0													
		15'-16'	S-7	12"	6"	9	15				SM		Brown fine to course SAND, little Silt, little subrounded Gravel, medium dense, saturated. Angular Gravel in shoe
16.0													
17.0													SCH-15 Terminated at 16.0' then grouted to surface.
18.0													
19.0													
20.0													

NOTES:

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

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

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

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

SCH-15
K-169.0-7.4
K-169.0-7.5
SCH-15A
Mohawk River
890
Rice Rd
Google Earth
1000 ft
N

BORING LOG NO. K-169.0-7.4

PROJECT: Champlain-Hudson Power Express Package 4b

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

SITE: Champlain to Hudson HDD Crossings
Schenectady, NY

LOCATION See Exploration Plan

Latitude: 42.8320° Longitude: -73.9970°

Surface Elev.: 351.30 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5	351	**TOPSOIL**					
		FILL - SILTY SAND WITH GRAVEL, brown and black, very loose to loose	1	3-2-1 N=3			
			3	1-3-4-2 N=7			
4.0	347.5	**LEAN CLAY WITH SAND (CL)**, brown and gray, medium stiff to stiff	10	3-3-2-1 N=5	26.3	34-22-12	82
			14	3-5-10-20 N=15	13.6		
9.0	342.5	**WEATHERED ROCK**, gray					
10.0	341.5	**SHALE**, slightly weathered, very close fractured, very poor RQD, gray		REC = 100% RQD = 0%			
15.0	336.5	**SHALE**, slightly weathered, very close fractured, very poor RQD, gray		REC = 100% RQD = 0%			
20.0	331.5	**SHALE**, slightly weathered, close fractured, very poor RQD, gray		REC = 100% RQD = 14%			
25.0	326.5	**SHALE**, slightly weathered, close fractured, poor RQD, gray		REC = 100% RQD = 43%			

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations provided by Kiewit

Notes:

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

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 05-02-2022 | Boring Completed: 05-04-2022
Drill Rig: CME 550x | Driller: S. Kahn
Project No.: JB215256F

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/22/22

BORING LOG NO. K-169.0-7.4

PROJECT: Champlain-Hudson Power Express Package 4b

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

SITE: Champlain to Hudson HDD Crossings
Schenectady, NY

LOCATION See Exploration Plan

Latitude: 42.8320° Longitude: -73.9970°

Surface Elev.: 351.30 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS
SHALE, slightly weathered, close fractured, poor RQD, gray *(continued)*			
30.0	321.5	30	
SHALE, unweathered, close fractured, fair RQD, gray			REC = 100% RQD = 75%
35.0	316.5	35	
SHALE, unweathered, close fractured, excellent RQD, gray			REC = 100% RQD = 97%
40.0	311.5	40	
Boring Terminated at 40 Feet			

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

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations provided by Kiewit

Notes:

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

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 05-02-2022 | Boring Completed: 05-04-2022
Drill Rig: CME 550x | Driller: S. Kahn
Project No.: JB215256F

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/22/22

BORING LOG NO. K-169.0-7.5

PROJECT: Champlain-Hudson Power Express Package 4b

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

SITE: Champlain to Hudson HDD Crossings
Schenectady, NY

LOCATION See Exploration Plan

Latitude: 42.8309° Longitude: -73.9955°

Surface Elev.: 345.82 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	RECOVERY (In.)	FIELD TEST RESULTS
0.5	345.5	**TOPSOIL**		
1.8	344	**FILL - LEAN CLAY**, with sand, brown, medium stiff	14	WOH-1-3-5 N=4
5.0	341	**WEATHERED ROCK**, gray, dense	20	12-15-29-52 N=44
10.0	336	**SHALE**, moderately to slightly weathered, very close fractured, very poor RQD, gray		REC = 100% RQD = 0%
15.0	331	**SHALE**, unweathered, very close fractured, very poor RQD, gray		REC = 100% RQD = 0%
20.0	326	**SHALE**, unweathered, very close fractured, very poor RQD, gray		REC = 100% RQD = 0%
25.0	321	**SHALE**, unweathered, very close fractured, poor RQD, gray		REC = 100% RQD = 32%
		SHALE, unweathered, close to moderately fractured, fair RQD, gray		REC = 100% RQD = 64%

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

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations provided by Kiewit

Notes:

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

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 04-20-2022 | Boring Completed: 04-22-2022

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

Project No.: JB215256F

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/22/22

BORING LOG NO. K-169.0-7.5

PROJECT: Champlain-Hudson Power Express Package 4b

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

SITE: Champlain to Hudson HDD Crossings
Schenectady, NY

LOCATION See Exploration Plan

Latitude: 42.8309° Longitude: -73.9955°

Surface Elev.: 345.82 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	FIELD TEST RESULTS
		SHALE, unweathered, close to moderately fractured, fair RQD, gray *(continued)*	
30.0	316	**SHALE**, unweathered, close to moderately fractured, good RQD, gray	REC = 100% RQD = 88%
35.0	311	**SHALE**, unweathered, close to moderately fractured, excellent RQD, gray	REC = 100% RQD = 93%
40.0	306	**SHALE**, unweathered, close to moderately fractured, fair RQD, gray	REC = 100% RQD = 72%
45.0	301	**SHALE**, unweathered, close to moderately fractured, excellent RQD, gray	REC = 100% RQD = 95%
50.0	296	**SHALE**, unweathered, close to moderately fractured, excellent RQD, gray	REC = 100% RQD = 95%
55.0	291	**SHALE**, unweathered, close to moderately fractured, good RQD, gray	

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

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations provided by Kiewit

Notes:

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

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 04-20-2022 | Boring Completed: 04-22-2022
Drill Rig: CME 550x | Driller: S. Kahn
Project No.: JB215256F

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/22/22

BORING LOG NO. K-169.0-7.5

PROJECT: Champlain-Hudson Power Express Package 4b

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

SITE: Champlain to Hudson HDD Crossings
Schenectady, NY

LOCATION See Exploration Plan

Latitude: 42.8309° Longitude: -73.9955°

Surface Elev.: 345.82 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	FIELD TEST RESULTS
		SHALE, unweathered, close to moderately fractured, good RQD, gray *(continued)*	REC = 100% RQD = 90%
60.0	286	**SHALE**, unweathered, close to moderately fractured, excellent RQD, gray	REC = 100% RQD = 95%
65.0	281	**SHALE**, unweathered, very widely fractured, excellent RQD, gray	REC = 100% RQD = 95%
70.0	276	**SHALE**, unweathered, very widely fractured, good RQD, gray	REC = 100% RQD = 88%
75.0	271	***Boring Terminated at 75 Feet***	

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

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations provided by Kiewit

Notes:

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

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 04-20-2022 | Boring Completed: 04-22-2022

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

Project No.: JB215256F

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/22/22

K-169.0-6.9- Runs 6 and 7

K-169.0-7.4 Runs 1-4

K-169.0-7.4 Runs 5 and 6

169.0-7.5 Runs 1-4

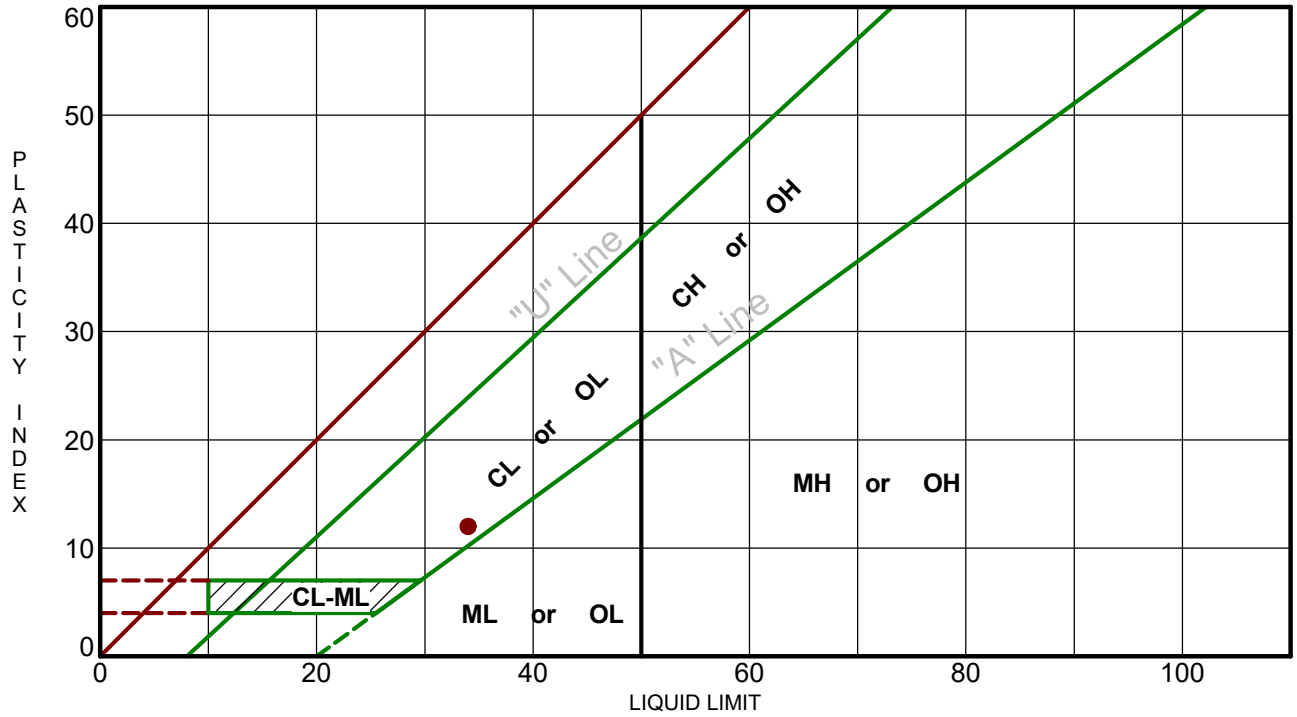
169.0-7.5 Runs 5-8

169.0-7.5 Runs 9-12

169.0-7.5 Runs 13 and 14

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
● K-169.0-7.4	4 - 6	34	22	12	81.9	CL	LEAN CLAY with SAND

PROJECT: Champlain-Hudson Power Express Package 4b

SITE: Champlain to Hudson HDD Crossings Schenectady, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

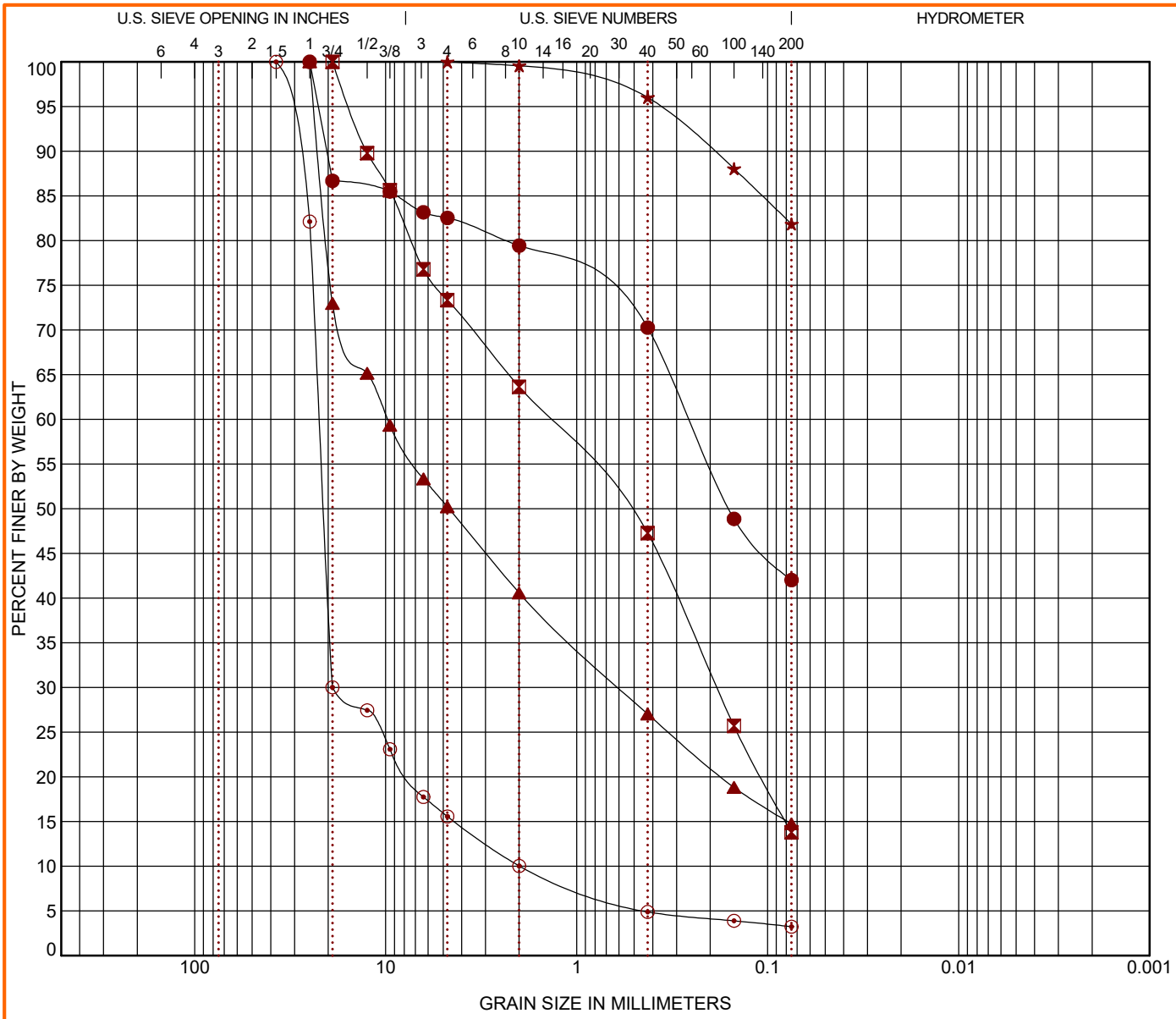
PROJECT NUMBER: JB215256F

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

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/16/22

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	K-121.0	6 - 8	SILTY SAND with GRAVEL (SM)	20.3					
⊠	K-169.0-6.9	4 - 6	SILTY SAND with GRAVEL (SM)	9.2					
▲	K-169.0-6.9	8 - 10	SILTY GRAVEL with SAND (GM)	12.1					
★	K-169.0-7.4	4 - 6	LEAN CLAY with SAND (CL)	26.3	34	22	12		
⊙	K-169.0-8.5	15 - 17	POORLY GRADED GRAVEL (GP)	13.5				8.14	11.21

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-121.0	6 - 8	25	0.258			0.0	17.5	40.5		42.0	
⊠	K-169.0-6.9	4 - 6	19	1.418	0.185		0.0	26.7	59.5		13.8	
▲	K-169.0-6.9	8 - 10	25	9.802	0.597		0.0	49.8	35.5		14.7	
★	K-169.0-7.4	4 - 6	4.75				0.0	0.0	18.1		81.9	
⊙	K-169.0-8.5	15 - 17	37.5	22.25	18.959	1.984	0.0	84.4	12.3		3.2	

PROJECT: Champlain-Hudson Power Express Package 4b

SITE: Champlain to Hudson HDD Crossings Schenectady, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256F

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

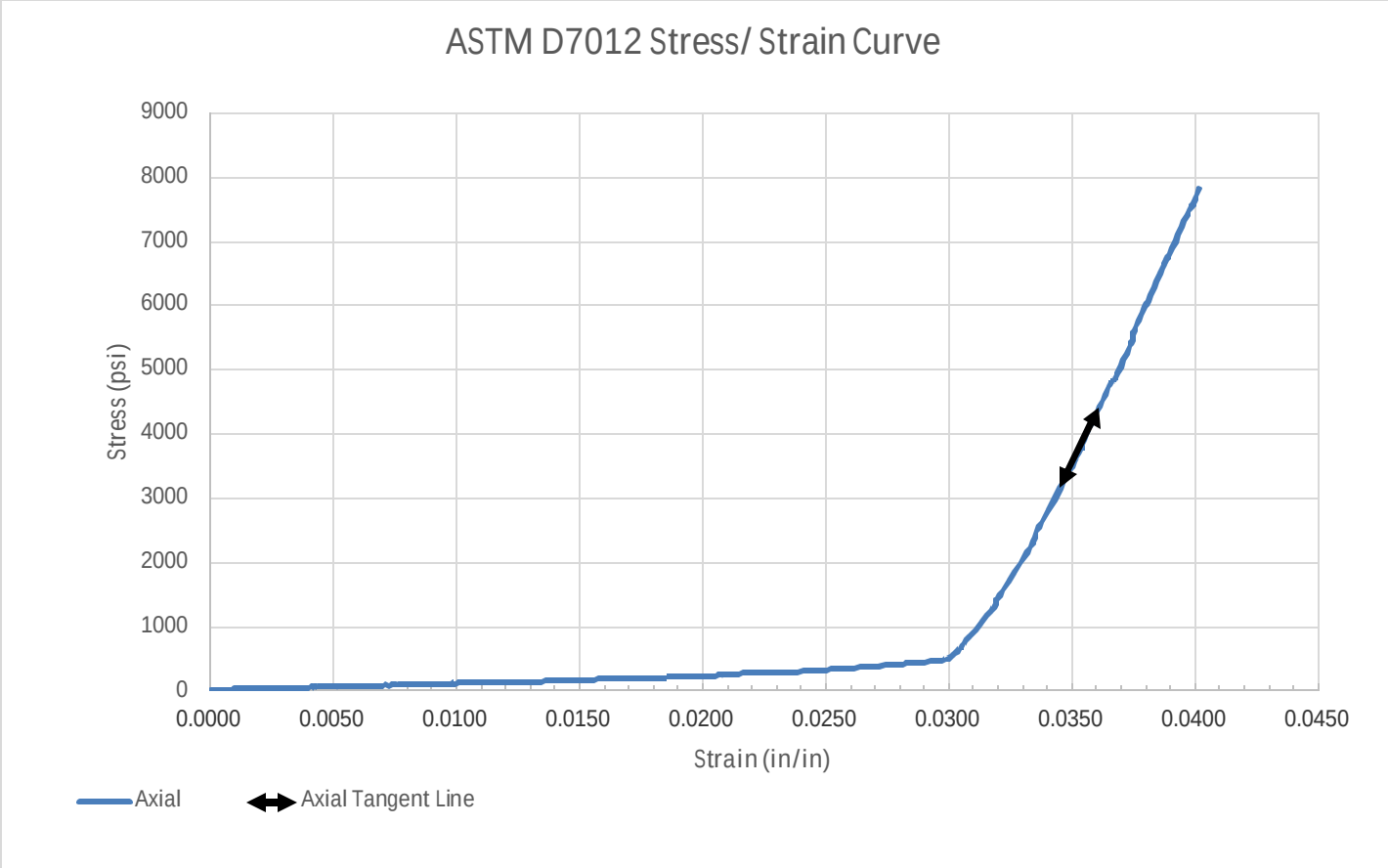
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/16/22

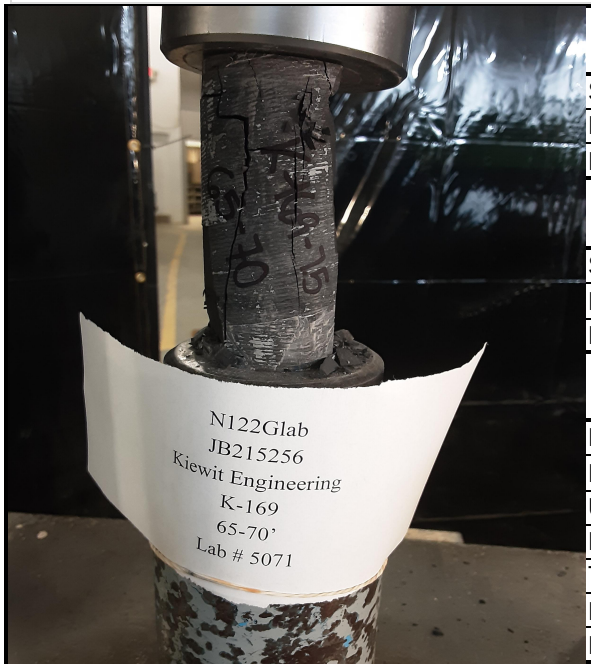
Rock Core D7012 Method C

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JB215256





SAMPLE LOCATION

Site:	Kiewit Engineering Corp.		
Description:	Shale		
Boring:	K-169.0-7.5	Depth (feet):	65-70

SPECIMEN INFORMATION

Sample No.:	Lab: 5071	Mass (g):	556.42
Length (in.):	4.09	Diameter (in.):	2
L/D Ratio:	2.045	Density (pcf):	164.971

TEST RESULTS

Failure Load (lbs):	24585
Failure Strain (in/in):	0.046
Unconfined Compressive Strength (psi):	7,826
Elastic Modulus, E, (ksi):	789
Time of Failure (min):	04:21
Rate of Loading (in/sec):	0.04
Moisture Content Post-break:	1.31%

Rock Core D7012 Method C

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

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

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

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

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

Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JB215256

Splitting Tensile Strength of Intact Rock Core Specimens, ASTM D3967

Boring	K-169.0-7.5	**Material Description**	Shale
Sample No		**Equipment Used**	Tinius Olsen (120,000lbs)
Depth (ft)	65-70	**TICCS ID/Serial No.**	C-48999, 118285
Lab No	5071	**Calibration Date**	11/2/2021

	TENSILE STRENGTH				
Sample No.	1	2	3	4	5
Diameter (in)	1.97	1.97	1.97	1.97	1.97
Length (in)	0.68	0.6	0.65	0.64	0.56
Length Diameter Ratio	0.35	0.30	0.33	0.32	0.28
Rate of Loading	0.0068	0.006	0.0065	0.0064	0.0056
Moisture Condition	1.31%	1.31%	1.31%	1.31%	1.31%
Maximum Applied Load (lbf)	1833	1419	1827	1763	1815
Splitting Tensile Strength (psi)	871.5	764.7	908.8	890.6	1047.9

	TENSILE STRENGTH				
Sample No.	6	7	8	9	10
Diameter (in)	2	2	2	2	2
Length (in)	0.62	0.53	0.65	0.63	0.59
Length Diameter Ratio	0.31	0.27	0.33	0.32	0.30
Rate of Loading	0.0062	0.0053	0.0065	0.0063	0.0059
Moisture Condition	1.31%	1.31%	1.31%	1.31%	1.31%
Maximum Applied Load (lbf)	2084	1775	1944	1874	1961
Splitting Tensile Strength (psi)	1070.5	1066.6	952.5	947.3	1058.5

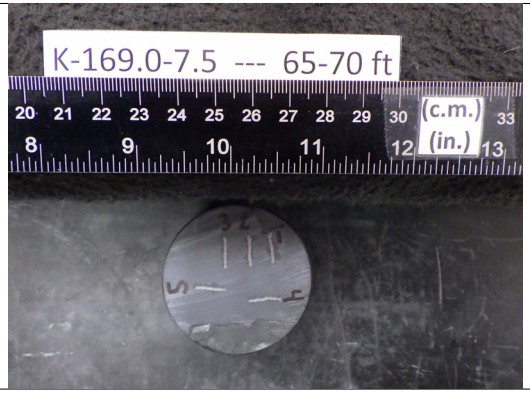
Client:	Terracon Consultants, Inc.		
Project:	Champlain-Hudson Power Express		
Location:		Project No:	GTX-315284
Boring ID: K-169.0-7.5	Sample Type: cylinder	Tested By:	tlm
Sample ID: ---	Test Date: 06/17/22	Checked By:	smd
Depth : 65-70 ft	Test Id: 670477		
Test Comment: ---			
Visual Description: ---			
Sample Comment: ---			

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
K-169.0-7.5	---	65-70 ft	1	0.7	0.5	0.60	
			2	0.5	0.6	0.55	
			3	1.0	0.3	0.65	
			4	0.8	0.7	0.75	
			5	0.5	0.7	0.60	
			Average CAIs			0.63	
			Average CAI *			1.10	
					CERCHAR Abrasiveness Index Classification	**Low abrasiveness**	

Notes

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



Kiewit

MEMORANDUM

DATE: April 10, 2023

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

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

SUBJECT: Geotechnical Data: Segment 7 – Design Package 4B – HDD Crossing 70A
Champlain Hudson Power Express Project
Schenectady, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located northwest of Schenectady, New York. The approximate station for the start of HDD crossing Number 70A is STA 45411+00 (42.8272°N, 73.9946°W).

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

- AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.
- Kiewit Engineering (NY) Corp., Package 4B Phase 4 Borings Rev. 1, Champlain Hudson Power Express, New York, dated March 31, 2023.

Contact us if you have questions or require additional information.

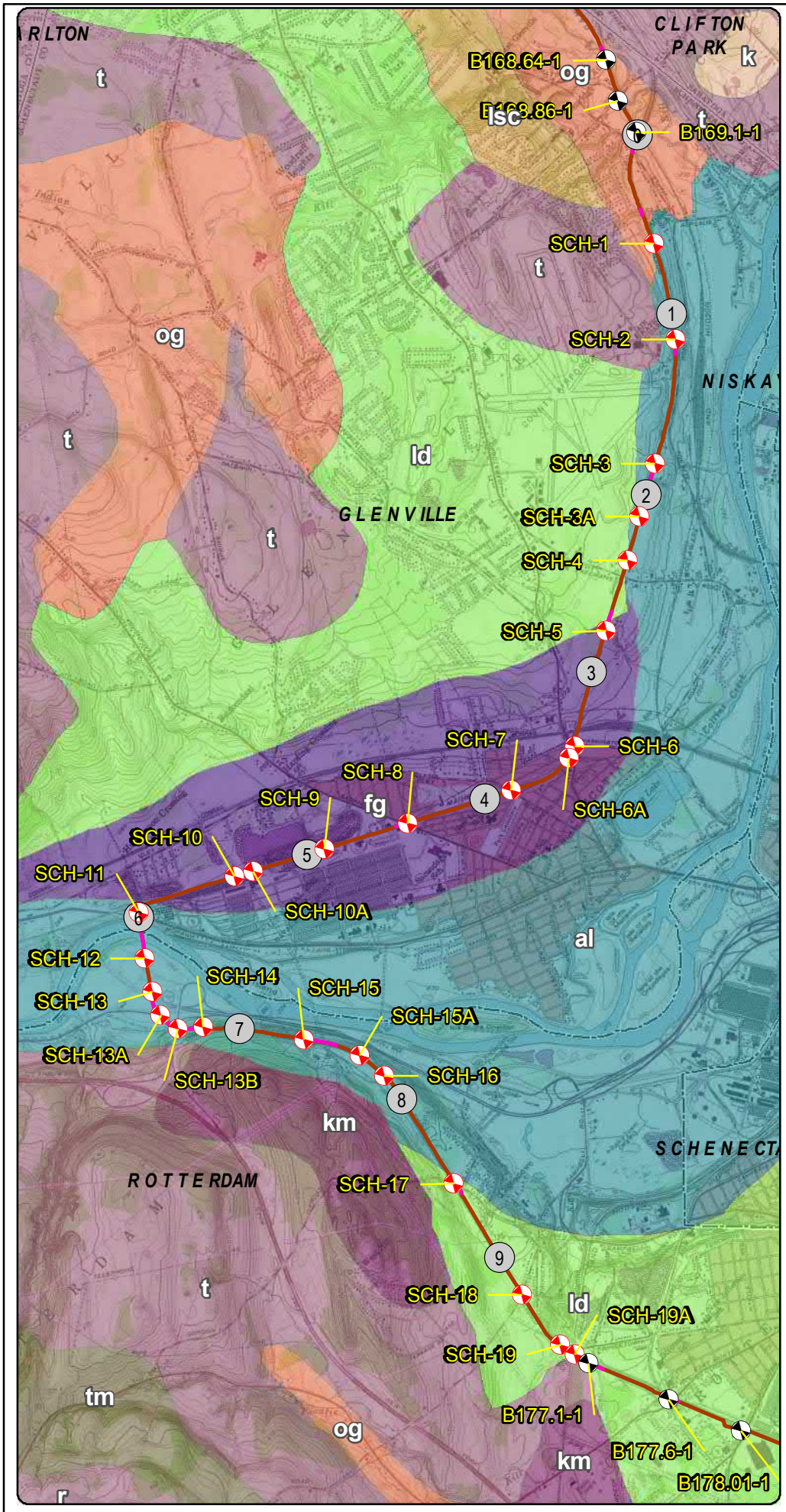
HDD 70A
Borings SCH-16, KB-169.0-7.9
Segment 7 - Design Package 4B

CHPE Segment 7 Package 4B
Soil Boring Coordinates and Elevations

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

Notes:
- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.
*** NYS DOT boring coordinates and elevations are approximated from drawing D257014 Sheet 170 "GENERAL SUBSURFACE PROFILE, STRUCTURE #3 - RAMP TWY OVER I-890"
**** Kiewit boring coordinates and elevations are noted on the boring logs.

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



LEGEND

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

Surficial Geology

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

N

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

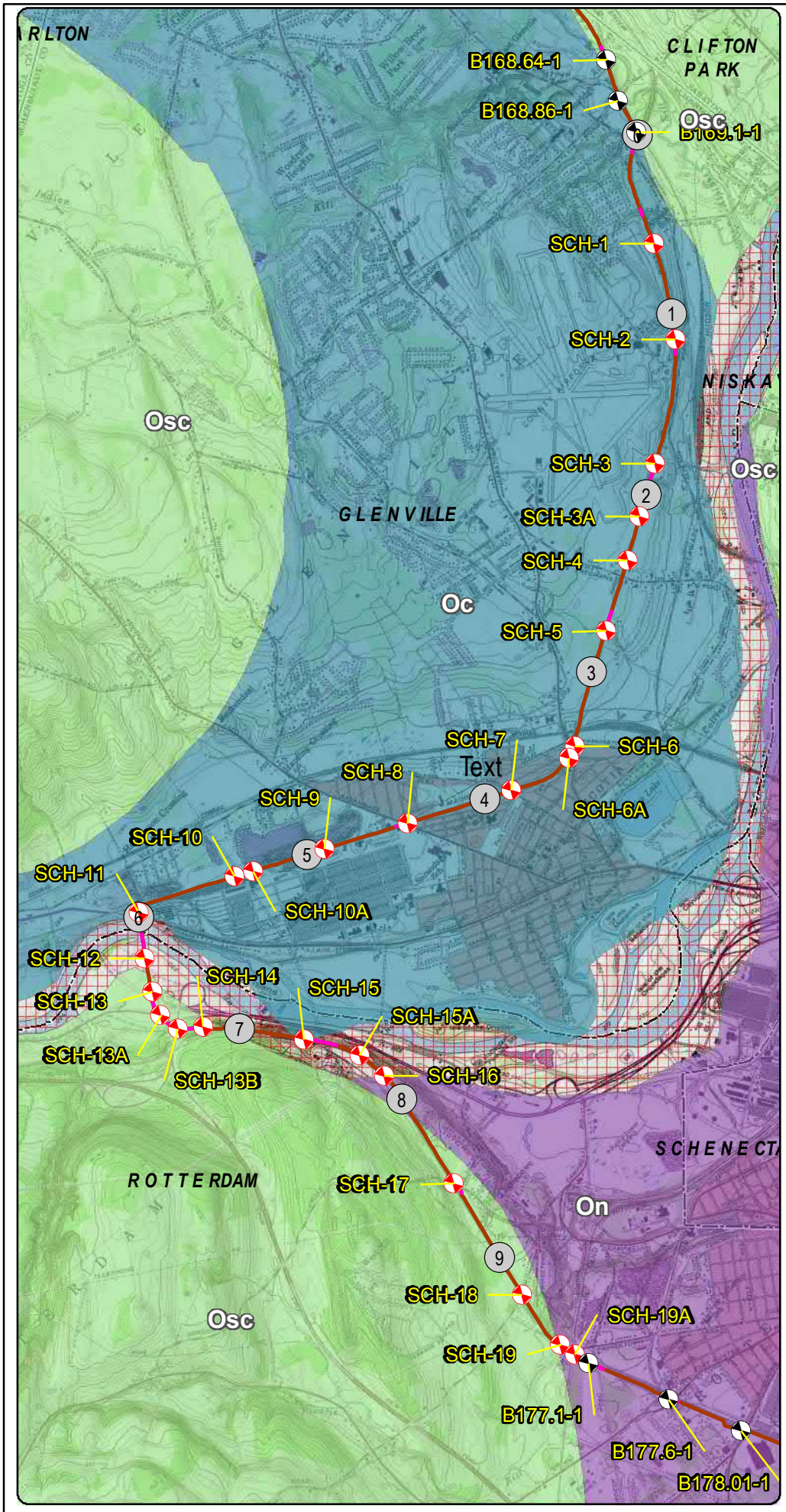
Surficial Geology and Geotechnical Borings Schenectady Preferred Alt Figure 3-7

Prepared on 4/27/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Surficial_Map_May_2021_Report.mxd



LEGEND

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

Bedrock Geology

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

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

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

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

Prepared on 4/29/2021

by: AECOM

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

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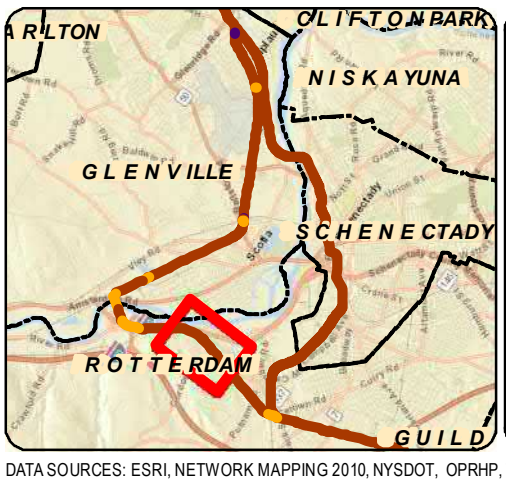
SCH-15
7.4
7.5
7.6
SCH-15A
7.7
7.8
SCH-16
7.9
8
8.1
8.2
8.3
8.4
8.5
SCH-17
8.6
GLENVILLE
ROTTERDAM
Conrail
I-890 E
I-890 W
Rice Rd
Schermerhorn Rd
Gordon Rd
Newell Rd
Valley View Ave
Groveland Ave
Viewland Ave
0
1,000
Feet



LEGEND

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

Parcel Ownership: TOWN NAME

Road Name: Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Schenectady Preferred Alternative

Figure A-7

Sheet 7 of 8

Prepared by: AECOM 4/27/2021

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

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

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 1
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-16**
SOILS ENGINEER/GEOLOGIST: Chris French		START DATE: 3/9/21
	BORING LOG	FINISH DATE: 3/9/21
LOCATION: MP - 7.83 (CSX Rail)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
Water at 1.5' (observed)	TYPE	Flush Joint Steel			NQ	BORING TYPE: Core
	SIZE I.D.	4"			1 7/8"	BORING O.D.: 3"
	SIZE O.D.	4.5"			3"	SURFACE ELEV.:
	HAMMER WT.	140 lbs				NORTHING
	HAMMER FALL	30"				EASTING

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'-1.5'				Hand Cleared		SP		0'-1.5' Dark Brown fine to medium SAND, trace sub-rounded Gravel, trace Cobbles, trace Silt, dense, moist
1.0										
2.0									Shale	Hand clearance refusal, transitioning to core
3.0										
		3'-8'	R-1	60"	60"	RQD: 0" = 0%				Grey SHALE, thinly laminated to thinly bedded, unweathered, heavy mechanical jointing, jointing occurring along bedding plain at 0°
4.0										
5.0										
6.0										
7.0										TR-1; (4.2'-13.7') Bulk sample of shale pieces collected across this interval in lieu no solid core segments > 5"
8.0										
		8'-13'	R-2	60"	59.5"	RQD: 0" = 0%				SAA, heavily jointed
9.0										
10.0										
11.0										
12.0										
13.0										
		13'-16.3'	R-3	40"	40"	RQD: 0" = 0%				SAA, heavily jointed
14.0										
15.0										
16.0										
17.0										SCH-16 terminated at 16.3' then grouted to surface
18.0										
19.0										
20.0										

NOTES:

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

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

Composite thermal resistivity sample taken for SCH-16, no competent rock core of adequate size.

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

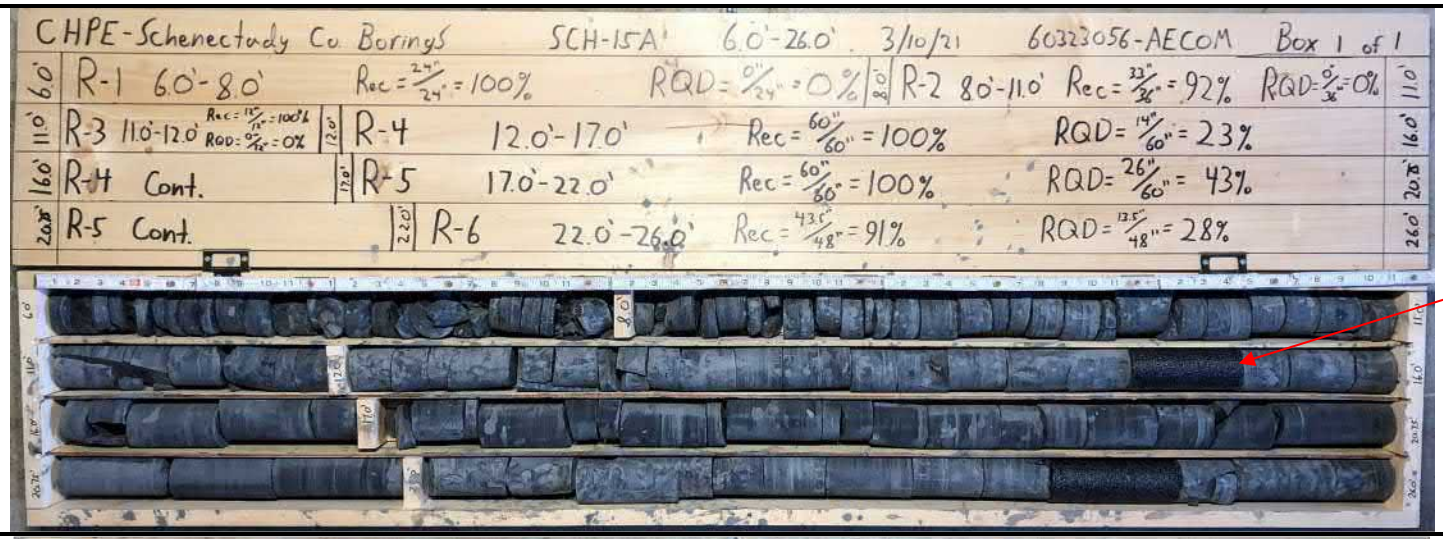
The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.

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

ROCK CORE PHOTOGRAPHIC LOG

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

Boring No.	Depth (ft.)
SCH-15A	6.0-26.0



Boring No.	Depth (ft.)
SCH-16	3.0-16.3

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

Package 4B Phase 4 Borings Rev 1

Champlain Hudson Power Express

New York

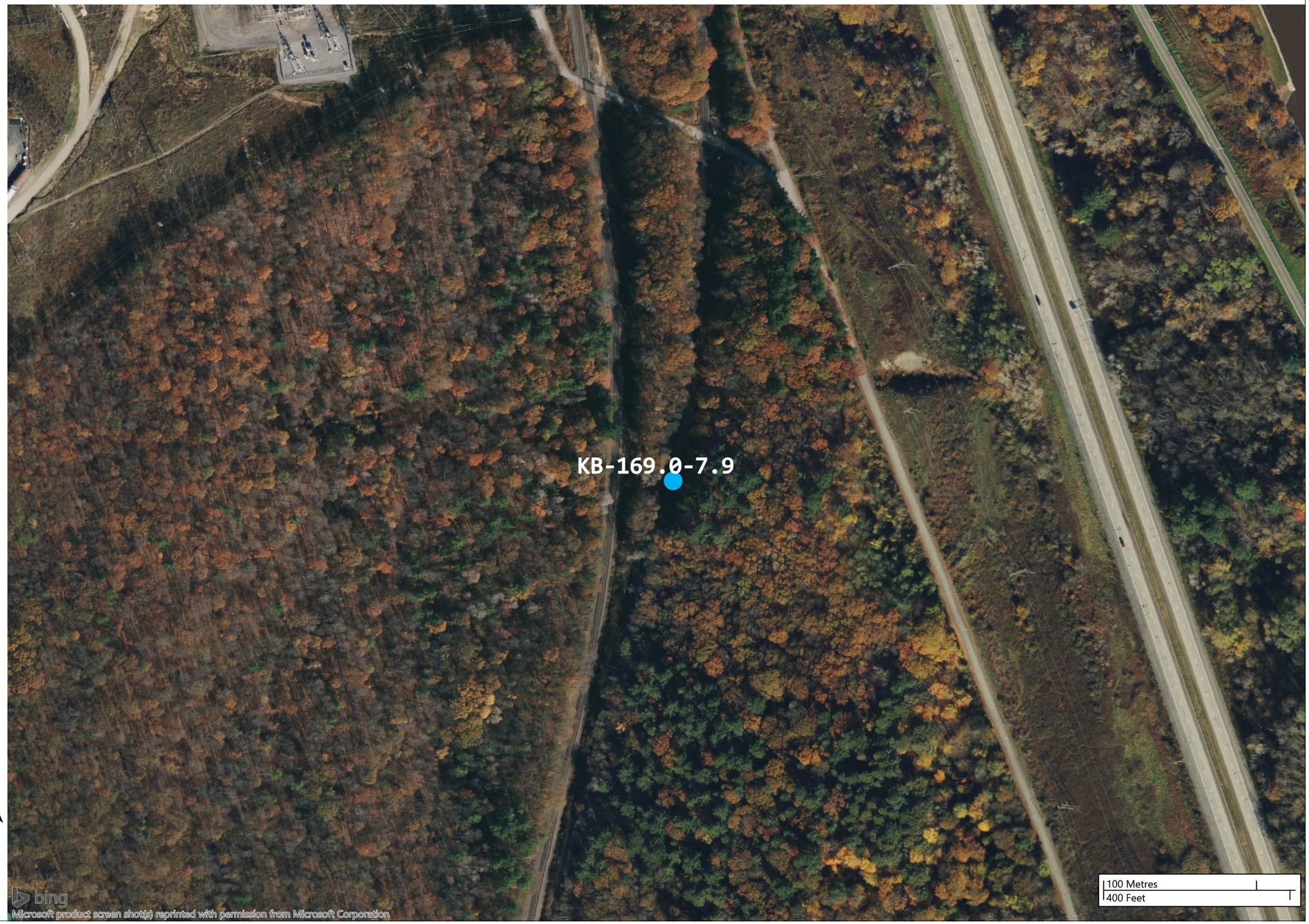
PROJECT NUMBER 20001480

CREATED BY Kiewit

DATE 03/31/2023

Legend Key

- Kiewit Borings



N

EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

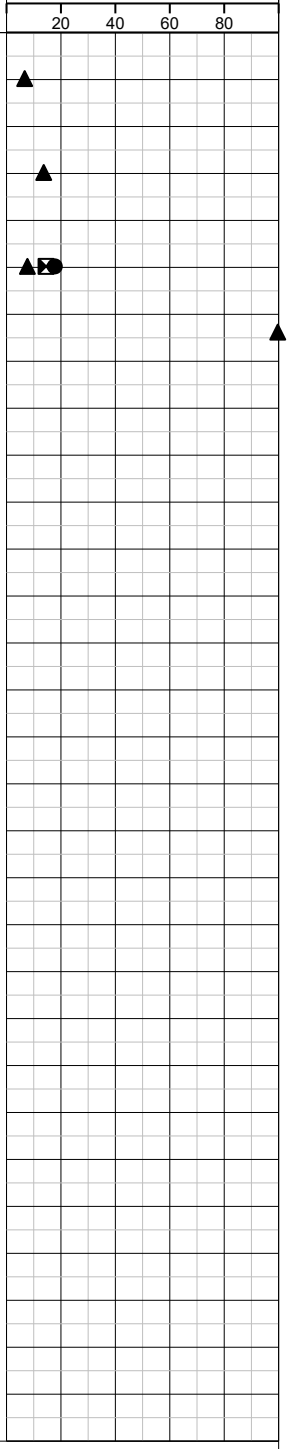
BORING NO: KB-169.0-7.9

PROJECT NUMBER	20001480	**LOGGED BY**	J. Techel	**COORDINATES**	N 1454437.76 E 627701.02
START DATE	12/12/2022	**DRILLER/RIG**	Eric / Geoprobe 7822DT	**GROUND ELEV.**	351.5 ft
FINISH DATE	12/14/2022	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			FILL: SAND (SP), loose, trace organics		1	4%		1-3-4-6 (7)	
	349.5		Silty SAND (SM), dark yellow brown to dark brown, loose to very dense, fine to coarse grained		2	58%		7-7-7-6 (14)	
5					3	66%		4-4-4-3 (8)	
					4	100%		2-55/4"	
	344.5		SHALE, dark gray, poor RQD						Roller bit advanced to 10ft
10					1	100% / 27			
15			fair RQD		2	100% / 50			
20					3	100% / 55			
25			good RQD		4	100% / 85			UCS = 6132 psi
30									

Legend

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



EXPLORATORY BORING LOG

Champlain Hudson Power Express

New York

BORING NO: KB-169.0-7.9

PROJECT NUMBER	20001480	**LOGGED BY**	J. Techel	**COORDINATES**	N 1454437.76 E 627701.02
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FINISH DATE	12/14/2022	**DRILL CONTRACTOR**	ADT Inc.	**HAMMER TYPE/EFF.**	Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % / RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes
			SHALE, dark gray, excellent RQD		5	100% / 93			
35					6	95% / 95			
40			good RQD		7	100% / 75			
45	306.5		Boring Terminated at 45 feet						
50									
55									
60									

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

20 40 60 80

Champlain Hudson Power Express
Kiewit Engineering (NY) Corp.

KB-169.0-7.9 - Runs 1 through 4

KB-169.0-7.9 - Runs 5 through 7

Summary of Laboratory Results

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

PROJECT: Lab Testing

SITE: Champlain to Hudsdon Power Express

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256H

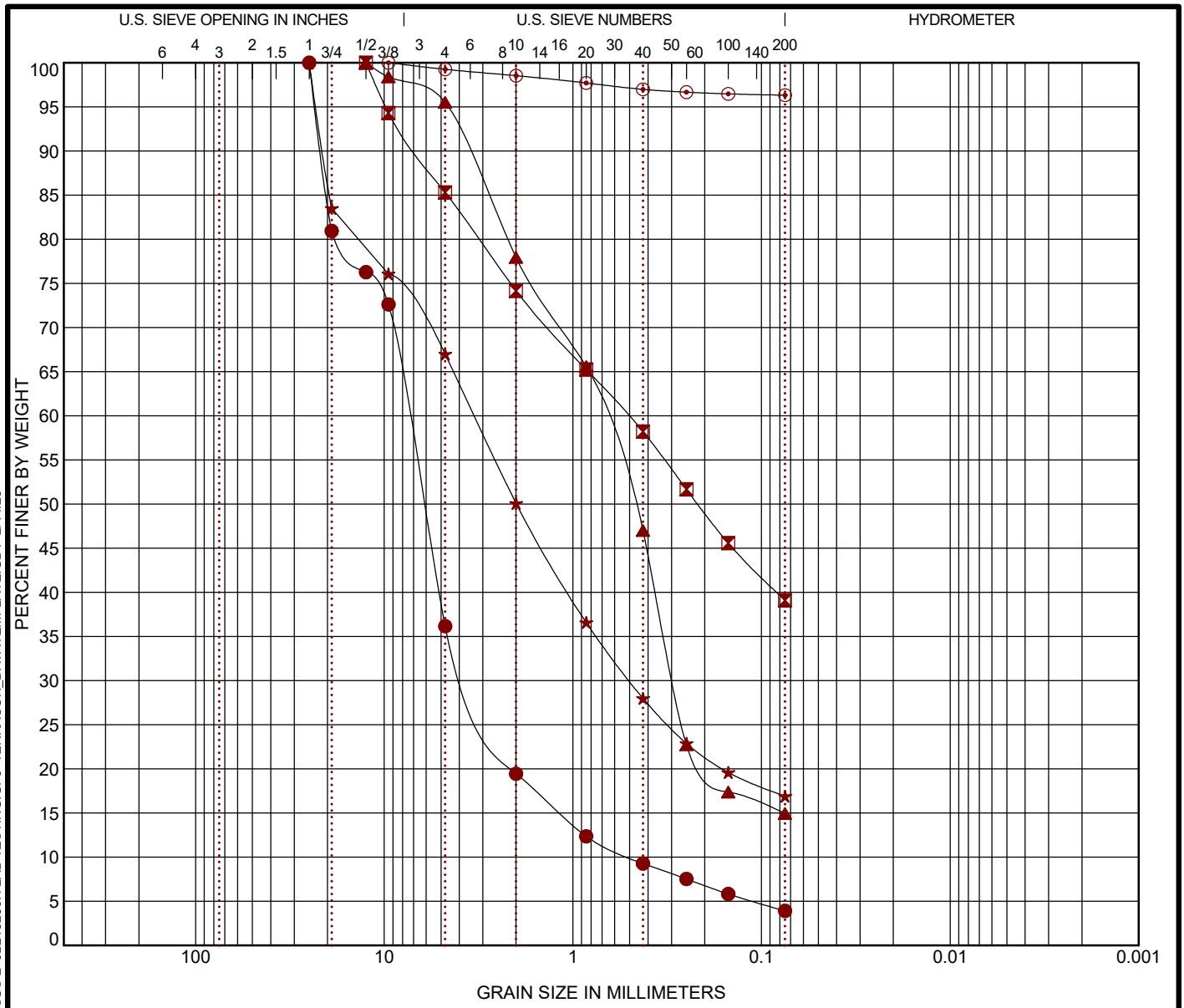
CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

EXHIBIT: B-1

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 2/14/23

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	KB-169.0-3.7	40 - 42	POORLY GRADED GRAVEL with SAND (GP)	4.4				3.19	14.93
⊠	KB-169.0-3.7	60 - 62	SILTY SAND (SM)	8.6	11	10	1		
▲	KB-169.0-7.9	4 - 6	SILTY SAND (SM)	18.1					
★	KB-221.0B	4 - 6	SILTY, CLAYEY SAND with GRAVEL (SC-SM)	11.0	24	20	4		
⊙	KB-221.0B	10 - 12	LEAN CLAY (CL)	40.8	46	26	20		

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	KB-169.0-3.7	40 - 42	25	7.474	3.454	0.501	0.0	63.8	32.2		3.9	
⊠	KB-169.0-3.7	60 - 62	12.5	0.507			0.0	14.7	46.2		39.1	
▲	KB-169.0-7.9	4 - 6	12.5	0.69	0.293		0.0	4.5	80.6		14.9	
★	KB-221.0B	4 - 6	25	3.323	0.5		0.0	33.0	50.1		16.9	
⊙	KB-221.0B	10 - 12	9.5				0.0	0.7	2.9		96.3	

PROJECT: Lab Testing

SITE: Champlain to Hudsdon Power Express

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256H

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

EXHIBIT: B-5

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 2/14/23

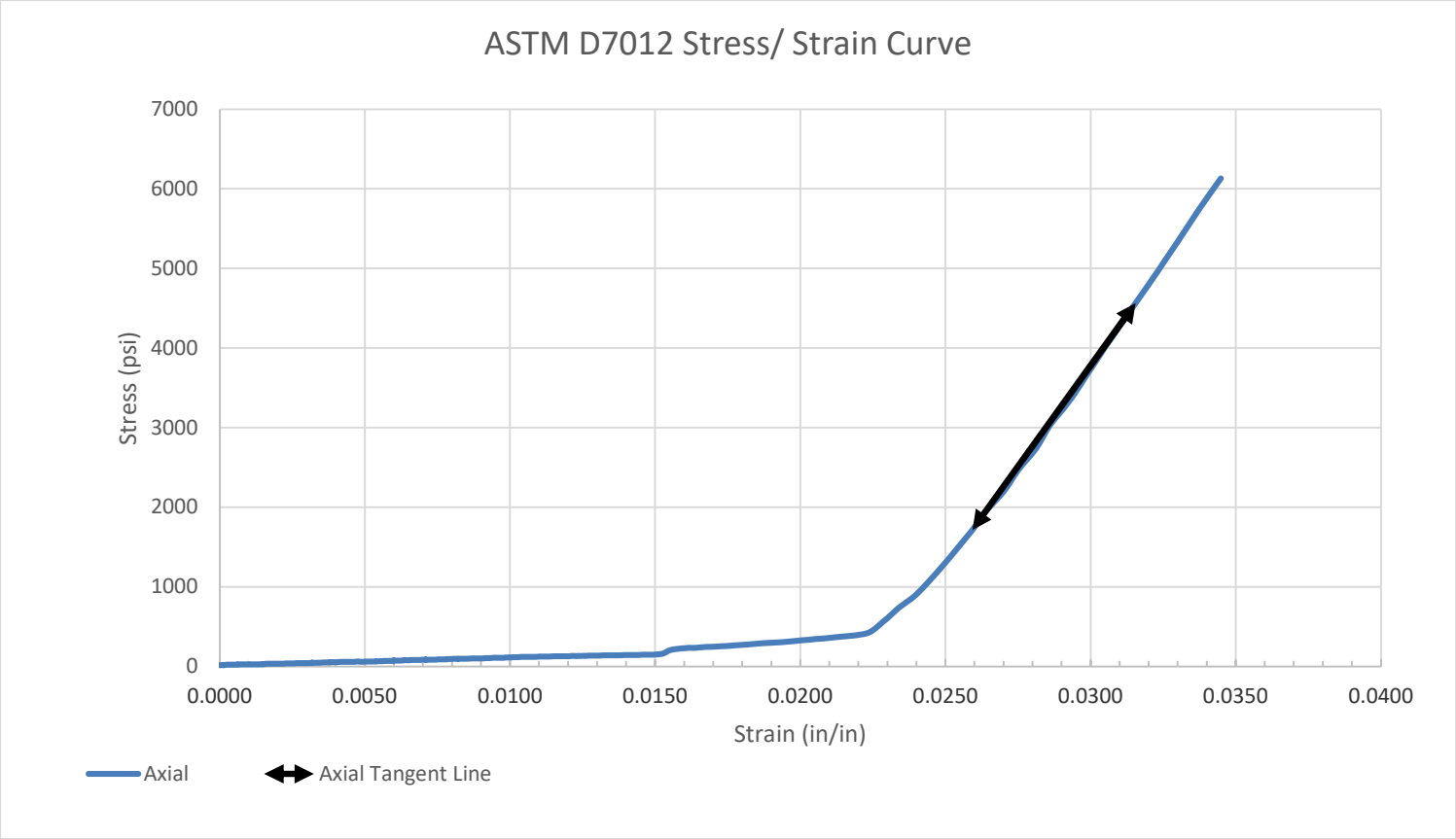
Rock Core D7012 Method C

Terracon
Explore with us

Client
Kiewit

Project
Lab Testing

Project No. JB215256H



SAMPLE LOCATION

Site:	JB215256H		
Description:	Shale		
Boring:	KB-169.0-7.9	Depth (feet):	29.0

SPECIMEN INFORMATION

Sample No.:	RC-1	Mass (g):	555.38
Length (in.):	4.11	Diameter (in.):	1.99
L/D Ratio:	2.065	Density (pcf):	165.512

TEST RESULTS

Failure Load (lbs):	19263
Failure Strain (in/in):	0.038
Unconfined Compressive Strength (psi):	6,132
Elastic Modulus, E, (ksi):	506
Time of Failure (min):	02:59
Rate of Loading (in/sec):	0.04
Moisture Content Post-break:	1.62%

Rock Core D7012 Method C

Client	Project
Kiewit	Lab Testing
	Project No. JB215256H

Equipment:

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

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

Notes:

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

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.

Per ASTM D4543 and ASTM D7012, the desired specimen length to diameter are between 2.0:1 and 2.5:1. According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

Kiewit

MEMORANDUM

DATE: April 10, 2023

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

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

SUBJECT: Geotechnical Data: Segment 7 – Design Package 4B – HDD Crossing 70B – Revision 1
Champlain Hudson Power Express Project
Schenectady, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located northwest of Schenectady, New York. The approximate station for the start of HDD crossing Number 70B is STA 45447+50 (42.8175°N, 73.9967°W).

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

- AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.
- Terracon, Field Exploration and Laboratory Testing Results, Champlain-Hudson Power Express Project-Package 4b, Schenectady, dated June 24, 2022.

Contact us if you have questions or require additional information.

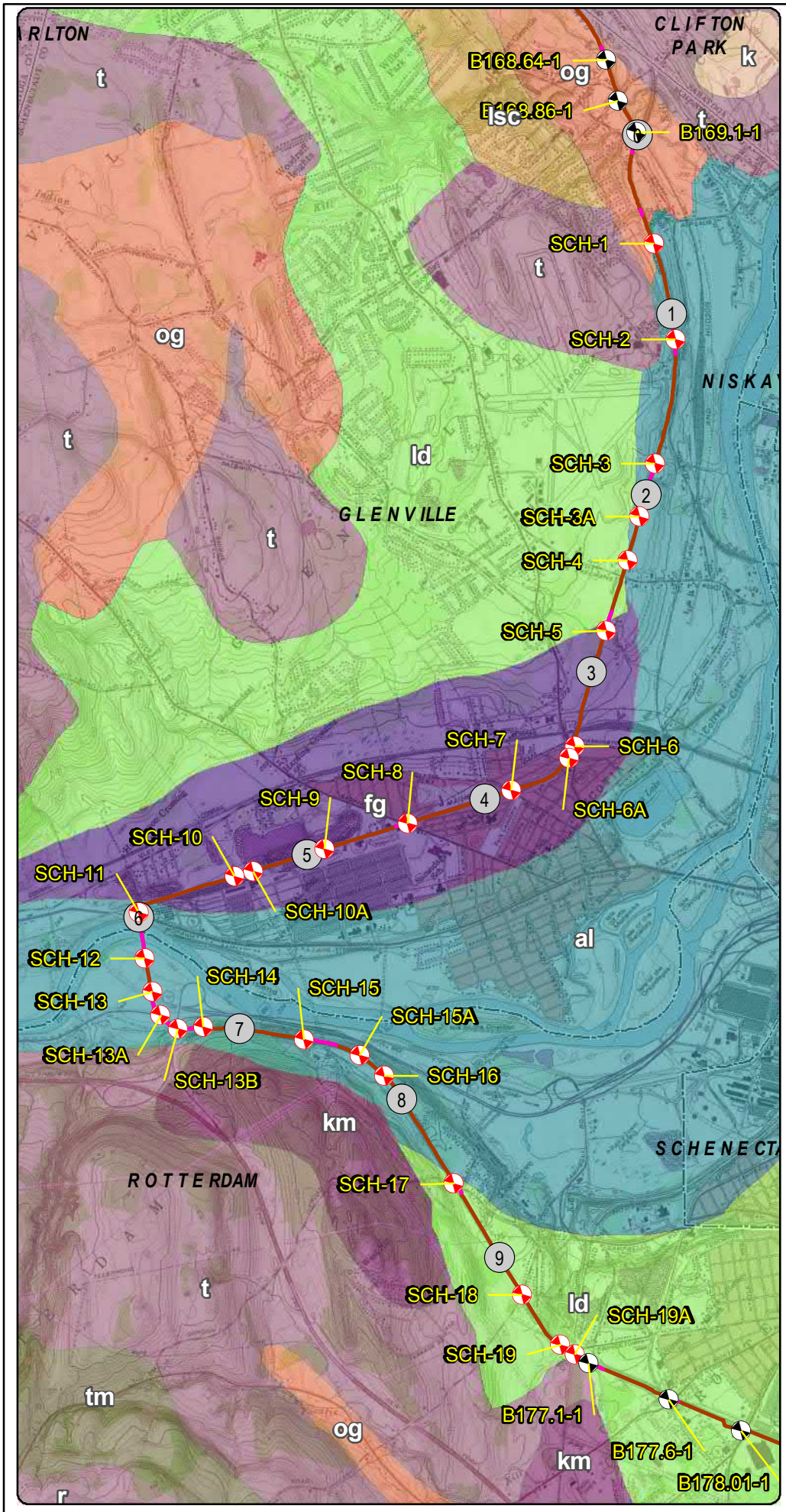
HDD 70.B
Borings K-169.0-8.5, SCH-17, K-169.0-8.6
Segment 7 - Design Package 4B

CHPE Segment 7 Package 4B
Soil Boring Coordinates and Elevations

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

Notes:
- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.
** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.
*** NYS DOT boring coordinates and elevations are approximated from drawing D257014 Sheet 170 "GENERAL SUBSURFACE PROFILE, STRUCTURE #3 - RAMP TWY OVER I-890"
**** Kiewit boring coordinates and elevations are noted on the boring logs.

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



LEGEND

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

Surficial Geology

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

N

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

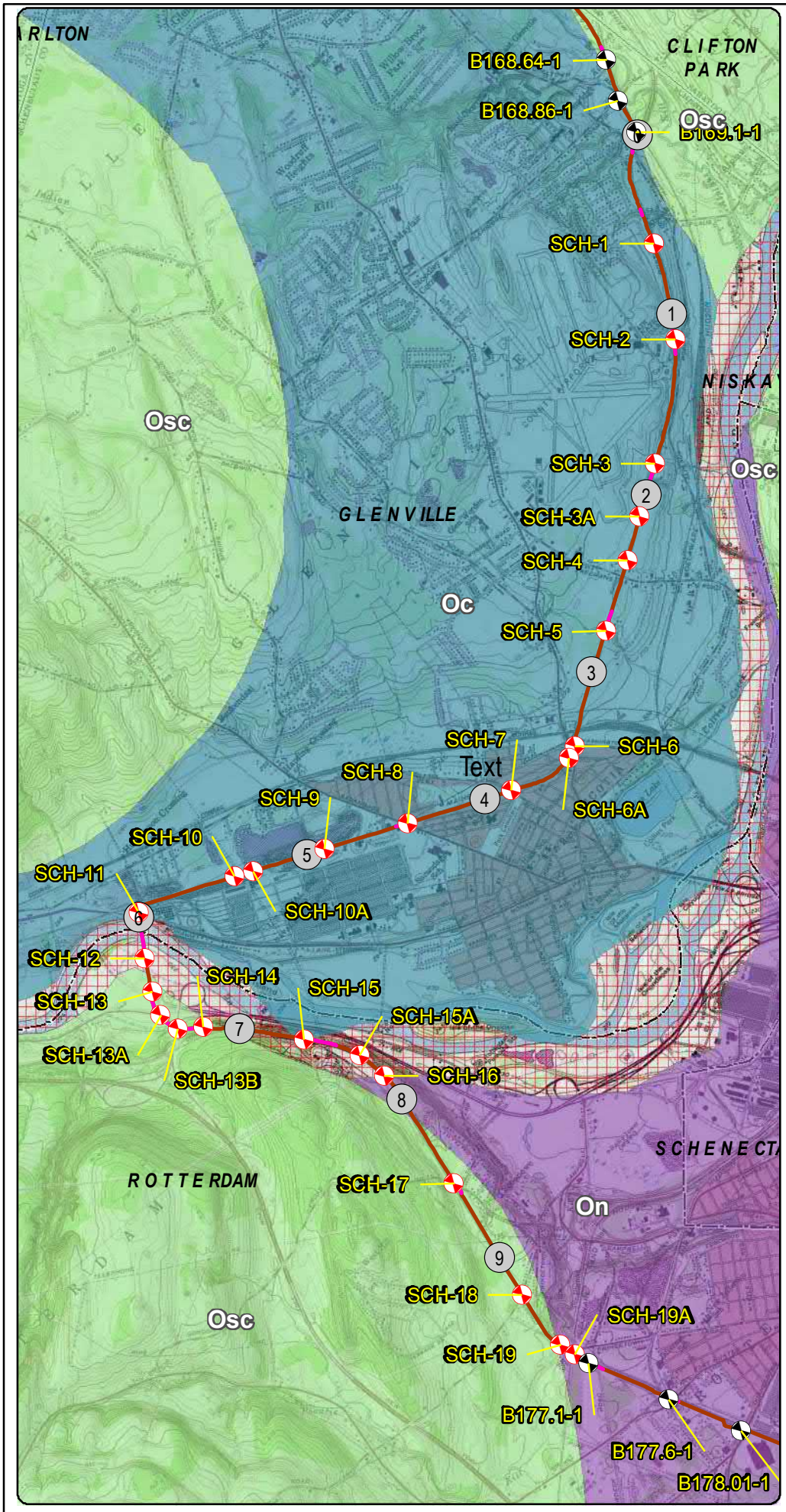
Surficial Geology and Geotechnical Borings Schenectady Preferred Alt Figure 3-7

Prepared on 4/27/2021

by: AECOM

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

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MXD\Alt_5_Routes_DZ_20190\Boring_Locations\Maps_for_May_2021_Report\Alt_Route_Schenectady_Boring_Locations_Surficial_Map_May_2021_Report.mxd



LEGEND

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

Bedrock Geology

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

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

0.4 0.2 0 0.4 Miles

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

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

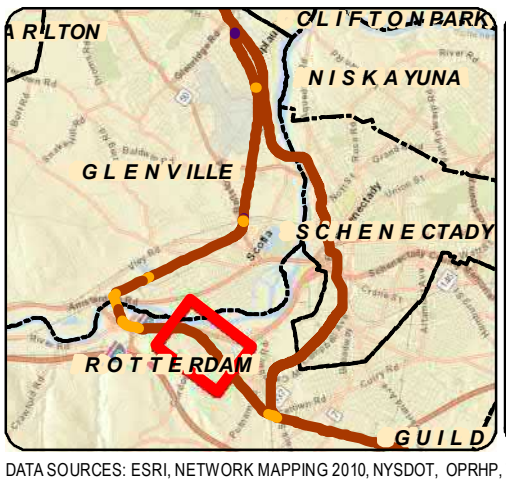
Prepared on 4/29/2021

by: AECOM

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

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

SCH-15
7.4
7.5
7.6
SCH-15A
7.7
7.8
SCH-16
7.9
8
8.1
8.2
8.3
8.4
8.5
SCH-17
8.6
GLENVILLE
ROTTERDAM
Conrail
I-890 E
I-890 W
Rice Rd
Schermerhorn Rd
Gordon Rd
Newell Rd
Valley View Ave
Groveland Ave
Viewland Ave
0
1,000
Feet



LEGEND

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

Parcel Ownership: TOWN NAME

Road Name: Village Name

Transmission Developers Inc.

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

BORING LOCATION PLAN

Schenectady Preferred Alternative

Figure A-7

Sheet 7 of 8

Prepared by: AECOM 4/27/2021

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

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

BORING CONTRACTOR: ADT	AECOM	SHEET 1 OF 1
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
		PROJECT NO.: 60323056
		HOLE NO.: **SCH-17**
SOILS ENGINEER: Chris French		START DATE: 3/9/21
	BORING LOG	FINISH DATE: 3/9/21
LOCATION: MP 8.52 (CSX Rail)		OFFSET: N/A

GROUND WATER OBSERVATIONS		CASING	SAMPLER	DRILL BIT	CORE BARREL	DRILL RIG: CME LC-55
	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			NORTHING
	HAMMER FALL	30"	30"			EASTING

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'-4'				Hand Cleared					SM	Fill	0'-1.3' Black fine to coarse SAND, little Silt, little sub-rounded to sub-angular Gravel, frozen
1.0											SM		1.3'-2.7' Black fine to coarse SAND, little Silt, little sub-rounded to sub-angular Gravel, dense, moist
2.0											SP/GP		2.7'-4' Black fine to coarse SAND, little sub-rounded to angular Gravel, trace Silt, dense, moist
3.0		3'-4'	S-1										TR1; (3'-4')
4.0		4'-6'	S-2	24"	14"	26	24	41	42	42	SM	Silty Gravelly SAND (Dense Till)	Brown fine to coarse SAND, some Silt, little rounded to sub-rounded Gravel, very dense, moist (weathered Till)
5.0													
6.0		6'-8'	S-3	7"	7"	25	53/1"			-	SM		SAA
7.0													
8.0		8'-10'	S-4	24"	5"	15	20	14	21	22	SM		SAA
9.0													
10.0		10'-12'	S-5	24"	9"	13	14	15	22	19	SM		Brown fine to coarse SAND, some sub-rounded to sub-angular Gravel, some Silt, dense, moist
11.0													
12.0		12'-14'	S-6	24"	6"	20	27	63	62	59	SM		Brown fine to coarse SAND, some sub-rounded to sub-angular Gravel, some Silt, very dense, moist
13.0													
14.0		14'-16'	S-7	24"	2"	10	9	48	37	37	GP		Grey angular GRAVEL
15.0													
16.0													
17.0													SCH-17 terminated at 16' then grouted to surface Note- poor sample recovery prevented collection of additional TR samples
18.0													
19.0													
20.0													

NOTES:

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

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

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

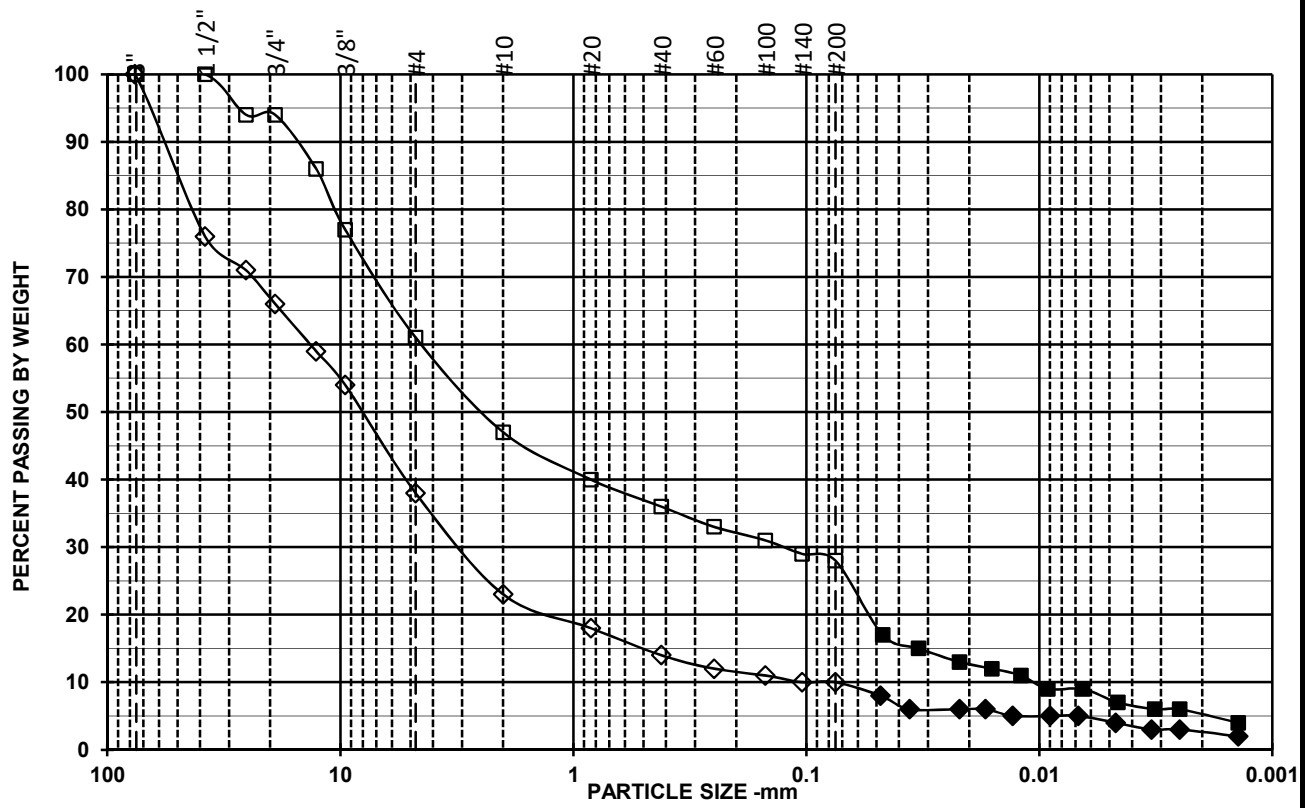
The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.

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

Aquifer
CHPE - Schenectady Bypass Borings
LABORATORY SOIL TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS								REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	ORGANIC CONTENT (burnoff) (%)	
SCH-3	S-4	9-11	12.1				SC	19	6		
SCH-3	S-6	13-15	15.8				SM	19	6		
SCH-3	S-10	30-32	6.0				SM	32	10		
SCH-3A	S-3	7-9	22.9				SP-SM	12	3		
SCH-3A	S-7	15-17	15.2				SP-SM	12	4		
SCH-3A	S-9	25-27	26.3				CL	99.1	40		
SCH-6	S-3	7-9	8.8	36	21	15	GC	14	5		
SCH-6	S-7	15-17	10.4				GC	17	5		
SCH-7	S-2	5-7	21.6	25	19	6	CL-ML	79.3	16		
SCH-7	S-4	9-11	13.9				SM	39	7		
SCH-10A	S-3	7-9	6.3				GP-GM	8	2		
SCH-10A	S-6	15-17	4.6				GW-GM	8	2		
SCH-10A	S-10	30-32	4.0				GP-GM	5			
SCH-11	S-3	7-9	9.6				SC	21	6		
SCH-11	S-16	60-62	5.6				SW-SM	12	3		
SCH-11	S-20	80-82	19.3				SM	17.5	3		
SCH-11	S-25	105-107	21.1				SM	24.3	3		
SCH-12	S-3	7-9	28.5	33	19	14	CL	85	18		
SCH-12	S-9	25-27	23.3				SM	19.8	3		
SCH-12	S-14	50-52	18.3				SM	15	3		
SCH-12	S-19	75-77	7.6	18	11	7	SC-SM	41	14		
SCH-12	S-25	105-107	7.6	19	11	8	SC	41	14		
SCH-13	S-3	7-9	7.0				GP-GM	6	2		
SCH-13	S-6	13-15	0.3				GW	2	1		
SCH-13	S-11	35-37	20.9				SM	18.4	3		
SCH-13B	S-2	5-7	12.8				GC	19	6		
SCH-13B	S-3	7-9	11.3				GC	22	6		
SCH-17	S-2	5-7	9.1				GM	28	5		
SCH-17	S-4	9-11	8.5				GP-GM	10	3		
SCH-19	S-2	5-7	10.7				SM	19	5		
SCH-19	S-7	15-17	7.8				GP-GM	11	3		
SCH-19	S-10	30-32	13.9	22	12	10	SC	28	11		

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



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

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	9.1				GM		Brown, Silty gravel with sand, Insufficient sample size	04/27/21
◇	8.5				GP-GM		Brown, Poorly graded gravel with silt and sand, Insufficient sample size	04/27/21
○								

Symbol	□	◇	○
Boring	SCH-17	SCH-17	
Sample	S-2	S-4	
Depth	5-7	9-11	
% +3"	0	0	
% Gravel	39	62	
% SAND	33	28	
%C SAND	14	15	
%M SAND	11	9	
%F SAND	8	4	
% FINES	28	10	
D_{100} (mm)	38.1	76.2	
D_{60} (mm)	4.47	13.5	
D_{30} (mm)	0.12	3	
D_{10} (mm)	0.011	0.1	
Cc	0.3	6.7	
Cu	406.4	135	

Sieve Size/ID #	Percent Finer Data		
6"	100	100	
4"	100	100	
3"	100	100	
1 1/2"	100	76	
1"	94	71	
3/4"	94	66	
1/2"	86	59	
3/8"	77	54	
#4	61	38	
#10	47	23	
#20	40	18	
#40	36	14	
#60	33	12	
#100	31	11	
#140	29	10	
#200	28	10	
5μ m	7	4	
2μ m	5	3	
1μ m	3	1	

Aquifer

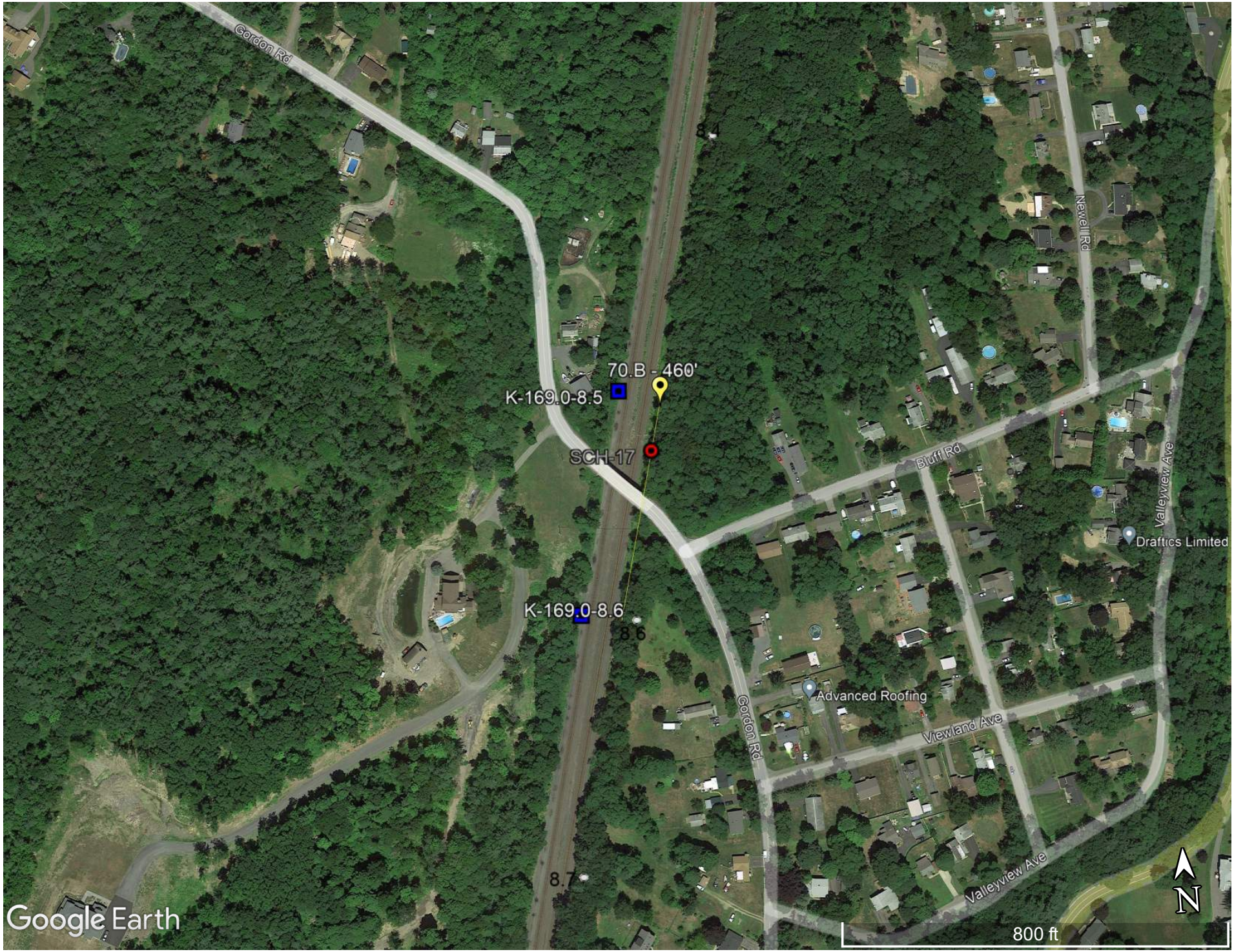
TerraSense, LLC #7853-21006

CHPE - Schenectady Bypass Borings

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

TerraSense Analysis File: GrainSizeV6Rev1a14

Siev1l.xlsx 5/7/2021


Gordon Rd
8.4
Newell Rd
70.B - 460'
K-169.0-8.5
SCH-17
Bluff Rd
Valleyview Ave
Draftics Limited
K-169.0-8.6
8.6
Advanced Roofing
Gordon Rd
Viewland Ave
8.7
Valleyview Ave
Google Earth
800 ft
N

BORING LOG NO. K-169.0-8.5

PROJECT: Champlain-Hudson Power Express Package 4b

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

SITE: Champlain to Hudson HDD Crossings
Schenectady, NY

LOCATION See Exploration Plan

Latitude: 42.8172° Longitude: -73.9974°

Surface Elev.: 362.15 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.0	362.15	**FILL - POORLY GRADED SAND WITH GRAVEL**, black, loose
2.0	360	**FILL - SILTY SAND WITH GRAVEL**, brown, loose to medium dense
15.0	347	**POORLY GRADED GRAVEL (GP)**, brown, medium dense
23.0	339	**POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)**, brown

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		10	3-3-4-5 N=7			
		12	4-3-3-3 N=6			
5		12	3-2-4-5 N=6			
		12	6-10-11-17 N=21			
		1	50/1"			
10		4	7-5-3-5 N=8			
15		4	11-11-13-9 N=24	13.5		3
20		2	5-5-7-5 N=12			
		NR	4-5-8-14	13.3		10
25		NR	3" Split Spoon Bulk Sample			
			56-50/2" 3" Split Spoon Bulk Sample			

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations provided by Kiewit

Notes:
Logged by:LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.2% +/-2.4%
Hammer Efficiency Correction (CE):1.49
NR = Not recorded. Sample for bulk testing only.

WATER LEVEL OBSERVATIONS

While drilling

At completion of drilling

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-30-2022 | Boring Completed: 03-30-2022

Drill Rig: Diedrich D-70 | Driller: J. Rauscher

Project No.: JB215256F

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/22/22

BORING LOG NO. K-169.0-8.5

PROJECT: Champlain-Hudson Power Express Package 4b

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

SITE: Champlain to Hudson HDD Crossings
Schenectady, NY

LOCATION See Exploration Plan

Latitude: 42.8172° Longitude: -73.9974°

Surface Elev.: 362.15 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), brown *(continued)*									
	30.0	332	30							
	SILTY SAND WITH GRAVEL (SM), gray, dense, (GLACIAL TILL)					6	20-15-21-40 N=36			
	33.0	329								
	33.7 **WEATHERED ROCK**, black, very dense	328.5				8	57-50/2"			
	Boring Terminated at 33.7 Feet									

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations provided by Kiewit

Notes:

Logged by:LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.2% +/-2.4%
Hammer Efficiency Correction (CE):1.49

WATER LEVEL OBSERVATIONS

While drilling

At completion of drilling

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-30-2022 | Boring Completed: 03-30-2022

Drill Rig: Diedrich D-70 | Driller: J. Rauscher

Project No.: JB215256F

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/22/22

BORING LOG NO. K-169.0-8.6

PROJECT: Champlain-Hudson Power Express Package 4b

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

SITE: Champlain to Hudson HDD Crossings
Schenectady, NY

LOCATION See Exploration Plan

Latitude: 42.8159° Longitude: -73.9978°

Surface Elev.: 361.76 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
		FILL - SILTY SAND WITH GRAVEL, black
2.0	360	
		FILL - SILTY SAND WITH GRAVEL, brown, loose to medium dense
8.0	354	
		FILL - SANDY SILT, trace gravel, gray, medium dense
10.0	352	
		SILTY GRAVEL WITH SAND (GM), brown, medium dense
		3" Spoon was driven from 15' to 17' after the original 2" spoon was driven to collect a bulk sample for TR testing
18.0	344	
		CORED THROUGH BOULDER
20.0	342	
		SILTY SAND WITH GRAVEL (SM), gray, medium dense, (GLACIAL TILL)

DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	12	5-6 3" Spoon			
	10	3-4-3-3 N=7			
5	14	6-6-4-6 N=10			
	10	5-5-5-7 N=10			
	14	16-14-14-6 N=28			
10	14	7-7-7-10 N=14	13.3		42
	NR	22-16-18-22 3" Split Spoon With Ring Samplers			
15	14	9-7-5-5 N=12			
20					
25	14	17-6-5-5 N=11	15.0		19

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations provided by Kiewit

Notes:

Logged by: MO
Hammer Efficiency Summary:
Energy Transfer Ratio: 84.7% +/-5.7%
Hammer Efficiency Correction (CE):1.41
NR = Not recorded. Sample for bulk testing only.

WATER LEVEL OBSERVATIONS

While drilling

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-30-2022	Boring Completed: 03-30-2022
Drill Rig: Diedrich D-50	Driller: B. Duffey
Project No.: JB215256F	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/22/22

BORING LOG NO. K-169.0-8.6

PROJECT: Champlain-Hudson Power Express Package 4b

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

SITE: Champlain to Hudson HDD Crossings
Schenectady, NY

LOCATION See Exploration Plan

Latitude: 42.8159° Longitude: -73.9978°

Surface Elev.: 361.76 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND WITH GRAVEL (SM), gray, medium dense, (GLACIAL TILL) *(continued)*									
	30.0	332	30							
	WEATHERED ROCK, gray, very dense					5	50/5"			
	33.5	328.5				5	50/5"			
	Boring Terminated at 33.5 Feet									

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

Hammer Type: Automatic

Advancement Method:
3 1/4 HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations provided by Kiewit

Notes:

Logged by: MO
Hammer Efficiency Summary:
Energy Transfer Ratio: 84.7% +/-5.7%
Hammer Efficiency Correction (CE):1.41

WATER LEVEL OBSERVATIONS

While drilling

Terracon
30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-30-2022 | Boring Completed: 03-30-2022

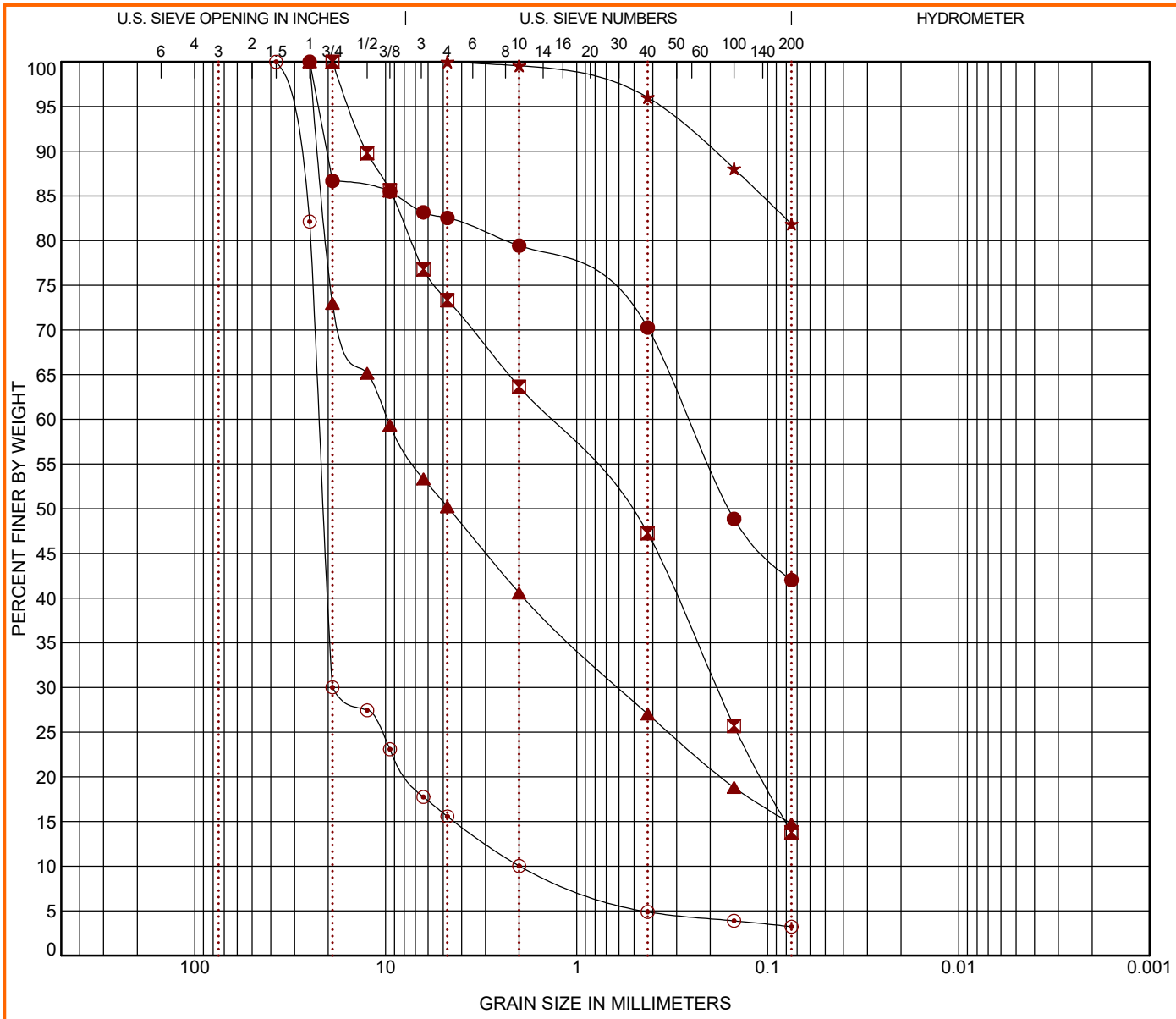
Drill Rig: Diedrich D-50 | Driller: B. Duffey

Project No.: JB215256F

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/22/22

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	K-121.0	6 - 8	SILTY SAND with GRAVEL (SM)	20.3					
⊠	K-169.0-6.9	4 - 6	SILTY SAND with GRAVEL (SM)	9.2					
▲	K-169.0-6.9	8 - 10	SILTY GRAVEL with SAND (GM)	12.1					
★	K-169.0-7.4	4 - 6	LEAN CLAY with SAND (CL)	26.3	34	22	12		
⊙	K-169.0-8.5	15 - 17	POORLY GRADED GRAVEL (GP)	13.5				8.14	11.21

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-121.0	6 - 8	25	0.258			0.0	17.5	40.5		42.0	
⊠	K-169.0-6.9	4 - 6	19	1.418	0.185		0.0	26.7	59.5		13.8	
▲	K-169.0-6.9	8 - 10	25	9.802	0.597		0.0	49.8	35.5		14.7	
★	K-169.0-7.4	4 - 6	4.75				0.0	0.0	18.1		81.9	
⊙	K-169.0-8.5	15 - 17	37.5	22.25	18.959	1.984	0.0	84.4	12.3		3.2	

PROJECT: Champlain-Hudson Power Express Package 4b

SITE: Champlain to Hudson HDD Crossings Schenectady, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

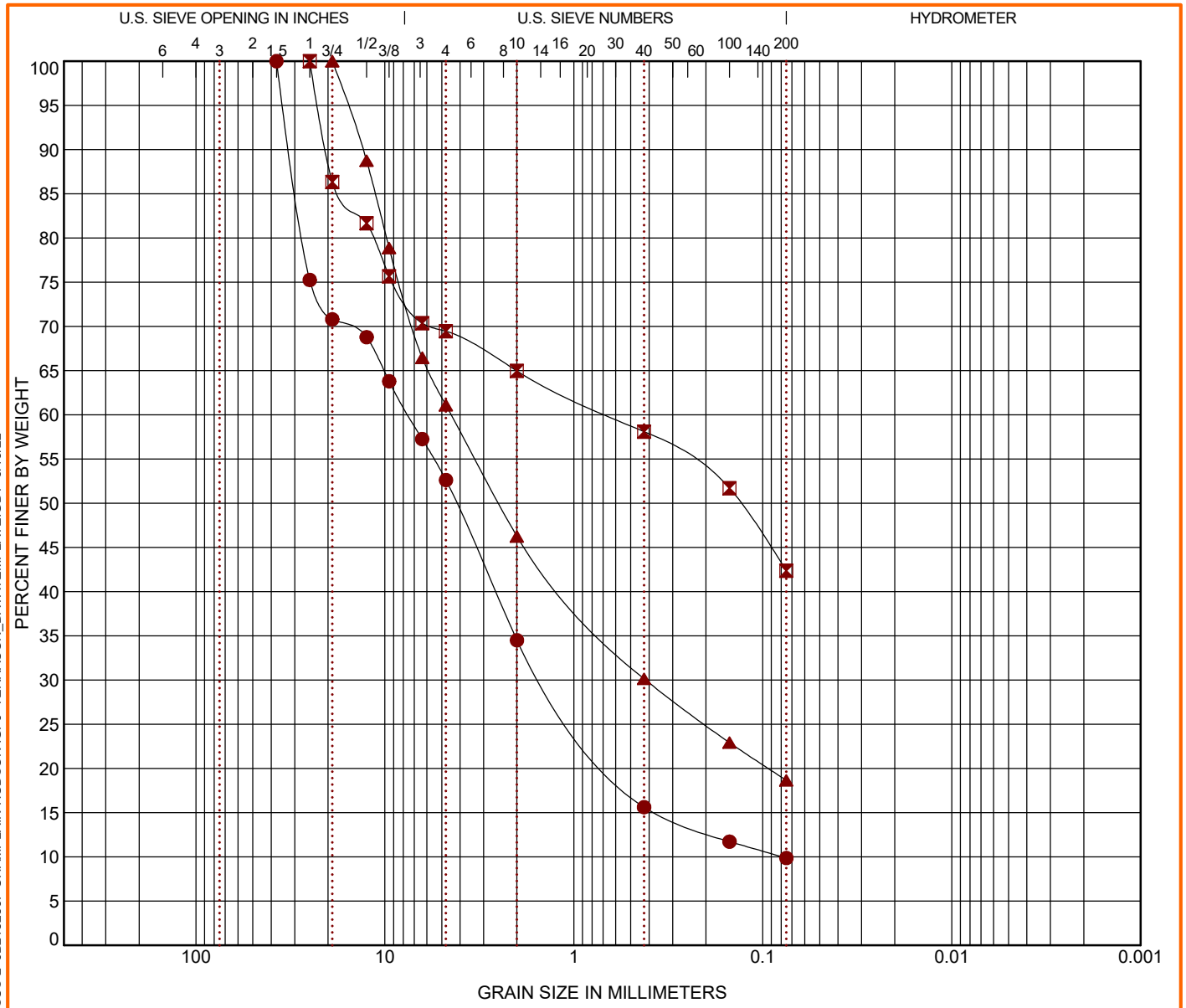
PROJECT NUMBER: JB215256F

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

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/16/22

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	K-169.0-8.5	23 - 25	POORLY GRADED GRAVEL with SILT and SAND (GP-GM)	13.3				3.22	95.42
⊠	K-169.0-8.6	10 - 12	SILTY GRAVEL with SAND (GM)	13.3					
▲	K-169.0-8.6	25 - 27	SILTY SAND with GRAVEL (SM)	15.0					

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	K-169.0-8.5	23 - 25	37.5	7.522	1.383	0.079	0.0	47.4	42.7		9.9	
⊠	K-169.0-8.6	10 - 12	25	0.653			0.0	30.5	27.1		42.4	
▲	K-169.0-8.6	25 - 27	19	4.459	0.417		0.0	38.9	42.4		18.6	

PROJECT: Champlain-Hudson Power Express Package 4b

SITE: Champlain to Hudson HDD Crossings Schenectady, NY

Terracon
30 Corporate Cir Ste 201
Albany, NY

PROJECT NUMBER: JB215256F

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

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 6/16/22

Summary of Laboratory Results

BORING ID	Depth (Ft.)	Organic Content (%)
K-169.0-8.6	4-6	0.8

PROJECT: Champlain-Hudson Power Express Package 4b

SITE: Champlain to Hudson HDD Crossings Schenectady, NY

Terracon
30 Corporate Cir Ste 201
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EXHIBIT: B-1

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT JB215256F CHAMPLAIN-HUDSON .GPJ TERRACON_DATATEMPLATE.GDT 5/2/22

Client

Kiewit Engineering (NY) Corp
Lone Tree, CO

Project

Champlain-Hudson Power Express Project
JB215256

Date Received: 4/25/2022

Results from Corrosion Testing

Sample Location	K-169.0-8.5
Sample Depth (ft.)	2'-6'
pH Analysis, ASTM G 51	6.94
Water Soluble Sulfate (SO4), ASTM C 1580 (ppm)	8
Sulfides, AWWA 4500-S D, (mg/kg)	Nil
Chlorides, ASTM D 512, (ppm)	21
Red-Ox, ASTM G 200, (mV)	+468
Total Salts, AWWA 2520 B, (mg/kg)	175
Resistivity (Saturated), ASTM G 57, (ohm-cm)	9730

Analyzed By: Kyle Lemcke
Laboratory Supervisor

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

Appendix D

BoreAid HDD Simulation Output

Generated Output

WARNING: The accuracy of the data obtained by the BoreAid® system is highly dependent upon accurate data gathering, data input and proper use of the software. Vermeer is not responsible for that information. BoreAid® data is not intended to replace the need for future on-site utility locating, measuring and verification procedures, which are essential for accurate placement of new underground installations and avoidance of existing utilities.

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Project Summary

General:	CHPE HDD 62
	P4B
	Start Date: 12-10-2021
	End Date: 12-10-2021
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	TAR
	CHA
Description:	HDD 62 10-inch DR 9 Conduit 2

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Input Summary

Start Coordinate	(0.00, 0.00, 243.00) ft
End Coordinate	(874.90, 0.00, 267.00) ft
Project Length	874.90 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	10.750 in
Pipe DR	9.0
Pipe Thickness	1.19 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

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Soil Summary

Number of Layers: 8

Soil Layer #1 USCS, Gravel (G), GP
From Assistant
Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3]
Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Sand (S), SW
From Assistant
Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3]
Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #3 USCS, Sand (S), SP
From Assistant
Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3]
Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #4 USCS, Silt (M), ML
From Assistant
Unit Weight: 80.0000 (dry), 100.0000 (sat) [lb/ft3]
Phi: 28.00, S.M.: 50.00, Coh: 0.00 [psi]

Soil Layer #5 USCS, Sand (S), SM
From Assistant
Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3]
Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #6 USCS, Clay (C), CL
From Assistant
Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3]
Phi: 0.00, S.M.: 145.00, Coh: 5.55 [psi]

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Soil Layer #7 USCS, Silt (M), ML

From Assistant

Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3]

Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi]

Soil Layer #8 USCS, Clay (C), CL

From Assistant

Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3]

Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi]

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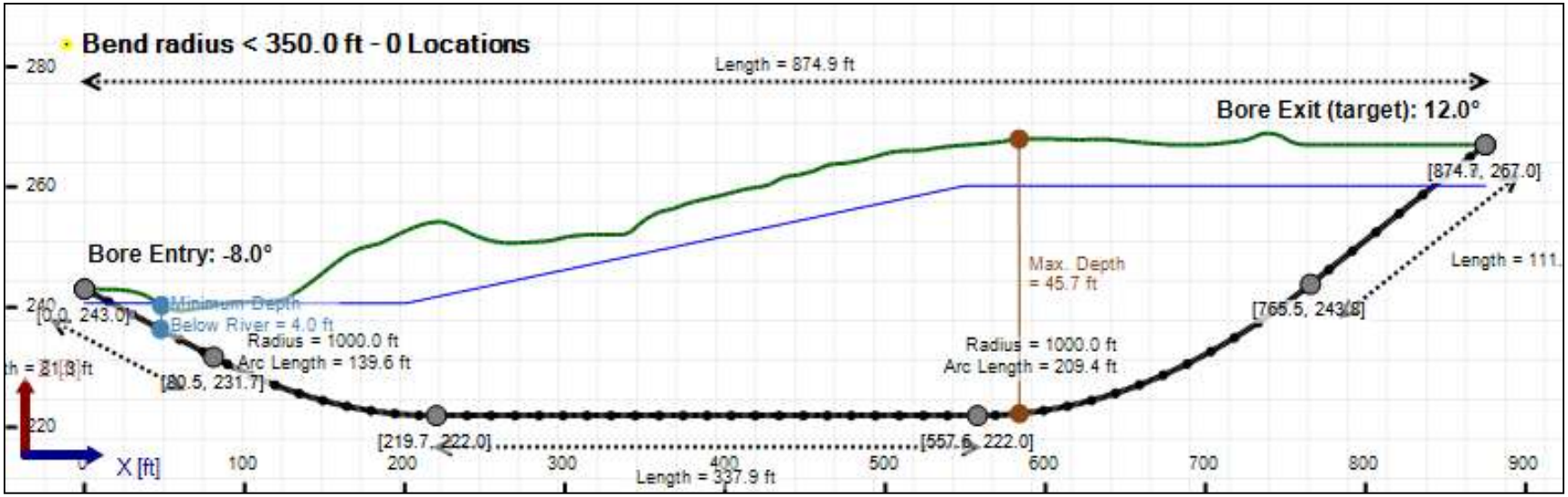
Bore Cross-Section View



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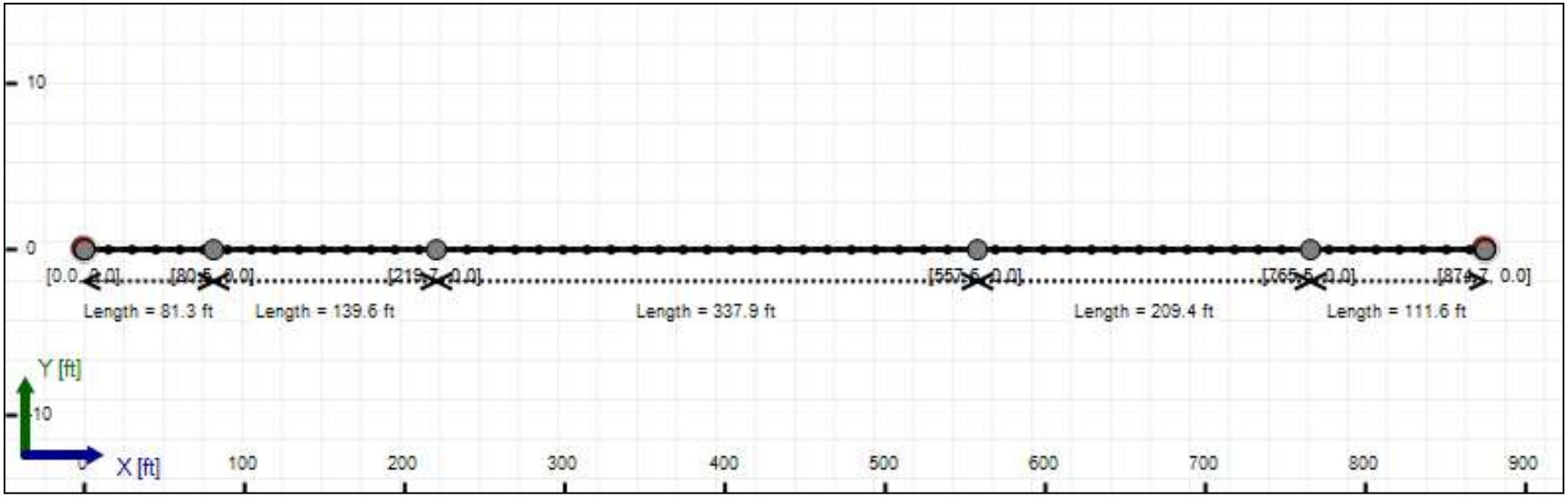
Bore Plan View



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Load Verifier Input Summary:

Pipe Application: Electrical Cable

Pipe Type: HDPE

Classification: IPS

Pipe OD: 10" (10.75")

Pipe DR: 9

Pipe Length: 885.00 ft

Internal Pressure: 0 psi

Borehole Diameter: 1.34400002161662 ft

Silo Width: 1.34400002161662 ft

Surface Surcharge: 0 psi

Short Term Modulus: 57500 psi

Long Term Modulus: 28200 psi

Short Term Poisson Ratio: 0.35

Long Term Poisson Ratio: 0.45

Pipe Unit Weight: 59.30500 lb/ft3

Allowable Tensile Stress (Short Term): 1200 psi

Allowable Tensile Stress (Long Term): 1100 psi

Allowable Compressive Stress (Short Term): 1150 psi

Allowable Compressive Stress (Long Term): 1150 psi

Surface-pipe friction coefficient at entrance: 0.5

Surface-pipe friction coefficient in borehole: 0.3

Pipe-soil friction angle: 30

Slurry Unit Weight: 93.64118 lb/ft3

Hydrokinetic Pressure: 10 psi

Ballast Unit Weight: 62.42746 lb/ft3

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In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.9	17.7
Water Pressure	16.6	16.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	19.5	34.1
Deflection		
Earth Load Deflection	1.065	4.820
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.197	4.952
Compressive Stress [psi]		
Compressive Wall Stress	87.9	153.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	15651.4	15651.4
Pullback Stress [psi]	436.5	436.5
Pullback Strain	7.591E-3	7.591E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	436.5	459.6
Tensile Strain	7.591E-3	8.441E-3

Net External Pressure = 33.1 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 567.6 lb

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In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.197	7.5	6.3	OK
Unconstrained Collapse [psi]	30.0	124.0	4.1	OK
Compressive Wall Stress [psi]	87.9	1150.0	13.1	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	40.0	229.2	5.7	OK
Tensile Stress [psi]	459.6	1200.0	2.6	OK

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Maximum Allowable Bore Pressure Summary

Ream Number	Initial Diameter	Final Diameter	Estimated Maximum Pressure (Avg.)	Estimated Maximum Pressure (Local)
Pilot Bore	0.00 in	8.00 in	73.278 psi	62.879 psi
1	8.00 in	12.00 in	73.235 psi	62.720 psi
2	12.00 in	16.13 in	73.172 psi	62.493 psi

Note: The maximum bore pressures presented in this table are the maximum values along the length of the bore and not the maximum allowable at any point. The estimated maximum pressures should be compared to the estimated circulating pressures along the bore to determine potential locations of inadvertant returns.

Estimated Circulating Pressure Summary

Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/min

Drill Fluid Density: 68.700 lb/ft3

Rheological model: Bingham-Plastic

Plastic Viscosity (PV): 25.53

Yield Point (YP): 16.49

Effective Viscosity (cP): 1202.0

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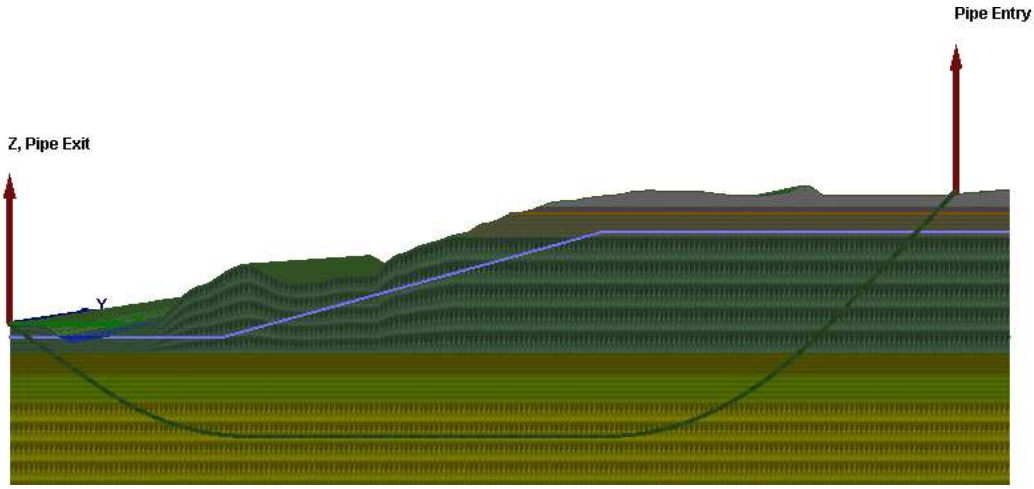
Virtual Site



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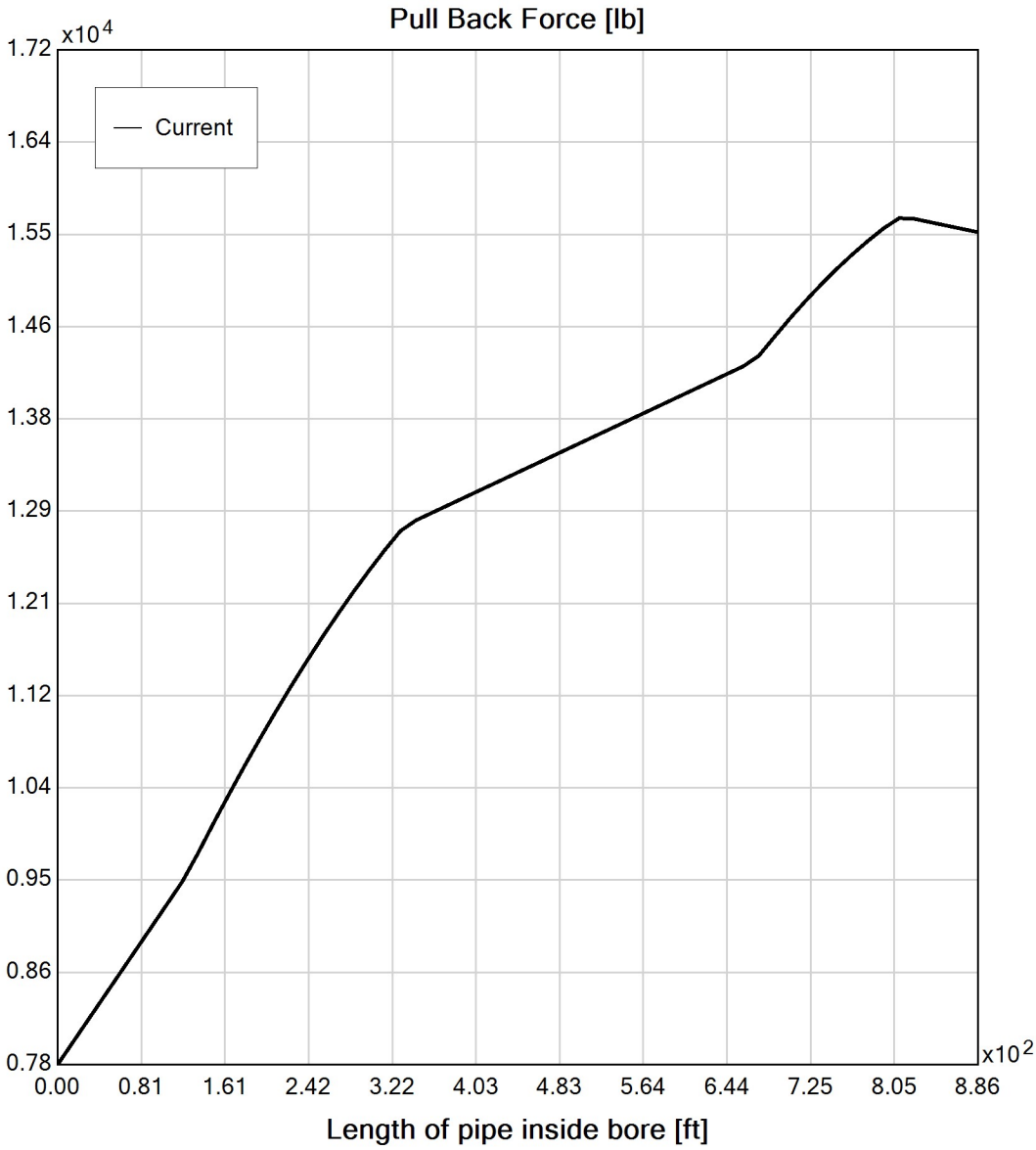

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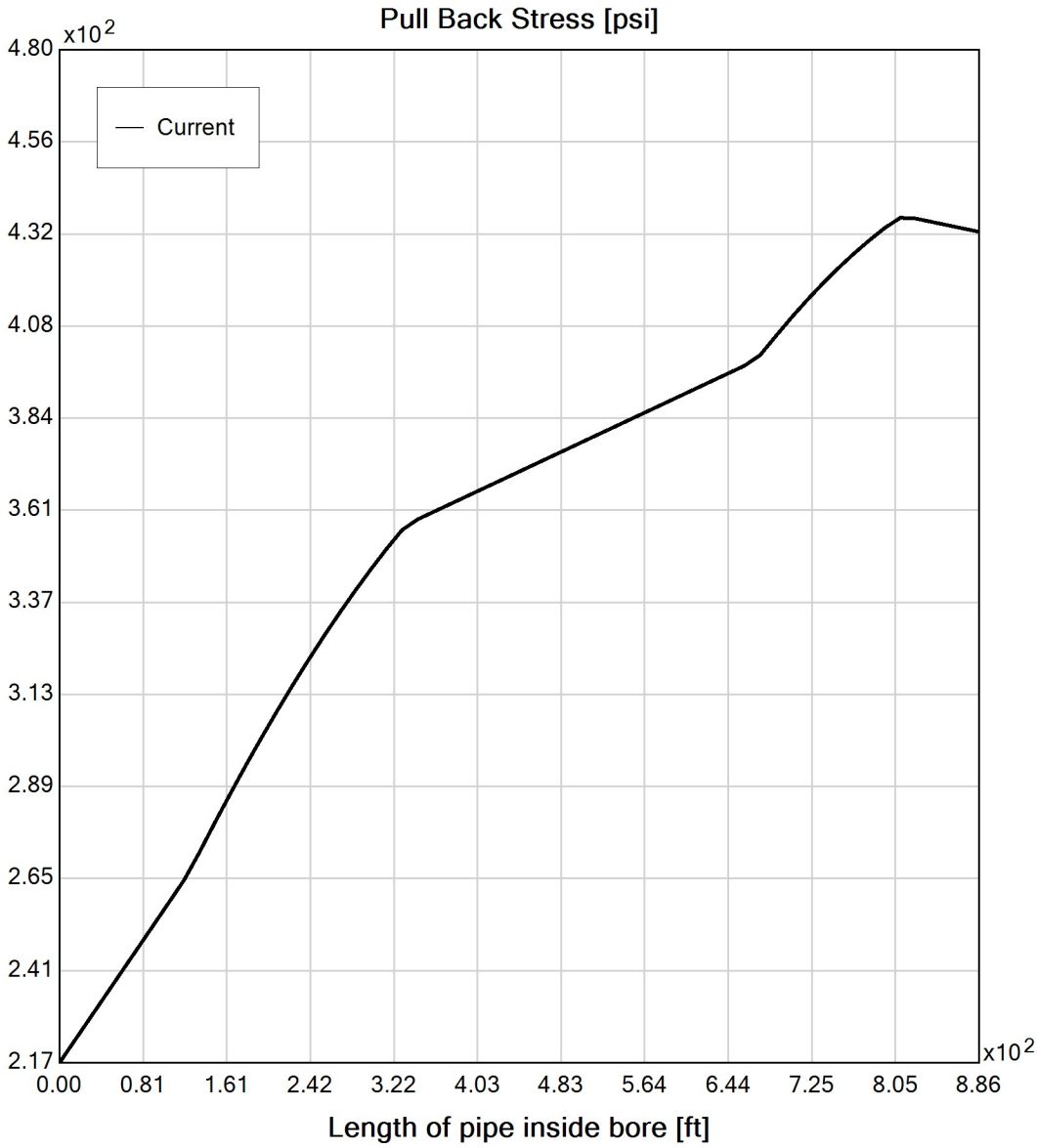

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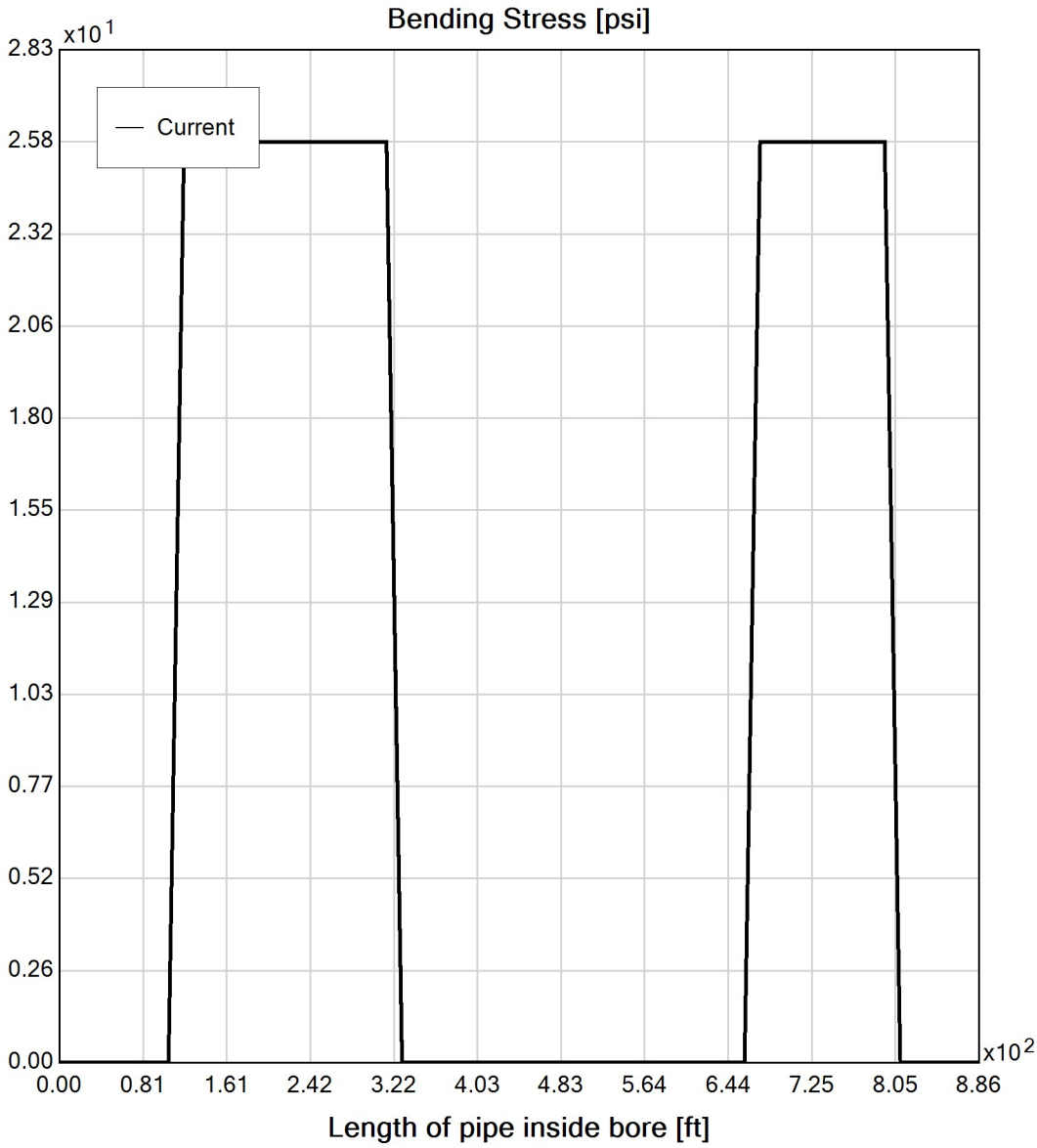

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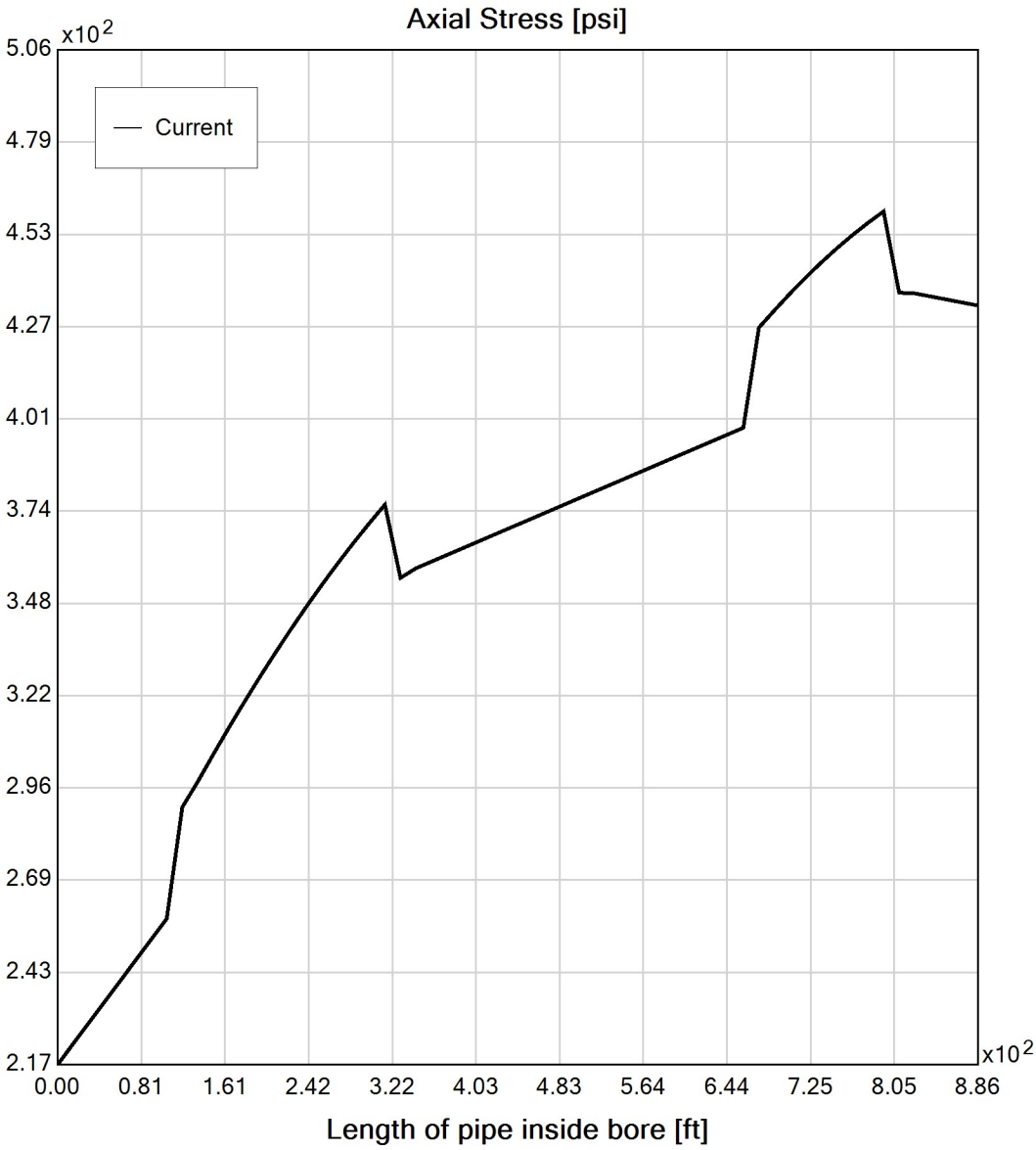

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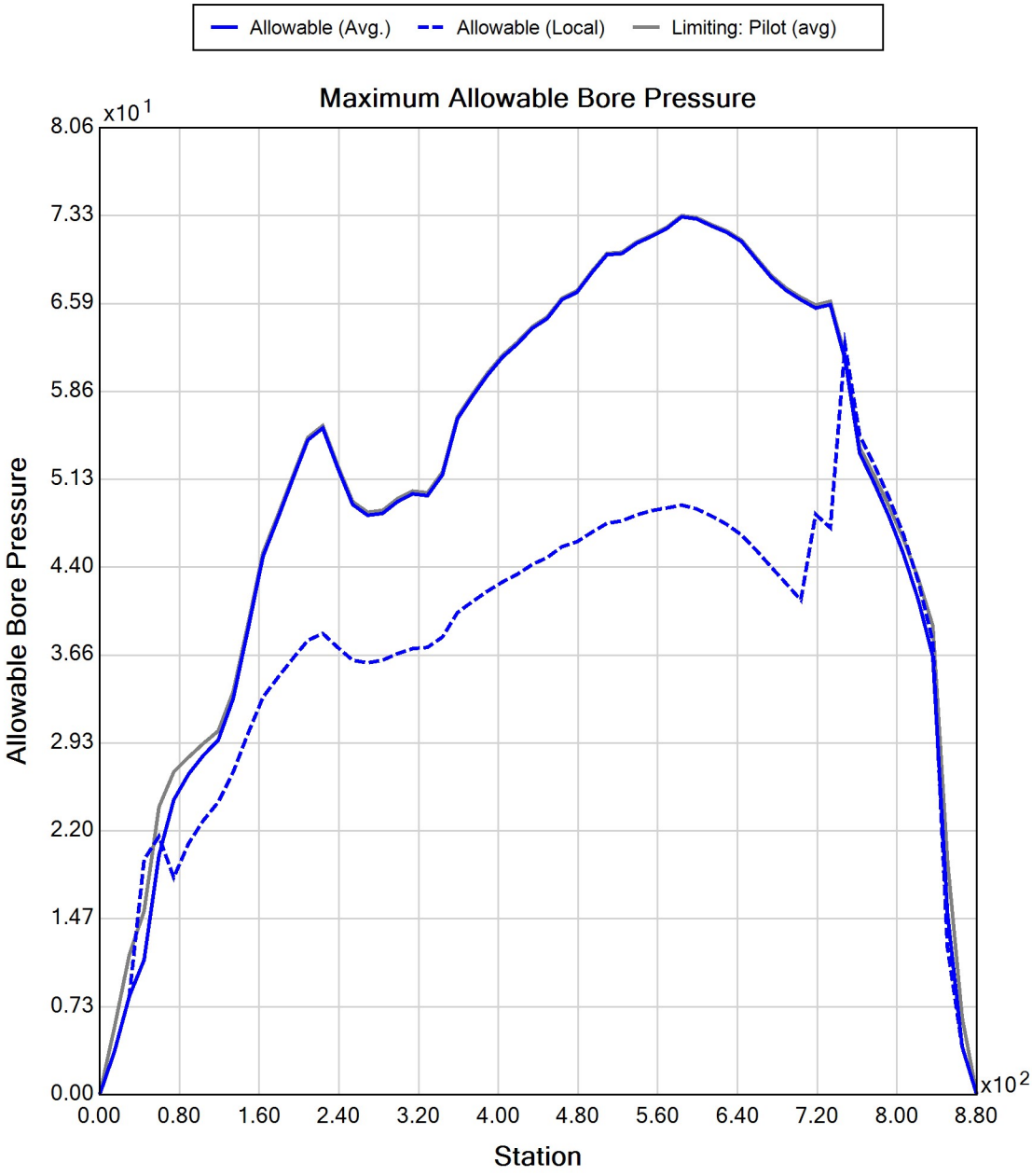

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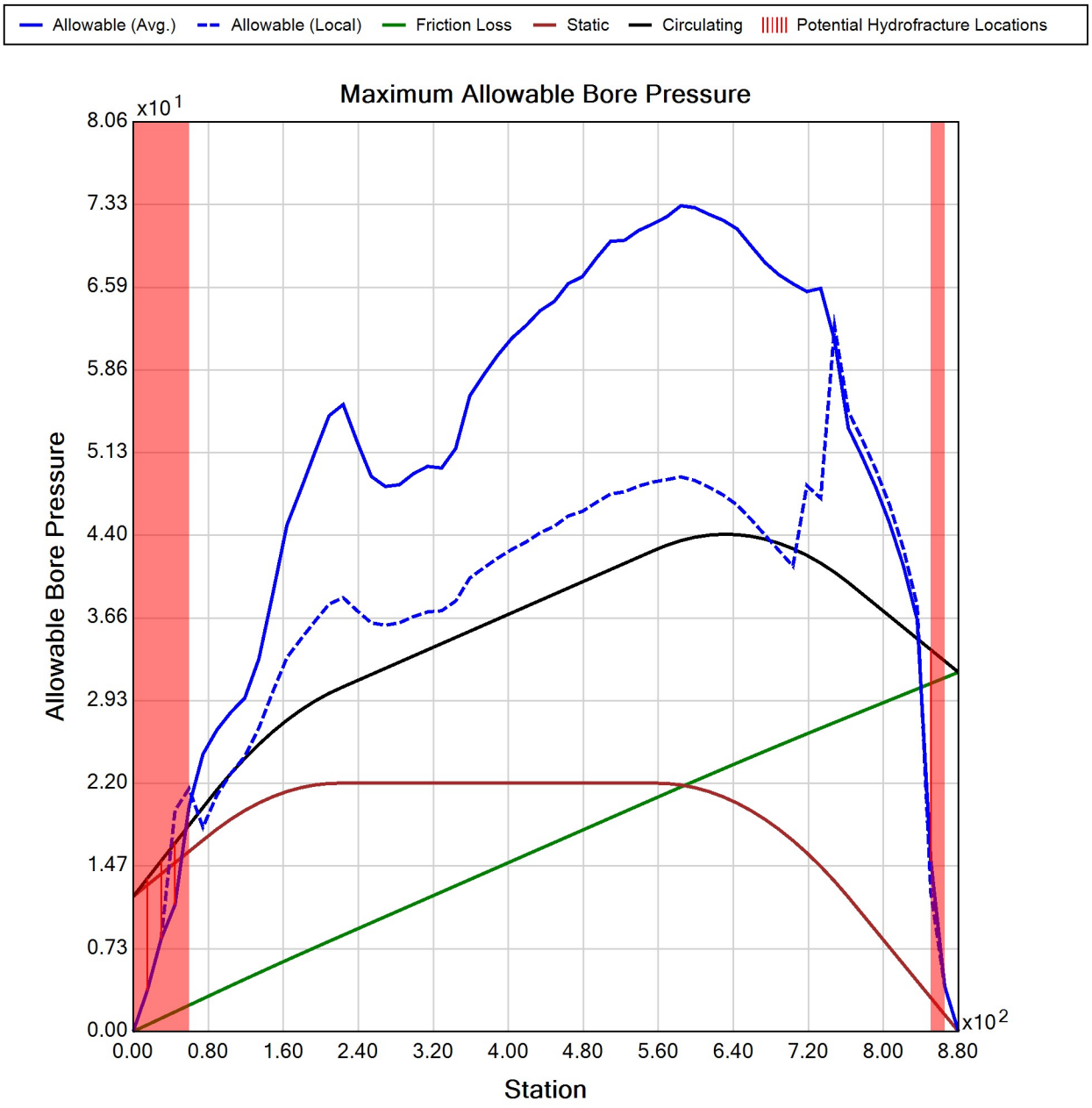

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Project Summary

General:	CHPE HDD 62
	P4B
	Start Date: 12-10-2021
	End Date: 12-10-2021
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	TAR
	CHA
Description:	HDD 62 2-inch DR 9

Powered by Vermeer | BoreAid

Input Summary

Start Coordinate	(0.00, 0.00, 243.00) ft
End Coordinate	(874.90, 0.00, 267.00) ft
Project Length	874.90 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	2.375 in
Pipe DR	9.0
Pipe Thickness	0.26 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Powered by Vermeer | BoreAid

Load Verifier Input Summary:

Pipe Application: Electrical Cable

Pipe Type: HDPE

Classification: IPS

Pipe OD: 2" (2.375")

Pipe DR: 9

Pipe Length: 885.00 ft

Internal Pressure: 0 psi

Borehole Diameter: 0.531000018119812 ft

Silo Width: 0.531000018119812 ft

Surface Surcharge: 0 psi

Short Term Modulus: 57500 psi

Long Term Modulus: 28200 psi

Short Term Poisson Ratio: 0.35

Long Term Poisson Ratio: 0.45

Pipe Unit Weight: 59.30500 lb/ft3

Allowable Tensile Stress (Short Term): 1200 psi

Allowable Tensile Stress (Long Term): 1100 psi

Allowable Compressive Stress (Short Term): 1150 psi

Allowable Compressive Stress (Long Term): 1150 psi

Surface-pipe friction coefficient at entrance: 0.5

Surface-pipe friction coefficient in borehole: 0.3

Pipe-soil friction angle: 30

Slurry Unit Weight: 93.64118 lb/ft3

Hydrokinetic Pressure: 10 psi

Ballast Unit Weight: 62.42746 lb/ft3

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In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	1.2	17.7
Water Pressure	16.6	16.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	17.7	34.1
Deflection		
Earth Load Deflection	0.469	4.820
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.498	4.849
Compressive Stress [psi]		
Compressive Wall Stress	79.9	153.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	873.5	873.5
Pullback Stress [psi]	499.1	499.1
Pullback Strain	8.680E-3	8.680E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	499.1	502.1
Tensile Strain	8.680E-3	8.832E-3

Net External Pressure = 33.1 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 137.3 lb

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In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.498	7.5	15.1	OK
Unconstrained Collapse [psi]	30.0	132.6	4.4	OK
Compressive Wall Stress [psi]	79.9	1150.0	14.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	40.0	227.3	5.7	OK
Tensile Stress [psi]	502.1	1200.0	2.4	OK

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Project Summary

General:	CHPE HDD 62A
	P4B
	Start Date: 12-10-2021
	End Date: 12-10-2021
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	TAR
	CHA
Description:	HDD 62A 10-inch DR 9

Powered by Vermeer | BoreAid

Input Summary

Start Coordinate	(0.00, 0.00, 284.00) ft
End Coordinate	(714.40, 0.00, 279.00) ft
Project Length	714.40 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	10.750 in
Pipe DR	9.0
Pipe Thickness	1.19 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Powered by Vermeer | BoreAid

Soil Summary

Number of Layers: 4

Soil Layer #1 USCS, Sand (S), SW
From Assistant
Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3]
Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Gravel (G), GW
From Assistant
Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3]
Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #3 USCS, Sand (S), SP
From Assistant
Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3]
Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #4 USCS, Clay (C), CL
From Assistant
Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3]
Phi: 0.00, S.M.: 145.00, Coh: 5.56 [psi]

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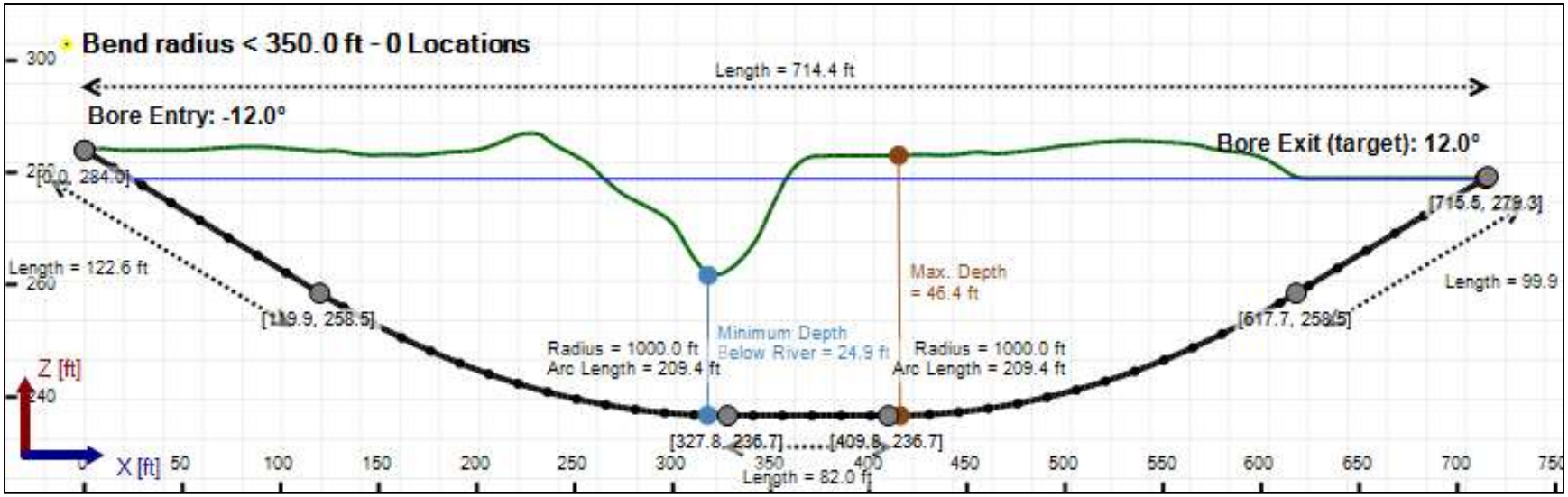
Bore Cross-Section View



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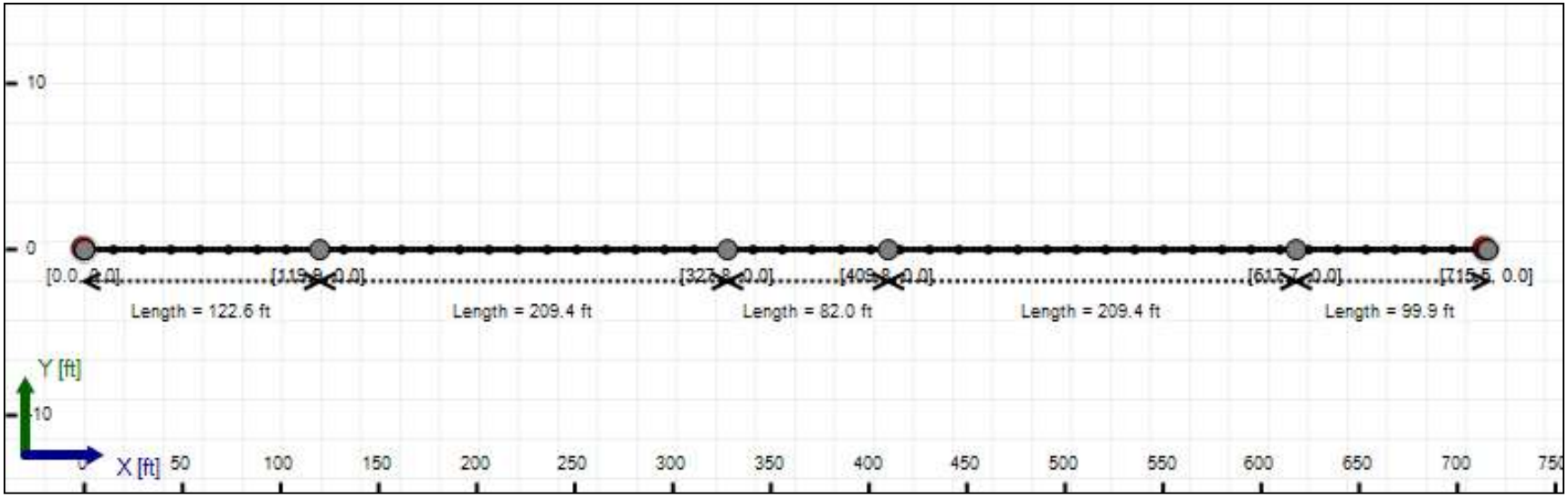
Bore Plan View



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Load Verifier Input Summary:

Pipe Application: Electrical Cable

Pipe Type: HDPE

Classification: IPS

Pipe OD: 10" (10.75")

Pipe DR: 9

Pipe Length: 735.00 ft

Internal Pressure: 0 psi

Borehole Diameter: 1.34400002161662 ft

Silo Width: 1.34400002161662 ft

Surface Surcharge: 0 psi

Short Term Modulus: 57500 psi

Long Term Modulus: 28200 psi

Short Term Poisson Ratio: 0.35

Long Term Poisson Ratio: 0.45

Pipe Unit Weight: 59.30500 lb/ft3

Allowable Tensile Stress (Short Term): 1200 psi

Allowable Tensile Stress (Long Term): 1100 psi

Allowable Compressive Stress (Short Term): 1150 psi

Allowable Compressive Stress (Long Term): 1150 psi

Surface-pipe friction coefficient at entrance: 0.5

Surface-pipe friction coefficient in borehole: 0.3

Pipe-soil friction angle: 30

Slurry Unit Weight: 93.64118 lb/ft3

Hydrokinetic Pressure: 10 psi

Ballast Unit Weight: 62.42746 lb/ft3

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In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	3.8	18.6
Water Pressure	18.3	18.3
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	22.1	36.9
Deflection		
Earth Load Deflection	1.035	5.291
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.167	5.423
Compressive Stress [psi]		
Compressive Wall Stress	99.5	165.9

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	12997.2	12997.2
Pullback Stress [psi]	362.5	362.5
Pullback Strain	6.304E-3	6.304E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	362.5	387.3
Tensile Strain	6.304E-3	7.183E-3

Net External Pressure = 26.2 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 567.6 lb

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In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.167	7.5	6.4	OK
Unconstrained Collapse [psi]	30.8	124.4	4.0	OK
Compressive Wall Stress [psi]	99.5	1150.0	11.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	40.8	234.3	5.7	OK
Tensile Stress [psi]	387.3	1200.0	3.1	OK

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Maximum Allowable Bore Pressure Summary

Ream Number	Initial Diameter	Final Diameter	Estimated Maximum Pressure (Avg.)	Estimated Maximum Pressure (Local)
Pilot Bore	0.00 in	8.00 in	81.864 psi	63.749 psi
1	8.00 in	12.00 in	81.814 psi	63.585 psi
2	12.00 in	16.13 in	81.742 psi	63.350 psi

Note: The maximum bore pressures presented in this table are the maximum values along the length of the bore and not the maximum allowable at any point. The estimated maximum pressures should be compared to the estimated circulating pressures along the bore to determine potential locations of inadvertant returns.

Estimated Circulating Pressure Summary

Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/min

Drill Fluid Density: 68.700 lb/ft3

Rheological model: Bingham-Plastic

Plastic Viscosity (PV): 25.53

Yield Point (YP): 16.49

Effective Viscosity (cP): 1202.0

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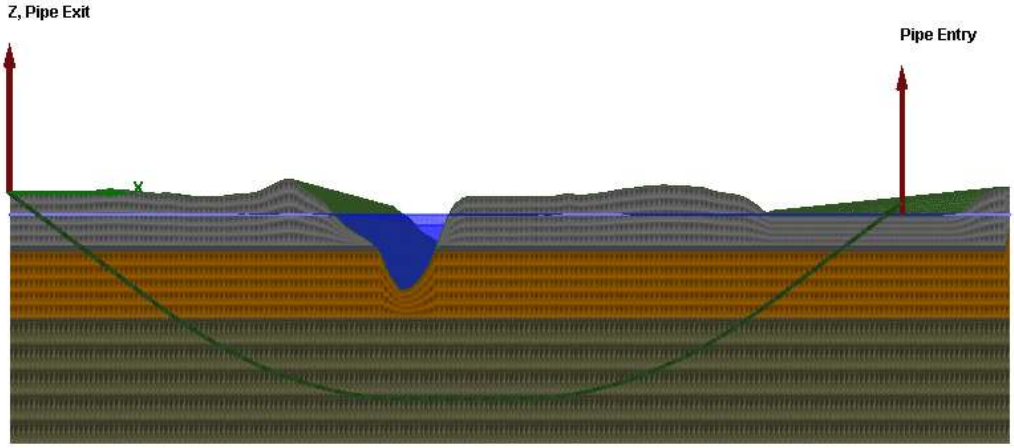
Virtual Site



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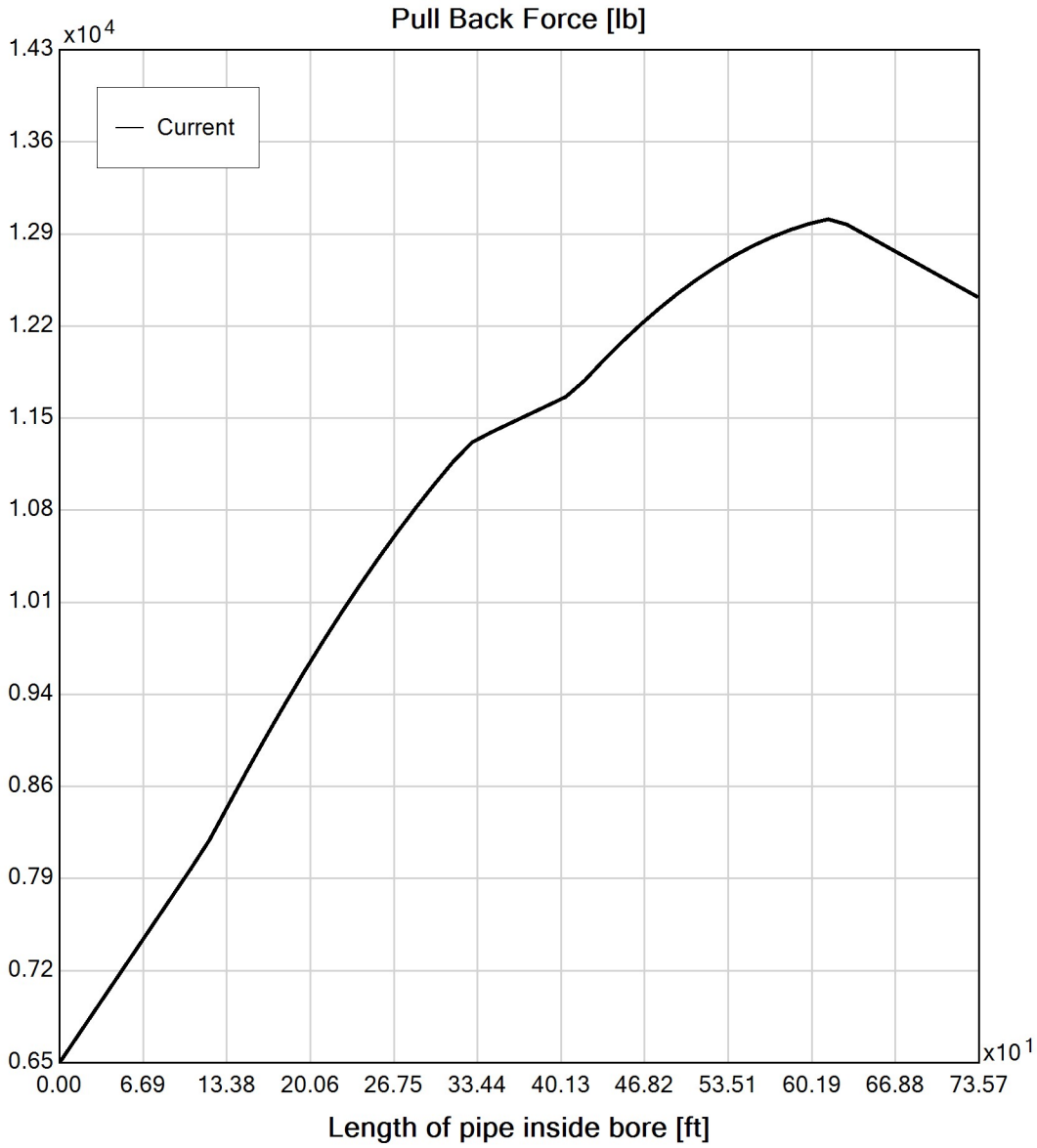

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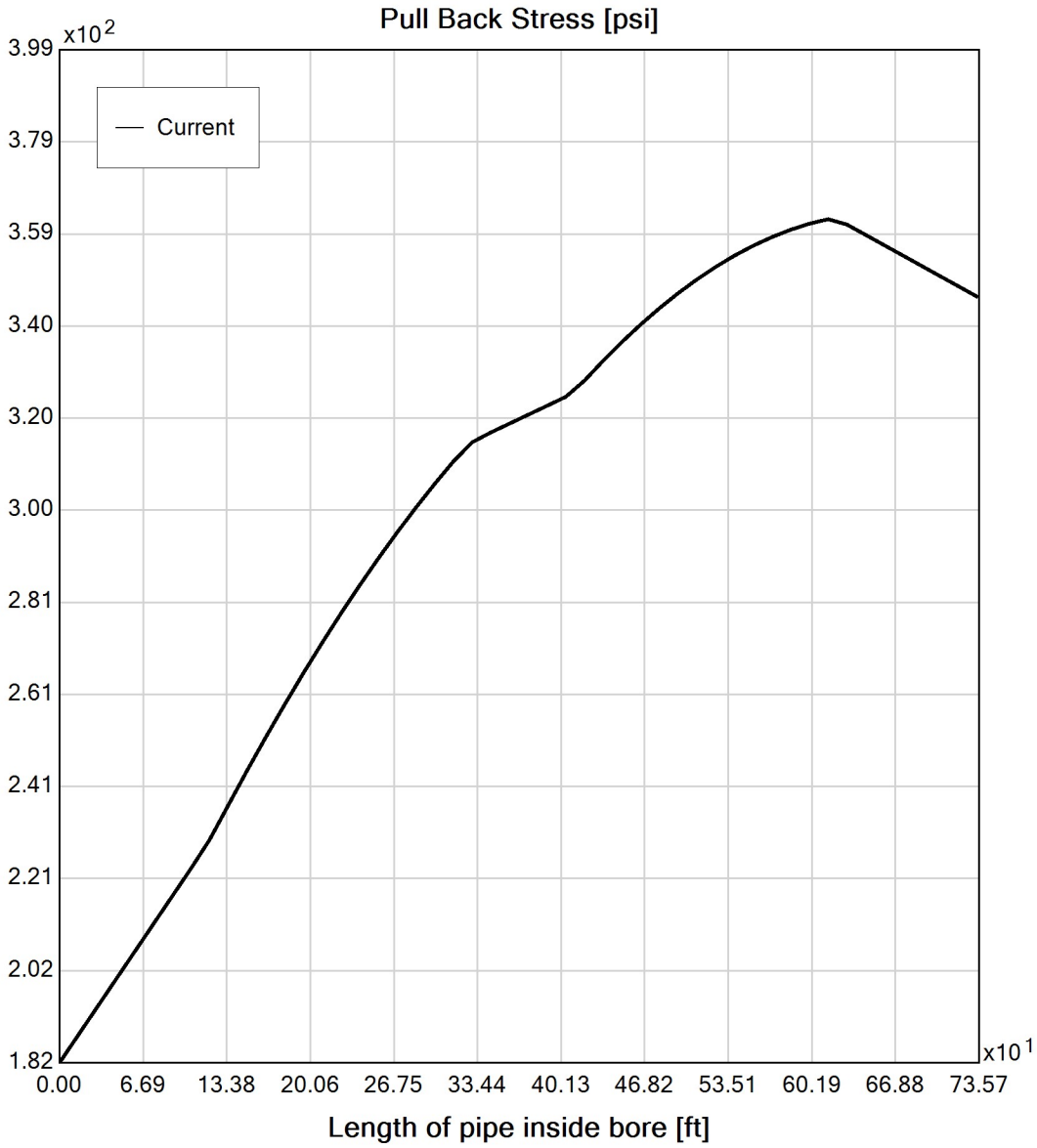

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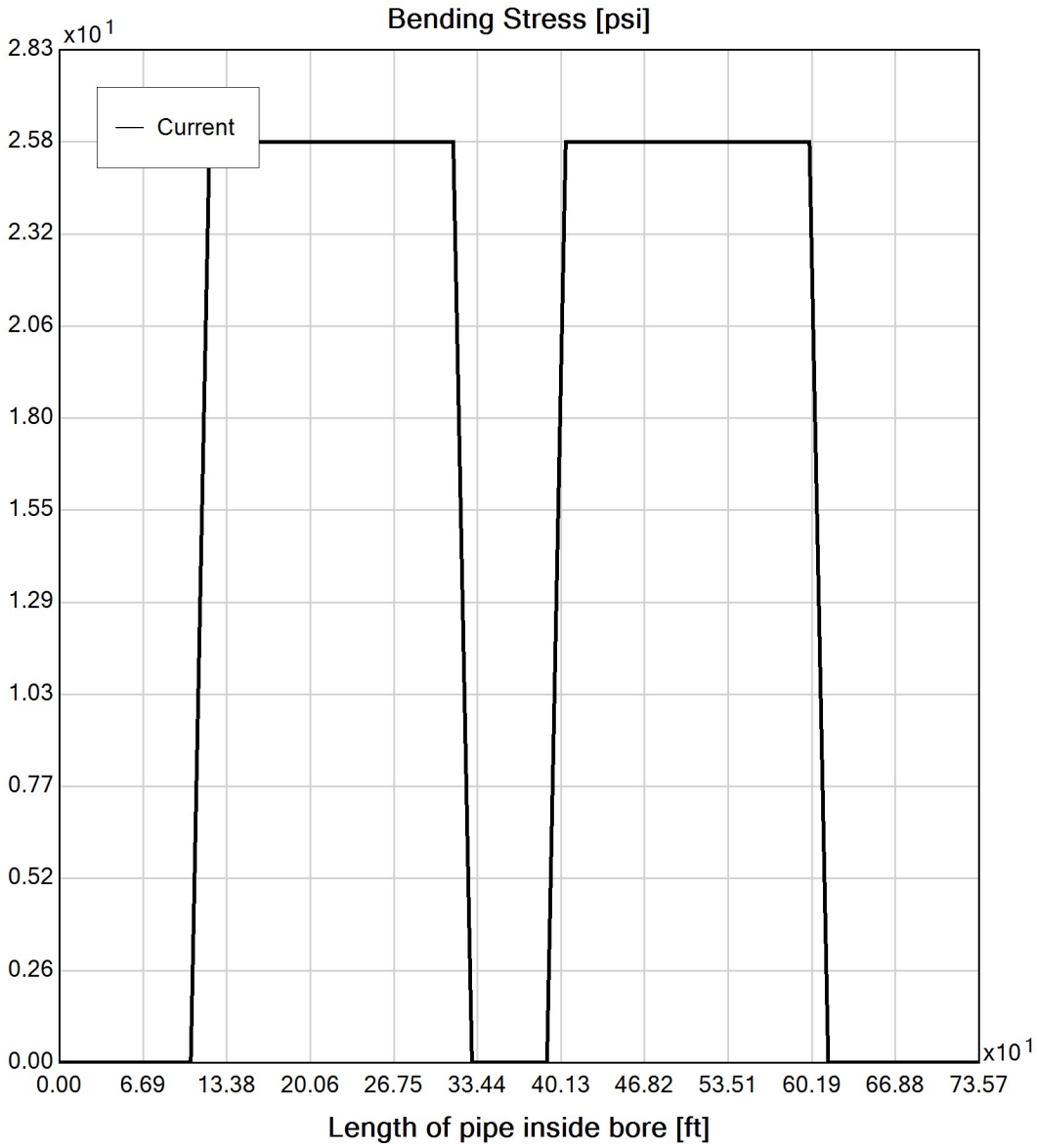

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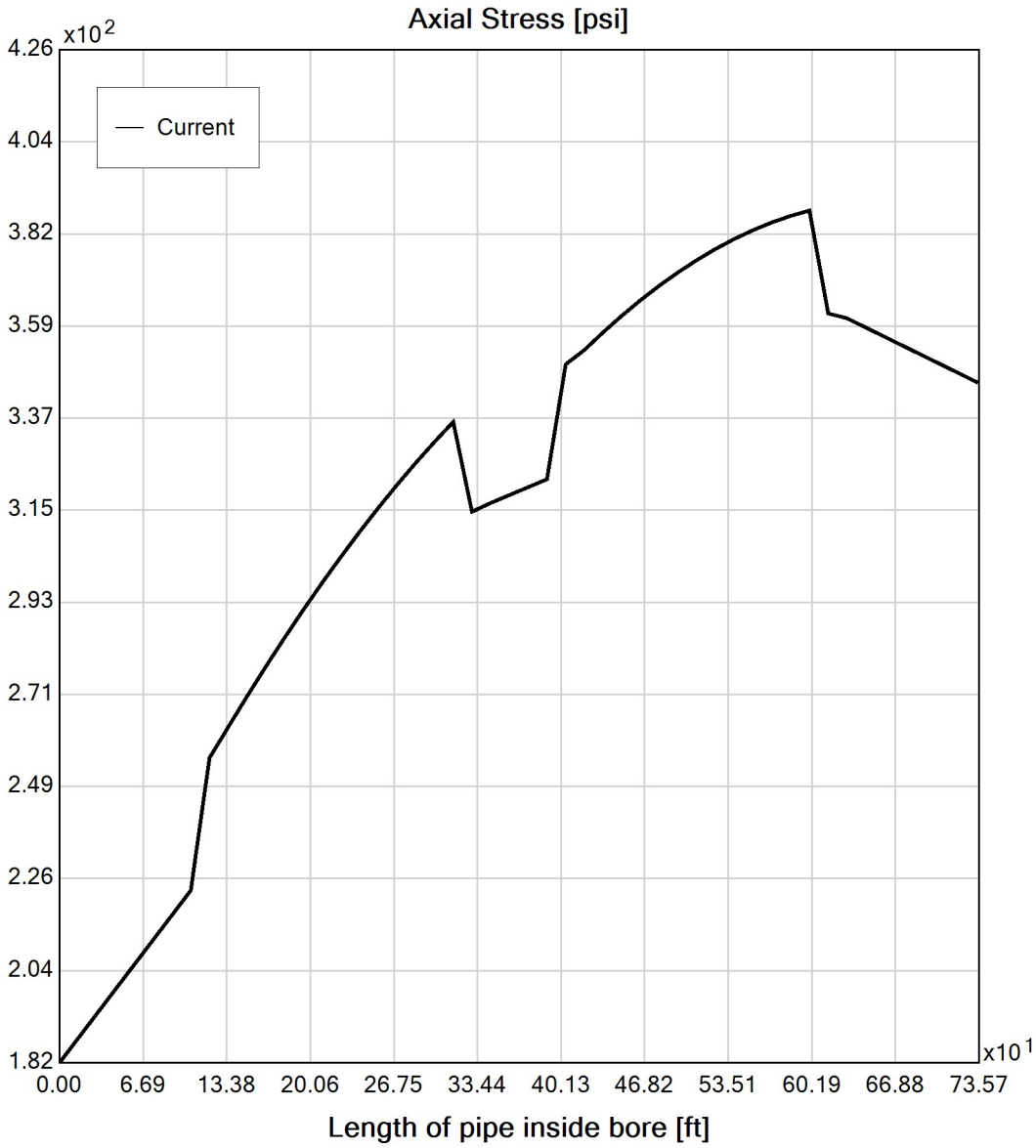

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