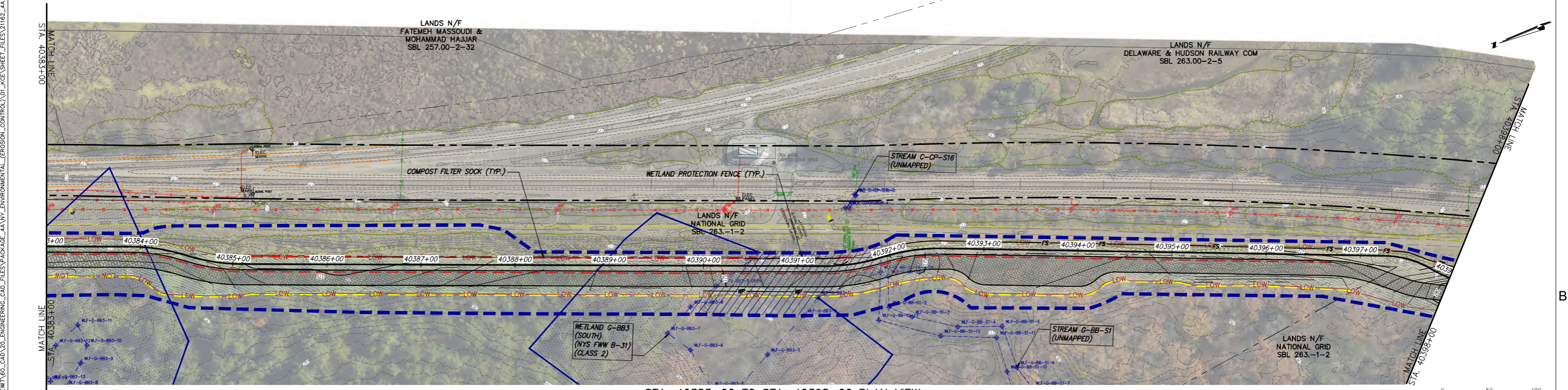
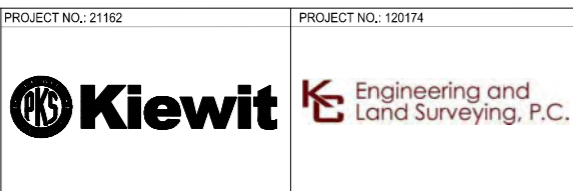


STA. 40368+00 TO STA. 40383+00 PLAN VIEW
SCALE: 1" = 50'



STA. 40383+00 TO STA. 40398+00 PLAN VIEW
SCALE: 1" = 50'



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

No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP
2	12/18/2023	NDC-0042_ALIGNMENT ADJUSTMENT AT FIREMAN'S LANE	JR	SL
1	09/13/2023	UPDATED PER NYSDEC COMMENTS	BL	SL
0	08/03/2023	ISSUED FOR CONSTRUCTION SUBMISSION	BL	SL

CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
EROSION AND SEDIMENT CONTROL PLAN
STA. 40368+00 TO STA. 40398+00

DRAWN BY: BL DESIGNED BY: BL APPROVED BY: SL
SCALE: AS NOTED
DATE: 08/03/2023

PERMIT DRAWING NO.	N/A
DRAWING NO.	C-413

File: P:\120174-CHPE\CABLE_INSTALL_KIEWIT\60_CAD\20_ENGINEERING_CAD_FILES\PACKAGE_4A\NY_ENVIRONMENTAL_EROSION_CONTROL\01_KCE\SHEET_FILES\2162_4A_C-413-415.DWG. Saved: 12/18/2023 3:06:47 PM. Plotted: 12/18/2023 3:06:47 PM. Current User: Jose Ramirez. LotSizeBy: Ramirez



CHPE LLC
623 Fifth Avenue, 20th Floor
New York, NY 10022

Segment 6 (Package 4A)
EM&CP Appendix J
HDD Design Summary Report Additions for HDD 57B

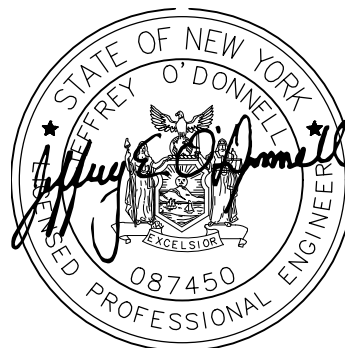


UPDATES TO
HDD Design Summary Report
Crossings HDD 51 to HDD 61
in Segment 6 – Package 4A
For HDD 57B
For Design Rev. #1 || Design Rev. Date: 12/20/2023

Ballston Spa to Glenville
Saratoga & Schenectady County, New York

CHA Project Number: 066076

Prepared for:
Transmission Developers Inc.
1301 Avenue of the Americas, 26th Floor
New York, NY 10019



Prepared by:
CHA Consulting, Inc.
III Winners Circle
Albany, New York 12205
(518) 453-4500

December 2023

1.0 INTRODUCTION

1.1 PURPOSE

Revised Text

- Review of the existing geological, hydrogeological, and geotechnical conditions for HDD 51 through HDD 61 for total of **20** crossings (2 per site) in Segment 6 – Package 4A.

2.0 PROJECT DESCRIPTION

Revised Table 1

Table 1: HDD Locations, Lengths, and Description

HDD#	Start Station	End Station	HDD Length, ft	Obstruction Crossed
51	40001+97	40022+12	1907/2018	Road/Rail/Wetland
52	40060+84	40087+80	2701	Wetland
53	40098+47	40106+61	815	Road (Rail Bridge)/Stream
53A	40227+56	40233+76	625/627	Culvert/Stream (Rail Bridge)
57B	A-P4A-18+50	A-P4A-38+35	1985/1978	Road/Wetland/Culvert
59	40409+11	40420+63	1124/1159	Culvert
59A	40425+37	40443+60	1826	Road/Rail
59B	40489+82	40498+10	829	Rail/Wetland
60	40511+60	40524+98	1332/1335	Wetland/Streams (Rail Bridge)
61	40527+60	40534+42	684/689	D.O.T Road

4.0 SITE CONDITIONS

4.1.1 Project Datum and Topography

Text Added

HDD #57B

HDD #57B consists of two HDD bores approximately 1985 feet and 1978 feet long that runs on the west side of the CP Rail railroad tracks, crossing underneath Main Street (RT 146A), existing utilities, multiple culverts, wetland and a pond in Ballston, NY, at approximately latitude 42.9109°N and longitude 73.8753°W. Both bores remain on west side of the tracks for the entire run. The HDD bores will pass approximately 16 feet below the estimated mudline (assuming a 5' water depth). The ground surface elevation at entry and exit of bore alignment is approximately El. 279 and El. 274, while most of the run it undulates between El. 275 to El. 280 and dipping down to El. 272 near water level (reference datum NAVD 1988).

4.1.2 Geotechnical Data

Text Added

HDD #57B

Subsurface investigations were conducted in 2013 by TRC, 2022 by Terracon. and 2022 by Kiewit for Transmission Developers, Inc. There are five borings to date at HDD #57B: B165.5-1, KB-165.5A, KB-165.5B, B165.8-1 and K-165.8, which reached depths of 13, 45, 35, 15 and 39 feet below grade, respectively. There appears to be a 4-foot layer of medium dense silty sand over a 4-foot layer of very dense gravel sized rock fragments, over a 5-foot layer of shale bedrock in boring B165.5-1. There appears to be a 2-foot layer of medium dense fill over a 4-foot layer of dense to very dense silty sand, over a 39-foot layer of shale bedrock in boring KB-165.5A. There appears to be a 2-foot layer of medium dense fill over a 2-foot layer of medium dense silty sand, over a 31-foot layer of shale bedrock in boring KB-165.5B. There appears to be a 2-foot

layer of medium stiff silt over a 5-foot layer of very dense weathered rock, over an 8-foot layer of shale bedrock in boring B165.8-1. There appears to be a 4-foot layer of loose fill over a 2.5-foot layer of soft lean clay, over a 3.5-foot layer of very dense weathered rock, over a 29-foot layer of shale bedrock in boring K-165.8. Due to the length of the proposed HDD alignment, and the varying thickness of the five main soil layers observed onsite, the BoreAid analysis will be based on non-horizontal layering corresponding to borings KB-165.5A, KB-165.5B, B165.8-1 and K-165.8. The Geotechnical Data Report for this location is provided in Appendix C

Based on the borings, the soil profile for the HDD #57B BoreAid analysis will consist of five (5) layers: loose fill (SM), medium dense silty sand (SM), soft low plasticity clay (CL), very dense weathered rock (GP) and shale bedrock. The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix D.

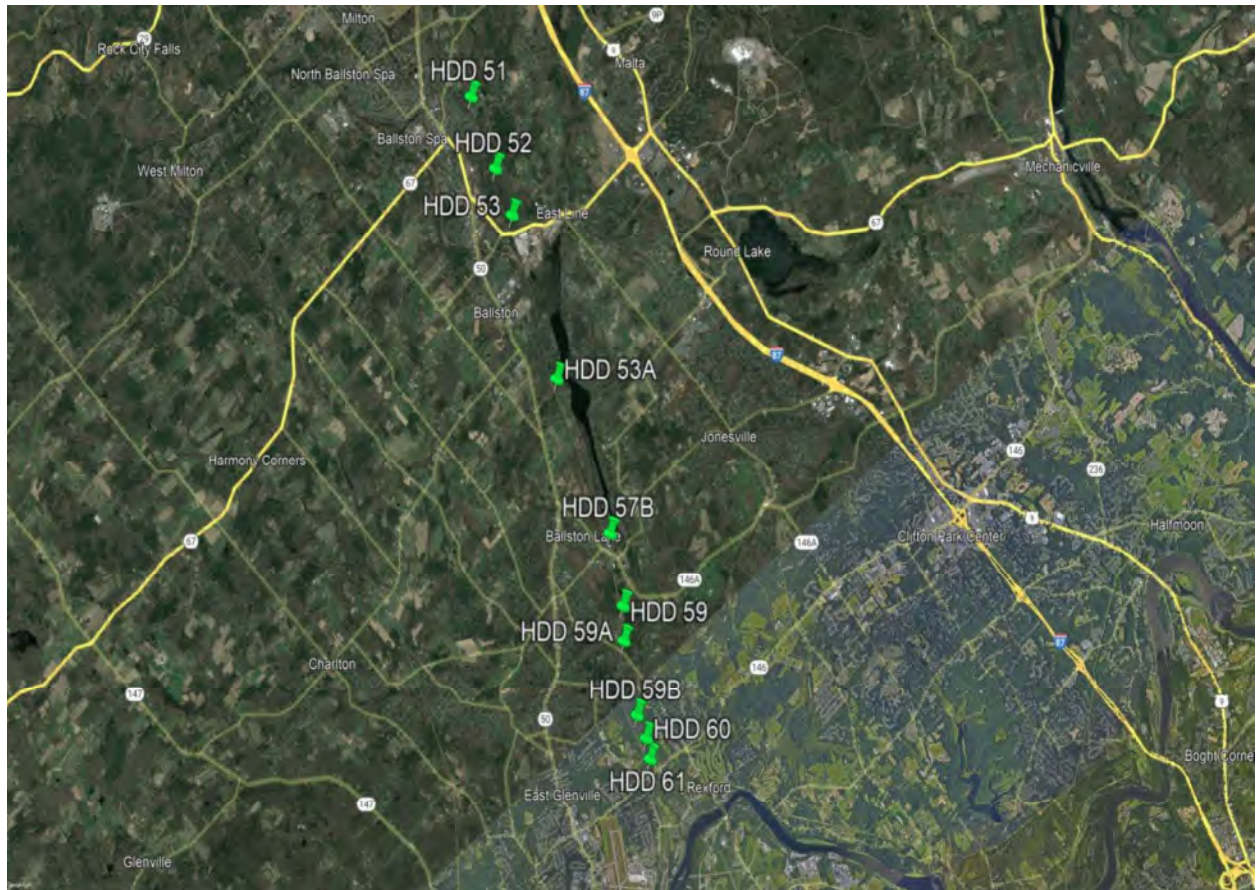
Appendix B

Appendix to EM&CP Appendix J
HDD Design Summary Report

Revised

Appendix B

Locus Map



Appendix C

Appendix to EM&CP Appendix J
HDD Design Summary Report

Sheets Added

Appendix C

*HDD Geotechnical Data Report for CHPE Segment 6 – Package 4A
HDDs*

DATE: August 9, 2023

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

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

SUBJECT: Geotechnical Data: Segment 6 – Package 4A – HDD Crossing 57B
Champlain Hudson Power Express Project
Burnt Hills, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located in Burnt Hills, New York. The approximate station for HDD crossing Number 57B is STA 40352+50 (42.9109° N, 73.8753° W).

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

- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 113.1-177.1, dated March 29, 2013.
- Terracon, Results of Field Exploration, Champlain Hudson Power Express, Ballston – Clifton Park – Glenville, NY, dated June 22, 2022
- Kiewit Engineering (NY) Corp., Package 4A Phase 4 Borings, Champlain Hudson Power Express, New York, dated January 20, 2023.

Contact us if you have questions or require additional information.

HDD 57B

Borings B165.5-1, B165.8-1,
K-165.8, KB-165.5A, KB-165.5B
Segment 6 - Design Package 4A

CHPE Segment 6 Package 4A Soil Boring Coordinates and Elevations

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

Notes:

- Northings and Eastings are provided in NAD83 New York State Plane East Zone.

- Elevations are referenced to the NAVD88 datum.

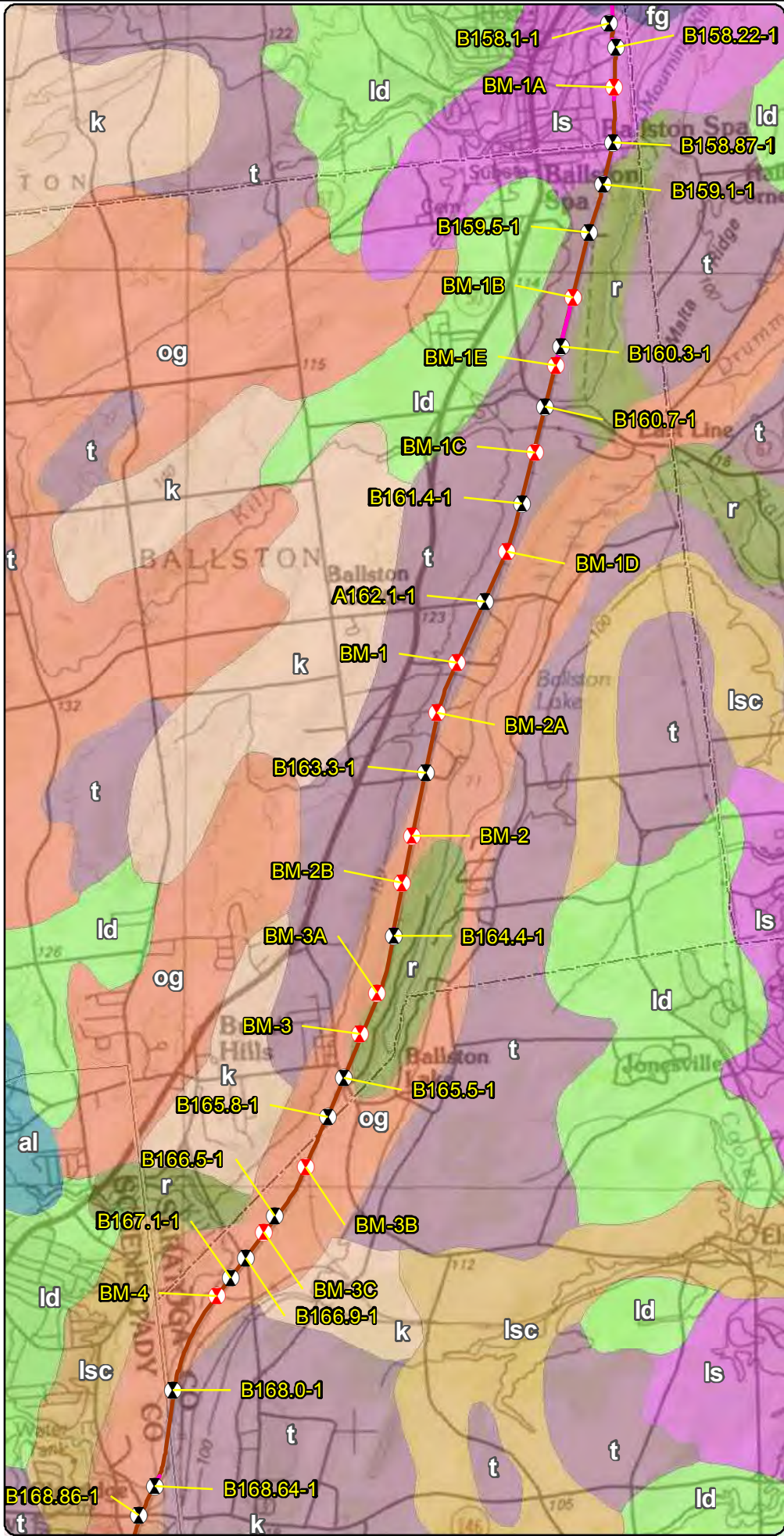
* TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.

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

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

Reference:

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



LEGEND

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

Surficial Geology

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

0.5 0.25 0 0.5 Miles

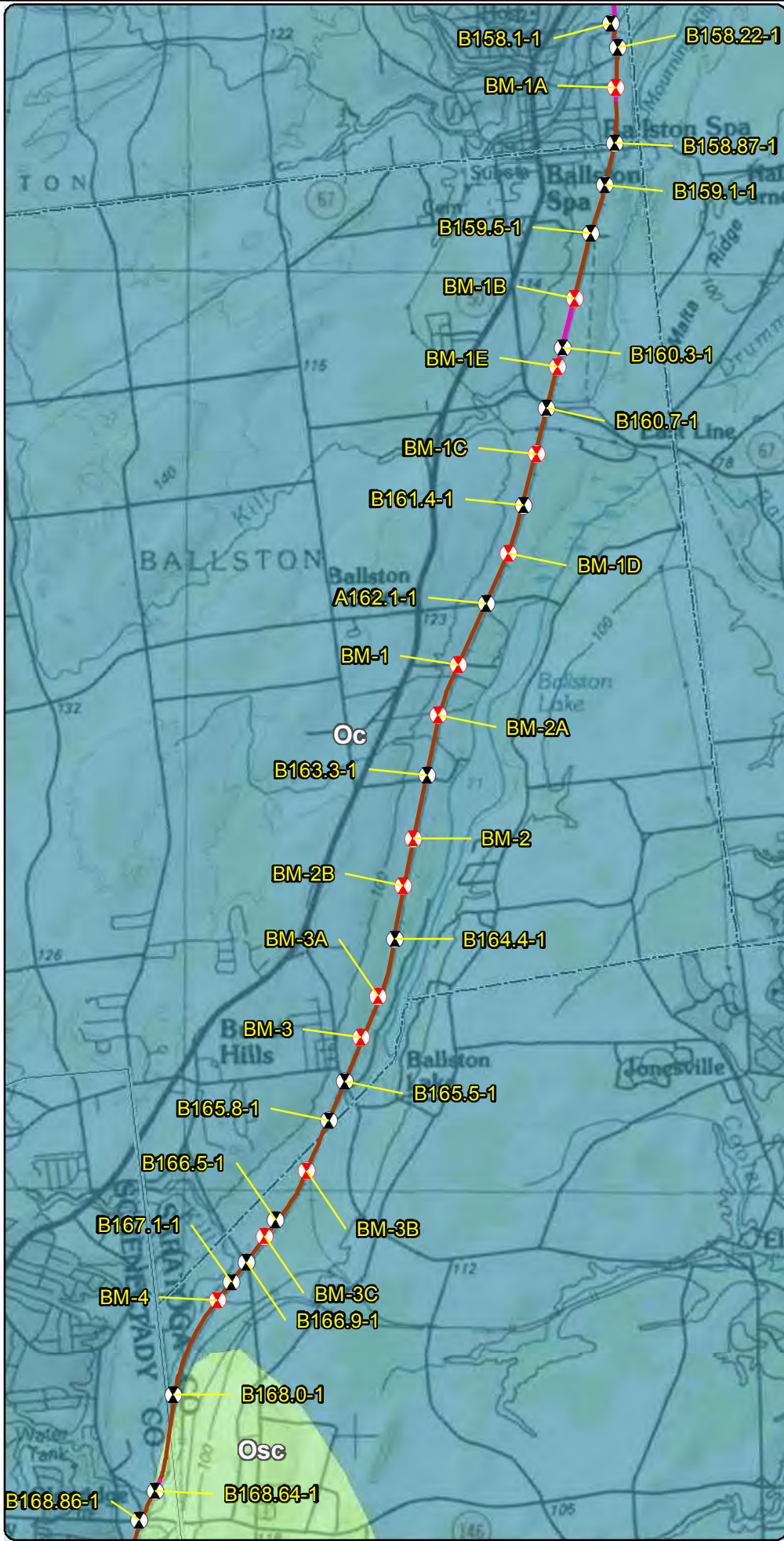
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

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

Prepared on 5/5/2021
by: **AECOM**

DATA SOURCES: ESRI, NYS DOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MD\Alt_5_Routes_DZ_201908\Boring_Locations\Maps_for_May_2021_Report\Ballston_to_Mohawk_Boring_Locations_Surficial_May_2021_Report.mxd



LEGEND

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

Bedrock Geology

- Oc - Canajoharie Shale
- Osc - Schenectady Formation

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

0.5 0.25 0 0.5 Miles

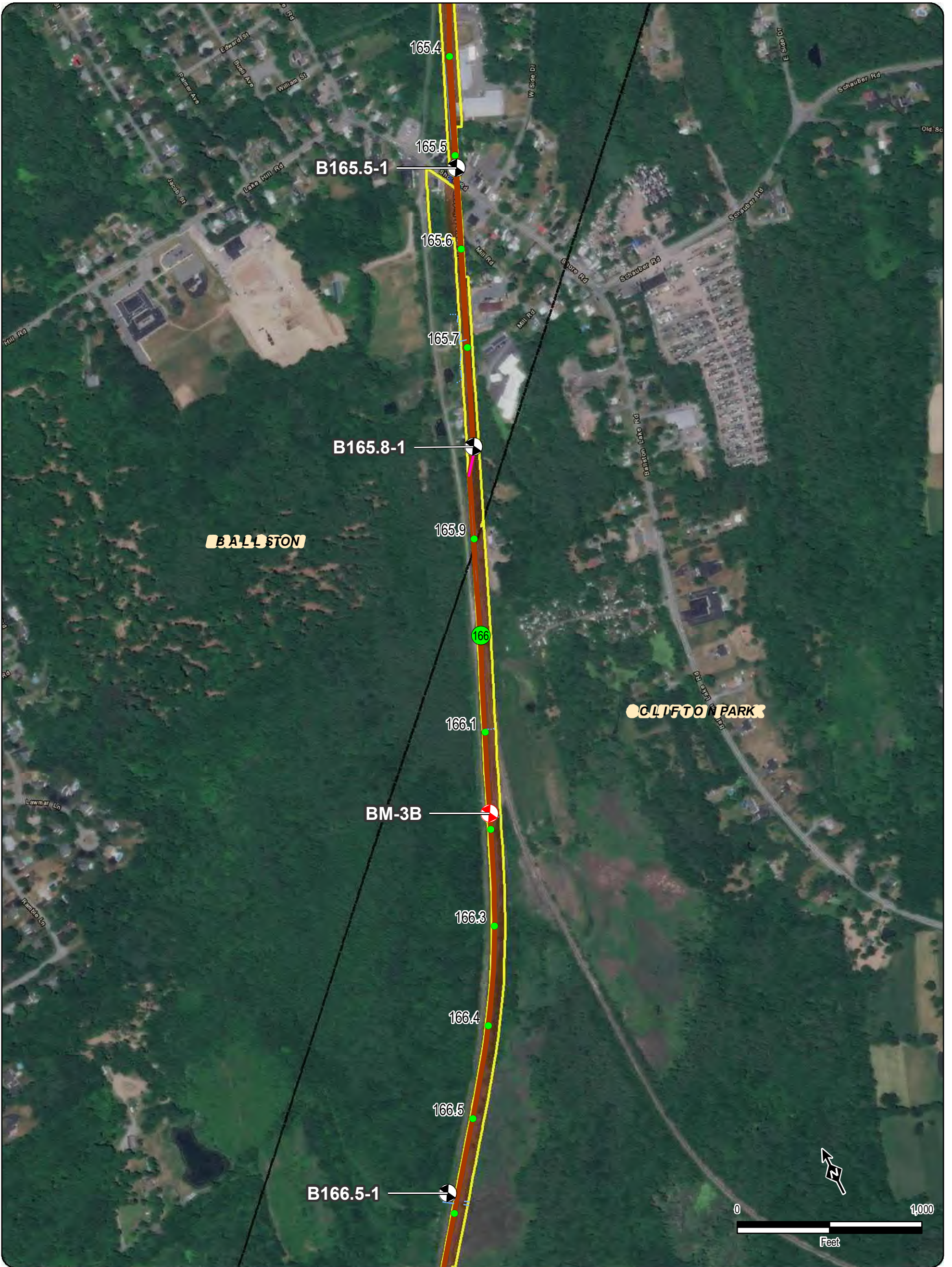
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

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


Prepared on 5/5/2021
by: **AECOM**

DATA SOURCES: ESRI, NYS DOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MD\Alt_5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Ballston_to_Mohawk_Boring_Locations_Bedrock_May_2021_Report.mxd



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
—	Road Name
—	Village Name



Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

BORING LOCATION PLAN
Ballston to Mohawk River
Figure A-6
Sheet 7 of 9

Prepared by: **AECOM** 5/19/2021



TEST BORING LOG

BORING **B165.5-1**

G.S. ELEV. N/A

FILE 195651

SHEET 1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
3.5'	14:23	1/15	0 HR

METHOD OF ADVANCING BOREHOLE			
a	FROM	TO	
	0.0'	6.3'	
d	6.3'	8.0'	
c ₂	8.0'	13.0'	

DRILLER	J. MEHALICK
HELPER	M. KERLIN
INSPECTOR	C. POPPE
DATE STARTED	01/15/2013
DATE COMPLETED	01/15/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	4 12 10 8		BROWN SILTY F/ GRAVEL SIZED ROCK FRAGMENTS, SM F/M SAND	13.4	
	S-2	5 5 6 10				
5	S-3	6 25 32 50/0.3		BROWN CLAY, SM F/ GRAVEL SIZED ROCK FRAGMENTS, TR F/ SAND	13.4	
	S-4	50/0.3				
10	R-1	REC =100% RQD =80%		GRAY MODERATELY WEATHERED, MEDIUM HARD SHALE, VERY CLOSE TO MODERATELY CLOSE HORIZONTAL FRACTURING		
13.0				END OF BORING AT 13'		
15						
20						
25						
30						
35						

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

DRN.	CMP
CKD.	PWK



TEST BORING LOG

BORING **B165.8-1**

G.S. ELEV. N/A

FILE 195651

SHEET 1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CP RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED DRY			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE			
a	FROM	0.0'	TO 4.0'
d	FROM	4.0'	TO 5.0'
c ₂	FROM	5.0'	TO 15.0'

DRILLER	T. FARRELL
HELPER	J. LANGDON
INSPECTOR	N/A
DATE STARTED	02/12/2013
DATE COMPLETED	02/12/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
				BROWN GRAVELLY CLAY, SM SILT, TR F/ SAND		
	S-1	3 2 3 8	2.0			
	S-2	15 24 35 50	5.0	BROWN SILT, SM ROCK FRAGMENTS (DECOMPOSED ROCK)		
5	S-3	47 50/0.2				
				GRAY, SEVERELY WEATHERED, SOFT SHALE, VERY CLOSE TO CLOSE, 0 TO 90 DEGREE FRACTURES		
10	R-1	REC =80% RQD =30%	7.0	GRAY, MODERATELY WEATHERED, SOFT SHALE, CLOSE TO MODERATELY CLOSE, 0 TO 60 DEGREE FRACTURES		
15	R-2	REC =100% RQD =88%	15.0	END OF BORING AT 15'		
20						
25						
30						
35						

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

DRN.	JPB
CKD.	PWK



SUMMARY OF LABORATORY TEST DATA

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

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index					
	R-2	18.1-18.8	-	-	-	-	-	-	-	-	-	-	169.1	475	-	
B163.3-1	S-2	2.0-4.0	-	-	-	-	-	-	-	-	-	27.5	-	-	-	
	S-4	6.0-8.0	SM	28.2	50.4	21.4	-	-	-	-	-	15.2	-	-	-	
	S-5	8.0-10.0														
	R-1	12.9-13.4	-	-	-	-	-	-	-	-	-	-	167.6	220	-	
	R-2	16.0-16.6	-	-	-	-	-	-	-	-	-	-	169.3	435	-	
	B164.4-1	S-3	4.0-6.0	SM	26.3	53.7	20.0	-	-	-	-	-	16.2	-	-	-
S-4		6.0-8.0														
R-1		12.5-13.0	-	-	-	-	-	-	-	-	-	-	168.2	950	-	
R-2		17.2-17.7	-	-	-	-	-	-	-	-	-	-	169.1	890	-	
B165.5-1	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	13.4	-	-	-	
	R-1	9.0-9.4	-	-	-	-	-	-	-	-	-	-	166.5	390	-	
B165.8-1	R-1	7.0-7.6	-	-	-	-	-	-	-	-	-	-	167.2	850	-	



SUMMARY OF LABORATORY TEST DATA

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

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

TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name: TDI
Project No.: 195651
Boring No.: B165.5-1
Sample No.: R-1
Depth (ft): 9.0-9.4
Elevation (ft):

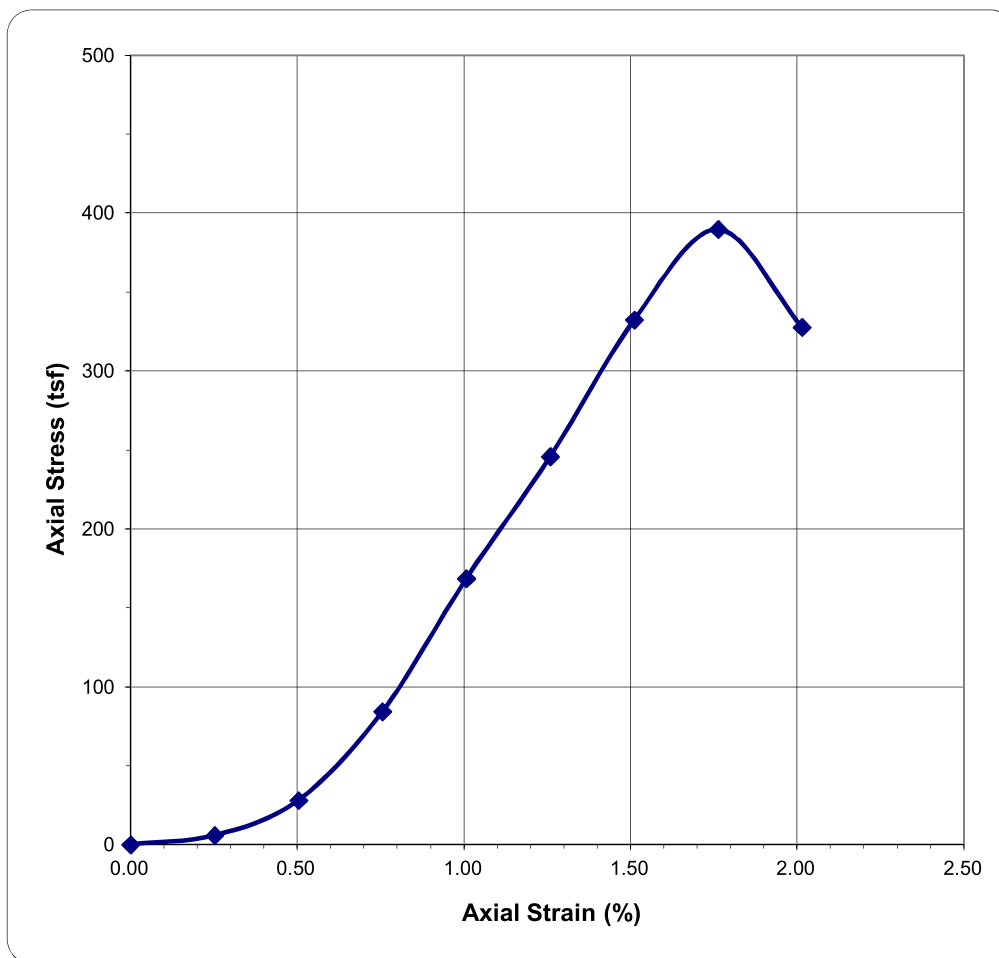
Average Sample Diameter (in.): 1.979
Cross Sectional Area (sq. in.): 3.076
Average Sample Height (in.): 3.971
Sample Mass-Dry (g): 533.8
Unit Weight (PCF) 166.5

Sample Description: _____

 GRAY SHALE

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	250	0.25	6
0.020	1200	0.50	28
0.030	3600	0.76	84
0.040	7200	1.01	169
0.050	10500	1.26	246
0.060	14200	1.51	332
0.070	16650	1.76	390
0.080	14000	2.01	328



Failure Conditions:



FIGURE: 127

TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name: TDI
Project No.: 195651
Boring No.: B165.8-1
Sample No.: R-1
Depth (ft): 7.0-7.6
Elevation (ft):

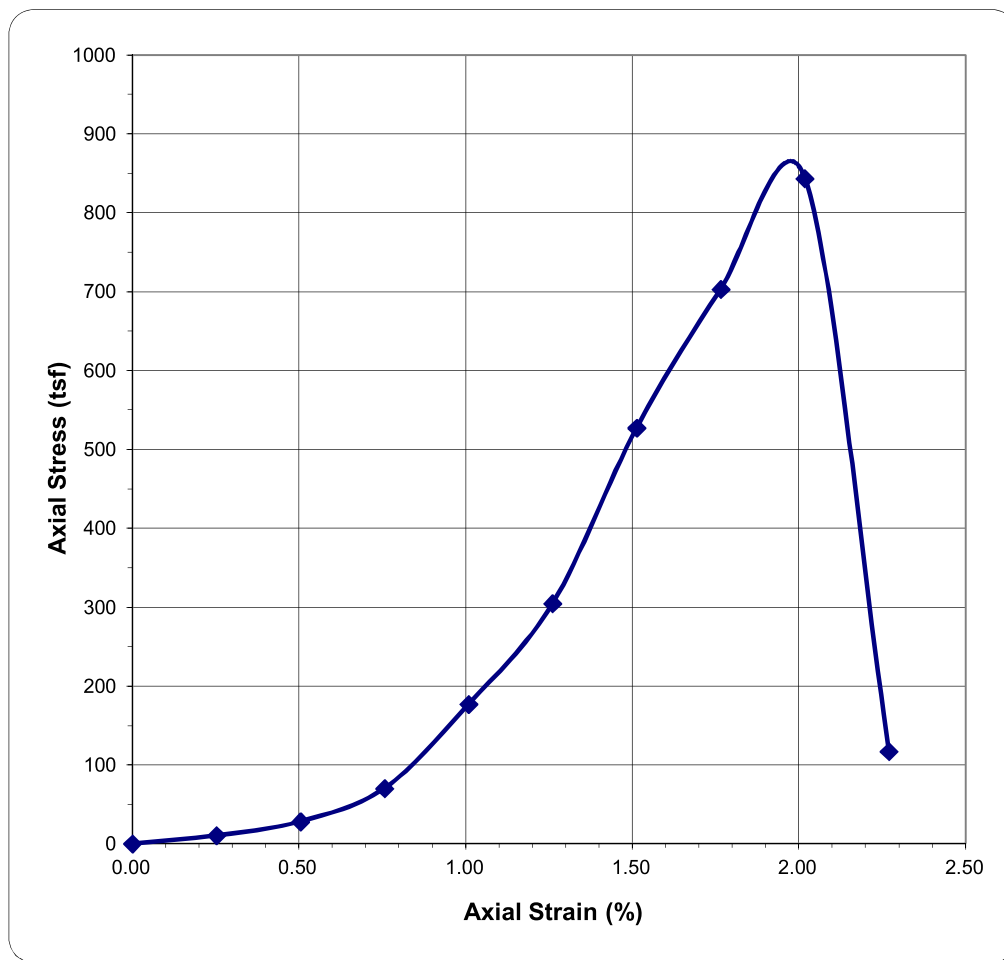
Average Sample Diameter (in.): 1.978
Cross Sectional Area (sq. in.): 3.073
Average Sample Height (in.): 3.965
Sample Mass-Dry (g): 534.67
Unit Weight (PCF): 167.2

Sample Description: _____

 GRAY SHALE

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	450	0.25	11
0.020	1200	0.50	28
0.030	3000	0.76	70
0.040	7550	1.01	177
0.050	13000	1.26	305
0.060	22500	1.51	527
0.070	30000	1.77	703
0.080	36000	2.02	844
0.090	5000	2.27	117



Failure Conditions:

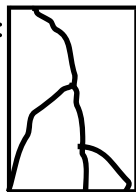


FIGURE: 128

TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name: TDI
Project No.: 195651
Boring No.: B165.8-1
Sample No.: R-2
Depth (ft): 10.0-10.5
Elevation (ft):

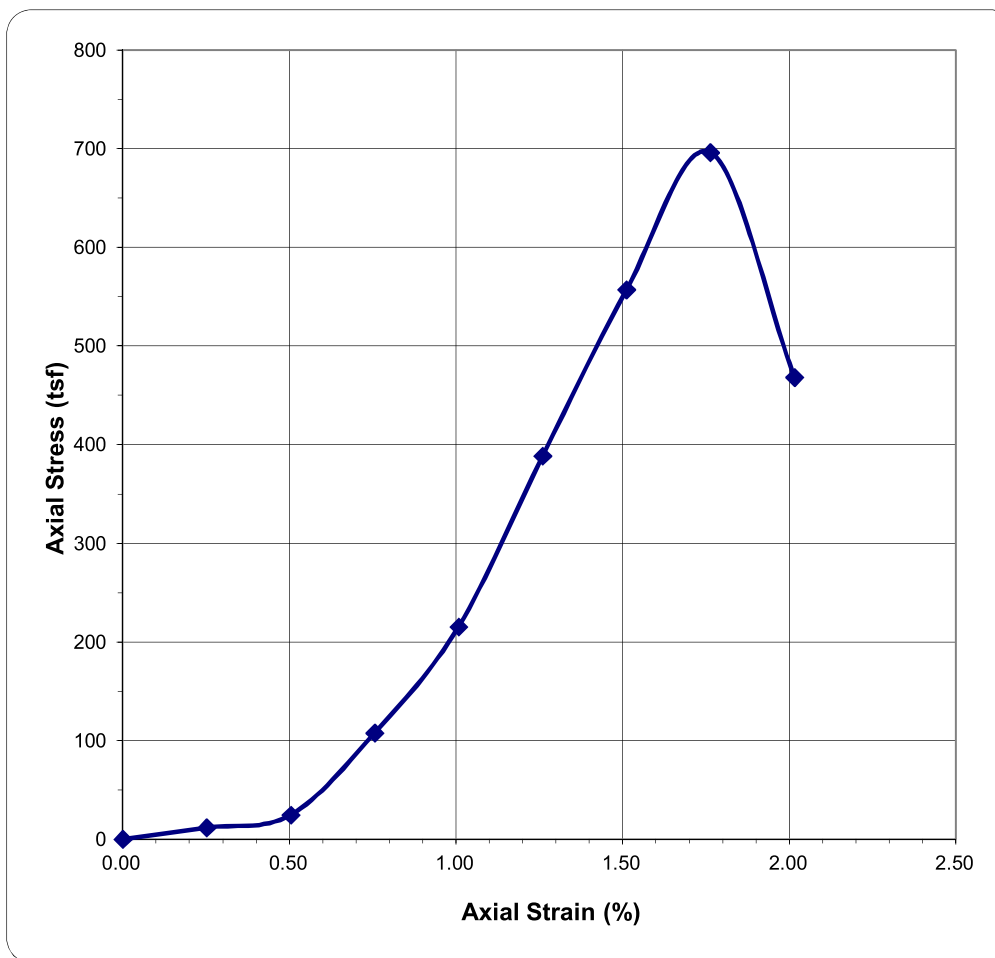
Average Sample Diameter (in.): 1.979
Cross Sectional Area (sq. in.): 3.076
Average Sample Height (in.): 3.970
Sample Mass-Dry (g): 529.83
Unit Weight (PCF) 165.3

Sample Description: _____

 GRAY SHALE

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	500	0.25	12
0.020	1050	0.50	25
0.030	4600	0.76	108
0.040	9200	1.01	215
0.050	16600	1.26	389
0.060	23800	1.51	557
0.070	29750	1.76	696
0.080	20000	2.02	468



Failure Conditions:

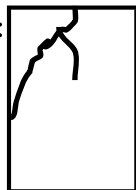


FIGURE: 129

EXPLORATION PLAN

Champlain-Hudson Power Express Design Package 4a ■ Ballston - Clifton Park - Glenville, NY
June 22, 2022 ■ Terracon Project No. JB215256A

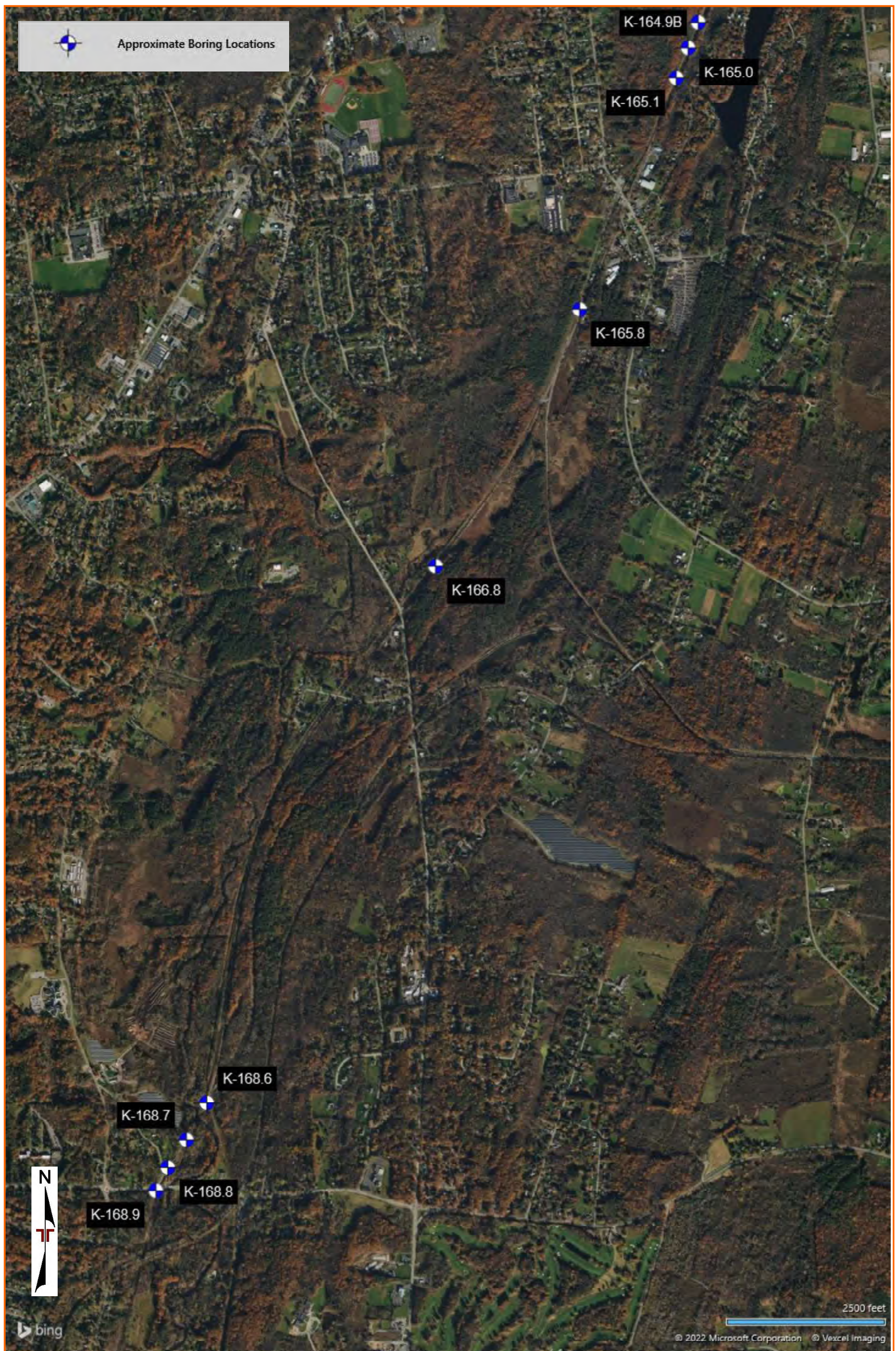


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. K-165.8

PROJECT: Champlain-Hudson Power Express Design
Package 4a

CLIENT: Kiewit Engineering (NY) Corp.

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

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

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
	DEPTH ELEVATION (Ft.)								LL-PL-PI	PERCENT FINES	
2.0	FILL - SILTY SAND WITH GRAVEL , brown, very loose	271			5	1-1-1-1 N=2					
4.0	FILL - SILT , contains organics, brown, soft	269			6	3-1-1-1 N=2					
6.5	LEAN CLAY (CL) , brown, soft	266.5			12	WOH-WOH-3-3 N = 3	26.7	36-23-13	85		
10.0	WEATHERED ROCK , gray, very dense	263			1.1	3-57-50/1"					
15.0	SHALE , slightly weathered, close to moderate fractured, good RQD, gray	258			0	50/5"					
20.0	SHALE , slightly weathered, close to moderate fractured, excellent RQD, gray	253				REC = 92% RQD = 88%					
24.0	SHALE , slightly weathered, moderate fractured, excellent RQD, gray	249				REC = 100% RQD = 96%					
25.0	SHALE , unweathered, moderate to wide fractured, excellent RQD, gray	249				REC = 100% RQD = 96%					
25.0	SHALE , unweathered, moderate to wide fractured, excellent RQD, gray	249				REC = 98% RQD = 97%					

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

Hammer Type: Automatic

Advancement Method:
4 1/4 ID HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit

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

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to coring

30 Corporate Cir Ste 201
Albany, NY

Boring Started: 05-06-2022	Boring Completed: 05-06-2022
Drill Rig: Diedrich D-50	Driller: S. Morey
Project No.: JB215256A	

BORING LOG NO. K-165.8

**PROJECT: Champlain-Hudson Power Express Design
Package 4a**

CLIENT: Kiewit Engineering (NY) Corp.

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

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 42.9051° Longitude: -73.8784° Surface Elev.: 273.13 (Ft.)								LL-PL-PI	
	DEPTH	ELEVATION (Ft.)								
29.0		244								
	SHALE , unweathered, moderate fractured, excellent RQD, gray									
34.0		239				REC = 98% RQD = 93%				
	SHALE , unweathered, moderate fractured, excellent RQD, gray									
39.0		234				REC = 100% RQD = 98%				
	Boring Terminated at 39 Feet									

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

Hammer Type: Automatic

Advancement Method:
4 1/4 ID HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

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

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to coring



Boring Started: 05-06-2022

Boring Completed: 05-06-2022

Drill Rig: Diedrich D-50

Driller: S. Morey

Project No.: JB215256A

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

Geotechnical Data Report

Champlain-Hudson Power Express- Package 4a

June 22, 2022 ■ Terracon Project No. JB215256A



Rock Core – Boring K-165.1



Rock Core – Boring K-165.8 (Runs 1-3)

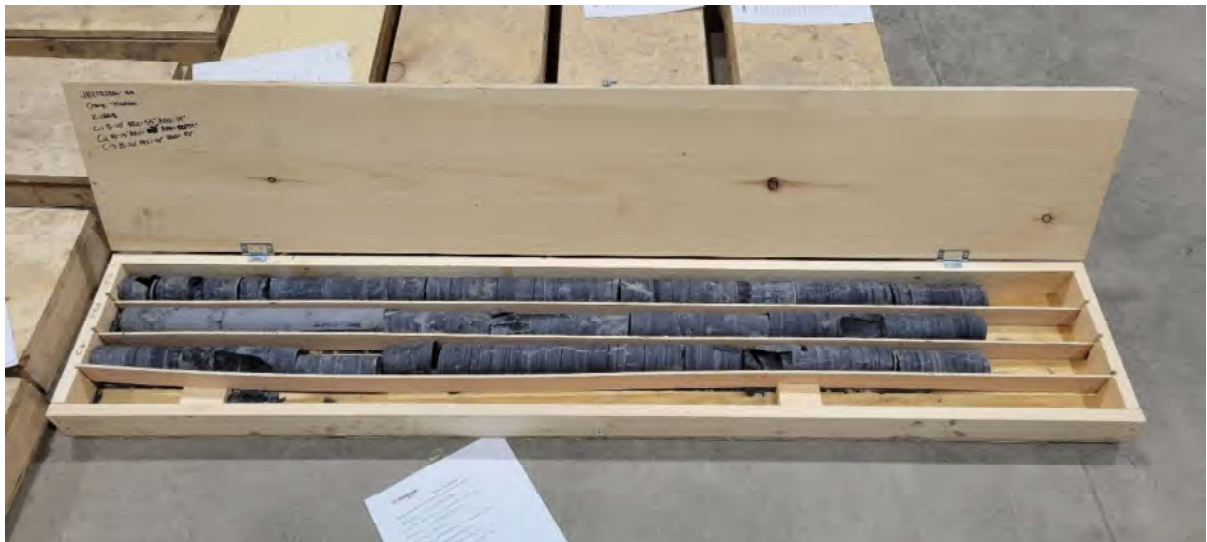
Geotechnical Data Report

Champlain-Hudson Power Express- Package 4a

June 22, 2022 ■ Terracon Project No. JB215256A



Rock Core – Boring K-165.8 (Runs 4-6)



Rock Core – Boring K-166.8

Summary of Laboratory Results

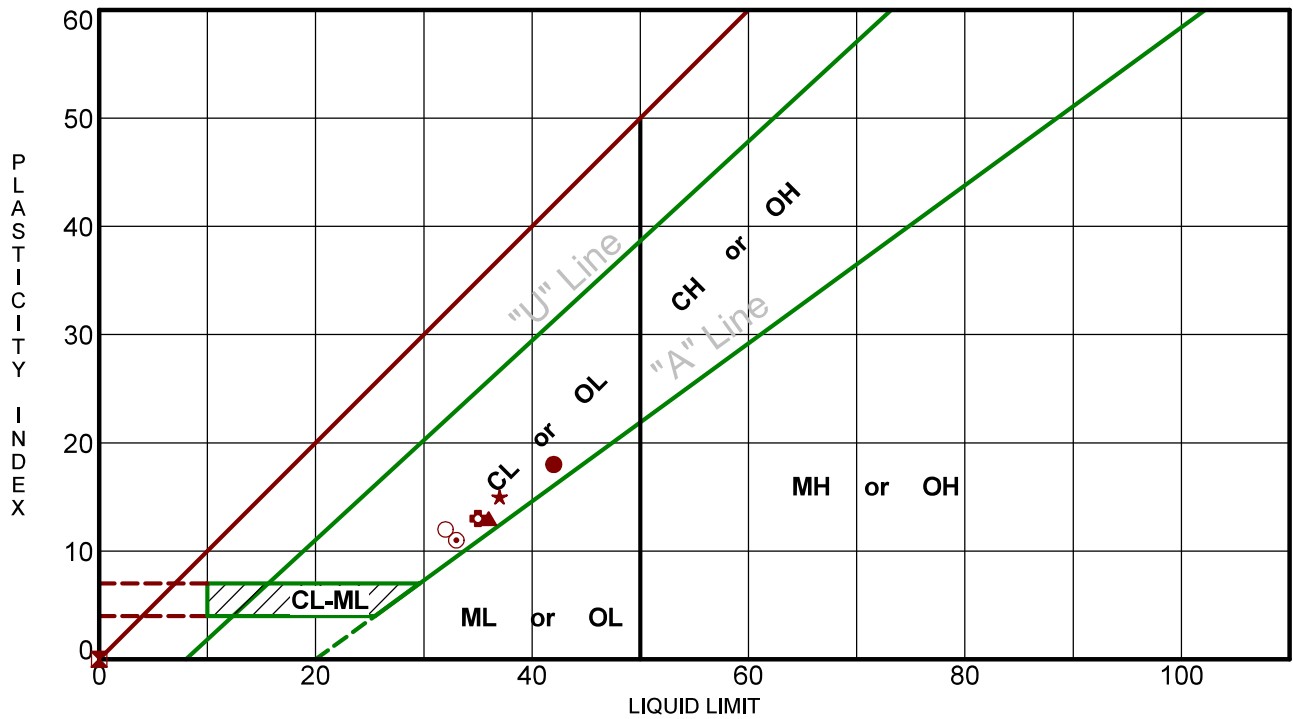
BORING ID	Depth (Ft.)	Organic Content (%)
K-160.1	4-6	0.8
K-165.8	2-4	75.5
K-168.6	4-6	7.4

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT_JB215256A CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 6/1/22

PROJECT: Champlain-Hudson Power Express Design Package 4a	 <p style="font-size: small; color: red;">30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256A
SITE: Champlain to Hudson HDD Crossings Ballston - Clifton Park - Glenville, NY		CLIENT: Kiewit Engineering (NY) Corp.
		EXHIBIT: B-1

ATTERBERG LIMITS RESULTS

ASTM D4318



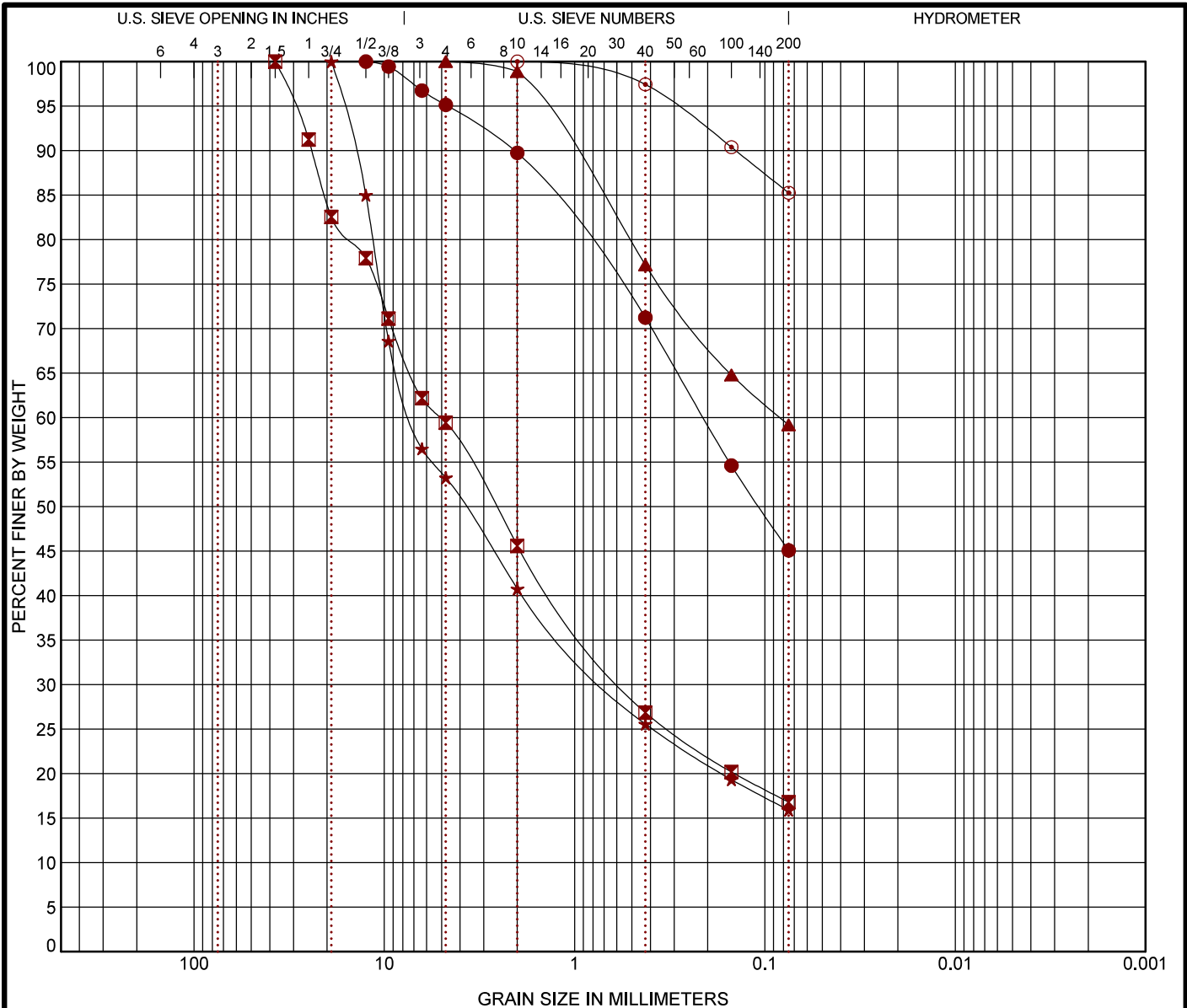
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS JB215256A CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 6/20/22

Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
● K-164.9B	4 - 6	42	24	18	59.2	CL	SANDY LEAN CLAY
▣ K-165.1	6 - 8	NP	NP	NP	15.9	GM	SILTY GRAVEL with SAND
▲ K-165.8	4 - 6	36	23	13	85.3	CL	LEAN CLAY
★ K-168.6	15 - 17	37	22	15	82.9	CL	LEAN CLAY with SAND
⊙ K-168.7	15 - 17	33	22	11	76.4	CL	LEAN CLAY with SAND
⊕ K-168.8	15 - 17	35	22	13	92.5	CL	LEAN CLAY
○ K-168.9	6 - 8	32	20	12	79.6	CL	LEAN CLAY with SAND

PROJECT: Champlain-Hudson Power Express Design Package 4a SITE: Champlain to Hudson HDD Crossings Ballston - Clifton Park - Glenville, NY	 30 Corporate Cir Ste 201 Albany, NY	PROJECT NUMBER: JB215256A CLIENT: Kiewit Engineering (NY) Corp.
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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-160.2	6 - 8	SILTY SAND (SM)				7.8					
☒ K-160.4	6 - 8	SILTY SAND with GRAVEL (SM)				9.4					
▲ K-164.9B	4 - 5.5	SANDY LEAN CLAY (CL)				35.1	42	24	18		
★ K-165.1	6 - 8	SILTY GRAVEL with SAND (GM)				9.3	NP	NP	NP		
⊙ K-165.8	4 - 6	LEAN CLAY (CL)				26.7	36	23	13		

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● K-160.2	6 - 8	12.5	0.21			0.0	4.9	50.1		45.1	
☒ K-160.4	6 - 8	37.5	5.042	0.551		0.0	40.6	42.6		16.8	
▲ K-164.9B	4 - 6	4.75	0.083			0.0	0.0	40.8		59.2	
★ K-165.1	6 - 8	19	7.137	0.668		0.0	46.8	37.3		15.9	
⊙ K-165.8	4 - 6	2				0.0	0.0	14.7		85.3	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256A CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 6/10/22

PROJECT: Champlain-Hudson Power Express Design Package 4a

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



PROJECT NUMBER: JB215256A

CLIENT: Kiewit Engineering (NY) Corp.

EXHIBIT: B-2



Package 4A Phase 4 Borings

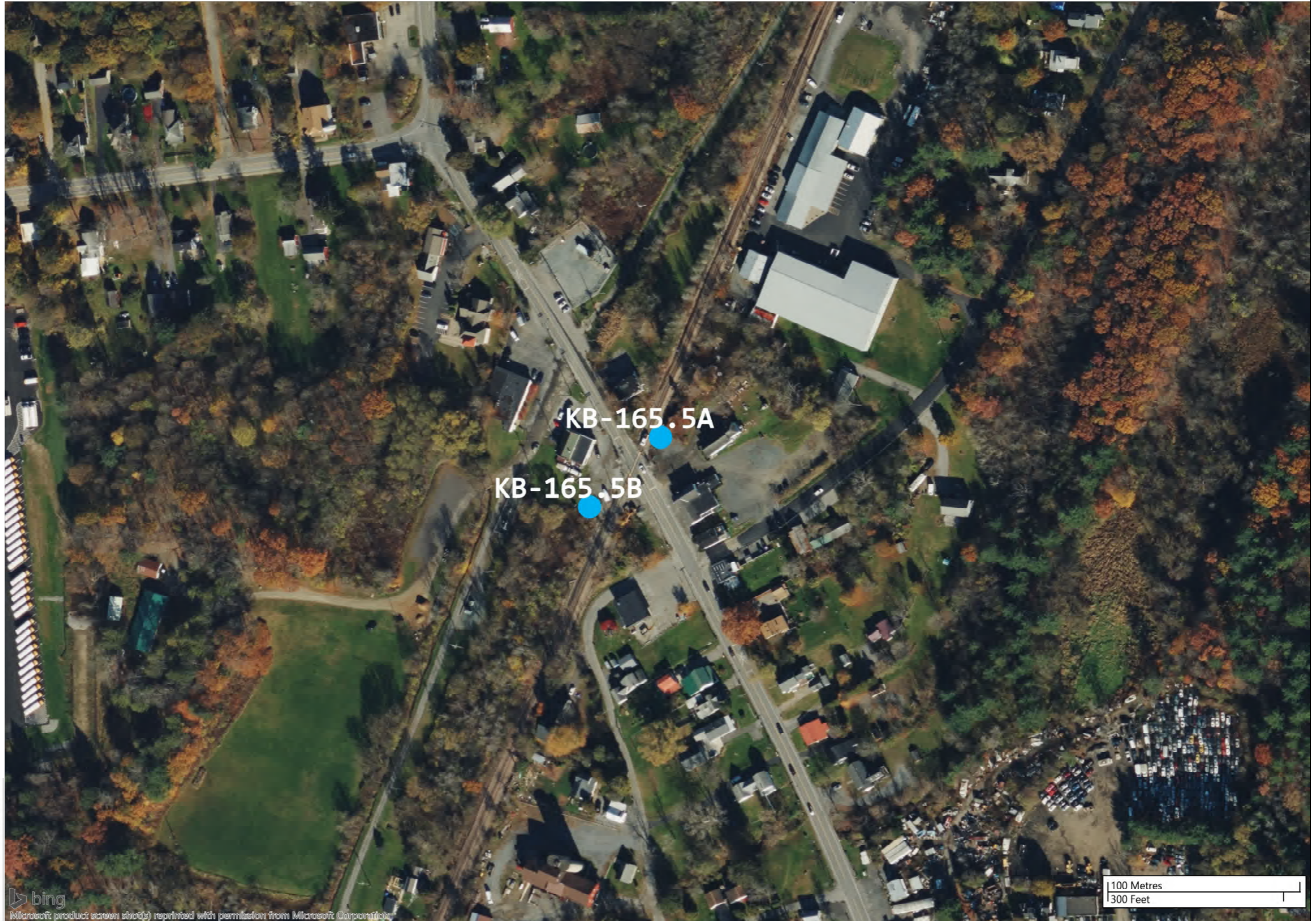
Champlain Hudson Power Express
New York

PROJECT NUMBER 20001480

CREATED BY Kiewit
DATE 01/20/2023

Legend Key

● Kiewit Borings





Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-165.5A

PROJECT NUMBER 20001480
 START DATE 12/06/2022
 FINISH DATE 12/06/2022

LOGGED BY S. Ahmad
 DRILLER/RIG John / Geoprobe 7822DT
 DRILL CONTRACTOR ADT Inc.

COORDINATES N 1485716.78
E 659440.27
 GROUND ELEV. 278.5 ft
 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	Legend							
											▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)				
	276.5		FILL: Clayey SAND with Gravel (SC), gray to black, medium dense, moist		1	58%			4-9-6-9 (15)									
			Silty SAND with Gravel (SM), gray, dense to very dense, moist		2	79%			9-9-40-33 (49)									
5					3	57%			3-9-50-50/3" (59)									
	272.5		SHALE, gray, very poor RQD, laminated		1	22%	16			10 minute core run								
10			fair RQD		2	100%	70			15 minute core run								
15			good RQD		3	90%	86			15 minute core run								
20			fair RQD		4	100%	68			20 minute core run								
25			excellent RQD		5	100%	100			20 minute core run								
30																		



Kiewit

EXPLORATORY BORING LOG Champlain Hudson Power Express New York

BORING NO: KB-165.5A

PROJECT NUMBER 20001480
 START DATE 12/06/2022
 FINISH DATE 12/06/2022

LOGGED BY S. Ahmad
 DRILLER/RIG John / Geoprobe 7822DT
 DRILL CONTRACTOR ADT Inc.

COORDINATES N 1485716.78
E 659440.27
 GROUND ELEV. 278.5 ft
 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	Legend									
										▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)						
			SHALE, gray, excellent RQD, laminated																
35			fair RQD		6	100% 93			20 minute core run										
									UCS = 17,365 psi										
40					7	82% 72			15 minute core run										
45	233.5		Boring Terminated at 45ft		8	100% 62			20 minute core run										
50																			
55																			
60																			

KB-165.5A - Runs 1 through 4



KB-165.5A - Runs 5 through 8





Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-165.5B

PROJECT NUMBER 20001480
 START DATE 12/05/2022
 FINISH DATE 12/06/2022

LOGGED BY J. Techel
 DRILLER/RIG Eric / Geoprobe 7822DT
 DRILL CONTRACTOR ADT Inc.

COORDINATES N 1485596.65
E 659319.38
 GROUND ELEV. 278.0 ft
 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	Legend			
										▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)
	276.0		FILL: SAND with Gravel (SP), black to brown, medium dense		1	66%		5-8-5-8 (13)		▲			
	274.0		Silty SAND with Gravel (SM), brown, medium dense, shale fragments		2	84%		4-6-8-13 (14)		●	☒		
5			SHALE, gray, very poor RQD		3	100%		22-50/5"					▲
10			fair RQD		1	100% 0							
15			good RQD		2	100% 67							
20			good RQD		3	100% 82							
25			good RQD		4	100% 78							
30			good RQD		5	84% 84							



Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-165.5B

PROJECT NUMBER 20001480
 START DATE 12/05/2022
 FINISH DATE 12/06/2022

LOGGED BY J. Techel
 DRILLER/RIG Eric / Geoprobe 7822DT
 DRILL CONTRACTOR ADT Inc.

COORDINATES N 1485596.65
E 659319.38
 GROUND ELEV. 278.0 ft
 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	Legend				
											▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)	
			SHALE, gray, good RQD									20	40	60	80
35	243.0		Boring Terminated at 35ft		6	100%	78								
40															
45															
50															
55															
60															

KB-165.5B - Runs 1 through 4



KB-165.5B - Runs 5 through 6



Summary of Laboratory Results

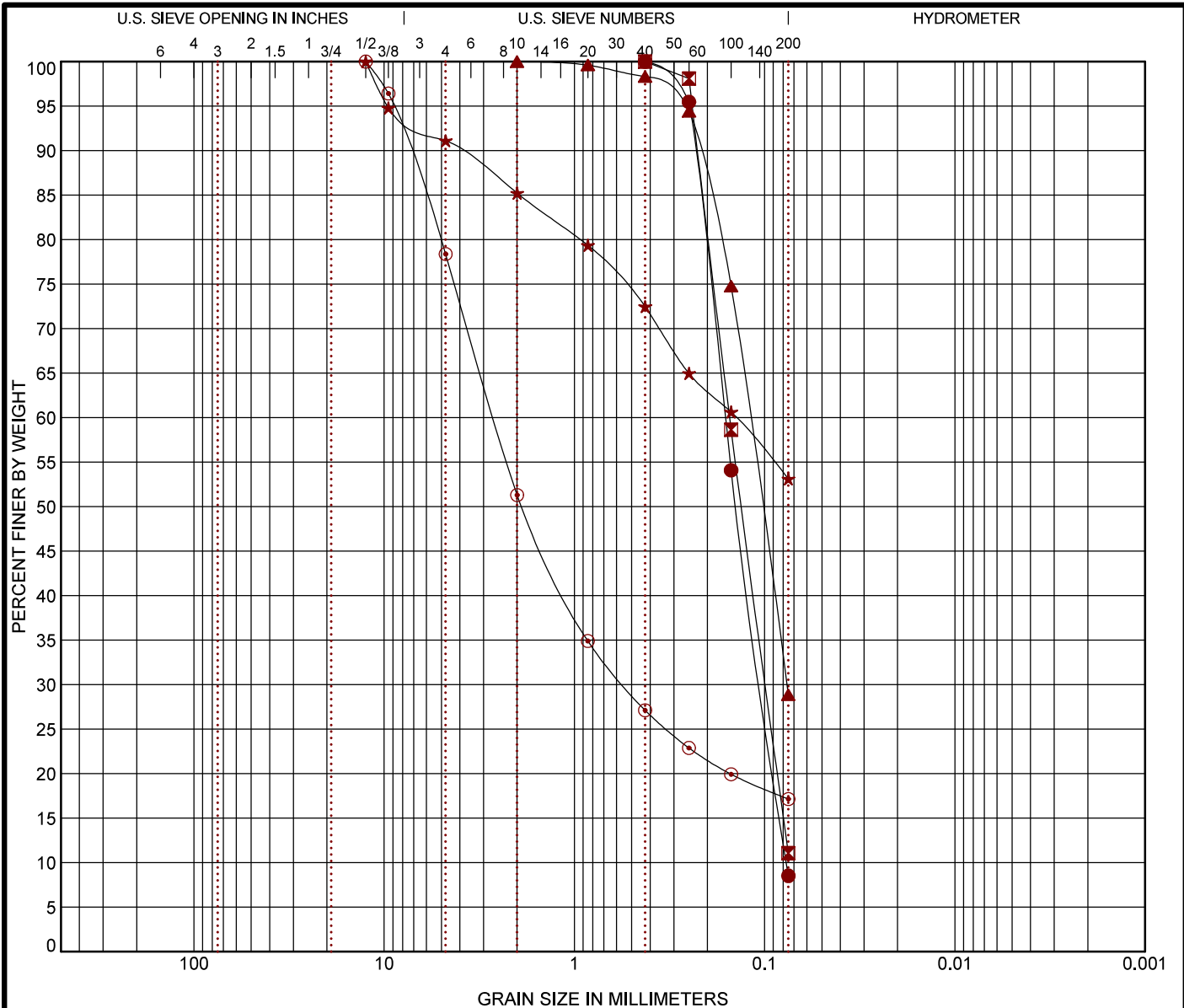
BORING ID	Depth (Ft.)	Water Content (%)
KB-149.6	60-62	22.7
KB-158.9	2-4	24.5
KB-165.5A	2	13.6
KB-165.5B	2-4	14.3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT_JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 1/19/23

PROJECT: Lab Testing	 <p style="font-size: small;">30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256H
SITE: Champlain to Hudson Power Express		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO
		EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	USCS Classification					WC (%)	LL	PL	PI	Cc	Cu
● KB-149.6	35 - 37	POORLY GRADED SAND with SILT (SP-SM)					24.7				0.87	2.10
☒ KB-149.6	45 - 47	POORLY GRADED SAND with SILT (SP-SM)					20.0				0.87	2.07
▲ KB-149.6	60 - 62	SILTY SAND (SM)					22.7					
★ KB-158.9	2 - 4	SANDY SILT (ML)					24.5					
⊙ KB-165.5A	2	SILTY SAND with GRAVEL (SM)					13.6					

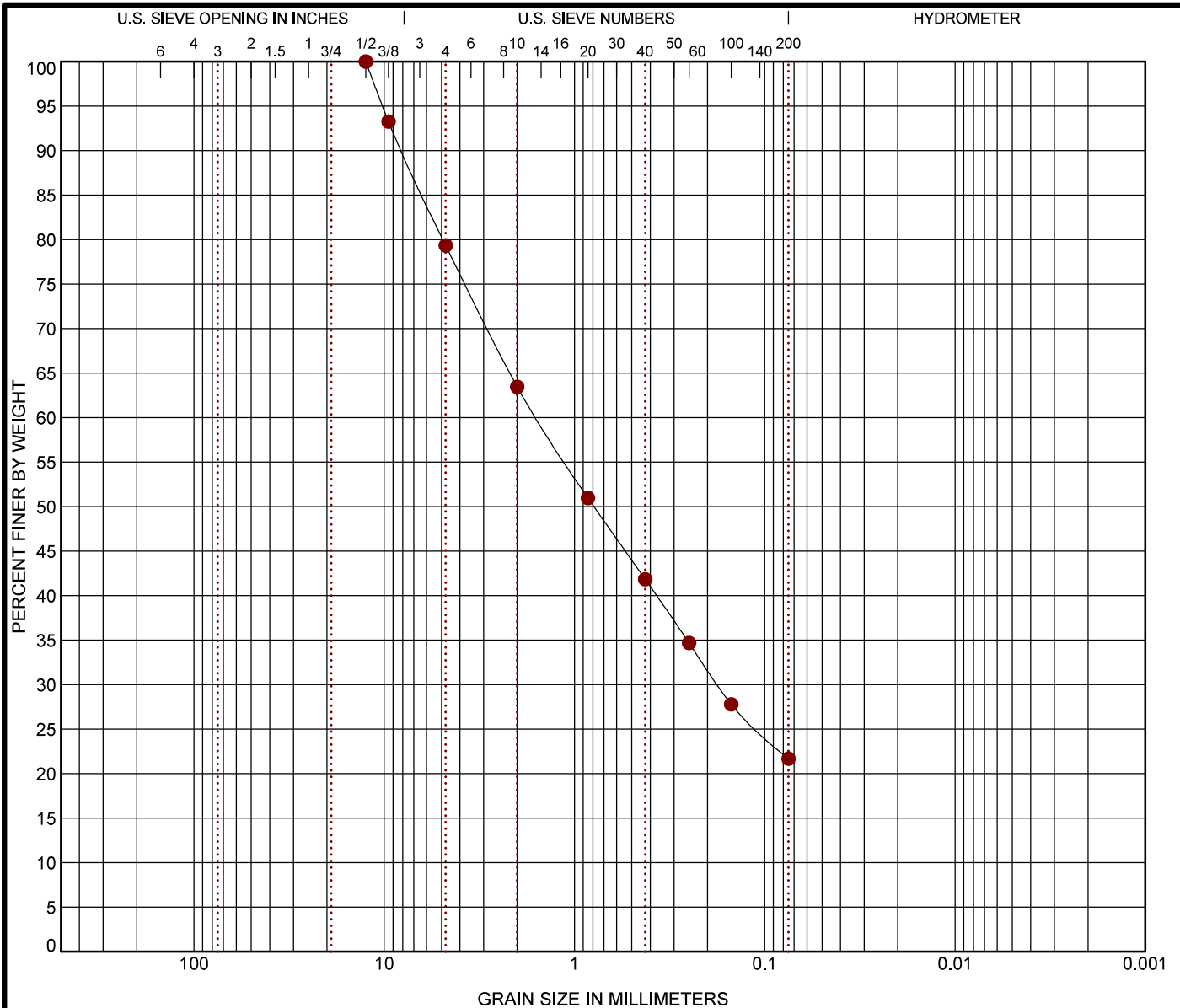
Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● KB-149.6	35 - 37	0.425	0.161	0.104	0.077	0.0	0.0	91.5		8.5	
☒ KB-149.6	45 - 47	0.425	0.153	0.099		0.0	0.0	88.9		11.1	
▲ KB-149.6	60 - 62	2	0.12	0.076		0.0	0.0	71.1		28.9	
★ KB-158.9	2 - 4	12.5	0.142			0.0	8.9	38.0		53.1	
⊙ KB-165.5A	2	12.5	2.641	0.549		0.0	21.6	61.2		17.1	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 1/19/23

PROJECT: Lab Testing	<p>30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256H
SITE: Champlain to Hudson Power Express		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO
		EXHIBIT: B-9

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-165.5B	2 - 4	SILTY SAND with GRAVEL (SM)	14.3					

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● KB-165.5B	2 - 4	12.5	1.579	0.177		0.0	20.7	57.7		21.7	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 1/19/23

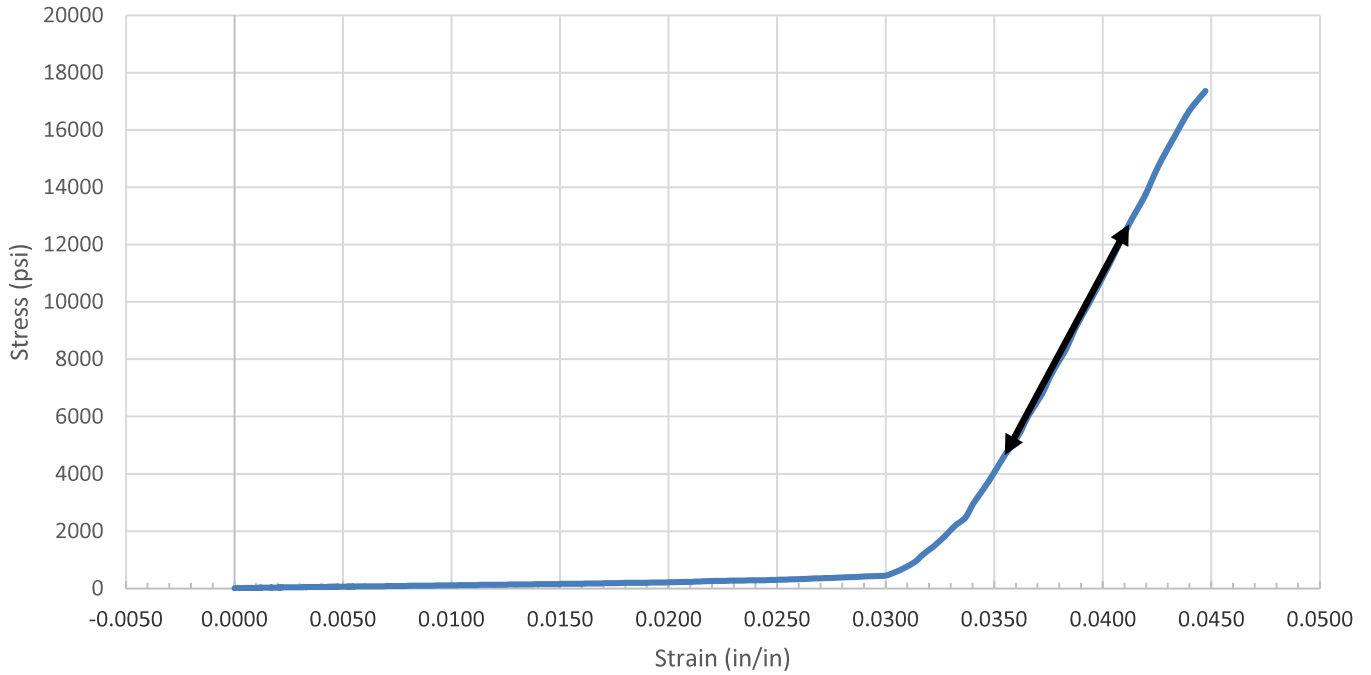
PROJECT: Lab Testing	<p style="font-size: small; margin: 0;">30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256H
SITE: Champlain to Hudson Power Express		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO
		EXHIBIT: B-10

Client
Kiewit Engineering Corp

Project
Lab Testing

Project No. JB215256H

ASTM D7012 Stress/ Strain Curve



— Axial ↔ Axial Tangent Line



SAMPLE LOCATION

Site:	JB215256H		
Description:	Shale		
Boring:	KB-165.5A	Depth (feet):	34

SPECIMEN INFORMATION

Sample No.:	LAB 11456	Mass (g):	552.11
Length (in.):	4.13	Diameter (in.):	1.96
L/D Ratio:	2.107	Density (pcf):	168.792

TEST RESULTS

Failure Load (lbs):	52393
Failure Strain (in/in):	0.048
Unconfined Compressive Strength (psi):	17,365
Elastic Modulus, E, (ksi):	1409
Time of Failure (min):	04:03
Rate of Loading (in/sec):	0.04
Moisture Content Post-break:	1.30%

Client

Kiewit Engineering Corp

Project

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 0.250°.
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 0.25°.

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.

Appendix D

Appendix to EM&CP Appendix J
HDD Design Summary Report

Sheets Added

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.

CALL YOUR ONE-CALL SYSTEM FIRST



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Project Summary

General: CHPE HDD 57B
P4A
Start Date: 12-10-2021
End Date: 12-10-2021

Project Owner: TDI
Project Contractor: Kiewit
Project Consultant: CHA

Designer: KDL
CHA

Description: HDD 57B 10-inch DR9 Conduit-1

Input Summary

Start Coordinate	(0.00, 0.00, 279.95) ft
End Coordinate	(1985.00, 0.00, 273.93) ft
Project Length	1985.00 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

Soil Summary

Number of Layers: 5

Soil Layer #1 USCS, Sand (S), SM

From Assistant

Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft³]

Phi: 30.00, S.M.: 200.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Sand (S), SM

From Assistant

Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft³]

Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

Soil Layer #3 USCS, Clay (C), CL

From Assistant

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

Phi: 0.00, S.M.: 200.00, Coh: 3.10 [psi]

Soil Layer #4 USCS, Gravel (G), GP

From Assistant

Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft³]

Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

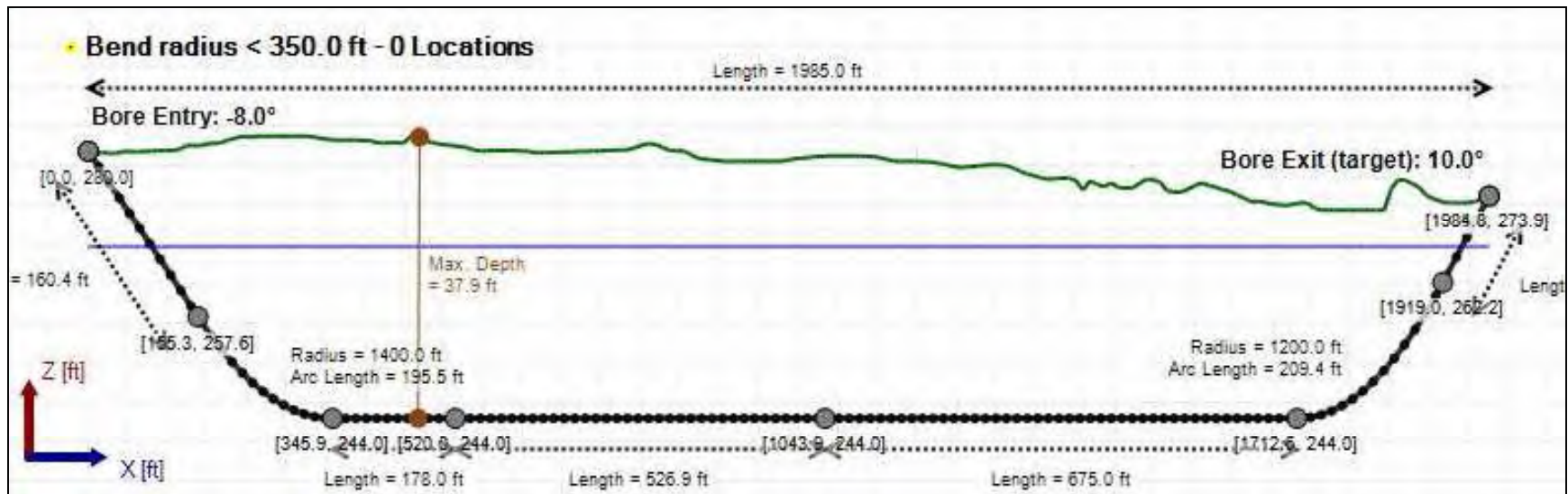
Soil Layer #5 Rock, Geological Classification, Sedimentary Rocks

From Assistant

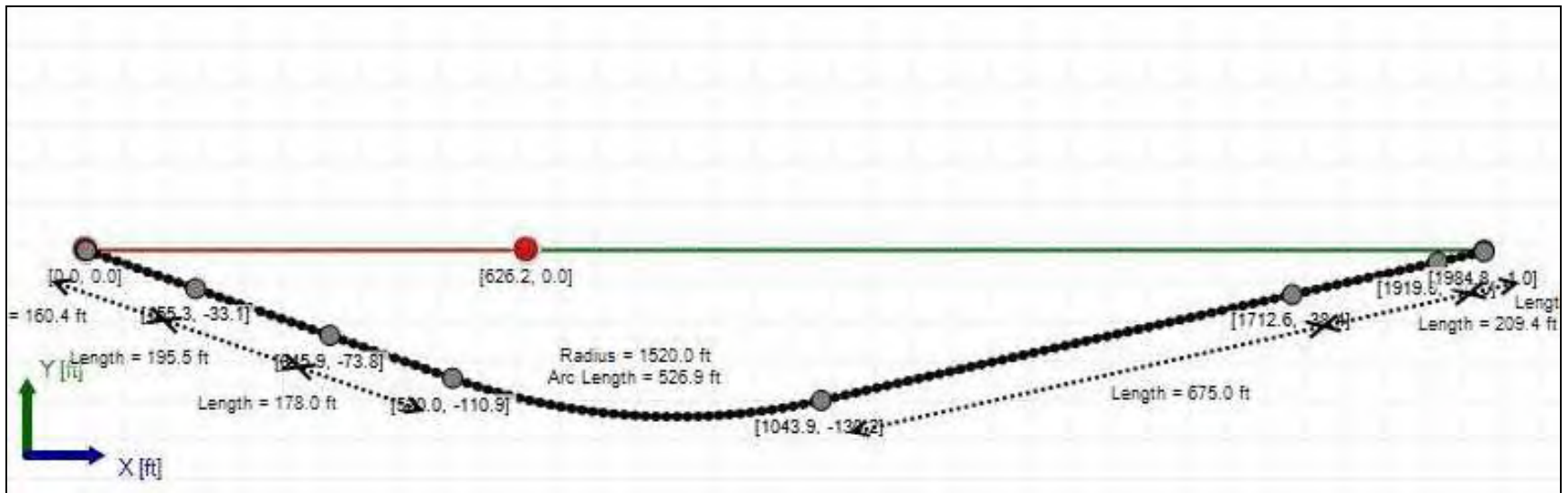
Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft³]

Phi: 37.00, S.M.: 2000.00, Coh: 3000.00 [psi]

Bore Cross-Section View



Bore Plan View



Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 10" (10.75")
Pipe DR: 9
Pipe Length: 2025.00 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

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	6.3	29.7
Water Pressure	10.0	10.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.3	39.6
Deflection		
Earth Load Deflection	1.721	8.076
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.853	8.208
Compressive Stress [psi]		
Compressive Wall Stress	73.3	178.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	34133.2	34133.2
Pullback Stress [psi]	951.9	951.9
Pullback Strain	1.656E-2	1.656E-2
Bending Stress [psi]	0.0	21.5
Bending Strain	0	3.733E-4
Tensile Stress [psi]	951.9	966.9
Tensile Strain	1.656E-2	1.714E-2

Net External Pressure = 23.6 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.853	7.5	4.0	OK
Unconstrained Collapse [psi]	23.4	117.0	5.0	OK
Compressive Wall Stress [psi]	73.3	1150.0	15.7	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	33.3	193.9	5.8	OK
Tensile Stress [psi]	966.9	1200.0	1.2	OK

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	1968.475 psi	2014.844 psi
1	8.00 in	12.00 in	1967.716 psi	2014.440 psi
2	12.00 in	16.13 in	1966.616 psi	2013.854 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 inadvertent 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

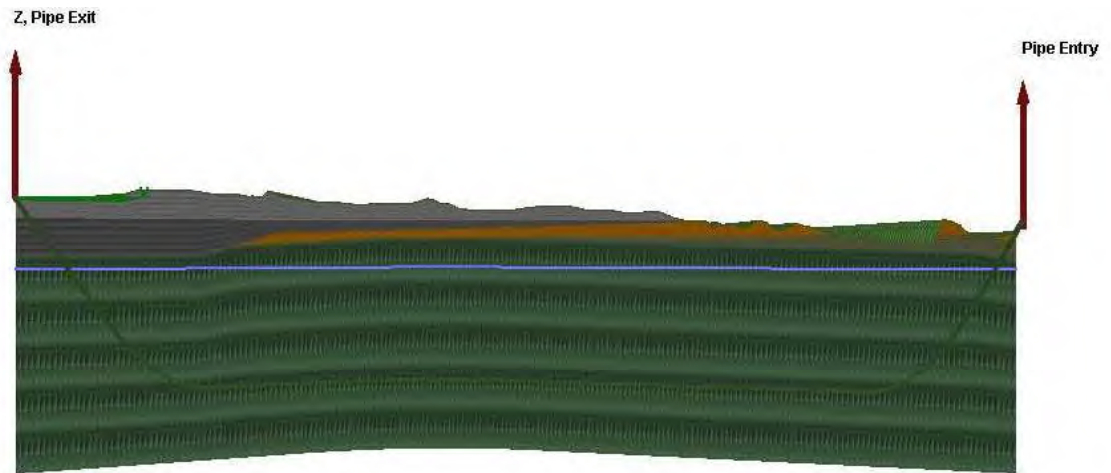
Rheological model: Bingham-Plastic

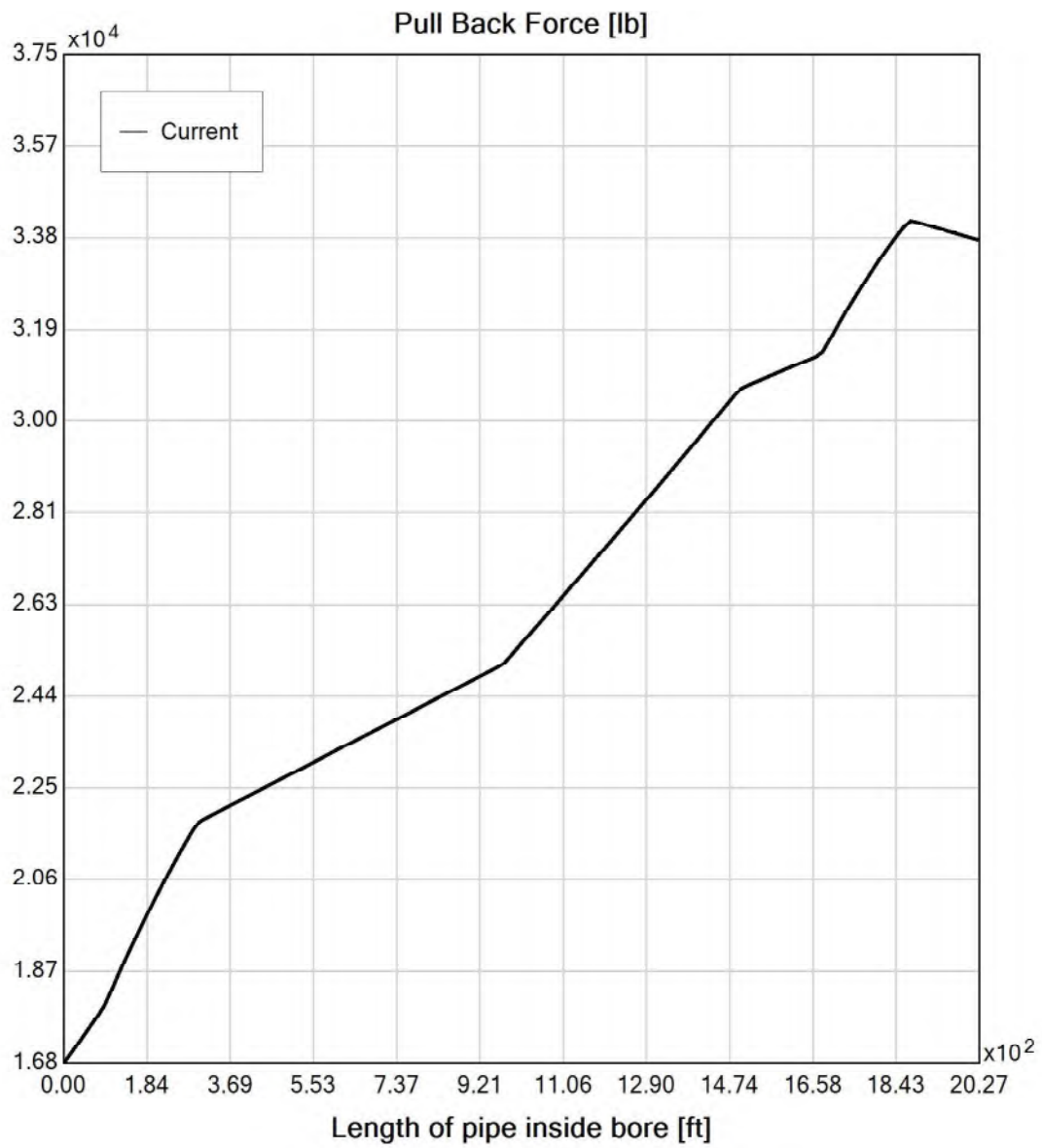
Plastic Viscosity (PV): 25.53

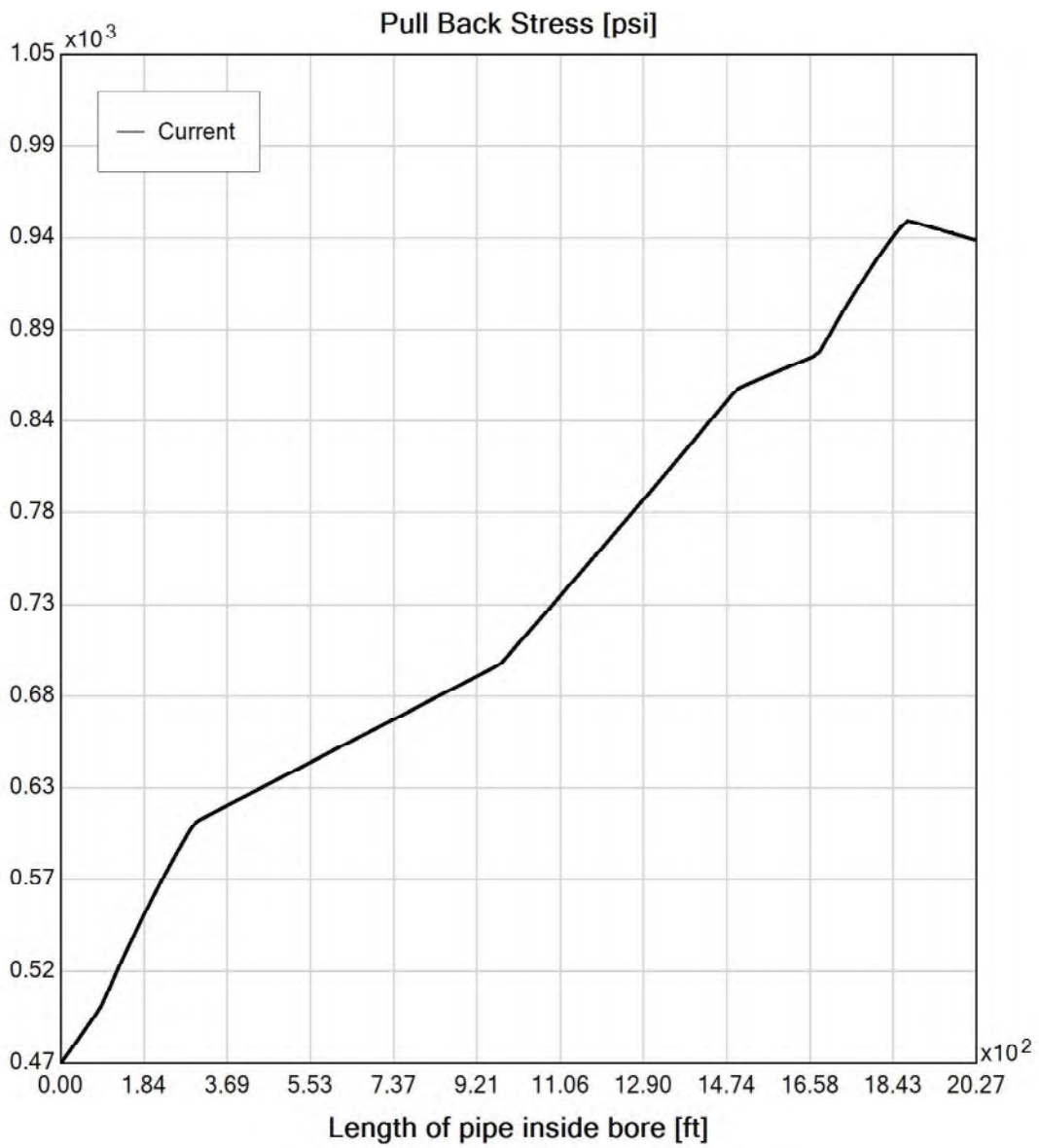
Yield Point (YP): 16.49

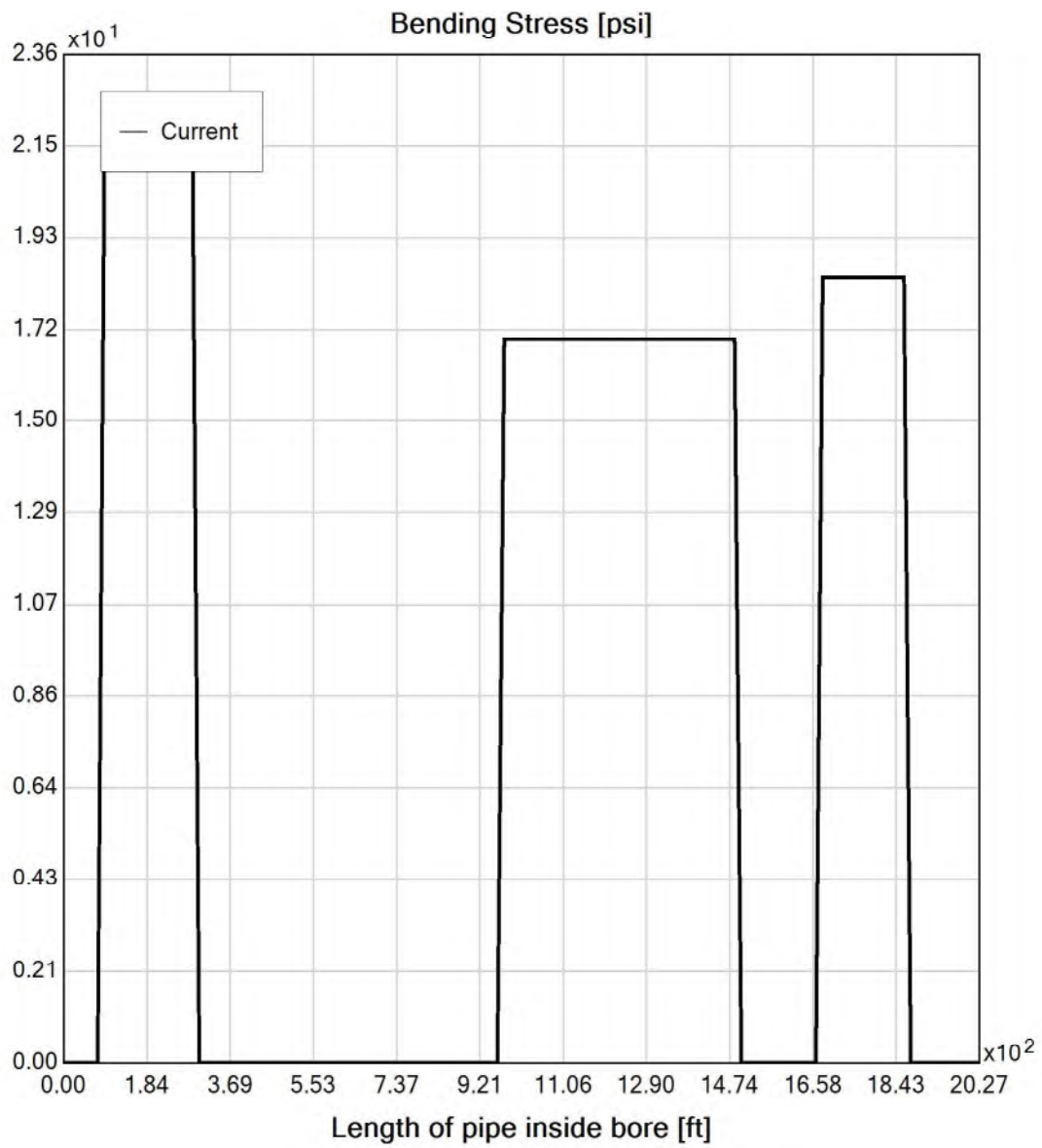
Effective Viscosity (cP): 1202.0

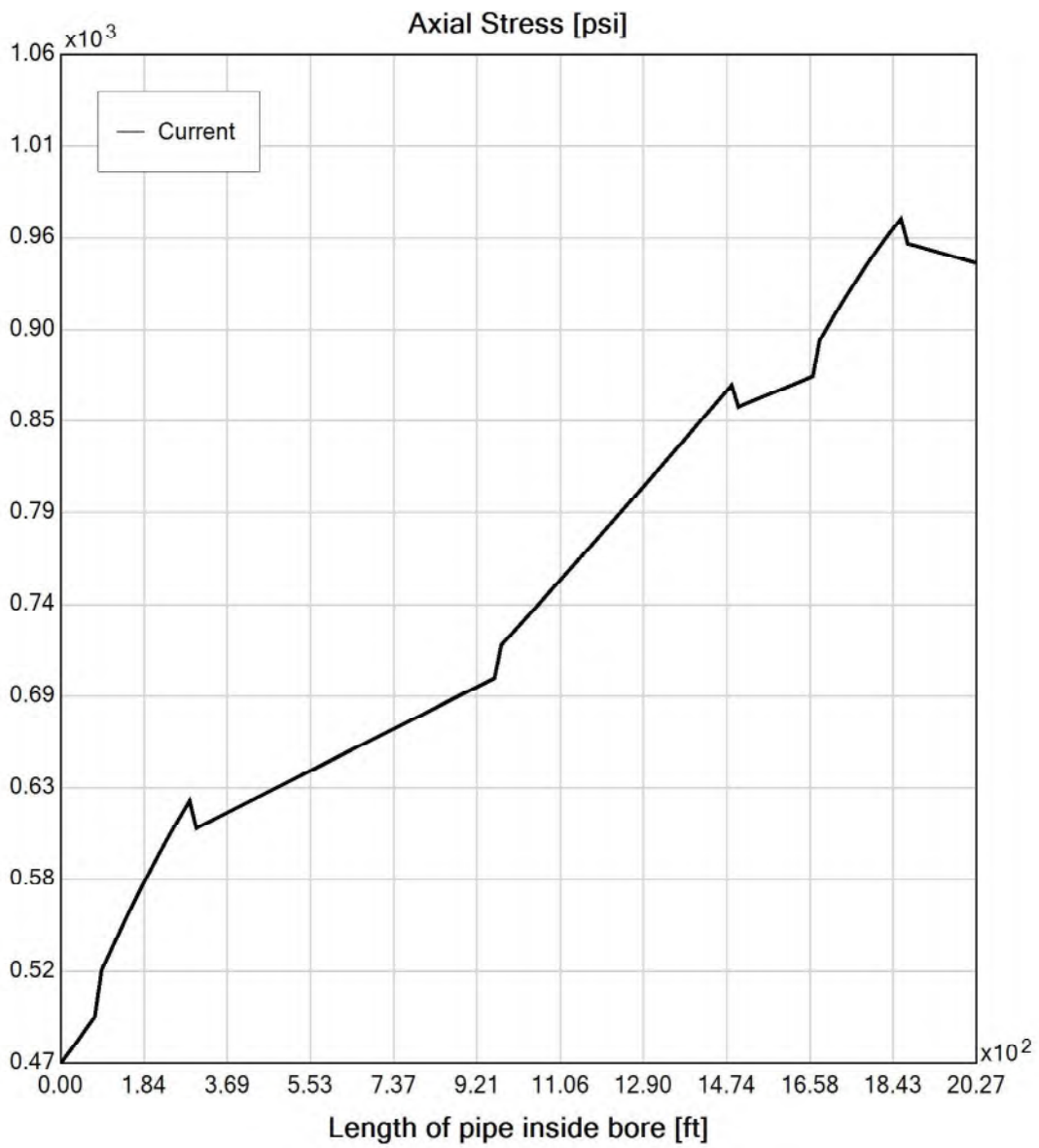
Virtual Site

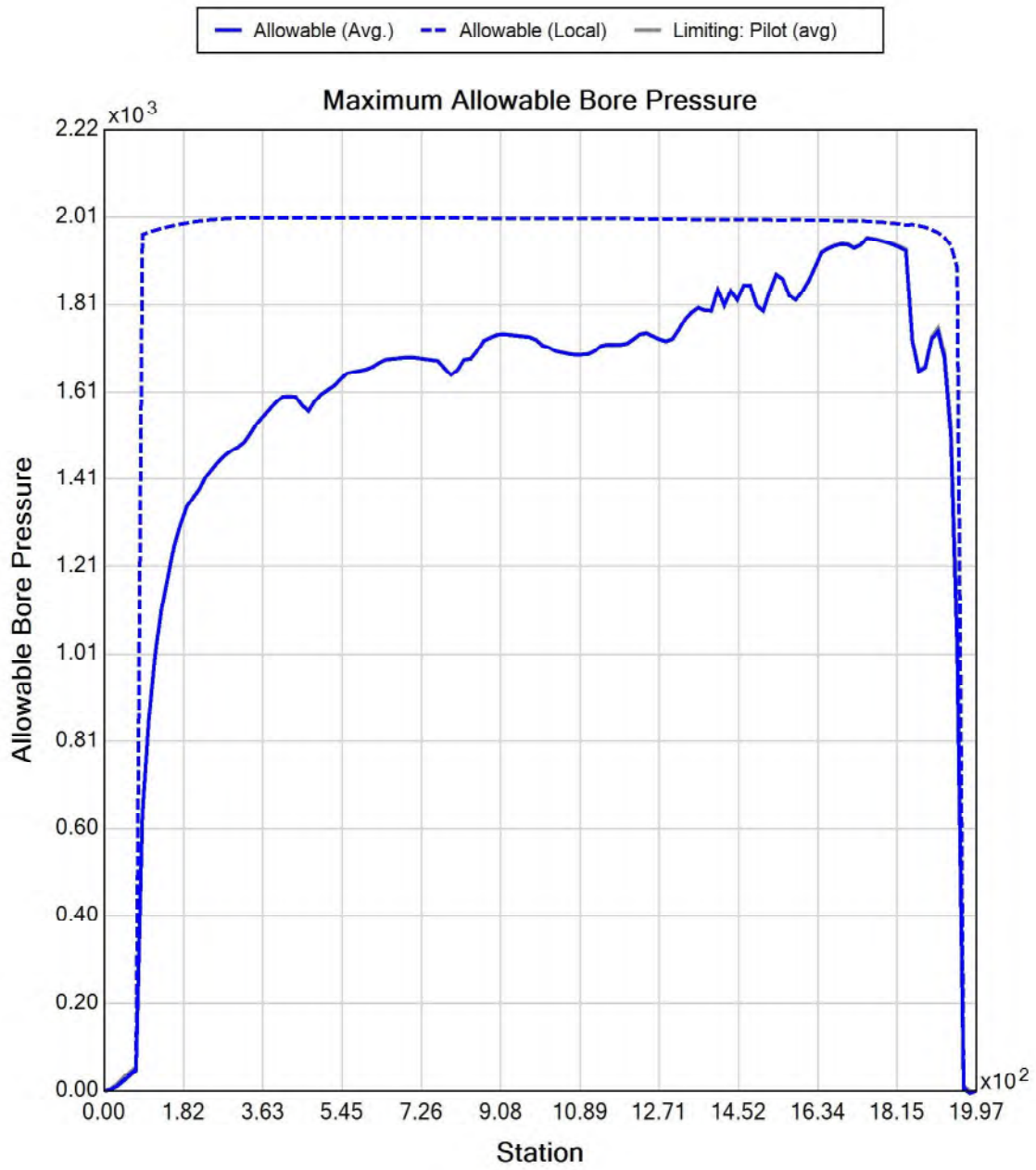


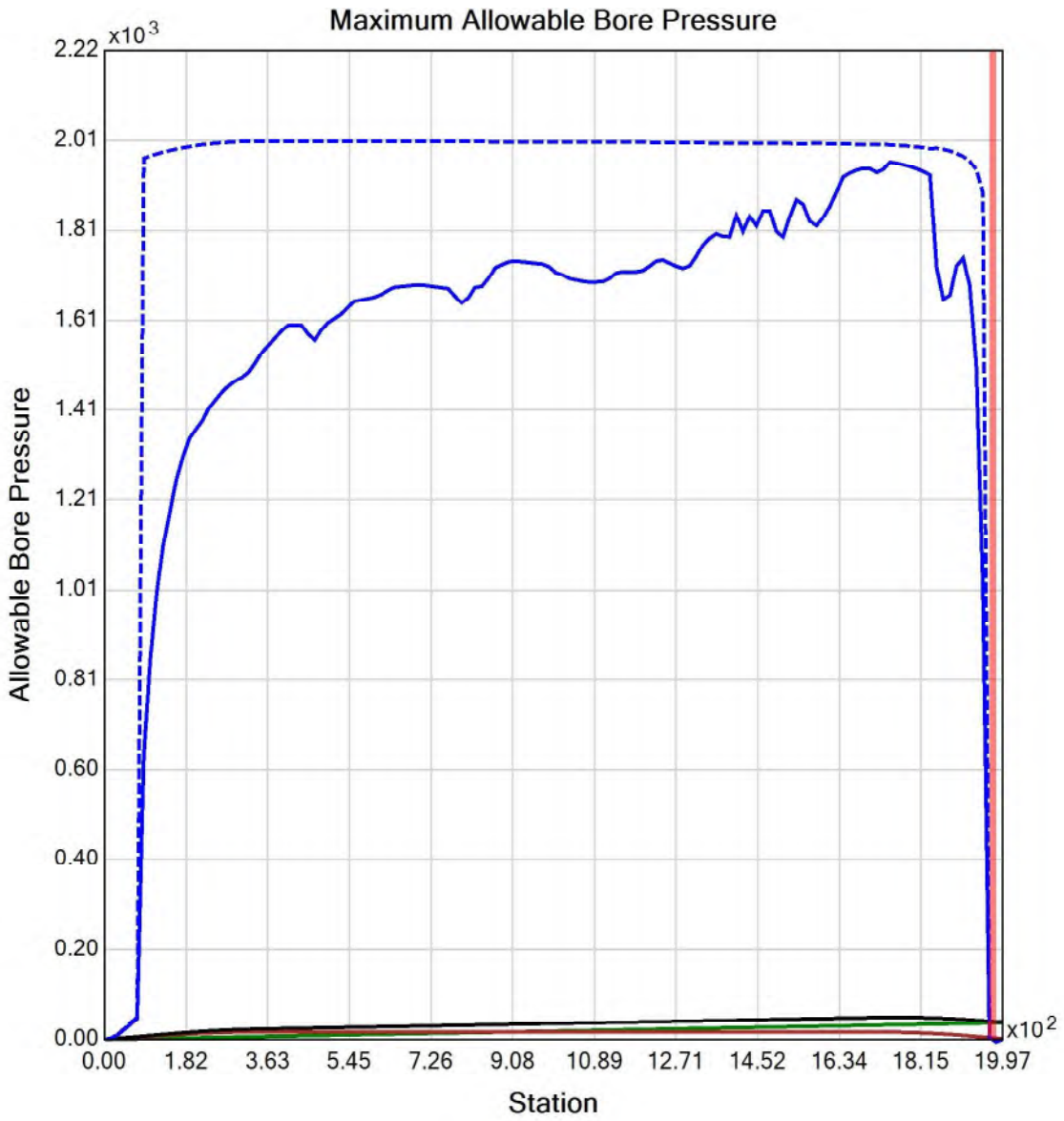














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Project Summary

General: CHPE HDD 57B
P4A
Start Date: 12-10-2021
End Date: 12-10-2021

Project Owner: TDI
Project Contractor: Kiewit
Project Consultant: CHA

Designer: KDL
CHA

Description: HDD 57B 2-inch DR9 Conduit-1

Input Summary

Start Coordinate	(0.00, 0.00, 279.95) ft
End Coordinate	(1985.00, 0.00, 273.93) ft
Project Length	1985.00 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

Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 2" (2.375")
Pipe DR: 9
Pipe Length: 2025.00 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

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.6	29.7
Water Pressure	10.0	10.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	12.5	39.6
Deflection		
Earth Load Deflection	0.734	8.076
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.763	8.105
Compressive Stress [psi]		
Compressive Wall Stress	56.4	178.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1775.6	1775.6
Pullback Stress [psi]	1014.5	1014.5
Pullback Strain	1.764E-2	1.764E-2
Bending Stress [psi]	0.0	4.7
Bending Strain	0	8.247E-5
Tensile Stress [psi]	1014.5	1015.2
Tensile Strain	1.764E-2	1.773E-2

Net External Pressure = 23.6 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.763	7.5	9.8	OK
Unconstrained Collapse [psi]	23.4	129.4	5.5	OK
Compressive Wall Stress [psi]	56.4	1150.0	20.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	33.3	190.7	5.7	OK
Tensile Stress [psi]	1015.2	1200.0	1.2	OK



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Project Summary

General: CHPE HDD 57B
P4A
Start Date: 12-10-2021
End Date: 12-10-2021

Project Owner: TDI
Project Contractor: Kiewit
Project Consultant: CHA

Designer: KDL
CHA

Description: HDD 57B 10-inch DR9 Conduit-2

Input Summary

Start Coordinate	(0.00, 0.00, 279.20) ft
End Coordinate	(1978.16, 0.00, 274.00) ft
Project Length	1978.16 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

Soil Summary

Number of Layers: 5

Soil Layer #1 USCS, Sand (S), SM

From Assistant

Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft³]

Phi: 30.00, S.M.: 200.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Sand (S), SM

From Assistant

Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft³]

Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

Soil Layer #3 USCS, Clay (C), CL

From Assistant

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

Phi: 0.00, S.M.: 200.00, Coh: 3.10 [psi]

Soil Layer #4 USCS, Gravel (G), GP

From Assistant

Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft³]

Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

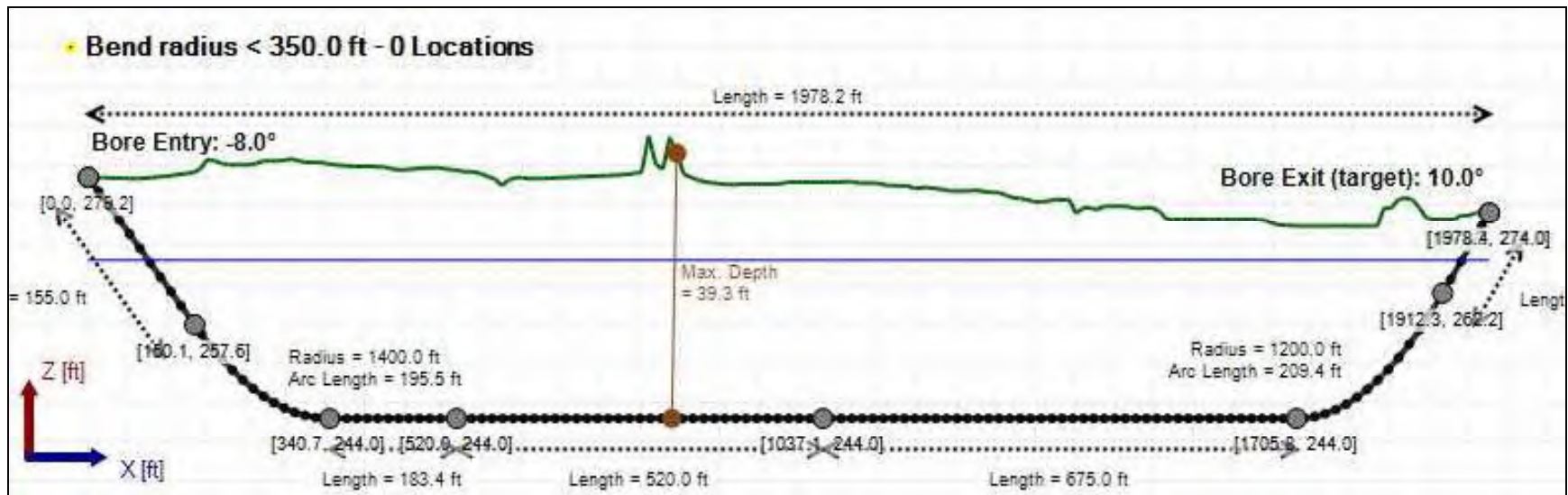
Soil Layer #5 Rock, Geological Classification, Sedimentary Rocks

From Assistant

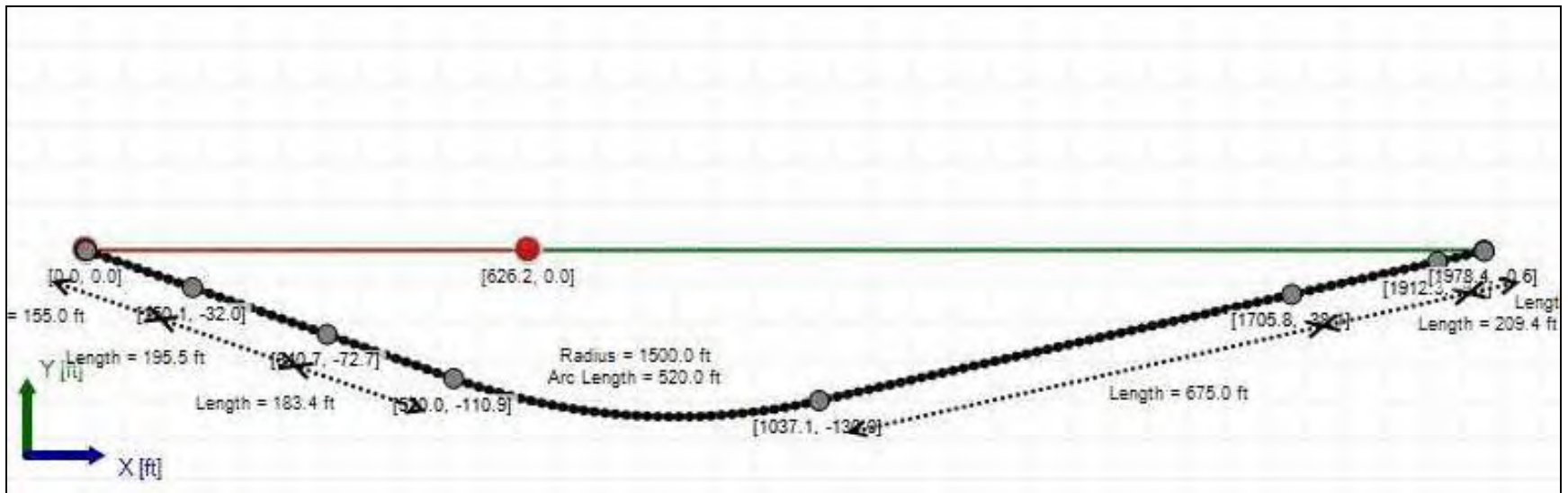
Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft³]

Phi: 37.00, S.M.: 2000.00, Coh: 3000.00 [psi]

Bore Cross-Section View



Bore Plan View



Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 10" (10.75")
Pipe DR: 9
Pipe Length: 2010.00 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

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	6.3	31.8
Water Pressure	10.0	10.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.3	41.8
Deflection		
Earth Load Deflection	1.727	8.663
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.859	8.795
Compressive Stress [psi]		
Compressive Wall Stress	73.4	188.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	33801.3	33801.3
Pullback Stress [psi]	942.7	942.7
Pullback Strain	1.639E-2	1.639E-2
Bending Stress [psi]	0.0	21.5
Bending Strain	0	3.733E-4
Tensile Stress [psi]	942.7	956.4
Tensile Strain	1.639E-2	1.695E-2

Net External Pressure = 22.2 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.859	7.5	4.0	OK
Unconstrained Collapse [psi]	22.9	116.9	5.1	OK
Compressive Wall Stress [psi]	73.4	1150.0	15.7	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	32.9	194.7	5.9	OK
Tensile Stress [psi]	956.4	1200.0	1.3	OK

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	1972.691 psi	2016.887 psi
1	8.00 in	12.00 in	1971.960 psi	2016.529 psi
2	12.00 in	16.13 in	1970.899 psi	2016.010 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 inadvertent 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

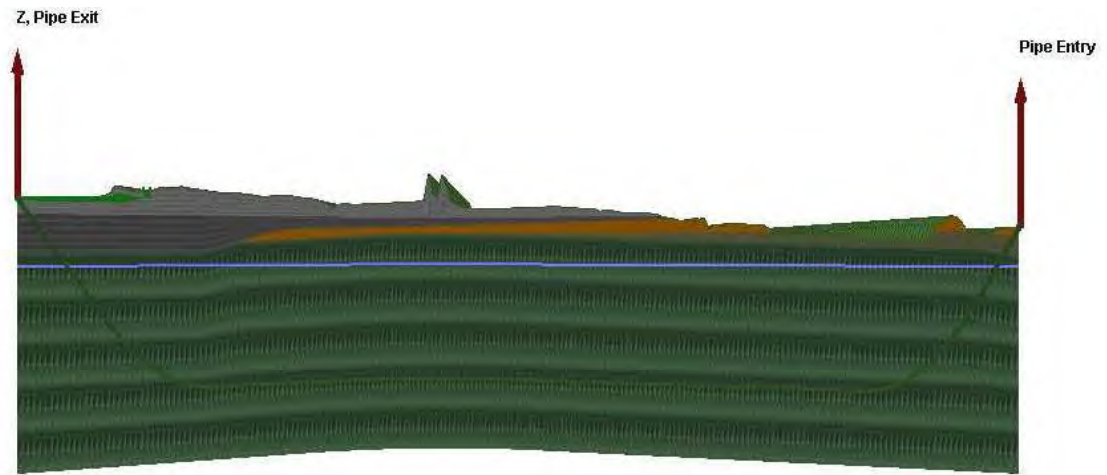
Rheological model: Bingham-Plastic

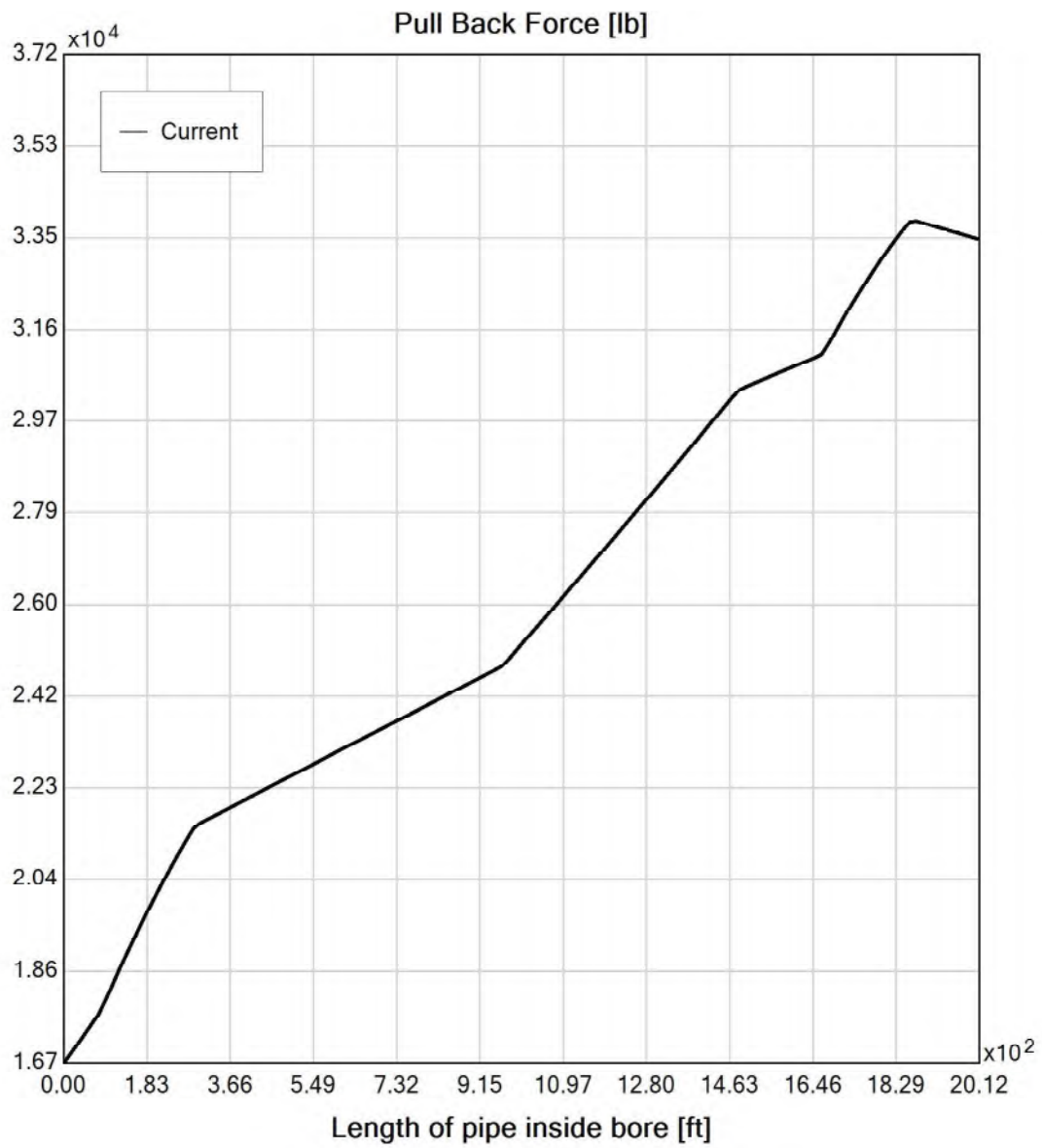
Plastic Viscosity (PV): 25.53

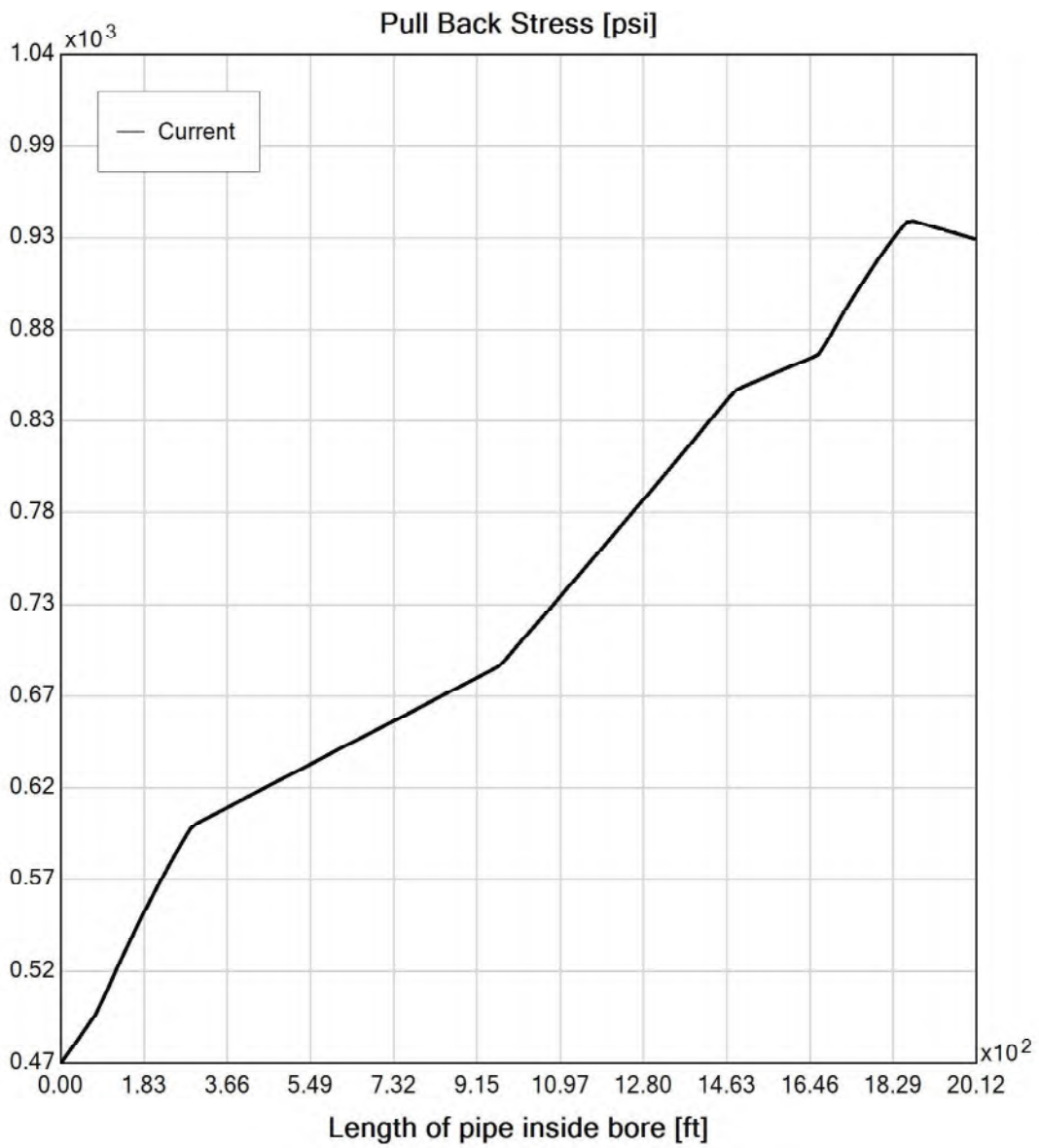
Yield Point (YP): 16.49

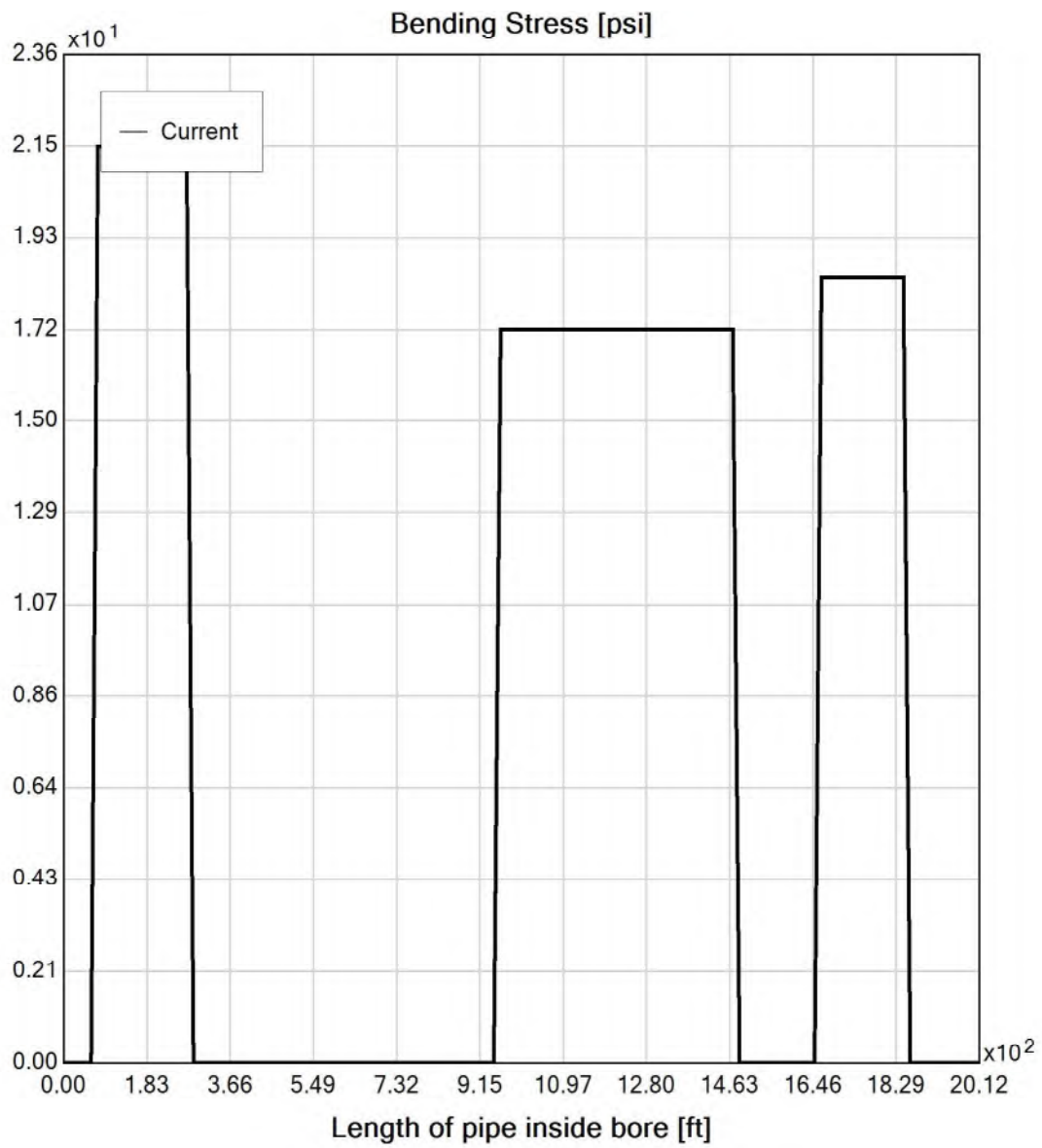
Effective Viscosity (cP): 1202.0

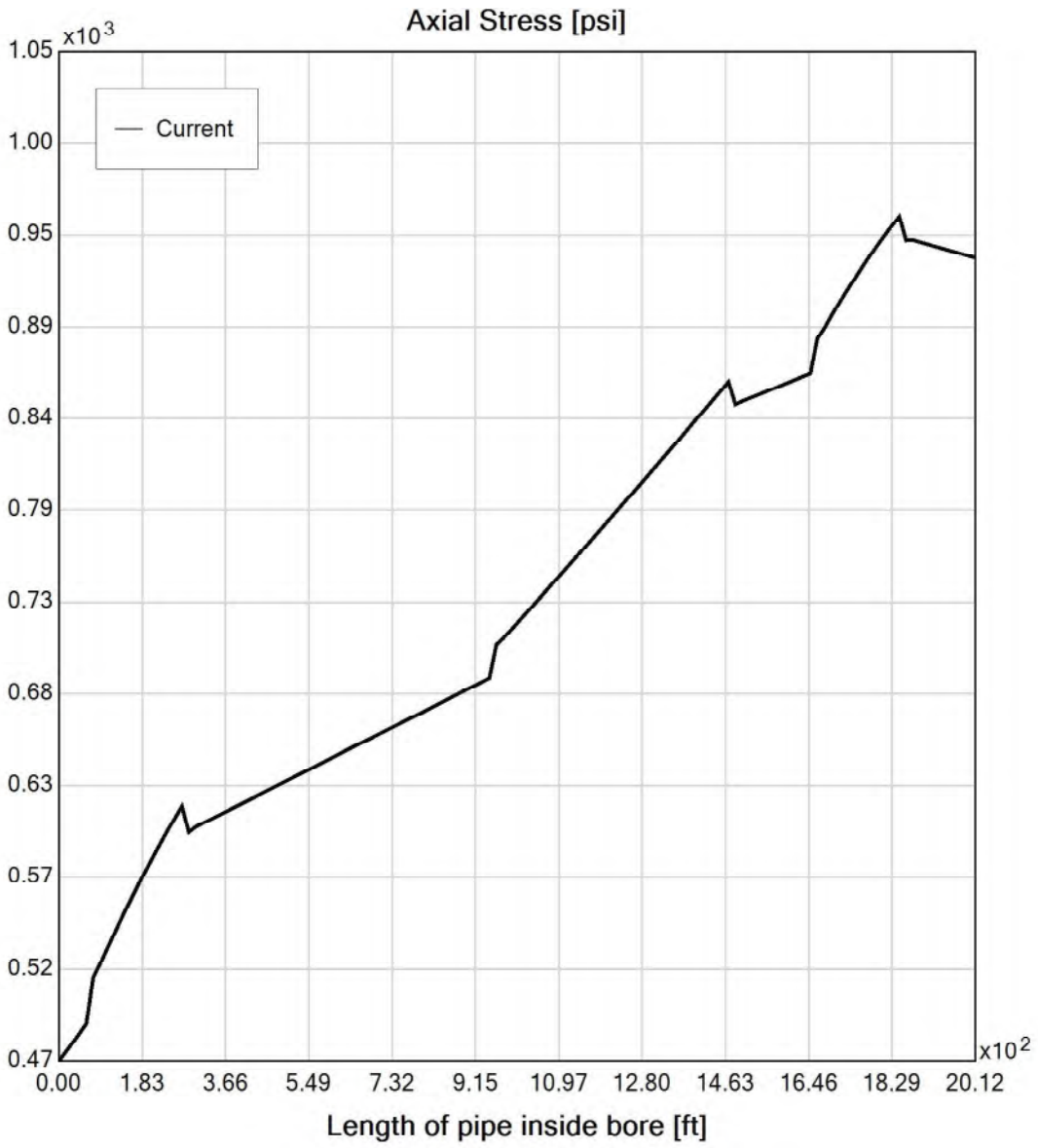
Virtual Site

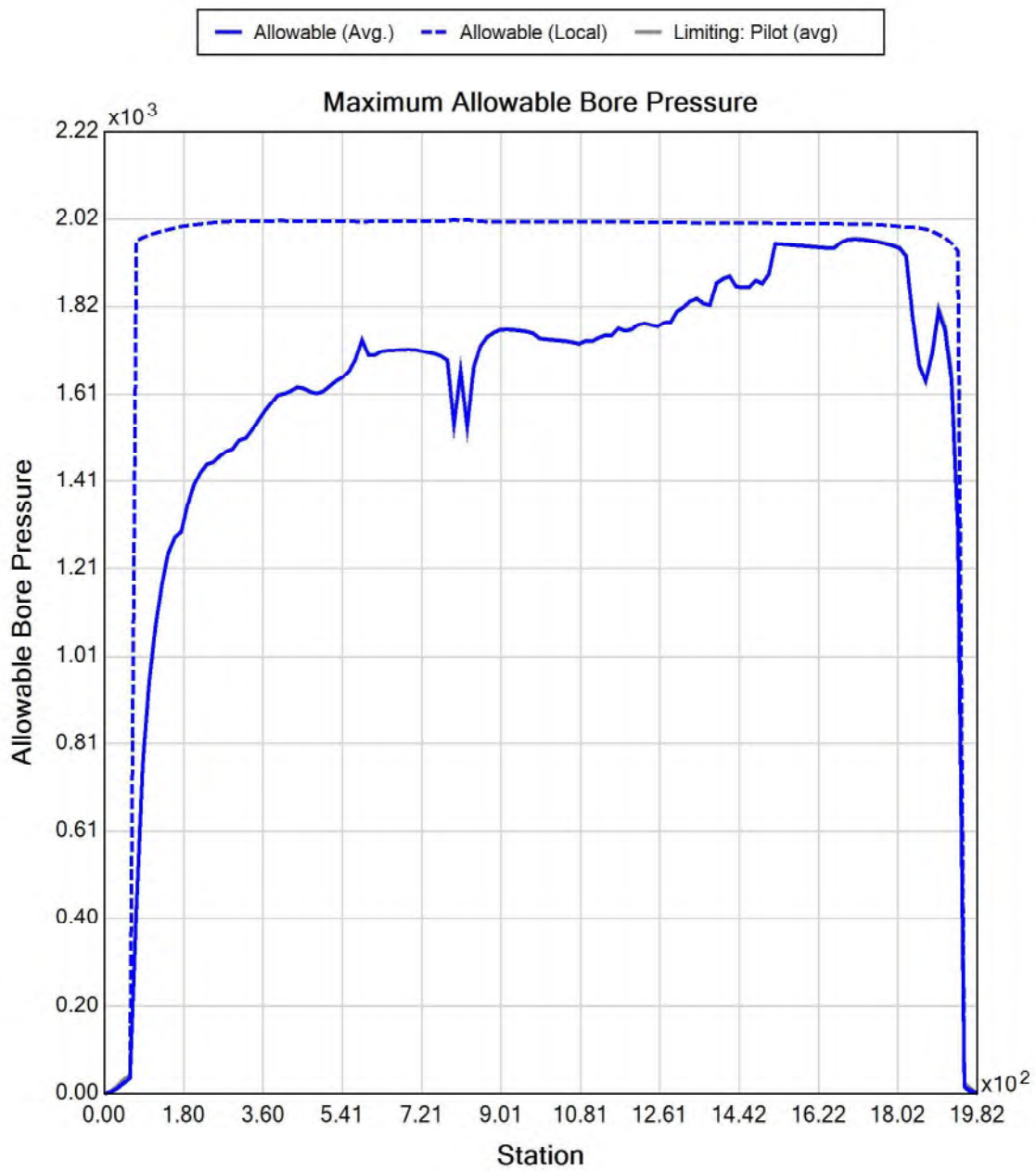


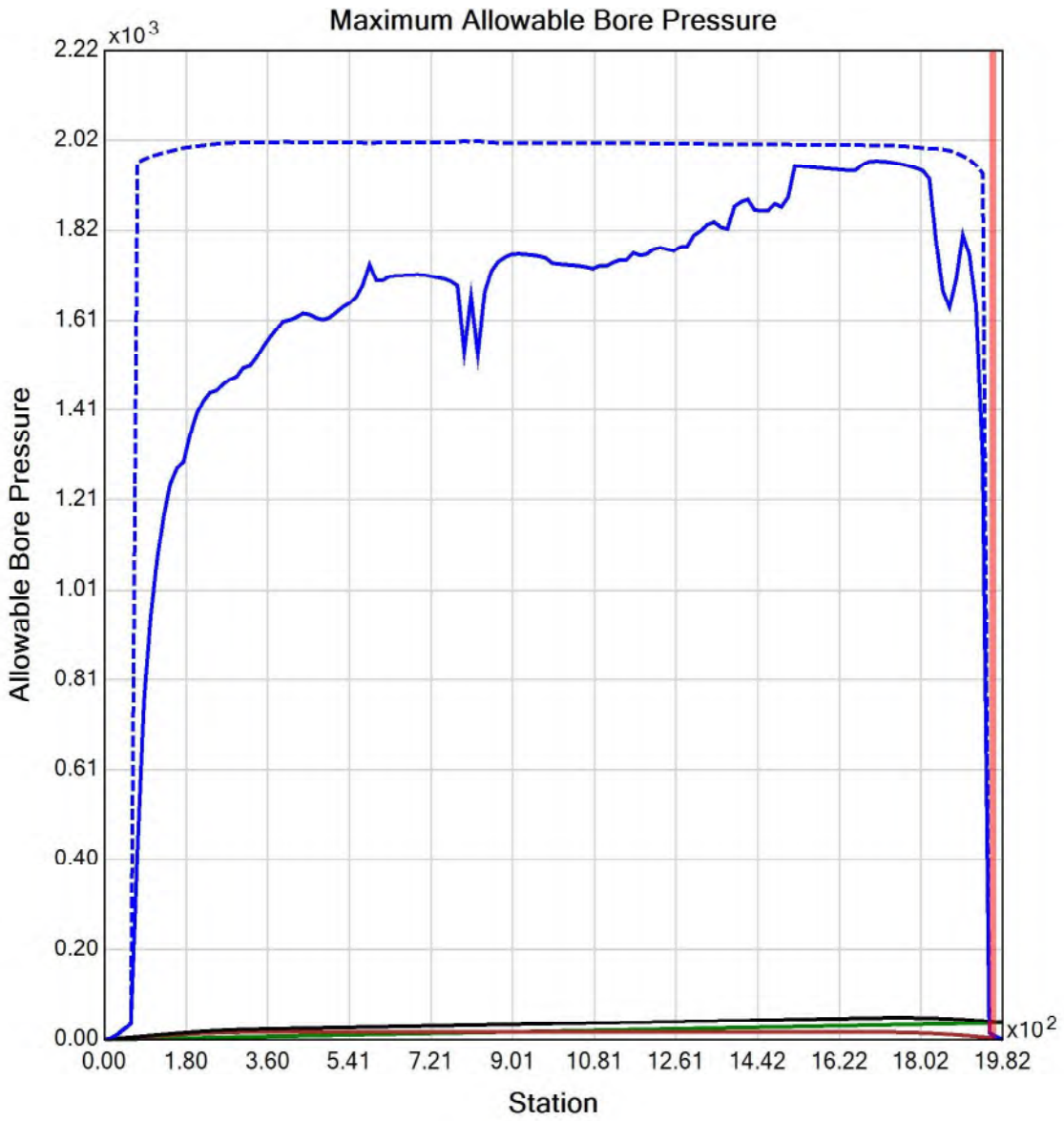














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Project Summary

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P4A
Start Date: 12-10-2021
End Date: 12-10-2021

Project Owner: TDI
Project Contractor: Kiewit
Project Consultant: CHA

Designer: KDL
CHA

Description: HDD 57B 2-inch DR9 Conduit-2

Input Summary

Start Coordinate	(0.00, 0.00, 279.20) ft
End Coordinate	(1978.16, 0.00, 274.00) ft
Project Length	1978.16 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

Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 2" (2.375")
Pipe DR: 9
Pipe Length: 2010.00 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

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.6	31.8
Water Pressure	10.0	10.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	12.5	41.8
Deflection		
Earth Load Deflection	0.738	8.663
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.767	8.692
Compressive Stress [psi]		
Compressive Wall Stress	56.5	188.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1759.4	1759.4
Pullback Stress [psi]	1005.3	1005.3
Pullback Strain	1.748E-2	1.748E-2
Bending Stress [psi]	0.0	4.7
Bending Strain	0	8.247E-5
Tensile Stress [psi]	1005.3	1005.3
Tensile Strain	1.748E-2	1.754E-2

Net External Pressure = 22.2 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.767	7.5	9.8	OK
Unconstrained Collapse [psi]	22.9	129.3	5.7	OK
Compressive Wall Stress [psi]	56.5	1150.0	20.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	32.9	191.5	5.8	OK
Tensile Stress [psi]	1005.3	1200.0	1.2	OK

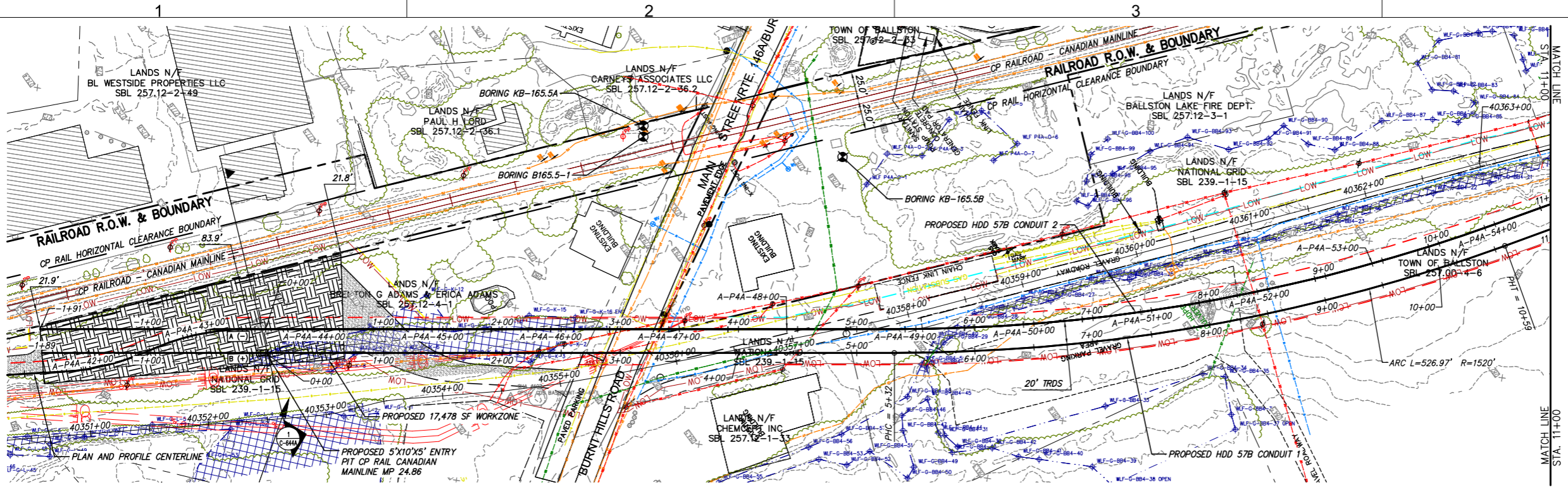
Appendix E

Appendix to EM&CP Appendix J
HDD Design Summary Report

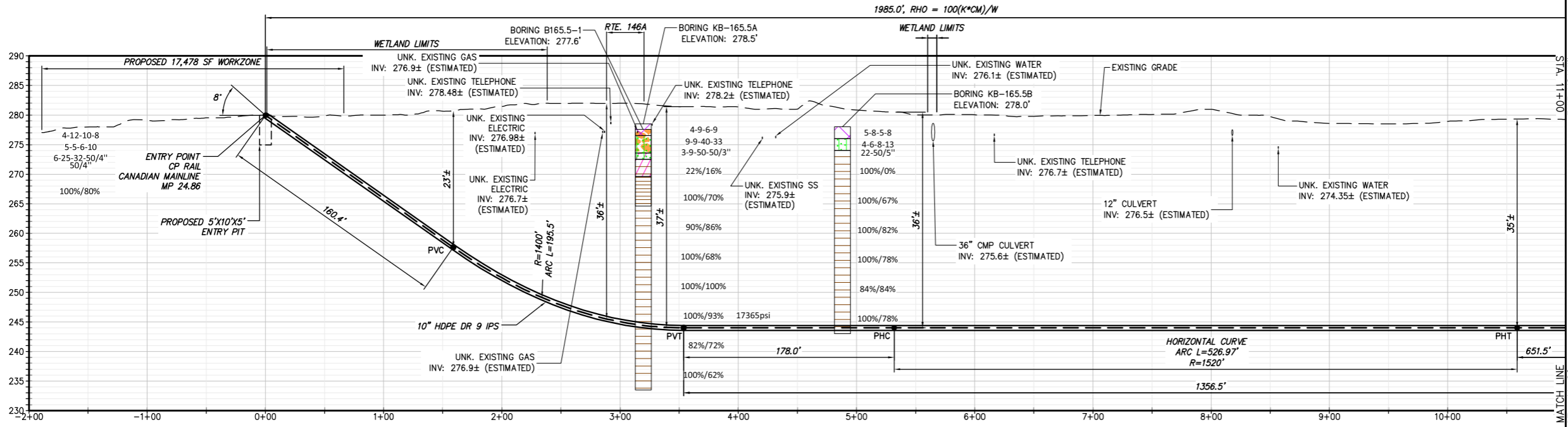
Sheets Added

Appendix E

HDD Design Drawings



PROPOSED HDD 57B PLAN VIEW
CONDUIT 1



PROPOSED HDD 57B PROFILE
CONDUIT 1

Legend	
ASPHALT	Asphalt
Bedrock	Bedrock
Boulder	Boulder
CH	Fat CLAY
CH-MH	SILTY Fat CLAY
CL	Lean CLAY
CL-ML	SILTY CLAY
CONCRETE	Concrete
Fill	Fill
GC	CLAYEY GRAVEL
GC-GM	SILTY CLAYEY GRAVEL
GM	SILTY GRAVEL
GP	Poorly Graded GRAVEL
GP-GC	Poorly Graded GRAVEL with CLAY
GP-GM	Poorly Graded GRAVEL with SILT
GW	Well Graded GRAVEL
GW-GC	Well Graded GRAVEL with CLAY
GW-GM	Well Graded GRAVEL with SILT
Limestone	Limestone
MH	Elastic SILT
ML	SILT
OH	ORGANIC Fat CLAY
OL	ORGANIC Lean CLAY
OL/OH	ORGANIC SOIL
PT	PEAT
Rock	Rock
Sandstone	Sandstone
SC	CLAYEY SAND
SC-SM	SILT, CLAYEY SAND
SHALE	Shale
SILTSTONE	Siltstone
SM	SILTY SAND
SP	Poorly Graded SAND
SP-SC	Poorly Graded SAND with CLAY
SP-SM	Poorly Graded SAND with SILT
SW	Well graded SAND
SW-SC	Well Graded SAND with CLAY
SW-SM	Well Graded SAND with SILT
Topsoil	Topsoil
USGS 601	Gravel or Conglomerate 1
USGS 654	Subgraywacke
USGS 670	Interbedded Sandstone and Shale
USGS 702	Quartzite
USGS 705	Schist
USGS 705	Schist
USGS 708	Gneiss
USGS 708	Gneiss
USGS 718	Granite 1
Void	Void
Water	Water
Weathered Rock	Undefined
Water Table	Water Table during drilling
Delayed Water Table	Water Table after drilling

NOTE:
1) BORE AND BORE HATCHING IN PROFILES ARE NOT CLEARLY LEGIBLE TO THE CLOSE PROXIMITY OF THE FOLLOWING BORES KB-165.5A AND B165.5-1 AT 50 SCALE. USERS MUST CONSULT THE ACTUAL BORE LOGS AND REPORTS FOR THE CLARIFICATION AND OR INTERPRETATION.

BORING LOG STRIP LEGEND	
B101	11000psi =UCS
Blow Counts per 6" = 10-10-10	Recovery %/RQD % = 95%/90%
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration	

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PROJECT NO.: 066076
ALTERED ON: NULL
AFFXED ON: 12/20/2023

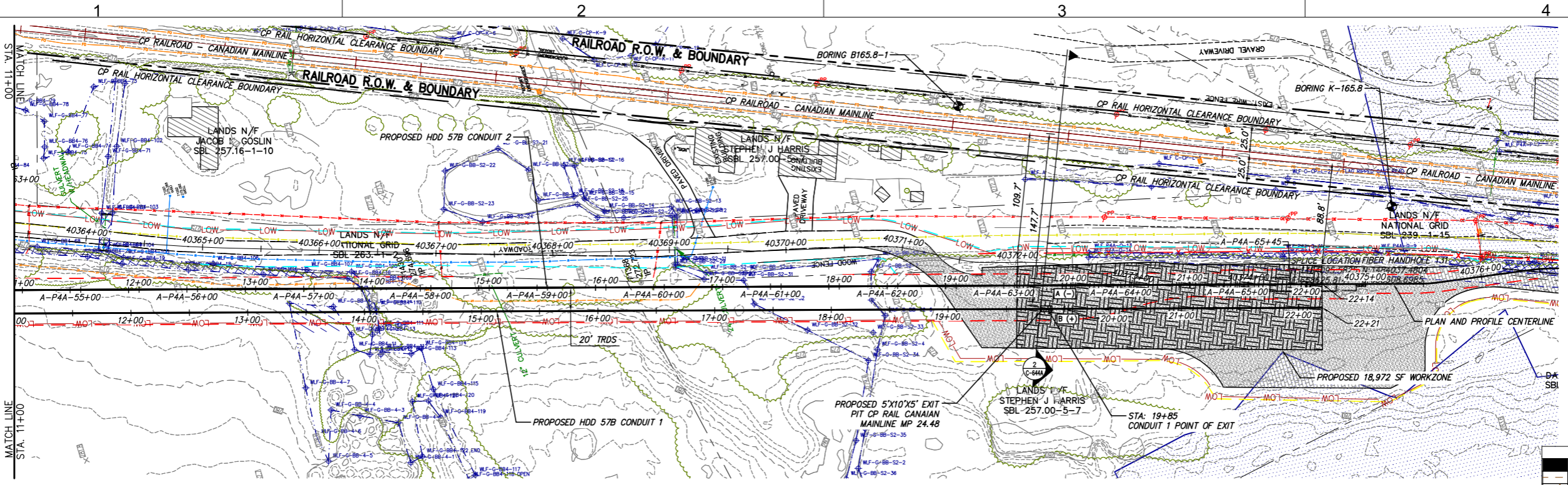
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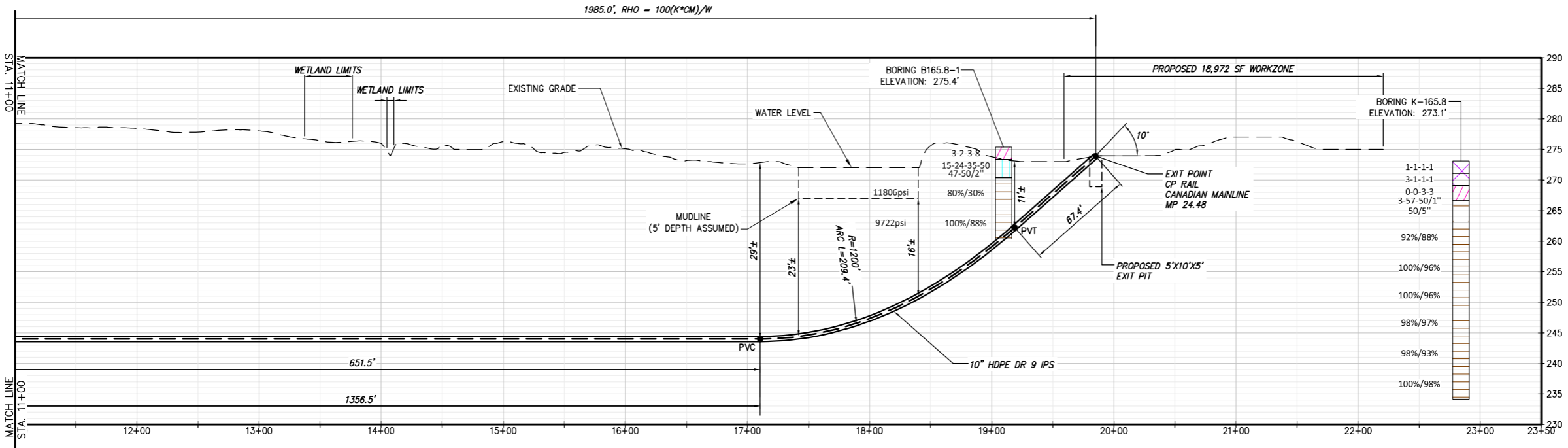
**CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE**
PLAN AND PROFILE - HDD 57B, CONDUIT 1

PERMIT DRAWING NO.
N/A
DRAWING NO.
C-304B

DRAWN BY: KDL DESIGNED BY: SPB APPROVED BY: JEO SCALE: AS NOTED DATE: 08/03/2023



PROPOSED HDD 57B PLAN VIEW
CONDUIT 1



PROPOSED HDD 57B PROFILE
CONDUIT 1

Legend	
ASPHALT	Asphalt
Bedrock	Bedrock
Boulder	Boulder
CH	Fat CLAY
CH-MH	SILTY Fat CLAY
CL	Lean CLAY
CL-ML	SILTY CLAY
CONCRETE	Concrete
Fill	Fill
GC	CLAYEY GRAVEL
GC-GM	SILTY CLAYEY GRAVEL
GM	SILTY GRAVEL
GP	Poorly Graded GRAVEL
GP-GC	Poorly Graded GRAVEL with CLAY
GP-GM	Poorly Graded GRAVEL with SILT
GW	Well Graded GRAVEL
GW-GC	Well Graded GRAVEL with CLAY
GW-GM	Well Graded GRAVEL with SILT
Limestone	Limestone
MH	Elastic SILT
ML	SILT
OH	ORGANIC Fat CLAY
OL	ORGANIC Lean CLAY
OL/OH	ORGANIC SOIL
PT	PEAT
Rock	Rock
Sandstone	Sandstone
SC	CLAYEY SAND
SC-SM	SILT, CLAYEY SAND
SHALE	Shale
SILTSTONE	Siltstone
SM	SILTY SAND
SP	Poorly Graded SAND
SP-SC	Poorly Graded SAND with CLAY
SP-SM	Poorly Graded SAND with SILT
SW	Well graded SAND
SW-SC	Well Graded SAND with CLAY
SW-SM	Well Graded SAND with SILT
Topsoil	Topsoil
USGS 601	Gravel or Conglomerate 1
USGS 654	Subgravel
USGS 702	Interbedded Sandstone and Shale
USGS 705	Quartzite
USGS 705	Schist
USGS 708	Gneiss
USGS 708	Gneiss
USGS 718	Granite 1
Void	Void
Water	Water
Weathered Rock	Undefined
Water Table	Water Table during drilling
Delayed Water Table	Water Table after drilling

BORING LOG STRIP LEGEND	
B101	11000psi =UCS
Blow Counts per 6" = 10-10-10	
Recovery %/RQD % = 95%/90%	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration	



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PROJECT NO.: 066076
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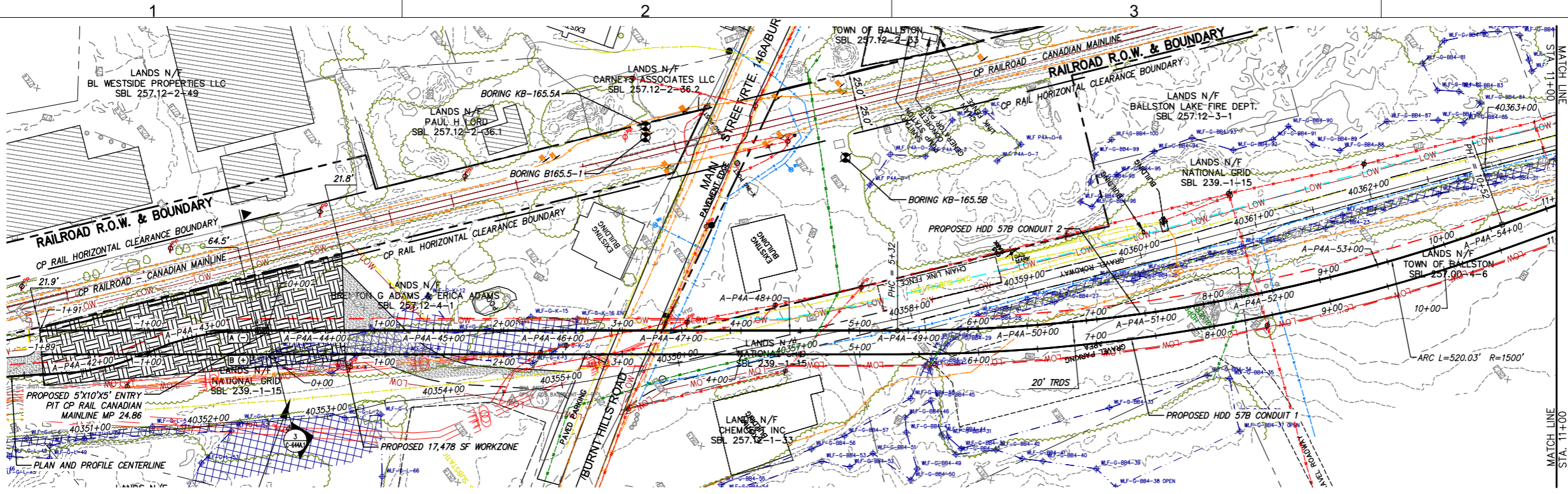
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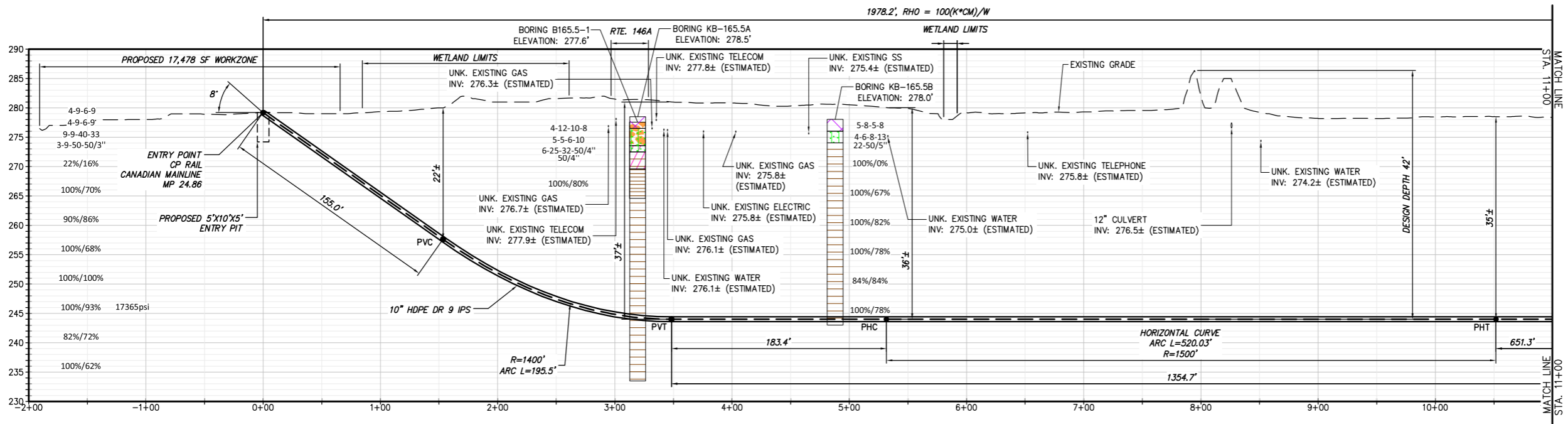
**CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE**
PLAN AND PROFILE - HDD 57B, CONDUIT 1

PERMIT DRAWING NO.
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PROPOSED HDD 57B PLAN VIEW
CONDUIT 2

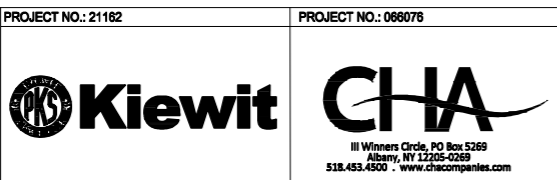


PROPOSED HDD 57B PROFILE
CONDUIT 2

Legend	
ASPHALT	Asphalt
Bedrock	Bedrock
Boulder	Boulder
CH	Fat CLAY
CH-MH	SILTY Fat CLAY
CL	Lean CLAY
CL-ML	SILTY CLAY
CONCRETE	Concrete
Fill	Fill
GC	CLAYEY GRAVEL
GC-GM	SILTY CLAYEY GRAVEL
GM	SILTY GRAVEL
GP	Poorly Graded GRAVEL
GP-GC	Poorly Graded GRAVEL with CLAY
GP-GM	Poorly Graded GRAVEL with SILT
GW	Well Graded GRAVEL
GW-GC	Well Graded GRAVEL with CLAY
GW-GM	Well Graded GRAVEL with SILT
Limestone	Limestone
MH	Elastic SILT
ML	SILT
OH	ORGANIC Fat CLAY
OL	ORGANIC Lean CLAY
OL/OH	ORGANIC SOIL
PT	PEAT
Rock	Rock
Sandstone	Sandstone
SC	CLAYEY SAND
SC-SM	SILT, CLAYEY SAND
SHALE	Shale
SILTSTONE	Siltstone
SM	SILTY SAND
SP	Poorly Graded SAND
SP-SC	Poorly Graded SAND with CLAY
SP-SM	Poorly Graded SAND with SILT
SW	Well graded SAND
SW-SC	Well Graded SAND with CLAY
SW-SM	Well Graded SAND with SILT
Topsoil	Topsoil
USGS 601	Gravel or Conglomerate 1
USGS 654	Subgraywacke
USGS 702	Interbedded Sandstone and Shale
USGS 705	Schist
USGS 705	Schist
USGS 708	Gneiss
USGS 708	Gneiss
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Void	Void
Water	Water
Weathered Rock	Undefined
Water Table	Water Table during drilling
Delayed Water Table	Water Table after drilling

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BORING LOG STRIP LEGEND	
B101	11000psi =UCS
Blow Counts per 6" = 10-10-10	Recovery %/RQD % = 95%/90%
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration	



PROJECT NO.: 21162
PROJECT NO.: 066076
ALTERED ON: NULL
AFFIXED ON: 12/20/2023

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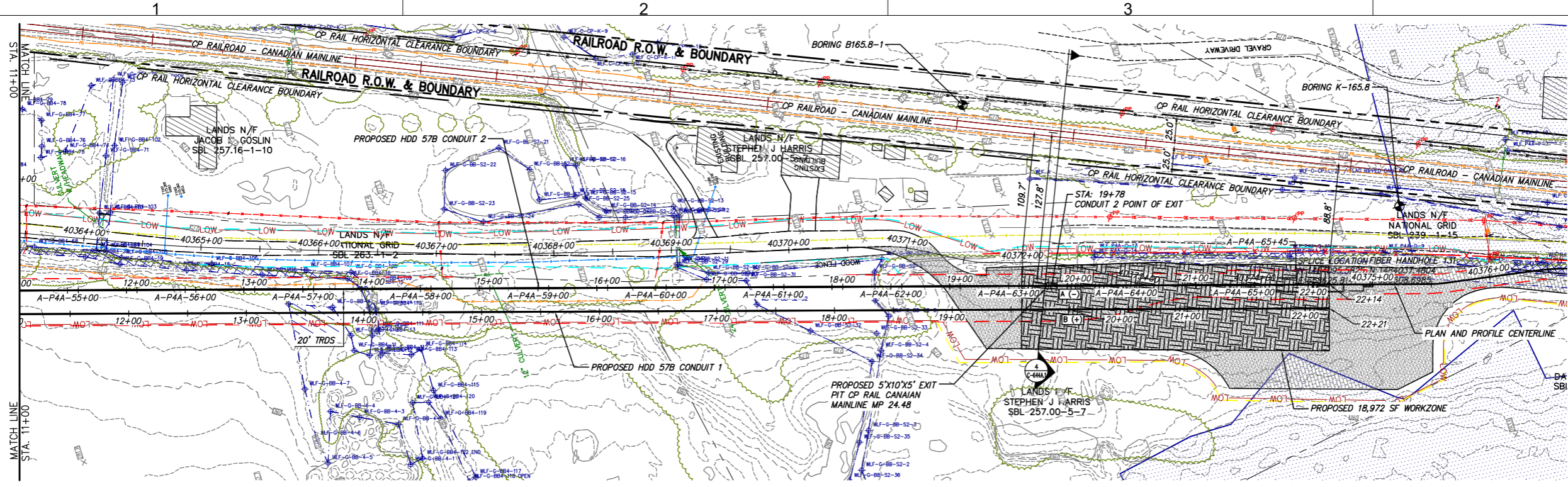
CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
PLAN AND PROFILE - HDD 57B, CONDUIT 2

DRAWN BY: KDL
DESIGNED BY: SPB
APPROVED BY: JEO

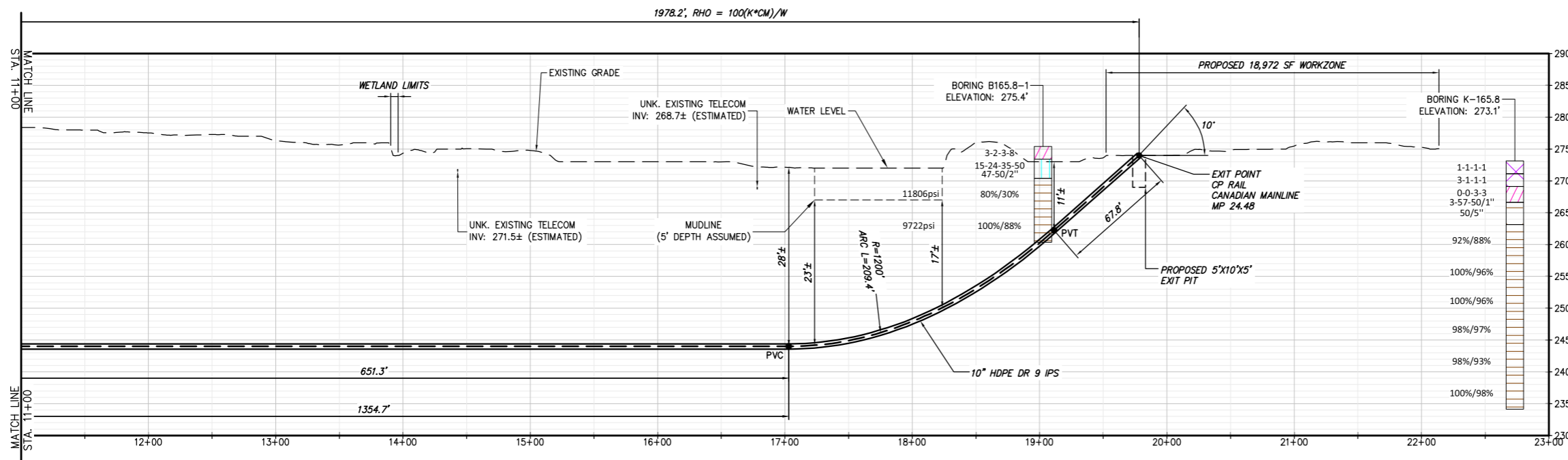
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DATE: 08/03/2023

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PROPOSED HDD 57B PLAN VIEW
CONDUIT 2



PROPOSED HDD 57B PROFILE
CONDUIT 2

Legend	
ASPHALT	Asphalt
Bedrock	Bedrock
Boulder	Boulder
CH	Fat CLAY
CH-MH	SILTY Fat CLAY
CL	Lean CLAY
CL-ML	SILTY CLAY
CONCRETE	Concrete
Fill	Fill
GC	CLAYEY GRAVEL
GC-GM	SILTY CLAYEY GRAVEL
GM	SILTY GRAVEL
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GW-GM	Well Graded GRAVEL with SILT
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MH	Elastic SILT
ML	SILT
OH	ORGANIC Fat CLAY
OL	ORGANIC Lean CLAY
OL/OH	ORGANIC SOIL
PT	PEAT
Rock	Rock
Sandstone	Sandstone
SC	CLAYEY SAND
SC-SM	SILT, CLAYEY SAND
SHALE	Shale
SILTSTONE	Siltstone
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SP-SM	Poorly Graded SAND with SILT
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USGS 670	Interbedded Sandstone and Shale
USGS 702	Quartzite
USGS 705	Schist
USGS 705	Schist
USGS 708	Gneiss
USGS 708	Gneiss
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Void	Void
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Weathered Rock	Undefined
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Delayed Water Table	Water Table after drilling

BORING LOG STRIP LEGEND	
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Blow Counts per 6" = 10-10-10	
Recovery %/RQD % = 95%/90%	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration	

PROJECT NO.: 21162 PROJECT NO.: 066076 ALTERED ON: NULL AFFIXED ON: 12/20/2023



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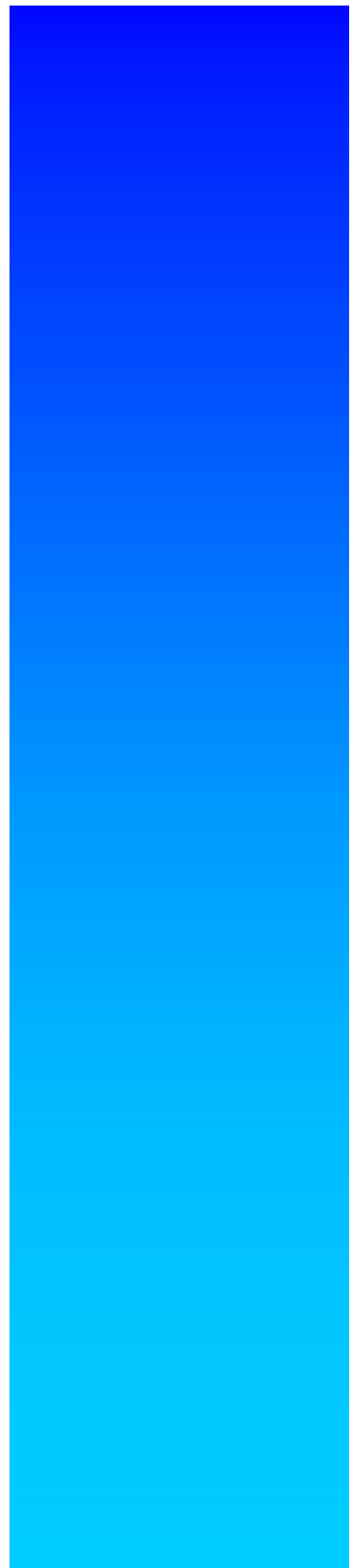
**CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE**
PLAN AND PROFILE - HDD 57B, CONDUIT 2

DRAWN BY: KDL DESIGNED BY: SPB APPROVED BY: JEO SCALE: AS NOTED DATE: 08/03/2023

PERMIT DRAWING NO.
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DRAWING NO.
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CHPE LLC
623 Fifth Avenue, 20th Floor
New York, NY 10022

Segment 6 (Package 4A)
EM&CP Appendix J2
HDD Inadvertent Release Contingency Plan Additions
for HDD 57B



UPDATES TO
Inadvertent Release Contingency Plan
For Horizontal Directional Drilling
in Segment 6 – Package 4A
For HDD 57B
For Design Rev. #1 || Design Rev. Date: 12/20/2023

Ballston Spa to Glenville
Saratoga & Schenectady County, New York

CHA Project Number: 066076

Prepared for:
Transmission Developers Inc.
1301 Avenue of the Americas, 26th Floor
New York, NY 10019



Prepared by:
CHA Consulting, Inc.
III Winners Circle
Albany, New York 12205
(518) 453-4500

December 2023

1.0 INTRODUCTION

Revised Text

This Inadvertent Release Contingency Plan (IRCP) is for Segment 6 – Package 4A which includes *ten* HDD crossings labeled HDD 51 through HDD 61.

9.0 CROSSING SPECIFIC DISCUSSION

Text Added

HDD CROSSING #57B

HDD #57B consists of two HDD bores located west of the CP Railroad Canadian Mainline, north of the Ballston Lake. The bores are approximately 1985 feet and 1978 feet long as shown in Appendix B. The HDD bores will pass approximately 16-23 feet below the estimated mudline of a pond (assuming a 5' water depth). The ground surface elevation at entry and exit of bore alignment is at approximately El. 279 and El. 274, while most of the run it undulates between El. 275 to El. 280 and dipping down to El. 272 near water level (reference datum NAVD 1988).

Portions of the work zones on both side of the bores are proposed to minorly impact NY designated wetlands. The proposed work at this location must be constructed in accordance with the Article VII Certificate and associated EM&CP.

Ground conditions at HDD #57B: *Based on the layering observed in the three borings conducted along the alignment, the soil profile for the HDD #57B BoreAid analysis will consist of five (5) layers: loose fill (SM), medium dense silty sand (SM), soft low plasticity clay (CL), very dense weathered rock (GP) and shale bedrock. The soil profiles used for BoreAid analyses for the HDD in this segment are presented in Appendix A.*

Specific design considerations for HDD #57B include:

- Depth of cover during profile design (based on soil borings) to limit the potential inadvertent break through to the road, railroad, or ground surface. General depth of cover under the estimated mudline of the pond (assuming a 5' water depth) is 16-23 feet. Preliminary analysis of the bore, assuming typical drilling methods, indicates that the lowest maximum allowable pressure capacity in the middle of the bore is approximately 1500 psi, Conduit 2 and the total circulating pressure estimated to occur in the middle portion of the bore is approximately 38 psi assuming standard HDD drilling methods. In the remainder of the bore the maximum allowable pressure ranges from approximately 0 to 1930 psi and the approximate applied slurry pressure during drilling ranges from 0 to 56 psi. A sketch showing the maximum allowable pressure and the applied pressure*

is provided in the summary BoreAid analyses in the attached Appendix A.

- *It appears that there is a potential for inadvertent releases in the last 15 ft of Conduit-1 & 2 near exit pit exist. These should be relatively easy to control through the use of conductive conduits, straw bales, silt fences, erosion control measures and vacuum trucks.*
- *Due to work zones being located within wetlands, measures to mitigate the potential inadvertent release are required:*
 - *Barriers to contain the releases to the ground surface, railroad surface and provisions to clean it up (such as use of a vacuum truck).*
 - *In addition, down the hole slurry pressure monitoring and/or conductor casings may be implemented to limit the potential for releases depending on the details of the HDD Subcontractor's selected means and methods.*
- *Generally, for the formation of inadvertent releases, the more critical stage of the HDD process tends to be during the initial pilot hole drilling when the annular space between the bore sidewall and the drill string is the smallest.*
- *Adjusting the drill alignment to miss existing infrastructure including existing utilities, and other obstacles,*
- *Establishing a drill alignment line that allows for gradual angular changes to minimize pressure build-up,*
- *Requiring drilling fluid composition and drilling procedures that minimize drilling fluid pressures,*
- *Requiring drilling fluids that adequately address site-specific drilling concerns while posing the least threat to the environment,*
- *Requiring monitoring and controlling drilling fluid pressures with down-the-hole sensors during pilot hole drilling.*

Appendix A

Appendix to EM&CP Appendix J2
HDD Inadvertent Release Contingency Plan

Sheets Added

Appendix A

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.

CALL YOUR ONE-CALL SYSTEM FIRST



WARNING: Always contact your local One-Call system before the start of your digging project. The BoreAid® system is intended to be used with other utility locating methods, such as the use of the One-Call system and the exposing of existing utilities by potholing.

Locate utilities before drilling. Call 811 (U.S. only) or 1-888-258-0808 (U.S. or Canada) or local utility companies or national regulating authority.

Before you start any digging project, do not forget to call the local One-Call system in your area and any utility company that does not subscribe to the One-Call system. For areas not represented by One-Call Systems International, contact the appropriate utility companies or national regulating authority to locate and mark the underground installations. If you do not call, you may have an accident or suffer injuries; cause interruption of services; damage the environment; or experience job delays.

OSHA CFR 29 1926.651 requires that the estimated location of underground utilities be determined before beginning the excavation or underground drilling operation. When the actual excavation or bore approaches an estimated utility location, the exact location of the underground installation must be determined by a safe, acceptable and dependable method. If the utility cannot be precisely located, it must be shut off by the utility company.

Project Summary

General: CHPE HDD 57B
P4A
Start Date: 12-10-2021
End Date: 12-10-2021

Project Owner: TDI
Project Contractor: Kiewit
Project Consultant: CHA

Designer: KDL
CHA

Description: HDD 57B 10-inch DR9 Conduit-1

Input Summary

Start Coordinate	(0.00, 0.00, 279.95) ft
End Coordinate	(1985.00, 0.00, 273.93) ft
Project Length	1985.00 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

Soil Summary

Number of Layers: 5

Soil Layer #1 USCS, Sand (S), SM

From Assistant

Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft³]

Phi: 30.00, S.M.: 200.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Sand (S), SM

From Assistant

Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft³]

Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

Soil Layer #3 USCS, Clay (C), CL

From Assistant

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

Phi: 0.00, S.M.: 200.00, Coh: 3.10 [psi]

Soil Layer #4 USCS, Gravel (G), GP

From Assistant

Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft³]

Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

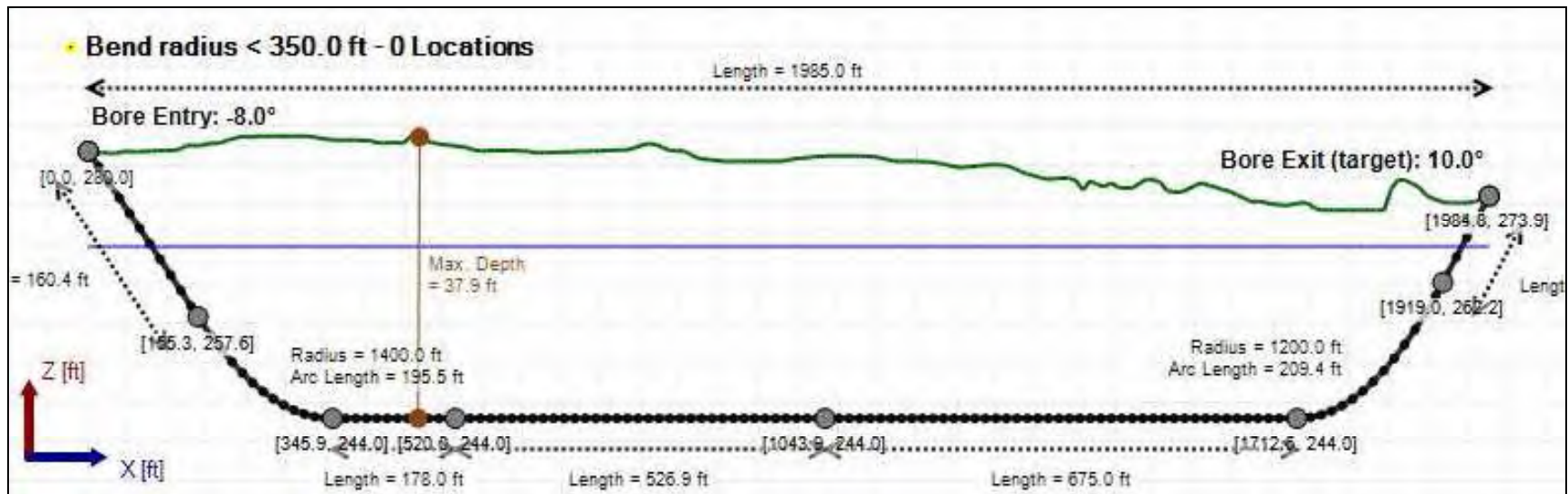
Soil Layer #5 Rock, Geological Classification, Sedimentary Rocks

From Assistant

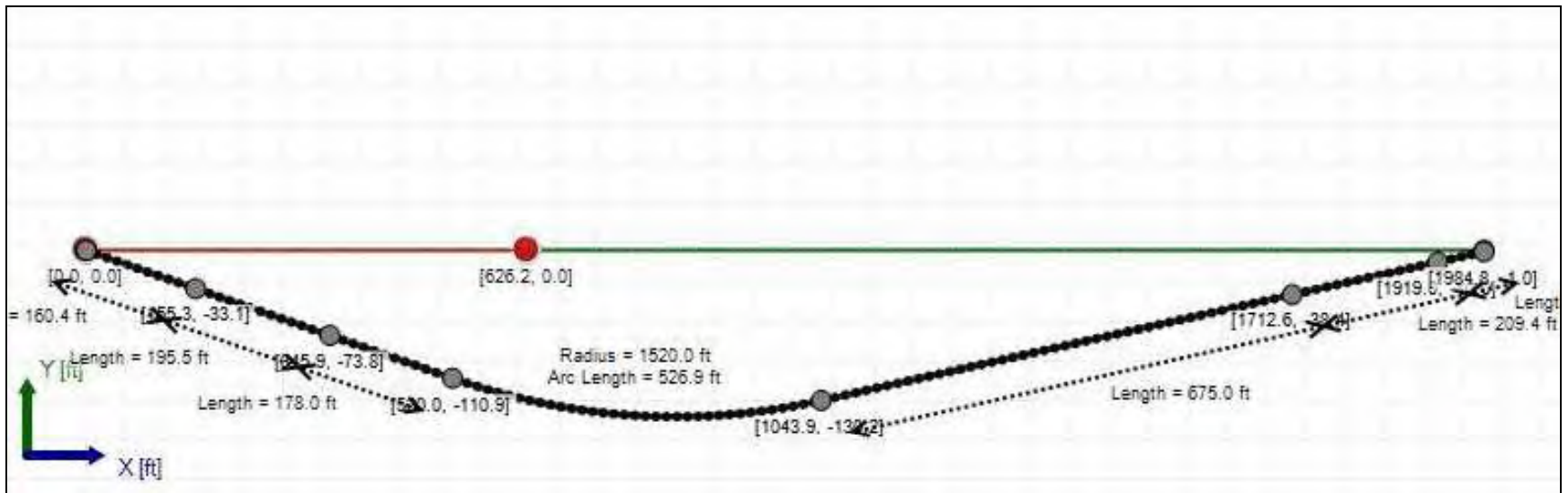
Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft³]

Phi: 37.00, S.M.: 2000.00, Coh: 3000.00 [psi]

Bore Cross-Section View



Bore Plan View



Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 10" (10.75")
Pipe DR: 9
Pipe Length: 2025.00 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

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	6.3	29.7
Water Pressure	10.0	10.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.3	39.6
Deflection		
Earth Load Deflection	1.721	8.076
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.853	8.208
Compressive Stress [psi]		
Compressive Wall Stress	73.3	178.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	34133.2	34133.2
Pullback Stress [psi]	951.9	951.9
Pullback Strain	1.656E-2	1.656E-2
Bending Stress [psi]	0.0	21.5
Bending Strain	0	3.733E-4
Tensile Stress [psi]	951.9	966.9
Tensile Strain	1.656E-2	1.714E-2

Net External Pressure = 23.6 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.853	7.5	4.0	OK
Unconstrained Collapse [psi]	23.4	117.0	5.0	OK
Compressive Wall Stress [psi]	73.3	1150.0	15.7	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	33.3	193.9	5.8	OK
Tensile Stress [psi]	966.9	1200.0	1.2	OK

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	1968.475 psi	2014.844 psi
1	8.00 in	12.00 in	1967.716 psi	2014.440 psi
2	12.00 in	16.13 in	1966.616 psi	2013.854 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 inadvertent 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

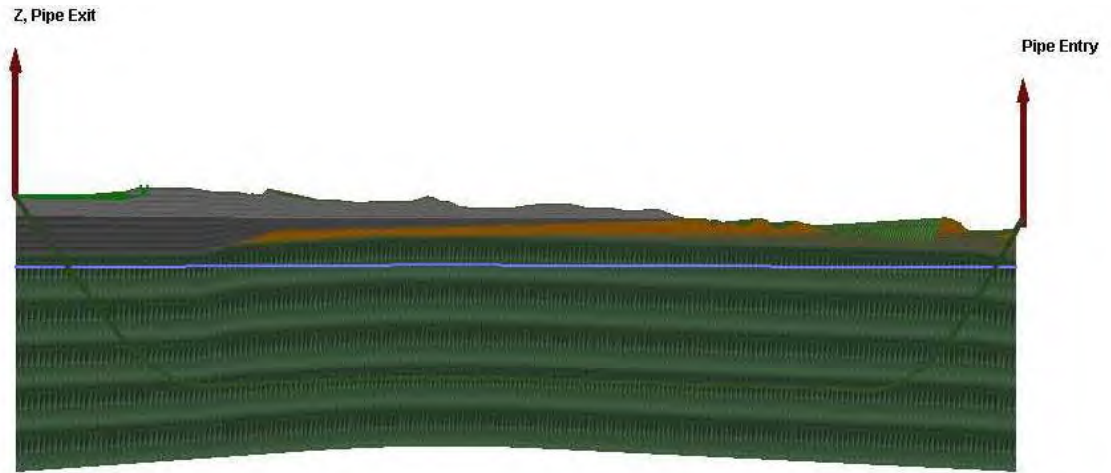
Rheological model: Bingham-Plastic

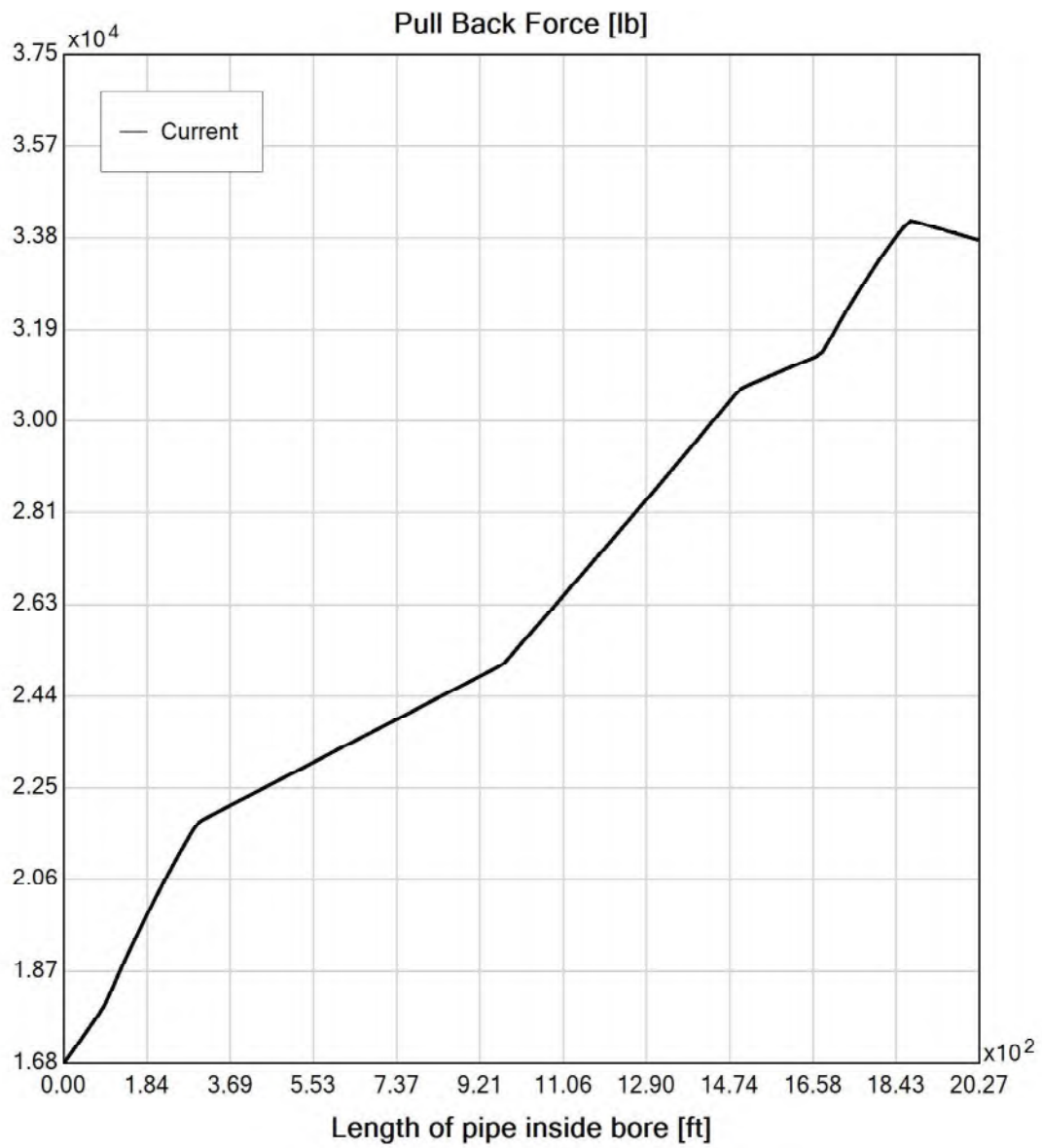
Plastic Viscosity (PV): 25.53

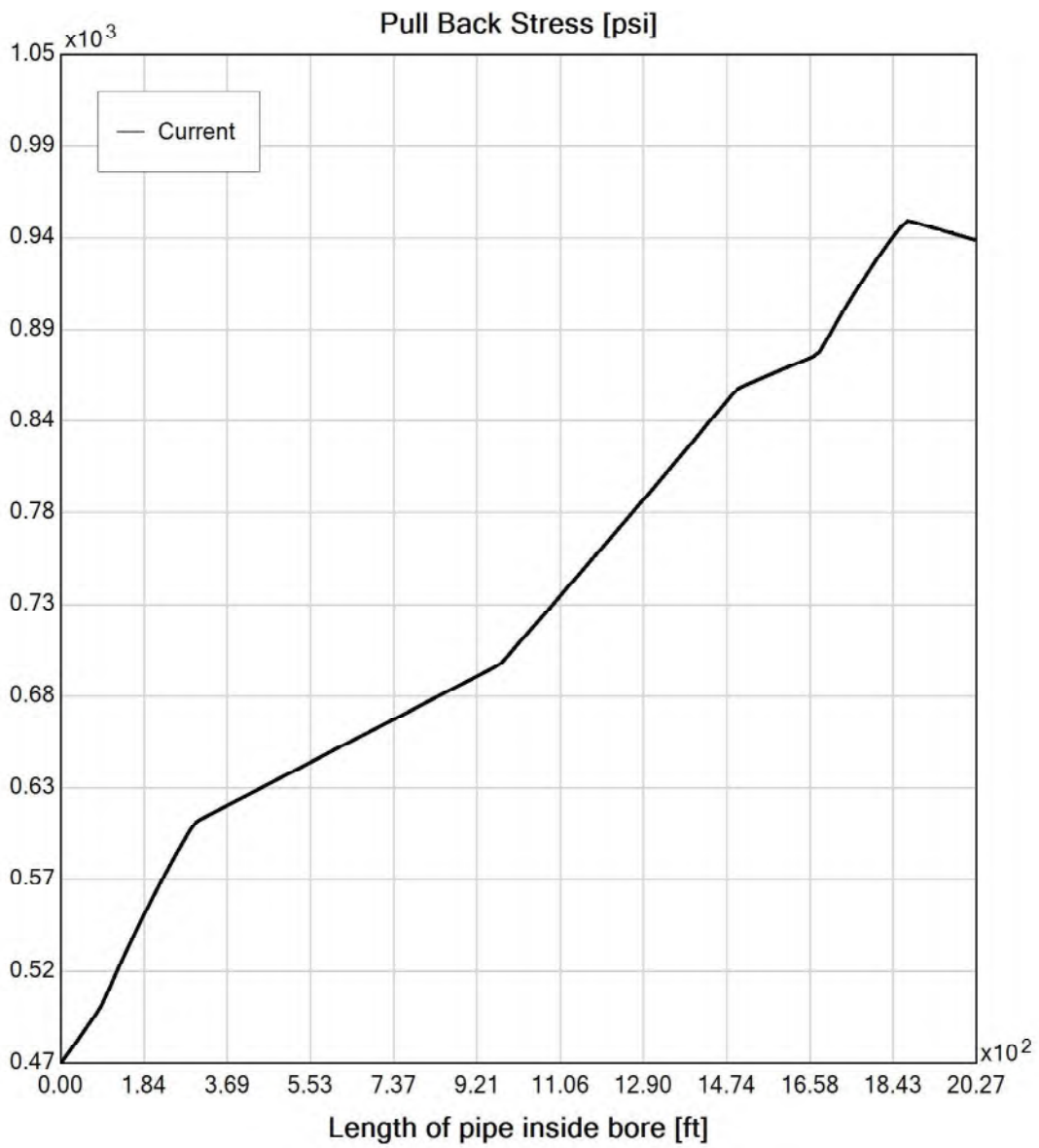
Yield Point (YP): 16.49

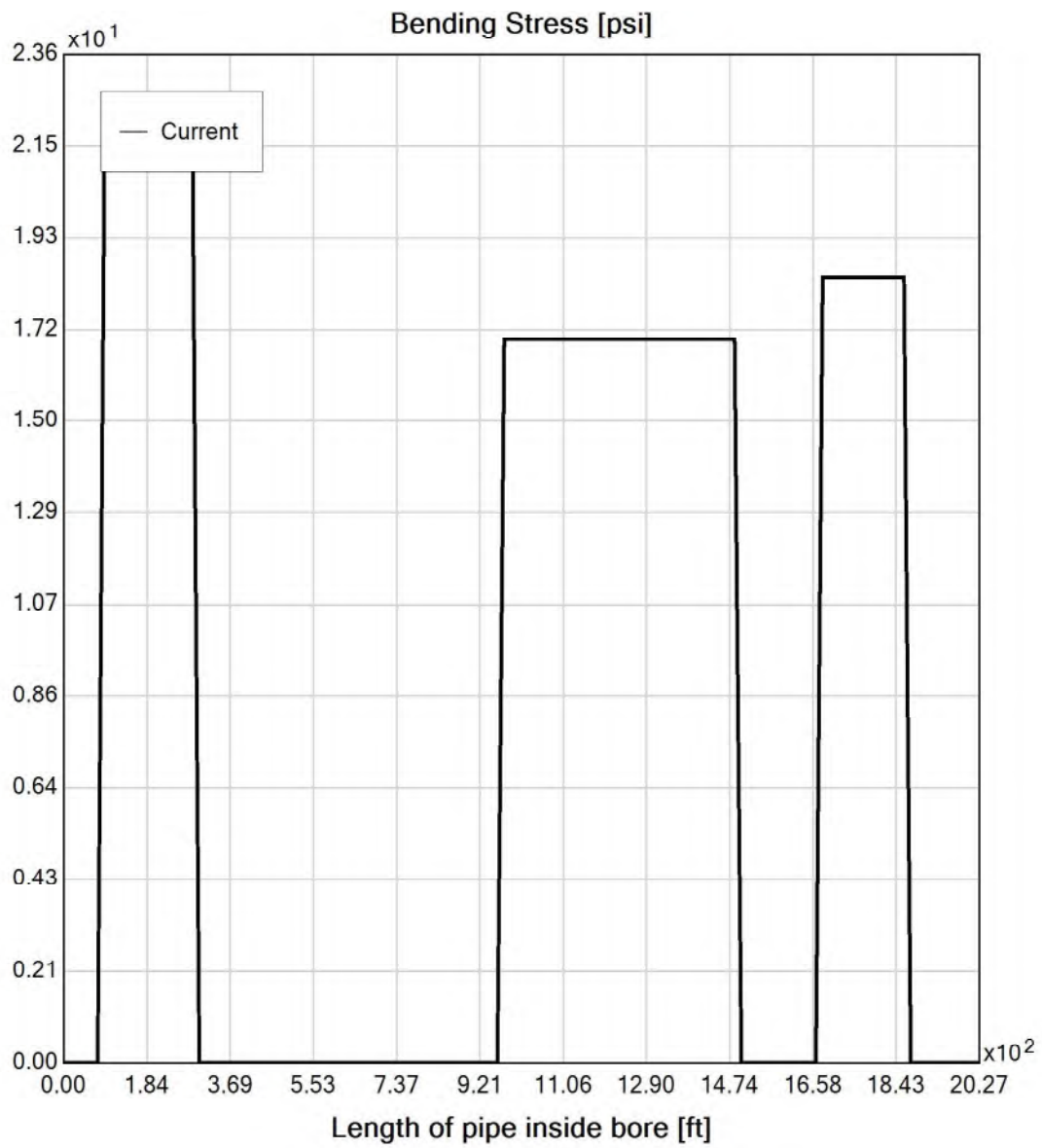
Effective Viscosity (cP): 1202.0

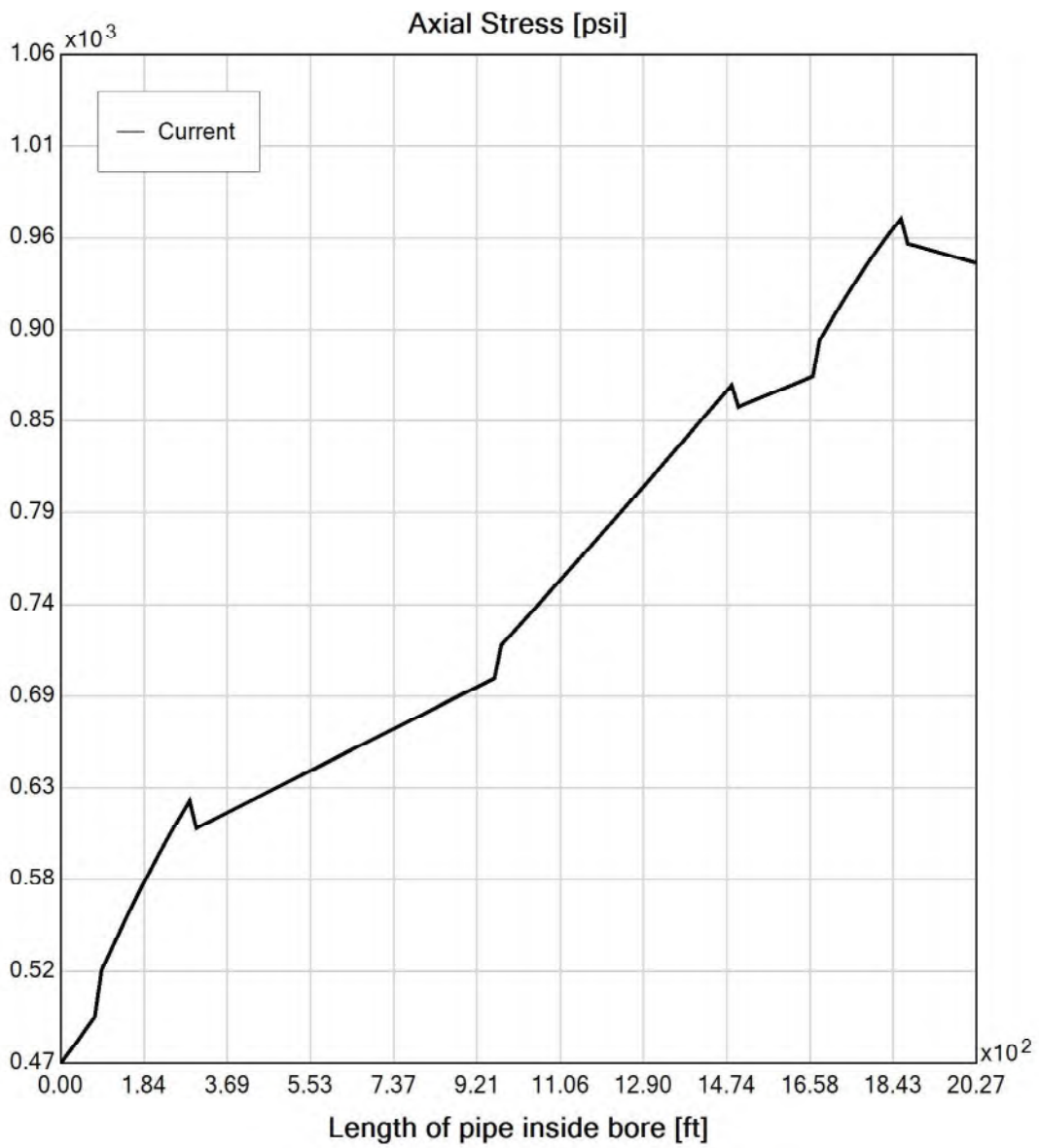
Virtual Site

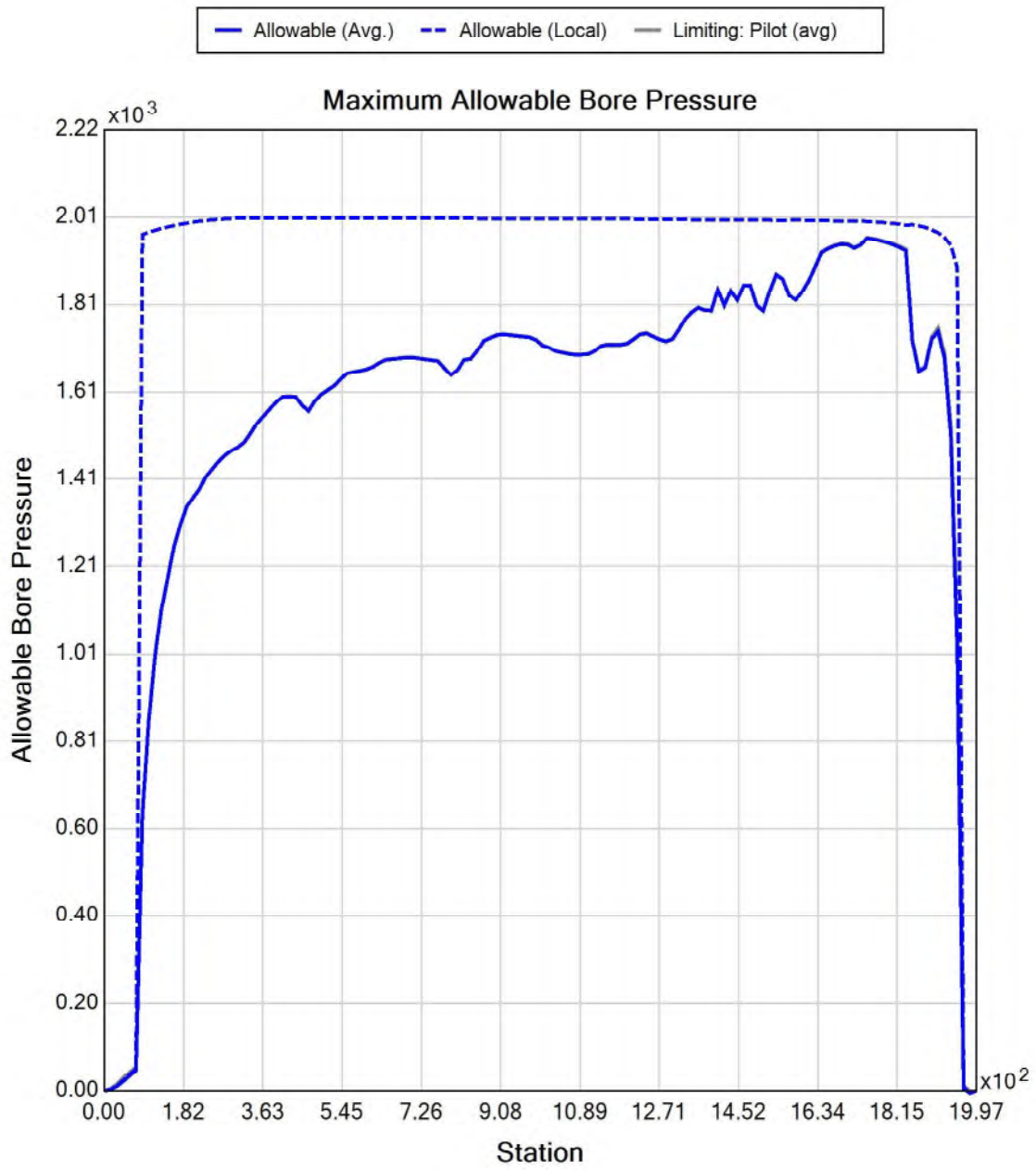


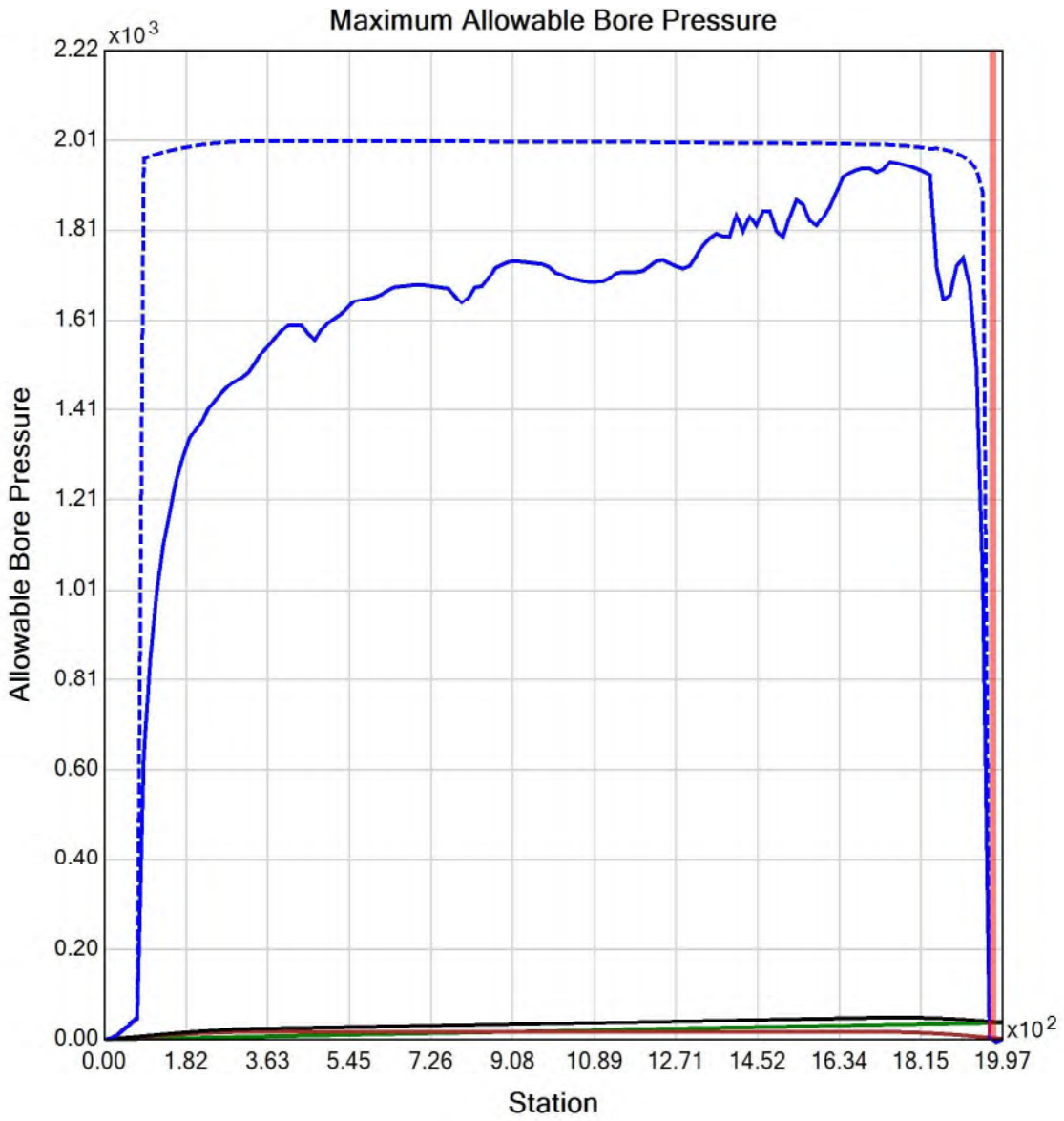














Generated Output



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OSHA CFR 29 1926.651 requires that the estimated location of underground utilities be determined before beginning the excavation or underground drilling operation. When the actual excavation or bore approaches an estimated utility location, the exact location of the underground installation must be determined by a safe, acceptable and dependable method. If the utility cannot be precisely located, it must be shut off by the utility company.

Project Summary

General: CHPE HDD 57B
P4A
Start Date: 12-10-2021
End Date: 12-10-2021

Project Owner: TDI
Project Contractor: Kiewit
Project Consultant: CHA

Designer: KDL
CHA

Description: HDD 57B 2-inch DR9 Conduit-1

Input Summary

Start Coordinate	(0.00, 0.00, 279.95) ft
End Coordinate	(1985.00, 0.00, 273.93) ft
Project Length	1985.00 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

Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 2" (2.375")
Pipe DR: 9
Pipe Length: 2025.00 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

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.6	29.7
Water Pressure	10.0	10.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	12.5	39.6
Deflection		
Earth Load Deflection	0.734	8.076
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.763	8.105
Compressive Stress [psi]		
Compressive Wall Stress	56.4	178.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1775.6	1775.6
Pullback Stress [psi]	1014.5	1014.5
Pullback Strain	1.764E-2	1.764E-2
Bending Stress [psi]	0.0	4.7
Bending Strain	0	8.247E-5
Tensile Stress [psi]	1014.5	1015.2
Tensile Strain	1.764E-2	1.773E-2

Net External Pressure = 23.6 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.763	7.5	9.8	OK
Unconstrained Collapse [psi]	23.4	129.4	5.5	OK
Compressive Wall Stress [psi]	56.4	1150.0	20.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	33.3	190.7	5.7	OK
Tensile Stress [psi]	1015.2	1200.0	1.2	OK



Generated Output



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Project Summary

General: CHPE HDD 57B
P4A
Start Date: 12-10-2021
End Date: 12-10-2021

Project Owner: TDI
Project Contractor: Kiewit
Project Consultant: CHA

Designer: KDL
CHA

Description: HDD 57B 10-inch DR9 Conduit-2

Input Summary

Start Coordinate	(0.00, 0.00, 279.20) ft
End Coordinate	(1978.16, 0.00, 274.00) ft
Project Length	1978.16 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

Soil Summary

Number of Layers: 5

Soil Layer #1 USCS, Sand (S), SM

From Assistant

Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft³]

Phi: 30.00, S.M.: 200.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Sand (S), SM

From Assistant

Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft³]

Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

Soil Layer #3 USCS, Clay (C), CL

From Assistant

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

Phi: 0.00, S.M.: 200.00, Coh: 3.10 [psi]

Soil Layer #4 USCS, Gravel (G), GP

From Assistant

Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft³]

Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

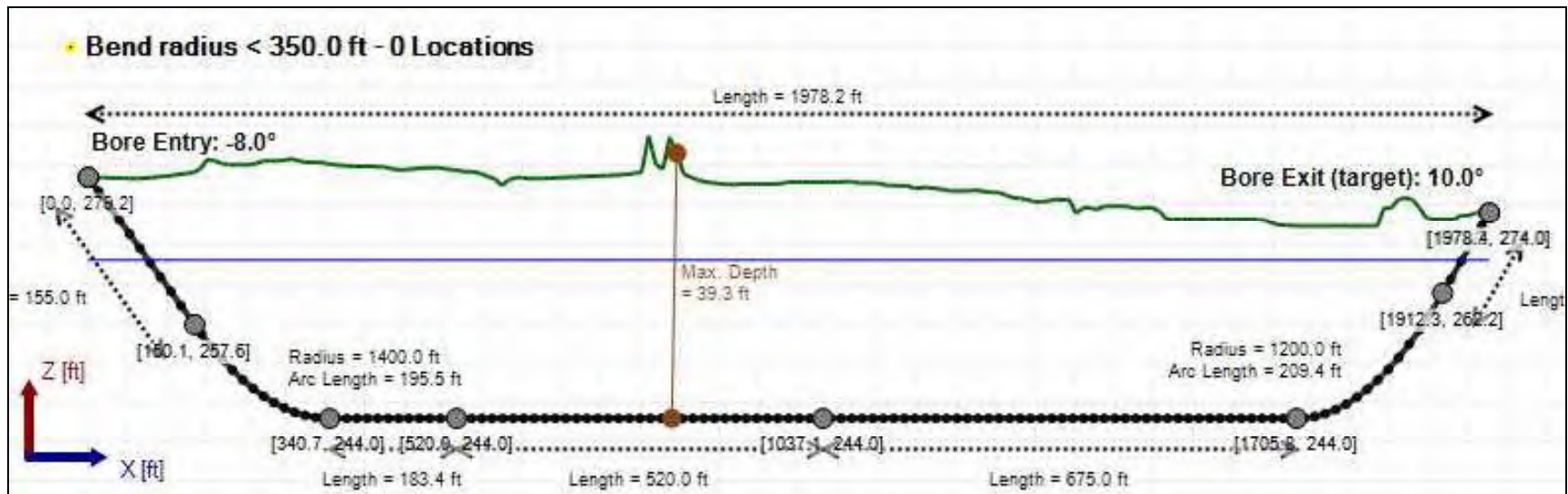
Soil Layer #5 Rock, Geological Classification, Sedimentary Rocks

From Assistant

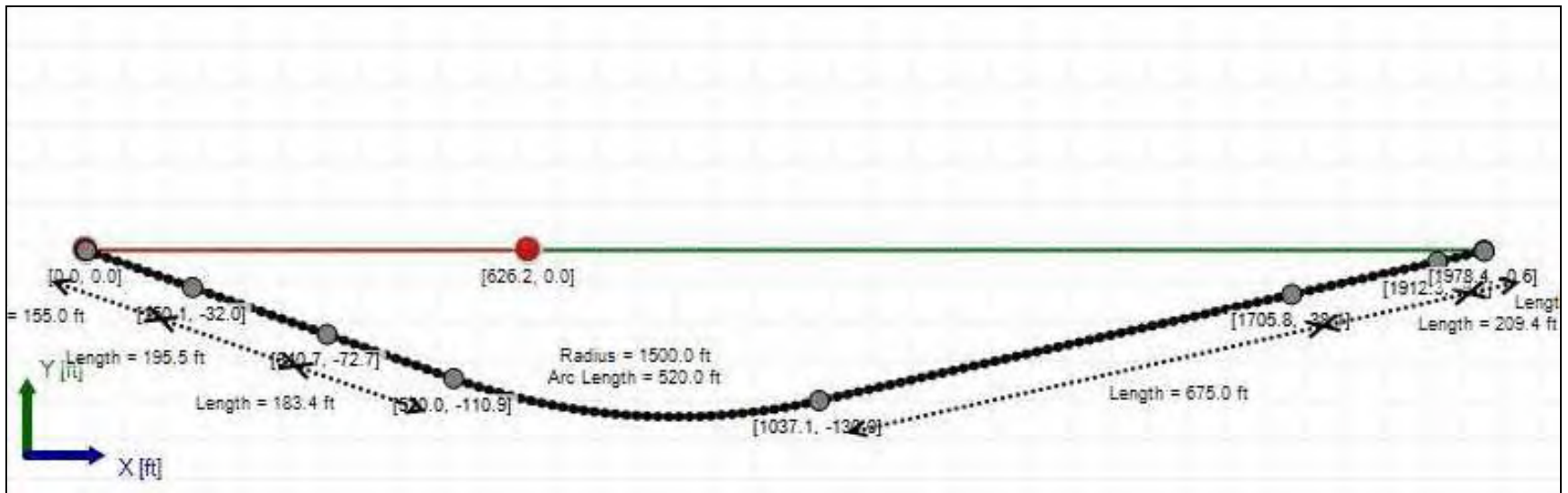
Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft³]

Phi: 37.00, S.M.: 2000.00, Coh: 3000.00 [psi]

Bore Cross-Section View



Bore Plan View



Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 10" (10.75")
Pipe DR: 9
Pipe Length: 2010.00 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

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	6.3	31.8
Water Pressure	10.0	10.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.3	41.8
Deflection		
Earth Load Deflection	1.727	8.663
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.859	8.795
Compressive Stress [psi]		
Compressive Wall Stress	73.4	188.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	33801.3	33801.3
Pullback Stress [psi]	942.7	942.7
Pullback Strain	1.639E-2	1.639E-2
Bending Stress [psi]	0.0	21.5
Bending Strain	0	3.733E-4
Tensile Stress [psi]	942.7	956.4
Tensile Strain	1.639E-2	1.695E-2

Net External Pressure = 22.2 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.859	7.5	4.0	OK
Unconstrained Collapse [psi]	22.9	116.9	5.1	OK
Compressive Wall Stress [psi]	73.4	1150.0	15.7	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	32.9	194.7	5.9	OK
Tensile Stress [psi]	956.4	1200.0	1.3	OK

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	1972.691 psi	2016.887 psi
1	8.00 in	12.00 in	1971.960 psi	2016.529 psi
2	12.00 in	16.13 in	1970.899 psi	2016.010 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 inadvertent 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

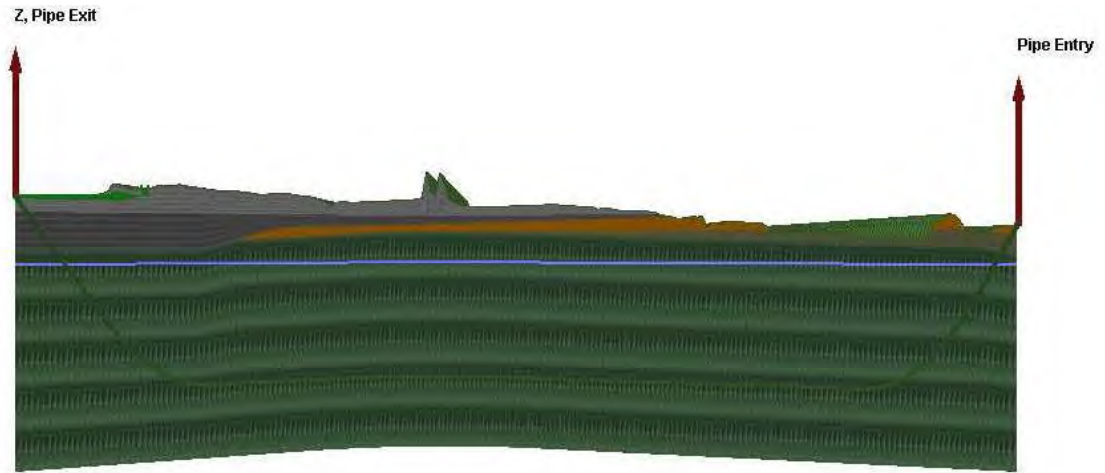
Rheological model: Bingham-Plastic

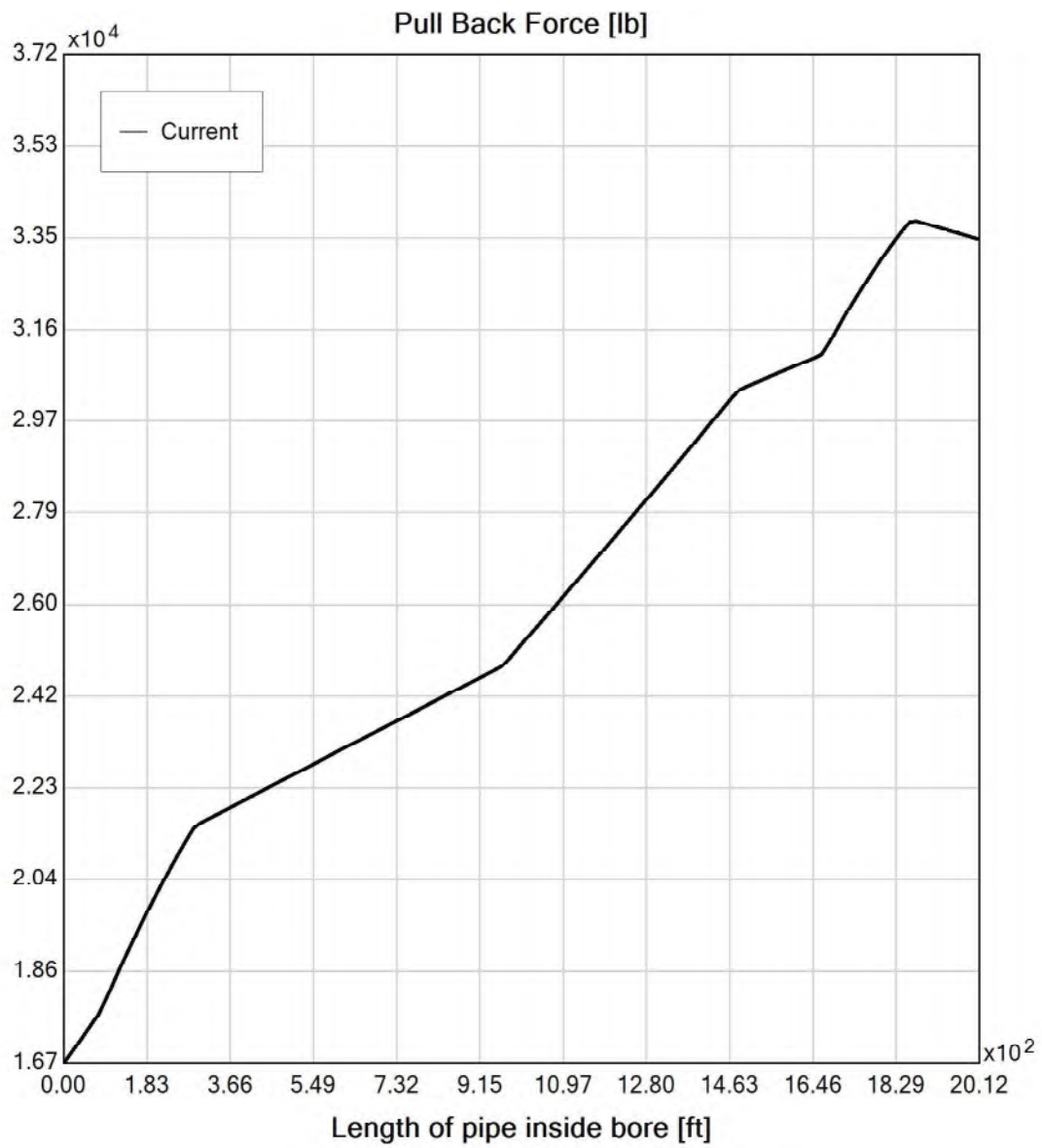
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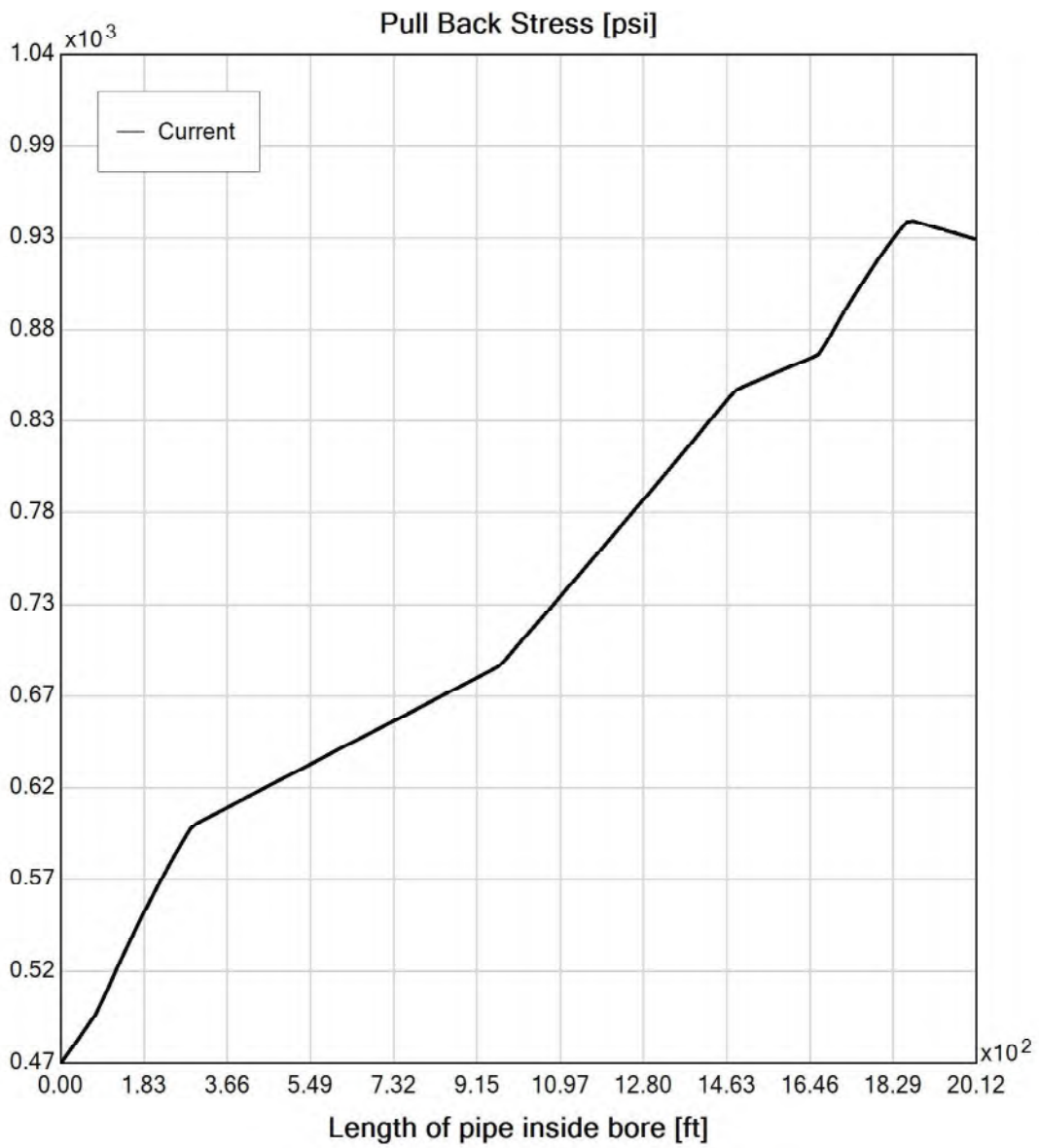
Yield Point (YP): 16.49

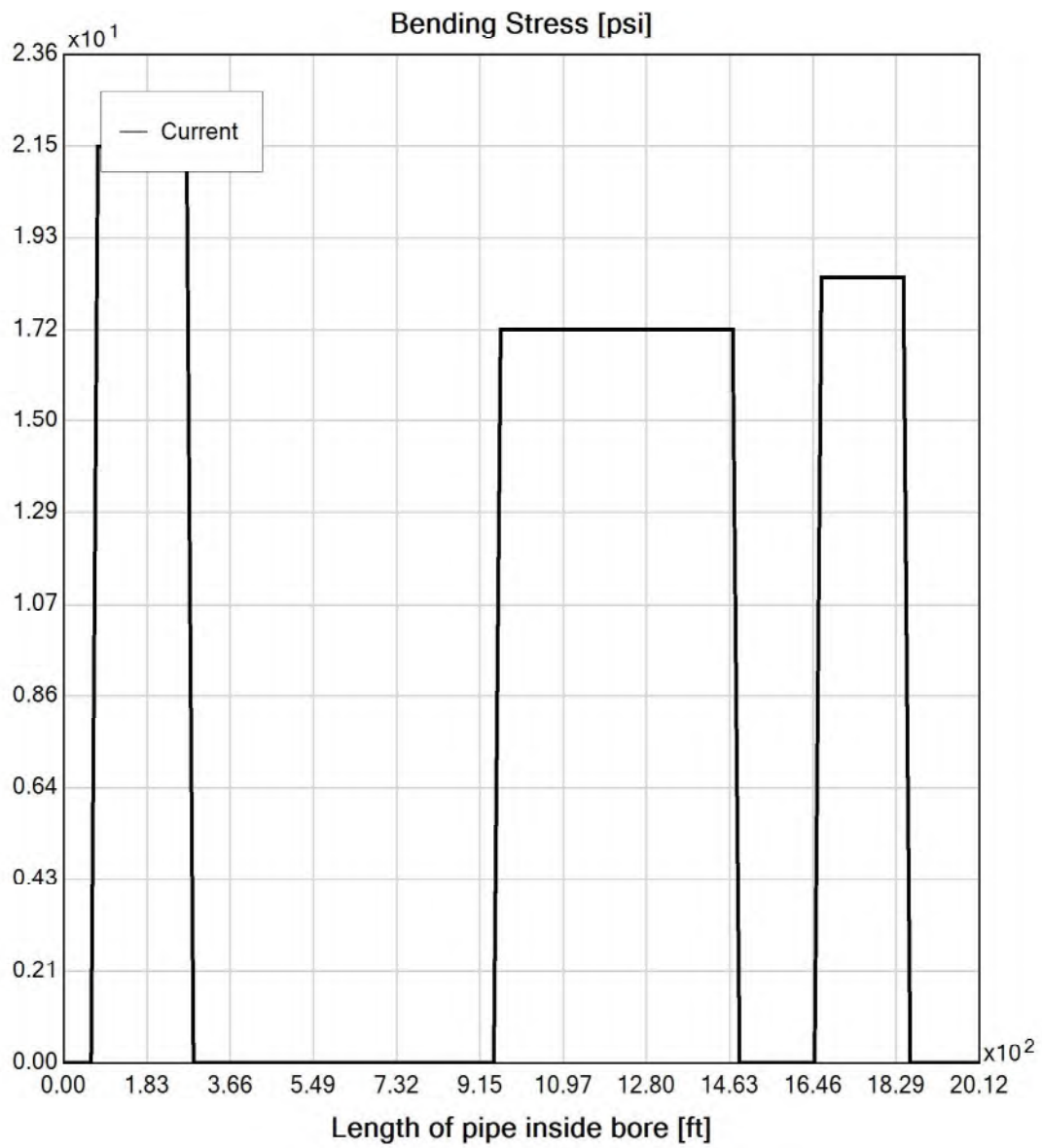
Effective Viscosity (cP): 1202.0

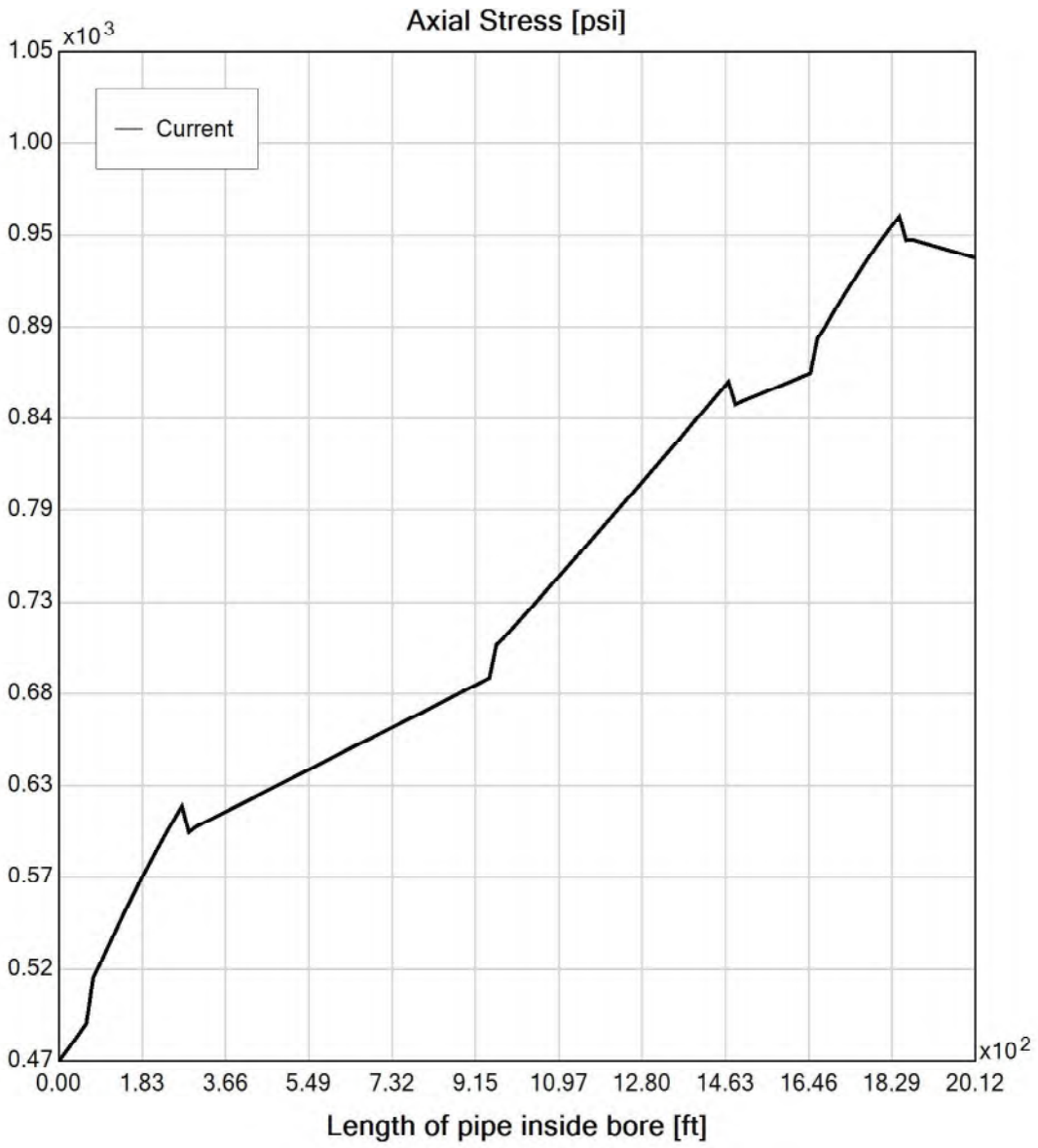
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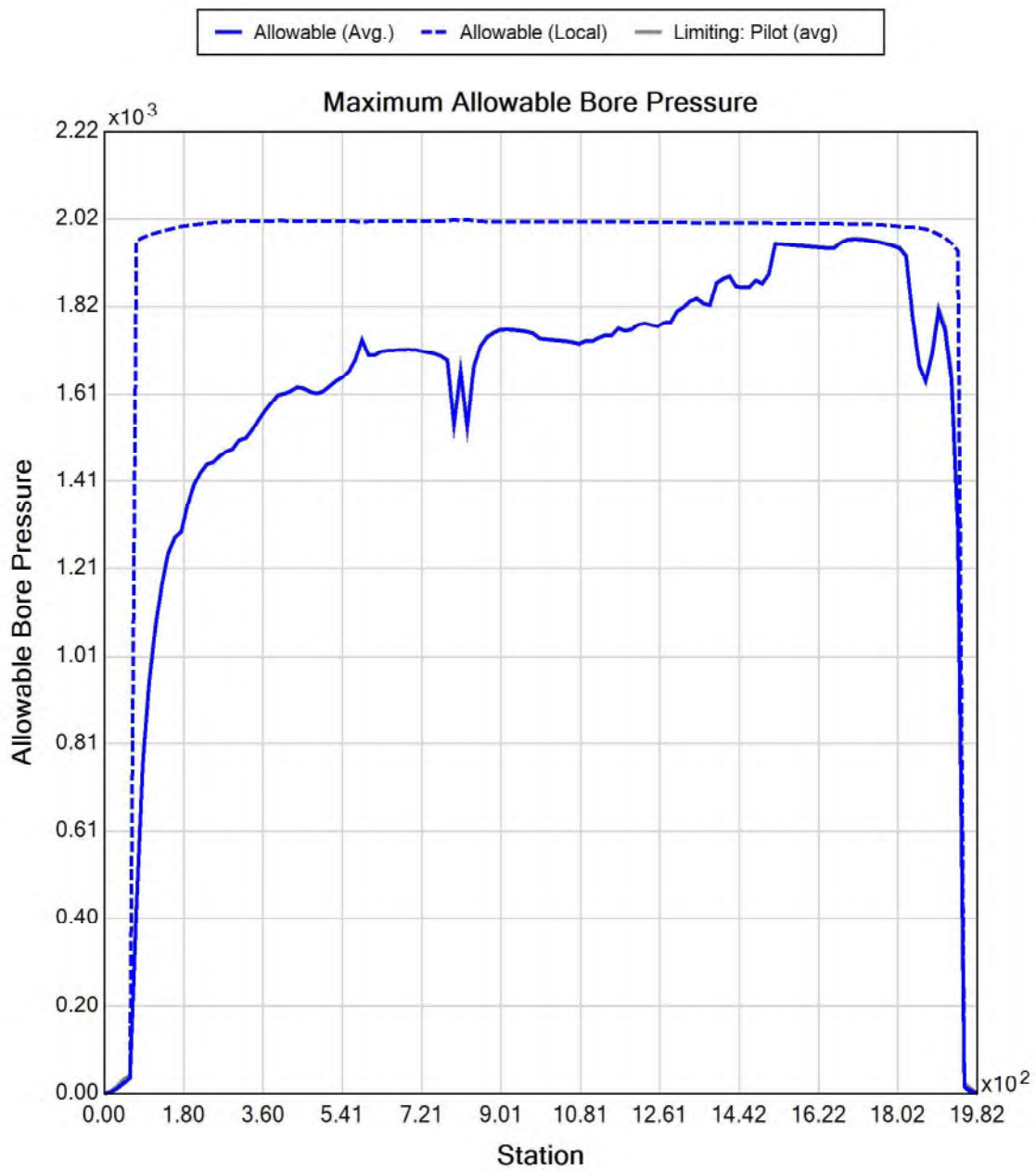


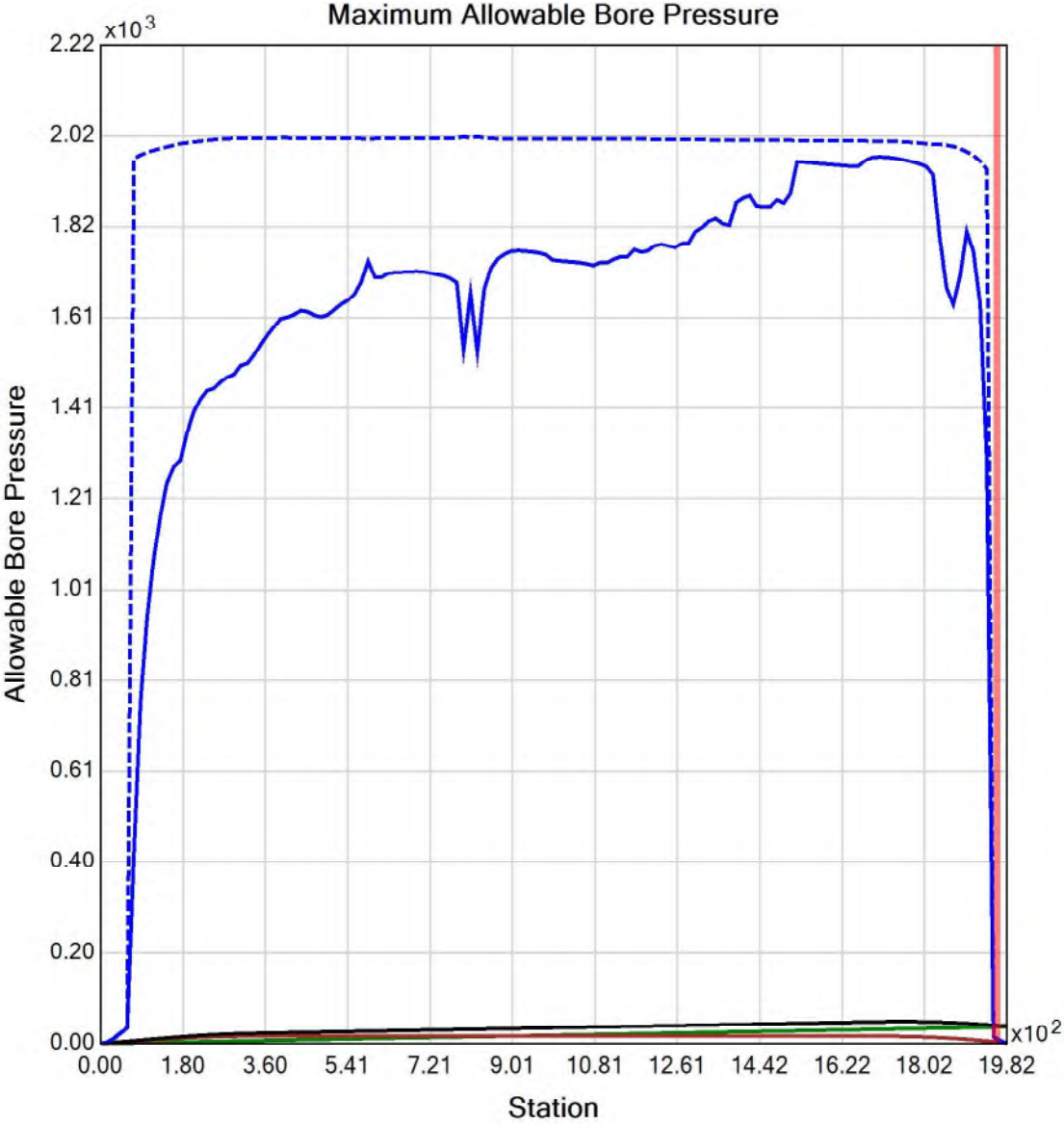














Generated Output



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Project Summary

General: CHPE HDD 57B
P4A
Start Date: 12-10-2021
End Date: 12-10-2021

Project Owner: TDI
Project Contractor: Kiewit
Project Consultant: CHA

Designer: KDL
CHA

Description: HDD 57B 2-inch DR9 Conduit-2

Input Summary

Start Coordinate	(0.00, 0.00, 279.20) ft
End Coordinate	(1978.16, 0.00, 274.00) ft
Project Length	1978.16 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

Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 2" (2.375")
Pipe DR: 9
Pipe Length: 2010.00 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

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.6	31.8
Water Pressure	10.0	10.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	12.5	41.8
Deflection		
Earth Load Deflection	0.738	8.663
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.767	8.692
Compressive Stress [psi]		
Compressive Wall Stress	56.5	188.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1759.4	1759.4
Pullback Stress [psi]	1005.3	1005.3
Pullback Strain	1.748E-2	1.748E-2
Bending Stress [psi]	0.0	4.7
Bending Strain	0	8.247E-5
Tensile Stress [psi]	1005.3	1005.3
Tensile Strain	1.748E-2	1.754E-2

Net External Pressure = 22.2 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.767	7.5	9.8	OK
Unconstrained Collapse [psi]	22.9	129.3	5.7	OK
Compressive Wall Stress [psi]	56.5	1150.0	20.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	32.9	191.5	5.8	OK
Tensile Stress [psi]	1005.3	1200.0	1.2	OK

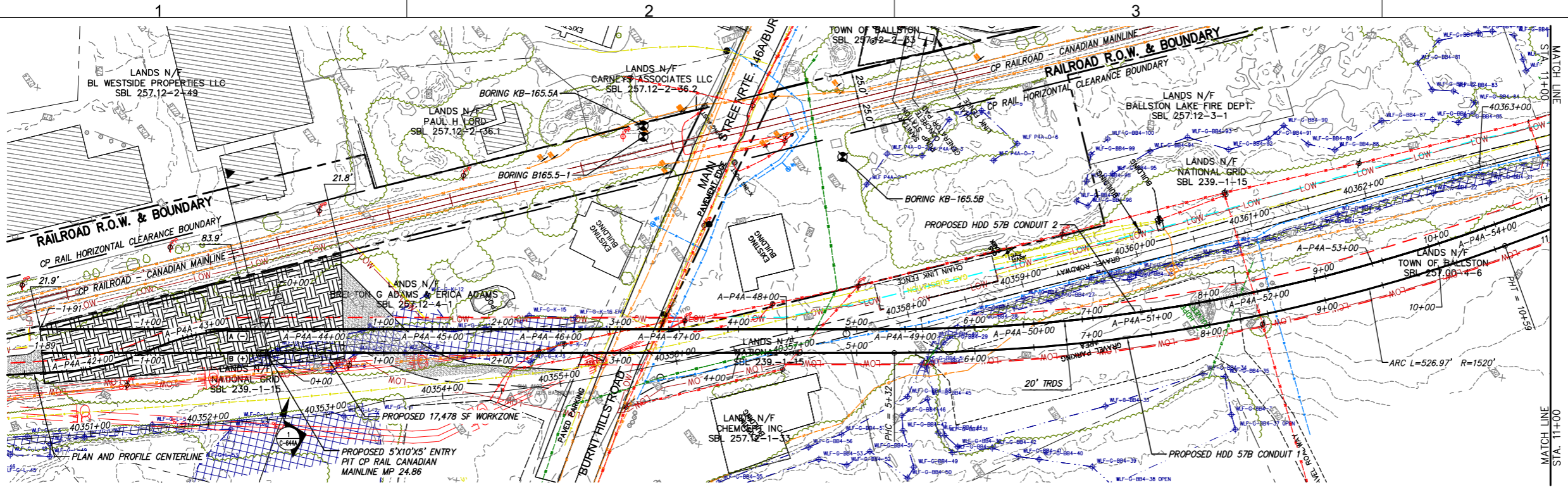
Appendix B

Appendix to EM&CP Appendix J2
HDD Inadvertent Release Contingency Plan

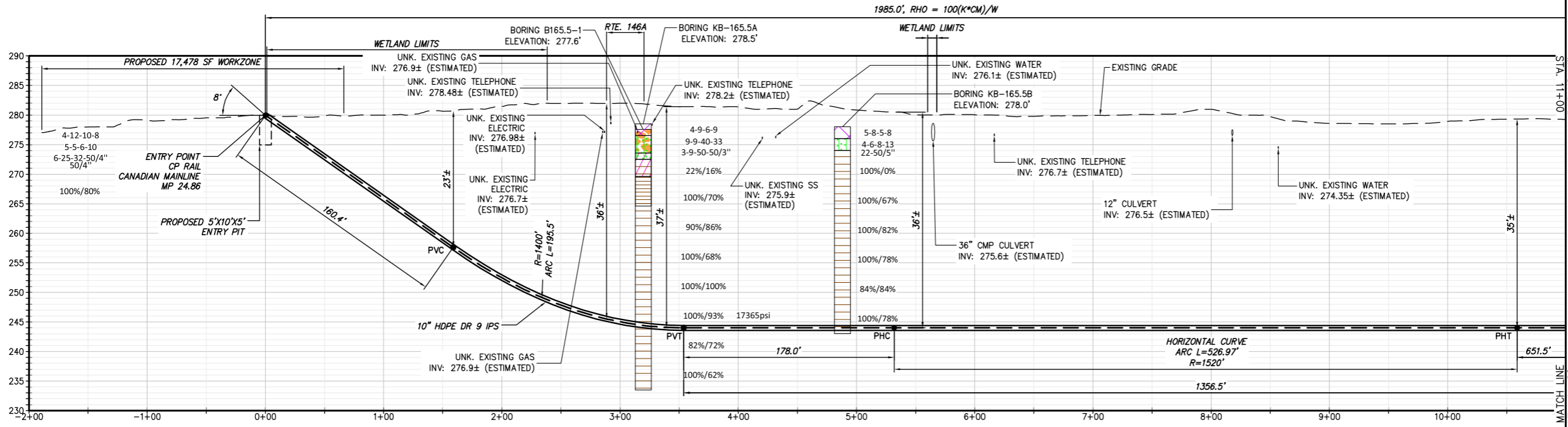
Sheets Added

Appendix B

HDD Design Drawings



PROPOSED HDD 57B PLAN VIEW
CONDUIT 1



PROPOSED HDD 57B PROFILE
CONDUIT 1

Legend	
ASPHALT	Asphalt
Bedrock	Bedrock
Boulder	Boulder
CH	Fat CLAY
CH-MH	SILTY Fat CLAY
CL	Lean CLAY
CL-ML	SILTY CLAY
CONCRETE	Concrete
Fill	Fill
GC	CLAYEY GRAVEL
GC-GM	SILTY CLAYEY GRAVEL
GM	SILTY GRAVEL
GP	Poorly Graded GRAVEL
GP-GC	Poorly Graded GRAVEL with CLAY
GP-GM	Poorly Graded GRAVEL with SILT
GW	Well Graded GRAVEL
GW-GC	Well Graded GRAVEL with CLAY
GW-GM	Well Graded GRAVEL with SILT
Limestone	Limestone
MH	Elastic SILT
ML	SILT
OH	ORGANIC Fat CLAY
OL	ORGANIC Lean CLAY
OL/OH	ORGANIC SOIL
PT	PEAT
Rock	Rock
Sandstone	Sandstone
SC	CLAYEY SAND
SC-SM	SILT, CLAYEY SAND
SHALE	Shale
SILTSTONE	Siltstone
SM	SILTY SAND
SP	Poorly Graded SAND
SP-SC	Poorly Graded SAND with CLAY
SP-SM	Poorly Graded SAND with SILT
SW	Well graded SAND
SW-SC	Well Graded SAND with CLAY
SW-SM	Well Graded SAND with SILT
Topsoil	Topsoil
USGS 601	Gravel or Conglomerate 1
USGS 654	Subgraywacke
USGS 670	Interbedded Sandstone and Shale
USGS 702	Quartzite
USGS 705	Schist
USGS 705	Schist
USGS 708	Gneiss
USGS 708	Gneiss
USGS 718	Granite 1
Void	Void
Water	Water
Weathered Rock	Undefined
Water Table	Water Table during drilling
Delayed Water Table	Water Table after drilling

NOTE:
1) BORE AND BORE HATCHING IN PROFILES ARE NOT CLEARLY LEGIBLE TO THE CLOSE PROXIMITY OF THE FOLLOWING BORES KB-165.5A AND B165.5-1 AT 50 SCALE. USERS MUST CONSULT THE ACTUAL BORE LOGS AND REPORTS FOR THE CLARIFICATION AND OR INTERPRETATION.

BORING LOG STRIP LEGEND	
B101	11000psi =UCS
Blow Counts per 6" = 10-10-10	Recovery %/RQD % = 95%/90%
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration	

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PROJECT NO.: 21162
PROJECT NO.: 066076
ALTERED ON: NULL
AFFXED ON: 12/20/2023

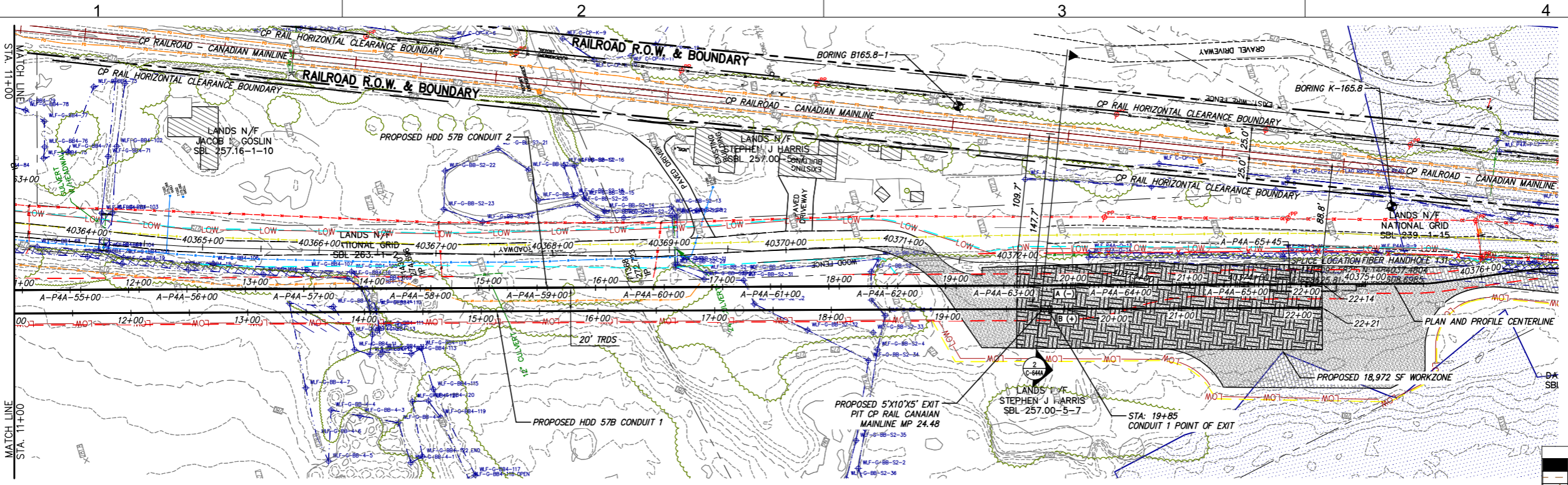
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE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

No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP
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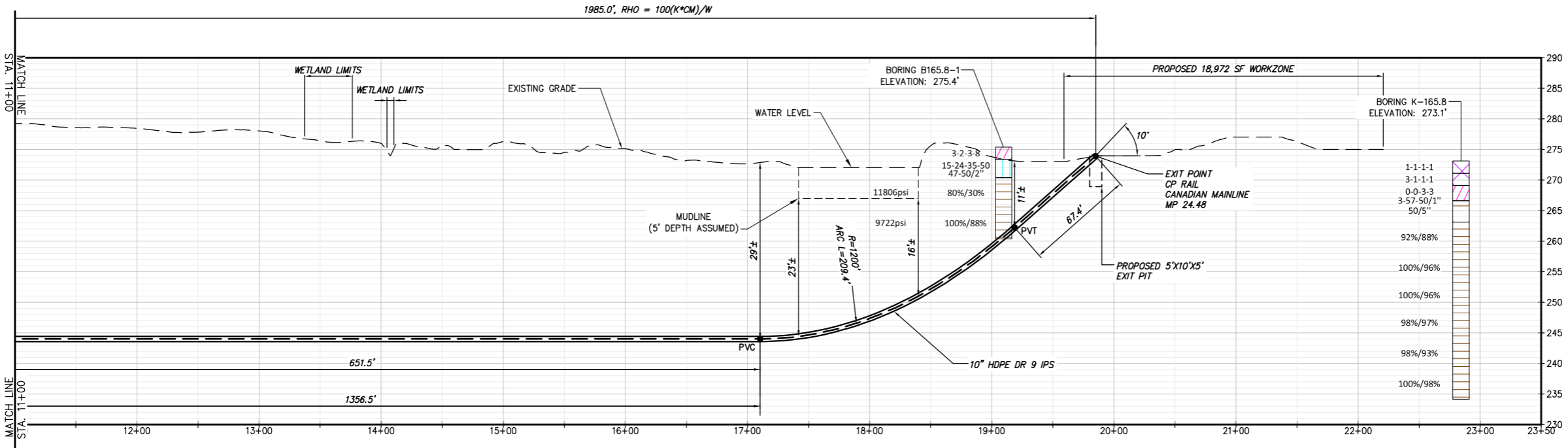
CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
PLAN AND PROFILE - HDD 57B, CONDUIT 1

PERMIT DRAWING NO.
N/A
DRAWING NO.
C-304B

DRAWN BY: KDL DESIGNED BY: SPB APPROVED BY: JEO SCALE: AS NOTED DATE: 08/03/2023



PROPOSED HDD 57B PLAN VIEW
CONDUIT 1



PROPOSED HDD 57B PROFILE
CONDUIT 1

Legend	
ASPHALT	Asphalt
Bedrock	Bedrock
Boulder	Boulder
CH	Fat CLAY
CH-MH	SILTY Fat CLAY
CL	Lean CLAY
CL-ML	SILTY CLAY
CONCRETE	Concrete
Fill	Fill
GC	CLAYEY GRAVEL
GC-GM	SILTY CLAYEY GRAVEL
GM	SILTY GRAVEL
GP	Poorly Graded GRAVEL
GP-GC	Poorly Graded GRAVEL with CLAY
GP-GM	Poorly Graded GRAVEL with SILT
GW	Well Graded GRAVEL
GW-GC	Well Graded GRAVEL with CLAY
GW-GM	Well Graded GRAVEL with SILT
Limestone	Limestone
MH	Elastic SILT
ML	SILT
OH	ORGANIC Fat CLAY
OL	ORGANIC Lean CLAY
OL/OH	ORGANIC SOIL
PT	PEAT
Rock	Rock
Sandstone	Sandstone
SC	CLAYEY SAND
SC-SM	SILT, CLAYEY SAND
SHALE	Shale
SILTSTONE	Siltstone
SM	SILTY SAND
SP	Poorly Graded SAND
SP-SC	Poorly Graded SAND with CLAY
SP-SM	Poorly Graded SAND with SILT
SW	Well graded SAND
SW-SC	Well Graded SAND with CLAY
SW-SM	Well Graded SAND with SILT
Topsoil	Topsoil
USGS 601	Gravel or Conglomerate 1
USGS 654	Subgravel
USGS 702	Interbedded Sandstone and Shale
USGS 705	Quartzite
USGS 705	Schist
USGS 708	Gneiss
USGS 708	Gneiss
USGS 718	Granite 1
Void	Void
Water	Water
Weathered Rock	Undefined
Water Table	Water Table during drilling
Delayed Water Table	Water Table after drilling

BORING LOG STRIP LEGEND	
B101	11000psi =UCS
Blow Counts per 6" = 10-10-10	
Recovery %/RQD % = 95%/90%	
2D strip logs shown at 10x exaggeration	
3D strip logs have no exaggeration	



PROJECT NO.: 21162
PROJECT NO.: 066076
ALTERED ON: NULL
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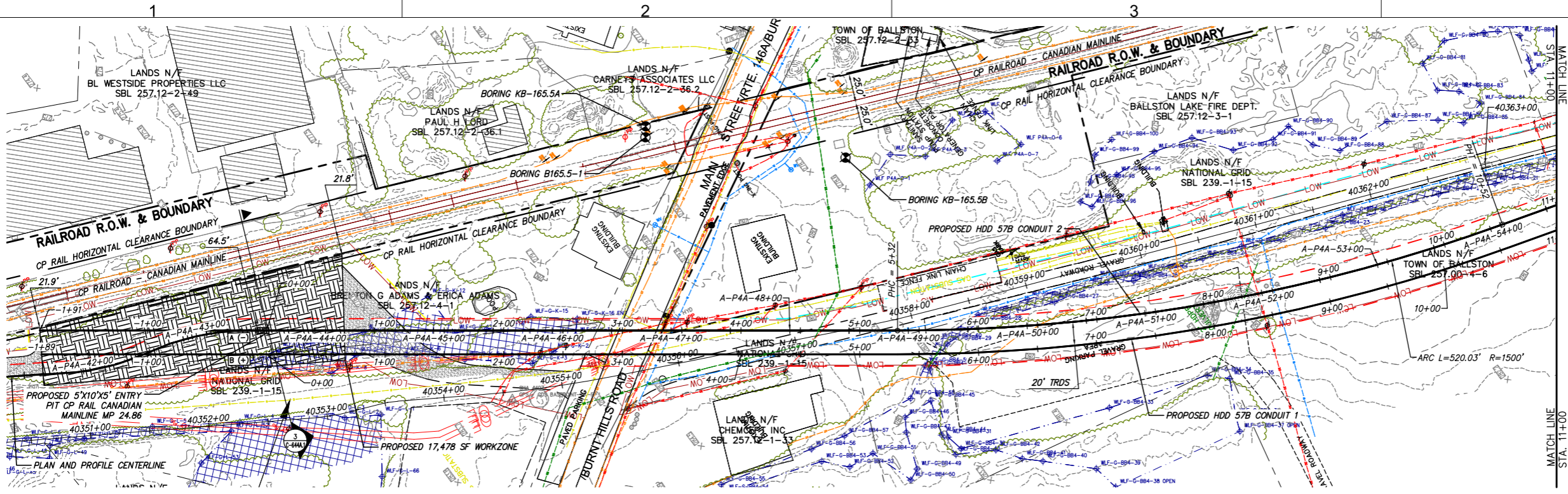
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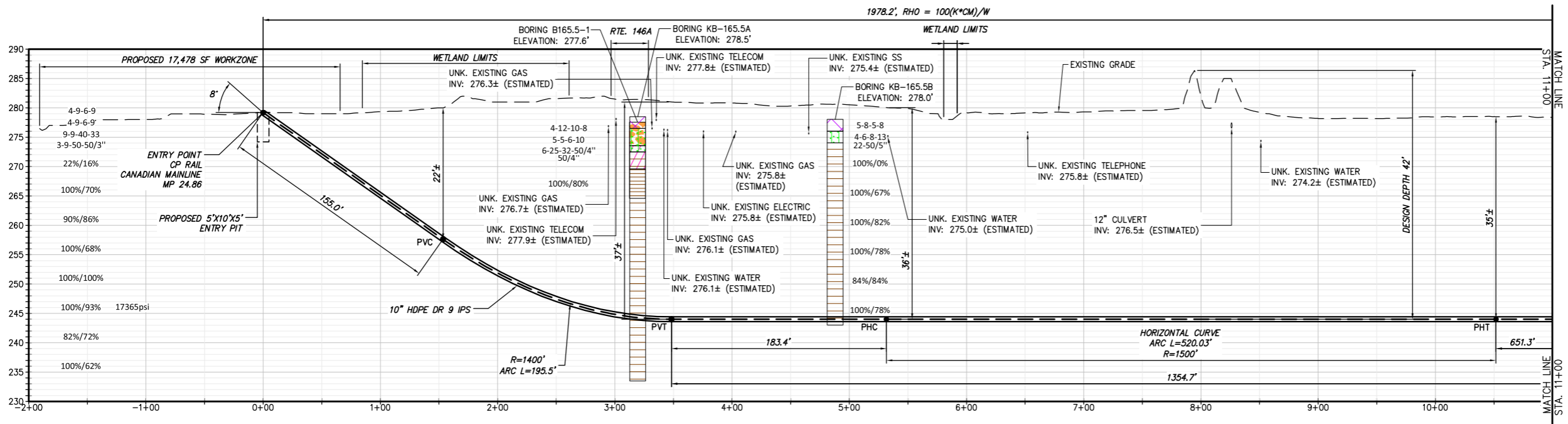
**CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE**
PLAN AND PROFILE - HDD 57B, CONDUIT 1

PERMIT DRAWING NO.
N/A
DRAWING NO.
C-304B.1

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PROPOSED HDD 57B PLAN VIEW
CONDUIT 2



PROPOSED HDD 57B PROFILE
CONDUIT 2

NOTE:
1) BORE AND BORE HATCHING IN PROFILES ARE NOT CLEARLY LEGIBLE TO THE CLOSE PROXIMITY OF THE FOLLOWING BORES KB-165.5A AND B165.5-1 AT 50 SCALE. USERS MUST CONSULT THE ACTUAL BORE LOGS AND REPORTS FOR THE CLARIFICATION AND OR INTERPRETATION.

BORING LOG STRIP LEGEND

B101	Blow Counts per 6" = 10-10-10
	Recovery %/RQD % = 95%/90%
	11000psi =UCS
	2D strip logs shown at 10x exaggeration
	3D strip logs have no exaggeration

Legend

ASPHALT	Asphalt
Bedrock	Bedrock
Boulder	Boulder
CH	Fat CLAY
CH-MH	SILTY Fat CLAY
CL	Lean CLAY
CL-ML	SILTY CLAY
CONCRETE	Concrete
Fill	Fill
GC	CLAYEY GRAVEL
GC-GM	SILTY CLAYEY GRAVEL
GM	SILTY GRAVEL
GP	Poorly Graded GRAVEL
GP-GC	Poorly Graded GRAVEL with CLAY
GP-GM	Poorly Graded GRAVEL with SILT
GW	Well Graded GRAVEL
GW-GC	Well Graded GRAVEL with CLAY
GW-GM	Well Graded GRAVEL with SILT
Limestone	Limestone
MH	Elastic SILT
ML	SILT
OH	ORGANIC Fat CLAY
OL	ORGANIC Lean CLAY
OL/OH	ORGANIC SOIL
PT	PEAT
Rock	Rock
Sandstone	Sandstone
SC	CLAYEY SAND
SC-SM	SILT, CLAYEY SAND
SHALE	Shale
SILTSTONE	Siltstone
SM	SILTY SAND
SP	Poorly Graded SAND
SP-SC	Poorly Graded SAND with CLAY
SP-SM	Poorly Graded SAND with SILT
SW	Well graded SAND
SW-SC	Well Graded SAND with CLAY
SW-SM	Well Graded SAND with SILT
Topsoil	Topsoil
USGS 601	Gravel or Conglomerate 1
USGS 654	Subgraywacke
USGS 702	Interbedded Sandstone and Shale
USGS 705	Schist
USGS 705	Schist
USGS 708	Gneiss
USGS 708	Gneiss
USGS 718	Granite 1
Void	Void
Water	Water
Weathered Rock	Undefined
Water Table	Water Table during drilling
Delayed Water Table	Water Table after drilling



PROJECT NO.: 21162
PROJECT NO.: 066076
ALTERED ON: NULL
AFFIXED ON: 12/20/2023

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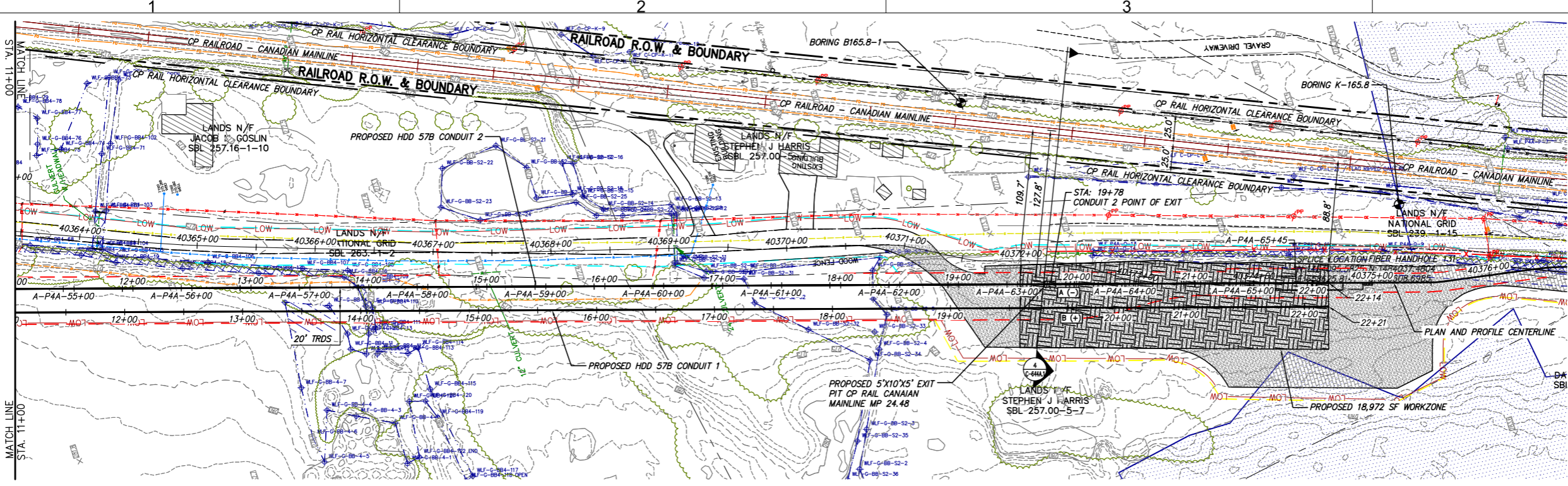
No.	DATE	SUBMITTAL / REVISION DESCRIPTION	SPB	JEO
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**CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE**
PLAN AND PROFILE - HDD 57B, CONDUIT 2

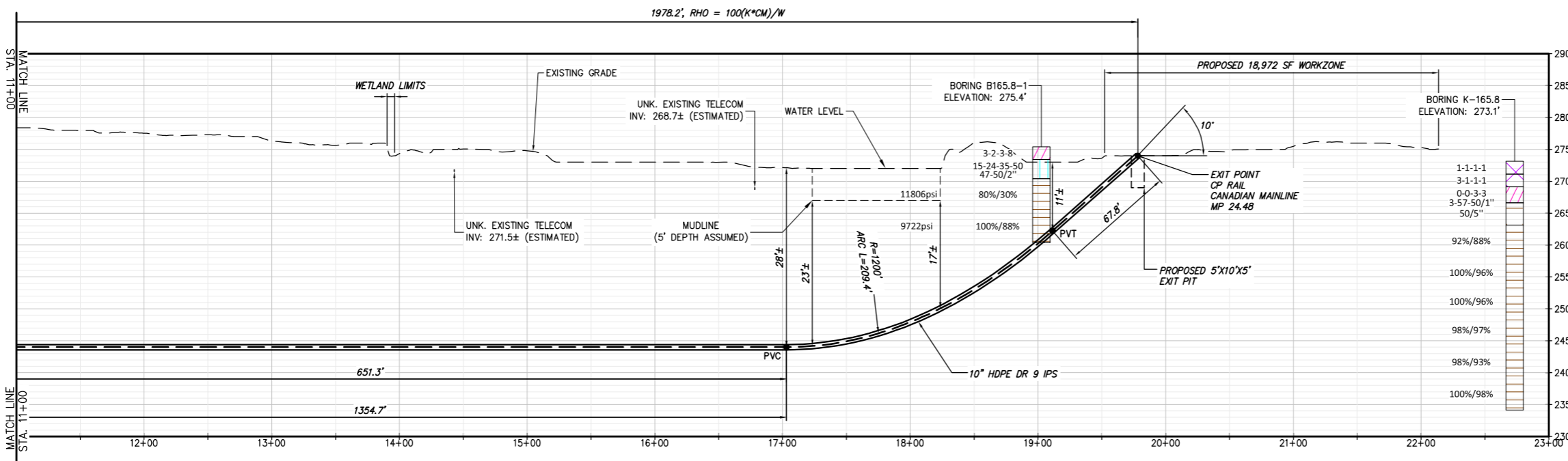
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C-304C

DRAWN BY: KDL DESIGNED BY: SPB APPROVED BY: JEO SCALE: AS NOTED DATE: 08/03/2023

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PROPOSED HDD 57B PLAN VIEW
CONDUIT 2



PROPOSED HDD 57B PROFILE
CONDUIT 2

Legend	
ASPHALT	Asphalt
Bedrock	Bedrock
Boulder	Boulder
CH	Fat CLAY
CH-MH	SILTY Fat CLAY
CL	Lean CLAY
CL-ML	SILTY CLAY
CONCRETE	Concrete
Fill	Fill
GC	CLAYEY GRAVEL
GC-GM	SILTY CLAYEY GRAVEL
GM	SILTY GRAVEL
GP	Poorly Graded GRAVEL
GP-GC	Poorly Graded GRAVEL with CLAY
GP-GM	Poorly Graded GRAVEL with SILT
GW	Well Graded GRAVEL
GW-GC	Well Graded GRAVEL with CLAY
GW-GM	Well Graded GRAVEL with SILT
Limestone	Limestone
MH	Elastic SILT
ML	SILT
OH	ORGANIC Fat CLAY
OL	ORGANIC Lean CLAY
OL/OH	ORGANIC SOIL
PT	PEAT
Rock	Rock
Sandstone	Sandstone
SC	CLAYEY SAND
SC-SM	SILT, CLAYEY SAND
SHALE	Shale
SILTSTONE	Siltstone
SM	SILTY SAND
SP	Poorly Graded SAND
SP-SC	Poorly Graded SAND with CLAY
SP-SM	Poorly Graded SAND with SILT
SW	Well graded SAND
SW-SC	Well Graded SAND with CLAY
SW-SM	Well Graded SAND with SILT
Topsoil	Topsoil
USGS 601	Gravel or Conglomerate 1
USGS 654	Subgraywacke
USGS 670	Interbedded Sandstone and Shale
USGS 702	Quartzite
USGS 705	Schist
USGS 705	Schist
USGS 708	Gneiss
USGS 708	Gneiss
USGS 718	Granite 1
Void	Void
Water	Water
Weathered Rock	Undefined
Water Table	Water Table during drilling
Delayed Water Table	Water Table after drilling

BORING LOG STRIP LEGEND	
B101	11000psi = UCS
Blow Counts per 6" = 10-10-10	
Recovery %/RQD % = 95%/90%	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration	

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 Scale: 1" = 50'



PROJECT NO.: 21162	PROJECT NO.: 066076	ALTERED ON: NULL	AFFIXED ON: 12/20/2023
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No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP
0	12/20/2023	ISSUED FOR CONSTRUCTION: NDC-0042	SPB	JEO

**CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE**
 PLAN AND PROFILE - HDD 57B, CONDUIT 2

PERMIT DRAWING NO.
N/A
 DRAWING NO.
C-304C.1

DRAWN BY: KDL DESIGNED BY: SPB APPROVED BY: JEO SCALE: AS NOTED DATE: 08/03/2023

