

Generated Output

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Project Summary

General:	CHPE HDD 12A - Conduit 2
	P2
	Start Date: 06-21-2022
	End Date: 06-21-2022
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	
Description:	HDD 12A Conduit 2 10-inch DR 9

Input Summary

Start Coordinate	(0.00, 0.00, 141.40) ft
End Coordinate	(1490.00, 0.00, 141.40) ft
Project Length	1490.00 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

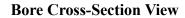
Soil Summary

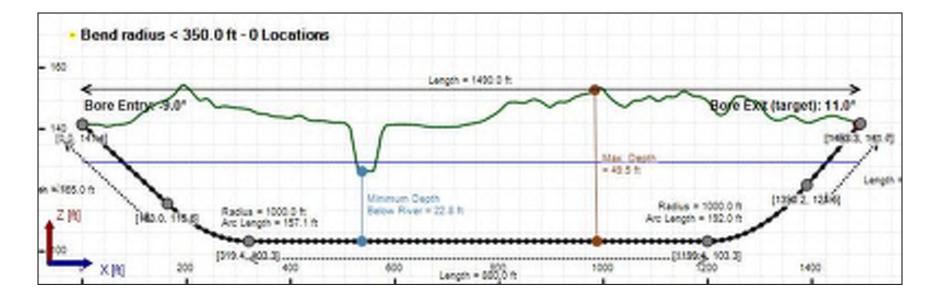
Number of Layers: 3

Soil Layer #1 USCS, Sand (S), SP Depth: 4.00 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 1.39, Coh: 0.00 [psi]

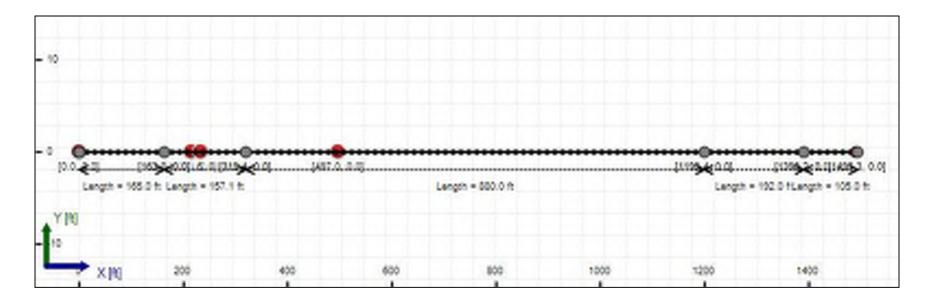
Soil Layer #2 Rock, Geological Classification, Sedimentary Rocks Depth: 40.00 ft Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

Soil Layer #3 Rock, Geological Classification, Sedimentary Rocks Depth: 20.00 ft Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]









Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 1500.00 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	5.1	32.4
Water Pressure	11.2	11.2
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.2	43.5
Deflection		
Earth Load Deflection	1.442	8.823
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.574	8.955
Compressive Stress [psi]		
Compressive Wall Stress	73.0	196.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	24022.6	24022.6
Pullback Stress [psi]	670.0	670.0
Pullback Strain	1.165E-2	1.165E-2
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	670.0	689.0
Tensile Strain	1.165E-2	1.243E-2

Net External Pressure = 25.6 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.574	7.5	4.8	OK
Unconstrained Collapse [psi]	25.1	120.6	4.8	OK
Compressive Wall Stress [psi]	73.0	1150.0	15.7	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	35.1	214.4	6.1	OK
Tensile Stress [psi]	689.0	1200.0	1.7	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	199.753 psi	238.537 psi
1	8.00 in	12.00 in	199.438 psi	237.994 psi
2	12.00 in	16.13 in	198.984 psi	237.213 psi

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

Estimated Circulating Pressure Summary

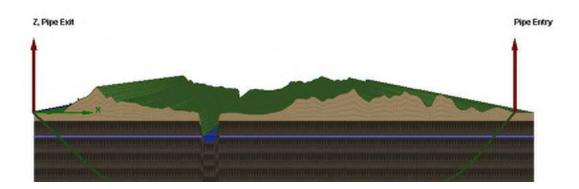
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

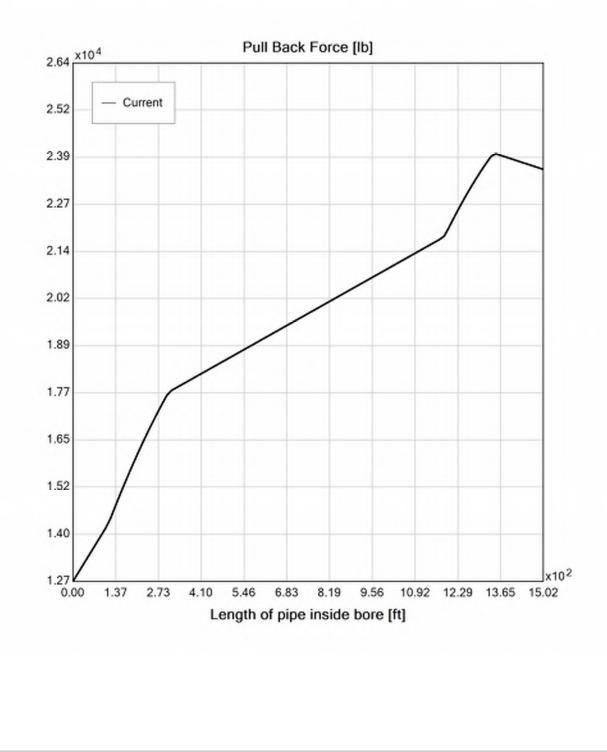
Yield Point (YP): 16.49

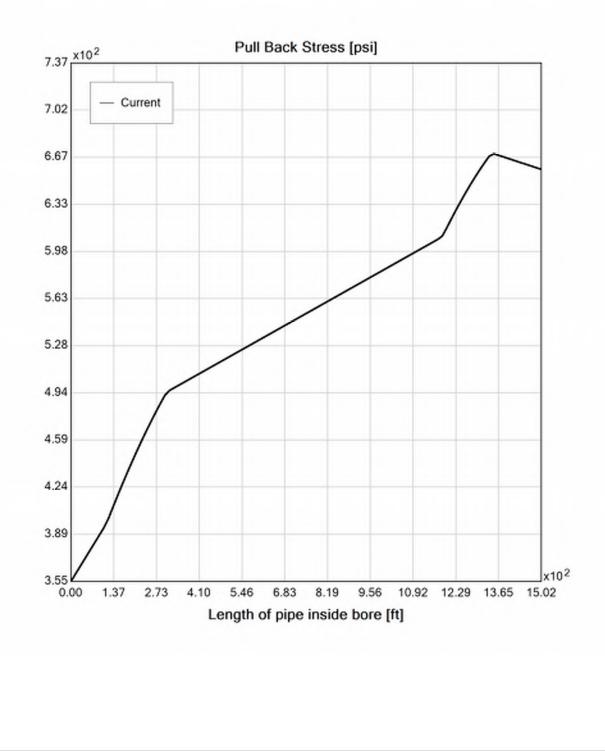
Effective Viscosity (cP): 1202.0

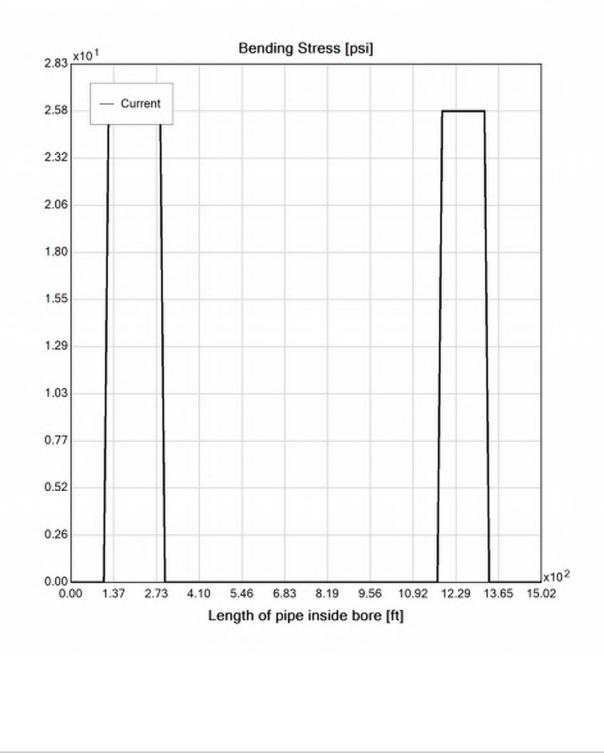
Virtual Site

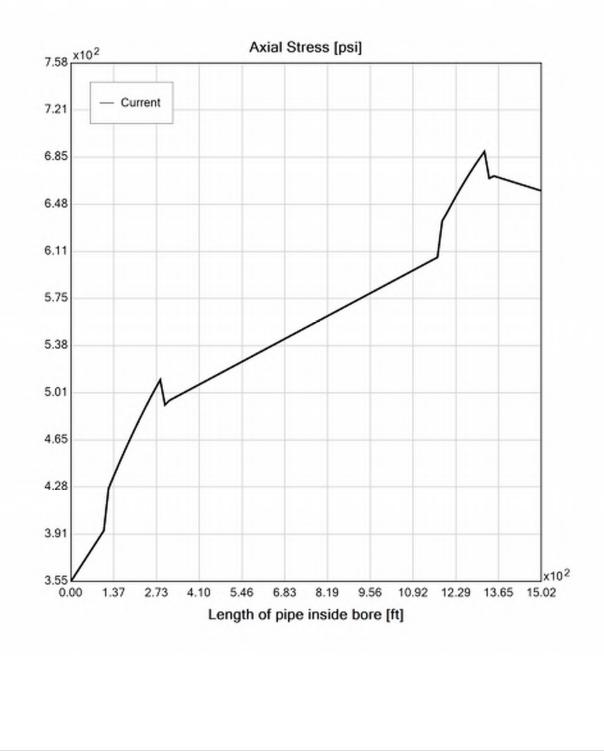


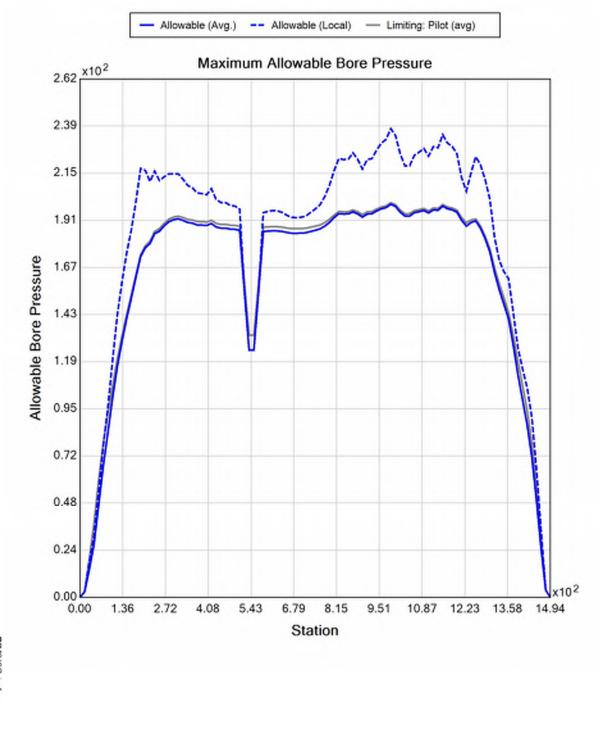


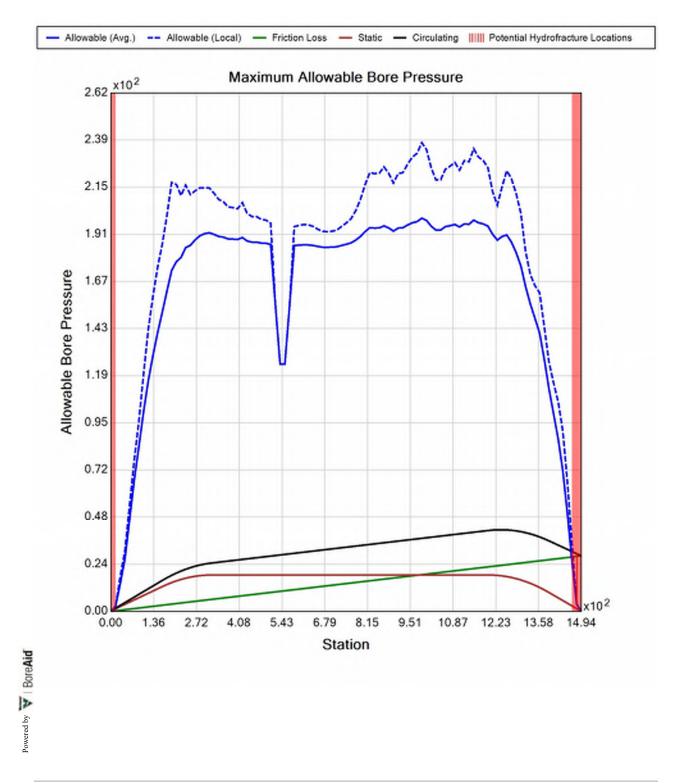














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Input Summary

Start Coordinate	(0.00, 0.00, 141.40) ft
End Coordinate	(1490.00, 0.00, 141.40) ft
Project Length	1490.00 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: 1500.00 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	2.0	32.4
Water Pressure	11.2	11.2
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	13.2	43.5
Deflection		
Earth Load Deflection	0.657	8.823
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.686	8.852
Compressive Stress [psi]		
Compressive Wall Stress	59.2	196.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1282.1	1282.1
Pullback Stress [psi]	732.6	732.6
Pullback Strain	1.274E-2	1.274E-2
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	732.6	732.6
Tensile Strain	1.274E-2	1.282E-2

Net External Pressure = 25.6 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.686	7.5	10.9	OK
Unconstrained Collapse [psi]	25.1	131.1	5.2	OK
Compressive Wall Stress [psi]	59.2	1150.0	19.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	35.1	212.2	6.1	OK
Tensile Stress [psi]	732.6	1200.0	1.6	OK



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Project Summary

General:	CHPE HDD 13 - Conduit 1 P2	
	Start Date: 06-21-2022	
	Start Date: 00-21-2022	
	End Date: 06-21-2022	
Project Owner:	TDI	
Project Contractor:	Kiewit	
Project Consultant:	CHA/BCE	
Designer:		
Description:	HDD 13 Conduit 1 10-inch DR 9	

Input Summary

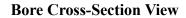
Start Coordinate	(0.00, 0.00, 129.00) ft
End Coordinate	(1478.00, 0.00, 132.00) ft
Project Length	1478.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	10.750 in
Pipe DR	9.0
Pipe Thickness	1.19 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

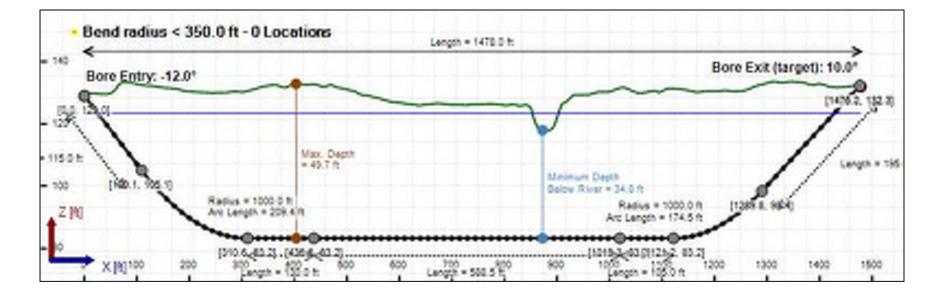
Soil Summary

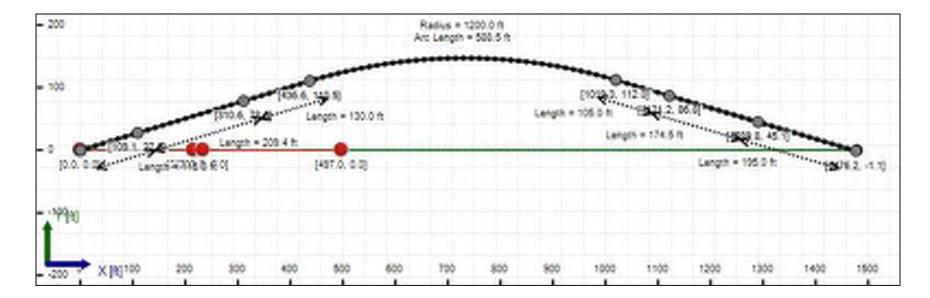
Number of Layers: 2

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), SP From Assistant Unit Weight: 109.5552 (dry), 126.6624 (sat) [lb/ft3] Phi: 30.00, S.M.: 300.00, Coh: 0.00 [psi]







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: 1529.99 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	3.8	24.9
Water Pressure	17.4	17.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	21.2	42.3
Deflection		
Earth Load Deflection	1.116	6.771
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.248	6.904
Compressive Stress [psi]		
Compressive Wall Stress	95.3	190.2

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	29060.8	29060.8
Pullback Stress [psi]	810.5	810.5
Pullback Strain	1.410E-2	1.410E-2
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	810.5	833.3
Tensile Strain	1.410E-2	1.494E-2

Net External Pressure = 27.7 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.248	7.5	6.0	OK
Unconstrained Collapse [psi]	33.3	124.5	3.7	OK
Compressive Wall Stress [psi]	95.3	1150.0	12.1	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	43.3	205.3	4.7	OK
Tensile Stress [psi]	833.3	1200.0	1.4	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	122.781 psi	125.100 psi
1	8.00 in	12.00 in	122.681 psi	124.991 psi
2	12.00 in	16.13 in	122.536 psi	124.833 psi

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

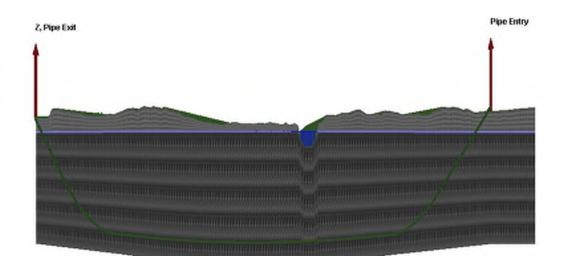
Estimated Circulating Pressure Summary

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

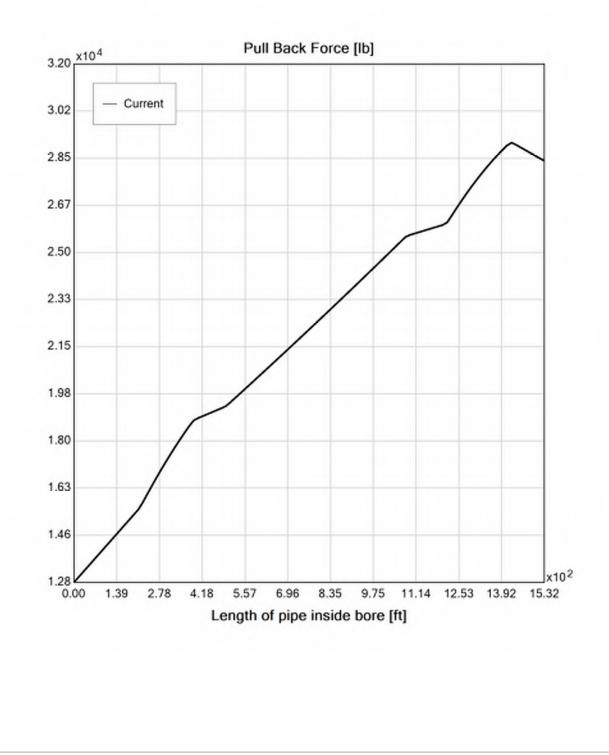
Yield Point (YP): 16.49

Effective Viscosity (cP): 1202.0

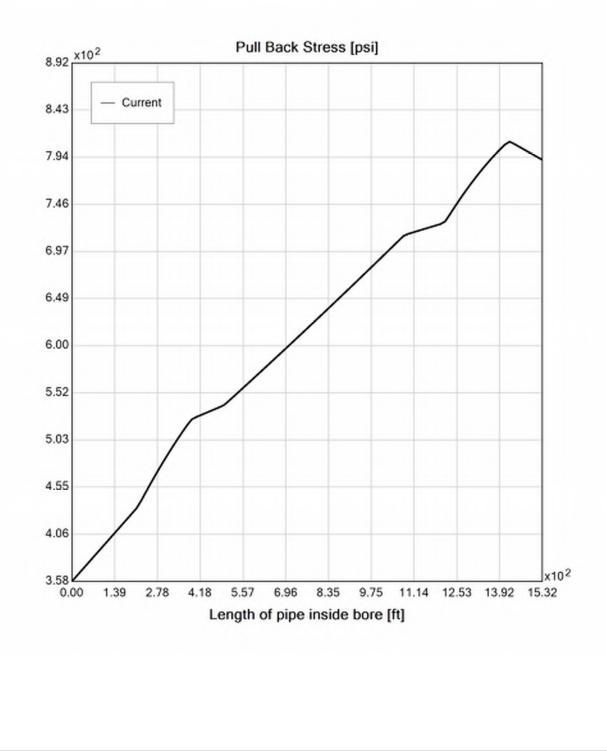
Virtual Site

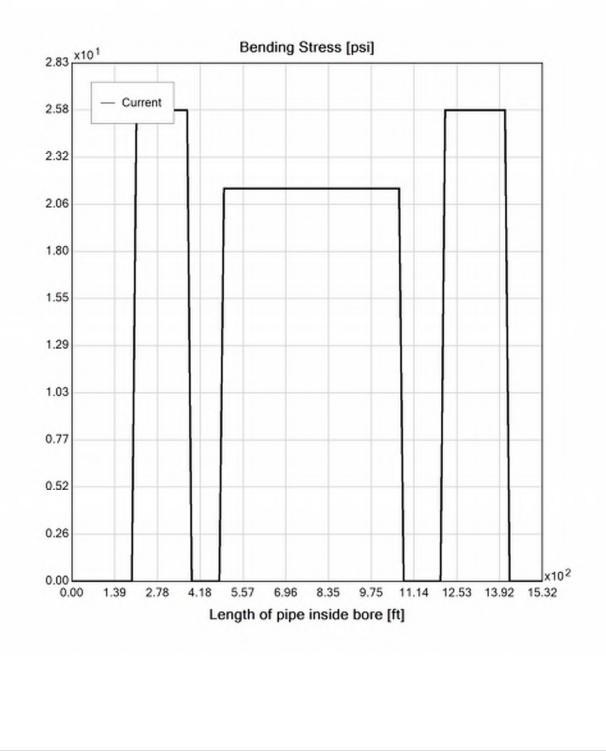


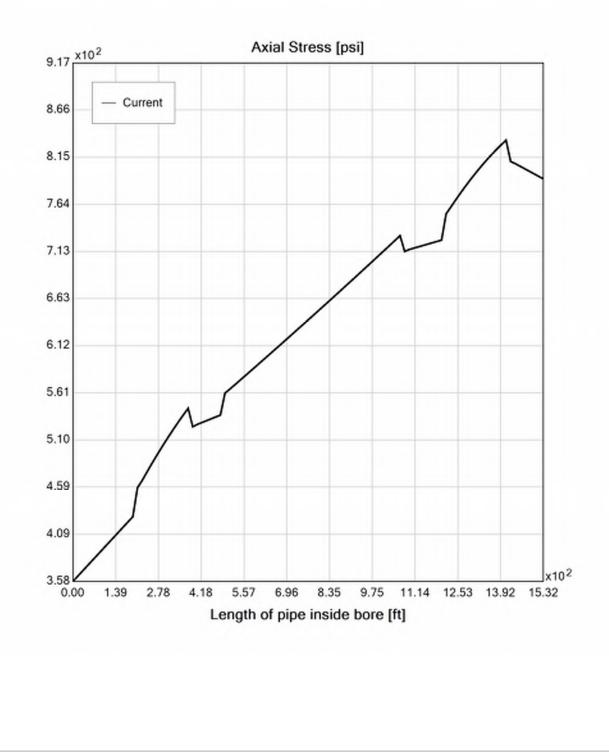


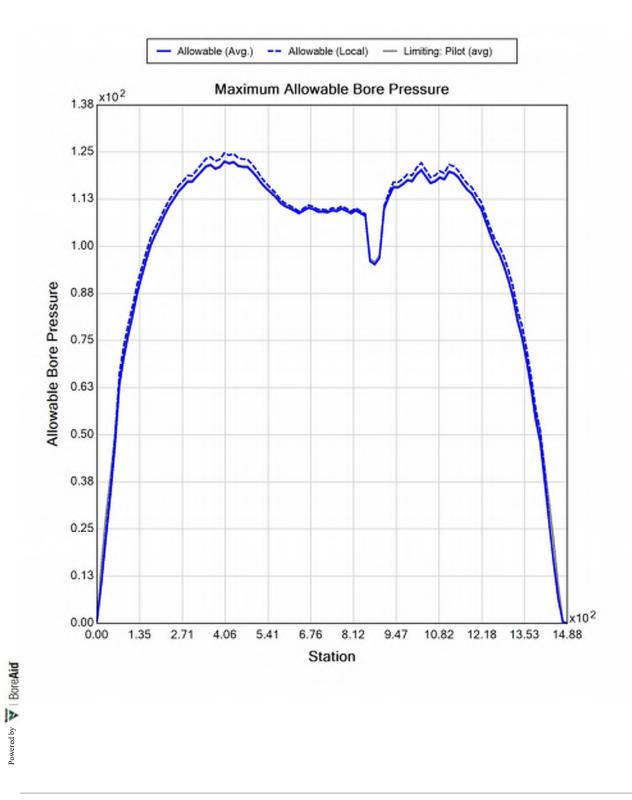


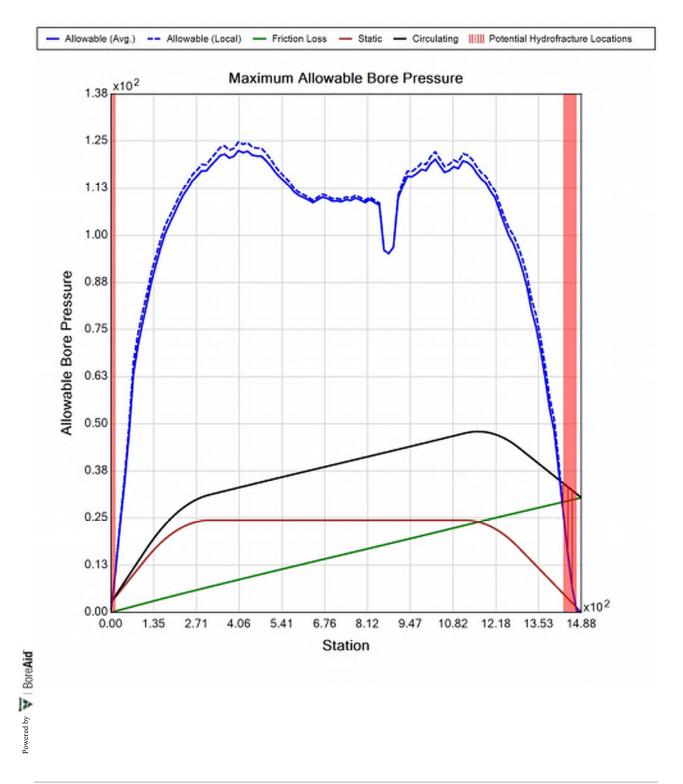














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Input Summary

(0.00, 0.00, 129.00) ft
(1478.00, 0.00, 132.00) ft
1478.00 ft
HDPE
IPS
2.375 in
9.0
0.26 in
15.00 ft
3.5 in
(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: 1529.99 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	1.5	24.9
Water Pressure	17.4	17.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	18.9	42.3
Deflection		
Earth Load Deflection	0.545	6.771
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.575	6.801
Compressive Stress [psi]		
Compressive Wall Stress	85.0	190.2

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1528.1	1528.1
Pullback Stress [psi]	873.1	873.1
Pullback Strain	1.518E-2	1.518E-2
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	873.1	875.9
Tensile Strain	1.518E-2	1.533E-2

Net External Pressure = 27.7 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.575	7.5	13.1	OK
Unconstrained Collapse [psi]	33.3	132.8	4.0	OK
Compressive Wall Stress [psi]	85.0	1150.0	13.5	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	43.3	202.9	4.7	OK
Tensile Stress [psi]	875.9	1200.0	1.4	OK



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Project Summary

General:	CHPE HDD 13 - Conduit 2 P2
	Start Date: 06-21-2022
	End Date: 06-21-2022
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	
Description:	HDD 13 Conduit 2 10-inch DR 9

Input Summary

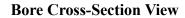
(0.00, 0.00, 132.00) ft
(1478.00, 0.00, 132.00) ft
1478.00 ft
HDPE
IPS
10.750 in
9.0
1.19 in
15.00 ft
3.5 in
(0.00, 0.00, 0.00) ft

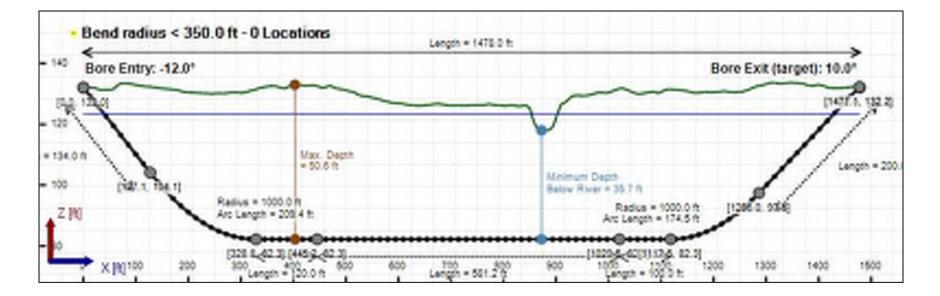
Soil Summary

Number of Layers: 2

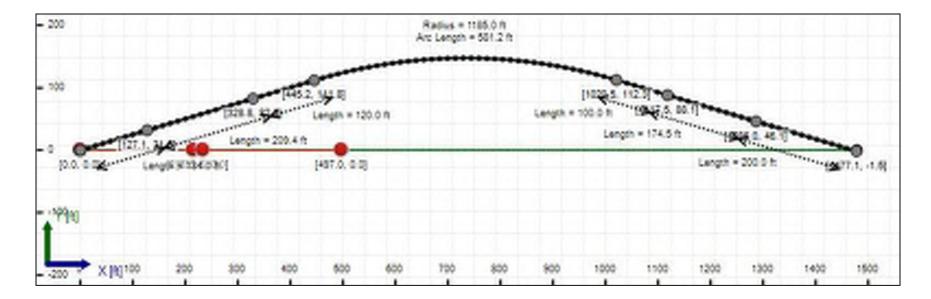
Soil Layer #1 USCS, Sand (S), SM From Assistant Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 200.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Sand (S), SP From Assistant Unit Weight: 109.0000 (dry), 126.6624 (sat) [lb/ft3] Phi: 30.00, S.M.: 300.00, Coh: 0.00 [psi]









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: 1529.99 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	3.8	25.3
Water Pressure	17.8	17.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	21.6	43.1
Deflection		
Earth Load Deflection	1.118	6.884
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.250	7.016
Compressive Stress [psi]		
Compressive Wall Stress	97.1	194.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	29007.3	29007.3
Pullback Stress [psi]	809.0	809.0
Pullback Strain	1.407E-2	1.407E-2
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	809.0	833.4
Tensile Strain	1.407E-2	1.494E-2

Net External Pressure = 27.6 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.250	7.5	6.0	OK
Unconstrained Collapse [psi]	33.7	124.5	3.7	OK
Compressive Wall Stress [psi]	97.1	1150.0	11.8	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	43.6	205.3	4.7	OK
Tensile Stress [psi]	833.4	1200.0	1.4	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	124.364 psi	126.708 psi
1	8.00 in	12.00 in	124.269 psi	126.603 psi
2	12.00 in	16.13 in	124.130 psi	126.452 psi

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

Estimated Circulating Pressure Summary

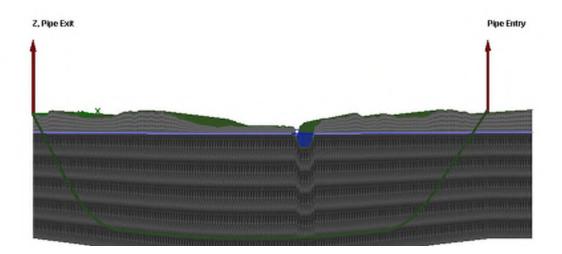
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/min
Drill Fluid Density: 68.700 lb/ft3
Rheological model: Bingham-Plastic
Plastic Viscosity (PV): 25.53

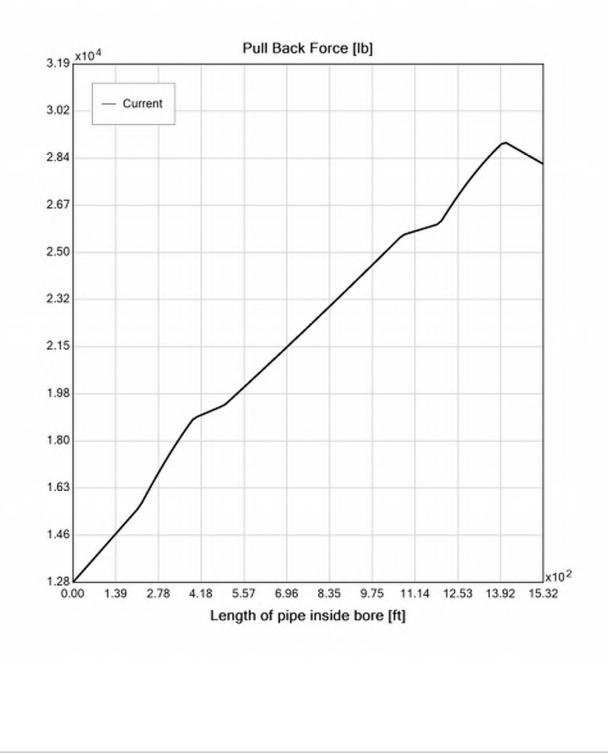
Yield Point (YP): 16.49

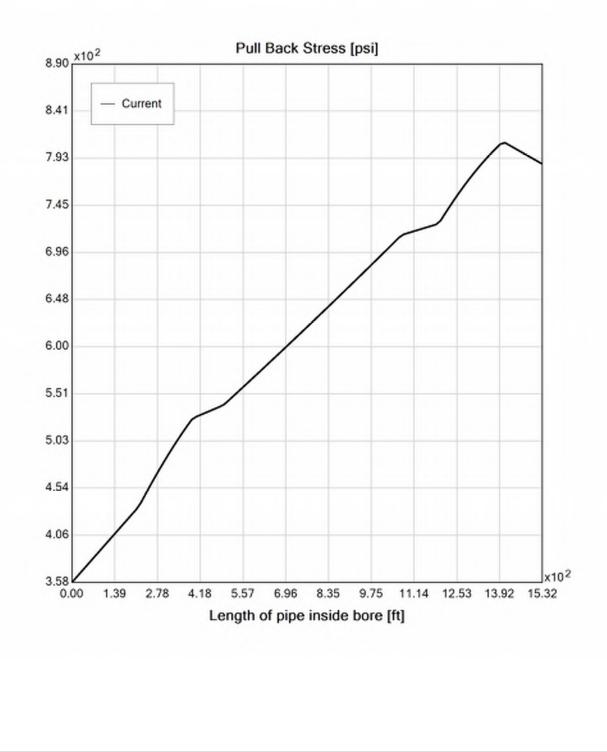
Effective Viscosity (cP): 1202.0

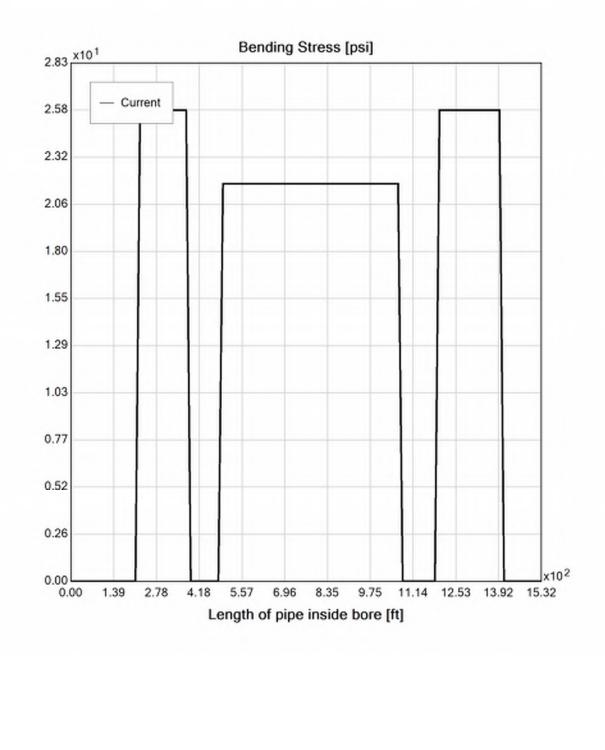
Virtual Site

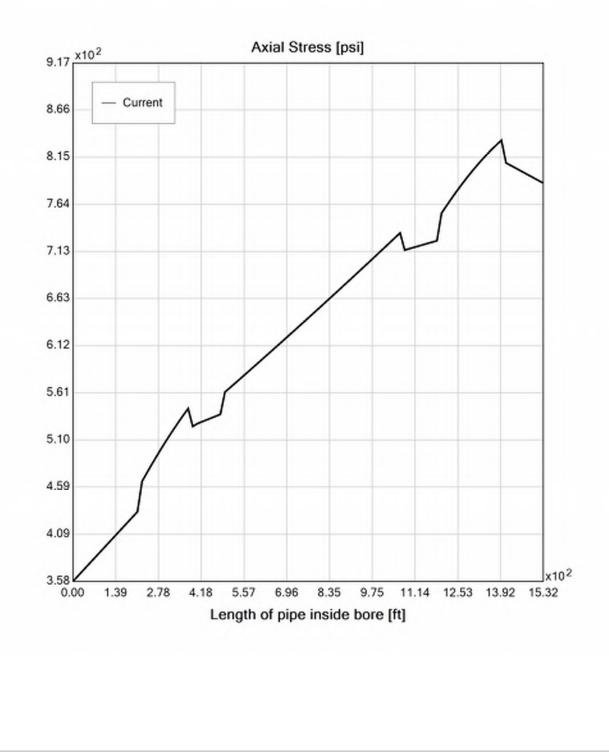


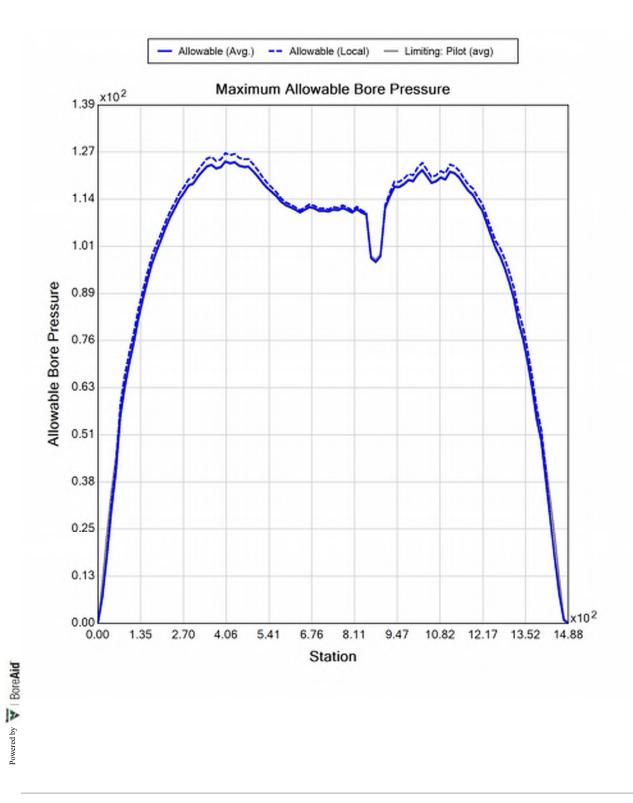


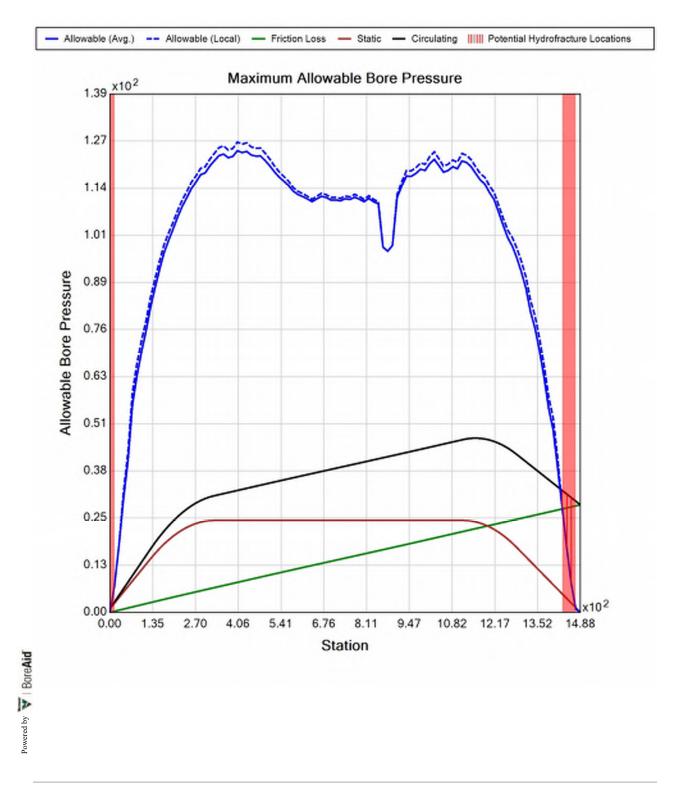














Generated Output

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Input Summary

Start Coordinate	(0.00, 0.00, 132.00) ft
End Coordinate	(1478.00, 0.00, 132.00) ft
Project Length	1478.00 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: 1529.99 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	1.5	25.3
Water Pressure	17.8	17.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	19.3	43.1
Deflection		
Earth Load Deflection	0.551	6.884
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.580	6.913
Compressive Stress [psi]		
Compressive Wall Stress	86.9	194.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1525.4	1525.4
Pullback Stress [psi]	871.6	871.6
Pullback Strain	1.516E-2	1.516E-2
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	871.6	875.9
Tensile Strain	1.516E-2	1.533E-2

Net External Pressure = 27.6 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.580	7.5	12.9	OK
Unconstrained Collapse [psi]	33.7	132.8	3.9	OK
Compressive Wall Stress [psi]	86.9	1150.0	13.2	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	43.6	202.8	4.6	OK
Tensile Stress [psi]	875.9	1200.0	1.4	OK



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Project Summary

General:	HDD#13A - Conduit 1
	Ref: Washington County, NY
	Whitehall
	Start Date: 06-21-2022
	End Date: 06-21-2022
Project Owner:	TDI
Project Contractor:	KIEWIT
Project Consultant:	СНА
Designer:	AJB
	СНА

Description:

Input Summary

(100.00, 0.00, 136.10) ft
(1014.80, 0.00, 133.80) ft
914.80 ft
HDPE
IPS
10.750 in
9.0
1.19 in
15.00 ft
2.875 in
(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 6

Soil Layer #1 USCS, Sand (S), SM From Assistant Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Silt (M), ML From Assistant Unit Weight: 80.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 28.00, S.M.: 50.00, Coh: 0.00 [psi]

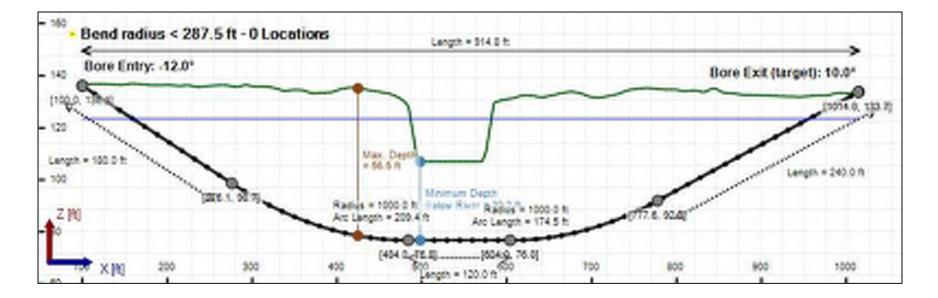
Soil Layer #3 USCS, Clay (C), CH From Assistant Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi]

Soil Layer #4 USCS, Clay (C), CL From Assistant Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi]

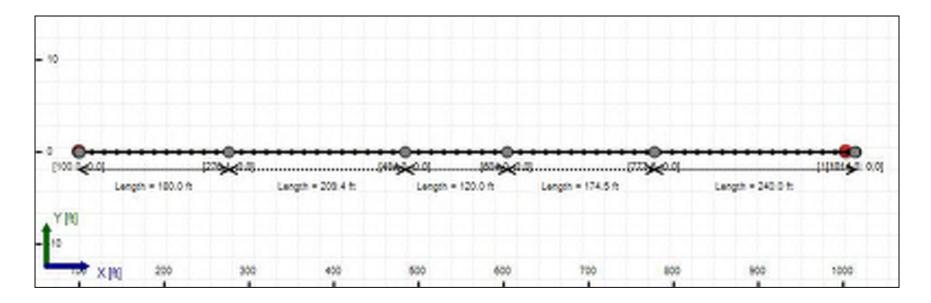
Soil Layer #5 USCS, Sand (S), SP From Assistant Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #6 USCS, Clay (C), CH From Assistant Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi]









Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 930.00 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	5.3	21.3
Water Pressure	20.2	19.5
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	25.6	40.8
Deflection		
Earth Load Deflection	1.449	5.812
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.581	5.944
Compressive Stress [psi]		
Compressive Wall Stress	115.0	183.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	16322.3	16322.3
Pullback Stress [psi]	455.2	455.2
Pullback Strain	7.917E-3	7.917E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	455.2	479.0
Tensile Strain	7.917E-3	8.778E-3

Net External Pressure = 34.3 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.581	7.5	4.7	OK
Unconstrained Collapse [psi]	38.5	119.9	3.1	OK
Compressive Wall Stress [psi]	115.0	1150.0	10.0	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	48.5	228.7	4.7	OK
Tensile Stress [psi]	479.0	1200.0	2.5	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	75.064 psi	90.664 psi
1	8.00 in	12.00 in	75.040 psi	90.627 psi
2	12.00 in	16.13 in	75.005 psi	90.573 psi

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

Estimated Circulating Pressure Summary

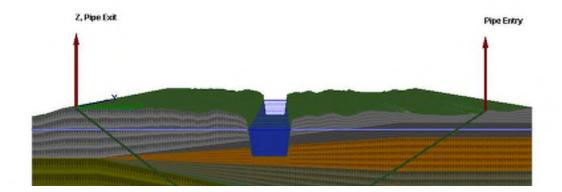
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

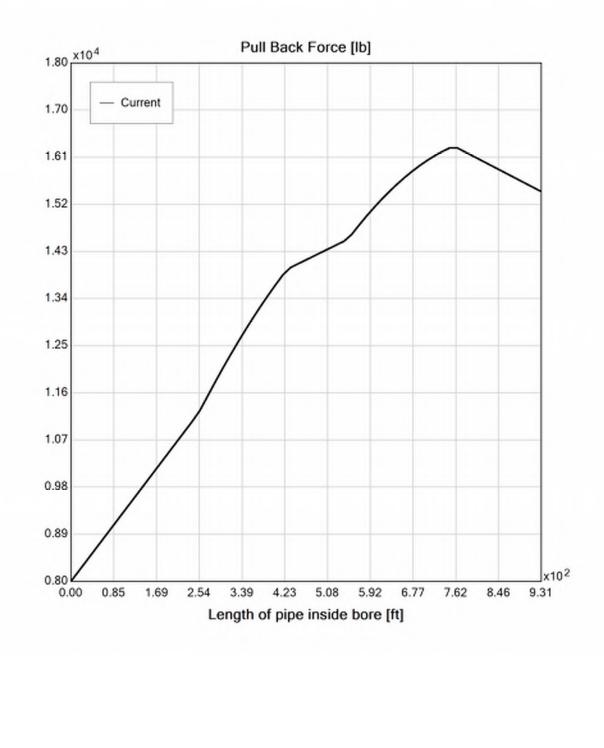
Yield Point (YP): 16.49

Effective Viscosity (cP): 1468.5

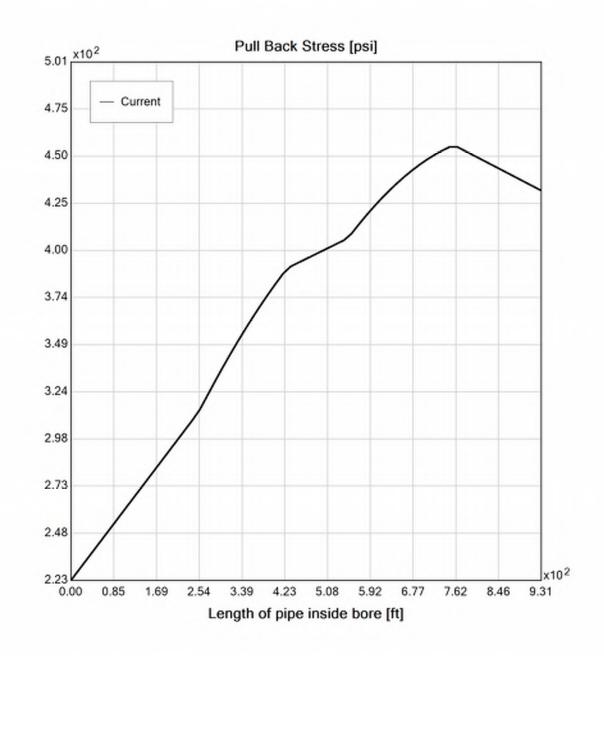
Virtual Site



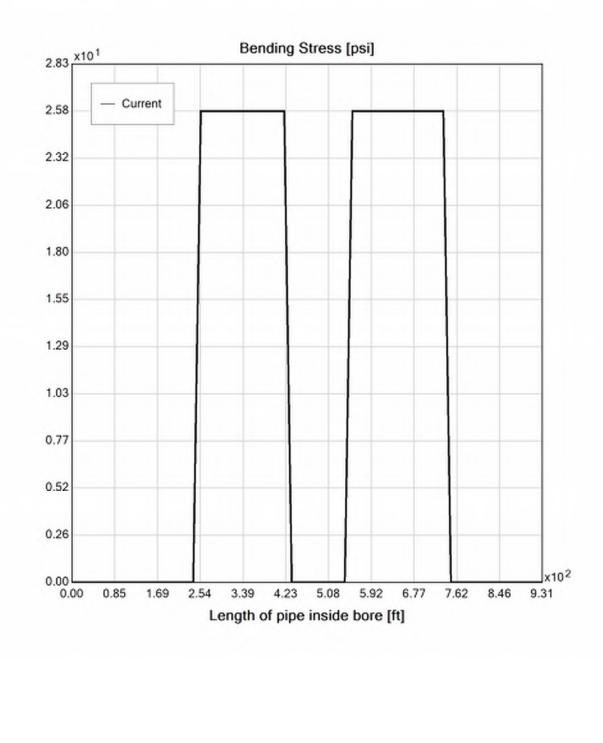




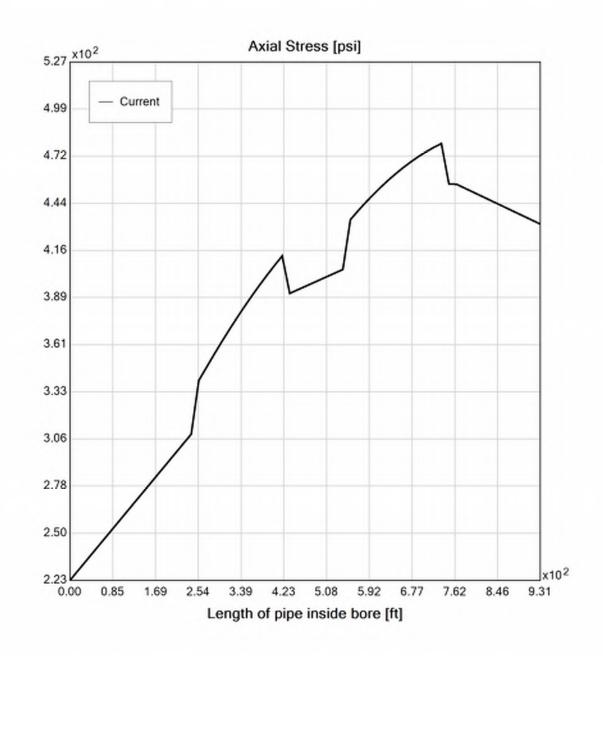
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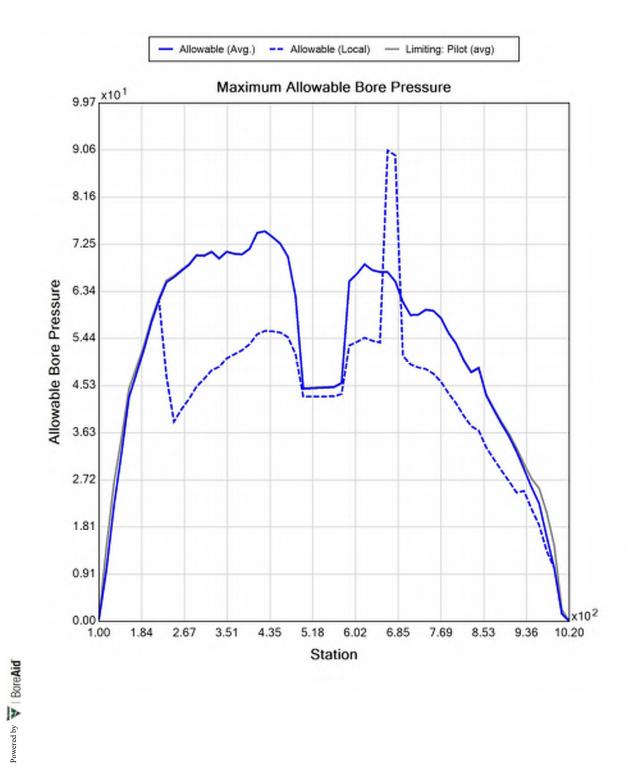
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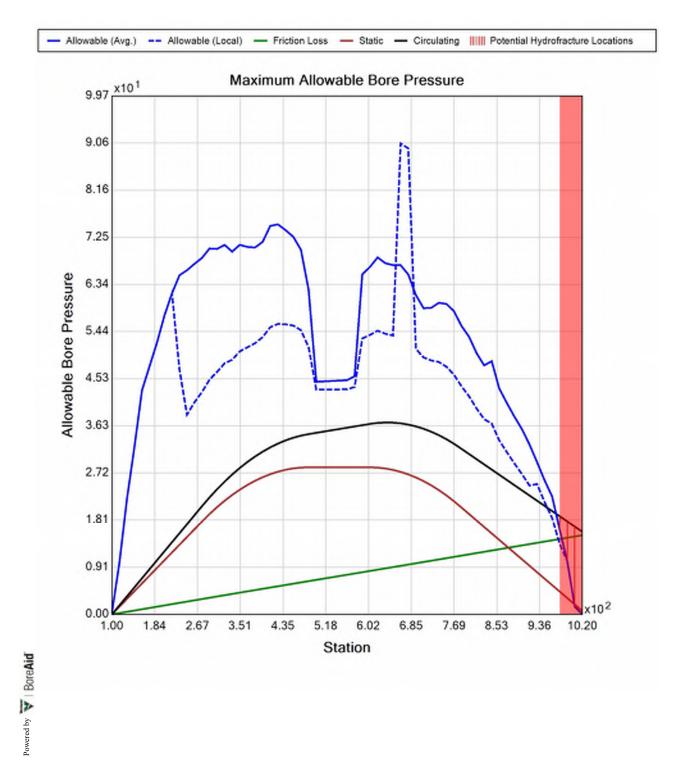


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Generated Output

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Input Summary

Start Coordinate	(100.00, 0.00, 136.10) ft
End Coordinate	(1014.80, 0.00, 133.80) ft
Project Length	914.80 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	2.875 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: 930.00 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	3.2	21.3
Water Pressure	20.2	19.5
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	23.4	40.8
Deflection		
Earth Load Deflection	0.858	5.812
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.887	5.841
Compressive Stress [psi]		
Compressive Wall Stress	105.2	183.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	906.3	906.3
Pullback Stress [psi]	517.8	517.8
Pullback Strain	9.006E-3	9.006E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	517.8	521.5
Tensile Strain	9.006E-3	9.169E-3

Net External Pressure = 34.3 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.887	7.5	8.5	OK
Unconstrained Collapse [psi]	38.5	127.5	3.3	OK
Compressive Wall Stress [psi]	105.2	1150.0	10.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	48.5	226.8	4.7	OK
Tensile Stress [psi]	521.5	1200.0	2.3	OK



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Project Summary

General:	CHPE HDD 14 - Conduit 1 P2
	Start Date: 02-28-2022
	End Date: 02-28-2022
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	
Description:	HDD 14 Conduit 1 10-inch DR 9

Input Summary

(0.00, 0.00, 129.00) ft
(707.00, 0.00, 135.46) ft
707.00 ft
HDPE
IPS
10.750 in
9.0
1.19 in
15.00 ft
3.5 in
(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 7

Soil Layer #1 USCS, Sand (S), SW Depth: 4.00 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

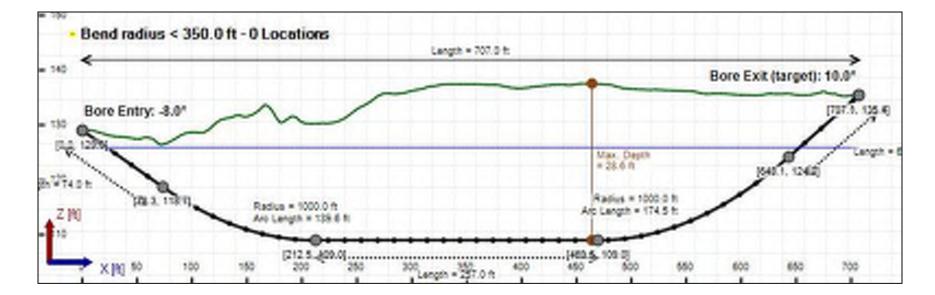
Soil Layer #2 USCS, Silt (M), ML Depth: 2.00 ft Unit Weight: 70.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.56 [psi]

Soil Layer #3 USCS, Sand (S), SM Depth: 4.00 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #4 USCS, Clay (C), CL Depth: 3.00 ft Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.56 [psi]

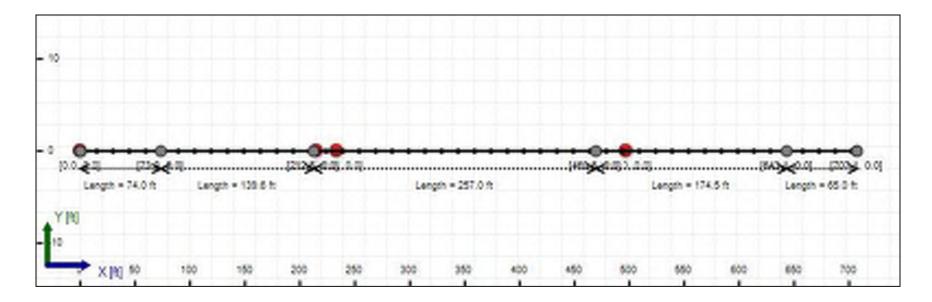
Soil Layer #5 USCS, Sand (S), SP Depth: 14.00 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #6 USCS, Clay (C), CH Depth: 6.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi] Soil Layer #7 USCS, Silt (M), ML Depth: 15.00 ft Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.56 [psi]



Bore Cross-Section View





Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 720.00 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	3.8	15.0
Water Pressure	7.3	7.3
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	11.2	22.3
Deflection		
Earth Load Deflection	1.141	4.081
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.274	4.213
Compressive Stress [psi]		
Compressive Wall Stress	50.2	100.5

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	12038.5	12038.5
Pullback Stress [psi]	335.7	335.7
Pullback Strain	5.839E-3	5.839E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	335.7	360.6
Tensile Strain	5.839E-3	6.719E-3

Net External Pressure = 20.7 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.274	7.5	5.9	OK
Unconstrained Collapse [psi]	18.3	124.3	6.8	OK
Compressive Wall Stress [psi]	50.2	1150.0	22.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	28.3	235.5	8.3	OK
Tensile Stress [psi]	360.6	1200.0	3.3	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	66.228 psi	67.567 psi
1	8.00 in	12.00 in	66.092 psi	67.420 psi
2	12.00 in	16.13 in	65.896 psi	67.210 psi

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

Estimated Circulating Pressure Summary

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

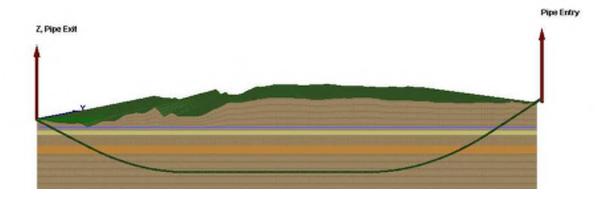
Flow Rate (Q): 40.00 US (liquid) gallon/min Drill Fluid Density: 68.700 lb/ft3 Rheological model: Power-Law

Fluid Consistency Index (K): 63.17

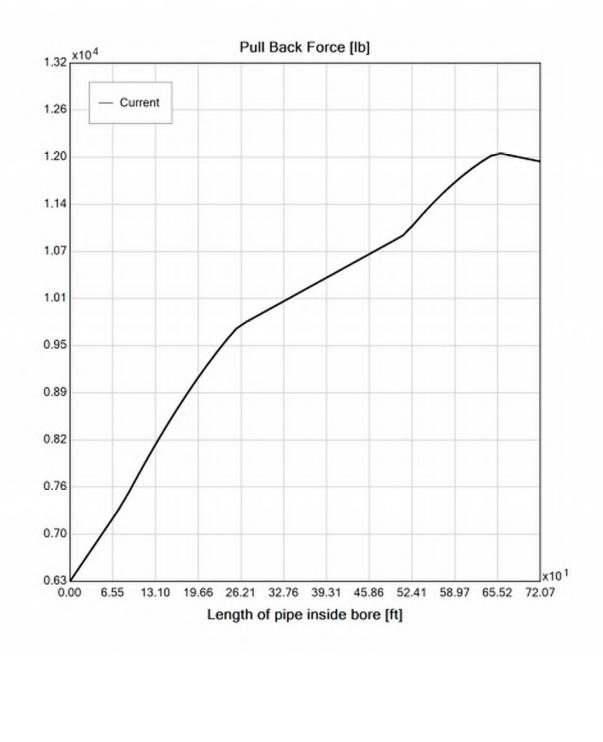
Power Law Exponent (n): 0.14

Effective Viscosity (cP): 859.3

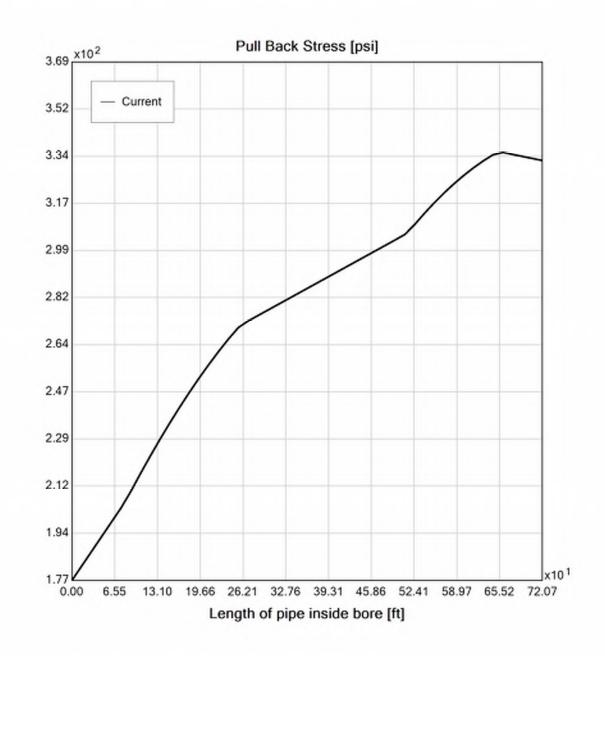
Virtual Site



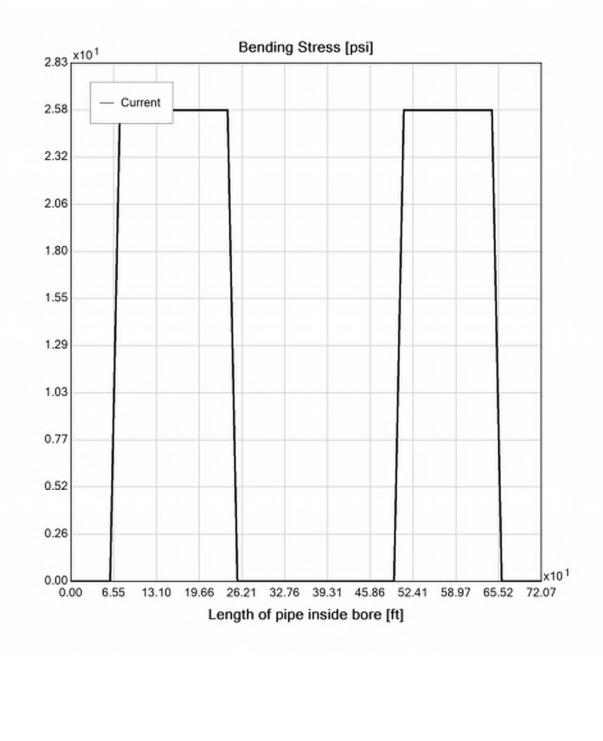




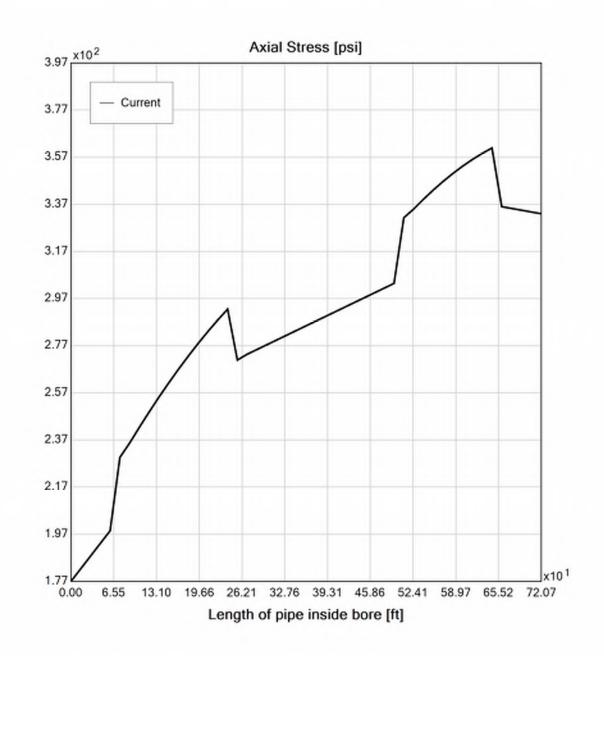
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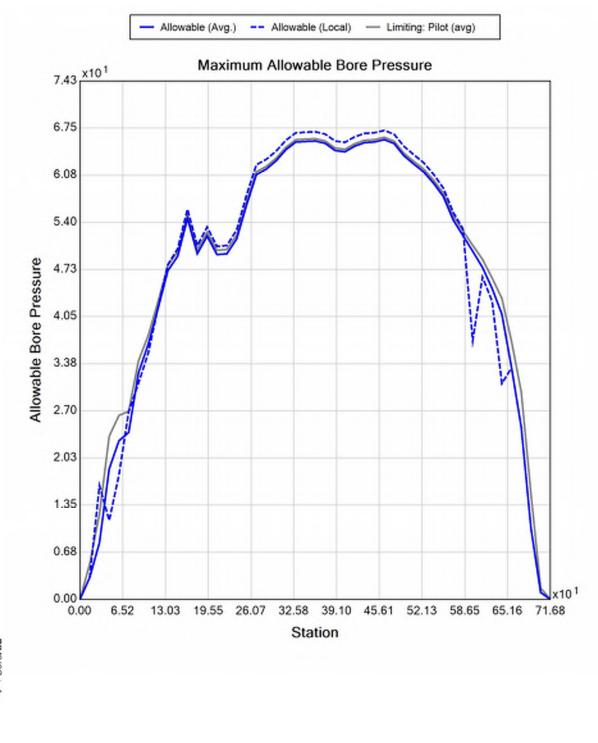
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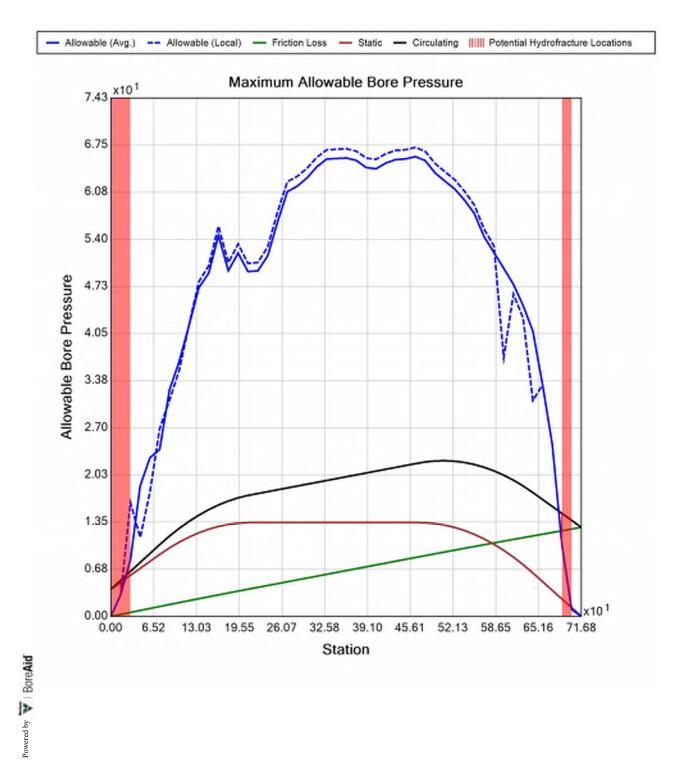




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Generated Output

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Input Summary

(0.00, 0.00, 129.00) ft
(707.00, 0.00, 135.46) ft
707.00 ft
HDPE
IPS
2.375 in
9.0
0.26 in
15.00 ft
3.5 in
(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: 720.00 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	1.5	15.0
Water Pressure	7.3	7.3
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	8.9	22.3
Deflection		
Earth Load Deflection	0.602	4.081
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.631	4.110
Compressive Stress [psi]		
Compressive Wall Stress	40.0	100.5

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	697.2	697.2
Pullback Stress [psi]	398.4	398.4
Pullback Strain	6.928E-3	6.928E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	398.4	403.2
Tensile Strain	6.928E-3	7.110E-3

Net External Pressure = 20.7 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.631	7.5	11.9	OK
Unconstrained Collapse [psi]	18.3	132.7	7.2	OK
Compressive Wall Stress [psi]	40.0	1150.0	28.8	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	28.3	233.8	8.3	OK
Tensile Stress [psi]	403.2	1200.0	3.0	OK



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Project Summary

CHPE HDD 14 - Conduit 2 Start Date: 02-28-2022 End Date: 02-28-2022

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

Designer:

General:

Description:

HDD 14 Conduit 2 10-inch DR 9

Input Summary

Start Coordinate	(66.00, 0.00, 130.42) ft
End Coordinate	(883.00, 0.00, 135.46) ft
Project Length	817.00 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: 7

Soil Layer #1 USCS, Sand (S), SW Depth: 4.00 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

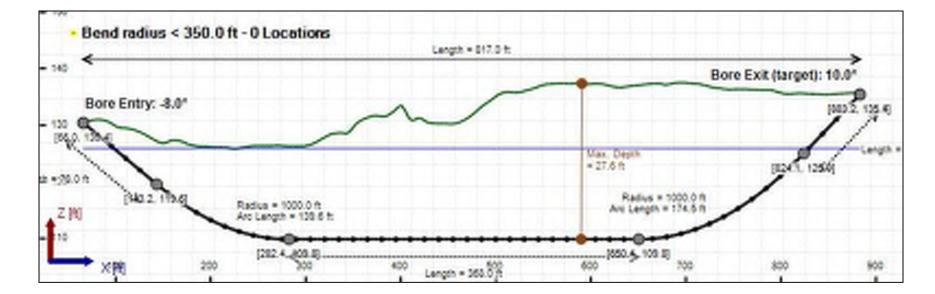
Soil Layer #2 USCS, Silt (M), ML Depth: 2.00 ft Unit Weight: 70.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.56 [psi]

Soil Layer #3 USCS, Sand (S), SM Depth: 4.00 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #4 USCS, Clay (C), CL Depth: 3.00 ft Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.56 [psi]

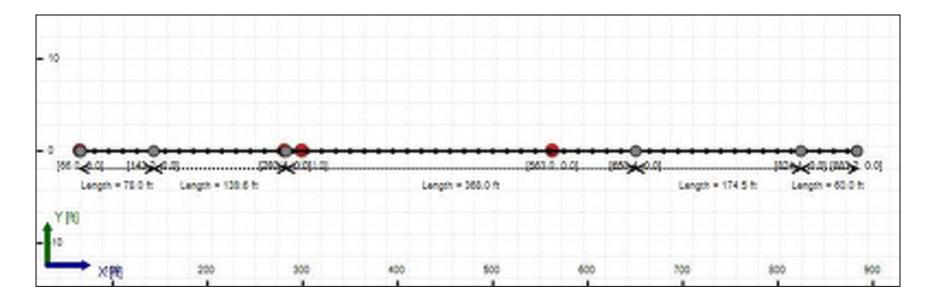
Soil Layer #5 USCS, Sand (S), SP Depth: 14.00 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #6 USCS, Clay (C), CH Depth: 6.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi] Soil Layer #7 USCS, Silt (M), ML Depth: 15.00 ft Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.56 [psi]



Bore Cross-Section View





Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 825.00 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	3.8	14.4
Water Pressure	7.0	7.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	10.7	21.3
Deflection		
Earth Load Deflection	1.119	3.908
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.251	4.041
Compressive Stress [psi]		
Compressive Wall Stress	48.4	95.9

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	13476.8	13476.8
Pullback Stress [psi]	375.9	375.9
Pullback Strain	6.537E-3	6.537E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	375.9	398.8
Tensile Strain	6.537E-3	7.383E-3

Net External Pressure = 19.2 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.251	7.5	6.0	OK
Unconstrained Collapse [psi]	17.2	124.4	7.2	OK
Compressive Wall Stress [psi]	48.4	1150.0	23.8	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	27.2	233.0	8.6	OK
Tensile Stress [psi]	398.8	1200.0	3.0	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	63.939 psi	65.471 psi
1	8.00 in	12.00 in	63.792 psi	65.311 psi
2	12.00 in	16.13 in	63.581 psi	65.082 psi

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

Estimated Circulating Pressure Summary

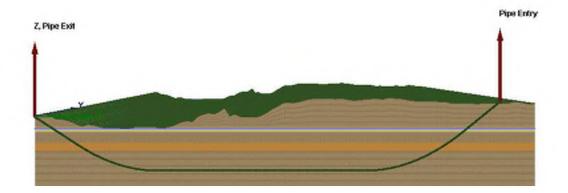
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/min
Drill Fluid Density: 68.700 lb/ft3
Rheological model: Bingham-Plastic
Plastic Viscosity (PV): 25.53

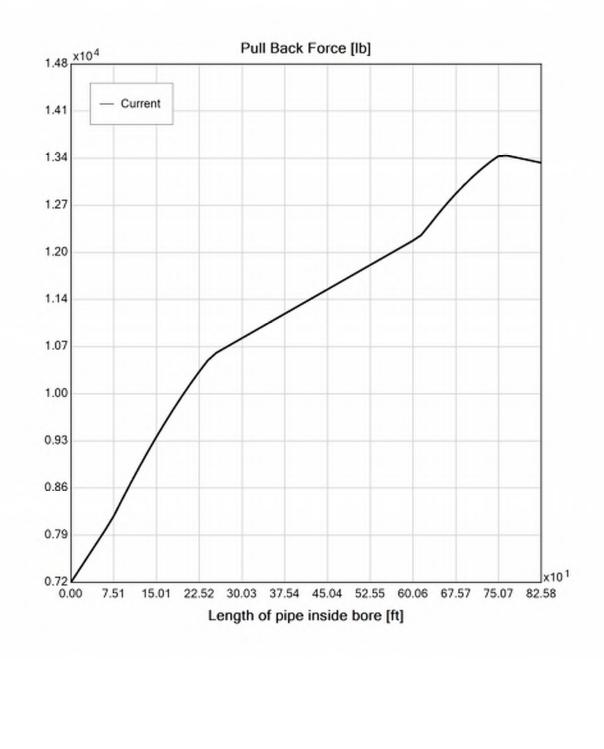
Yield Point (YP): 16.49

Effective Viscosity (cP): 1202.0

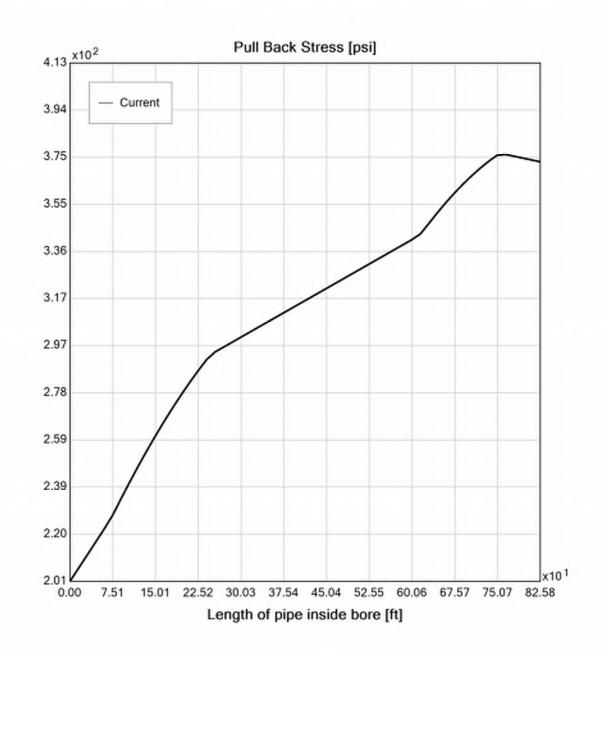
Virtual Site



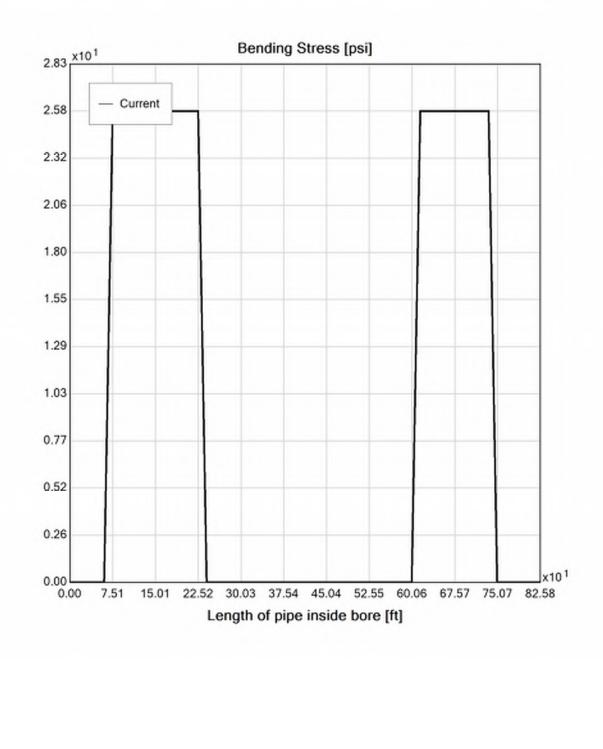




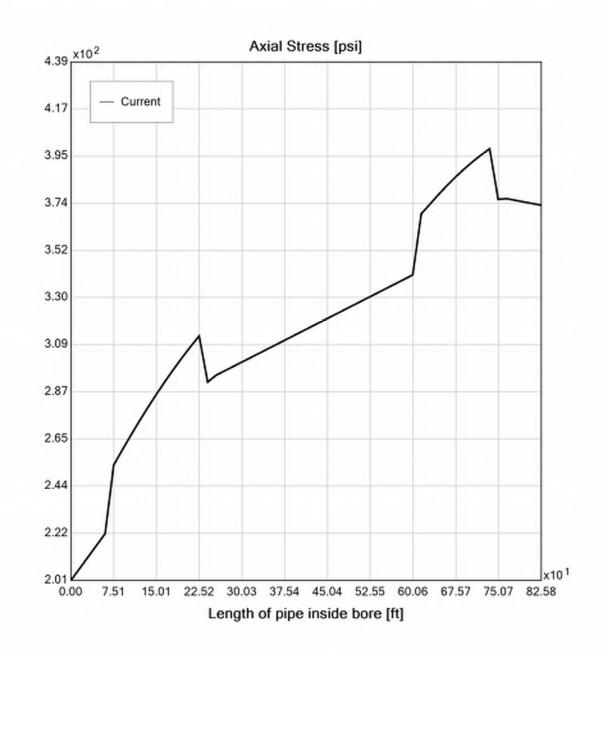
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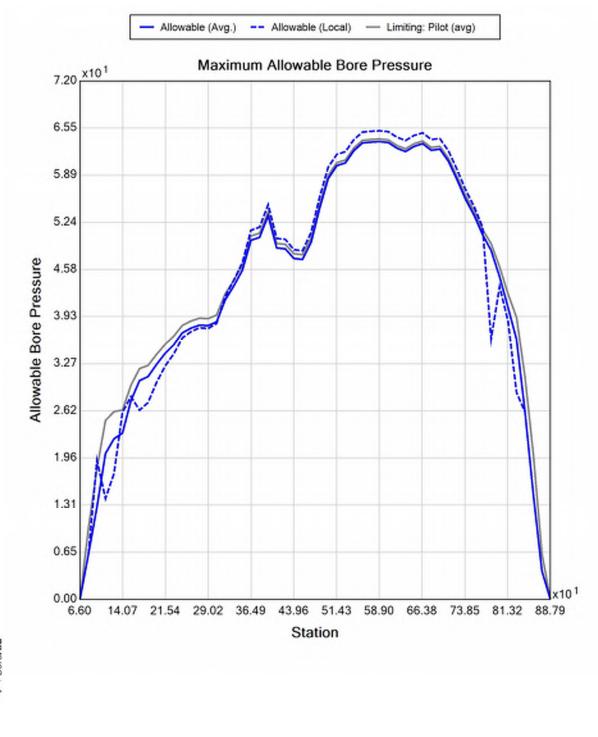
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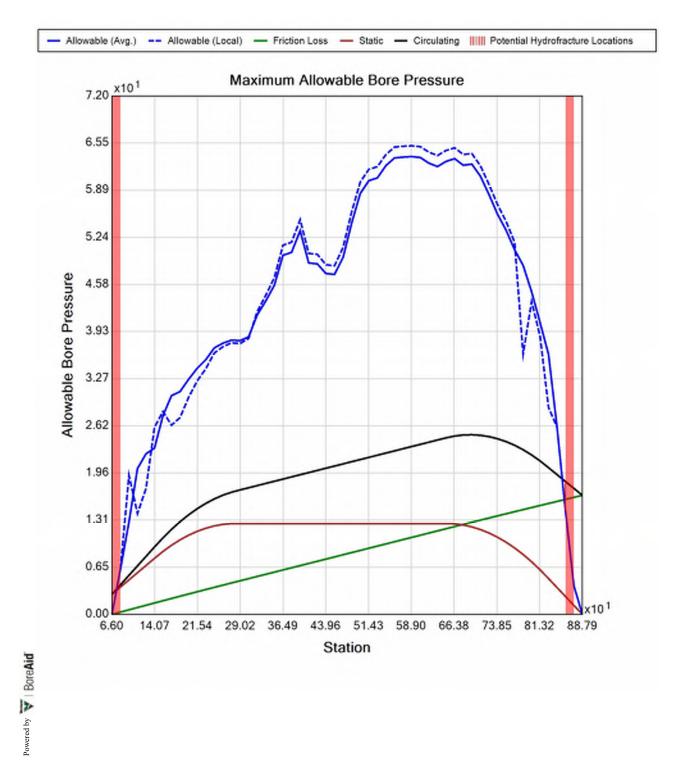
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Generated Output

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Input Summary

Start Coordinate	(66.00, 0.00, 130.42) ft
End Coordinate	(883.00, 0.00, 135.46) ft
Project Length	817.00 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: 825.00 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	1.5	14.4
Water Pressure	7.0	7.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	8.5	21.3
Deflection		
Earth Load Deflection	0.589	3.908
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.619	3.938
Compressive Stress [psi]		
Compressive Wall Stress	38.2	95.9

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	767.4	767.4
Pullback Stress [psi]	438.5	438.5
Pullback Strain	7.625E-3	7.625E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	438.5	441.3
Tensile Strain	7.625E-3	7.774E-3

Net External Pressure = 19.2 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.619	7.5	12.1	OK
Unconstrained Collapse [psi]	17.2	132.7	7.7	OK
Compressive Wall Stress [psi]	38.2	1150.0	30.1	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	27.2	231.3	8.5	OK
Tensile Stress [psi]	441.3	1200.0	2.7	OK



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Project Summary

General:	CHPE HDD 14A Conduit 1
	P2
	Start Date: 02-28-2022
	End Date: 02-28-2022
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	
Description:	HDD 14A Conduit 1 10-inch DR 9

Input Summary

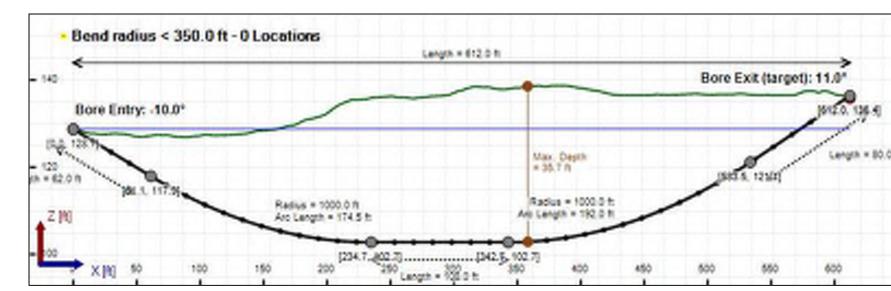
Start Coordinate	(0.00, 0.00, 128.70) ft
End Coordinate	(612.00, 0.00, 135.90) ft
Project Length	612.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	10.750 in
Pipe DR	9.0
Pipe Thickness	1.19 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 2

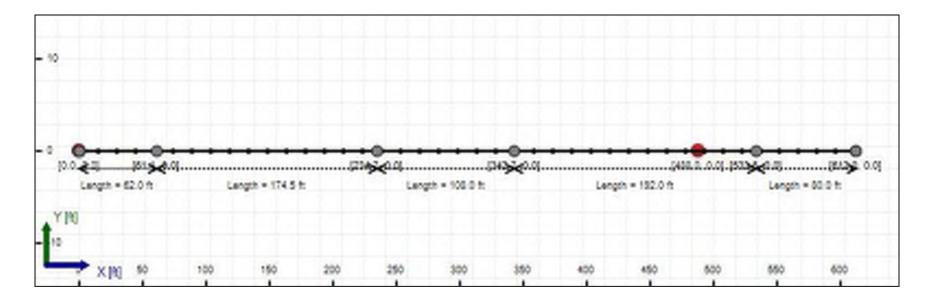
Soil Layer #1 USCS, Sand (S), SM Depth: 3.40 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 4.40 [psi]

Soil Layer #2 USCS, Clay (C), CH Depth: 42.00 ft Unit Weight: 89.6832 (dry), 114.3936 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.70 [psi]



Bore Cross-Section View





Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 630.00 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	4.7	16.5
Water Pressure	11.3	11.2
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.0	27.8
Deflection		
Earth Load Deflection	1.360	4.495
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.492	4.627
Compressive Stress [psi]		
Compressive Wall Stress	71.9	124.9

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	11206.0	11206.0
Pullback Stress [psi]	312.5	312.5
Pullback Strain	5.435E-3	5.435E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	312.5	337.0
Tensile Strain	5.435E-3	6.309E-3

Net External Pressure = 23.4 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.492	7.5	5.0	OK
Unconstrained Collapse [psi]	23.5	121.7	5.2	OK
Compressive Wall Stress [psi]	71.9	1150.0	16.0	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	33.5	236.9	7.1	OK
Tensile Stress [psi]	337.0	1200.0	3.6	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	71.629 psi	60.892 psi
1	8.00 in	12.00 in	71.574 psi	60.829 psi
2	12.00 in	16.13 in	71.496 psi	60.739 psi

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

Estimated Circulating Pressure Summary

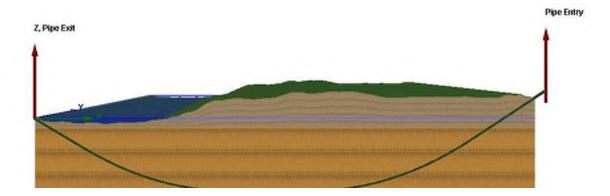
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

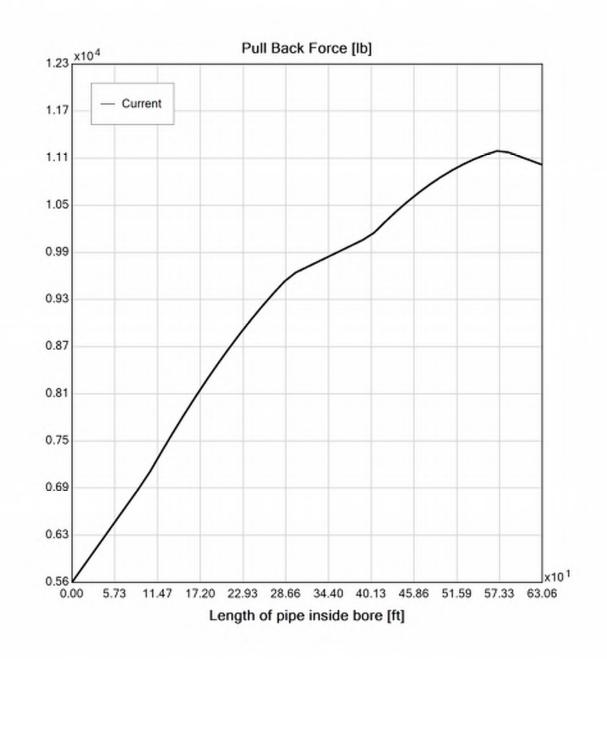
Yield Point (YP): 16.49

Effective Viscosity (cP): 1202.0

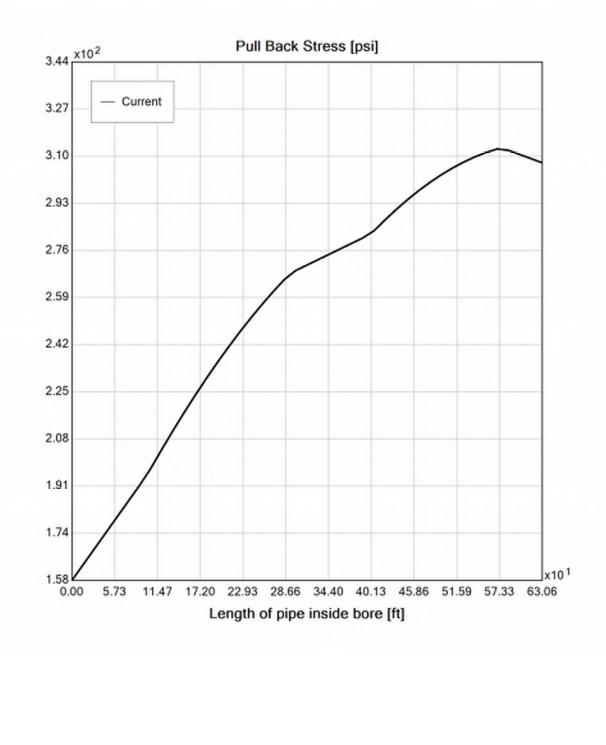
Virtual Site



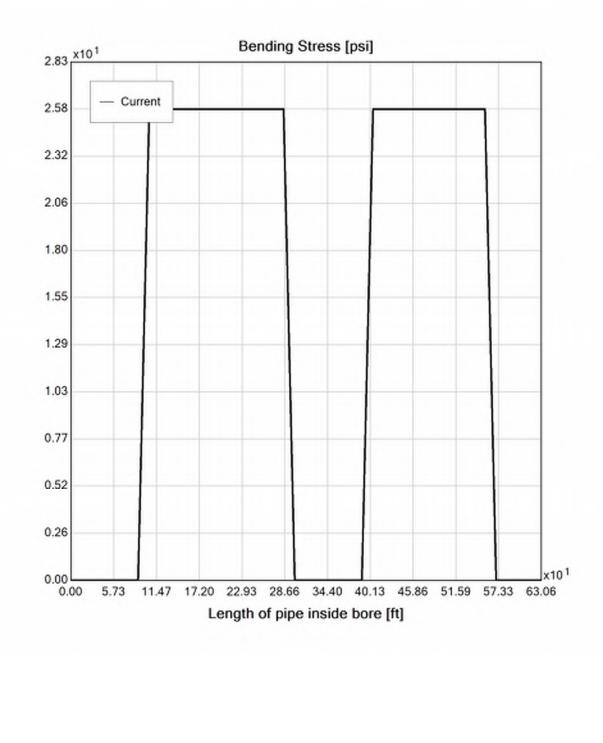




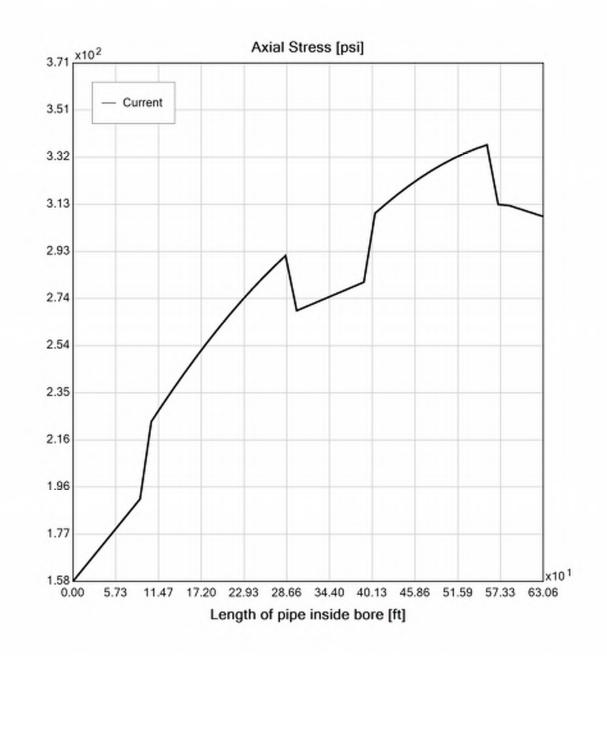
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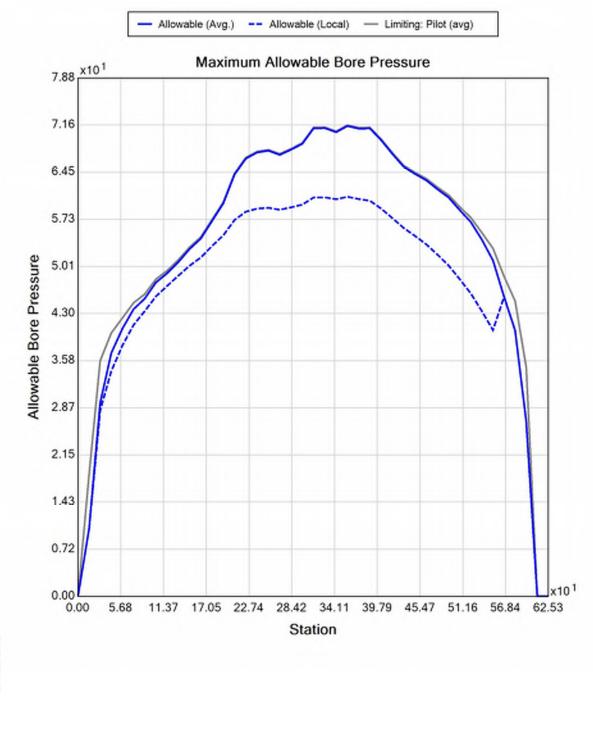
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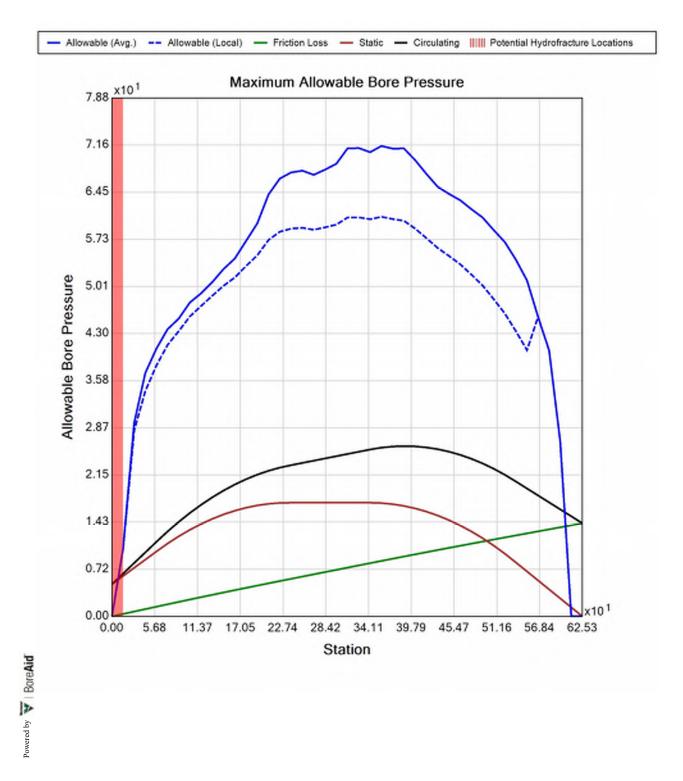
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Generated Output

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Input Summary

Start Coordinate	(0.00, 0.00, 128.70) ft
End Coordinate	(612.00, 0.00, 135.90) ft
Project Length	612.00 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: 630.00 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	2.0	16.5
Water Pressure	11.3	11.2
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	13.3	27.8
Deflection		
Earth Load Deflection	0.833	4.495
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.862	4.525
Compressive Stress [psi]		
Compressive Wall Stress	59.6	124.9

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	656.6	656.6
Pullback Stress [psi]	375.1	375.1
Pullback Strain	6.524E-3	6.524E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	375.1	379.5
Tensile Strain	6.524E-3	6.700E-3

Net External Pressure = 23.4 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.862	7.5	8.7	OK
Unconstrained Collapse [psi]	23.5	131.3	5.6	OK
Compressive Wall Stress [psi]	59.6	1150.0	19.3	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	33.5	235.3	7.0	OK
Tensile Stress [psi]	379.5	1200.0	3.2	OK



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Project Summary

General:	CHPE HDD 14A Conduit 2	
	P2	
	Start Date: 02-28-2022	
	End Date: 02-28-2022	
Project Owner:	TDI	
Project Contractor:	Kiewit	
Project Consultant:	CHA/BCE	
Designer:		
Description:	HDD 14A Conduit 2 10-inch DR 9	

Input Summary

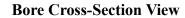
Start Coordinate	(0.00, 0.00, 127.50) ft
End Coordinate	(600.00, 0.00, 134.90) ft
Project Length	600.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	10.750 in
Pipe DR	9.0
Pipe Thickness	1.19 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

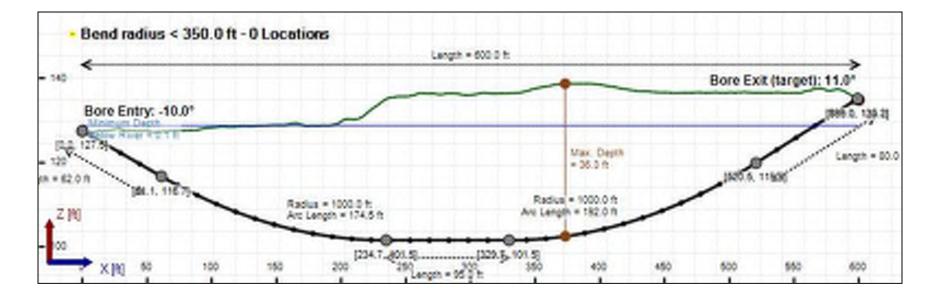
Soil Summary

Number of Layers: 2

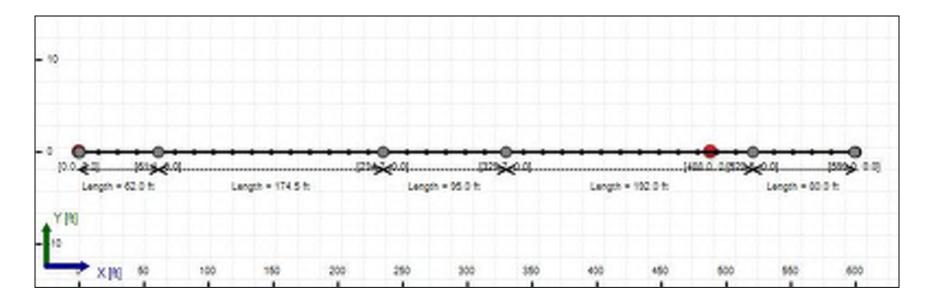
Soil Layer #1 USCS, Sand (S), SM Depth: 3.40 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 4.40 [psi]

Soil Layer #2 USCS, Clay (C), CH Depth: 42.00 ft Unit Weight: 89.6832 (dry), 114.3936 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.70 [psi]









Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 615.00 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	4.8	16.8
Water Pressure	11.7	11.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.5	28.2
Deflection		
Earth Load Deflection	1.331	4.569
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.463	4.701
Compressive Stress [psi]		
Compressive Wall Stress	74.1	126.8

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	10954.4	10954.4
Pullback Stress [psi]	305.5	305.5
Pullback Strain	5.313E-3	5.313E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	305.5	330.0
Tensile Strain	5.313E-3	6.188E-3

Net External Pressure = 23.2 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.463	7.5	5.1	OK
Unconstrained Collapse [psi]	23.3	121.8	5.2	OK
Compressive Wall Stress [psi]	74.1	1150.0	15.5	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	33.3	237.3	7.1	OK
Tensile Stress [psi]	330.0	1200.0	3.6	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	73.094 psi	61.327 psi
1	8.00 in	12.00 in	73.040 psi	61.266 psi
2	12.00 in	16.13 in	72.961 psi	61.179 psi

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

Estimated Circulating Pressure Summary

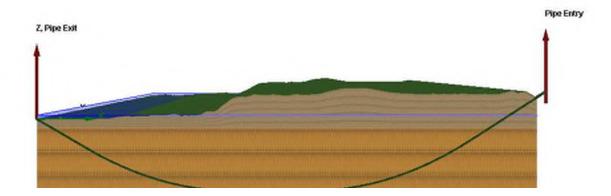
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

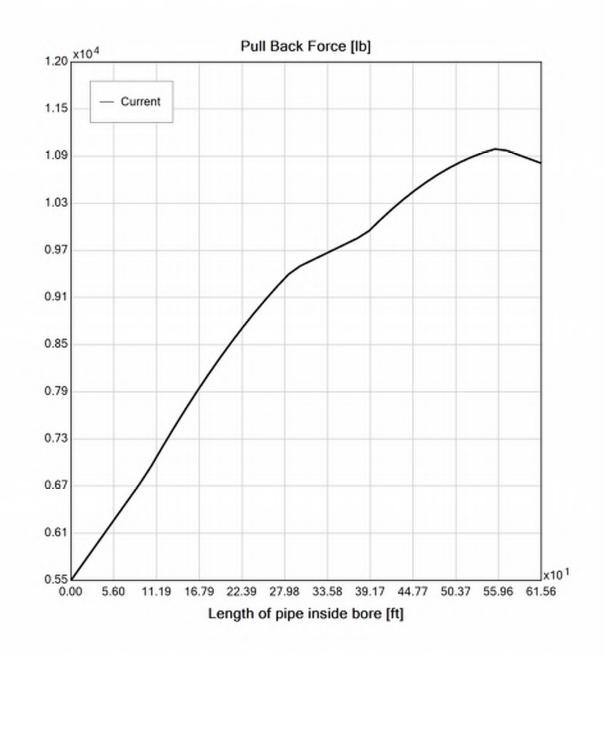
Yield Point (YP): 16.49

Effective Viscosity (cP): 1202.0

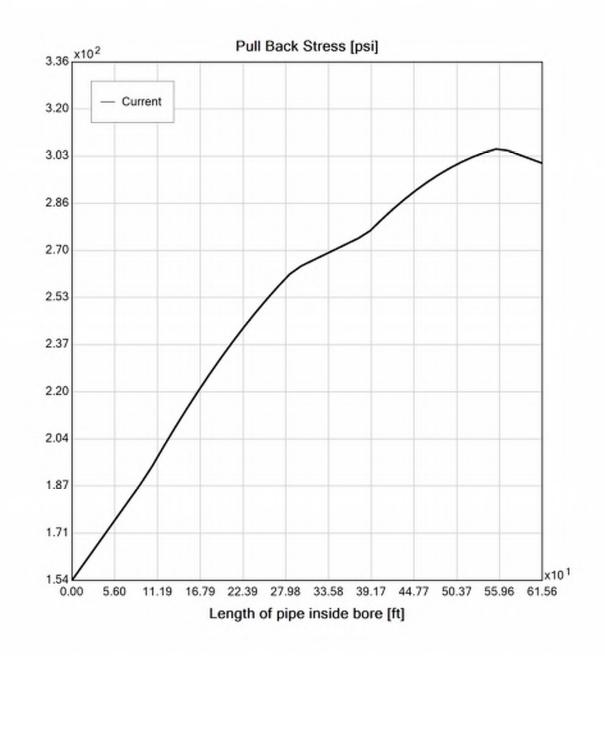
Virtual Site



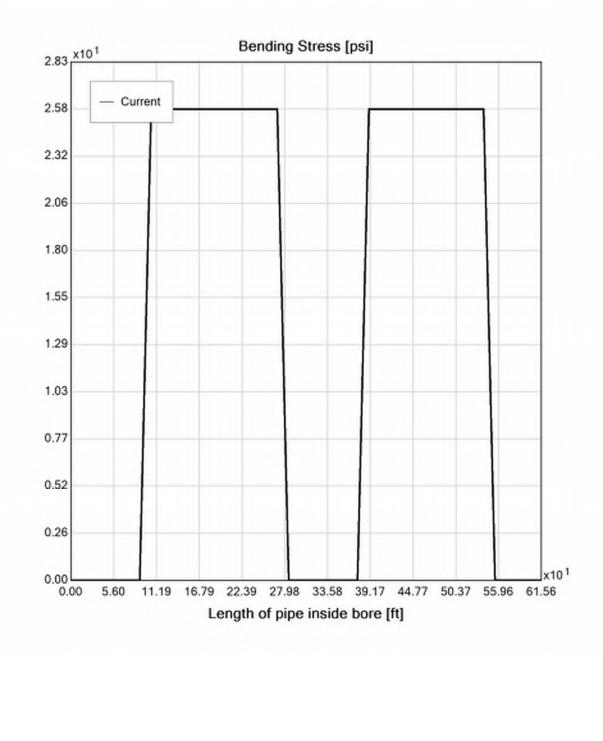




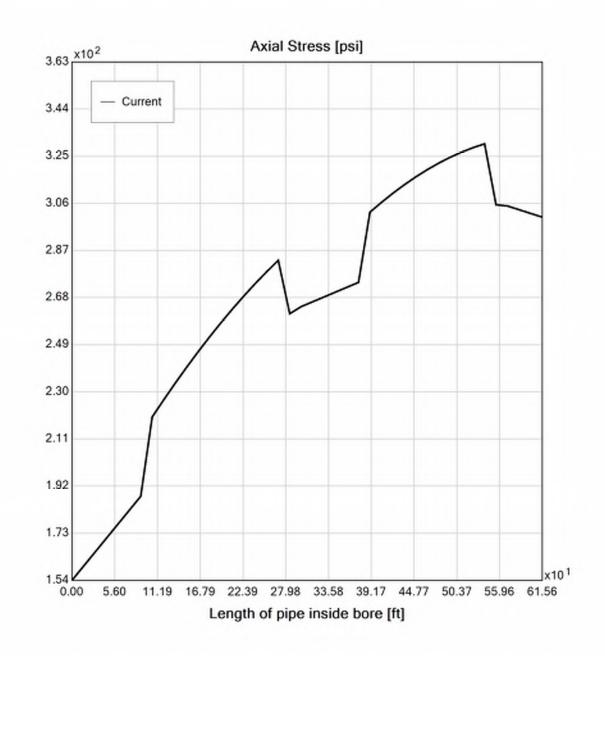
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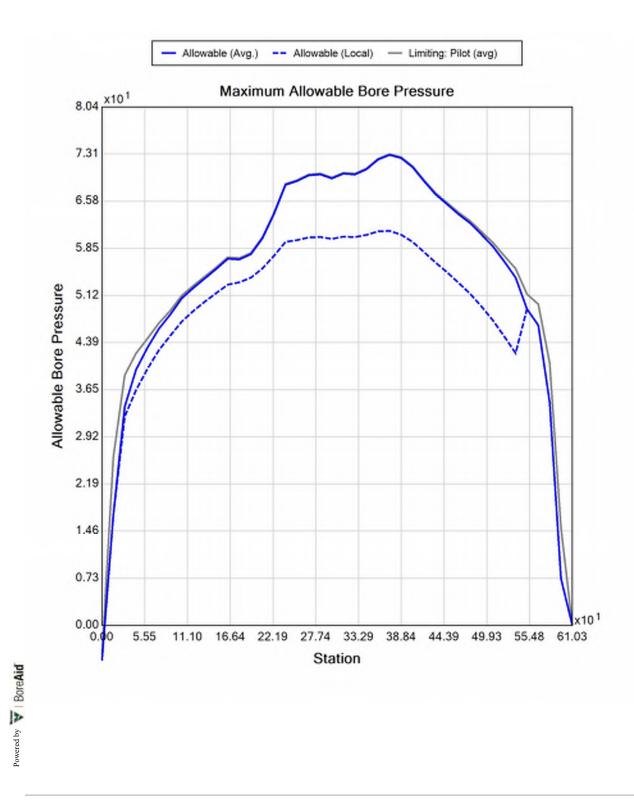
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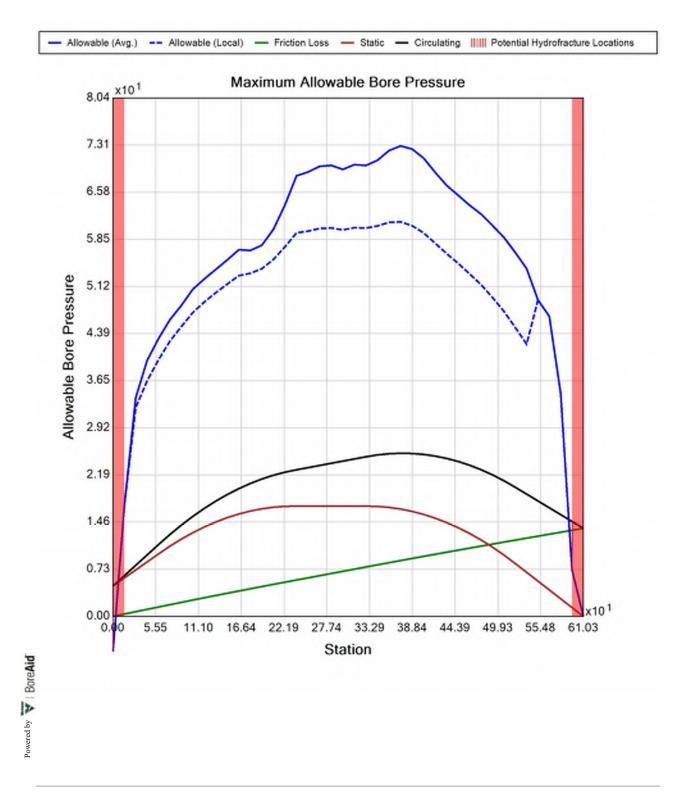


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Generated Output

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Input Summary

Start Coordinate	(0.00, 0.00, 127.50) ft
End Coordinate	(600.00, 0.00, 134.90) ft
Project Length	600.00 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: 615.00 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	2.2	16.8
Water Pressure	11.7	11.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	13.9	28.2
Deflection		
Earth Load Deflection	0.653	4.569
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.682	4.598
Compressive Stress [psi]		
Compressive Wall Stress	62.4	126.8

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	644.3	644.3
Pullback Stress [psi]	368.1	368.1
Pullback Strain	6.402E-3	6.402E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	368.1	372.6
Tensile Strain	6.402E-3	6.579E-3

Net External Pressure = 23.2 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.682	7.5	11.0	OK
Unconstrained Collapse [psi]	23.3	131.2	5.6	OK
Compressive Wall Stress [psi]	62.4	1150.0	18.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	33.3	235.7	7.1	OK
Tensile Stress [psi]	372.6	1200.0	3.2	OK



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Project Summary

General:	CHPE HDD 15
	P2
	Start Date: 02-28-2022
	End Date: 02-28-2022
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	
Description:	HDD 15 10-inch DR 9

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Input Summary

Start Coordinate	(0.00, 0.00, 131.91) ft
End Coordinate	(624.18, 0.00, 131.59) ft
Project Length	624.18 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: 6

Soil Layer #1 USCS, Sand (S), SW Depth: 4.00 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 36.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Silt (M), ML Depth: 4.00 ft Unit Weight: 80.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 50.00, Coh: 4.40 [psi]

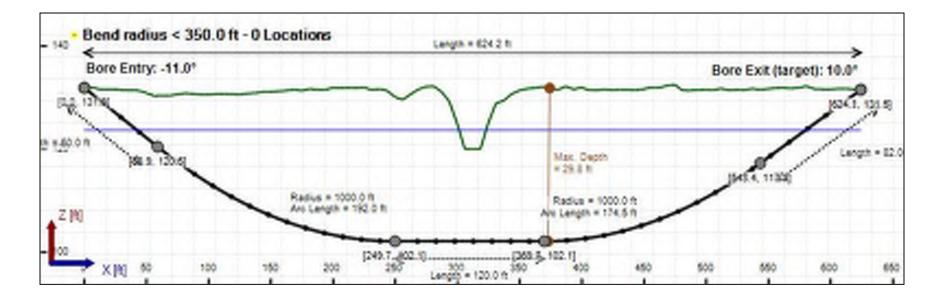
Soil Layer #3 USCS, Clay (C), CH Depth: 3.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.70 [psi]

Soil Layer #4 USCS, Sand (S), SP Depth: 6.00 ft Unit Weight: 109.5552 (dry), 125.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

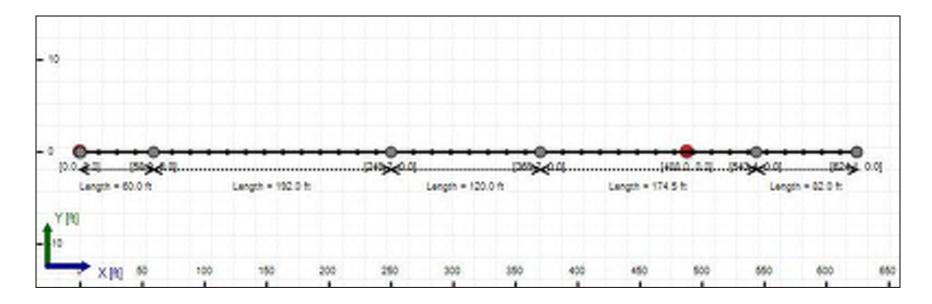
Soil Layer #5 USCS, Clay (C), CH Depth: 20.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.70 [psi]

Soil Layer #6 USCS, Silt (M), ML Depth: 4.00 ft Unit Weight: 80.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 50.00, Coh: 4.40 [psi]

Bore Cross-Section View







Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 630.00 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	4.0	12.2
Water Pressure	9.4	9.3
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	13.4	21.5
Deflection		
Earth Load Deflection	1.092	3.323
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.224	3.455
Compressive Stress [psi]		
Compressive Wall Stress	60.2	96.8

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	10712.4	10712.4
Pullback Stress [psi]	298.8	298.8
Pullback Strain	5.196E-3	5.196E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	298.8	323.6
Tensile Strain	5.196E-3	6.075E-3

Net External Pressure = 17.4 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.224	7.5	6.1	OK
Unconstrained Collapse [psi]	19.4	123.8	6.4	OK
Compressive Wall Stress [psi]	60.2	1150.0	19.1	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	29.3	237.8	8.1	OK
Tensile Stress [psi]	323.6	1200.0	3.7	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	6.00 in	56.064 psi	54.649 psi
1	6.00 in	12.00 in	55.966 psi	54.529 psi
2	12.00 in	16.13 in	55.861 psi	54.401 psi

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

Estimated Circulating Pressure Summary

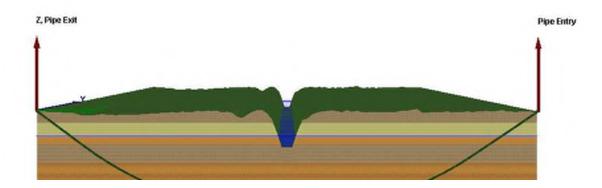
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 20.00 US (liquid) gallon/min
Drill Fluid Density: 68.700 lb/ft3
Rheological model: Bingham-Plastic
Plastic Viscosity (PV): 25.53

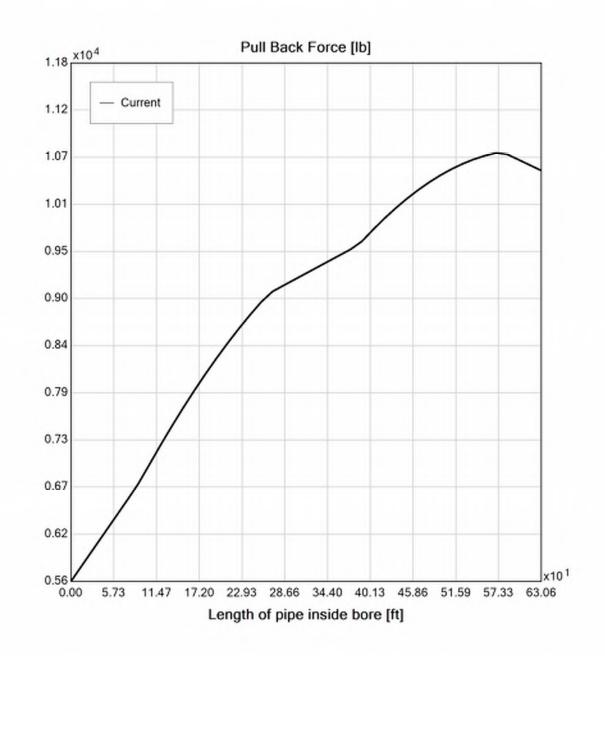
Yield Point (YP): 16.49

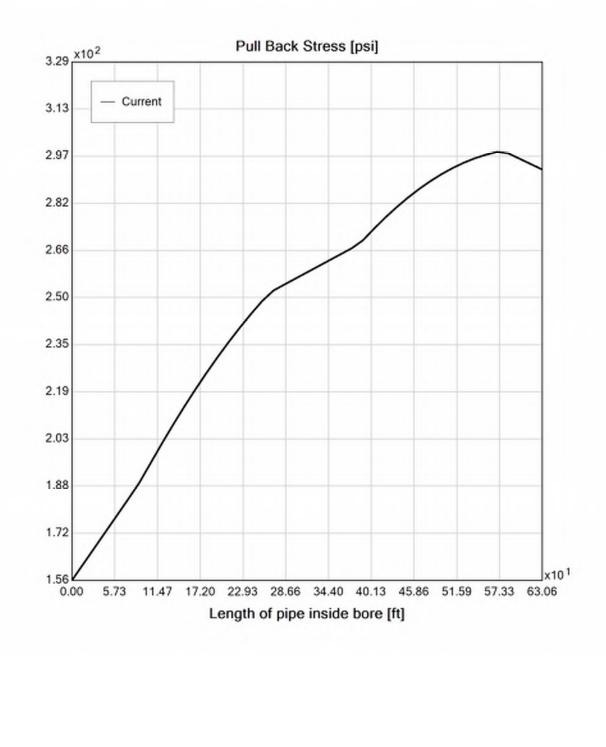
Effective Viscosity (cP): 625.4

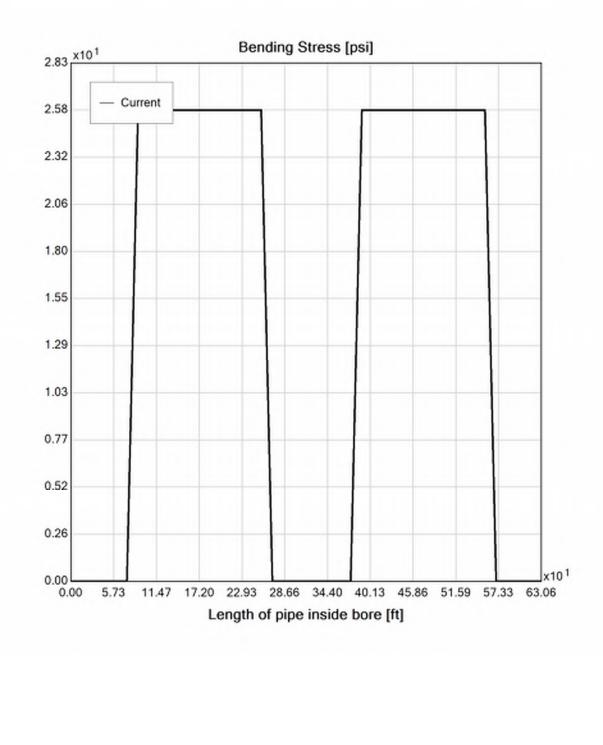
Virtual Site

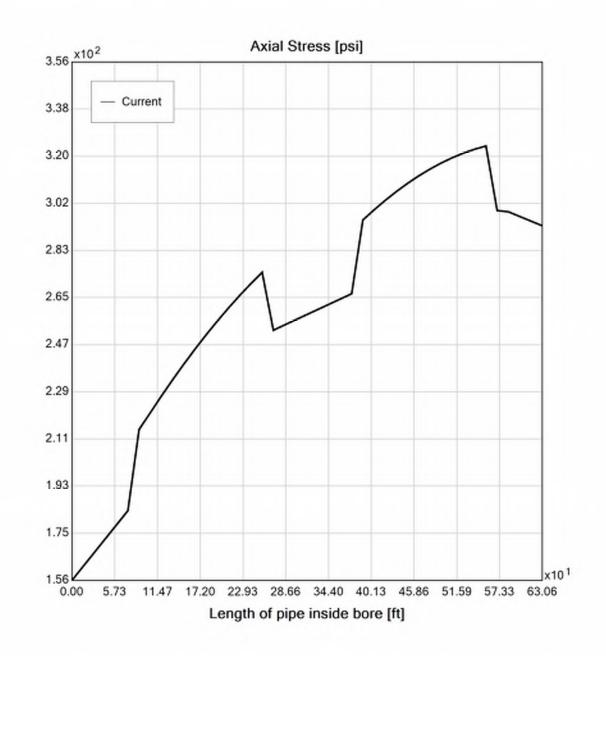


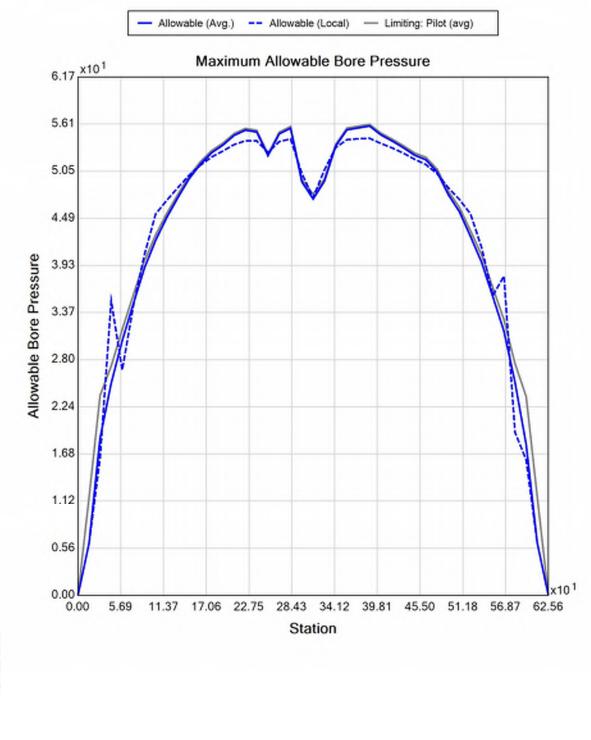


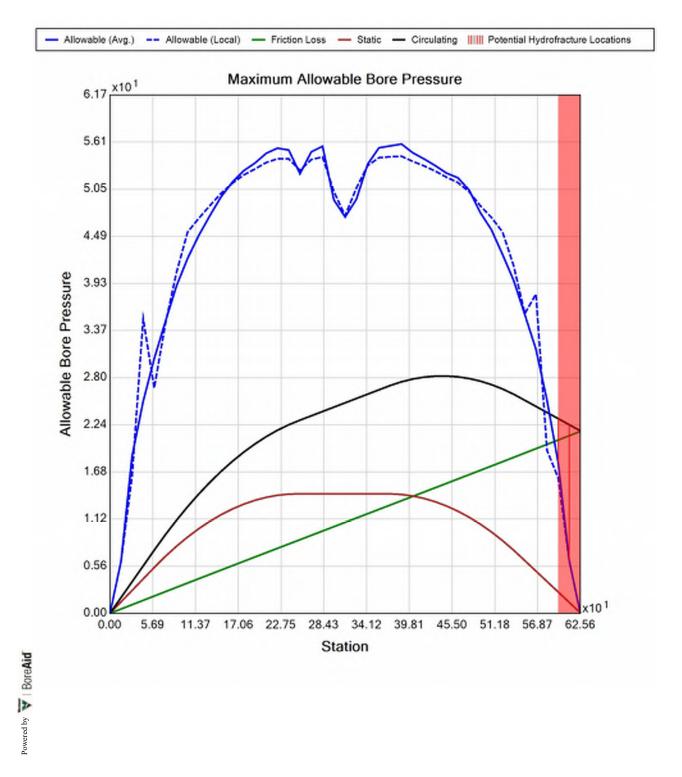














Generated Output

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Input Summary

Start Coordinate	(0.00, 0.00, 131.91) ft
End Coordinate	(624.18, 0.00, 131.59) ft
Project Length	624.18 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: 630.00 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	1.8	12.2
Water Pressure	9.4	9.3
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	11.2	21.5
Deflection		
Earth Load Deflection	0.538	3.323
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.567	3.352
Compressive Stress [psi]		
Compressive Wall Stress	50.4	96.8

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	632.5	632.5
Pullback Stress [psi]	361.4	361.4
Pullback Strain	6.285E-3	6.285E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	361.4	366.1
Tensile Strain	6.285E-3	6.466E-3

Net External Pressure = 17.4 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.567	7.5	13.2	OK
Unconstrained Collapse [psi]	19.4	131.7	6.8	OK
Compressive Wall Stress [psi]	50.4	1150.0	22.8	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	29.3	236.2	8.0	OK
Tensile Stress [psi]	366.1	1200.0	3.3	OK



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Project Summary

General:	CHPE HDD 16 - Conduit 1	
	P2	
	Start Date: 02-28-2022	
	End Date: 02-28-2022	
Project Owner:	TDI	
Project Contractor:	Kiewit	
Project Consultant:	CHA/BCE	
Designer:		
Description:	CHPE HDD 16 Conduit 1 10-inch DR 9	

Input Summary

Start Coordinate	(0.00, 0.00, 141.83) ft
End Coordinate	(640.60, 0.00, 142.08) ft
Project Length	640.60 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 Depth: 3.00 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 4.40 [psi]

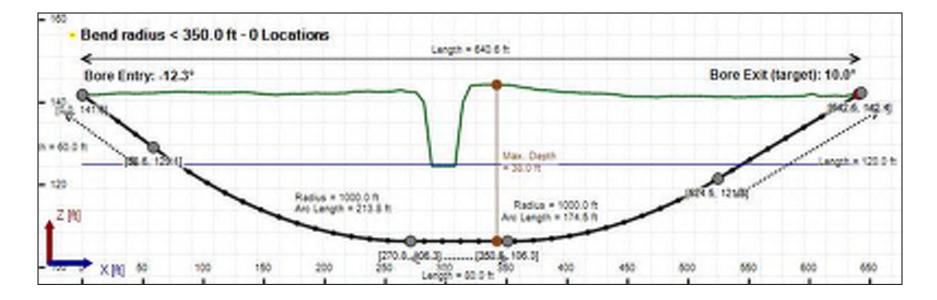
Soil Layer #2 USCS, Silt (M), ML Depth: 2.00 ft Unit Weight: 80.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 4.40 [psi]

Soil Layer #3 USCS, Clay (C), CL Depth: 4.00 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 7.30 [psi]

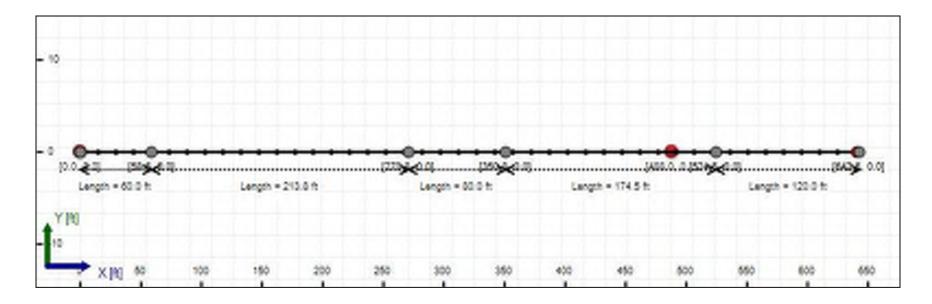
Soil Layer #4 USCS, Sand (S), SM Depth: 8.00 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 4.40 [psi]

Soil Layer #5 USCS, Clay (C), CH Depth: 24.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.70 [psi]









Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 660.00 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	5.4	19.0
Water Pressure	8.1	8.1
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	13.5	27.0
Deflection		
Earth Load Deflection	1.468	5.161
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.600	5.293
Compressive Stress [psi]		
Compressive Wall Stress	60.7	121.7

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	11591.3	11591.3
Pullback Stress [psi]	323.3	323.3
Pullback Strain	5.622E-3	5.622E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	323.3	348.3
Tensile Strain	5.622E-3	6.505E-3

Net External Pressure = 19.9 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.600	7.5	4.7	OK
Unconstrained Collapse [psi]	24.7	119.6	4.8	OK
Compressive Wall Stress [psi]	60.7	1150.0	19.0	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	34.7	236.6	6.8	OK
Tensile Stress [psi]	348.3	1200.0	3.4	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	70.697 psi	64.078 psi
1	8.00 in	12.00 in	70.650 psi	63.681 psi
2	12.00 in	16.13 in	70.581 psi	63.120 psi

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

Estimated Circulating Pressure Summary

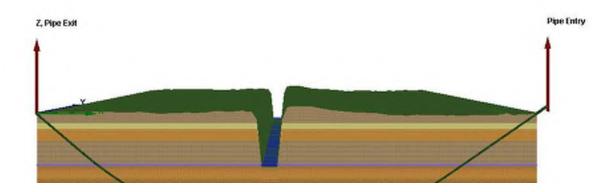
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 20.00 US (liquid) gallon/min
Drill Fluid Density: 68.700 lb/ft3
Rheological model: Bingham-Plastic
Plastic Viscosity (PV): 25.53

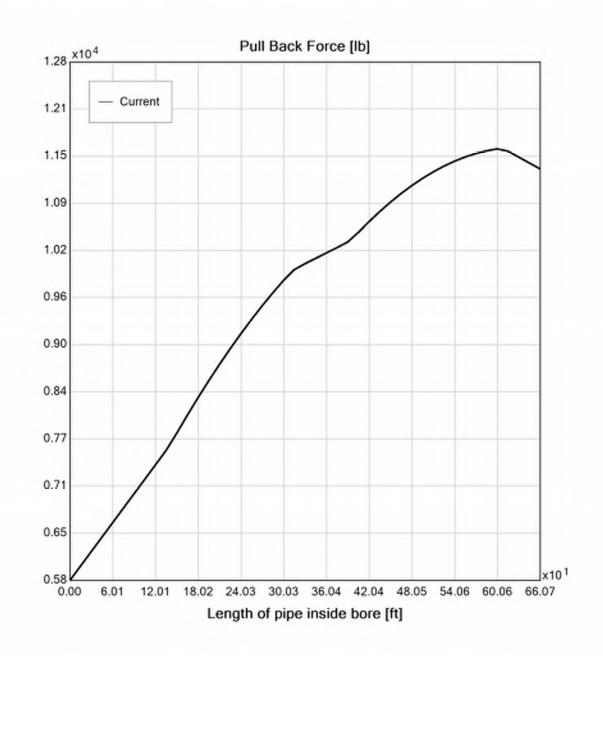
Yield Point (YP): 16.49

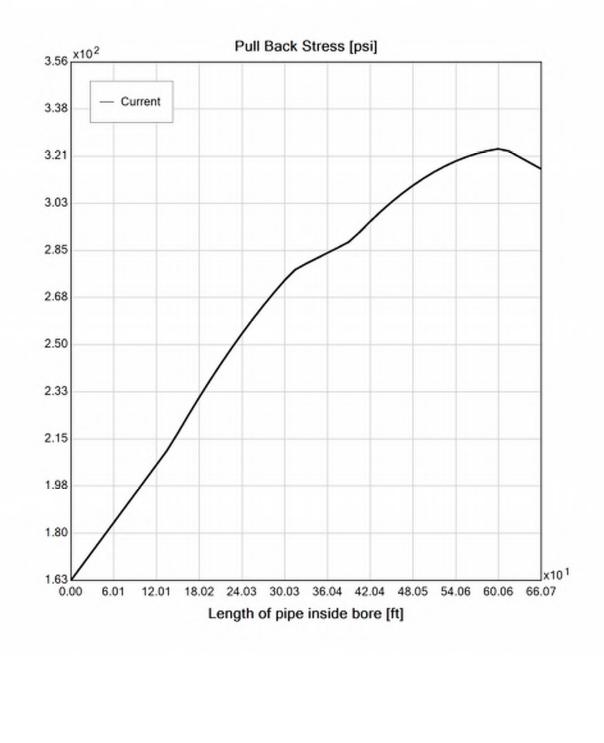
Effective Viscosity (cP): 2378.4

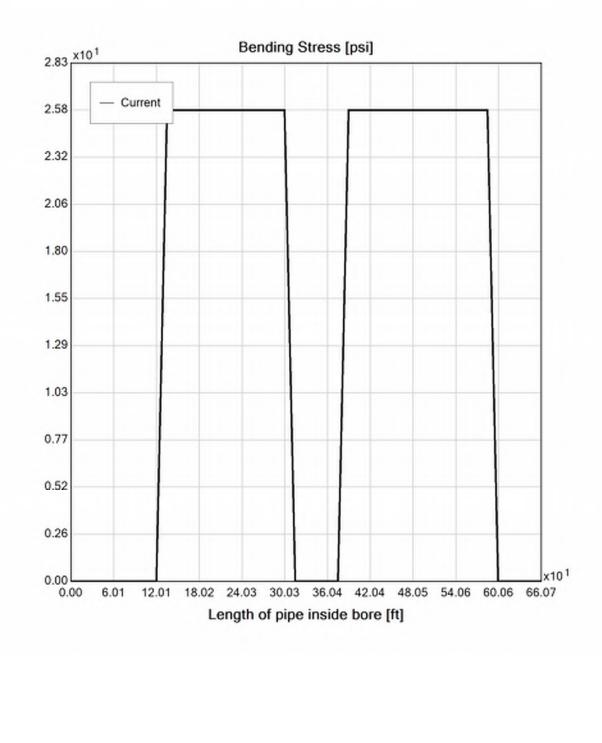
Virtual Site

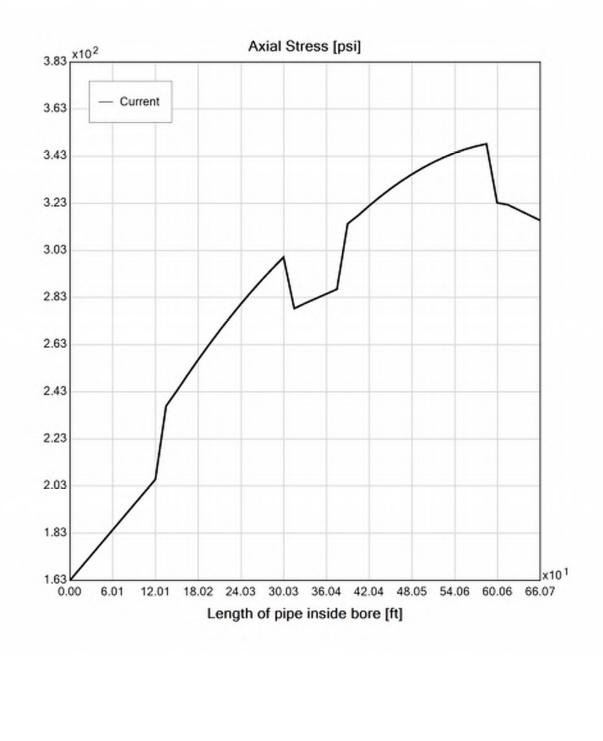


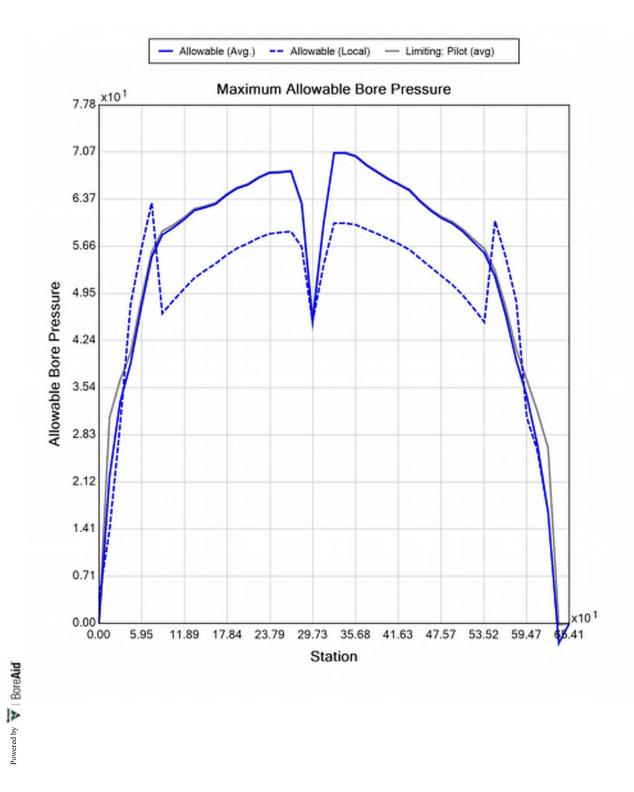


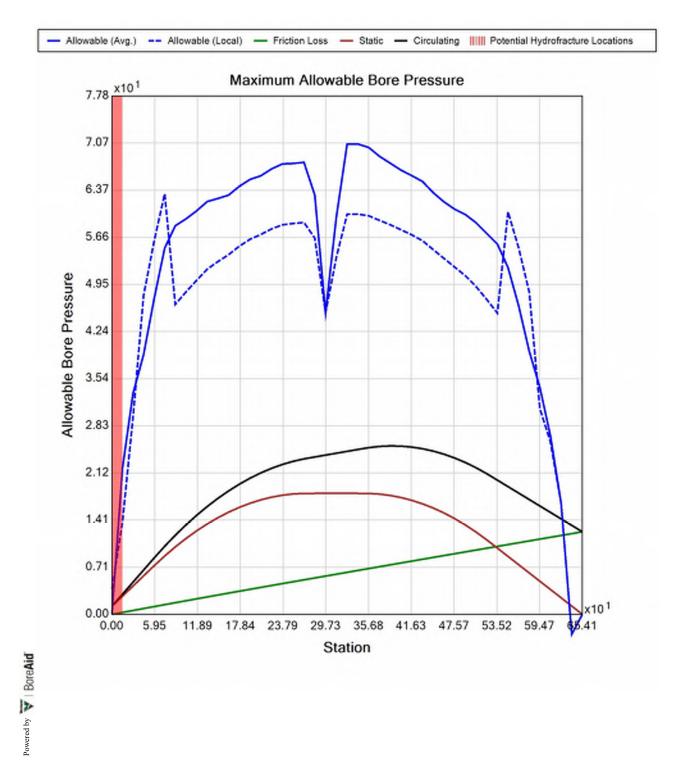














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Input Summary

Start Coordinate	(0.00, 0.00, 141.83) ft
End Coordinate	(640.60, 0.00, 142.08) ft
Project Length	640.60 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: 660.00 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	4.7	19.0
Water Pressure	8.1	8.1
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	12.8	27.0
Deflection		
Earth Load Deflection	1.291	5.161
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	1.320	5.190
Compressive Stress [psi]		
Compressive Wall Stress	57.8	121.7

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	675.4	675.4
Pullback Stress [psi]	385.9	385.9
Pullback Strain	6.711E-3	6.711E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	385.9	390.8
Tensile Strain	6.711E-3	6.896E-3

Net External Pressure = 19.9 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.320	7.5	5.7	OK
Unconstrained Collapse [psi]	24.7	122.7	5.0	OK
Compressive Wall Stress [psi]	57.8	1150.0	19.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	34.7	234.9	6.8	OK
Tensile Stress [psi]	390.8	1200.0	3.1	OK



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Project Summary

General:	CHPE HDD 16 - Conduit 2
	P2
	Start Date: 02-28-2022
	End Date: 02-28-2022
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	
Description:	CHPE HDD 16 Conduit 2 10-inch DR 9

Input Summary

Start Coordinate	(0.00, 0.00, 141.83) ft
End Coordinate	(640.60, 0.00, 142.08) ft
Project Length	640.60 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 Depth: 3.00 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 4.40 [psi]

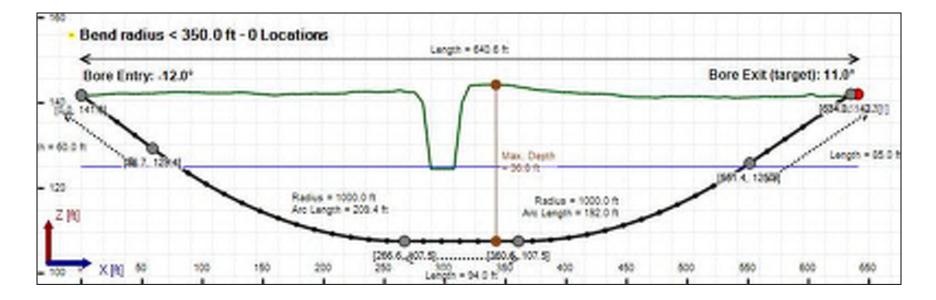
Soil Layer #2 USCS, Silt (M), ML Depth: 2.00 ft Unit Weight: 80.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 4.40 [psi]

Soil Layer #3 USCS, Clay (C), CL Depth: 4.00 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 7.30 [psi]

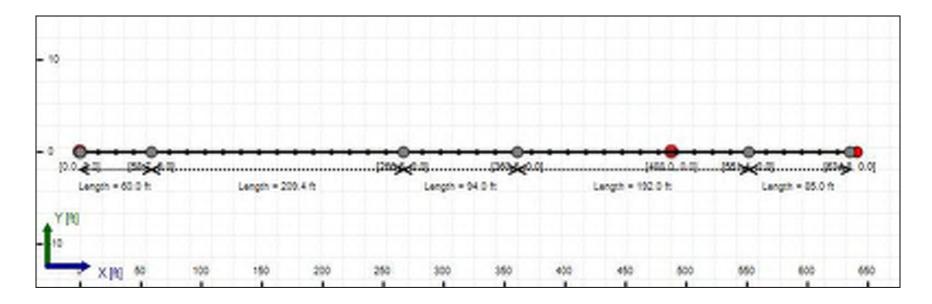
Soil Layer #4 USCS, Sand (S), SM Depth: 8.00 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 4.40 [psi]

Soil Layer #5 USCS, Clay (C), CH Depth: 24.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.70 [psi]









Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 645.00 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	5.3	18.6
Water Pressure	7.6	7.6
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	12.9	26.2
Deflection		
Earth Load Deflection	1.438	5.078
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.570	5.210
Compressive Stress [psi]		
Compressive Wall Stress	57.9	118.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	11277.7	11277.7
Pullback Stress [psi]	314.5	314.5
Pullback Strain	5.470E-3	5.470E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	314.5	339.6
Tensile Strain	5.470E-3	6.354E-3

Net External Pressure = 18.9 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.570	7.5	4.8	OK
Unconstrained Collapse [psi]	23.1	120.0	5.2	OK
Compressive Wall Stress [psi]	57.9	1150.0	19.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	33.0	236.9	7.2	OK
Tensile Stress [psi]	339.6	1200.0	3.5	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	70.036 psi	63.465 psi
1	8.00 in	12.00 in	69.985 psi	63.051 psi
2	12.00 in	16.13 in	69.912 psi	62.468 psi

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

Estimated Circulating Pressure Summary

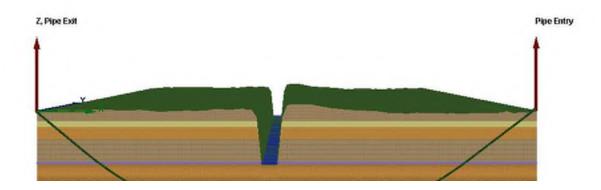
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 20.00 US (liquid) gallon/min
Drill Fluid Density: 68.700 lb/ft3
Rheological model: Bingham-Plastic
Plastic Viscosity (PV): 25.53

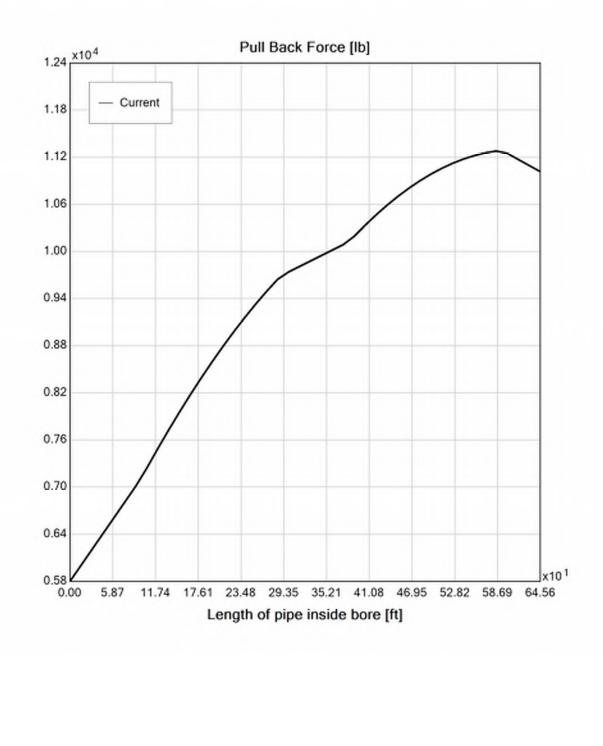
Yield Point (YP): 16.49

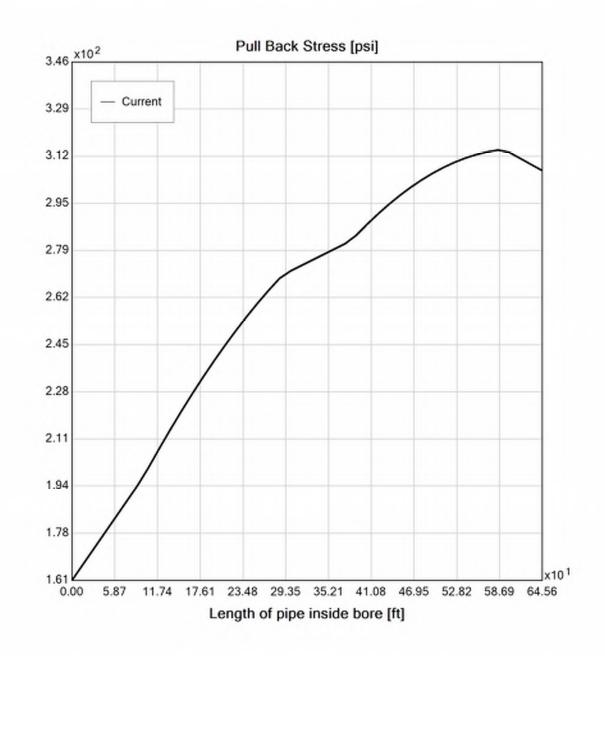
Effective Viscosity (cP): 2378.4

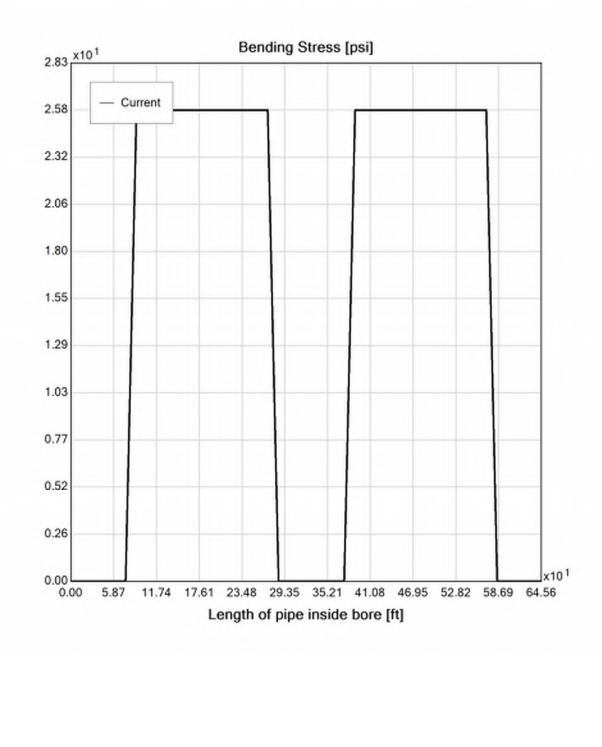
Virtual Site

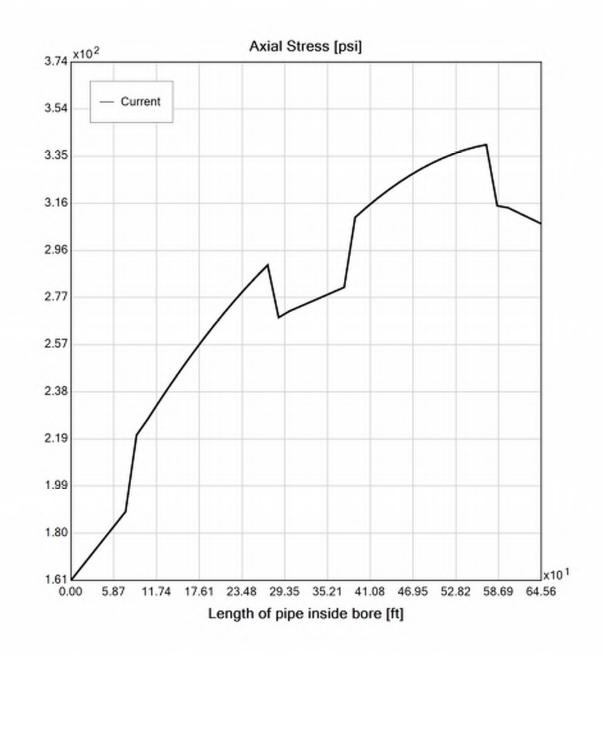


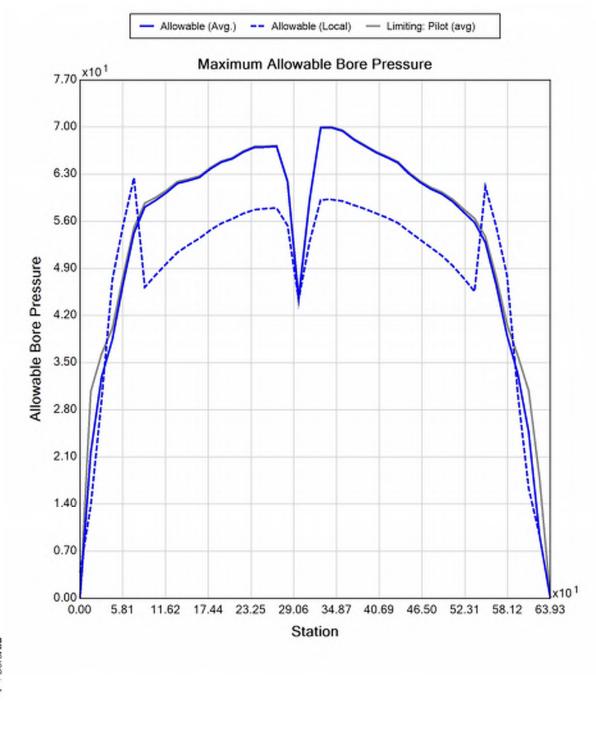


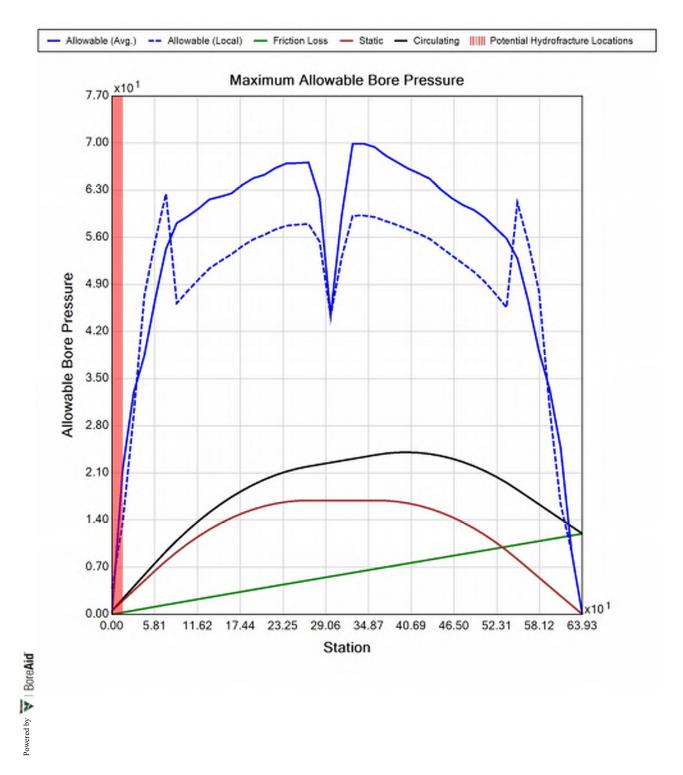














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Input Summary

Start Coordinate	(0.00, 0.00, 141.83) ft
End Coordinate	(640.60, 0.00, 142.08) ft
Project Length	640.60 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: 645.00 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	4.4	18.6
Water Pressure	7.6	7.6
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	12.0	26.2
Deflection		
Earth Load Deflection	1.208	5.078
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	1.237	5.107
Compressive Stress [psi]		
Compressive Wall Stress	54.1	118.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	660.1	660.1
Pullback Stress [psi]	377.1	377.1
Pullback Strain	6.559E-3	6.559E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	377.1	382.1
Tensile Strain	6.559E-3	6.745E-3

Net External Pressure = 18.9 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.237	7.5	6.1	OK
Unconstrained Collapse [psi]	23.1	123.6	5.4	OK
Compressive Wall Stress [psi]	54.1	1150.0	21.3	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	33.0	235.2	7.1	OK
Tensile Stress [psi]	382.1	1200.0	3.1	OK



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Project Summary

General:	CHPE HDD 17 - Conduit 1	
	P2	
	Start Date: 06-17-2022	
	End Date: 06-17-2022	
Project Owner:	TDI	
Project Contractor:	Kiewit	
Project Consultant:	CHA/BCE	
Designer:		
Description:	CHPE HDD 17 Conduit 1 10-inch DR 9	

Input Summary

Start Coordinate	(0.00, 0.00, 144.20) ft
End Coordinate	(662.00, 0.00, 142.90) ft
Project Length	662.00 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: 7

Soil Layer #1 USCS, Sand (S), SP Depth: 4.50 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Clay (C), CL Depth: 2.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.33 [psi]

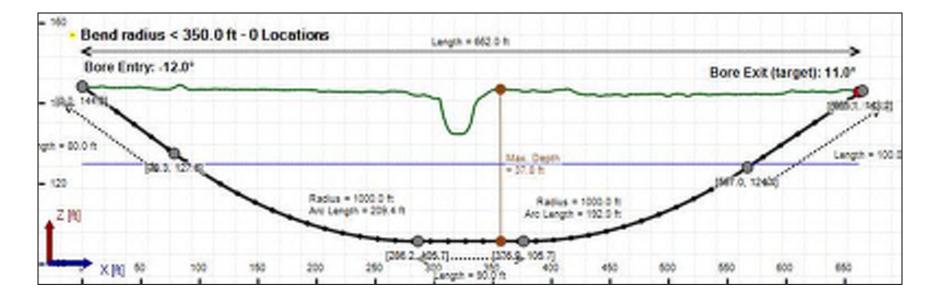
Soil Layer #3 USCS, Clay (C), CH Depth: 3.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.33 [psi]

Soil Layer #4 USCS, Clay (C), CL Depth: 3.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.30 [psi]

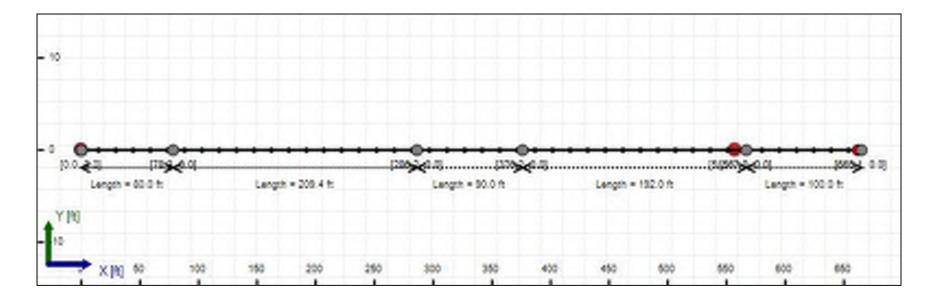
Soil Layer #5 USCS, Clay (C), CL Depth: 9.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.30 [psi]

Soil Layer #6 USCS, Clay (C), CH Depth: 9.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.30 [psi] Soil Layer #7 USCS, Clay (C), CL Depth: 10.00 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.30 [psi]

Bore Cross-Section View







Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 675.00 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	13.9	20.7
Water Pressure	8.4	8.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	22.3	29.1
Deflection		
Earth Load Deflection	3.783	5.644
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	3.915	5.776
Compressive Stress [psi]		
Compressive Wall Stress	100.1	130.9

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	11799.8	11799.8
Pullback Stress [psi]	329.1	329.1
Pullback Strain	5.723E-3	5.723E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	329.1	354.3
Tensile Strain	5.723E-3	6.609E-3

Net External Pressure = 20.1 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	3.915	7.5	1.9	OK
Unconstrained Collapse [psi]	25.0	97.3	3.9	OK
Compressive Wall Stress [psi]	100.1	1150.0	11.5	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	35.0	236.2	6.7	OK
Tensile Stress [psi]	354.3	1200.0	3.4	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	63.632 psi	61.097 psi
1	8.00 in	12.00 in	63.596 psi	61.041 psi
2	12.00 in	16.13 in	63.543 psi	60.961 psi

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

Estimated Circulating Pressure Summary

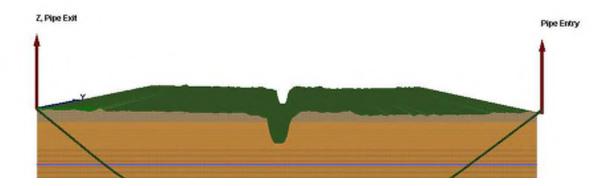
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

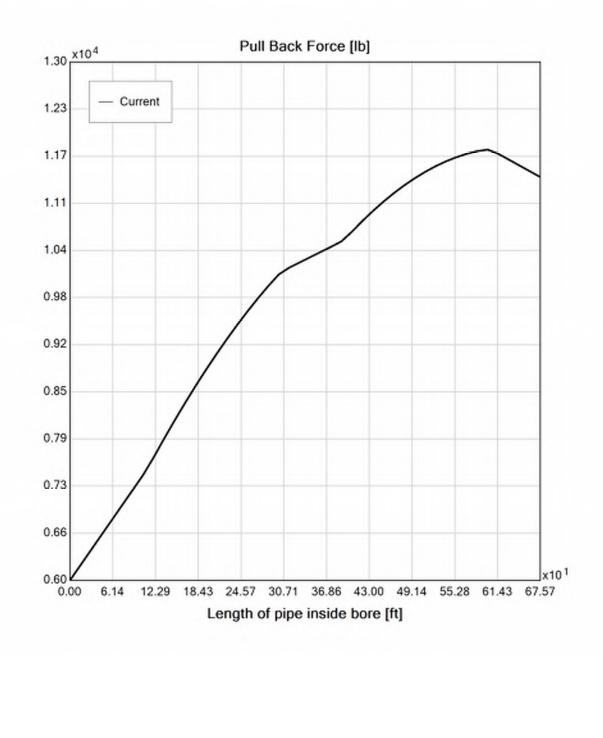
Yield Point (YP): 16.49

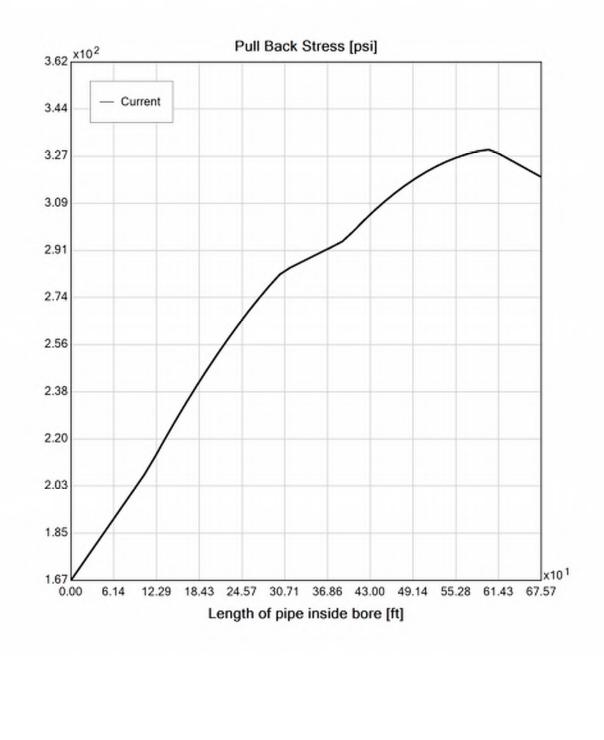
Effective Viscosity (cP): 1202.0

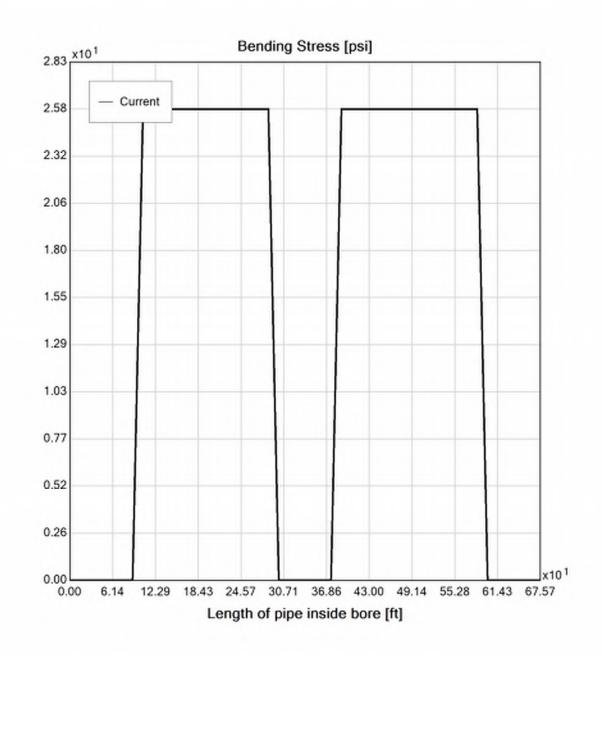
Virtual Site

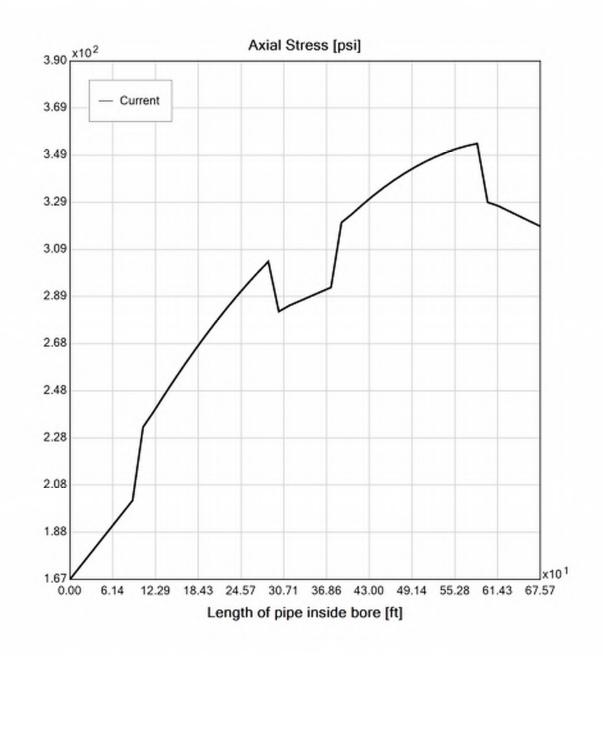


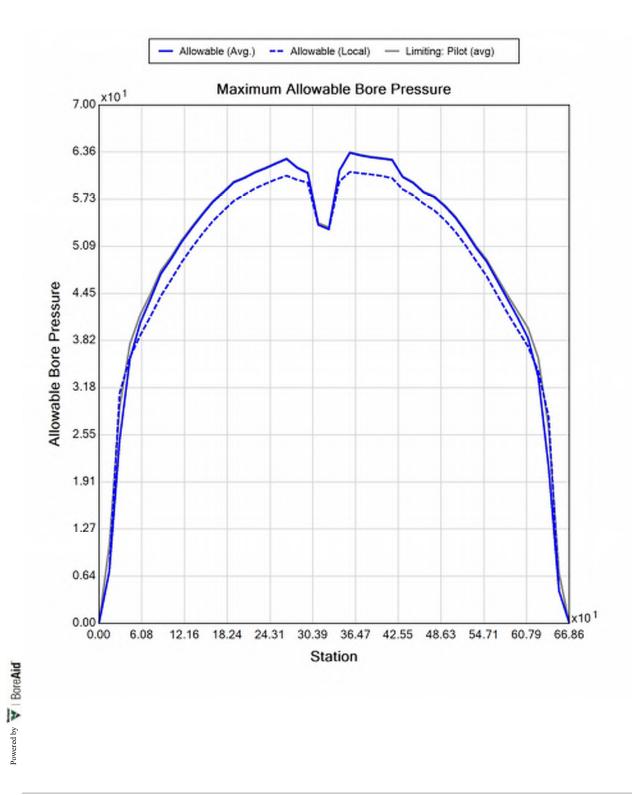


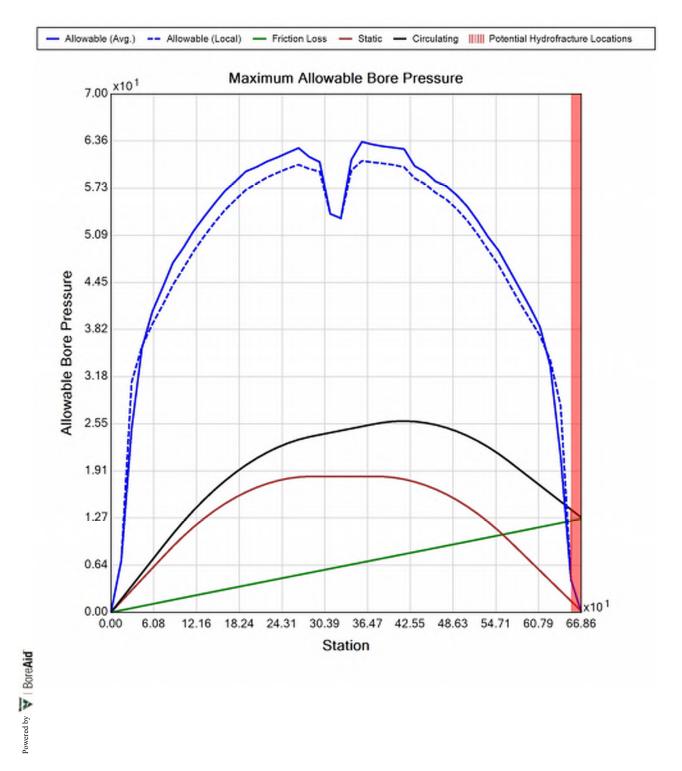














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Input Summary

Start Coordinate	(0.00, 0.00, 144.20) ft
End Coordinate	(662.00, 0.00, 142.90) ft
Project Length	662.00 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: 675.00 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	13.7	20.7
Water Pressure	8.4	8.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	22.1	29.1
Deflection		
Earth Load Deflection	3.740	5.644
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	3.769	5.673
Compressive Stress [psi]		
Compressive Wall Stress	99.4	130.9

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	685.5	685.5
Pullback Stress [psi]	391.7	391.7
Pullback Strain	6.812E-3	6.812E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	391.7	396.8
Tensile Strain	6.812E-3	7.000E-3

Net External Pressure = 20.1 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	3.769	7.5	2.0	OK
Unconstrained Collapse [psi]	25.0	98.6	3.9	OK
Compressive Wall Stress [psi]	99.4	1150.0	11.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	35.0	234.5	6.7	OK
Tensile Stress [psi]	396.8	1200.0	3.0	OK



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Project Summary

General:	CHPE HDD 17 - Conduit 2
	P2
	Start Date: 06-17-2022
	End Date: 06-17-2022
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	
Description:	CHPE HDD 17 Conduit 2 10-inch DR 9

Input Summary

Start Coordinate	(0.00, 0.00, 144.96) ft
End Coordinate	(575.00, 0.00, 145.00) ft
Project Length	575.00 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: 7

Soil Layer #1 USCS, Sand (S), SP Depth: 4.50 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

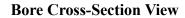
Soil Layer #2 USCS, Clay (C), CL Depth: 2.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.33 [psi]

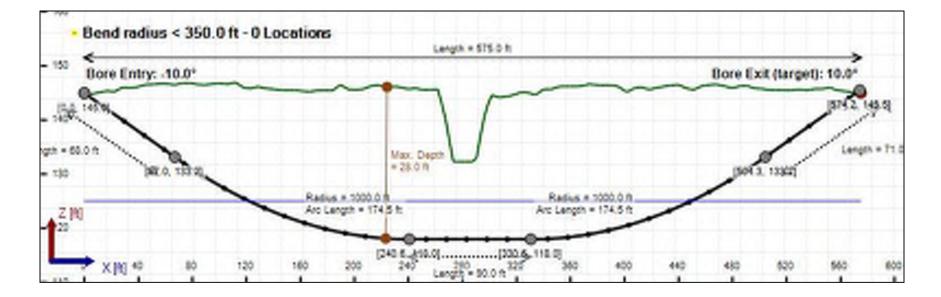
Soil Layer #3 USCS, Clay (C), CH Depth: 3.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.33 [psi]

Soil Layer #4 USCS, Clay (C), CL Depth: 3.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.30 [psi]

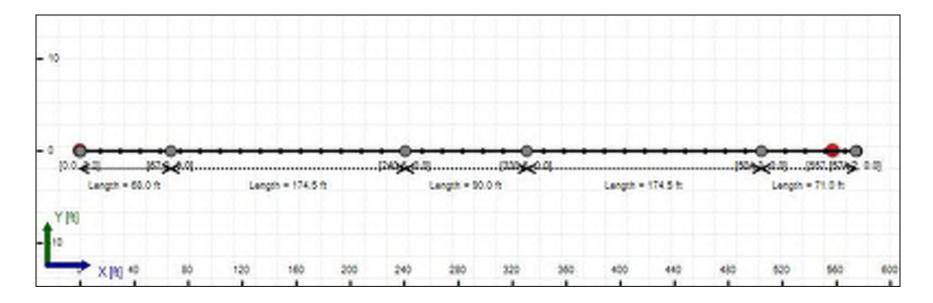
Soil Layer #5 USCS, Clay (C), CL Depth: 9.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.30 [psi]

Soil Layer #6 USCS, Clay (C), CH Depth: 9.50 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.30 [psi] Soil Layer #7 USCS, Clay (C), CL Depth: 10.00 ft Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 8.30 [psi]









Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 585.00 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	12.7	17.6
Water Pressure	3.1	3.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	15.8	20.6
Deflection		
Earth Load Deflection	3.464	4.804
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	3.596	4.937
Compressive Stress [psi]		
Compressive Wall Stress	71.0	92.7

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	9992.2	9992.2
Pullback Stress [psi]	278.7	278.7
Pullback Strain	4.846E-3	4.846E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	278.7	303.8
Tensile Strain	4.846E-3	5.731E-3

Net External Pressure = 17.9 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	3.596	7.5	2.1	OK
Unconstrained Collapse [psi]	18.7	100.1	5.4	OK
Compressive Wall Stress [psi]	71.0	1150.0	16.2	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	28.7	239.0	8.3	OK
Tensile Stress [psi]	303.8	1200.0	4.0	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	56.651 psi	52.585 psi
1	8.00 in	12.00 in	56.572 psi	52.484 psi
2	12.00 in	16.13 in	56.460 psi	52.340 psi

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

Estimated Circulating Pressure Summary

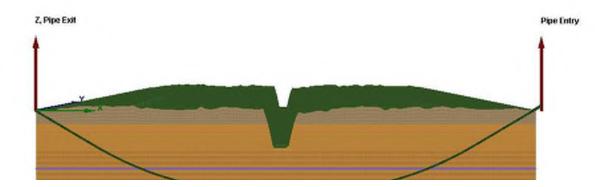
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

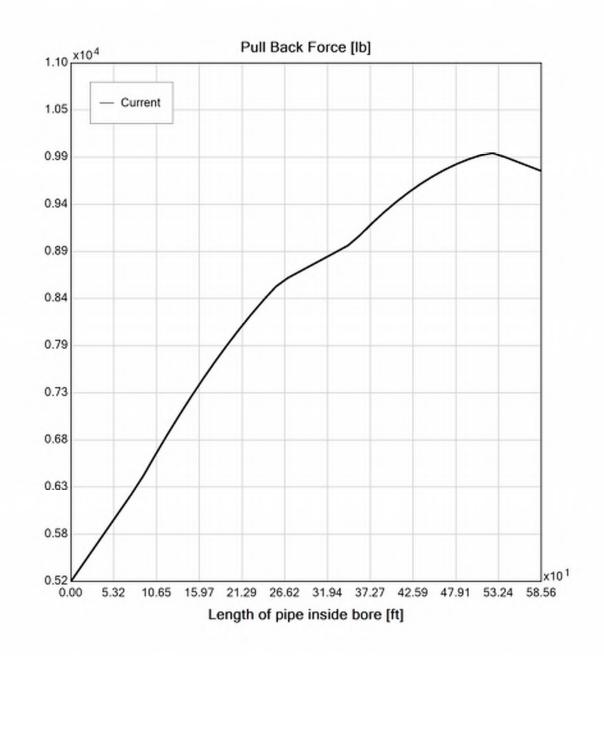
Yield Point (YP): 16.49

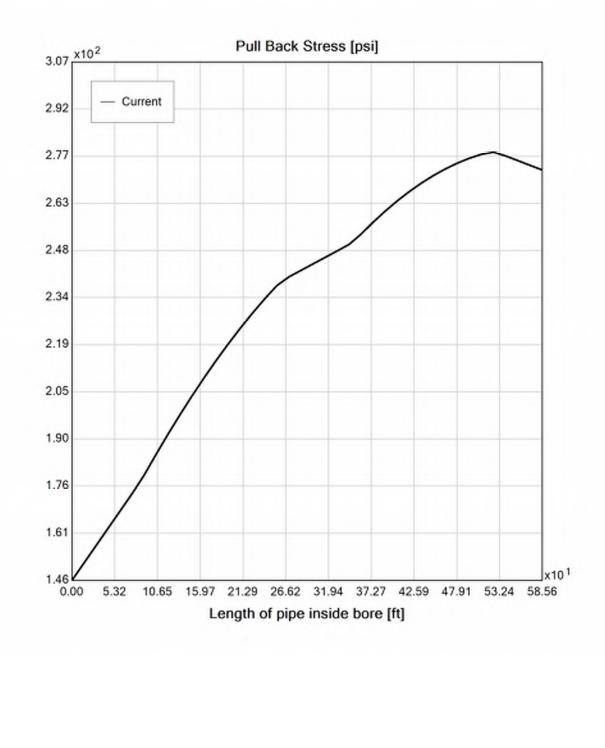
Effective Viscosity (cP): 1202.0

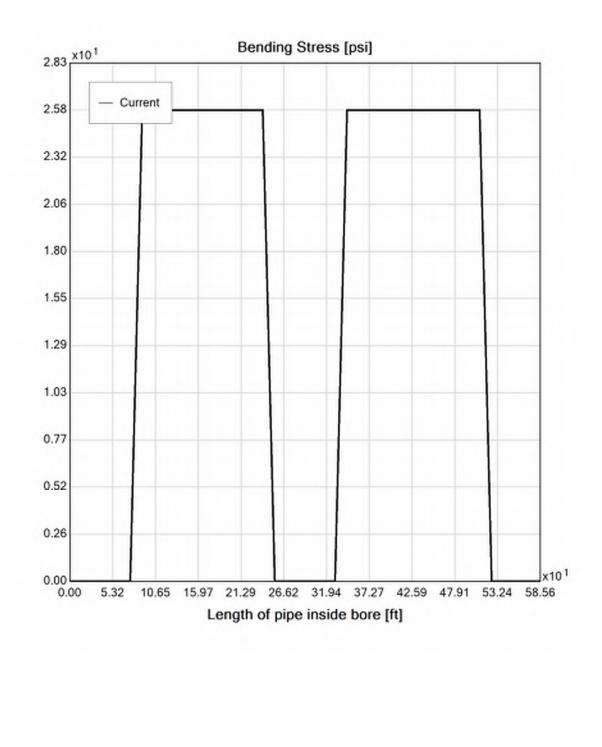
Virtual Site

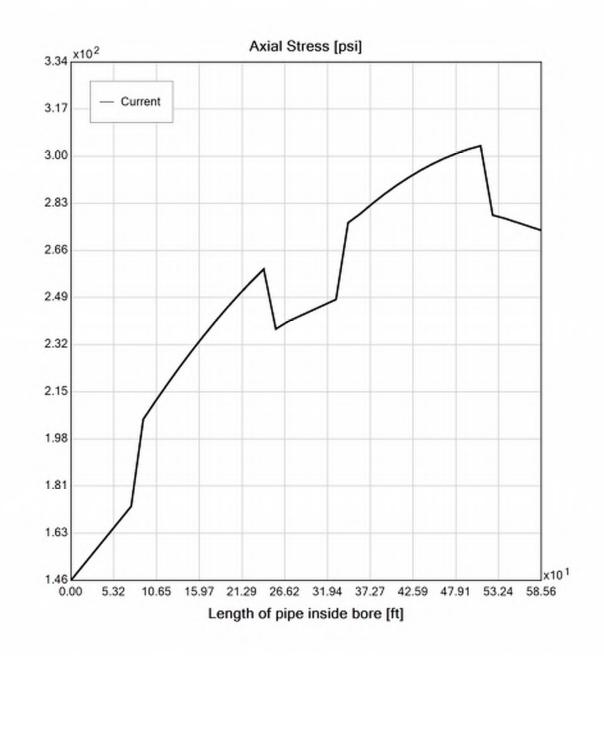


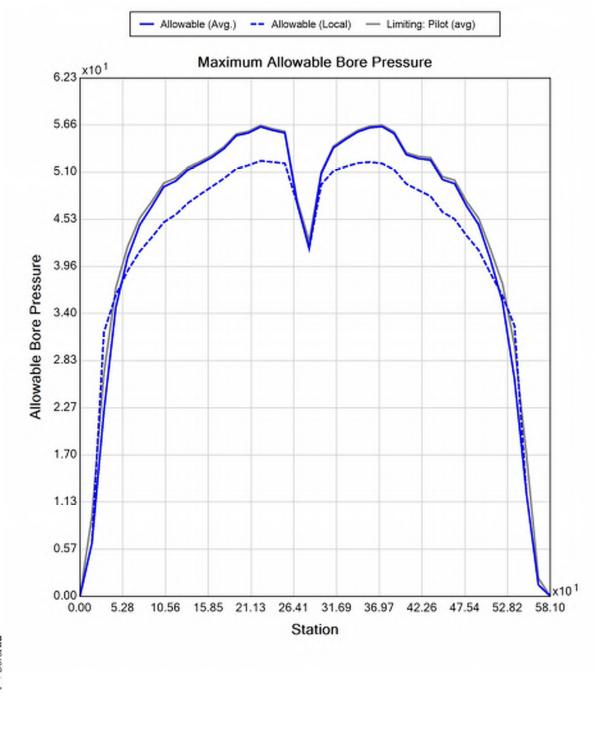


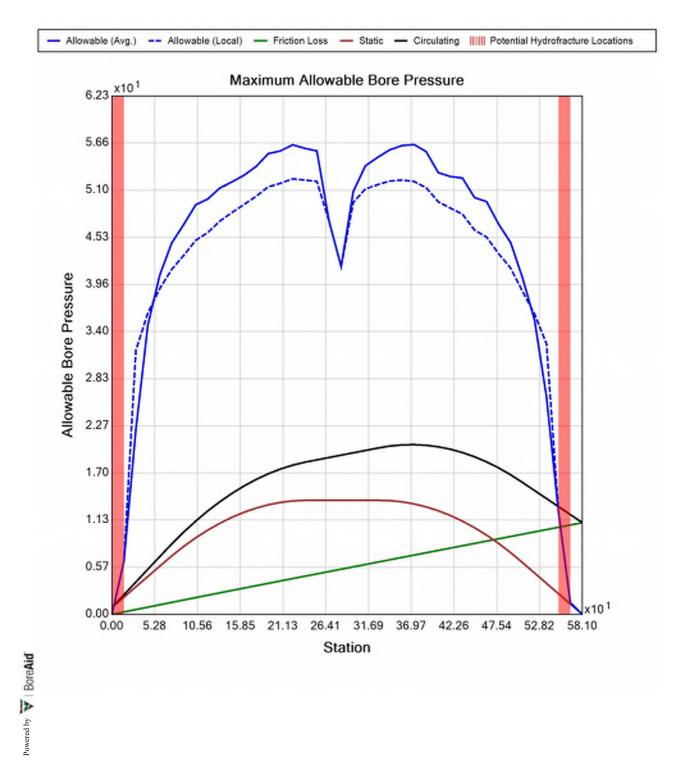














Generated Output

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Input Summary

Start Coordinate	(0.00, 0.00, 144.96) ft
End Coordinate	(575.00, 0.00, 145.00) ft
Project Length	575.00 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: 585.00 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	12.7	17.6
Water Pressure	3.1	3.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	15.8	20.6
Deflection		
Earth Load Deflection	3.464	4.804
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	3.493	4.834
Compressive Stress [psi]		
Compressive Wall Stress	71.0	92.7

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	597.3	597.3
Pullback Stress [psi]	341.3	341.3
Pullback Strain	5.935E-3	5.935E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	341.3	346.3
Tensile Strain	5.935E-3	6.122E-3

Net External Pressure = 17.9 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	3.493	7.5	2.1	OK
Unconstrained Collapse [psi]	18.7	101.0	5.4	OK
Compressive Wall Stress [psi]	71.0	1150.0	16.2	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	28.7	237.4	8.3	OK
Tensile Stress [psi]	346.3	1200.0	3.5	OK



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Project Summary

General:	CHPE HDD 18
	P2
	Start Date: 02-28-2022
	End Date: 02-28-2022
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	

Description:

HDD 18 10-inch DR 9

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Input Summary

Start Coordinate	(0.00, 0.00, 141.72) ft
End Coordinate	(620.76, 0.00, 141.30) ft
Project Length	620.76 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: 7

Soil Layer #1 USCS, Sand (S), SM Depth: 3.00 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 300.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Organic (O), OH Depth: 6.00 ft Unit Weight: 80.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 100.00, Coh: 0.00 [psi]

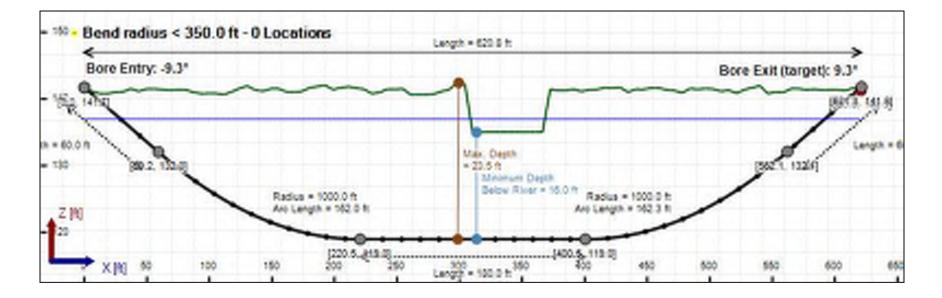
Soil Layer #3 USCS, Silt (M), ML Depth: 7.00 ft Unit Weight: 80.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 28.00, S.M.: 50.00, Coh: 0.00 [psi]

Soil Layer #4 USCS, Clay (C), CL Depth: 7.00 ft Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 200.00, Coh: 3.10 [psi]

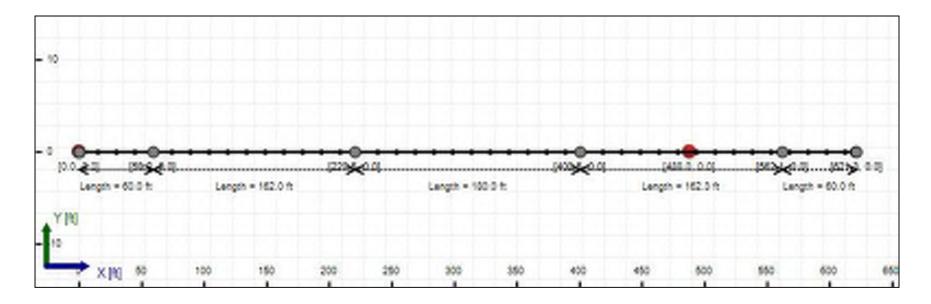
Soil Layer #5 USCS, Sand (S), SP Depth: 3.50 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

Soil Layer #6 USCS, Clay (C), CH Depth: 5.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 200.00, Coh: 3.10 [psi] Soil Layer #7 USCS, Clay (C), CH Depth: 15.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.12 [psi]









Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 630.00 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	2.8	9.0
Water Pressure	7.8	7.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	10.6	16.8
Deflection		
Earth Load Deflection	0.759	2.446
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	0.891	2.578
Compressive Stress [psi]		
Compressive Wall Stress	47.7	75.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	10420.8	10420.8
Pullback Stress [psi]	290.6	290.6
Pullback Strain	5.054E-3	5.054E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	290.6	314.8
Tensile Strain	5.054E-3	5.923E-3

Net External Pressure = 15.4 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.891	7.5	8.4	OK
Unconstrained Collapse [psi]	15.5	127.5	8.3	OK
Compressive Wall Stress [psi]	47.7	1150.0	24.1	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	25.4	238.2	9.4	OK
Tensile Stress [psi]	314.8	1200.0	3.8	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	45.272 psi	32.677 psi
1	8.00 in	12.00 in	45.065 psi	32.491 psi
2	12.00 in	16.13 in	44.773 psi	32.240 psi

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

Estimated Circulating Pressure Summary

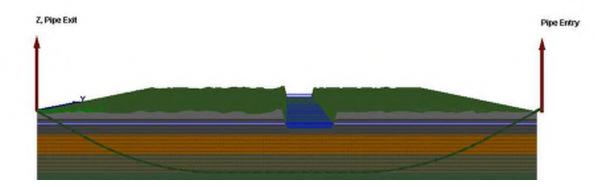
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

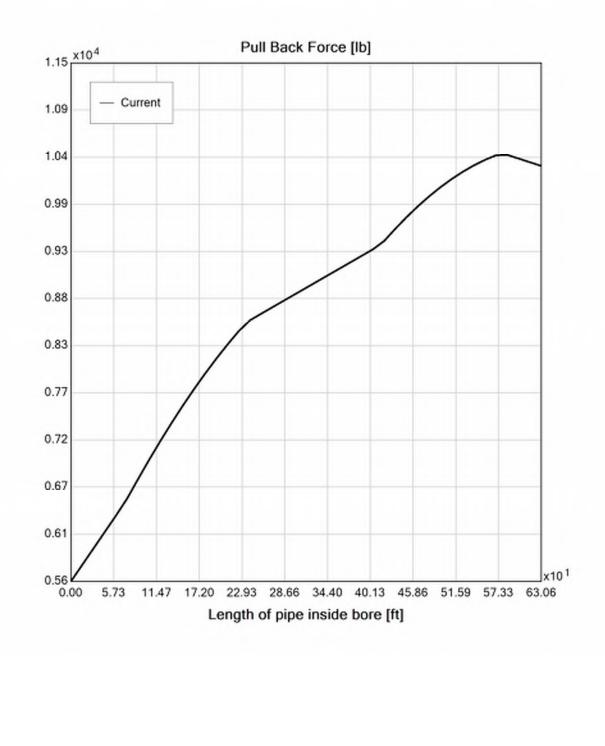
Yield Point (YP): 16.49

Effective Viscosity (cP): 1202.0

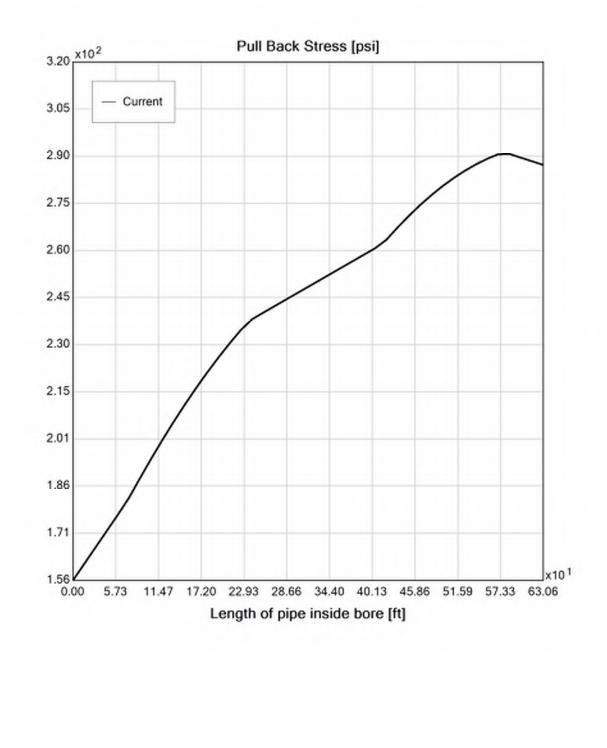
Virtual Site



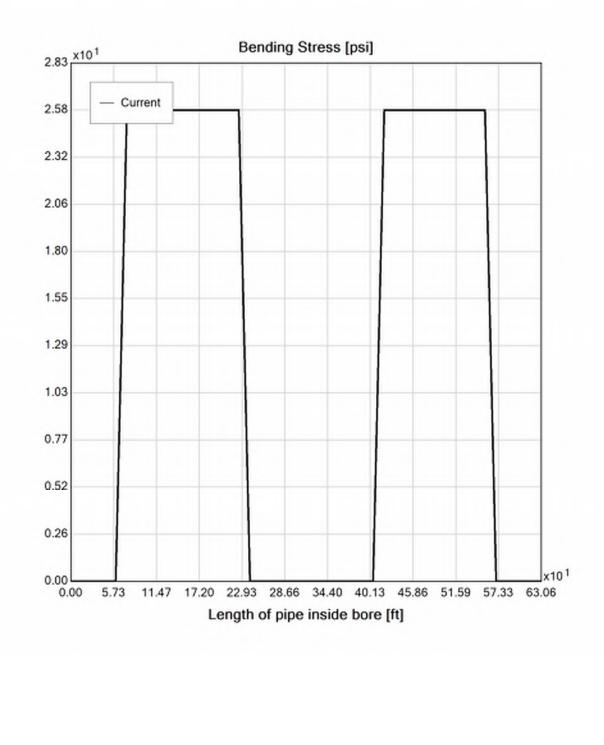




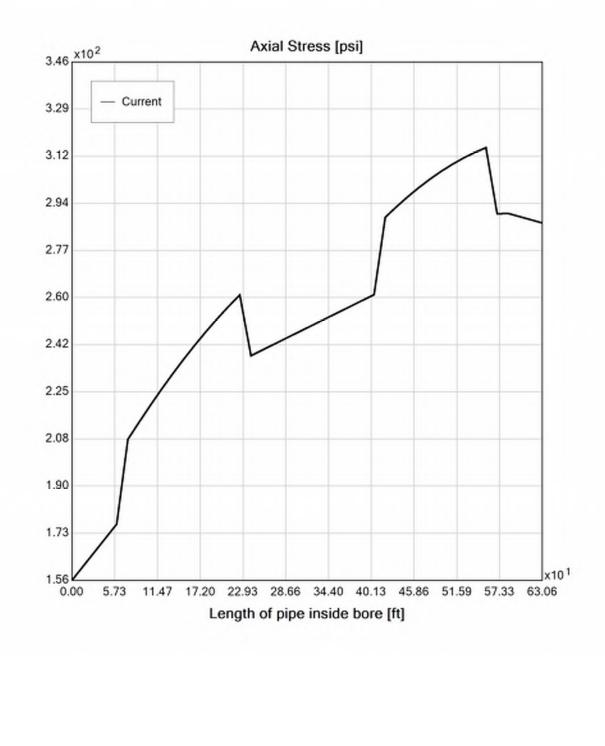
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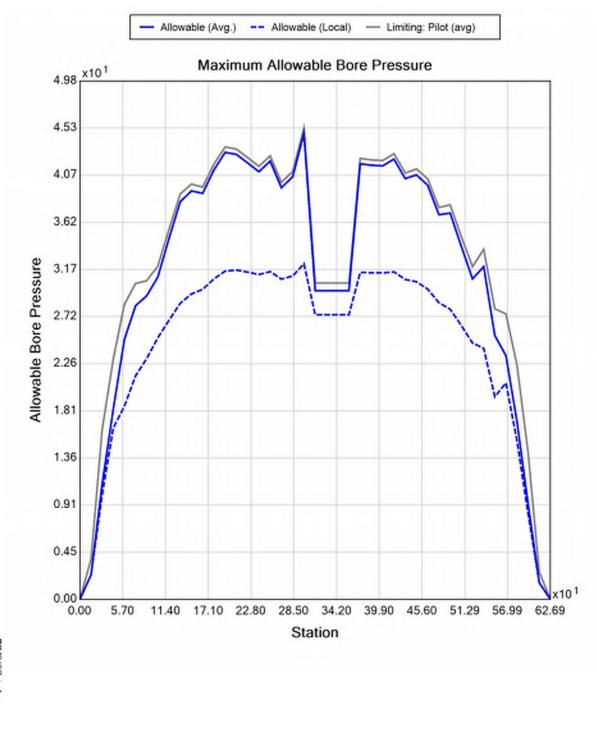
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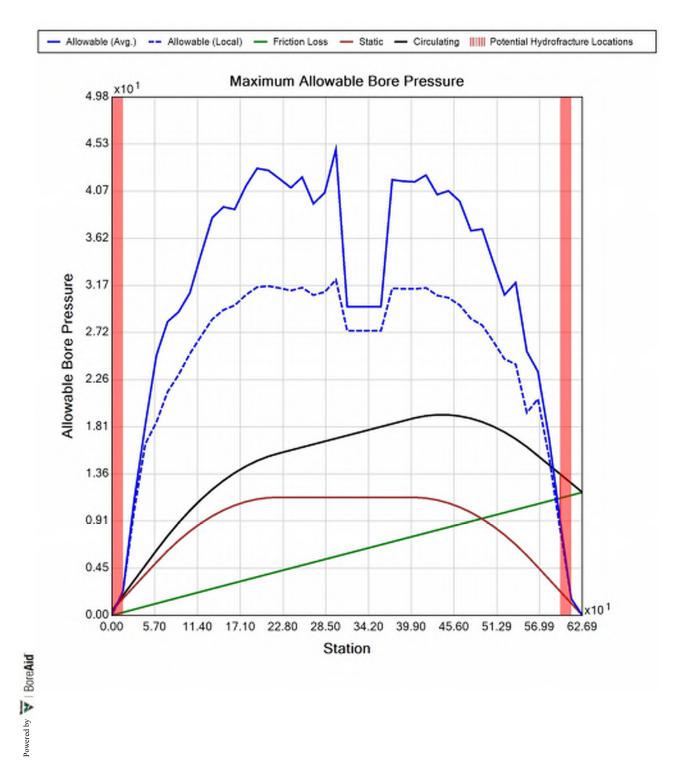
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Generated Output

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Input Summary

Start Coordinate	(0.00, 0.00, 141.72) ft
End Coordinate	(620.76, 0.00, 141.30) ft
Project Length	620.76 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: 630.00 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	1.2	9.0
Water Pressure	7.8	7.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	9.0	16.8
Deflection		
Earth Load Deflection	0.409	2.446
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.439	2.476
Compressive Stress [psi]		
Compressive Wall Stress	40.4	75.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	618.2	618.2
Pullback Stress [psi]	353.2	353.2
Pullback Strain	6.143E-3	6.143E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	353.2	357.4
Tensile Strain	6.143E-3	6.314E-3

Net External Pressure = 15.4 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.439	7.5	17.1	OK
Unconstrained Collapse [psi]	15.5	133.9	8.7	OK
Compressive Wall Stress [psi]	40.4	1150.0	28.5	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	25.4	236.5	9.3	OK
Tensile Stress [psi]	357.4	1200.0	3.4	OK



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Project Summary

General:	CHPE HDD 19
	P2
	Start Date: 06-20-2022
	End Date: 06-20-2022
Project Owner:	TDI
Project Contractor:	KIEWIT
Project Consultant:	СНА
Designer:	MCS
	СНА
Description:	HDD 19 10-inch DR 9

Input Summary

Start Coordinate	(70.00, 0.00, 141.10) ft
End Coordinate	(663.40, 0.00, 141.30) ft
Project Length	593.40 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	10.750 in
Pipe DR	9.0
Pipe Thickness	1.19 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 5

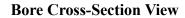
Soil Layer #1 USCS, Clay (C), CL Depth: 2.80 ft Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.60 [psi]

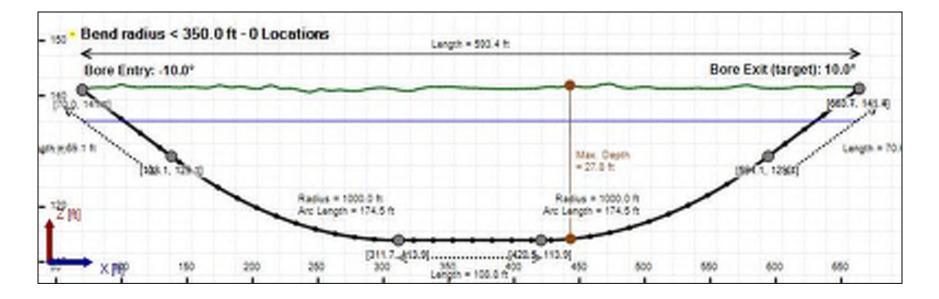
Soil Layer #2 USCS, Clay (C), CH Depth: 7.50 ft Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.60 [psi]

Soil Layer #3 USCS, Clay (C), CL Depth: 10.00 ft Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.60 [psi]

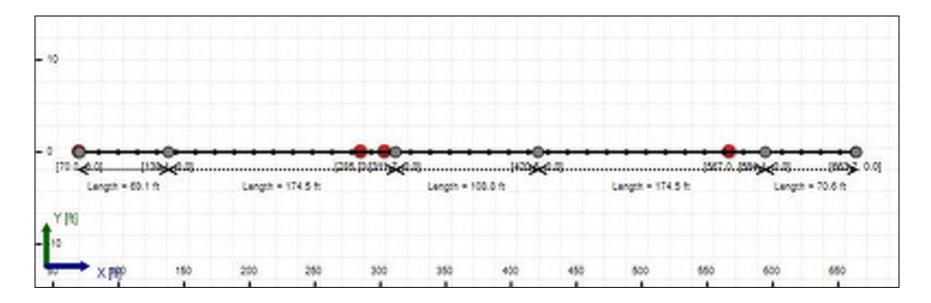
Soil Layer #4 USCS, Silt (M), ML Depth: 5.00 ft Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 5.60 [psi]

Soil Layer #5 USCS, Sand (S), SM Depth: 15.00 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]









Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 600.00 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	9.4	10.8
Water Pressure	8.8	9.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	18.2	20.1
Deflection		
Earth Load Deflection	2.632	2.942
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	2.764	3.074
Compressive Stress [psi]		
Compressive Wall Stress	81.8	90.5

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	10163.0	10163.0
Pullback Stress [psi]	283.4	283.4
Pullback Strain	4.929E-3	4.929E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	283.4	308.6
Tensile Strain	4.929E-3	5.815E-3

Net External Pressure = 17.2 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	2.764	7.5	2.7	OK
Unconstrained Collapse [psi]	18.2	108.5	6.0	OK
Compressive Wall Stress [psi]	81.8	1150.0	14.1	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	28.1	238.7	8.5	OK
Tensile Stress [psi]	308.6	1200.0	3.9	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	45.246 psi	61.759 psi
1	8.00 in	12.00 in	45.180 psi	61.579 psi
2	12.00 in	16.13 in	45.086 psi	61.321 psi

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

Estimated Circulating Pressure Summary

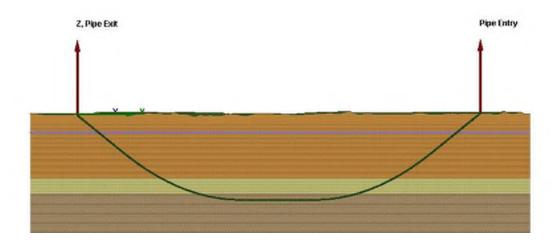
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/min
Drill Fluid Density: 68.700 lb/ft3
Rheological model: Bingham-Plastic
Plastic Viscosity (PV): 25.53

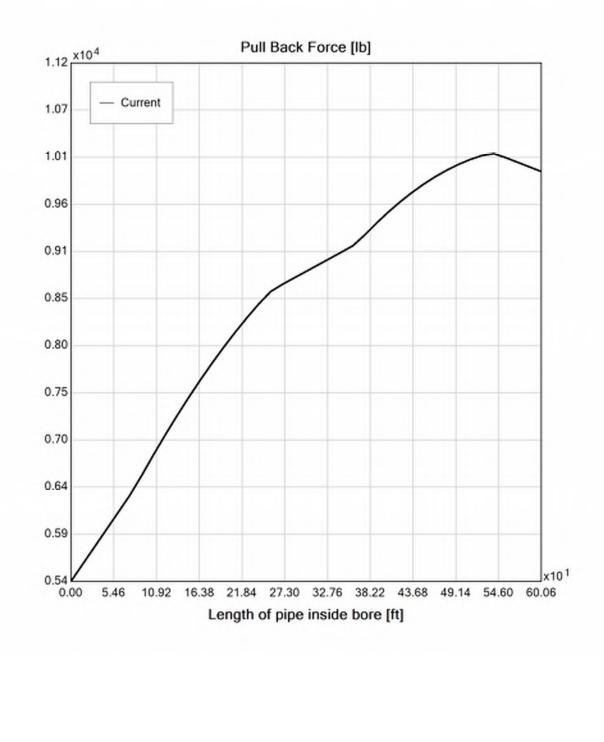
Yield Point (YP): 16.49

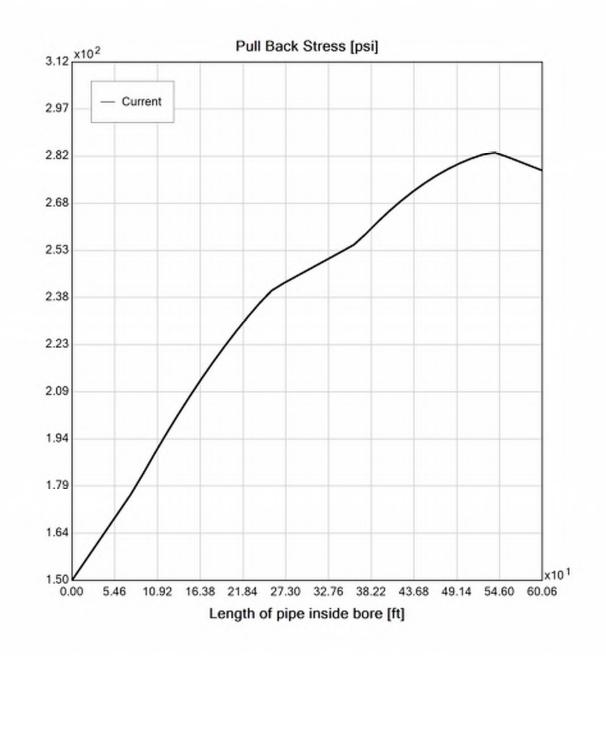
Effective Viscosity (cP): 1202.0

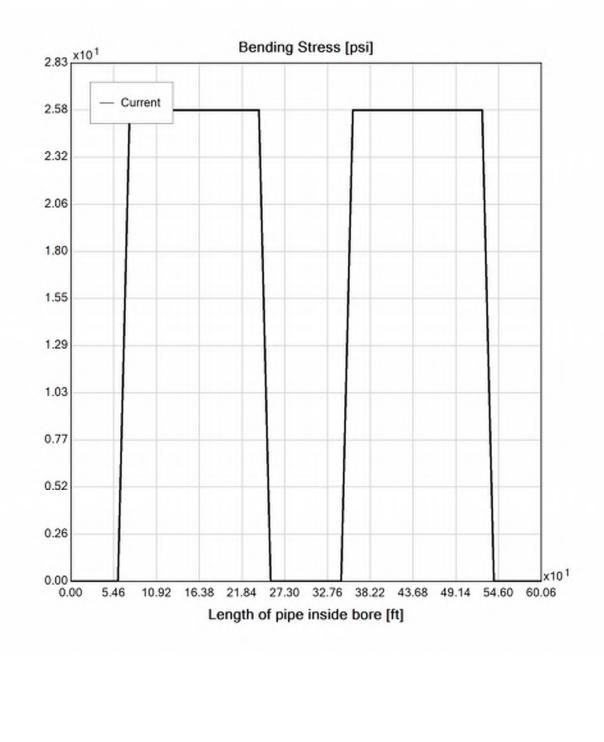
Virtual Site

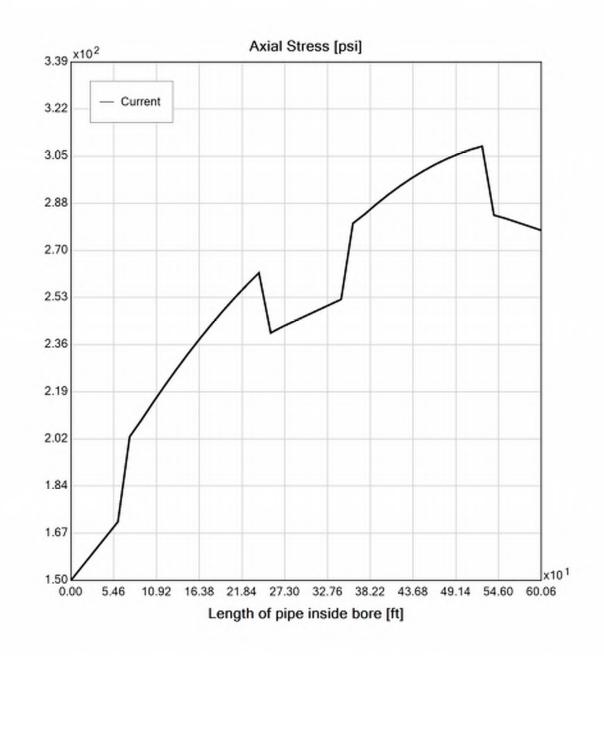


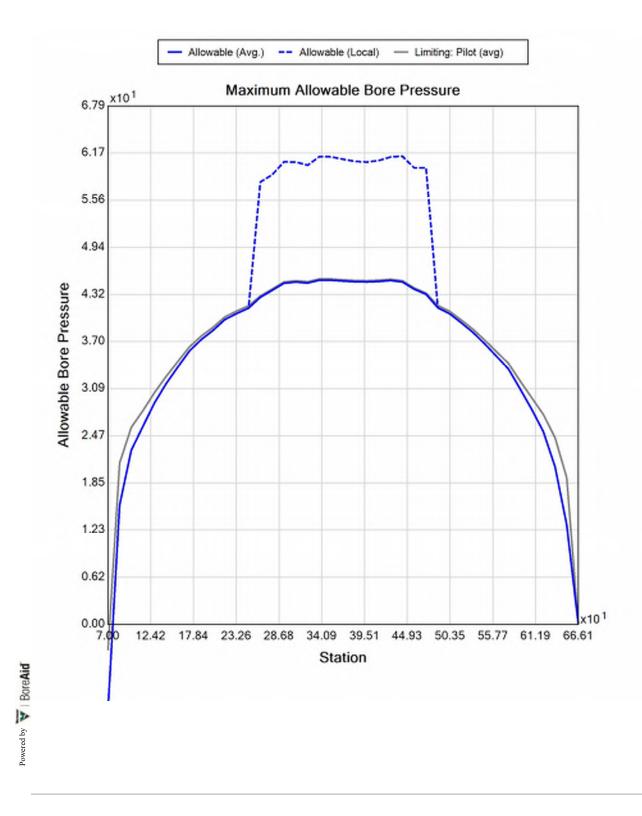


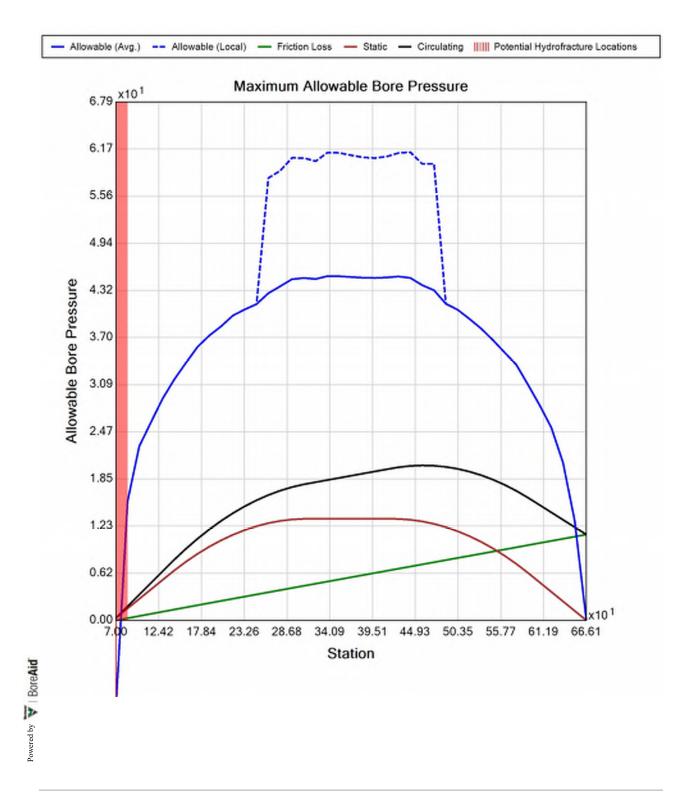














Generated Output

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Input Summary

Start Coordinate	(70.00, 0.00, 141.10) ft
End Coordinate	(663.40, 0.00, 141.30) ft
Project Length	593.40 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: 600.00 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	9.7	10.8
Water Pressure	8.4	9.4
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	18.0	20.1
Deflection		
Earth Load Deflection	2.632	2.942
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	2.661	2.971
Compressive Stress [psi]		
Compressive Wall Stress	81.2	90.5

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	605.6	605.6
Pullback Stress [psi]	346.0	346.0
Pullback Strain	6.018E-3	6.018E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	346.0	351.2
Tensile Strain	6.018E-3	6.206E-3

Net External Pressure = 17.2 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	2.661	7.5	2.8	OK
Unconstrained Collapse [psi]	18.0	108.8	6.0	OK
Compressive Wall Stress [psi]	81.2	1150.0	14.2	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	28.1	237.1	8.4	OK
Tensile Stress [psi]	351.2	1200.0	3.4	OK



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Project Summary

General:	CHPE HDD 20	
	P2	
	Start Date: 12-10-2021	
	End Date: 12-10-2021	
Project Owner:	TDI	
Project Contractor:	Kiewit	
Project Consultant:	CHA/BCE	
Designer:		
Description:	HDD 20 10-inch DR 9	

Input Summary

(100.00, 0.00, 141.00) ft
(1300.00, 0.00, 147.20) ft
1200.00 ft
HDPE
IPS
10.750 in
9.0
1.19 in
15.00 ft
3.5 in
(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 6

Soil Layer #1 USCS, Sand (S), SM Depth: 2.40 ft Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Sand (S), SM Depth: 2.00 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

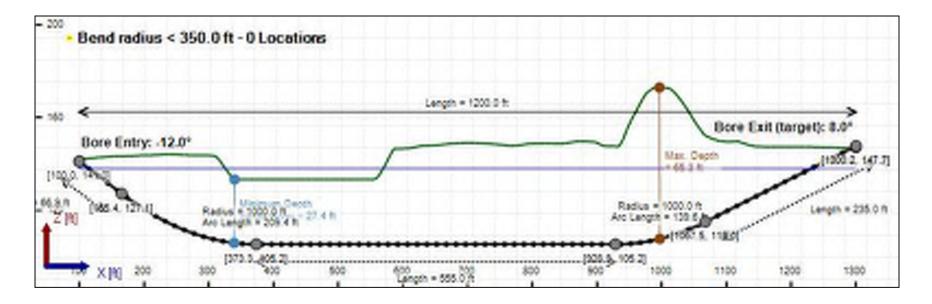
Soil Layer #3 USCS, Clay (C), CH Depth: 4.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi]

Soil Layer #4 USCS, Sand (S), SM Depth: 5.00 ft Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 145.00, Coh: 0.00 [psi]

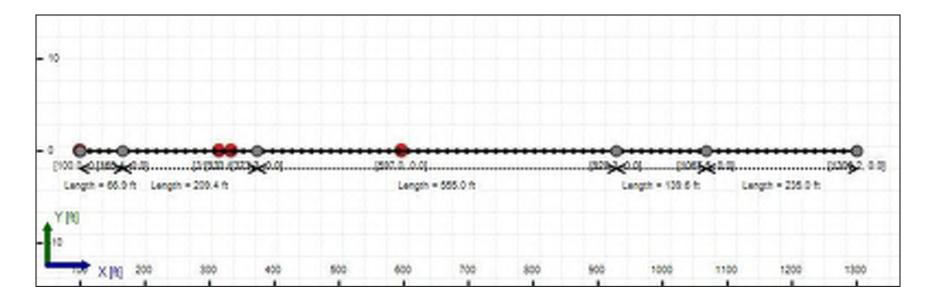
Soil Layer #5 USCS, Silt (M), MH Depth: 10.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi]

Soil Layer #6 USCS, Clay (C), CH Depth: 23.00 ft Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi]

Bore Cross-Section View







Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 1215.00 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	4.0	35.2
Water Pressure	14.2	13.2
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	18.2	48.4
Deflection		
Earth Load Deflection	1.131	9.597
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.263	9.729
Compressive Stress [psi]		
Compressive Wall Stress	82.0	217.9

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	20355.1	20355.1
Pullback Stress [psi]	567.7	567.7
Pullback Strain	9.873E-3	9.873E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	567.7	591.0
Tensile Strain	9.873E-3	1.073E-2

Net External Pressure = 23.3 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.263	7.5	5.9	OK
Unconstrained Collapse [psi]	28.4	123.7	4.4	OK
Compressive Wall Stress [psi]	82.0	1150.0	14.0	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	38.4	222.1	5.8	OK
Tensile Stress [psi]	591.0	1200.0	2.0	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	107.090 psi	63.570 psi
1	8.00 in	12.00 in	107.070 psi	63.551 psi
2	12.00 in	16.13 in	107.041 psi	63.524 psi

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

Estimated Circulating Pressure Summary

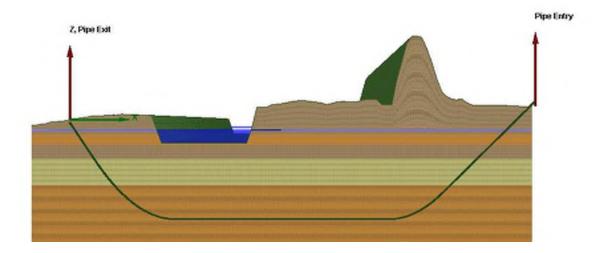
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

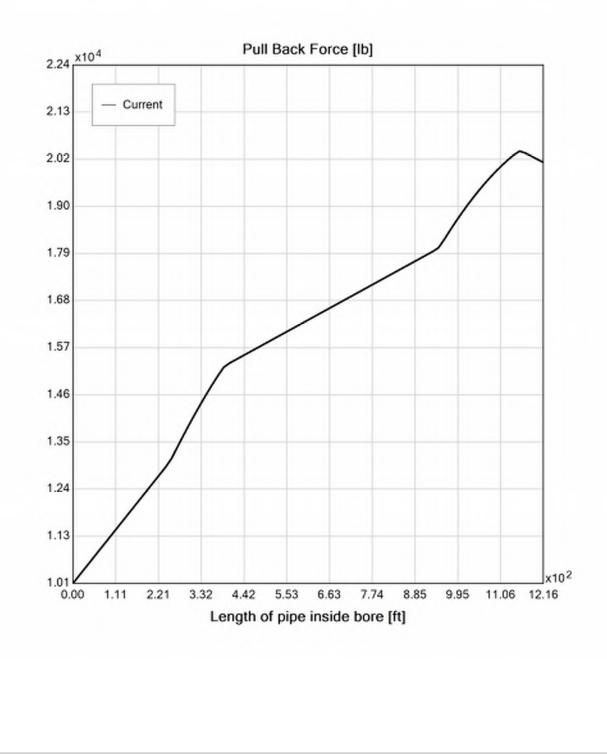
Yield Point (YP): 16.49

Effective Viscosity (cP): 1202.0

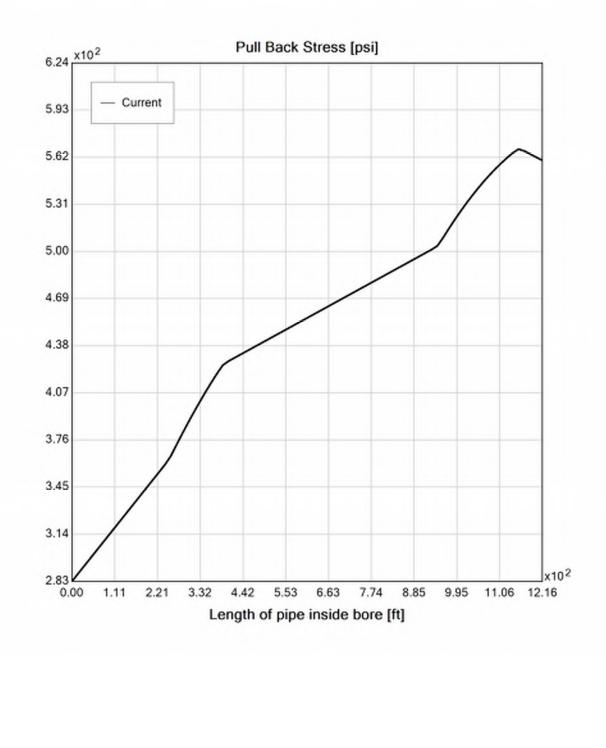
Virtual Site

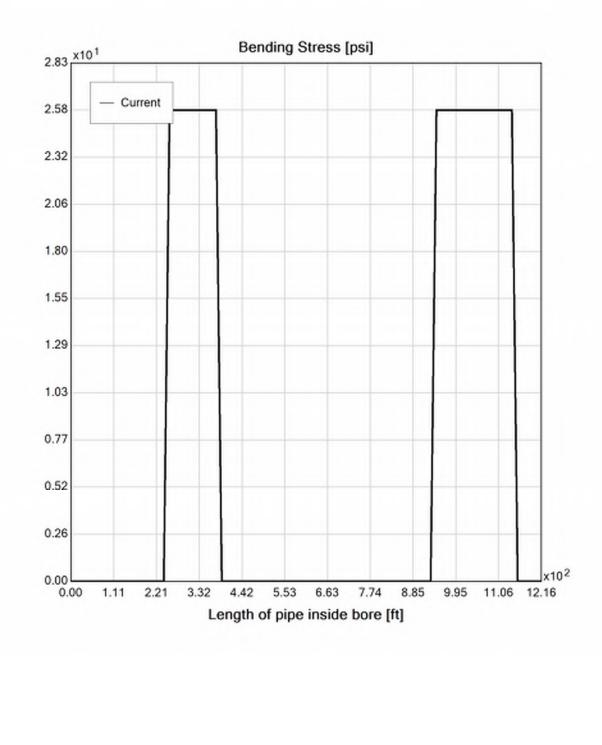




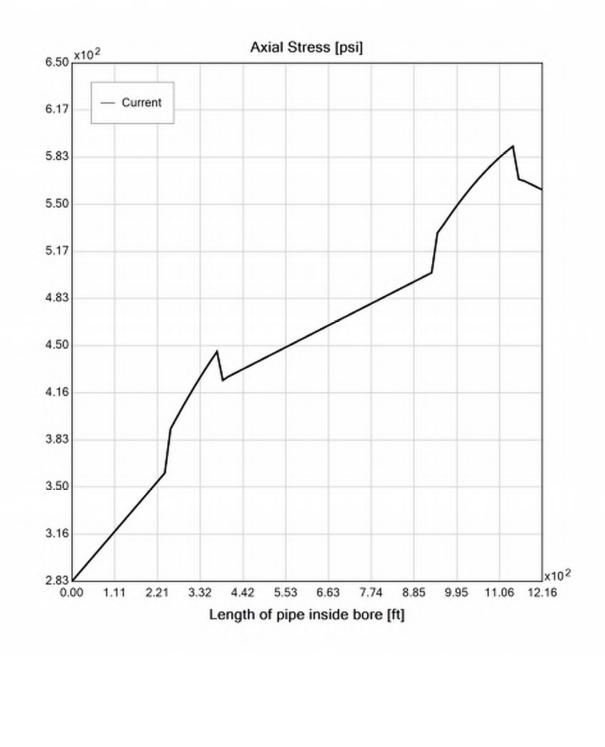


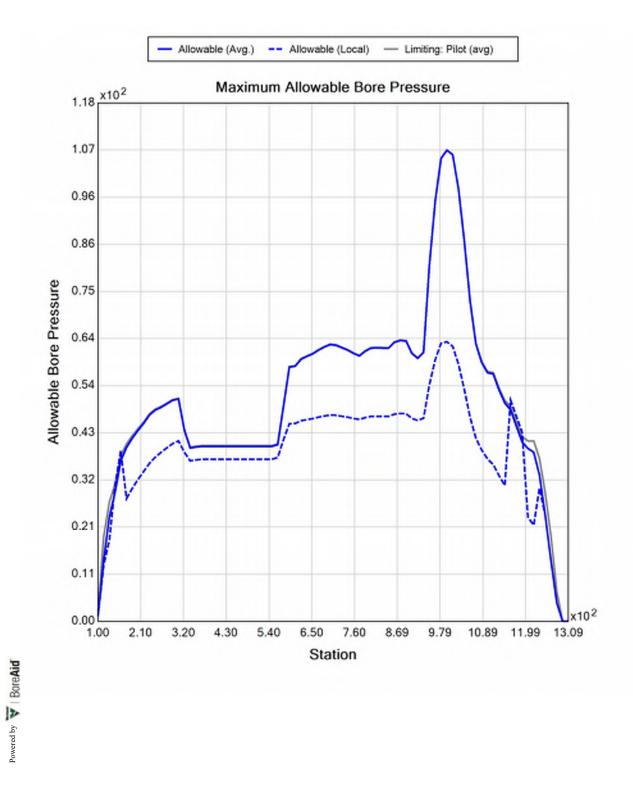


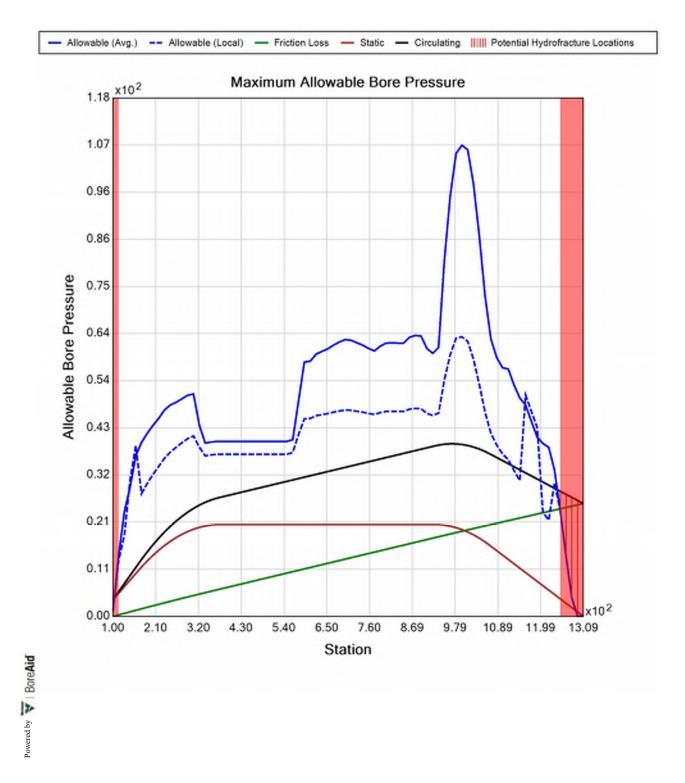














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Input Summary

(100.00, 0.00, 141.00) ft
(1300.00, 0.00, 147.20) ft
1200.00 ft
HDPE
IPS
2.375 in
9.0
0.26 in
15.00 ft
3.5 in
(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: 1215.00 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	1.9	35.2
Water Pressure	14.2	13.2
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.2	48.4
Deflection		
Earth Load Deflection	0.601	9.597
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.631	9.626
Compressive Stress [psi]		
Compressive Wall Stress	72.7	217.9

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1103.1	1103.1
Pullback Stress [psi]	630.3	630.3
Pullback Strain	1.096E-2	1.096E-2
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	630.3	633.5
Tensile Strain	1.096E-2	1.112E-2

Net External Pressure = 23.3 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.631	7.5	11.9	OK
Unconstrained Collapse [psi]	28.4	131.3	4.6	OK
Compressive Wall Stress [psi]	72.7	1150.0	15.8	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	38.4	220.0	5.7	OK
Tensile Stress [psi]	633.5	1200.0	1.9	OK



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Project Summary

General:	CHPE HDD 21	
	P2	
	Start Date: 09-14-2022	
	End Date: 09-14-2022	
Project Owner:	TDI	
Project Contractor:	Kiewit	
Project Consultant:	CHA/BCE	
Designer:		
Description:	HDD 21 10-inch DR 9	

Input Summary

Start Coordinate	(0.00, 0.00, 134.00) ft
End Coordinate	(1975.00, 0.00, 135.00) ft
Project Length	1975.00 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: 6

Soil Layer #1 USCS, Sand (S), SW 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, Clay (C), CL From Assistant Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 400.00, Coh: 8.30 [psi]

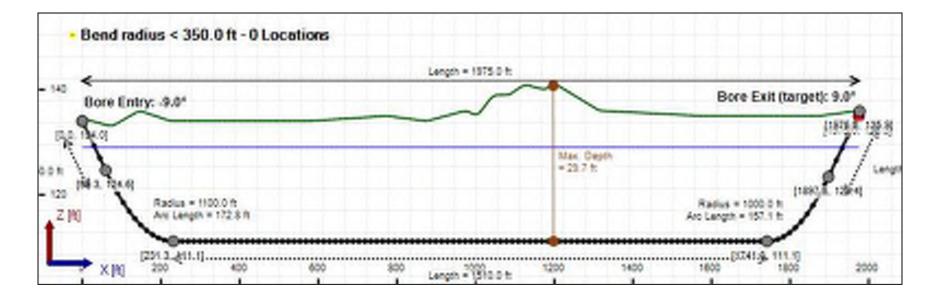
Soil Layer #3 USCS, Organic (O), OL From Assistant Unit Weight: 80.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 28.00, S.M.: 50.00, Coh: 0.00 [psi]

Soil Layer #4 USCS, Clay (C), CL From Assistant Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 200.00, Coh: 3.13 [psi]

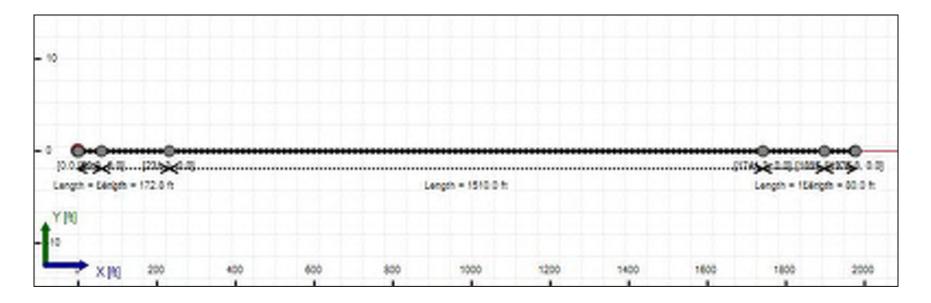
Soil Layer #5 USCS, Gravel (G), GW From Assistant Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

Soil Layer #6 Rock, Geological Classification, Sedimentary Rocks From Assistant Unit Weight: 165.0000 (dry), 177.0000 (sat) [lb/ft3] Phi: 35.00, S.M.: 1450.40, Coh: 2900.80 [psi]

Bore Cross-Section View







Load Verifier Input Summary:

Pipe Application: Gas Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 1980.00 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	10.5	13.6
Water Pressure	7.8	7.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	18.3	21.4
Deflection		
Earth Load Deflection	2.868	3.703
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	3.000	3.835
Compressive Stress [psi]		
Compressive Wall Stress	82.4	96.2

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	30710.4	30710.4
Pullback Stress [psi]	856.5	856.5
Pullback Strain	1.490E-2	1.490E-2
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	856.5	871.5
Tensile Strain	1.490E-2	1.556E-2

Net External Pressure = 15.8 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	3.000	7.5	2.5	OK
Unconstrained Collapse [psi]	18.3	105.6	5.8	OK
Compressive Wall Stress [psi]	82.4	1150.0	14.0	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	26.1	201.6	7.7	OK
Tensile Stress [psi]	871.5	1200.0	1.4	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	9.50 in	54.748 psi	49.587 psi
1	9.50 in	14.00 in	54.583 psi	48.272 psi
2	14.00 in	16.13 in	54.484 psi	47.566 psi

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

Estimated Circulating Pressure Summary

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

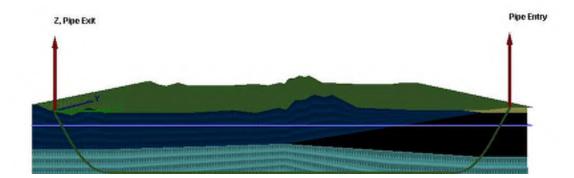
Flow Rate (Q): 80.00 US (liquid) gallon/min
Drill Fluid Density: 68.700 lb/ft3
Rheological model: Bingham-Plastic
Plastic Viscosity (PV): 25.53

Yield Point (YP): 16.49

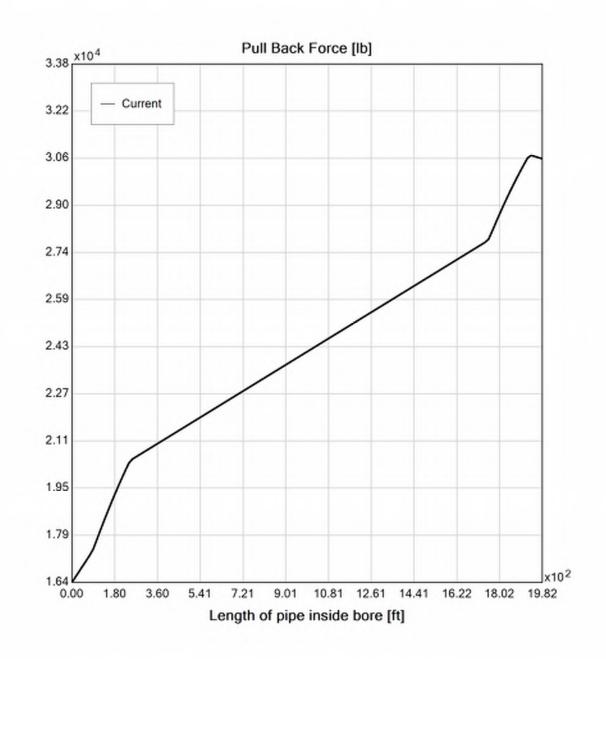
Effective Viscosity (cP): 1207.7

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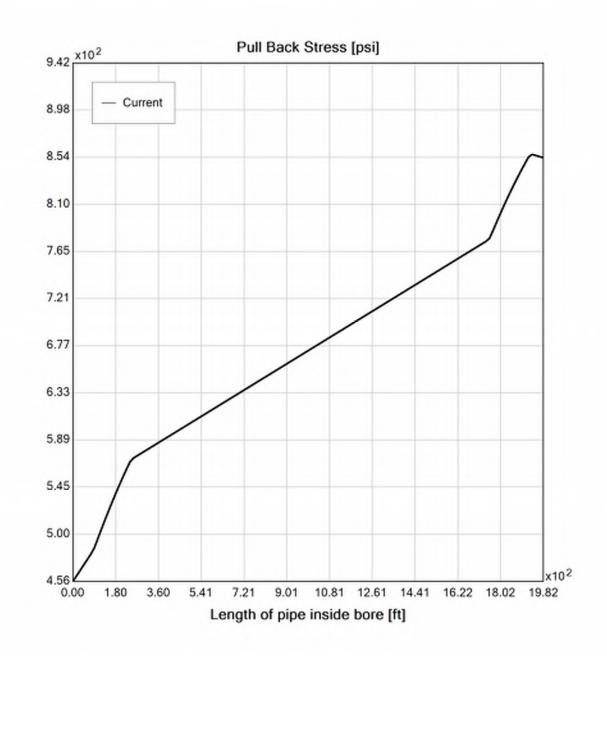
Virtual Site



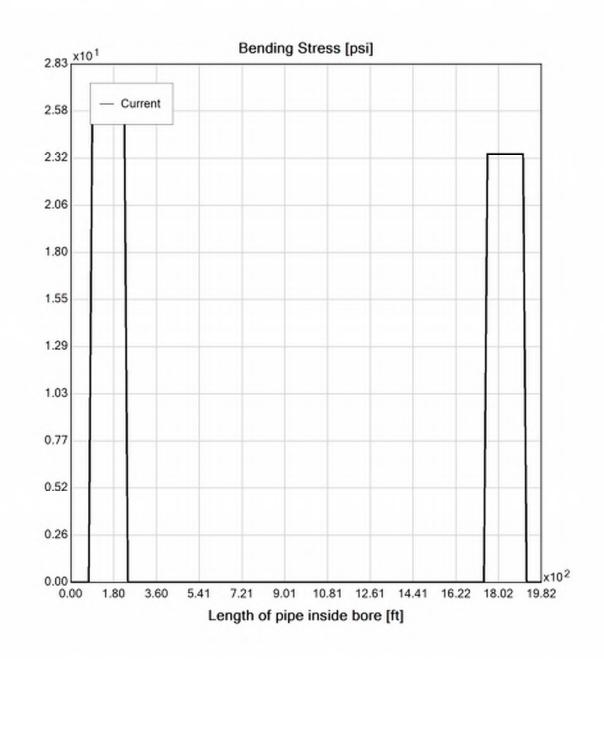




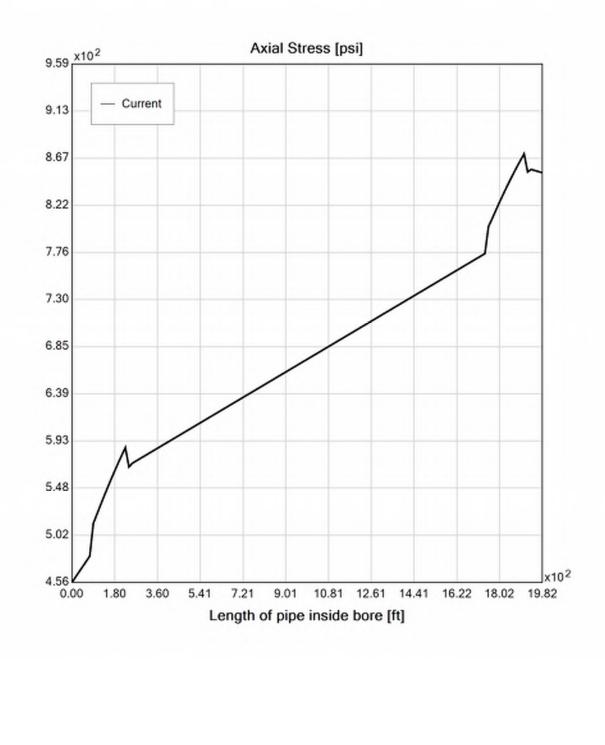
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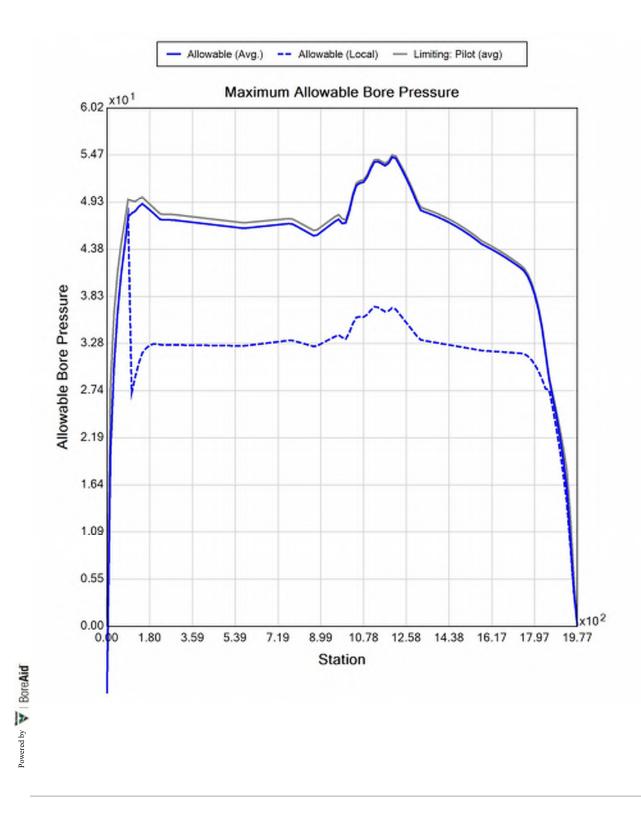
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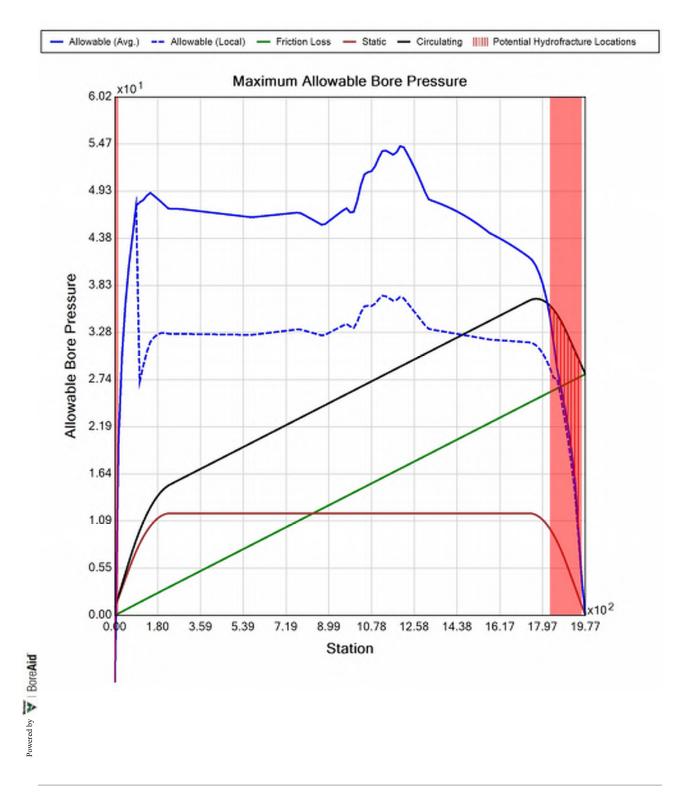


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Generated Output

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Input Summary

Start Coordinate	(0.00, 0.00, 134.00) ft
End Coordinate	(1975.00, 0.00, 135.00) ft
Project Length	1975.00 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: Gas Pipe Type: HDPE Classification: IPS Pipe OD: 2" (2.375") Pipe DR: 9 Pipe Length: 1980.00 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	10.5	13.6
Water Pressure	7.8	7.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	18.2	21.4
Deflection		
Earth Load Deflection	2.848	3.703
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	2.877	3.732
Compressive Stress [psi]		
Compressive Wall Stress	82.0	96.2

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1608.6	1608.6
Pullback Stress [psi]	919.1	919.1
Pullback Strain	1.598E-2	1.598E-2
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	919.1	919.1
Tensile Strain	1.598E-2	1.602E-2

Net External Pressure = 15.8 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	2.877	7.5	2.6	OK
Unconstrained Collapse [psi]	18.2	106.7	5.9	OK
Compressive Wall Stress [psi]	82.0	1150.0	14.0	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	26.1	198.9	7.6	OK
Tensile Stress [psi]	919.1	1200.0	1.3	OK



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Project Summary

General:	CHPE HDD 21A
	P2
	Start Date: 09-15-2022
	End Date: 09-15-2022
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE

Description:

HDD 21A 10-inch DR 9

Input Summary

Start Coordinate	(0.00, 0.00, 136.00) ft
End Coordinate	(1965.00, 0.00, 139.00) ft
Project Length	1965.00 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	2.875 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 5

Soil Layer #1 USCS, Sand (S), SW From Assistant Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

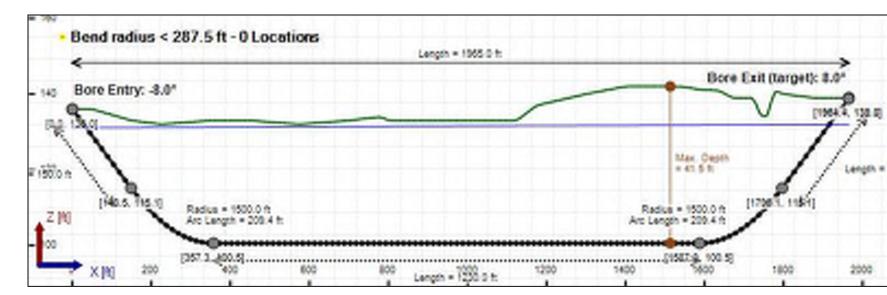
Soil Layer #2 USCS, Clay (C), CL From Assistant Unit Weight: 100.0000 (dry), 120.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 400.00, Coh: 8.30 [psi]

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: 3.13 [psi]

Soil Layer #4 USCS, Gravel (G), GW From Assistant Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

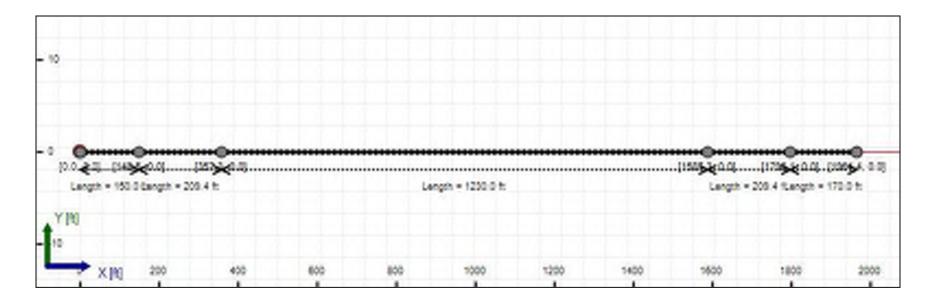
Soil Layer #5 Rock, Geological Classification, Sedimentary Rocks From Assistant Unit Weight: 165.0000 (dry), 177.0000 (sat) [lb/ft3] Phi: 35.00, S.M.: 1450.40, Coh: 2900.80 [psi]

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Bore Cross-Section View

Bore Plan View



Load Verifier Input Summary:

Pipe Application: Gas Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 1980.00 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	10.8	19.9
Water Pressure	13.4	13.5
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	24.1	33.4
Deflection		
Earth Load Deflection	2.944	5.418
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	3.076	5.550
Compressive Stress [psi]		
Compressive Wall Stress	108.5	150.5

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	30586.0	30586.0
Pullback Stress [psi]	853.0	853.0
Pullback Strain	1.483E-2	1.483E-2
Bending Stress [psi]	0.0	17.2
Bending Strain	0	2.986E-4
Tensile Stress [psi]	853.0	863.8
Tensile Strain	1.483E-2	1.532E-2

Net External Pressure = 25.0 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	3.076	7.5	2.4	OK
Unconstrained Collapse [psi]	25.9	104.9	4.1	OK
Compressive Wall Stress [psi]	108.5	1150.0	10.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	35.8	201.9	5.6	OK
Tensile Stress [psi]	863.8	1200.0	1.4	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	9.50 in	114.800 psi	107.704 psi
1	9.50 in	14.00 in	114.128 psi	106.581 psi
2	14.00 in	16.13 in	113.735 psi	105.923 psi

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

Estimated Circulating Pressure Summary

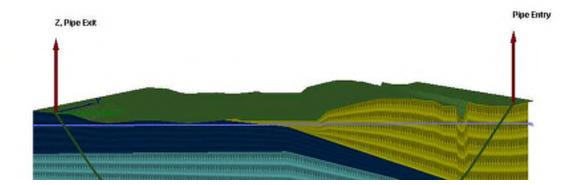
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 80.00 US (liquid) gallon/min
Drill Fluid Density: 68.700 lb/ft3
Rheological model: Bingham-Plastic
Plastic Viscosity (PV): 25.53

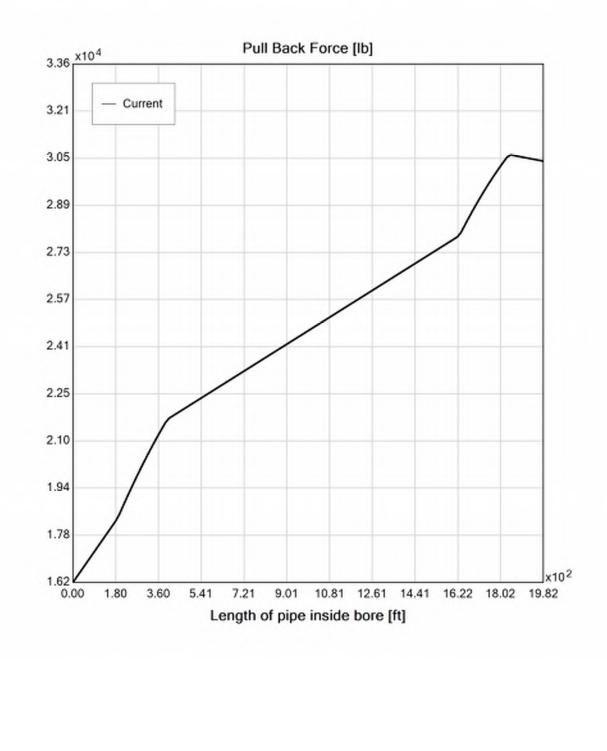
Yield Point (YP): 16.49

Effective Viscosity (cP): 1397.5

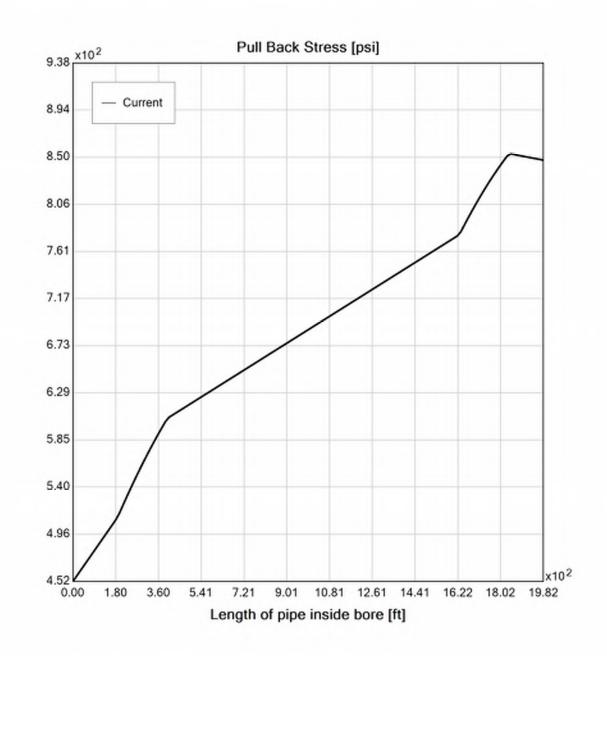
Virtual Site



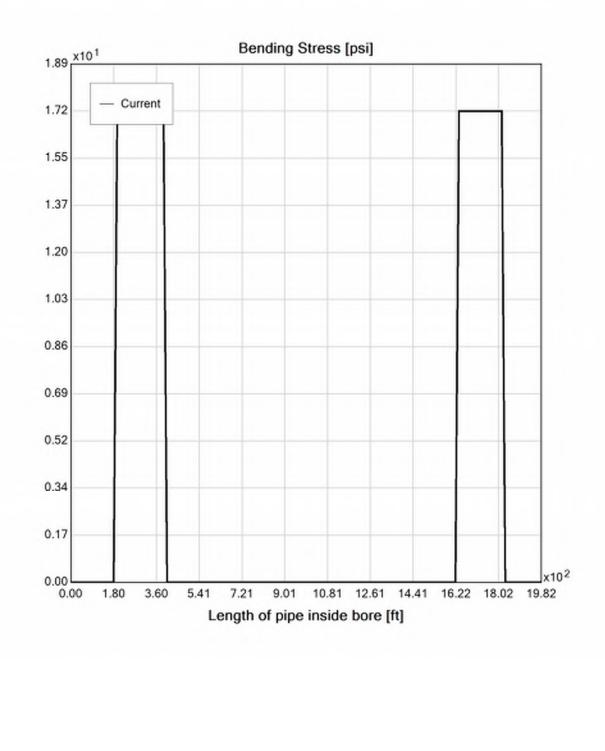




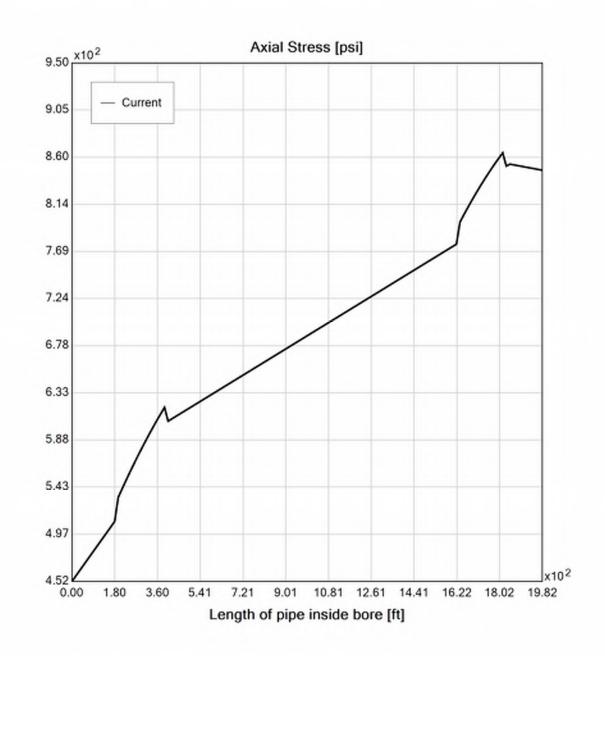
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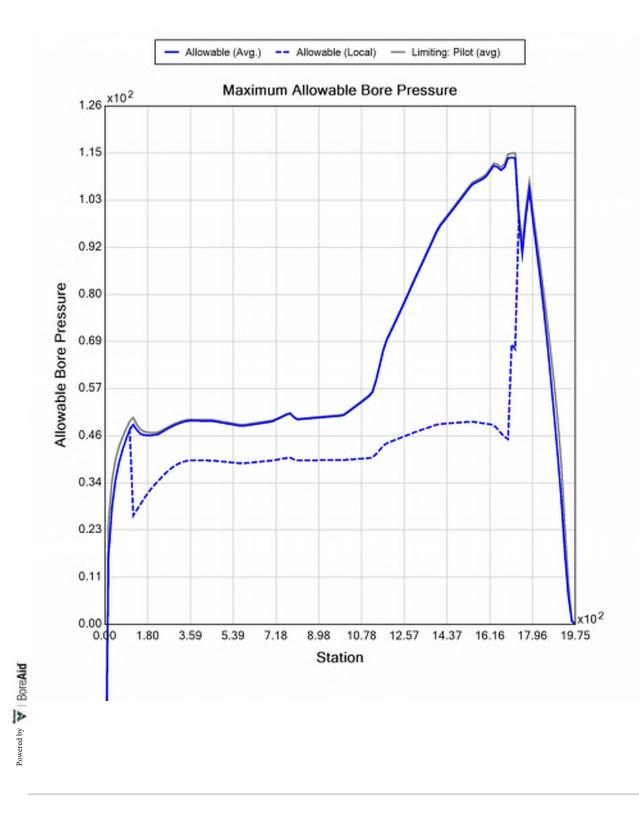
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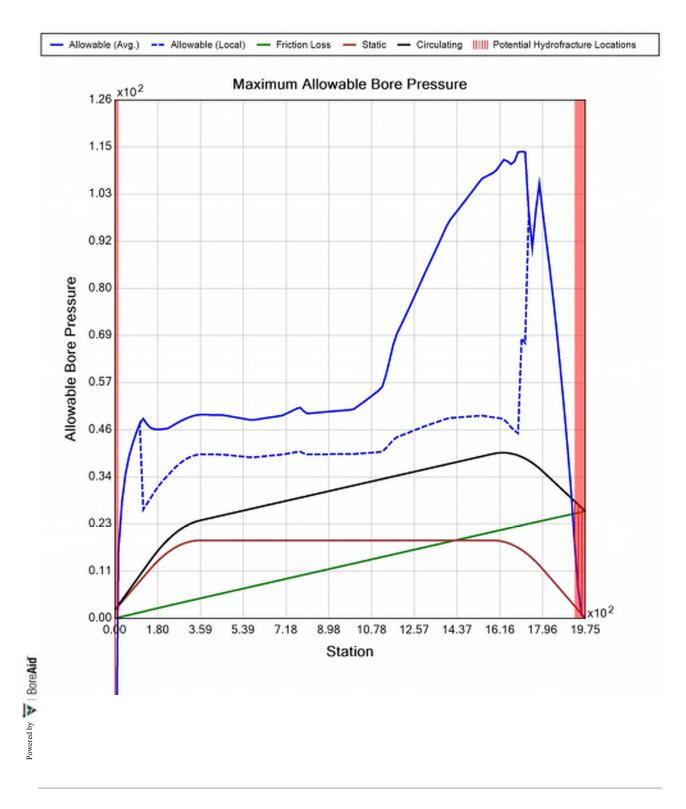


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Input Summary

Start Coordinate	(0.00, 0.00, 136.00) ft
End Coordinate	(1965.00, 0.00, 139.00) ft
Project Length	1965.00 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	2.875 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Load Verifier Input Summary:

Pipe Application: Gas Pipe Type: HDPE Classification: IPS Pipe OD: 2" (2.375") Pipe DR: 9 Pipe Length: 1980.00 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	10.8	19.9
Water Pressure	13.4	13.5
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	24.1	33.4
Deflection		
Earth Load Deflection	2.944	5.418
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	2.973	5.448
Compressive Stress [psi]		
Compressive Wall Stress	108.5	150.5

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1602.5	1602.5
Pullback Stress [psi]	915.6	915.6
Pullback Strain	1.592E-2	1.592E-2
Bending Stress [psi]	0.0	3.8
Bending Strain	0	6.597E-5
Tensile Stress [psi]	915.6	915.6
Tensile Strain	1.592E-2	1.595E-2

Net External Pressure = 25.0 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

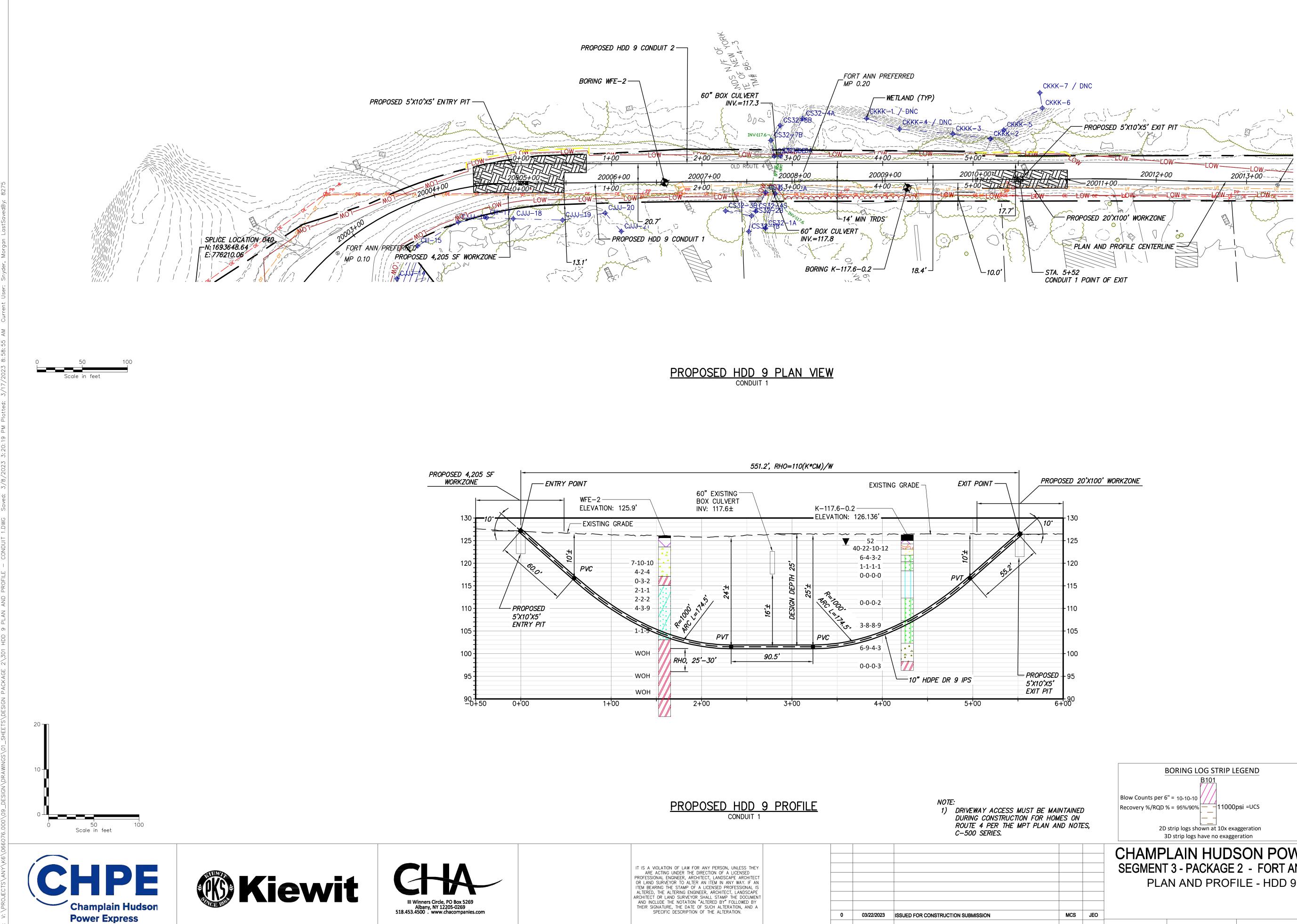
	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	2.973	7.5	2.5	OK
Unconstrained Collapse [psi]	25.9	105.8	4.1	OK
Compressive Wall Stress [psi]	108.5	1150.0	10.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	35.8	198.8	5.5	OK
Tensile Stress [psi]	915.6	1200.0	1.3	OK

Appendix E

HDD Design Drawings



PROPOSED HDD CONDUIT 1	<u>9 PROFILE</u>		NOTE: 1) DRIVEWAY ACCESS MUST DURING CONSTRUCTION I ROUTE 4 PER THE MPT C-500 SERIES.	FOR HOMES ON	BI
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.		0 03/22/2023		MCS	C s

No.

DATE SUBMITTAL / REVISION DESCRIPTION

			ROOM	GP-GM	Poorly Graded GRAVEL with SILT
SED 20	o'x100'	WORKZONE		GW	Well Graded GRAVEL
				GW-GC	Well Graded GRAVEL with CLAY
			5 2 37	GW-GM	Well Graded GRAVEL with SILT
				Limestone	Limestone
-130				MH	Elastic SILT
				ML	SILT
4.05				DH	DRGANIC Fat CLAY
-125				DL	ORGANIC Lean CLAY
			1811	OL/OH	ORGANIC SDIL
-120				PT	PEAT
				Rock	Rock
- 115			·····	Sandstone	Sandstone
110			1. 1. 1.	SC	CLAYEY SAND
				SC-SM	SILT, CLAYEY SAND
- 110			r. 4 . 1.	SHALE	Shale
				SILTSTONE	Siltstone
-105				SM	SILTY SAND
				SP	Poorly Graded SAND
100			7	SP-SC	Poorly Graded SAND with CLAY
-100				SP-SM	Poorly Graded SAND with SILT
				۶W	Well graded SAND
- 95				SW-SC	Well Graded SAND with CLAY
				SW-SM	Well Graded SAND with SILT
- 90				Topsoil	Topsoil
- 90 00				USGS 601	Gravel or Conglomerate 1
				USGS 654	Subgraywacke
				USGS 670	Interbedded Sandstone and Shale
				USGS 702	Quartzite
			<u> 21117</u>	USGS 705	Schist
				USGS 705	Schist
				USGS 708	Gnelss
		BORING LOG STRIP LEGEND		USGS 708	Gneiss
		<u>B101</u>		USGS 718	Granite 1
				Void	Void
		Blow Counts per 6" = 10-10-10		Water	Water
TAINED)	Recovery %/RQD % = 95%/90% 11000psi =UCS	HEHEH	Weathered Rock	Undefined
S ON	-0		<u>TUTUT</u>	Water Table	Water Table during drilling
) NOTE	:5,	2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration		Delayed Water Table	Water Table after drilling
		CHAMPLAIN HUDSON POWE			KIEWIT PROJECT NO.
		SEGMENT 3 - PACKAGE 2 - FORT ANN	I TO KIN	NGSBURY	CHA PROJECT NO.
					066076 DRAWING NO.
		PLAN AND PROFILE - HDD 9, 0		11 1	
					C-301
MCS	JEO		SCALE		TED DATE 03/22/2023
DB	APP	DRAWN BY: SK DESIGNED BY: SK APPROVED BY: JEO			

Legend

Asphalt

Bedrock

Boulder Fat CLAY

SILTY Fat CLAY

Lean CLAY

SILTY CLAY

Concrete

Fill

CLAYEY GRAVEL SILTY CLAYEY GRAVEL

SILTY GRAVEL Poorly Graded GRAVEL

Poorly Graded Gravel with CLAY

ASPHALT

Bedrock

Boulder

СН

CH-MH

CL

CL-ML

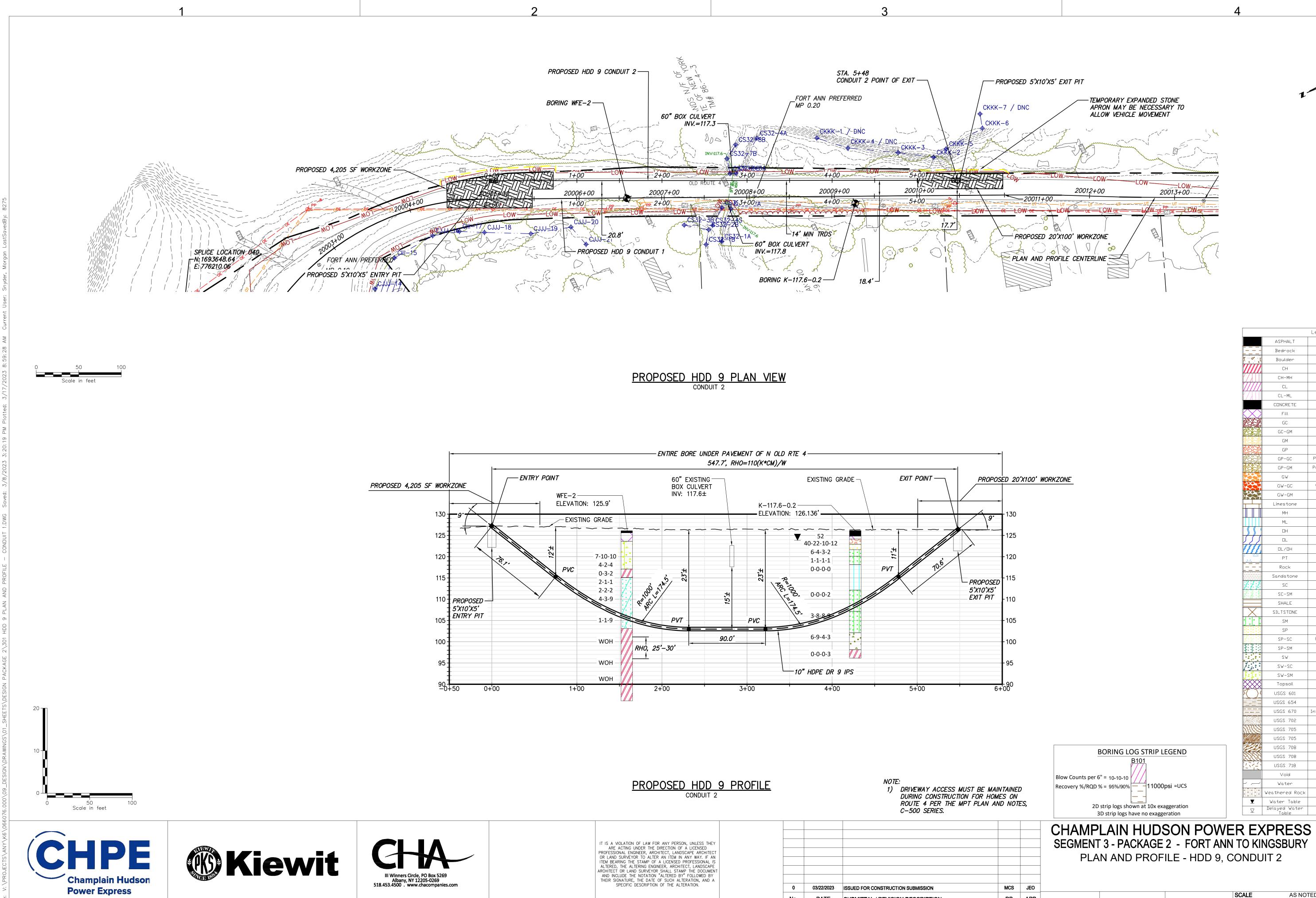
CONCRETE

Fill

GC

GC-GM GM

GP GP-GC



PROPOSED HDD CONDUIT 2	9 PROFILE	NO 1)	TE: DRIVEWAY ACCESS DURING CONSTRUCT ROUTE 4 PER THE C-500 SERIES.	tion for home	ES ON	5,
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						

	-						C
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED							S
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.	-						-
SI EGINO DESCRIPTION OF THE ACTEMATION.	-	0	03/22/2023	ISSUED FOR CONSTRUCTION SUBMISSION	MCS	JEO	
		No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP	DRAV

						SCALE	AS
RAWN BY:	SK	DESIGNED BY:	SK	APPROVED BY:	JEO	REV. NO.	

NOTED	DATE
×	

C-301A 03/22/2023

21162

CHA PROJECT NO.

066076

DRAWING NO.

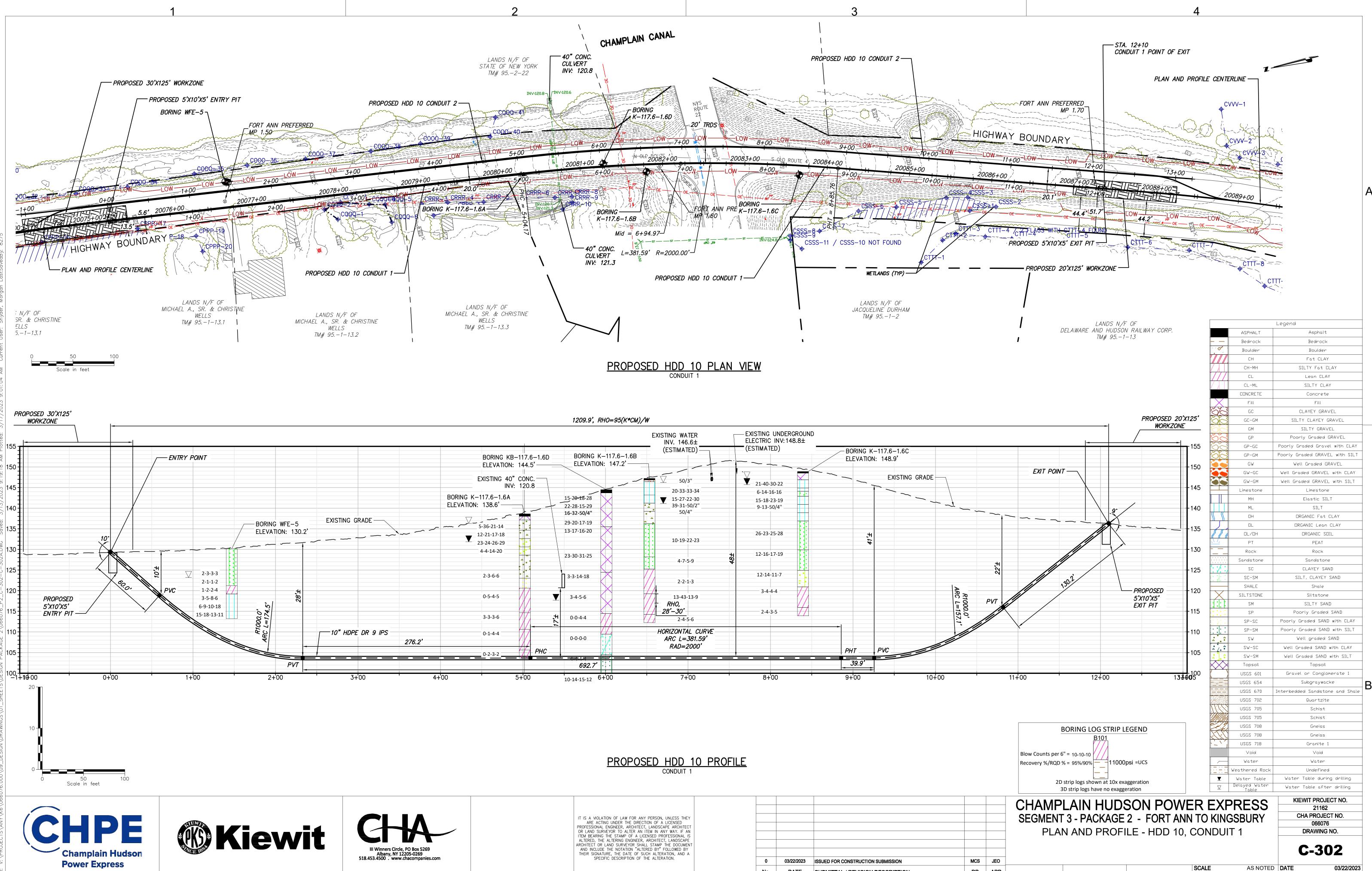
B

	Bedrock	Bedrock
<u>ار من المناطقة المن</u>	Boulder	Boulder
	СН	Fat CLAY
	СН-МН	SILTY Fat CLAY
1////	CL	Lean CLAY
	CL-ML	SILTY CLAY
/ /	CONCRETE	Concrete
\sim	Fill	Fill
¥77.4	GC	CLAYEY GRAVEL
	GC-GM	SILTY CLAYEY GRAVEL
	GM	SILTY GRAVEL
300-20	GP	Poorly Graded GRAVEL
		Poorly Graded Gravel with CLAY
A A A	GP-GC	
1993	GP-GM	Poorly Graded GRAVEL with SILT
	GW	Well Graded GRAVEL
	GW-GC	Well Graded GRAVEL with CLAY
20	GW-GM	Well Graded GRAVEL with SILT
	Limestone	Limestone
	МН	Elastic SILT
	ML	SILT
	DH	DRGANIC Fat CLAY
\$	OL	ORGANIC Lean CLAY
	OL/OH	ORGANIC SOIL
	PT	PEAT
	Rock	Rock
	Sandstone	Sandstone
///	SC	CLAYEY SAND
	SC-SM	SILT, CLAYEY SAND
<u> </u>	SHALE	Shale
\mathbf{X}	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
7	SW-SC	Well Graded SAND with CLAY
	SW-SM	Well Graded SAND with SILT
	Topsoil	Topsoil
XXXX	USGS 601	Gravel or Conglomerate 1
	USGS 654	Subgraywacke
	USGS 670	Interbedded Sandstone and Shal
211172	USGS 702	Quartzite
	USGS 705	Schist
	USGS 705	Schist
	USGS 708	Gneiss
STILL	USGS 708	Gneiss
公合	USGS 718	Granite 1
	Void	Void
~	Water	Water
	Weathered Rock	Undefined
T	Water Table	Water Table during drilling
	Delayed Water	Water Table after drilling

Legend

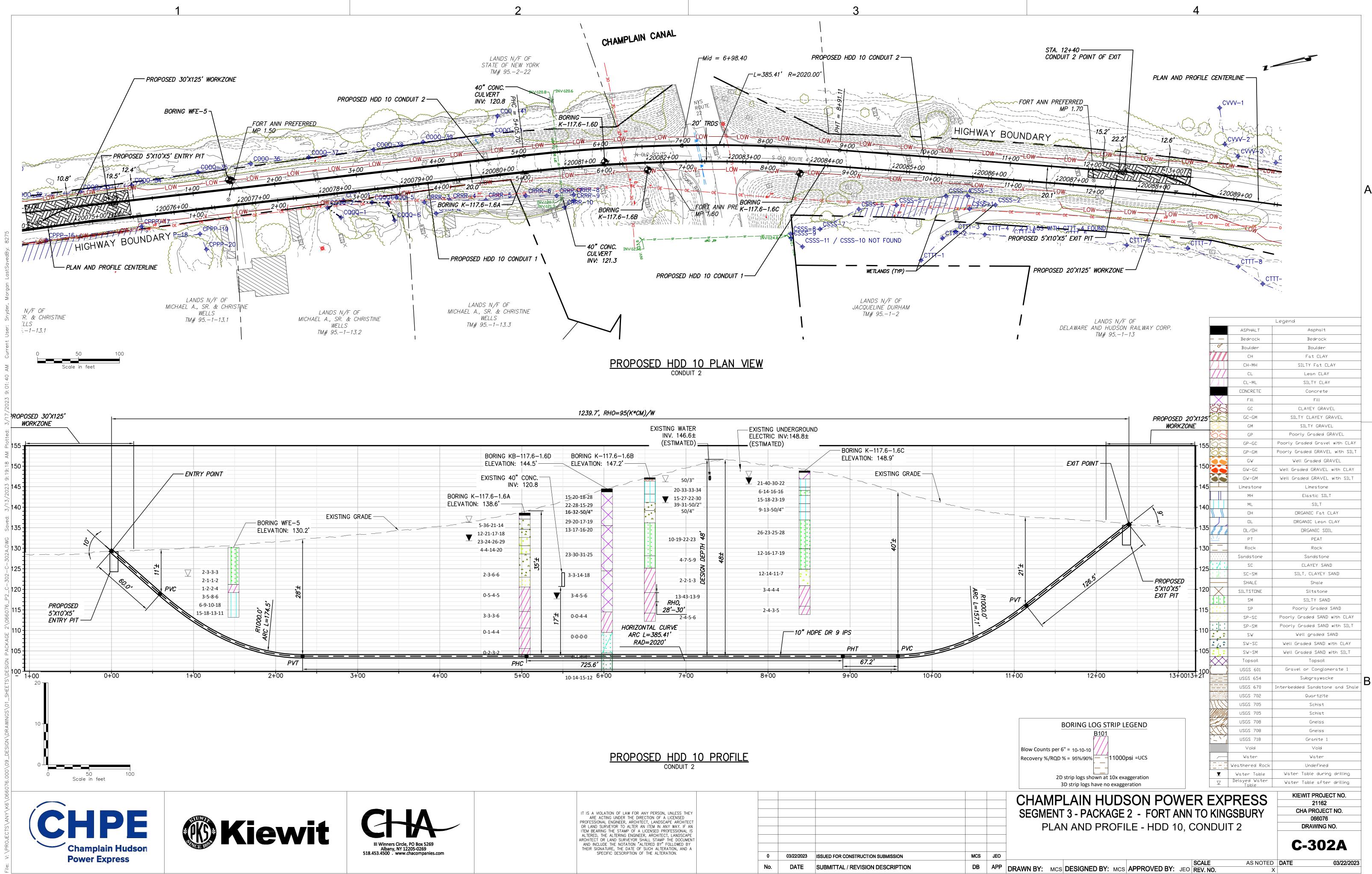
Asphalt

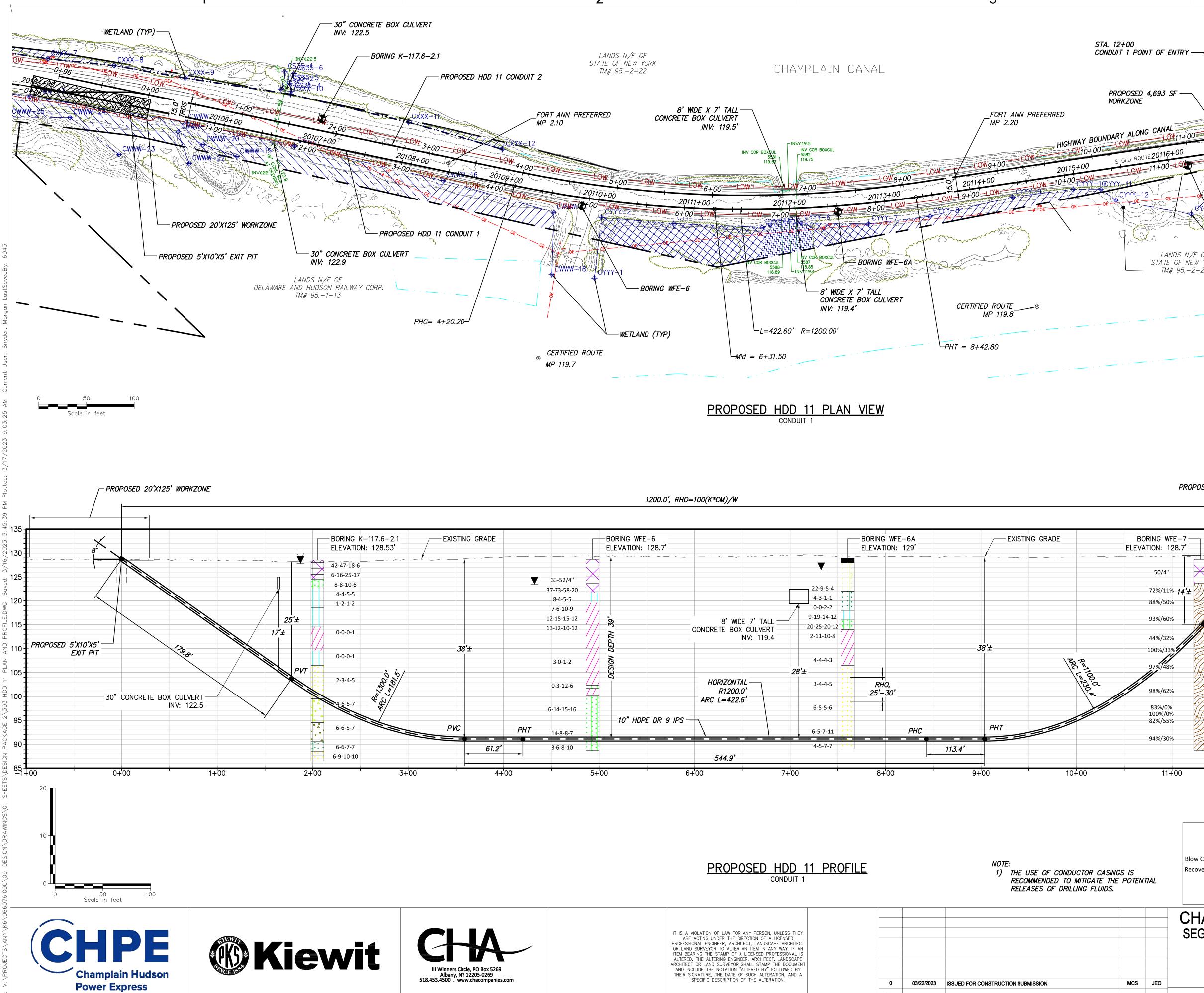
ASPHALT



No. DATE SUBMITTAL / REVISION DESCRIPTION

03/22/2023

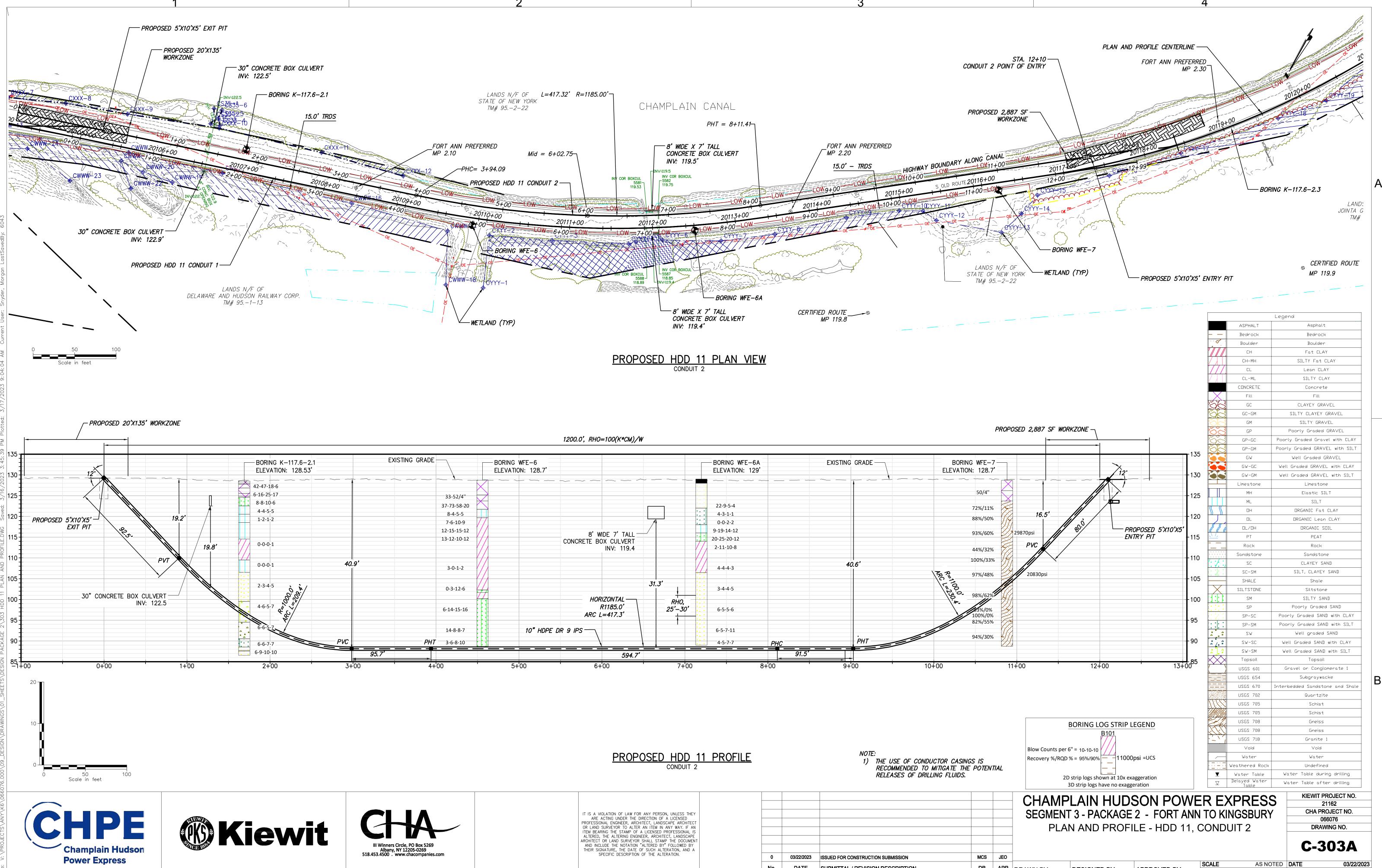




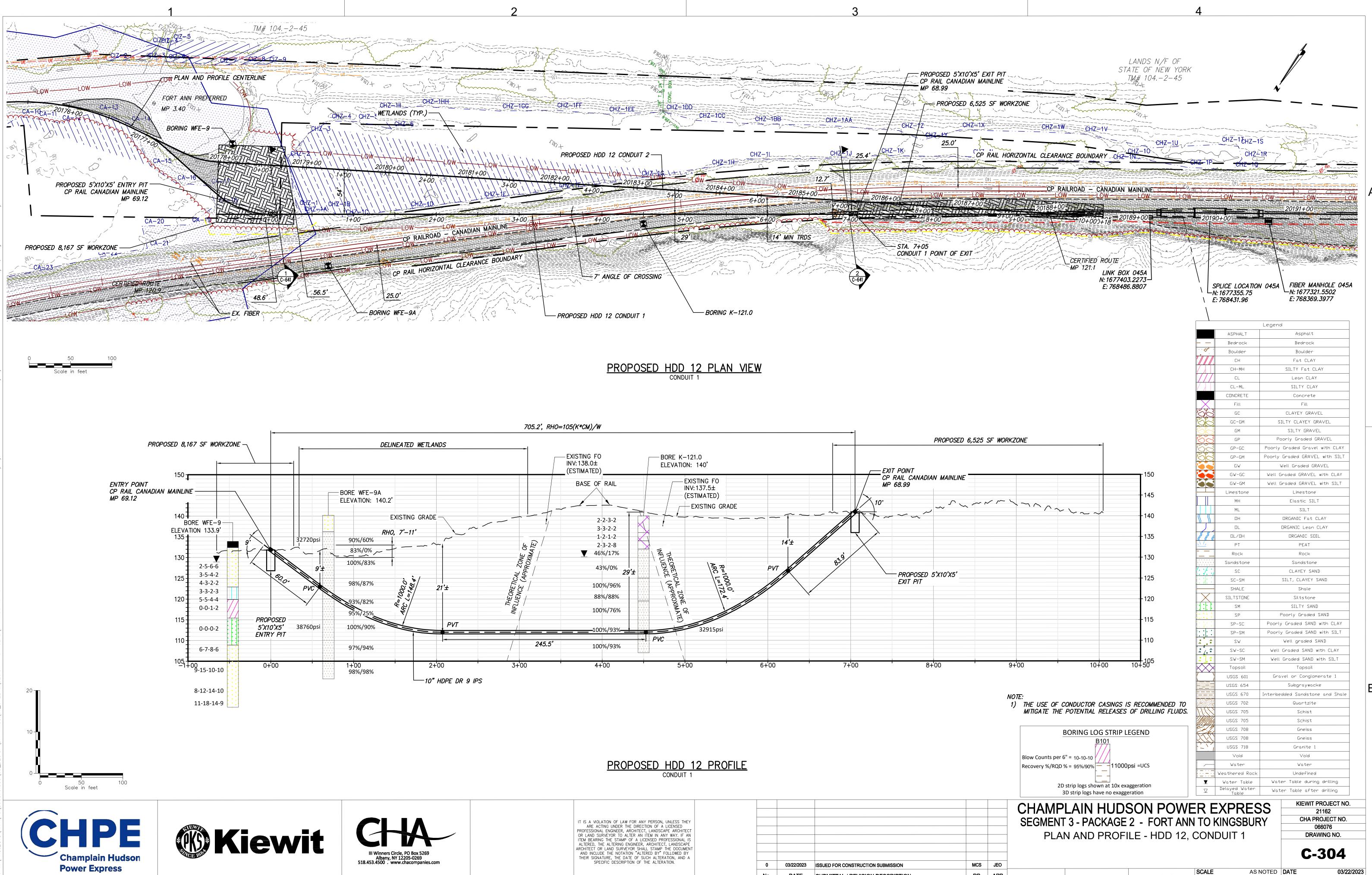
				PROPOSED 4,693 SF WORKZONE	\	CENTERLINE CENTERCON	20119+00		
RED	8' WIDE X 7' TALL CONCRETE BOX CULVERT		FORT ANN PREFERRED		and the second s	LOW 12+63 12+00 12+63			
	INV: 119.5'		WI 2.20	DUNDARY ALONG CANAL	11+00 + W	12100	OF THE		
		- INV:119.5 INV COR BOXCUL 5582 [119.75]	104 July 104	POULTE 20116+	00 + 23.00	Contraction of the second seco	OE Norman))/		
	119.93	-Store - Store	LON 9+00 LOW 20115+00	LOW 11+00		trange at			
OW 5+00	OW LOW 6+00 LOW 6-	0 7+00 - 0 20 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0W 9+00 - LOW - 10+00-00 - 10+00-00-00-00-00-00-00-00-00-00-00-00-00	-10:YYY-17	CYYY-14	PB 0E {			
0+00		20113+00 20113+00 0W	OW 19700	OE		- Jam h	BORING K-117.6-2.3	A	
		2 CYYY - T CYYY - T TO T	THE FLORE OF		BORING WFE-				
			Sum (String)	P. E.P. ~					
		NV COR BOXCUL 4587 BORING WFE-6A	A	LAND STATE (DS N/F OF DF NEW YORK	(TYP)	5'X10'X5' ENTRY PIT	⊕ CERTIFIE ® MP 119.:	
OYYY-1	5588 118.89	18.85 INV 119.4	ALE		95.—2—22				
B	PORING WFE-6	8' WDE X 7' TALL					· · · · ·		
		CONCRETE BOX CULVERT INV: 119.4'	CERTIFIED ROUTE						
			MP 119.8	. <u> </u>					
N WETLAN	D(TYP) $-L=422.0$	50' R=1200.00'	PHT = 8+42.80						
ΓE	-Mid = 6+31.50		-++11 - 0++2.00		<u> </u>		L	egend	
			· · · · · · · · · · ·				ASPHALT Bedrock	Asphalt Bedrock	
							Boulder	Boulder	
	PROPOSED HD	D 11 PLAN VIEW					СН СН-МН	Fat CLAY SILTY Fat CLAY	
	CO	NDUIT 1					CL	Lean CLAY	
							CL-ML CONCRETE	SILTY CLAY Concrete	
							Fill GC	Fill CLAYEY GRAVEL	
							GC-GM	SILTY CLAYEY GRAVEL	
					PROPOSED 4,693 SF WORI	KZONE -	GP GP	SILTY GRAVEL Poorly Graded GRAVEL	
	1200.0', RHO=100(K*CM)/W					1		Poorly Graded Gravel with CLAY Poorly Graded GRAVEL with SILT	
						````	GW	Well Graded GRAVEL	
BORING WFE ELEVATION:		BORING WFE-6A ELEVATION: 129'	EXISTING GRADE	BORING WFE ELEVATION: 128		12.		Well Graded GRAVEL with CLAY Well Graded GRAVEL with SILT	
							-130 Limestone	Limestone Elastic SILT	
				50/4"		$\left \right\rangle$	-125 ML	SILT	
		22-9-5-4 4-3-1-1		72%/11%		X		DRGANIC Fat CLAY DRGANIC Lean CLAY	
		0-0-2-2		88%/50%	68.9	PROPOSED 5'X10'X5'	-120	DRGANIC SDIL PEAT	
, 39,	8' WIDE 7' TALL	9-19-14-12 20-25-20-12	Image:	93%/60%	29870psi PVC	ENTRY PIT	-115 Rock	Rock	
DEPTH	INV: 119.4	2-11-10-8		44%/32%			-110 Sandstone	Sandstone CLAYEY SAND	
	Image:	4-4-4-3		100%/33% 97%/48%			SC-SM SHALE	SILT, CLAYEY SAND Shale	
- DES	HORIZONTAL		C 1100.0	97%/48%	20830psi		-105 SILTSTONE	Siltstone	
	R1200.0' ARC L=422.6'	3-4-4-5 <i>RHO</i> , <i>25'-30'</i>		98%/62%			-100 SP	SILTY SAND Poorly Graded SAND	
		6-5-5-6		83%/0% 100%/0%			SP-SM	Poorly Graded SAND with CLAY Poorly Graded SAND with SILT	
10" HDP	PE DR 9 IPS	6-5-7-11 PHC	PHT	82%/55%			95 SW	Well graded SAND	
		4-5-7-7	113.4'	94%/30%			-90 SW-SC	Well Graded SAND with CLAY Well Graded SAND with SILT	
	544.9'						R5 USGS 601	Topsoil Gravel or Conglomerate 1	
-00	6+00 7-	+00 8+00	9+00 10+00	i 11+0	00 12-	+00 13-	-00 ⁻⁰⁰ -05654	Subgraywacke	
							USGS 670 Ir USGS 702	nterbedded Sandstone and Shale Quartzite	
							USGS 705 USGS 705	Schist Schist	
					BORING L	.OG STRIP LEGEND	USGS 708	Gneiss	
						B101	USGS 708	Gneiss Granite 1	
			NOTE:		Blow Counts per 6" = 10-10-10		Void Water	Void Water	
	PROPOSED HD	DUIT 1	1) THE USE OF CONDUCTOR RECOMMENDED TO MITIGA	TE THE POTENTIAL	Recovery %/RQD % = 95%/90%	6 — 11000psi =UCS	Weathered Rock	Undefined	
			RELEASES OF DRILLING FL	LUIDS.		hown at 10x exaggeration have no exaggeration	▼ Water Table ∑ Delayed Water Table	Water Table during drilling Water Table after drilling	
							WER EXPRESS	KIEWIT PROJECT NO.	
	IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLES						ANN TO KINGSBURY	CHA PROJECT NO.	
	ARE ACTING UNDER THE DIRECTION OF A LICENS PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE AR OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY	SED RCHITECT Y. IF AN				PROFILE - HDD		066076 DRAWING NO.	
	ITEM BEARING THE STAMP OF A LICENSED PROFESSIO ALTERED, THE ALTERING ENGINEER, ARCHITECT, LAND ARCHITECT OR LAND SURVEYOR SHALL STAMP THE DO AND INCLUDE THE NOTATION "ALTERED BY" FOLLOW	DSCAPE OCUMENT					, <b></b>	C 202	
	THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, SPECIFIC DESCRIPTION OF THE ALTERATION.	AND A	ISSUED FOR CONSTRUCTION SUBMISSION	MCS JEO				<b>C-303</b>	
		No. DATE	SUBMITTAL / REVISION DESCRIPTION		RAWN BY: JAS DESIGNE	ED BY: MB APPROVED BY	JEO REV. NO.	ED <b>DATE 03/22/2023</b> X	

FORT ANN PREFERRED_ MP 2.30

PLAN AND PROFILE -CENTERLINE



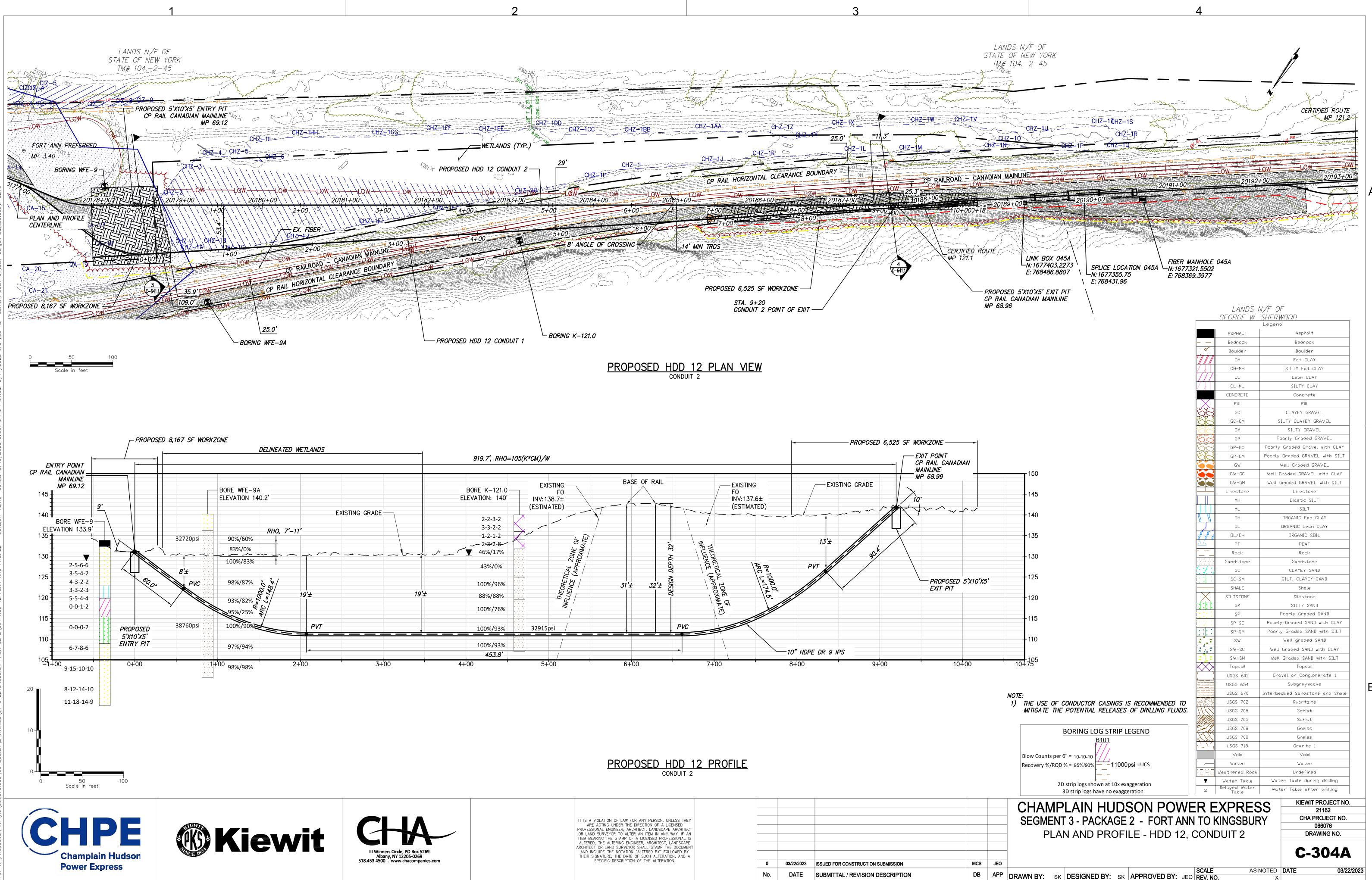
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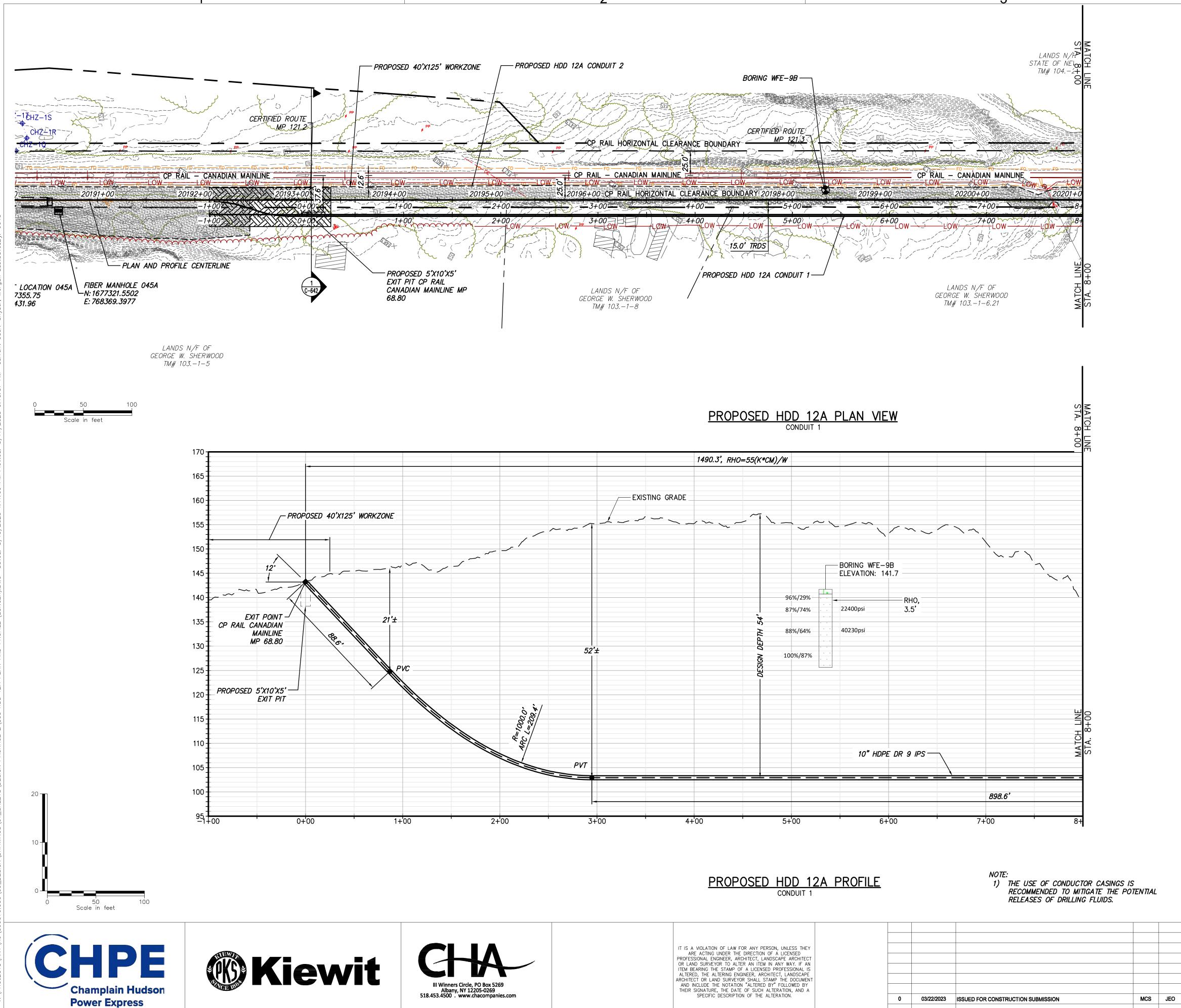


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	No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP	DRA

RAWN BY: SK DESIGNED BY: SK APPROVED BY: JEO REV. NO.



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	No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP	DRA



MCS JEO DB APP DRA

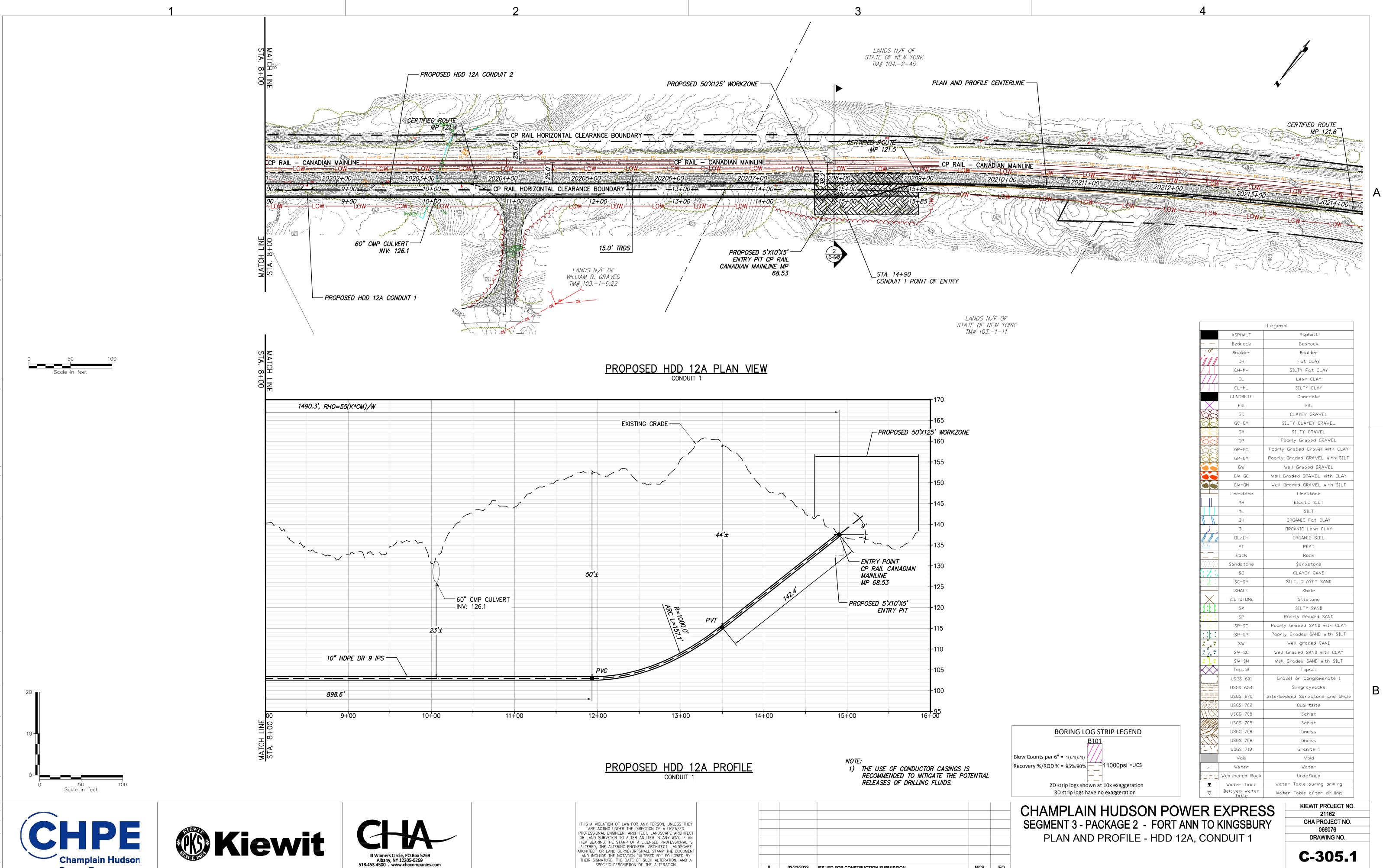
No.

DATE SUBMITTAL / REVISION DESCRIPTION

		ASPHALT		Asphalt	
	<u> </u>	Bedrock		Bedrock	
		Boulder		Boulder	
		СН		Fat CLAY	
		СН-МН	SIL	TY Fat CLAY	
	///	CL		Lean CLAY	
		CL-ML		SILTY CLAY	
		CONCRETE		Concrete	
		Fill		Fill	
		GC		AYEY GRAVEL	
	90	GC-GM		CLAYEY GRAVEL	
		GM		LTY GRAVEL	
	00	GP	,	Graded GRAVEL	
		GP-GC	-	ded Gravel with CLAY	
		GP-GM	,	ded GRAVEL with SILT	
		GW		Graded GRAVEL	
		GW-GC		ed GRAVEL with CLAY	
		GW-GM	Well Grade	ed GRAVEL with SILT	
		Limestone		Limestone	
	╟╴╿╴╢	MH	E	Ilastic SILT	
		ML		SILT	
	<u>}</u>	DH		ANIC Fat CLAY	
				NIC Lean CLAY	
	i i i	0L/0H		RGANIC SOIL	
	<u> </u>	PT		PEAT	
		Rock		Rock	
		Sandstone		Sandstone	
		SC		LAYEY SAND	
		SC-SM	SILT	, CLAYEY SAND	
		SHALE		Shale	
		SILTSTONE		Siltstone	
		SM		SILTY SAND	
		SP		ly Graded SAND	
	- / -	SP-SC		aded SAND with CLAY	
		SP-SM	-	aded SAND with SILT	
		SM		. graded SAND	
	<u> </u>	SM-SC		ked SAND with CLAY	
		SW-SM	Well Gra	ded SAND with SILT	
		Topsoil		Topsoil	
		USGS 601		or Conglomerate 1	
		USGS 654		ubgraywacke	B
		USGS 670	Interbeddec	Sandstone and Shale	
		USGS 702		Quartzite	
		USGS 705		Schist	
		USGS 705		Schist	
BORING LOG STRIP LEGEND		USGS 708		Gneiss	
<u>B101</u>		USGS 708		Gneiss	
low Counts per 6" = 10-10-10	[]	USGS 718		Granite 1	
		Void		Vold	
ecovery %/RQD % = 95%/90% - 11000psi =UCS		Water		Water	
		Weathered Rock		Undefined	
2D strip logs shown at 10x exaggeration	<b>▼</b>	Water Table Delayed Water		able during drilling	
3D strip logs have no exaggeration	$\Box$	Table	Water 1	able after drilling	
				KIEWIT PROJECT NO.	
			<b>う</b> 一	21162	
CHAMPLAIN HUDSON POV	VER E				
			2Y 🗌	CHA PROJECT NO.	
SEGMENT 3 - PACKAGE 2 - FORT A	NN TO K	KINGSBUR	XY	066076	
	NN TO K	KINGSBUR	XY		
SEGMENT 3 - PACKAGE 2 - FORT A	NN TO K	KINGSBUR	(Y	066076 DRAWING NO.	
SEGMENT 3 - PACKAGE 2 - FORT A	NN TO K	KINGSBUR	(Y	066076	
SEGMENT 3 - PACKAGE 2 - FORT A	NN TO K	(Ingsbur Iduit 1		066076 DRAWING NO.	

Legend

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**Power Express** 

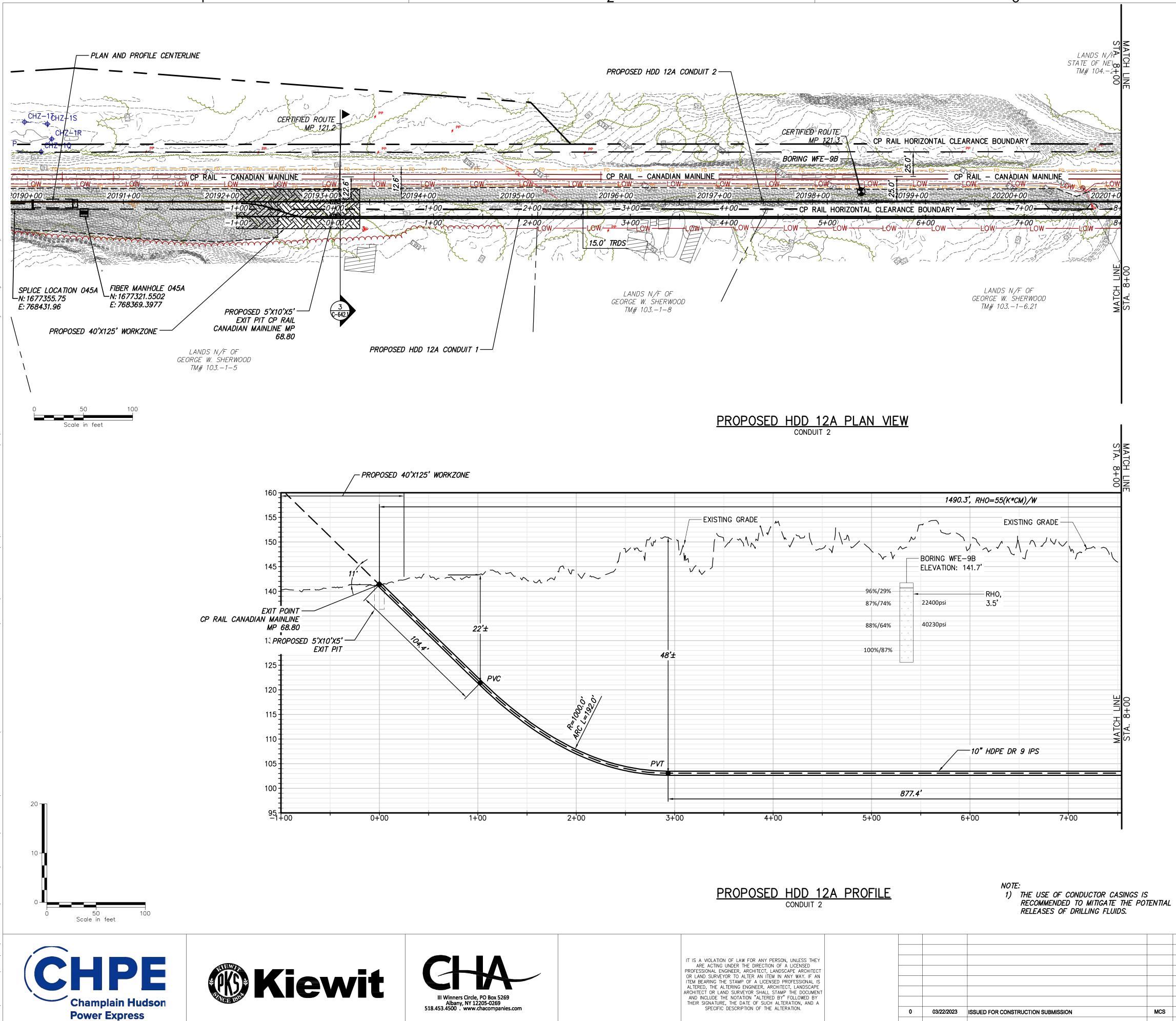
							(
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY							1
ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT							1
OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS							1
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SPECIFIC DESCRIPTION OF THE ALTERATION.		0	03/22/2023	ISSUED FOR CONSTRUCTION SUBMISSION	MCS	JEO	
	N	No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP	DR/

GP-GM       Poonly Graded GRAVEL with SILT         GW       Well Graded GRAVEL with CLAY         GW-GC       Well Graded GRAVEL with SILT         Limestone       Limestone         MH       Elastic SILT         ML       SILT         DH       DRGANIC Lean CLAY         DL/DH       DRGANIC SDIL         ML       SLT         OL/OH       DRGANIC SDIL         Sandstone       Sandstone         SC       CLAYEY SAND         SC       CLAYEY SAND         SHALE       Shale         SILTSTDNE       Siltstone         SP       Poorly Graded SAND         SP       SPORIY Graded SAND         SP       SV         SP       Pooriy Graded SAND         SP       SV         SV       Well Graded SAND with SLT         SV	· · · / • · ·	Bedrock	Bedrock
CH-MH       SILTY Fat CLAY         CL       Lean CLAY         CL-ML       SILTY CLAY         CUNCRETE       Concrete         Fili       Fili         GC       CLAYEY GRAVEL         GC       CLAYEY GRAVEL         GC       GLAYEY GRAVEL         GC       GLAYEY GRAVEL         GC       GLAYEY GRAVEL         GF       Poorty Graded GRAVEL         GF       Poorty Graded GRAVEL with SLT         GW       Well Graded GRAVEL with SLT         GW-GC       Well Graded GRAVEL with SLT         Umestone       Limestone         MH       Elastic SILT         MH       Elastic SILT         ML       SILT         MH       Elastic SILT         ML       DH         DH       DRGANIC Fat CLAY         QL/DH       IDRGANIC SOIL         ML       SILT SON         SLITSTDNE       Skitstone         SLITSTDNE       Skitstone         SN       SULTY SAND         SP-SM       Poorty Graded SAND         SW       Well Graded SAND with CLAY         SW-SC       Well Graded SAND         SW-SC       Well Graded SAND	· · ·		
CL       Lean CLAY         CL-ML       SILTY CLAY         CENCRETE       Concrete         Fill       Fill         GC       CLAYEY GRAVEL         GC       CLAYEY GRAVEL         GF       GC         GP       Poorly Graded GRAVEL         GP       Poorly Graded GRAVEL         GP-GC       Poorly Graded GRAVEL with SILT         GW       Well Graded GRAVEL with SILT         GW-GC       Well Graded GRAVEL with SILT         GW-GC       Well Graded GRAVEL with SILT         Limestone       Limestone         MH       Elestic SILT         MH       BLANK         GU/GH       DRGANIC Fat CLAY         GL/DH       DRGANIC SOIL         ML       SILT         ACK       Rock         Sandstone       Sandstone         Sandstone       Siltstone         SILTSTENE       Siltstone         SN       SILTY SAND         SP-SK       Poorly Graded SAND with SILT         SV-SK       Well Graded SAND with SIL			
CL-ML       SILTY CLAY         CDNCRETE       Concrete         Fill       Fill         GC       CLAYEY GRAVEL         GC       CLAYEY GRAVEL         GM       SILTY CLAYEY GRAVEL         GM       SILTY GRAVEL         GP       Poorly Graded GRAVEL         GP-GC       Poorly Graded GRAVEL with CLAY         GW-GW       Well Graded GRAVEL         GW-GW       Well Graded GRAVEL with SILT         GW-GW       Well Graded GRAVEL with SILT         Llinestone       Llinestone         Llinestone       Llinestone         ML       SILT         ML       GRANIC Fat CLAY         DL       DRGANIC Fat CLAY         DL/DH       DRGANIC SULL         ML       SILT, CLAYEY SAND         SC       CLAYEY SAND         SC-SM       SILT, CLAYEY SAND         SLTSTONE       Siltstone         SILTSTONE       Siltstone         SN       SILTY SAND         SP-SC       Poorly Graded SAND         SP-SC       Poorly Graded SAND with SILT         SP-SM       Vell Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         USGS 601			
CDNCRETE       Concrete         Fill       Fill         GC       CLAYEY GRAVEL         GC-GM       SILTY CLAYEY GRAVEL         GM       SILTY GRAVEL         GP       Poorly Graded GRAVEL         GP-GC       Poorly Graded GRAVEL with SLC         GW       Well Graded GRAVEL with SLC         GW-GC       Well Graded GRAVEL with SLT         Linestone       Linestone         MH       Elastic SILT         MH       GRANCE STAT         OH       DRGANIC Fat CLAY         OL/DH       DRGANIC SOIL         Y       PT         PEAT       PEAT         Rock       Rock         Sandstone       Sandstone         Sandstone       Sandstone         SILT, CLAYEY SAND       SSC-SM         SILTSTONE       SILTSTONE         SP Poorly Graded SAND       SP         SP-SC       Poorly Graded SAND         SP-SM       Poorly Graded SAND         SW-SC       Well Graded SAND with CLAY         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         USGS 601			
Fill       Fill         GC       CLAYEY GRAVEL         GC       SILTY CLAYEY GRAVEL         GM       SILTY GRAVEL         GP       Poorly Graded GRAVEL         GP-GC       Poorly Graded GRAVEL with SILT         GW       Well Graded GRAVEL with SILT         GW       GW-GC         GW-GC       Well Graded GRAVEL with SILT         Linestone       Linestone         MH       Elastic SILT         ML       MIT         DH       DRGANIC Fat CLAY         DL/DH       DRGANIC SDIL         M       Elastic SILT         ML       SILT, CLAYEY SAND         SC       CLAYEY SAND         SC       CLAYEY SAND         SC-SM       SILT, CLAYEY SAND         SLITSTONE       Siltstone         SILTSTONE       Siltstone         SN       SILTY SAND         SP-SC       Poorly Graded SAND         SP-SC       Poorly Graded SAND         SN       SULTY SAND         SN-SC       Well Graded SAND with CLAY         SN       SULTY SAND         SP-SC       Poorly Graded SAND         SN       SULTY SAND         SN       <			
GC CLAYEY GRAVEL GC-GM SILTY CLAYEY GRAVEL GP-GC Poorly Graded GRAVEL GP-GC Poorly Graded GRAVEL with SILT GW Well Graded GRAVEL with SILT GW Well Graded GRAVEL with SILT GW-GC Well Graded GRAVEL with SILT Linestone Linestone MH Elastic SILT ML SILT OH ORGANIC Fat CLAY OL/OH ORGANIC SOIL PT PEAT Rock Rock Sandstone Sandstone SILT, CLAYEY SAND SC CLAYEY SAND SILT, CLAYEY SAND SILT, SILT SM SILTY SAND SP Poorly Graded SAND with CLAY SF-SC Poorly Graded SAND with SILT SW Well Graded SAND with SILT SW SW Well Graded SAND with SILT SW Well Graded SAND with SILT WIGS 705 Schist USGS 670 Interbedded Sandstone and Shal USGS 708 Graeiss USGS 708 Graeiss USGS 708 Graeiss USGS 708 Graeiss USGS 708 Graeiss USGS 708 Graeiss Water Table Water Table Water Water Water Water Table Water Table After drilling Well ProJECT N SIET SIES SIET SIES SIES SIET SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES	$\mathbf{X}$		
GC-GM       SILTY CLAYEY GRAVEL         GM       SILTY GRAVEL         GP       Poorly Graded GRAVEL         GP-GC       Poorly Graded GRAVEL with SILT         GW       Well Graded GRAVEL with SILT         GW-GC       Well Graded GRAVEL with SILT         GW-GC       Well Graded GRAVEL with SILT         Linestone       Linestone         MH       Elastic SILT         ML       SILT         OH       ORGANIC Fat CLAY         OL       DRGANIC SOIL         PT       PEAT         Rack       Rock         Sandstone       Sandstone         Sandstone       Sandstone         SILT STONE       Siltstone         SN       SILTY SAND         SP       Poorly Graded SAND with CLAY         SP       Poorly Graded SAND with SILT         SP       Poorly Graded SAND with SILT         SP       Poorly Graded SAND with SILT         SP-SC       Poorly Graded SAND with SILT         SW       Well Graded SAND with SILT         SW       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SM       Wel	P-Y-3		
GP       Poorly Graded GRAVEL         GP-GC       Poorly Graded GRAVEL with CLAY         GW       Well Graded GRAVEL with SLT         GW-GC       Well Graded GRAVEL with SLT         GW-GM       Well Graded GRAVEL with SLT         Llinestone       Llinestone         MH       Elastic SILT         ML       SILT         DH       DRGANIC Fat CLAY         OL/DH       DRGANIC SDIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         SLITSTONE       SLITY SAND         SHALE       Shale         SLITSTONE       SLITY SAND         SP       Poorly Graded SAND         SV=SC       Well Graded SAND with CLAY         SV=SC       Well Graded SAND with SLT         USGS 654       Subgraywacke         USGS 705       Schist	Por s	GC-GM	
GP-GC       Poorly Graded Gravel with CLAY         GP-GM       Poorly Graded GRAVEL with SILT         GW-GC       Well Graded GRAVEL with SILT         GW-GC       Well Graded GRAVEL with SILT         Llmestone       Limestone         MH       Elastic SILT         ML       SILT         DH       DRGANIC Fat CLAY         DL/DH       DRGANIC SDIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         SLITSTONE       SILT, CLAYEY SAND         SHALE       Shale         SILTSTONE       Siltstone         SP       Poorly Graded SAND         SV       Well graded SAND with CLAY         SV-SC       Well Graded SAND with SILT         SW       Well Graded SAND with SILT         SW       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         USGS 670       Interbedde	56	GM	SILTY GRAVEL
GP-GM       Poorly Graded GRAVEL with SILT         GW       Well Graded GRAVEL with CLAY         GW-GM       Well Graded GRAVEL with SILT         Llmestone       Linestone         MH       Elastic SILT         ML       SILT         DH       DRGANIC Lean CLAY         DL/DH       DRGANIC SOIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         SC       CLAYEY SAND         SC       SLITY SAND         SSC       SLITY SAND         SP       Poorly Graded SAND with CLAY         SP       Poorly Graded SAND         SP       Poorly Graded SAND         SP       Poorly Graded SAND         SP       Poorly Graded SAND         SP       Poorly Graded SAND with CLAY         SP       SPorly Graded SAND         SV       Well graded SAND         SV       SV         SV       Well Graded SAND with SILT         SW       Well Graded SAND with SILT         SW       Well Graded SAND with SILT         SW       Well Graded SAND with SILT         USGS 610       Gravel or Conglomerate 1         USGS 705	200	GP	Poorly Graded GRAVEL
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         DH       DRGANIC Fat CLAY         DL/DH       DRGANIC SOIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         Sandstone       Sandstone         SLTSTONE       Siltstone         SHALE       Shale         SP       Poorly Graded SAND         SP-SC       Poorly Graded SAND         SV       Well Graded SAND with SILT         SW       SWEI Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         Topsoil       Topsoil         USGS 601       Gravel or Conglomerate 1         USGS 705       Schist         USGS 705       Schist         USGS 708       Gravit or Conglomerate 1         USGS 708       Gravite 1         Void       Void         Void       Void <td>00</td> <td>GP-GC</td> <td>Poorly Graded Gravel with CLAY</td>	00	GP-GC	Poorly Graded Gravel with CLAY
GW-GC       Well Graded GRAVEL with CLAY         GW-GM       Well Graded GRAVEL with SILT         Limestone       Limestone         MH       Elastic SILT         ML       SILT         DH       DRGANIC Fat CLAY         DL/DH       DRGANIC SDIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         SLTSTDNE       Siltstone         SHALE       Shale         SP       Poorly Graded SAND         SP-SC       Poorly Graded SAND         SW       Well Graded SAND         SW-SC       Well Graded SAND         SW-SC       Well Graded SAND         SW-SC       Well Graded SAND         SW-SC       Well Graded SAND         SW-SM       Well Graded SAND with SILT         Topsoil       Topsoil         USGS 601       Gravel or Conglomerate 1         USGS 705       Schist         USGS 708       Gneiss         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void       Void         Water       Water       Water         Water Table       Vater Table during dr	00	GP-GM	Poorly Graded GRAVEL with SILT
GW-GM       Well Graded GRAVEL with SILT         Linestone       Linestone         MH       Elastic SILT         ML       SILT         DH       DRGANIC Fat CLAY         DL/DH       DRGANIC SDIL         ML       SILT         ML       DRGANIC Lean CLAY         DL/DH       DRGANIC SDIL         ML       SC         Sandstone       Sandstone         Sandstone       Sandstone         SLTSTONE       Siltstone         SHALE       Shale         SILTSTONE       Siltstone         SP       Poorly Graded SAND         SP       Poorly Graded SAND         SP       Poorly Graded SAND         SP       SPORL Graded SAND with CLAY         SP       SPORL Graded SAND with SILT         SP       SV         SV-SC       Well graded SAND         SV-SC       Well Graded SAND with SILT         SW       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 702       Quartzite         USGS 703       Schist         USGS 704       Gneiss		GW	Well Graded GRAVEL
Linestone       Linestone         MH       Elastic SILT         ML       SILT         DH       DRGANIC Fat CLAY         DL       DRGANIC Can CLAY         DL/DH       DRGANIC SUIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         SC       CLAYEY SAND         SLTSTDNE       SILT, CLAYEY SAND         SHALE       Shale         SILTSTDNE       Siltstone         SP       Poorly Graded SAND         SP-SC       Poorly Graded SAND with CLAY         SW       Well graded SAND         SW-SM       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 702       Quartzite         USGS 703       Schist         USGS 704       Gravita 1         USGS 705       Schist         USGS 708		GW-GC	Well Graded GRAVEL with CLAY
MH       Elastic SILT         ML       SILT         DH       DRGANIC Fat CLAY         DL       DRGANIC Ean CLAY         DL/DH       DRGANIC SUIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         Sc       CLAYEY SAND         SC       CLAYEY SAND         SLTSTEINE       Siltstone         SHALE       Shale         SILTSTEINE       Siltstone         SP       Poorly Graded SAND         SP-SC       Poorly Graded SAND with CLAY         SW       Well graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SK       Well Graded SAND with SILT         SW-SK       Well Graded SAND with SILT         SW-SK       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 702       Quartzite         USGS 703       Schist         USGS 704       Granite 1         USGS 705       Schist         USGS 708       Granite 1         USGS 708       Granite 1         USGS 718       Granite 1     <		GW-GM	Well Graded GRAVEL with SILT
ML       SILT         □H       □RGANIC Fat CLAY         □L       □RGANIC Lean CLAY         □L/□H       □RGANIC SUIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         Sc       CLAYEY SAND         SC       CLAYEY SAND         SLTSTENE       Siltstone         SHALE       Shale         SILT STENE       Siltstone         SP       Poorly Graded SAND         SP-SC       Poorly Graded SAND with CLAY         SP-SC       Poorly Graded SAND with SILT         SW       Well graded SAND with SILT         SW-SC       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 702       Quartzite         USGS 703       Schist         USGS 704       Graits         USGS 705       Schist         USGS 708       Graits         USGS 708       Graits         USGS 708       Graits         USGS 718       Granite 1		Limestone	Limestone
□H       □RGANIC Fat CLAY         □L       □RGANIC Lean CLAY         □L/□H       □RGANIC SUIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         SC       CLAYEY SAND         SC       CLAYEY SAND         SC       CLAYEY SAND         SC       CLAYEY SAND         SLITSTONE       Siltstone         SM       SILTY SAND         SP       Poorly Graded SAND         SP       Poorly Graded SAND         SP       Poorly Graded SAND         SP       Poorly Graded SAND         SP       SW         SW       Well graded SAND         SW       Well Graded SAND with SILT         SW       Well Graded SAND with SILT         SW-SK       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 702       Quartzite         USGS 703       Schist         USGS 704       Gravita 1         USGS 708       Gravita 1 <tr< td=""><td></td><td>MH</td><td>Elastic SILT</td></tr<>		MH	Elastic SILT
□L       □RGANIC Lean CLAY         □L/□H       □RGANIC S□IL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         SC       CLAYEY SAND         SC-SM       SILT, CLAYEY SAND         SHALE       Shale         SILTSTONE       Siltstone         SILTSTONE       Siltstone         SP       Poorly Graded SAND         SP-SC       Poorly Graded SAND         SV       Vell graded SAND         SV       Vell graded SAND         SW-SC       Well Graded SAND with CLAY         SV-SC       Vell Graded SAND with SILT         SW-SM       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 705       Schist         USGS 708       Granits 1         USGS 708       Granits 1         USGS 718       Granite 1         Void       Void         Void		ML	SILT
DL/DH       DRGANIC SUIL         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         SV-SM       Well graded SAND         SW-SC       Well Graded SAND with CLAY         SW-SC       Well Graded SAND with SILT         SW-SM       Well Graded SAND with SILT         SW-SM       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         Topsoil       Topsoil         USGS 601       Gravel or Conglomerate 1         USGS 702       Quartzite         USGS 703       Schist         USGS 704       Gneiss         USGS 705       Schist         USGS 708       Gneiss         USGS 718       Gravite 1         Void       Void         Water       Water         Water       Water         Water Table       Water Table during drilling	N N	DH	ORGANIC Fat CLAY
PT       PEAT         Rock       Rock         Sandstone       Sandstone         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         SV       Well graded SAND with SILT         SW       SW-SC         Well Graded SAND with CLAY         SW-SC       Well Graded SAND with CLAY         SW-SM       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 705       Schist         USGS 706       Graite 1         USGS 7075       Schist         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Water       Water         Water       Water         We			ORGANIC Lean CLAY
Rock       Rock         Sandstone       Sandstone         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-SC       Poorly Graded SAND with SILT         SW       Well graded SAND         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with CLAY         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SM       Well Graded SAND with SILT         SW-SM       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 705       Schist         USGS 705       Schist         USGS 708       Gneiss         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Void       Void         Water Table Guring drilling         Delayed Water       <	î î î		
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-SC       Poorly Graded SAND with SILT         SW       Well graded SAND         SW-SC       Well Graded SAND with SILT         SW-SM       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 705       Schist         USGS 705       Schist         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Water       Water         Weathered Rock       Undefined         Water Table       Water Table during drilling         Delayed Water       Water	<u> </u>		
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-SC       Poorly Graded SAND with SILT         SW       Well graded SAND         SW-SM       Well Graded SAND with SILT         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 705       Schist         USGS 705       Schist         USGS 708       Gneiss         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Void       Void         Water Table       Water Table during drilling         Delayed Water       Wa			
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 SILT         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 705       Schist         USGS 706       Gneiss         USGS 707       Schist         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Void       Void         Water Table       Vater Table during drilling         Delayed Water       Water Table after drilling	······································		
Number Name       SHALE       Shale         SILTSTONE       Siltstone         SILTSTONE       Siltstone         SM       SILTY SAND         SP       Poorly Graded SAND with CLAY         SP-SC       Poorly Graded SAND with SILT         SV       Well graded SAND with SLT         SW       SW-SC         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 705       Schist         USGS 705       Schist         USGS 708       Gneiss         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Water Table       Water Table during drilling         Delayed Water       Water Table after drilling         Table       KIEWIT PROJECT N	• • • •		
SILTSTEINE       Siltstone         SM       SILTY SAND         SP       Poorly Graded SAND         SP-SC       Poorly Graded SAND with CLAY         SP-SM       Poorly Graded SAND with SILT         SV       Well graded SAND         SV-SC       Well Graded SAND with CLAY         SV-SC       Well Graded SAND with CLAY         SV-SC       Well Graded SAND with SILT         Topsoil       Topsoil         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 702       Quartzite         USGS 703       Schist         USGS 704       Granite 1         Void       Void         Void       Void         Water       Water         Weathered Rock       Undefined         Image: Vater Table during drilling			
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-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         SW-SC       Well Graded SAND with SILT         Topsoil       Topsoil         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 702       Quartzite         USGS 705       Schist         USGS 705       Schist         USGS 708       Gnaite 1         Void       Void         Void       Void         Water       Water         Water Table       Water Table during drilling         Delayed Water       Water Table after drilling         REXPRESS       KIEWIT PROJECT N			
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       Quartzite         USGS 705       Schist         USGS 705       Schist         USGS 708       Gneiss         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Vater       Water         Water Table       Vater Table during drilling         Delayed Water       Water Table after drilling         REXPRESS       KIEWIT PROJECT N			
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       Quartzite         USGS 705       Schist         USGS 705       Schist         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Void       Void         Water       Water Table during drilling         Q       Delayed Water         Table       KIEWIT PROJECT N		SP	Poorly Graded SAND
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 Shal         USGS 702       Quartzite         USGS 705       Schist         USGS 708       Gneiss         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Void       Void         Vater       Water         Water Table       Water Table during drilling         Q       Delayed Water         Table       KIEWIT PROJECT N         XIEWIT PROJECT N		SP-SC	Poorly Graded SAND with CLAY
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 Quartzite USGS 705 Schist USGS 705 Schist USGS 708 Gneiss USGS 708 Gneiss USGS 718 Granite 1 Void Void Void Void Water Water Water Water Water Table Water Table during drilling ∑ Delayed Water Table <b>KIEWIT PROJECT N</b> 21162		SP-SM	Poorly Graded SAND with SILT
SW-SM       Well Graded SAND with SILT         Topsoil       Topsoil         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 670       Interbedded Sandstone and Shal         USGS 702       Quartzite         USGS 705       Schist         USGS 705       Schist         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Vater       Water         Water Table       Water Table during drilling         Delayed Water Table       Water Table after drilling         KIEWIT PROJECT N       21162		٧Z	Well graded SAND
Topsoil       Topsoil         USGS 601       Gravel or Conglomerate 1         USGS 654       Subgraywacke         USGS 670       Interbedded Sandstone and Shal         USGS 702       Quartzite         USGS 705       Schist         USGS 705       Schist         USGS 705       Schist         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Vater       Water         Water Table       Water Table during drilling         Delayed Water Table       Water Table after drilling	<u>م /</u>	SM-2C	Well Graded SAND with CLAY
USGS 601 Gravel or Conglomerate 1 USGS 654 Subgraywacke USGS 670 Interbedded Sandstone and Shal USGS 702 Quartzite USGS 705 Schist USGS 705 Schist USGS 708 Gneiss USGS 708 Gneiss USGS 718 Granite 1 Void Void ✓ Vater Water Vater Veathered Rock Undefined ✓ Water Table Vater Table during drilling Ø Delayed Water Table KIEWIT PROJECT N 21162	4	SW-SM	Well Graded SAND with SILT
USGS 654       Subgraywacke         USGS 670       Interbedded Sandstone and Shal         USGS 702       Quartzite         USGS 705       Schist         USGS 705       Schist         USGS 705       Schist         USGS 708       Gneiss         USGS 718       Granite 1         Void       Void         Void       Void         Water       Water         Water Table       Water Table during drilling         Delayed Water Table       Water Table after drilling         REXPRESS       KIEWIT PROJECT N	$\sim$	Topsoil	Topsoil
USGS 670 Interbedded Sandstone and Shal USGS 702 Quartzite USGS 705 Schist USGS 705 Schist USGS 708 Gneiss USGS 708 Gneiss USGS 718 Granite 1 Void Void ✓ Void Void ✓ Water Water Veathered Rock Undefined ✓ Water Table Water Table during drilling ✓ Delayed Water Table KIEWIT PROJECT N 21162	$\langle \rangle$	USGS 601	Gravel or Conglomerate 1
USGS 702 Quartzite USGS 705 Schist USGS 705 Schist USGS 708 Gneiss USGS 708 Gneiss USGS 718 Granite 1 Void Void Void Void Void Void Vater Water Water Water Water Table during drilling Vater Table during drilling Vater Table during drilling KIEWIT PROJECT N 21162		USGS 654	Subgraywacke
USGS 705 Schist USGS 705 Schist USGS 708 Gneiss USGS 708 Gneiss USGS 718 Granite 1 Void Void Void Void Vater Water Water Water Water Table during drilling Vater Table during drilling Vater Table after drilling KIEWIT PROJECT N 21162		USGS 670	Interbedded Sandstone and Shal
USGS 705 Schist USGS 708 Gneiss USGS 708 Gneiss USGS 708 Granite 1 Void Void ✓ Void Void ✓ Water Vater ✓ Water Table Vater Table during drilling ✓ Delayed Water Table during drilling ✓ REXPRESS KIEWIT PROJECT N 21162		USGS 702	Quartzite
USGS 708 Gneiss USGS 708 Gneiss USGS 718 Granite 1 Void Void Water Water Water Water Weathered Rock Undefined Water Table Water Table during drilling Water Table Water Table after drilling KIEWIT PROJECT N 21162		USGS 705	Schist
USGS 708 Gneiss USGS 718 Granite 1 Void Void Water Water Weathered Rock Undefined Water Table Water Table during drilling Delayed Water Table during drilling Belayed Water Table after drilling KIEWIT PROJECT N 21162		USGS 705	Schist
USGS 718 Granite 1 Void Void Water Water Weathered Rock Undefined Water Table Water Table during drilling Delayed Water Water Table after drilling KIEWIT PROJECT N 21162			
Void       Void         Water       Water         Weathered Rock       Undefined         ▼       Water Table       Water Table during drilling         □       Delayed Water Table       Water Table after drilling         ■       Belayed Water Table       Water Table after drilling         ■       KIEWIT PROJECT N         ■       EXPRESS			
Water     Water       ✓     Weathered Rock     Undefined       ✓     Water Table     Water Table during drilling       ✓     Delayed Water Table     Water Table after drilling	[]		
Weathered Rock       Undefined         ▼       Water Table       Water Table during drilling         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       □       □         □       <			
▼       Water Table       Water Table during drilling         ▼       Delayed Water Table       Water Table after drilling         REXPRESS       KIEWIT PROJECT N         21162			
☑     Delayed Water Table     Water Table after drilling       REXPRESS     KIEWIT PROJECT N 21162			
REXPRESS KIEWIT PROJECT N 21162		Delayed Water	
REXPRESS 21162	<u>×</u>	Table	
		YDDEC	KIEWIT PROJECT N
	TOP	KINGSBUF	

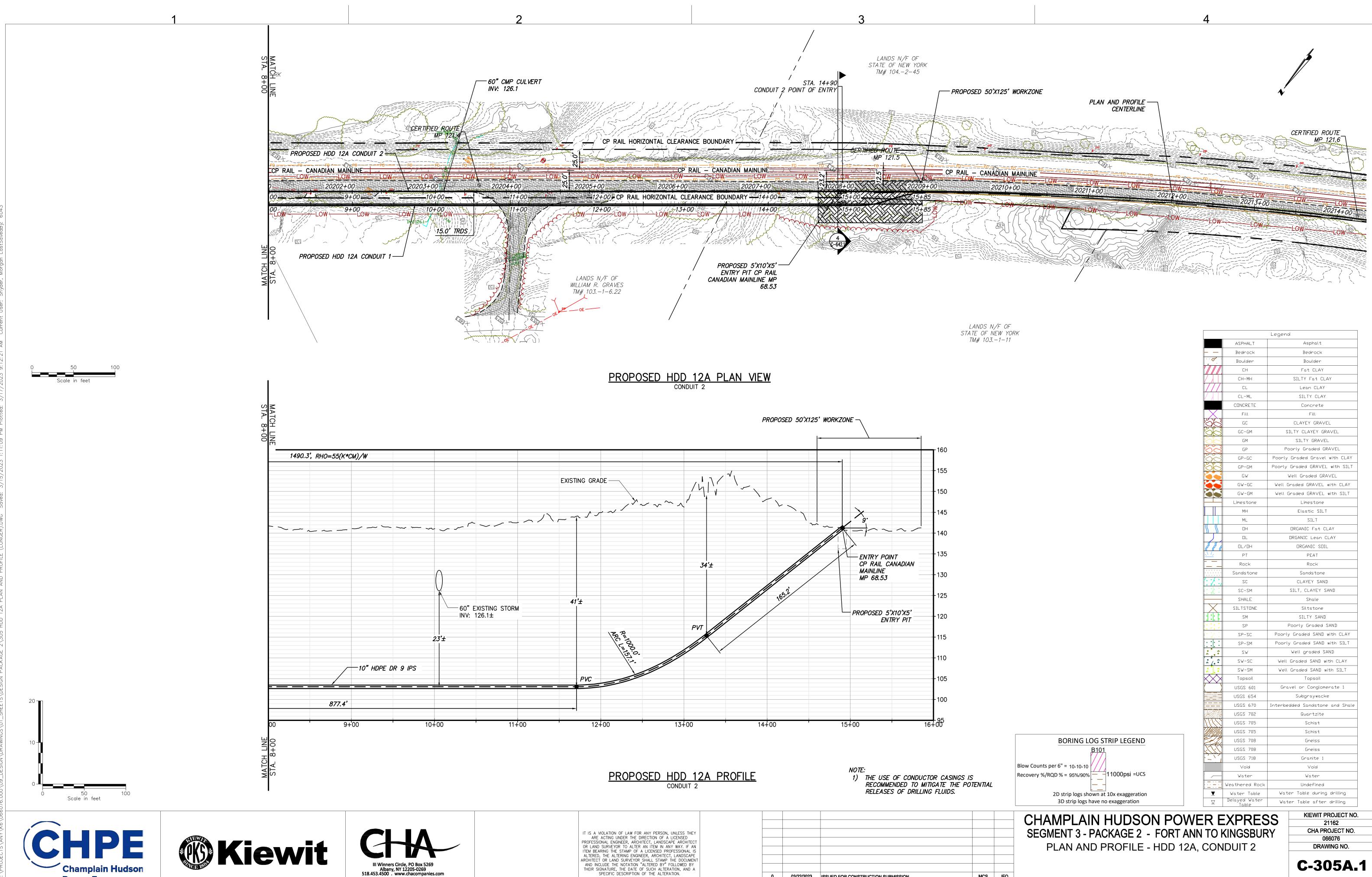
CHAMPLAIN HUDSON POWER EXPRESS	ľ
SEGMENT 3 - PACKAGE 2 - FORT ANN TO KINGSBURY	
PLAN AND PROFILE - HDD 12A, CONDUIT 1	

SCALE DRAWN BY: JAS DESIGNED BY: JAS APPROVED BY: JEO REV. NO. AS NOTED DATE

03/22/2023



			Legen	k	
		ASPHALT		Asphalt	
		Bedrock		Bedrock	
	· · · •	Boulder		Boulder	
		СН		Fat CLAY	
		CH-MH		SILTY Fat CLAY	
	777	CL		Lean CLAY	
		CL-ML		SILTY CLAY	
		CONCRETE		Concrete	
	VY Y	Fill		Fill	
	$\mathcal{O}$	GC		CLAYEY GRAVEL	
	00	GC-GM	S	ILTY CLAYEY GRAVEL	
	00	GM		SILTY GRAVEL	
	00	GP	P	oorly Graded GRAVEL	
	00	GP-GC	Poorly	Graded Gravel with CLAY	
	2003	GP-GM	Poorly	Graded GRAVEL with SILT	
		GW		Well Graded GRAVEL	
		GW-GC		Graded GRAVEL with CLAY	
	$\mathbf{S}$	GW-GM	well l	Graded GRAVEL with SILT	
		Limestone		Limestone	
		MH		Elastic SILT	
		ML		SILT	
	$\mathbb{S}$	DH		ORGANIC Fat CLAY	
		OL		ORGANIC Lean CLAY	
	8 8 6	OL/OH		ORGANIC SOIL	
	$\frac{\sqrt{1}}{2}$	PT		PEAT	
		Rock		Rock	
		Sandstone		Sandstone	
	· · · · · · · · · · · · · · · · · · ·	SC		CLAYEY SAND	
	- / - /				
	1.	SC-SM		SILT, CLAYEY SAND	
		SHALE		Shale	
		SILTSTONE		Siltstone	
		SM		SILTY SAND	
		SP		Poorly Graded SAND	
		SP-SC	Poorl	y Graded SAND with CLAY	
		SP-SM	Poorl	y Graded SAND with SILT	
		SW		Well graded SAND	
		SW-SC	\//e	Graded SAND with CLAY	
		SW-SM		Graded SAND with SILT	
			wen		
		Topsoil		Topsoil	
		USGS 601	Gro	vel or Conglomerate 1	
		USGS 654		Subgraywacke	
		USGS 670	Interbe	dded Sandstone and Shale	
		USGS 702		Quartzite	
	<u>] [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [</u>	USGS 705		Schist	
		USGS 705		Schist	
BORING LOG STRIP LEGEND		USGS 708		Gneiss	
B101		USGS 708		Gneiss	
rī / ī / l		USGS 718		Granite 1	
nts per 6" = 10-10-10	<u> </u>	Void		Void	
%/RQD % = 95%/90% - 11000psi =UCS					
		Water		Water	
		Weathered Rock		Undefined	
2D strip logs shown at 10x exaggeration	<b>T</b>	Water Table		er Table during drilling	
3D strip logs have no exaggeration	$\nabla$	Delayed Water Table	Wat	er Table after drilling	
AMPLAIN HUDSON POWE		YDRES	22	KIEWIT PROJECT NO.	
				21162	
GMENT 3 - PACKAGE 2 - FORT ANN	TO F	KINGSBUR	Y	CHA PROJECT NO.	
				066076	
	CON	IDULT 2		DRAWING NO.	
PLAN AND PROFILE - HDD 12A,					
FLAN AND FROFILE - NDD 12A,				<b>C-305A</b>	
FLAN AND FROFILE - HDD 12A,				C-305A	



**Power Express** 

	No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP	DR
SPECIFIC DESCRIPTION OF THE ALTERATION.	0	03/22/2023	ISSUED FOR CONSTRUCTION SUBMISSION	MCS	JEO	
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						
ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE						-
OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS						-
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. ARCHITECT. LANDSCAPE ARCHITECT						-

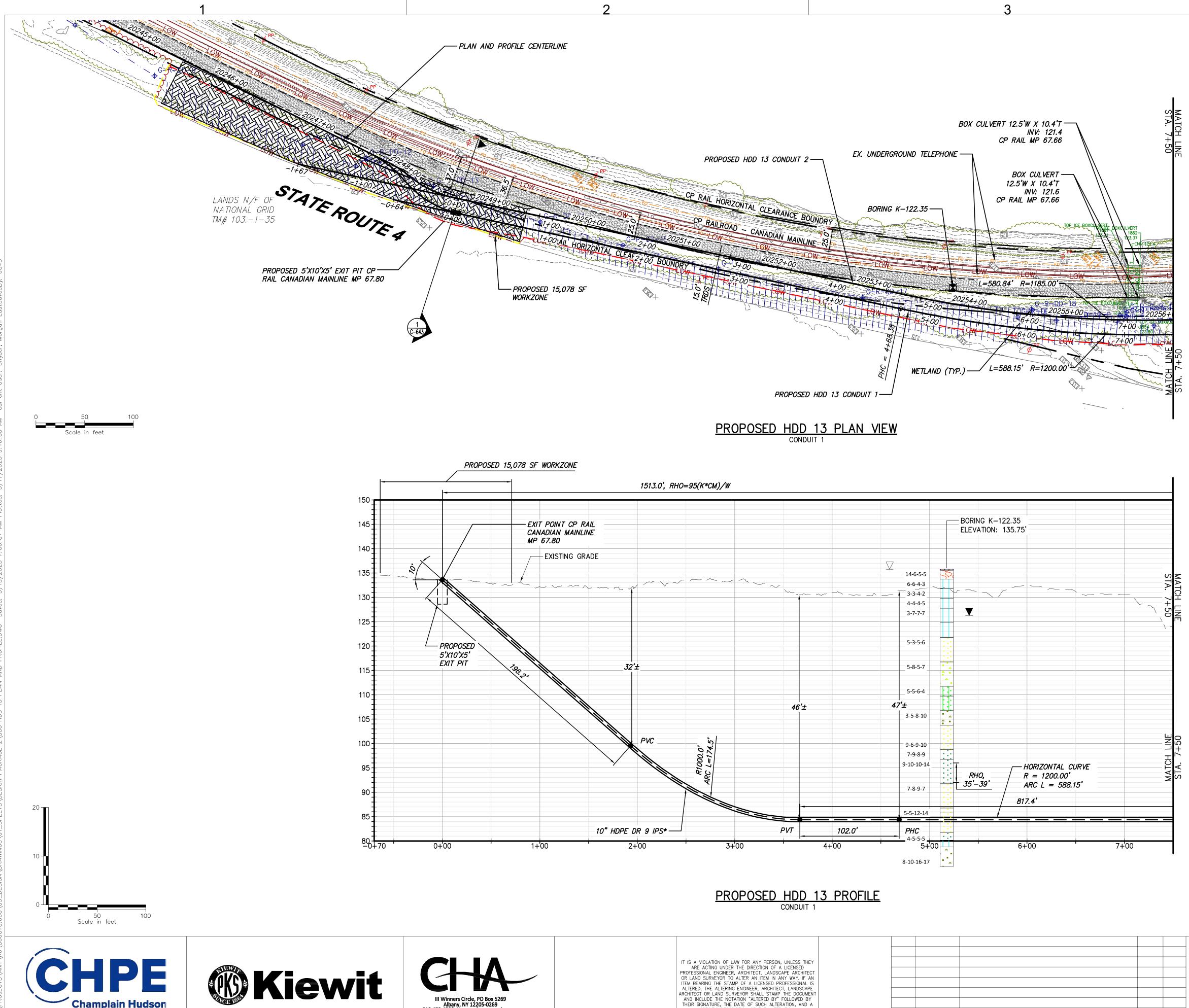
		Legend
	ASPHALT	Asphalt
	Bedrock	Bedrock
· · · •	Boulder	Boulder
	СН	Fat CLAY
	СН-МН	SILTY Fat CLAY
	CL	Lean CLAY
	CL-ML	
		SILTY CLAY
	CONCRETE	Concrete
	Fill	Fill
$\mathcal{O}\mathcal{O}$	GC	CLAYEY GRAVEL
00	GC-GM	SILTY CLAYEY GRAVEL
06	GM	SILTY GRAVEL
00	GP	Poorly Graded GRAVEL
00	GP-GC	Poorly Graded Gravel with CLAN
06	GP-GM	Poorly Graded GRAVEL with SIL
	GW	Well Graded GRAVEL
<b>EXA</b>	GW-GC	Well Graded GRAVEL with CLAY
ZA	GW-GM	Well Graded GRAVEL with SILT
	Limestone	Limestone
	MH	Elastic SILT
	ML	SILT
N N	ОН	ORGANIC Fat CLAY
200	OL	ORGANIC Lean CLAY
i i i	OL/OH	DRGANIC SDIL
<u> </u>	PT	PEAT
	Rock	Rock
•••••	Sandstone	Sandstone
: / :/	SC	CLAYEY SAND
	SC-SM	SILT, CLAYEY SAND
	SHALE	Shale
$\mathbf{X}$	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
$\sim$	Topsoil	Topsoil
<u> </u>	USGS 601	Gravel or Conglomerate 1
	USGS 654	Subgraywacke
	USGS 670	Interbedded Sandstone and Sha
	USGS 702	Quartzite
M(k)	USGS 705	Schist
UMM)	USGS 705	Schist
-2	USGS 708	Gneiss
1.1.1	USGS 708	Gneiss
	USGS 718	Granite 1
<u>/</u>	Void	Void
	Water	Water
· _ · · _	Weathered Rock	Undefined
<b>T</b>	Water Table Delayed Water	Water Table during drilling
$\nabla$	Table	Water Table after drilling
		KIEWIT PROJECT
ΚĿ	EXPRES	S 21162
	KINGSBUF	
	IDUIT 2	066076

DRAWN BY:JASDESIGNED BY:JASAPPROVED BY:JEOSCALEREV. NO.

AS NOTED DATE

03/22/2023

В



Champlain Hudson

Power Express

III Winners Circle, PO Box 5269 Albany, NY 12205-0269 518.453.4500 . www.chacompanies.com



	No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP	DR/
SPECIFIC DESCRIPTION OF THE ALTERATION.	0	03/22/2023	ISSUED FOR CONSTRUCTION SUBMISSION	MCS	JEO	
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						-
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED						

GP-GC Poorly Graded Gravel with GP-GM Poorly Graded GRAVEL with GV Well Graded GRAVEL with GV-GC Well Graded GRAVEL with Limestone Limestone MH Elastic SILT ML SILT DH DRGANIC Fat CLAY DL DRGANIC Fat CLAY DL DRGANIC SDIL PT PEAT Rock Rock Sandstone Sandstone Sandstone Sandstone SILT, CLAYEY SAND SHALE Shale	CLAY
GW       Well Graded GRAVEL         GW-GC       Well Graded GRAVEL with         GW-GM       Well Graded GRAVEL with         Limestone       Limestone         MH       Elastic SILT         ML       SILT         DL       DRGANIC Fat CLAY         DL/DH       DRGANIC SDIL         V       PT         PT       PEAT         Rock       Rock         Sandstone       Sandstone         Sc       CLAYEY SAND         SL       SLT, CLAYEY SAND	CLAY
GW-GC       Well Graded GRAVEL with         GW-GM       Well Graded GRAVEL with         Limestone       Limestone         MH       Elastic SILT         ML       SILT         OH       DRGANIC Fat CLAY         OL       ORGANIC Lean CLAY         OL       DRGANIC SOIL         ML       PT         PT       PEAT         Rock       Rock         Sandstone       Sandstone         Sc-SM       SILT, CLAYEY SAND	
GW-GM Well Graded GRAVEL with Limestone Limestone MH Elastic SILT ML SILT UH URGANIC Fat CLAY UL URGANIC Lean CLAY UL/UH URGANIC SUIL V PT PEAT Rock Rock Sandstone Sandstone Sandstone SILT, CLAYEY SAND SILT, CLAYEY SAND	
Limestone Limestone MH Elastic SILT ML SILT UH URGANIC Fat CLAY UL/UH URGANIC SUIL V PT PEAT Rock Rock Sandstone Sandstone V SC CLAYEY SAND	SILT
MH Elastic SILT ML SILT OH ORGANIC Fat CLAY OL ORGANIC Lean CLAY OL/OH ORGANIC SOIL Y PT PEAT Rock Rock Sandstone Sandstone Sandstone SC CLAYEY SAND	
ML SILT DH DRGANIC Fat CLAY DL DRGANIC Lean CLAY DL/DH DRGANIC SDIL M PT PEAT Rock Rock Sandstone Sandstone Sandstone SILT, CLAYEY SAND	
ML SILT DH DRGANIC Fat CLAY DL DRGANIC Lean CLAY DL/DH DRGANIC SDIL PT PEAT Rock Rock Sandstone Sandstone Sandstone SC CLAYEY SAND SC-SM SILT, CLAYEY SAND	
DHDRGANIC Fat CLAYDLDLDRGANIC Lean CLAYDL/DHDRGANIC SDILPTPEATRockRockSandstoneSandstoneSCCLAYEY SANDSC-SMSILT, CLAYEY SAND	
DL       DRGANIC Lean CLAY         DL/DH       DRGANIC SDIL         PT       PEAT         Rock       Rock         Sandstone       Sandstone         SC       CLAYEY SAND         SC-SM       SILT, CLAYEY SAND	
DL/DH     DRGANIC SDIL       PT     PEAT       Rock     Rock       Sandstone     Sandstone       SC     CLAYEY SAND       SC-SM     SILT, CLAYEY SAND	
PT PEAT PC Rock Rock Sandstone Sandstone CLAYEY SAND SC-SM SILT, CLAYEY SAND	
Rock     Rock       Sandstone     Sandstone       SC     CLAYEY SAND       SC-SM     SILT, CLAYEY SAND	
Sandstone Sandstone SC CLAYEY SAND SC-SM SILT, CLAYEY SAND	
SC CLAYEY SAND	
SC-SM SILT, CLAYEY SAND	
• 7 • 1	
STALE STALE	
SILTSTONE Siltstone	
SILTSTEINE SILTSTEINE SILTSTEINE	
SP Poorly Graded SAND	
SP-SC Poorly Graded SAND with 0	
SP-SM Poorly Graded SAND with	
SW-SC Well Graded SAND with CL	
SW-SM Well Graded SAND with Si Topsoil Topsoil Topsoil	
USGS 601 Gravel or Conglomerate	1
TE: USGS 654 Subgraywacke	
THE USE OF CONDUCTOR CASINGS IS	Shale
RECOMMENDED TO MITIGATE THE POTENTIAL	
RELEASES OF DRILLING FLUIDS.	
USGS 705 Schist	
BORING LOG STRIP LEGEND USGS 708 Gneiss	
B101 USGS 708 Gneiss	
USGS 718 Granite 1	
ow Counts per 6" = 10-10-10	
ecovery %/RQD % = 95%/90% 11000psi =UCS Water Water	
Weathered Rock Undefined	
2D strip logs shown at 10x exaggeration 2D strip logs have no exaggeration 2D str	-
3D strip logs have no exaggeration $\square$	ing
	ECT NO
	CT NO
GMENT 3 - PACKAGE 2 - FORT ANN TO KINGSBURY	
EGMENT 3 - PACKAGE 2 - FORT ANN TO KINGSBURY	6
GMENT 3 - PACKAGE 2 - FORT ANN TO KINGSBURY	6
EGMENT 3 - PACKAGE 2 - FORT ANN TO KINGSBURY	) NO.
EGMENT 3 - PACKAGE 2 - FORT ANN TO KINGSBURYCHA PROJECPLAN AND PROFILE - HDD 13, CONDUIT 1DRAWING	) NO.

В

Legend

Asphalt

Bedrock Boulder

Fat CLAY

SILTY Fat CLAY

Lean CLAY SILTY CLAY

Concrete

Fill

CLAYEY GRAVEL

SILTY CLAYEY GRAVEL

SILTY GRAVEL

ASPHALT

Bedrock

Boulder

СН

СН-МН

CL

CL-ML CONCRETE

Fill

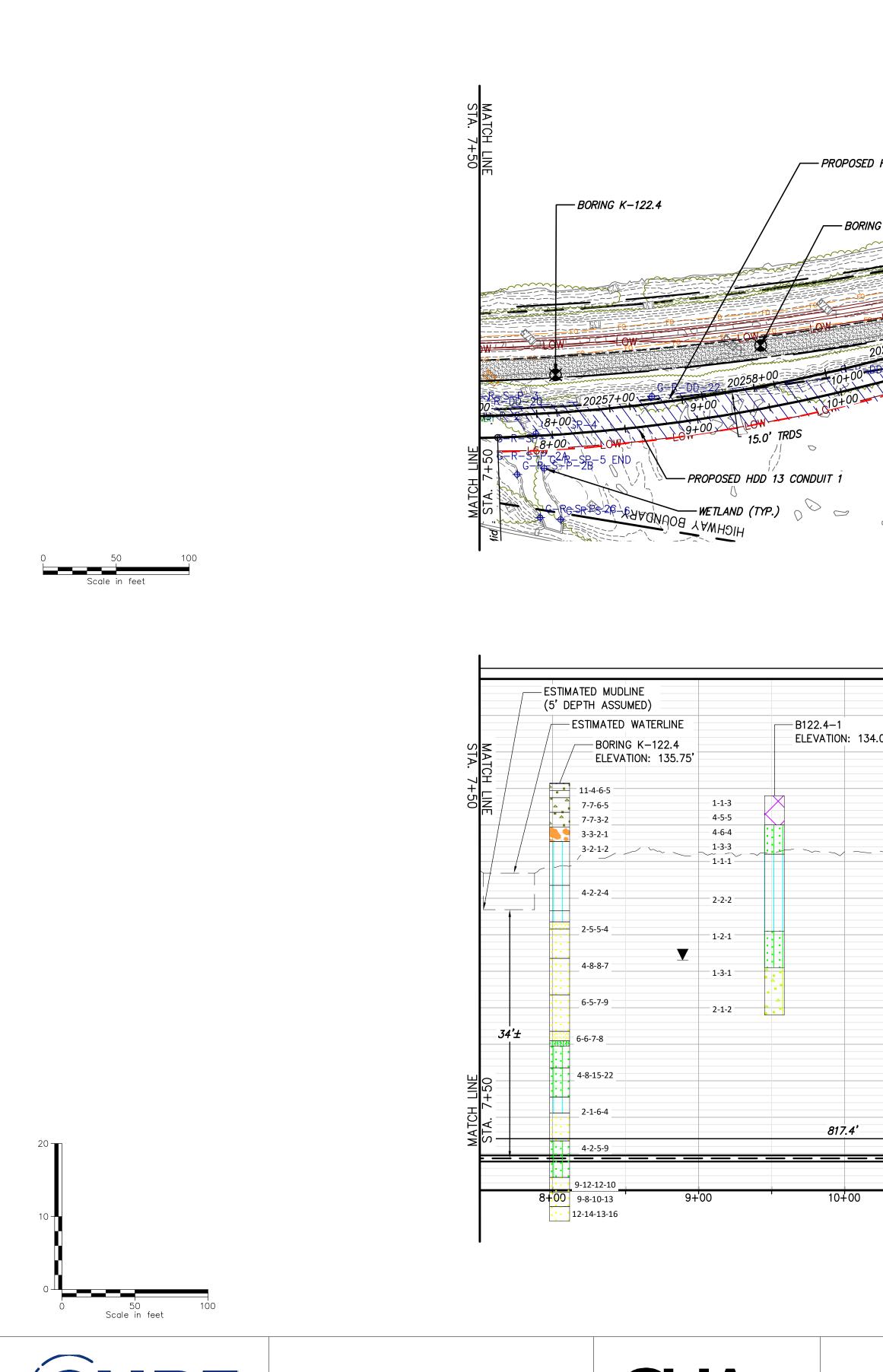
GC

GC-GM

GM

X

NC







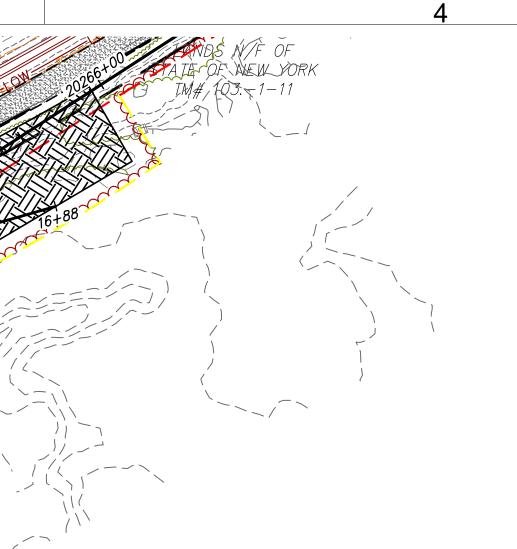


2		3								
		LANDS N/ STATE OF NE TM# 103	EW YORK							
			PLAN AI	ND PROFILE - CENTERLINE		PP PP PP PP PP PP PP PP PP PP PP PP PP	PO CW			
					10					
D HDD 13 CONDUIT 2	· · · · · · · · · · · · · · · · · · ·	NUNDRY	ALL STREET	TO	0057	2026 2026		16+30		
A CONTRACT OF THE OWNER	ZONTAL CLEARANCE E	PACTOR AND POLICE	I LOW		20263+00					
NG B122.4-1		and a state of the	20262+00	14+0		and the				
ED E	044 20261+00 20261+00 NCE BOUND	RY 13+00	-17	15.0-DD-27.1			PROPÓSED	2 13,510 SF		
1044 - 20260+00 RAIL HORIZONTA	12+00 12+00	<u>DD-25</u> G	} ~~~	R-DD-28	· · · · · · · · · · · · · · · · · · ·		STA. 15+13 CONDUIT 1 POIN	IT OF ENTRY		
20259+00 11+00 2 10 24								, n '		
	Ne	G- O-	-R-DD-29		Curi )					
HT = 10+50,50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				Cry .			PROPOSED 5'X10 PIT CP RAI MAINLIN	L CANADIAN E MP 67.52		
			G-R-DD-30							
Deren D	U A			G-R-DD-31	END					
		/7	Ψ	-						
	POSED HDD	13 PI AN	VIFW							
<u> </u>	CONDU	IT 1								
				PROPO	DSED 13,510 SF 1	NORKZONE				
	1513.0', RHO	)=95(K*CM)/W				-				
				ENTRY	POINT CP					
4.0'		EXIS	TING GRADE		CANADIAN					
							12			
		L	$\sim$ $\sim$ $\sim$ $\sim$	~~~~						
							/ — PROPOSED			
				24':	± //	122.1	5'X10'X5' ENTRY PIT			
42'±	47'±			PVT						
		-1.								
		R1000.0' ARC L=209.4'		//						
		2.0' 209.4'								
	-									
	PVC		— 10" HDPE							
11+00	12+00	13+	00	1	4+00	15+00		16+00 16+4		

# PROPOSED HDD 13 PROFILE

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. MCS JEO 0 03/22/2023 ISSUED FOR CONSTRUCTION SUBMISSION No. DATE SUBMITTAL / REVISION DESCRIPTION

	00	GC	CLAYEY GRAVEL
50	00	GC-GM	SILTY CLAYEY GRAVEL
50	06	GM	SILTY GRAVEL
	200	GP	Poorly Graded GRAVEL
45	00	GP-GC	Poorly Graded Gravel with CLAY
	00	GP-GM	Poorly Graded GRAVEL with SILT
40		GW	Well Graded GRAVEL
		GW-GC	Well Graded GRAVEL with CLAY
	66	GW-GM	Well Graded GRAVEL with SILT
35		Limestone	Limestone
		МН	Elastic SILT
30		ML	SILT
		DH	DRGANIC Fat CLAY
25	T J	DL	ORGANIC Lean CLAY
23	8 8 8	OL/OH	DRGANIC SDIL
	$\frac{\sqrt{7}}{2}$	PT	PEAT
20		Rock	Rock
		Sandstone	Sandstone
15		SC	CLAYEY SAND
		SC-SM	SILT, CLAYEY SAND
10	• 71• -	SHALE	Shale
10		SILTSTONE	Siltstone
		SM	SILTY SAND
05		SP	Poorly Graded SAND
		SP-SC	Poorly Graded SAND with CLAY
00		SP-SM	Poorly Graded SAND with SILT
		SM	Well graded SAND
-	<u>م /</u>	SW-SC	Well Graded SAND with CLAY
5		SW-SM	Well Graded SAND with SILT
		Topsoil	Topsoil
0		USGS 601	Gravel or Conglomerate 1
		USGS 654	Subgraywacke
5 NOTE:		USGS 670	Interbedded Sandstone and Shale
1) THE USE OF CONDUCTOR CASINGS IS		USGS 702	Quartzite
RECOMMENDED TO MITIGATE THE POTENTIAL RELEASES OF DRILLING FLUIDS.	1111	USGS 705	Schist
		USGS 705	Schist
BORING LOG STRIP LEGEND		USGS 708	Gneiss
B101		USGS 708	Gneiss
		USGS 718	Granite 1
Blow Counts per 6" = 10-10-10		Void	Void
Recovery %/RQD % = 95%/90% - 11000psi =UCS		Water	Water
		Weathered Rock	Undefined
2D strip logs shown at 10x exaggeration	· _ · · _	Water Table	Water Table during drilling
3D strip logs have no exaggeration	$\nabla$	Delayed Water	Water Table after drilling
	<u> </u>	Table	
HAMPLAIN HUDSON POWE		YDRES	KIEWIT PROJECT NO.
SEGMENT 3 - PACKAGE 2 - FORT ANN	N TO k	KINGSBUF	CHA PROJECT NO.
		ז דוו ור	066076
PLAN AND PROFILE - HDD 13,	CON		DRAWING NO.
			<b>C-306.1</b>



Legend

Asphalt

Bedrock Boulder

Fat CLAY

SILTY Fat CLAY

Lean CLAY

SILTY CLAY

Concrete

Fill

ASPHALT

Bedrock

Boulder

СН

СН-МН

CL

CL-ML CONCRETE

Fill