



Generated Output



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Project Summary

General:	CHPE HDD 59 P4A Start Date: 06-07-2023 End Date: 06-07-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA
Designer:	MDB BCE Amherst, MA
Description:	HDD 59 Reversed Conduit 2 2-inch DR9

Input Summary

Start Coordinate	(0.00, 0.00, 260.00) ft
End Coordinate	(1159.00, 0.00, 268.00) ft
Project Length	1159.00 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: 1170.00 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	2.3	23.2
Water Pressure	10.9	10.3
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	13.2	33.5
Deflection		
Earth Load Deflection	0.641	6.308
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.670	6.337
Compressive Stress [psi]		
Compressive Wall Stress	59.4	150.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1028.5	1028.5
Pullback Stress [psi]	587.6	587.6
Pullback Strain	1.022E-2	1.022E-2
Bending Stress [psi]	0.0	4.7
Bending Strain	0	8.247E-5
Tensile Stress [psi]	587.6	589.3
Tensile Strain	1.022E-2	1.033E-2

Net External Pressure = 24.1 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.670	7.5	11.2	OK
Unconstrained Collapse [psi]	23.5	130.1	5.5	OK
Compressive Wall Stress [psi]	59.4	1150.0	19.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	33.5	221.9	6.6	OK
Tensile Stress [psi]	589.3	1200.0	2.0	OK



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

Project Summary

General:	CHPE HDD 59A P4A Start Date: 05-16-2023 End Date: 05-16-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	MDB BCE
Description:	HDD 59A 8 -inch DR18 . Ballast Rollers PVC IPS pipe C1

Input Summary

Start Coordinate	(0.00, 0.00, 264.60) ft
End Coordinate	(1826.00, 0.00, 262.20) ft
Project Length	1826.00 ft
Pipe Type	PVC
OD Classification	IPS
Pipe OD	8.625 in
Pipe DR	18.0
Pipe Thickness	0.48 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: 4

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

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: 80.0000 (dry), 110.0000 (sat) [lb/ft3]

Phi: 0.00, S.M.: 300.00, Coh: 5.10 [psi]

Soil Layer #3 USCS, Gravel (G), GM

From Assistant

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

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

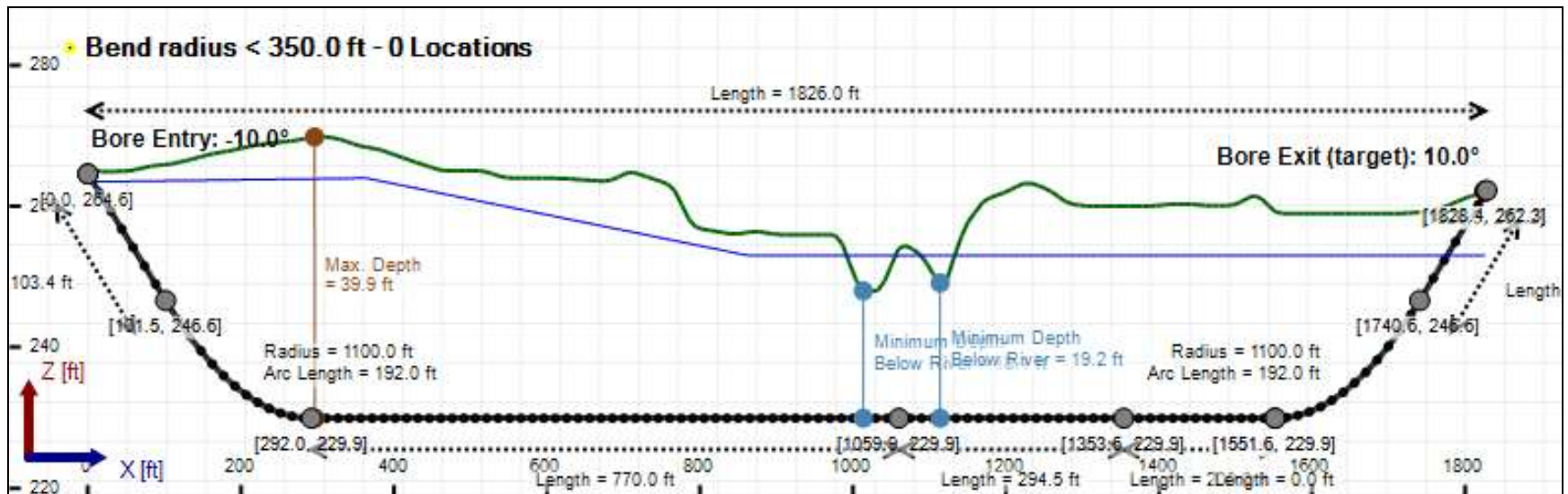
Soil Layer #4 Rock, Geological Classification, Sedimentary Rocks

From Assistant

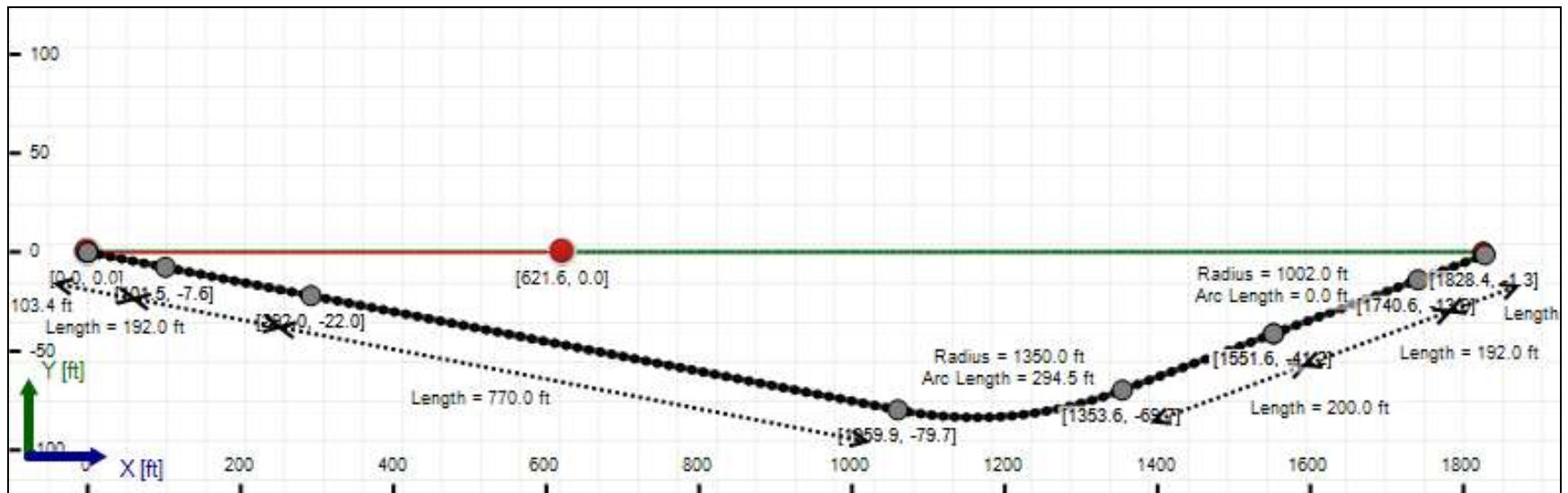
Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft3]

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

Bore Cross-Section View



Bore Plan View



Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: PVC
Classification: IPS
Pipe OD: 8" (8.625")
Pipe DR: 18
Pipe Length: 1845.00 ft
Internal Pressure: 0 psi
Borehole Diameter: 1.07799990971883 ft
Silo Width: 1.07799990971883 ft
Surface Surcharge: 0 psi
Short Term Modulus: 400000 psi
Long Term Modulus: 400000 psi
Short Term Poisson Ratio: 0.38
Long Term Poisson Ratio: 0.38
Pipe Unit Weight: 87.40220 lb/ft³
Allowable Tensile Stress (Short Term): 2800 psi
Allowable Tensile Stress (Long Term): 2800 psi
Allowable Compressive Stress (Short Term): 3200 psi
Allowable Compressive Stress (Long Term): 3200 psi
Surface-pipe friction coefficient at entrance: 0.1
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	4.5	28.3
Water Pressure	14.8	14.7
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	19.3	43.0
Deflection		
Earth Load Deflection	0.857	5.208
Buoyant Deflection	0.060	0.060
Reissner Effect	0	0
Net Deflection	0.917	5.268
Compressive Stress [psi]		
Compressive Wall Stress	173.3	387.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	27818.0	27818.0
Pullback Stress [psi]	2268.6	2268.6
Pullback Strain	5.671E-3	5.671E-3
Bending Stress [psi]	0.0	143.5
Bending Strain	0	3.587E-4
Tensile Stress [psi]	2268.6	2391.0
Tensile Strain	5.671E-3	6.304E-3

Net External Pressure = 13.4 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 365.0 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.917	7.5	8.2	OK
Unconstrained Collapse [psi]	22.5	175.3	7.8	OK
Compressive Wall Stress [psi]	173.3	3200.0	18.5	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.060	7.5	125.5	OK
Unconstrained Collapse [psi]	17.5	141.2	8.1	OK
Tensile Stress [psi]	2391.0	2800.0	1.2	OK

Maximum Allowable Bore Pressure Summary

Ream Number	Initial Diameter	Final Diameter	Estimated Maximum Pressure (Avg.)	Estimated Maximum Pressure (Local)
Pilot Bore	0.00 in	8.00 in	1998.702 psi	2018.341 psi
1	8.00 in	12.00 in	1996.917 psi	2017.976 psi
2	12.00 in	16.13 in	1994.331 psi	2017.447 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

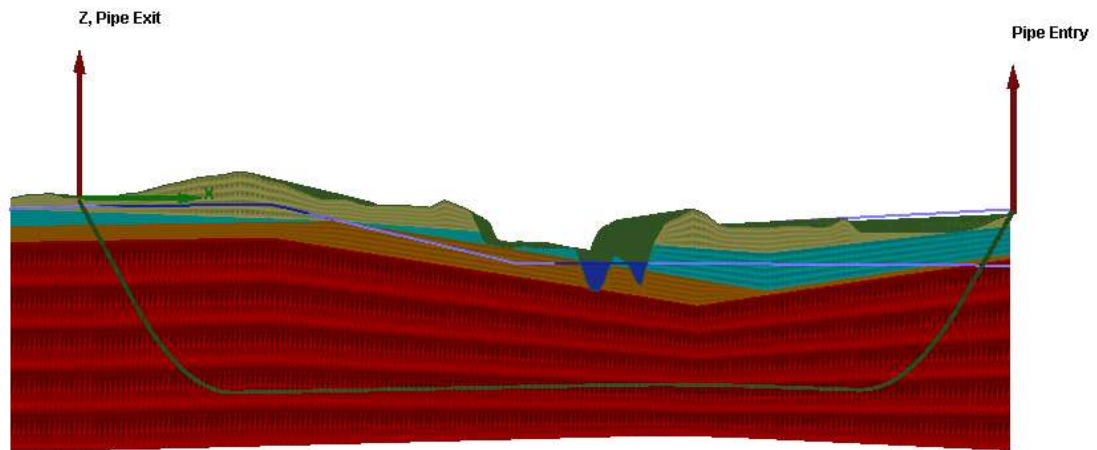
Rheological model: Power-Law

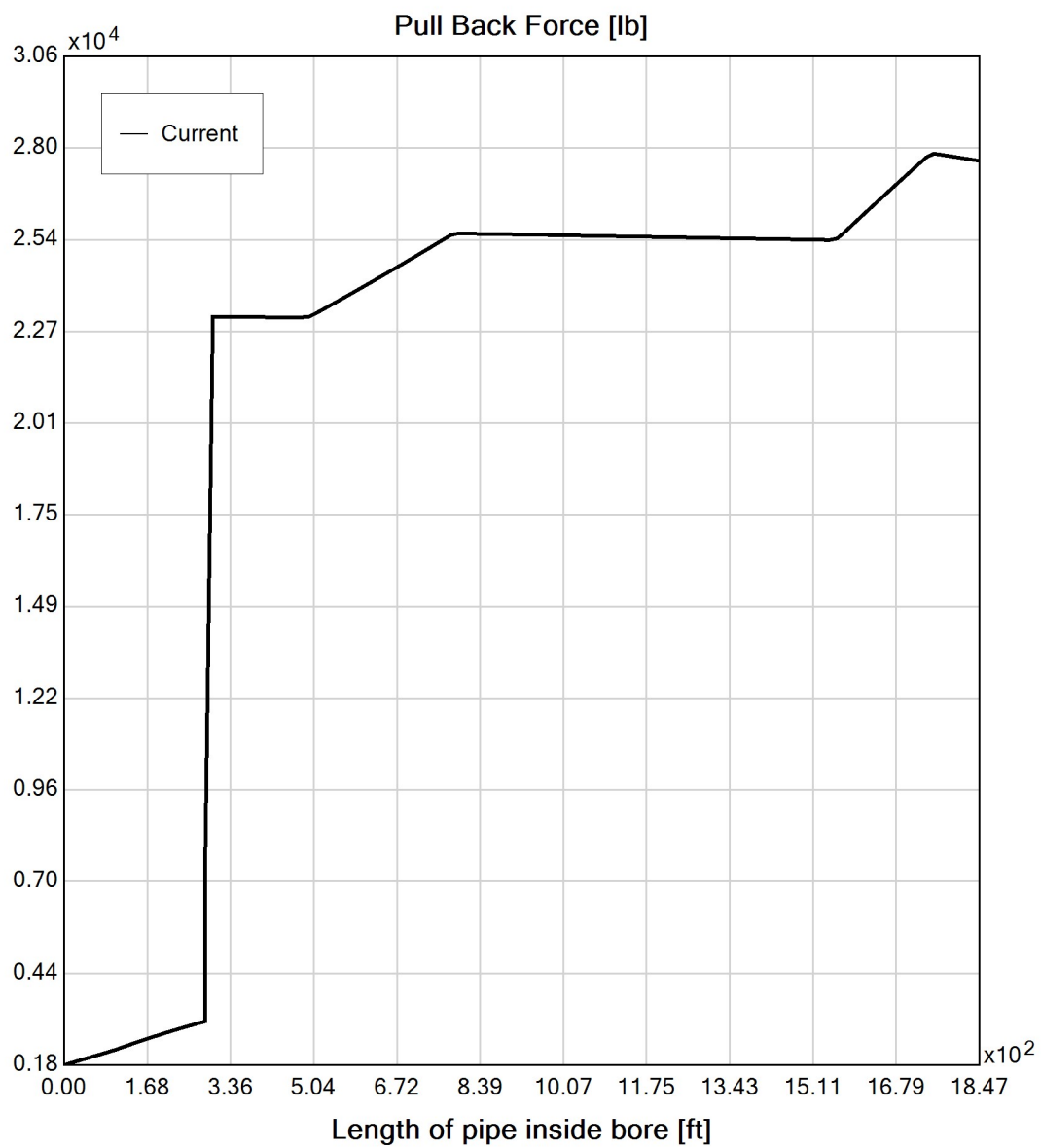
Fluid Consistency Index (K): 63.17

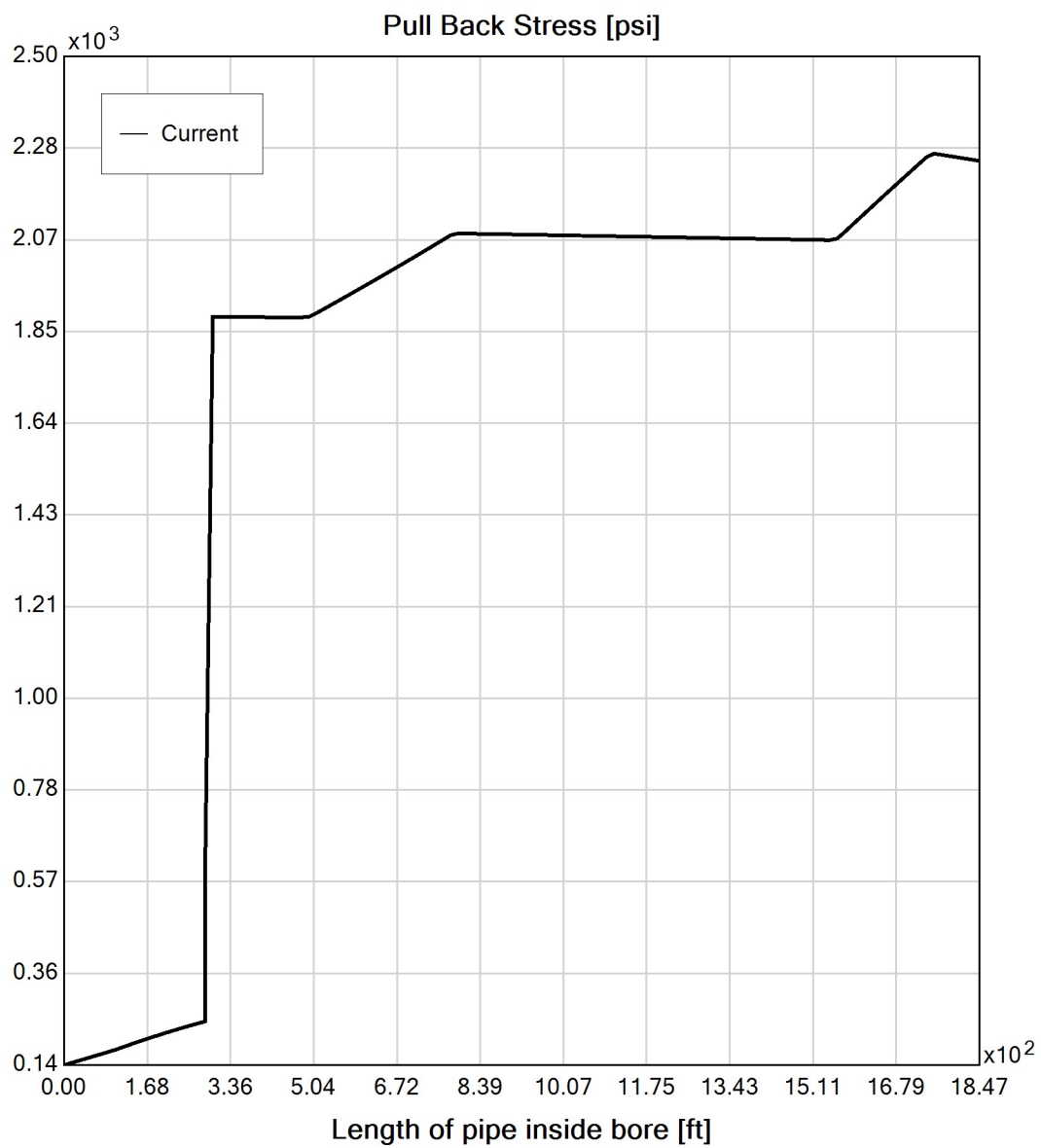
Power Law Exponent (n): 0.14

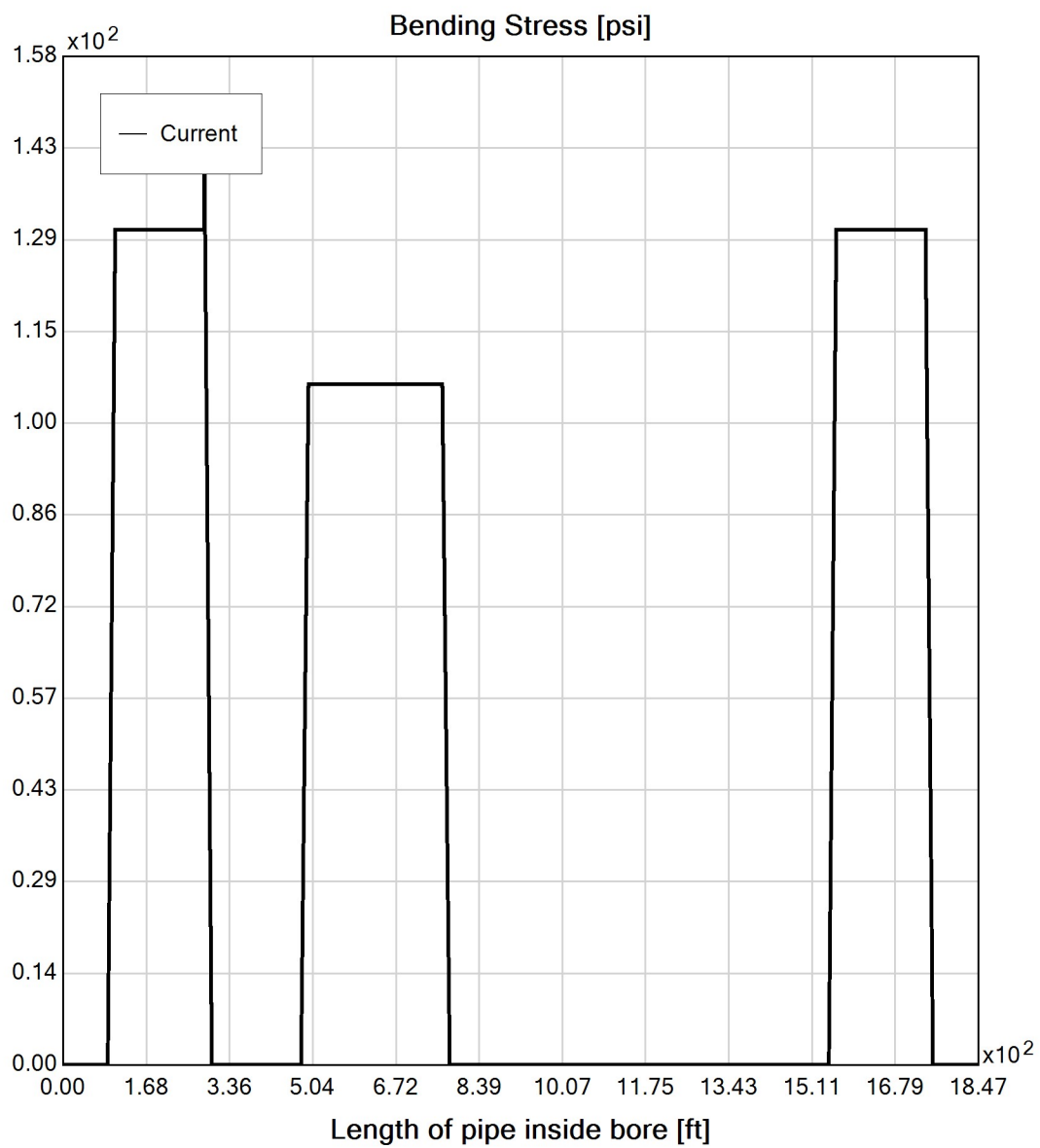
Effective Viscosity (cP): 859.3

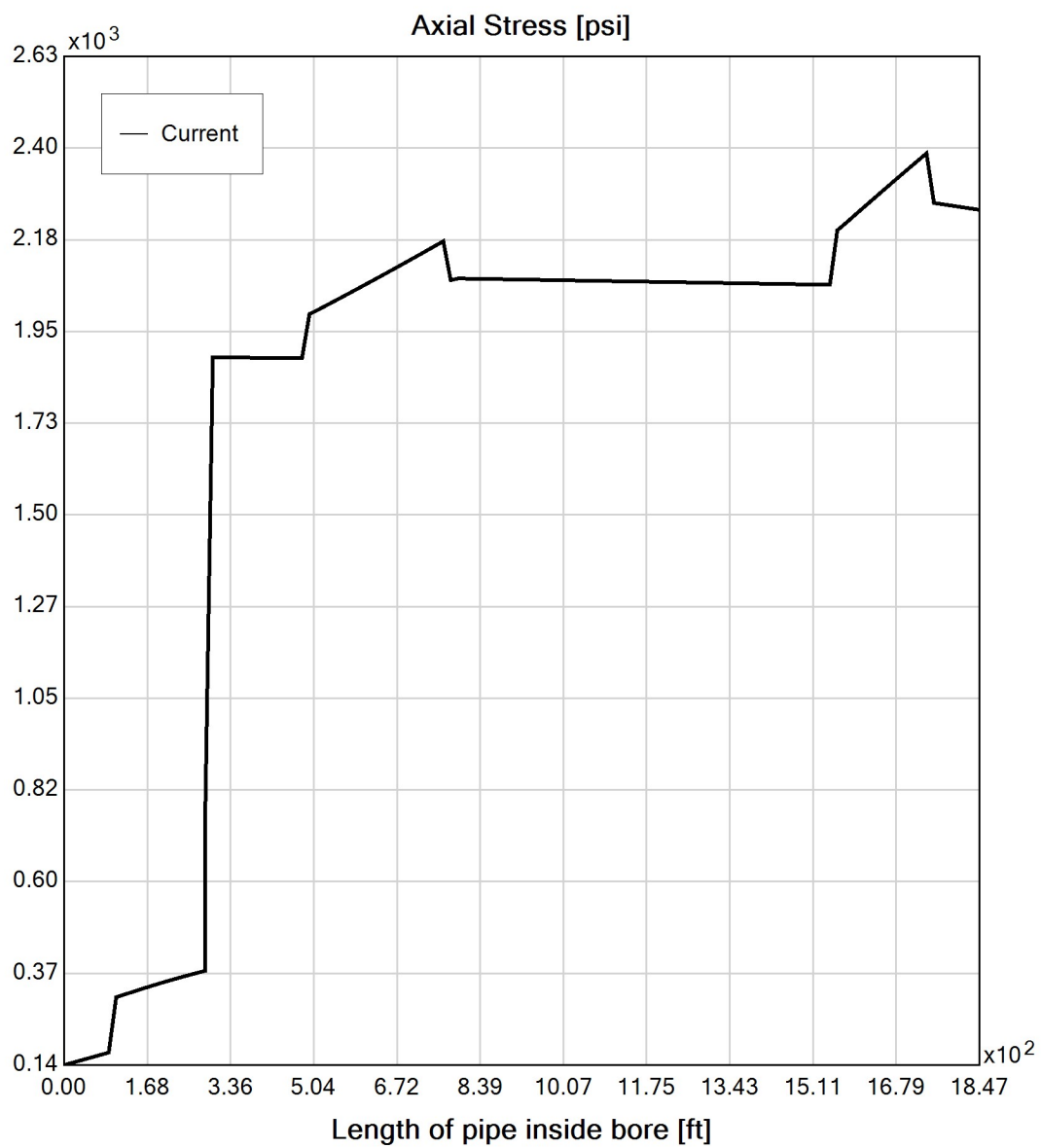
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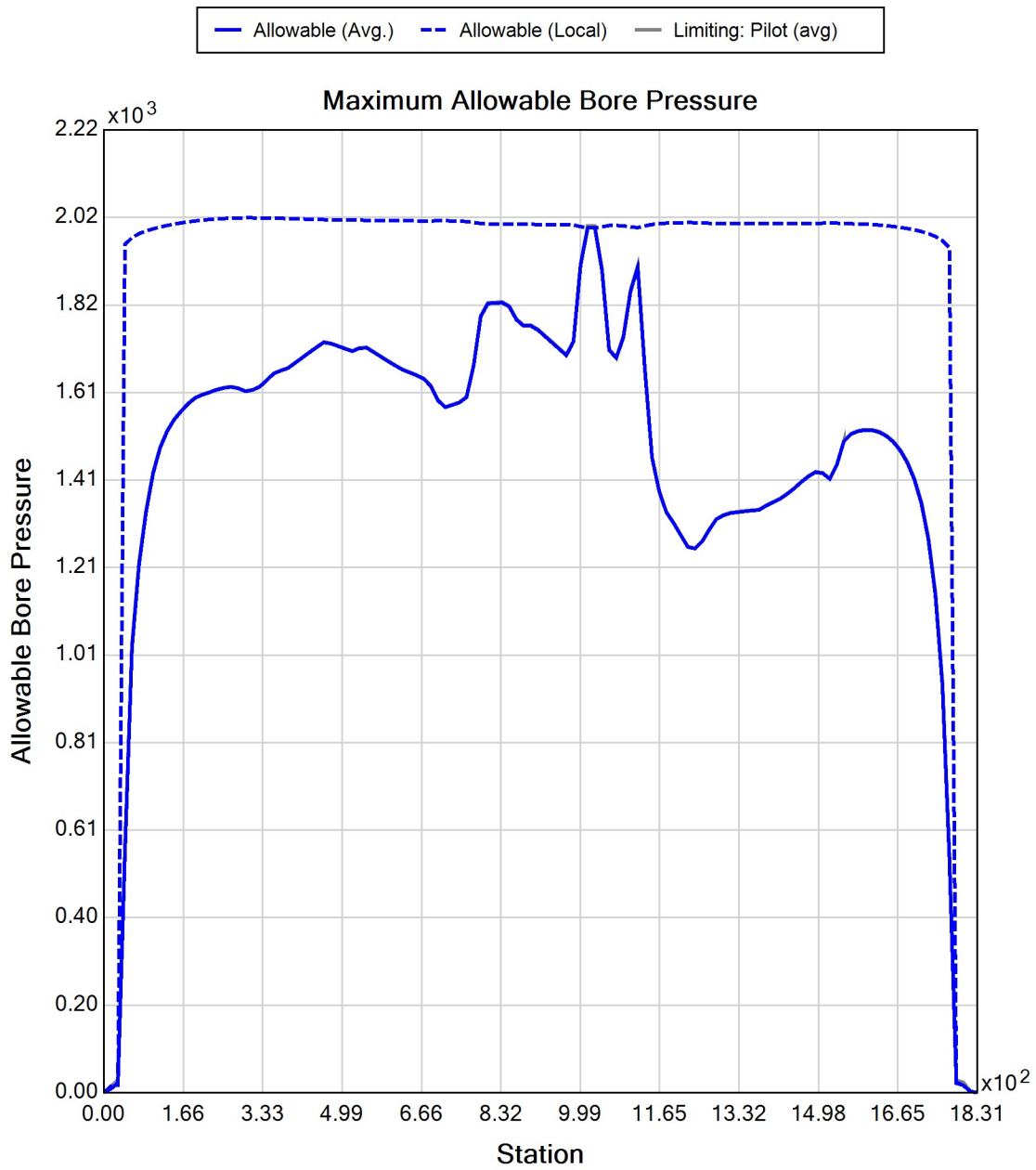


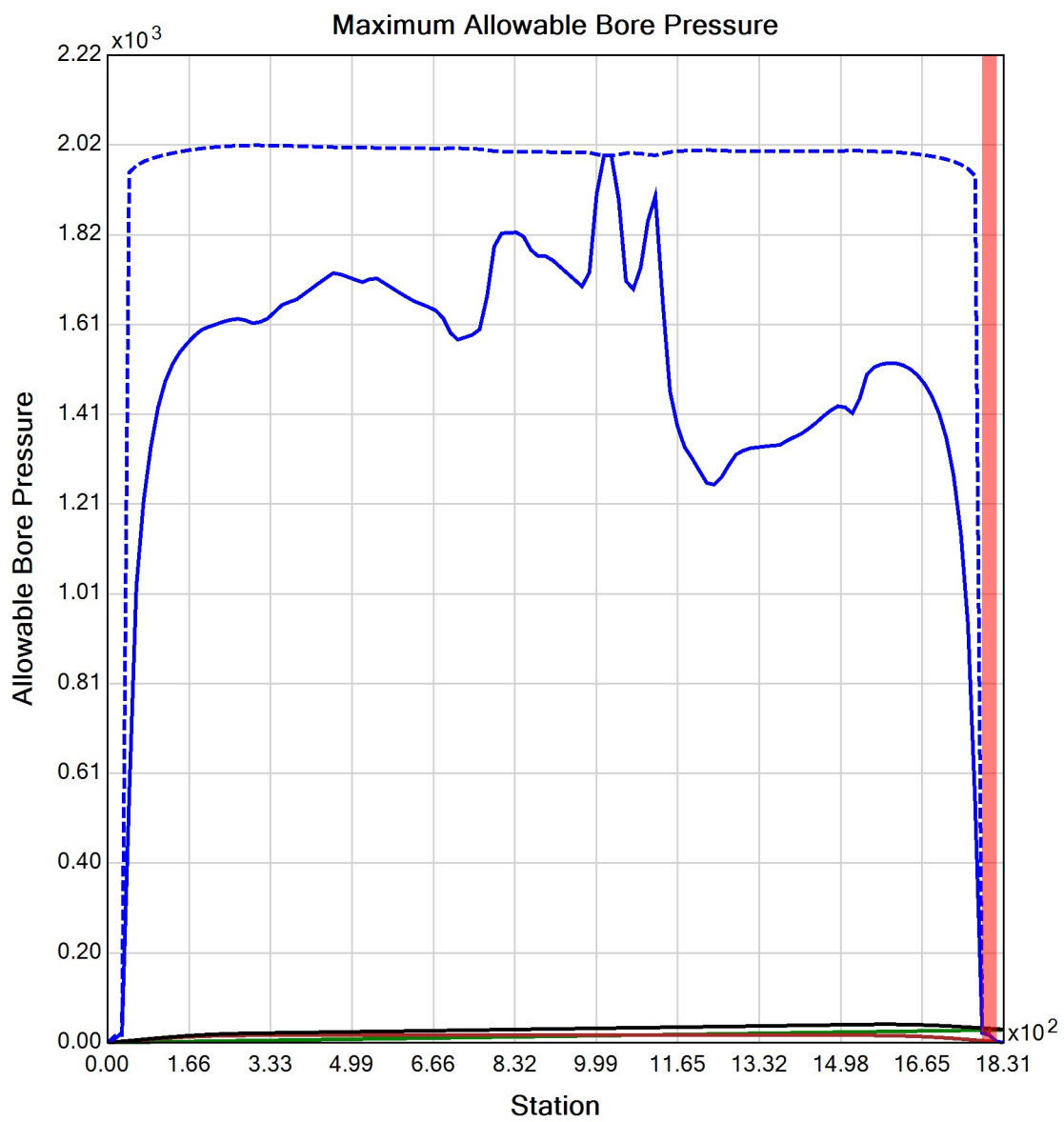














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Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	MDB BCE
Description:	HDD 59A 3-inch DR7 HDPE Telecom Ballast Rollers C1

Input Summary

Start Coordinate	(0.00, 0.00, 264.60) ft
End Coordinate	(1826.00, 0.00, 262.20) ft
Project Length	1826.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	3.500 in
Pipe DR	7.0
Pipe Thickness	0.50 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: 3" (3.5")
Pipe DR: 7
Pipe Length: 1845.00 ft
Internal Pressure: 0 psi
Borehole Diameter: 0.625 ft
Silo Width: 0.625 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): 1300 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: 0.1
Surface-pipe friction coefficient in borehole: 0.3
Pipe-soil friction angle: 30
Slurry Unit Weight: 93.64118 lb/ft³
Hydrokinetic Pressure: 10 psi
Ballast Unit Weight: 62.42746 lb/ft³

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.6	28.3
Water Pressure	14.8	14.7
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	17.4	43.0
Deflection		
Earth Load Deflection	0.320	3.248
Buoyant Deflection	0.020	0.020
Reissner Effect	0	0
Net Deflection	0.340	3.268
Compressive Stress [psi]		
Compressive Wall Stress	60.8	150.5

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	6325.1	6325.1
Pullback Stress [psi]	1342.2	1342.2
Pullback Strain	2.334E-2	2.334E-2
Bending Stress [psi]	0.0	8.4
Bending Strain	0	1.455E-4
Tensile Stress [psi]	1342.2	1345.5
Tensile Strain	2.334E-2	2.353E-2

Net External Pressure = 13.4 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 172.8 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.340	7.5	22.1	OK
Unconstrained Collapse [psi]	22.5	317.5	14.1	OK
Compressive Wall Stress [psi]	60.8	1150.0	18.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.010	7.5	756.1	OK
Unconstrained Collapse [psi]	17.5	403.1	23.0	OK
Tensile Stress [psi]	1345.5	1300.0	1.0	OK



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Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	MDB BCE
Description:	HDD 59A 8-inch DR18 . Ballast Rollers PVC pipe C2

Input Summary

Start Coordinate	(0.00, 0.00, 264.60) ft
End Coordinate	(1826.00, 0.00, 262.00) ft
Project Length	1826.00 ft
Pipe Type	PVC
OD Classification	IPS
Pipe OD	8.625 in
Pipe DR	18.0
Pipe Thickness	0.48 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: 4

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

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: 80.0000 (dry), 110.0000 (sat) [lb/ft3]

Phi: 0.00, S.M.: 300.00, Coh: 5.10 [psi]

Soil Layer #3 USCS, Gravel (G), GM

From Assistant

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

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

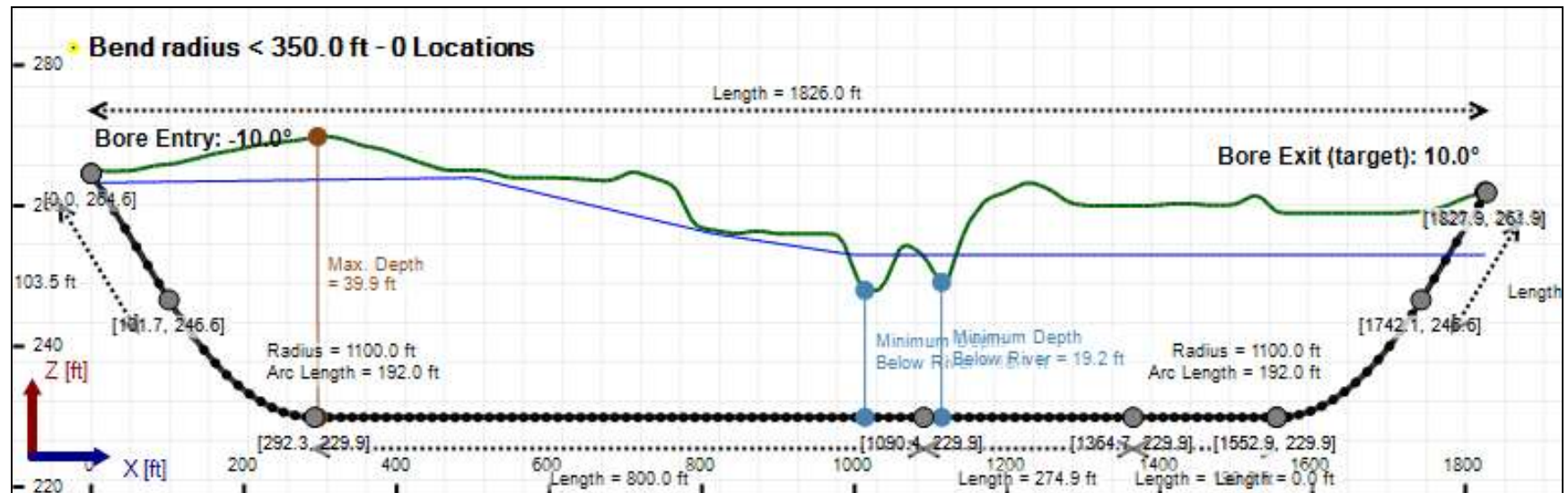
Soil Layer #4 Rock, Geological Classification, Sedimentary Rocks

From Assistant

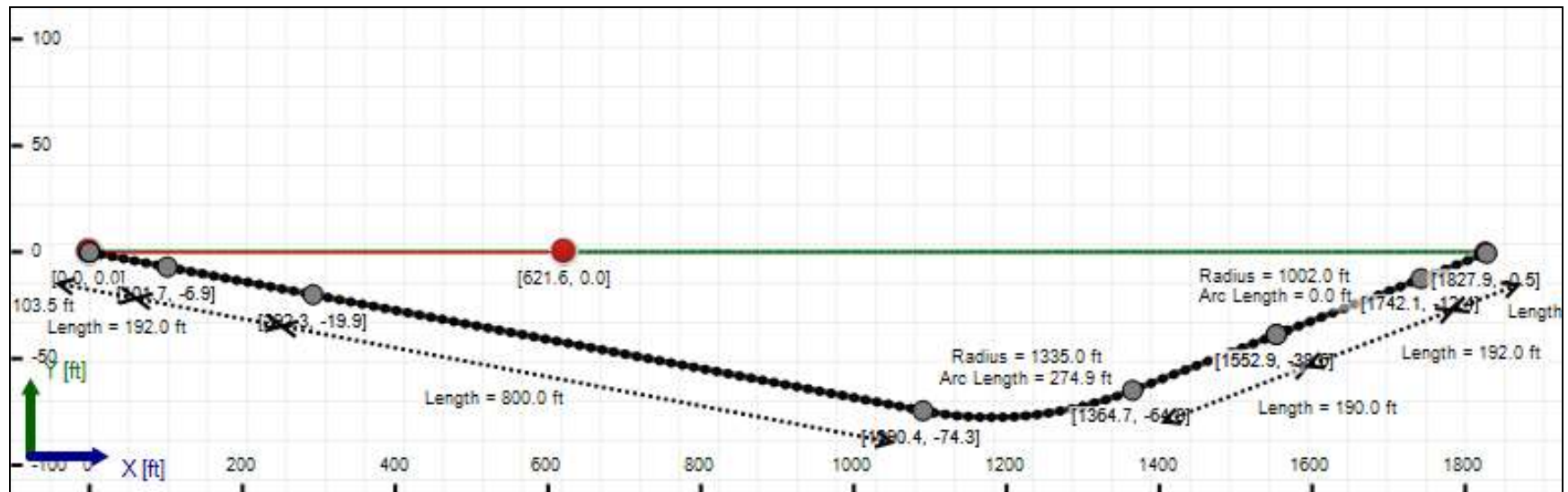
Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft3]

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

Bore Cross-Section View



Bore Plan View



Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: PVC
Classification: IPS
Pipe OD: 8" (8.625")
Pipe DR: 18
Pipe Length: 1845.14 ft
Internal Pressure: 0 psi
Borehole Diameter: 1.07799990971883 ft
Silo Width: 1.07799990971883 ft
Surface Surcharge: 0 psi
Short Term Modulus: 400000 psi
Long Term Modulus: 400000 psi
Short Term Poisson Ratio: 0.38
Long Term Poisson Ratio: 0.38
Pipe Unit Weight: 87.40220 lb/ft³
Allowable Tensile Stress (Short Term): 2800 psi
Allowable Tensile Stress (Long Term): 2800 psi
Allowable Compressive Stress (Short Term): 3200 psi
Allowable Compressive Stress (Long Term): 3200 psi
Surface-pipe friction coefficient at entrance: 0.1
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	4.5	28.3
Water Pressure	14.8	14.7
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	19.3	43.0
Deflection		
Earth Load Deflection	0.850	5.214
Buoyant Deflection	0.060	0.060
Reissner Effect	0	0
Net Deflection	0.909	5.274
Compressive Stress [psi]		
Compressive Wall Stress	173.5	386.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	26935.3	26935.3
Pullback Stress [psi]	2196.6	2196.6
Pullback Strain	5.491E-3	5.491E-3
Bending Stress [psi]	0.0	143.5
Bending Strain	0	3.587E-4
Tensile Stress [psi]	2196.6	2319.4
Tensile Strain	5.491E-3	6.125E-3

Net External Pressure = 13.4 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 365.0 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.909	7.5	8.2	OK
Unconstrained Collapse [psi]	22.6	175.4	7.8	OK
Compressive Wall Stress [psi]	173.5	3200.0	18.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.060	7.5	125.5	OK
Unconstrained Collapse [psi]	17.5	143.0	8.2	OK
Tensile Stress [psi]	2319.4	2800.0	1.2	OK

Maximum Allowable Bore Pressure Summary

Ream Number	Initial Diameter	Final Diameter	Estimated Maximum Pressure (Avg.)	Estimated Maximum Pressure (Local)
Pilot Bore	0.00 in	8.00 in	1998.953 psi	2018.295 psi
1	8.00 in	12.00 in	1997.308 psi	2017.931 psi
2	12.00 in	16.13 in	1994.922 psi	2017.402 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

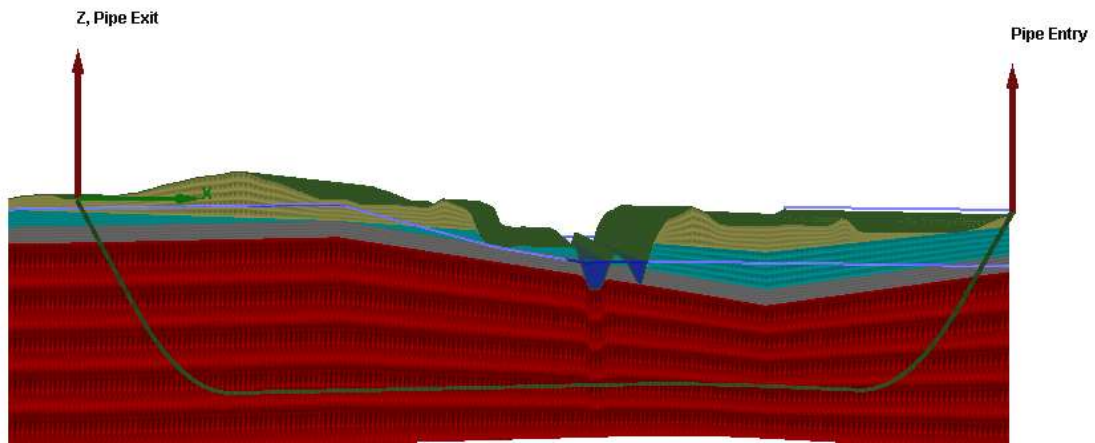
Rheological model: Power-Law

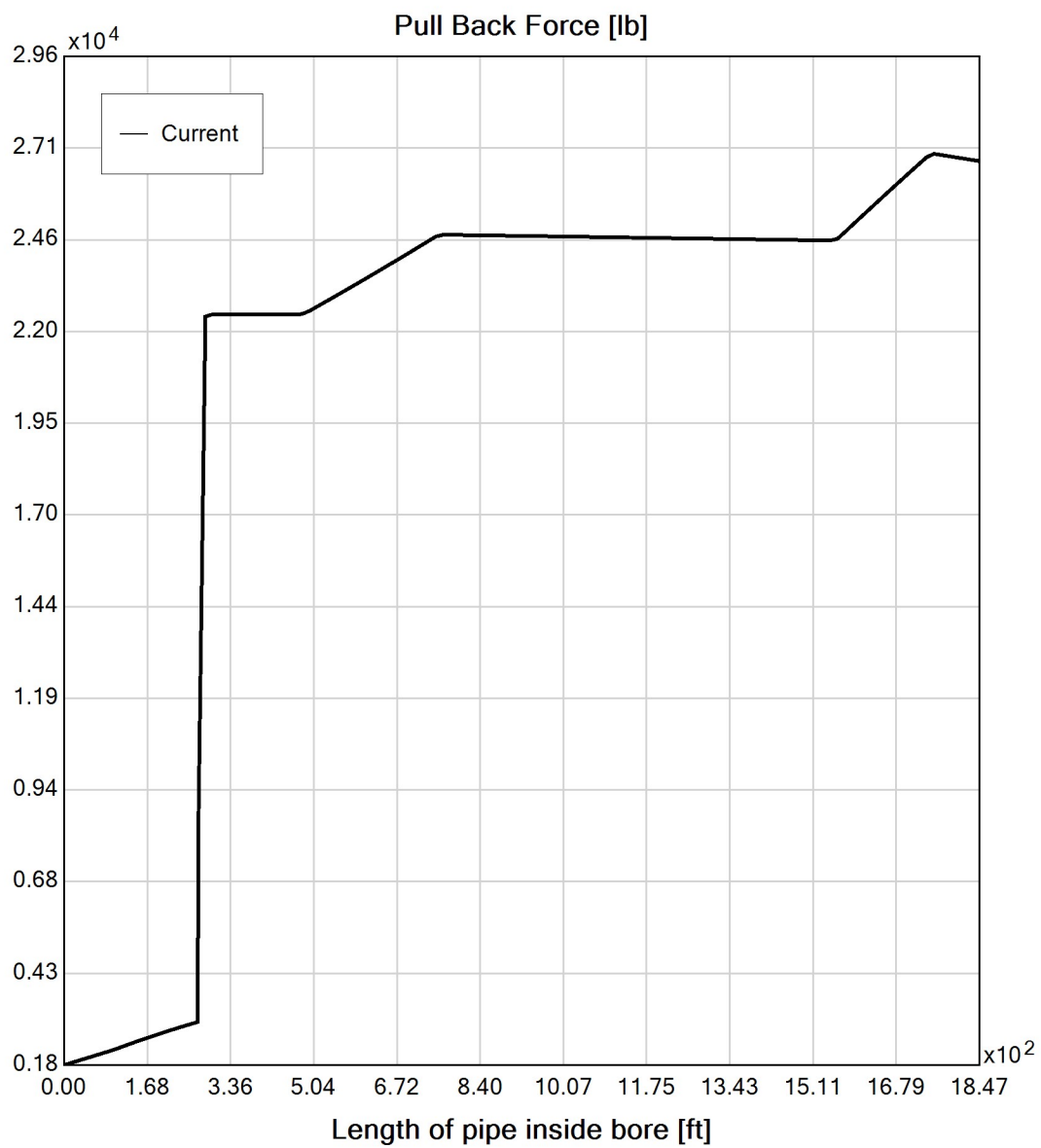
Fluid Consistency Index (K): 63.17

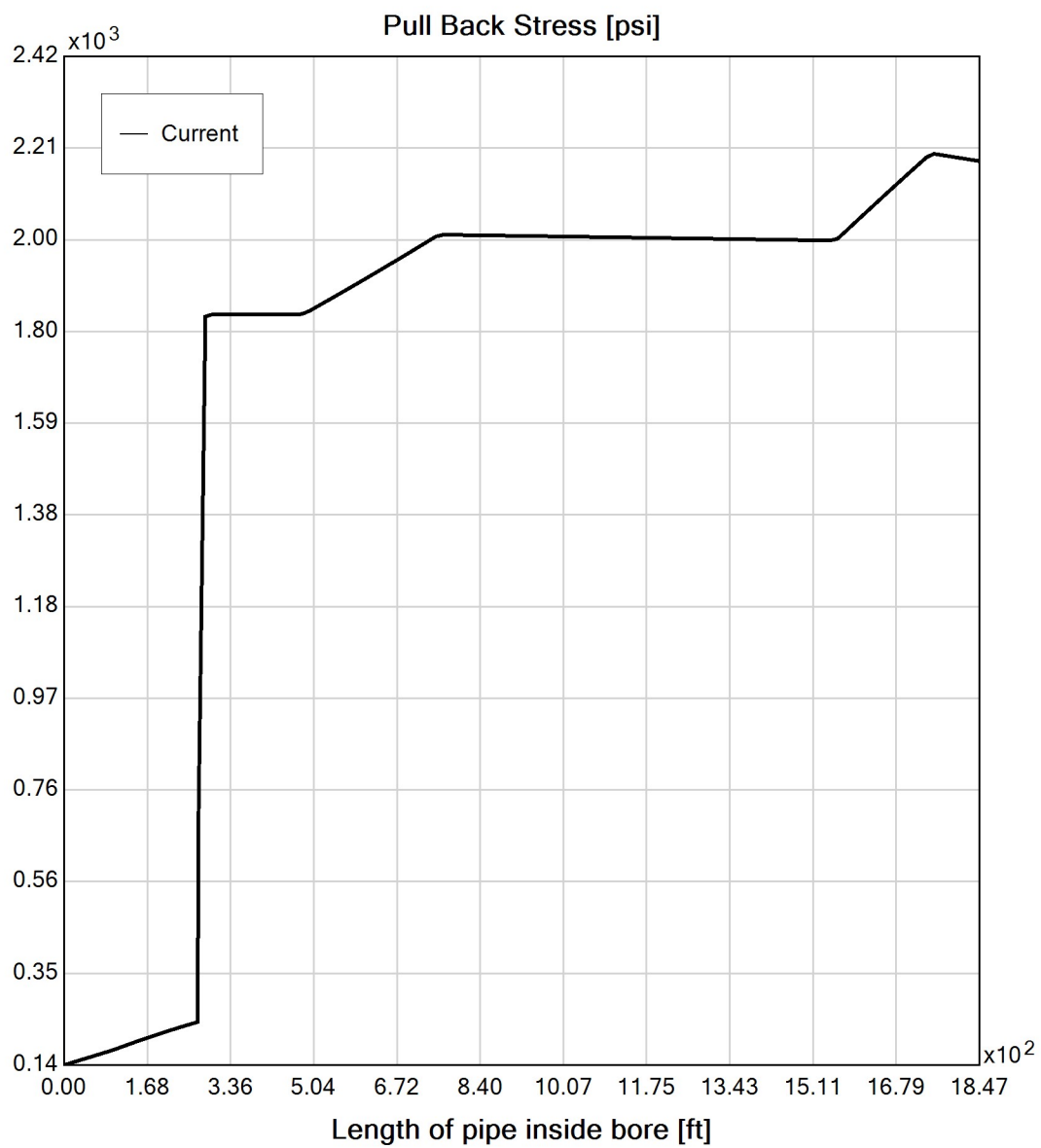
Power Law Exponent (n): 0.14

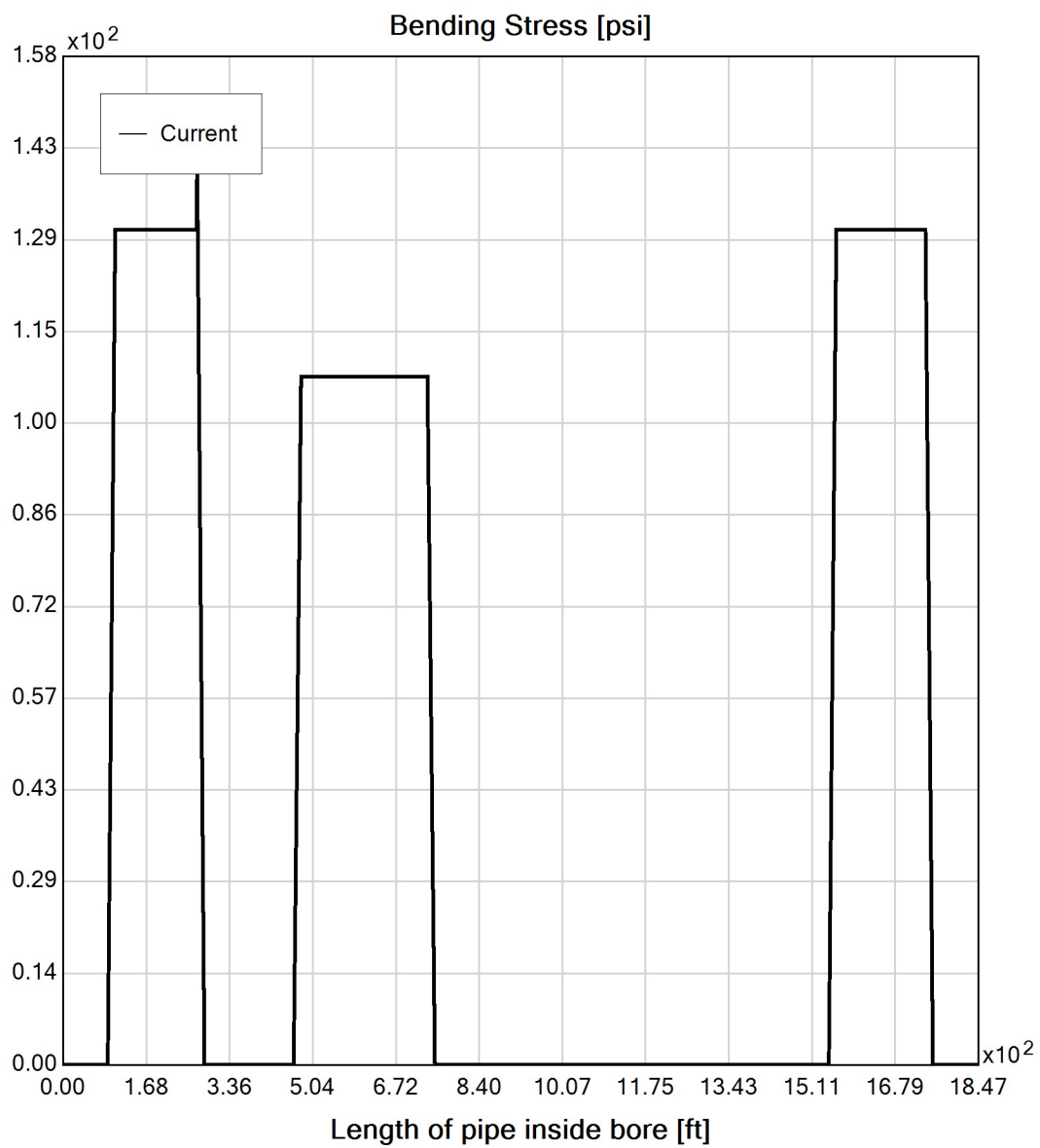
Effective Viscosity (cP): 859.3

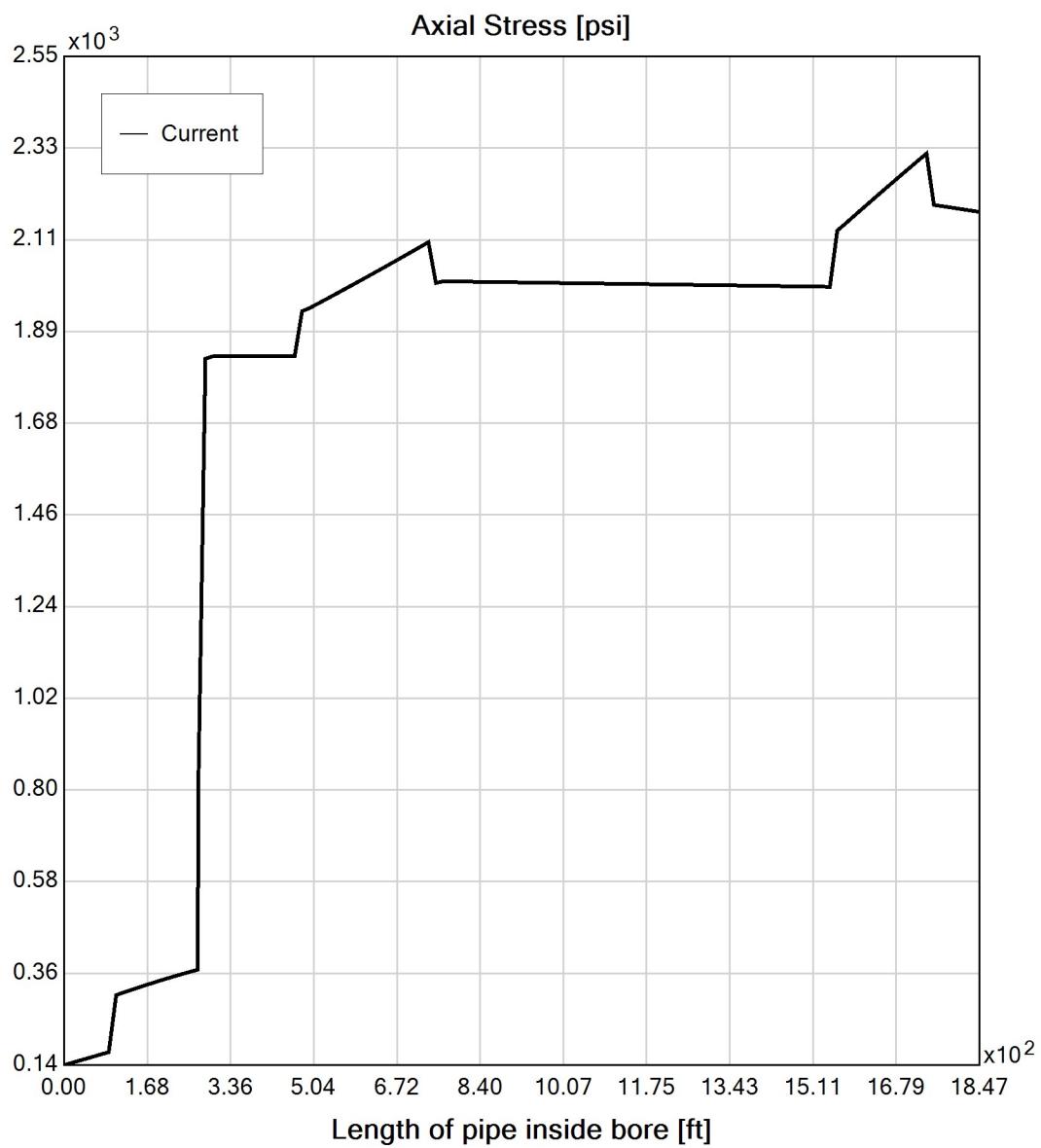
Virtual Site

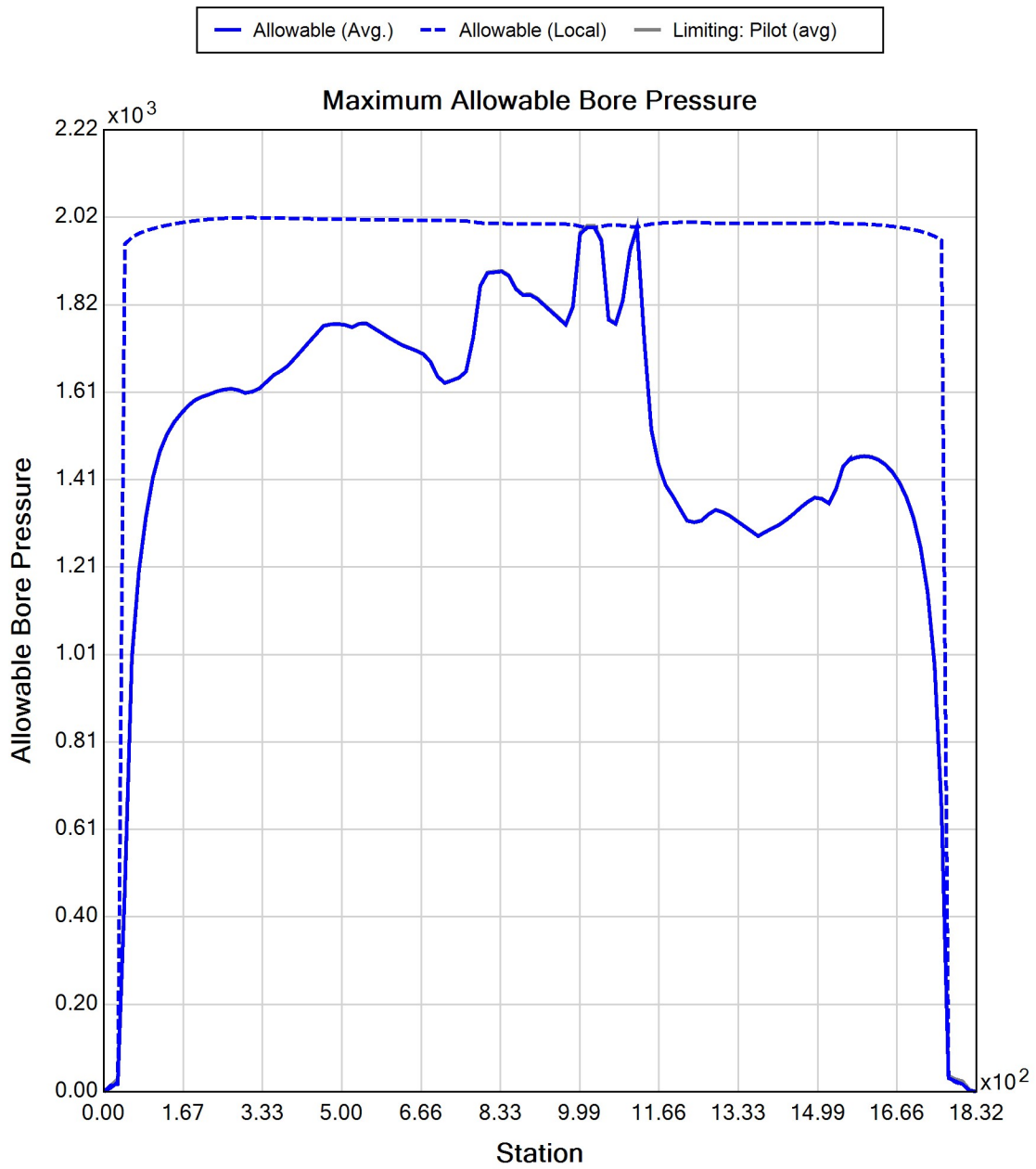


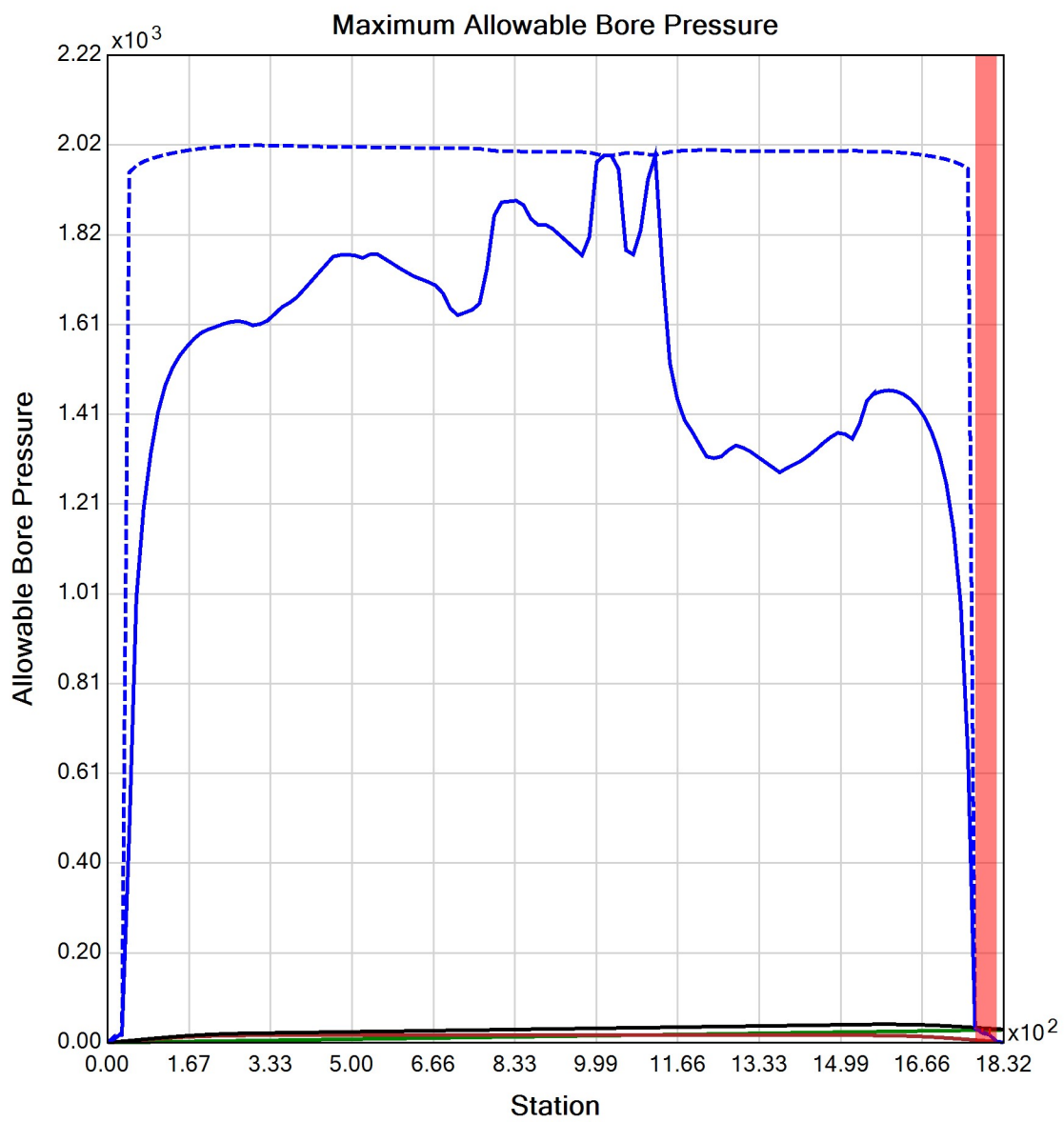














Generated Output



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Project Summary

General:	CHPE HDD 59A P4A Start Date: 07-31-2023 End Date: 07-31-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	MDB BCE
Description:	HDD 59A 3-inch HDPE DR 7. Ballast Rollers C2

Input Summary

Start Coordinate	(0.00, 0.00, 264.60) ft
End Coordinate	(1826.00, 0.00, 262.00) ft
Project Length	1826.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	3.500 in
Pipe DR	7.0
Pipe Thickness	0.50 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: 3" (3.5")
Pipe DR: 7
Pipe Length: 1845.14 ft
Internal Pressure: 0 psi
Borehole Diameter: 0.625 ft
Silo Width: 0.625 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): 1300 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: 0.1
Surface-pipe friction coefficient in borehole: 0.3
Pipe-soil friction angle: 30
Slurry Unit Weight: 93.64118 lb/ft³
Hydrokinetic Pressure: 10 psi
Ballast Unit Weight: 62.42746 lb/ft³

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.6	28.3
Water Pressure	14.8	14.7
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	17.4	43.0
Deflection		
Earth Load Deflection	0.320	3.252
Buoyant Deflection	0.020	0.020
Reissner Effect	0	0
Net Deflection	0.340	3.272
Compressive Stress [psi]		
Compressive Wall Stress	60.9	150.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	6134.7	6134.7
Pullback Stress [psi]	1301.8	1301.8
Pullback Strain	2.264E-2	2.264E-2
Bending Stress [psi]	0.0	8.4
Bending Strain	0	1.455E-4
Tensile Stress [psi]	1301.8	1305.4
Tensile Strain	2.264E-2	2.283E-2

Net External Pressure = 13.4 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 172.8 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.340	7.5	22.0	OK
Unconstrained Collapse [psi]	22.6	317.5	14.1	OK
Compressive Wall Stress [psi]	60.9	1150.0	18.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.010	7.5	756.1	OK
Unconstrained Collapse [psi]	17.5	410.9	23.5	OK
Tensile Stress [psi]	1305.4	1300.0	1.0	OK



Generated Output



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Project Summary

General:	CHPE HDD 59B P4A Start Date: 12-10-2021 End Date: 12-10-2021
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	AB CHA
Description:	HDD 59B 10-Inch DR 9 Conduit 1

Input Summary

Start Coordinate	(0.00, 0.00, 252.00) ft
End Coordinate	(830.00, 0.00, 241.00) ft
Project Length	830.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	10.750 in
Pipe DR	9.0
Pipe Thickness	1.19 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 5

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

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

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

Soil Layer #3 USCS, Sand (S), SM

From Assistant

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

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

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

From Assistant

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

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

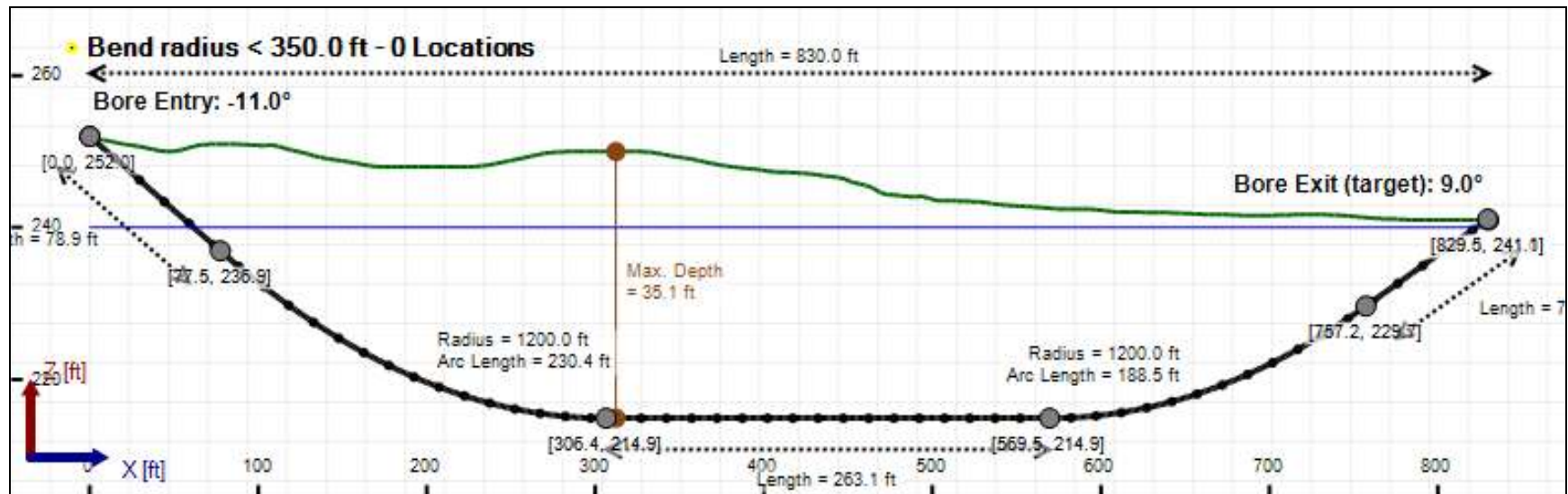
Soil Layer #5 Rock, Geological Classification, Sedimentary Rocks

From Assistant

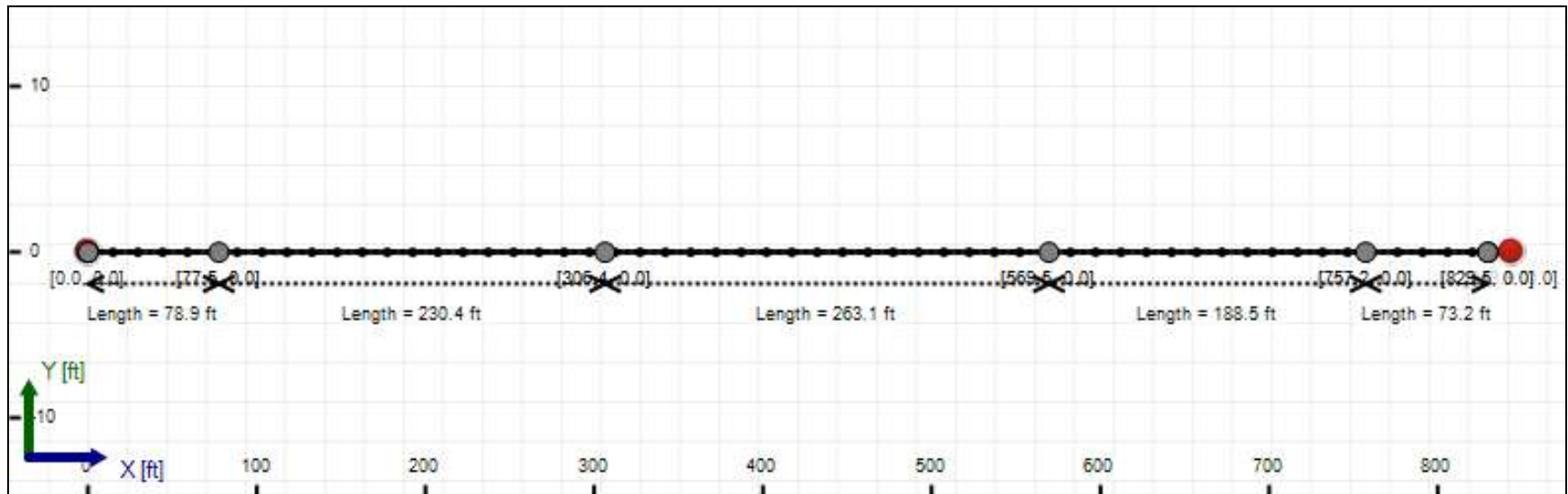
Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft3]

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

Bore Cross-Section View



Bore Plan View



Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 10" (10.75")
Pipe DR: 9
Pipe Length: 840.00 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	5.5	24.7
Water Pressure	10.9	10.9
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.4	35.6
Deflection		
Earth Load Deflection	1.503	6.732
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.635	6.864
Compressive Stress [psi]		
Compressive Wall Stress	73.6	160.1

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	13429.5	13429.5
Pullback Stress [psi]	374.5	374.5
Pullback Strain	6.514E-3	6.514E-3
Bending Stress [psi]	0.0	21.5
Bending Strain	0	3.733E-4
Tensile Stress [psi]	374.5	395.0
Tensile Strain	6.514E-3	7.244E-3

Net External Pressure = 19.3 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.635	7.5	4.6	OK
Unconstrained Collapse [psi]	24.1	119.4	4.9	OK
Compressive Wall Stress [psi]	73.6	1150.0	15.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	34.1	233.9	6.9	OK
Tensile Stress [psi]	395.0	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	1423.736 psi	2011.084 psi
1	8.00 in	12.00 in	1423.200 psi	2010.611 psi
2	12.00 in	16.13 in	1422.424 psi	2009.924 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

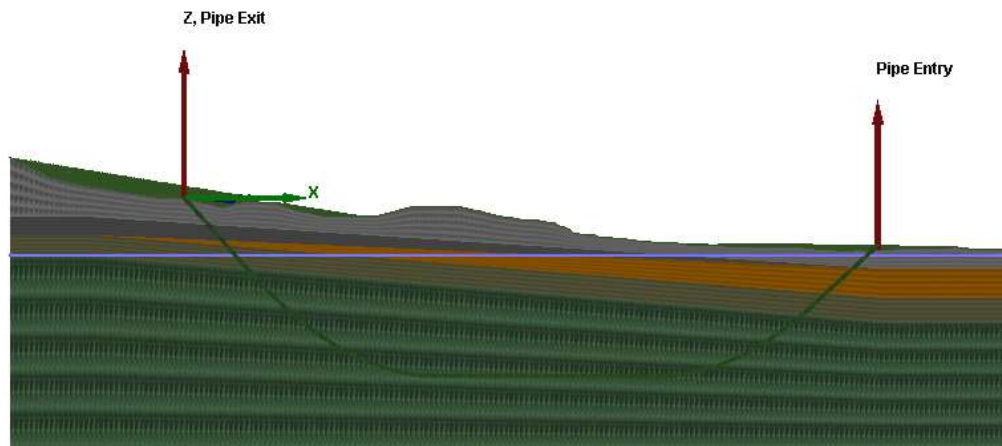
Rheological model: Bingham-Plastic

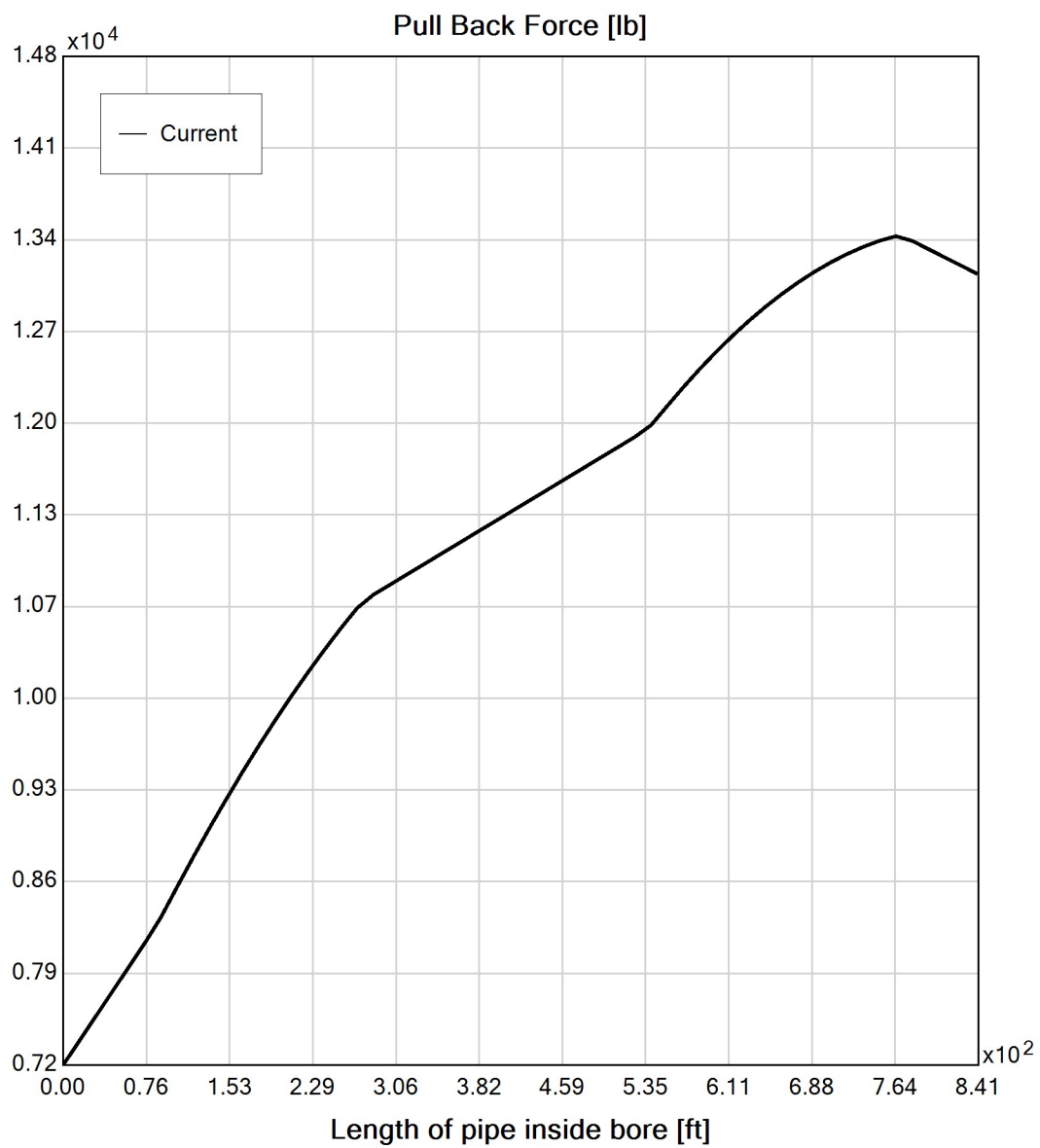
Plastic Viscosity (PV): 25.53

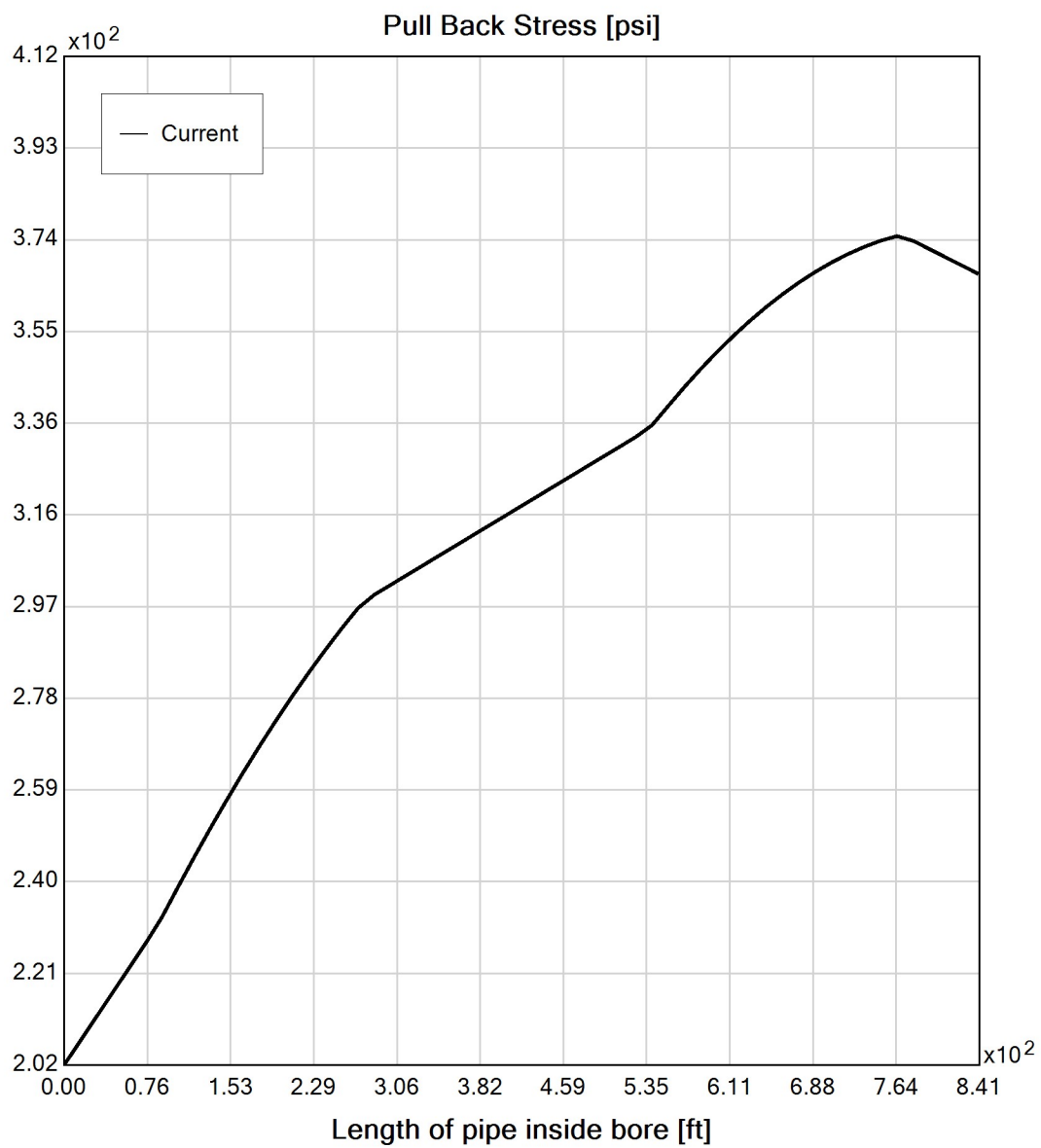
Yield Point (YP): 16.49

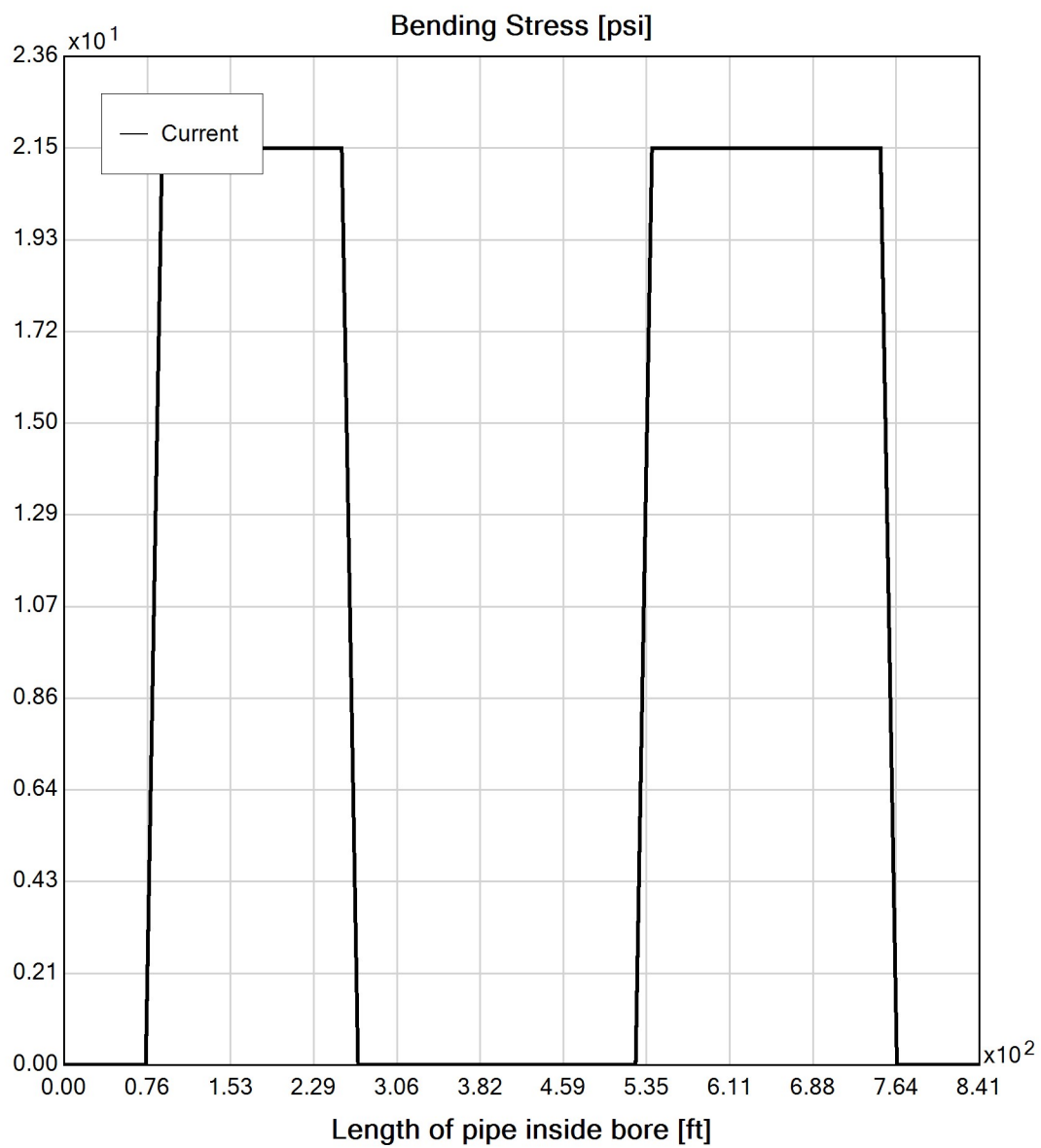
Effective Viscosity (cP): 1202.0

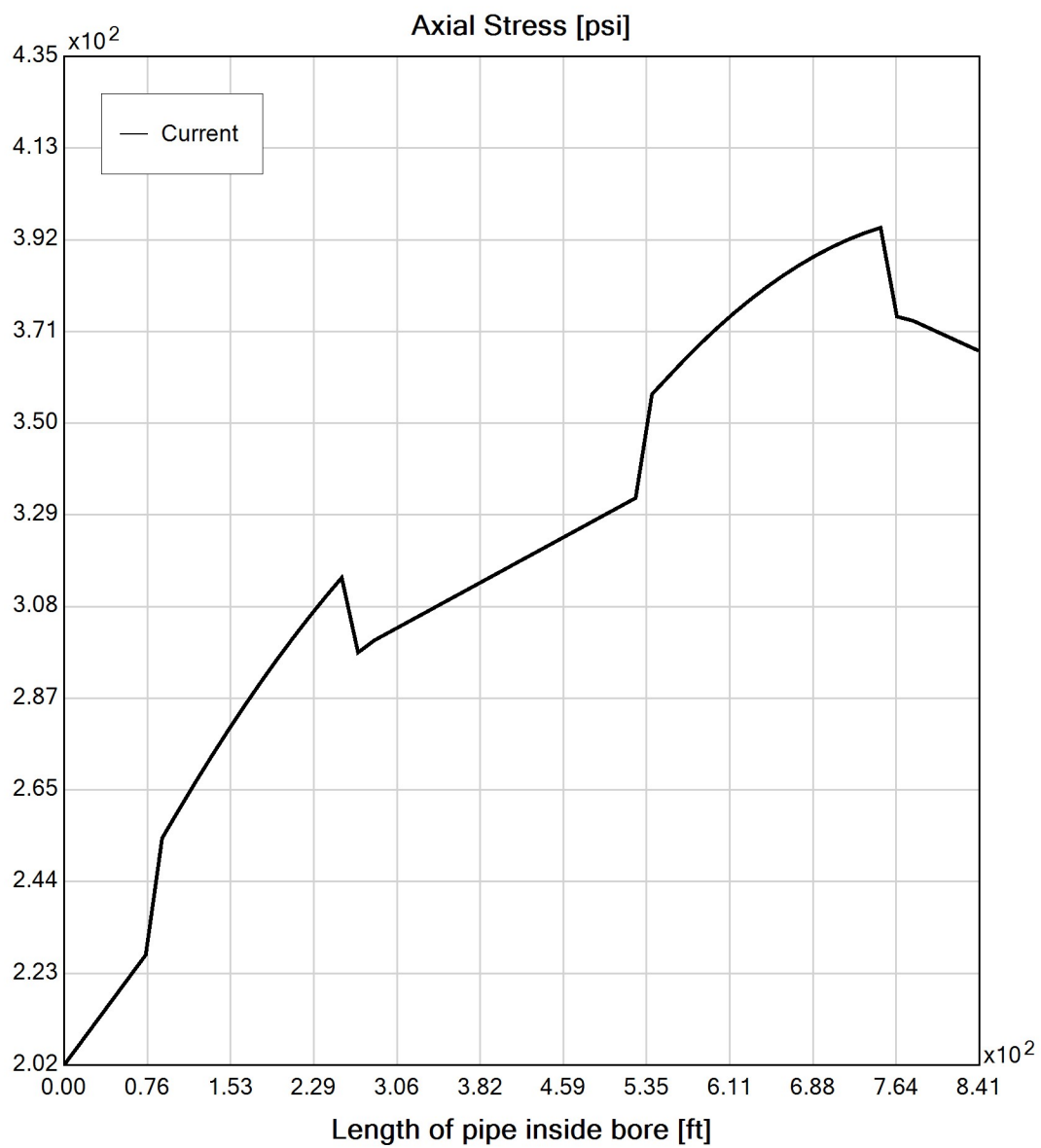
Virtual Site

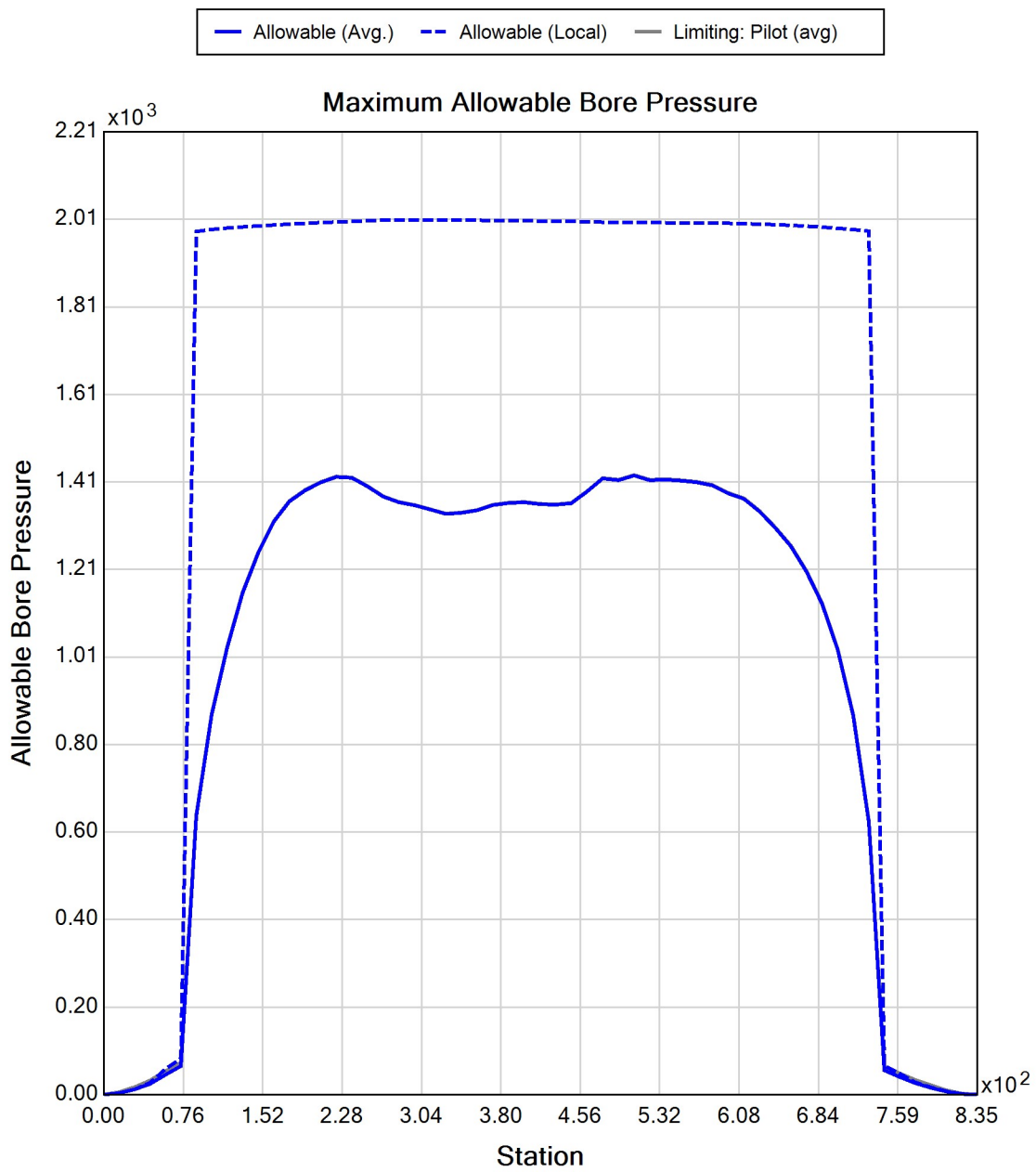


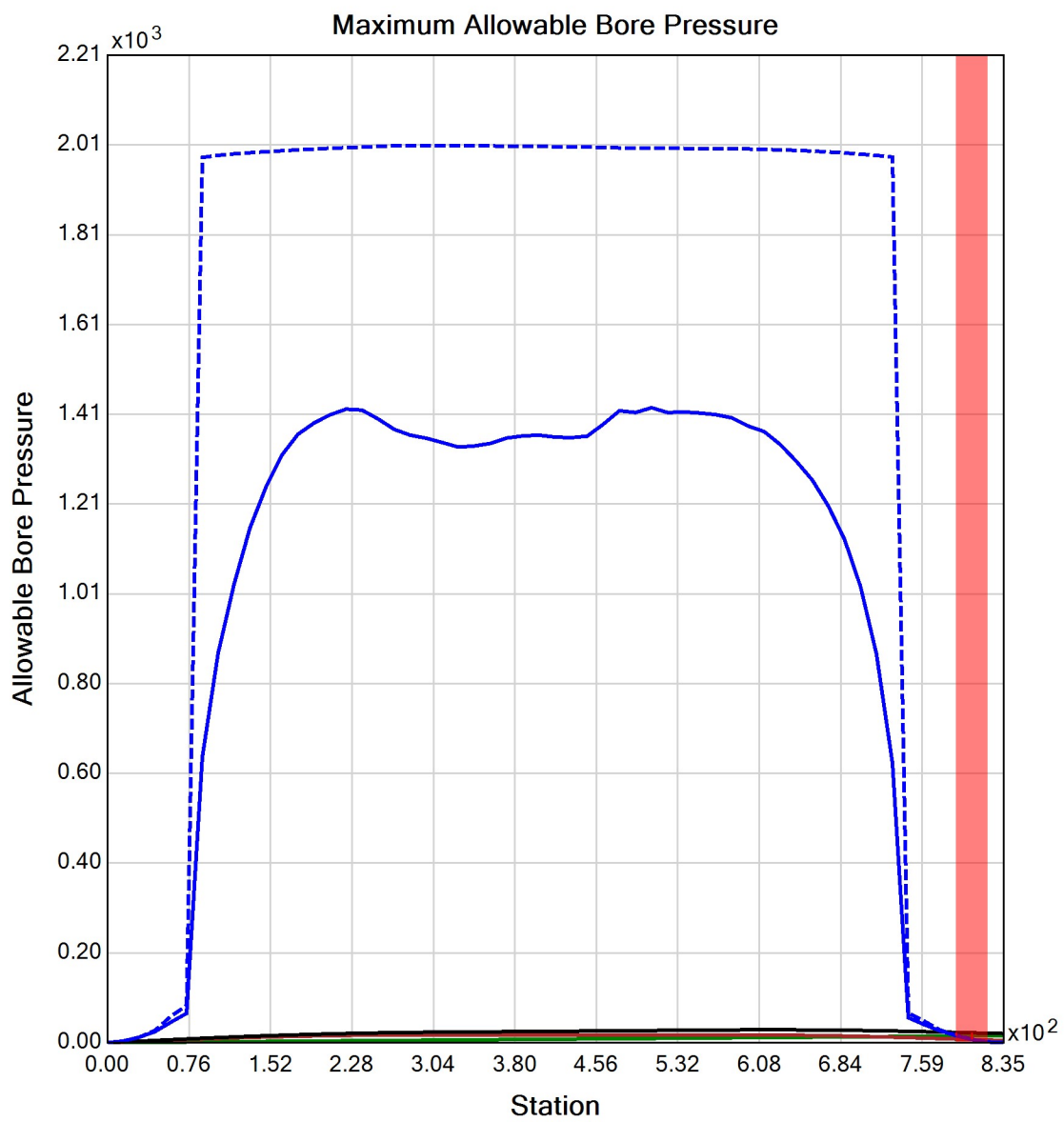














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Project Summary

General:	CHPE HDD 59B P4A Start Date: 12-10-2021 End Date: 12-10-2021
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	AB CHA
Description:	HDD 59B 2-Inch DR 9 Conduit 1

Input Summary

Start Coordinate	(0.00, 0.00, 252.00) ft
End Coordinate	(830.00, 0.00, 241.00) ft
Project Length	830.00 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: 840.00 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	24.7
Water Pressure	10.9	10.9
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	13.1	35.6
Deflection		
Earth Load Deflection	0.608	6.732
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.637	6.761
Compressive Stress [psi]		
Compressive Wall Stress	58.8	160.1

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	765.1	765.1
Pullback Stress [psi]	437.1	437.1
Pullback Strain	7.603E-3	7.603E-3
Bending Stress [psi]	0.0	4.7
Bending Strain	0	8.247E-5
Tensile Stress [psi]	437.1	440.9
Tensile Strain	7.603E-3	7.751E-3

Net External Pressure = 19.3 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.637	7.5	11.8	OK
Unconstrained Collapse [psi]	24.1	130.6	5.4	OK
Compressive Wall Stress [psi]	58.8	1150.0	19.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	34.1	231.9	6.8	OK
Tensile Stress [psi]	440.9	1200.0	2.7	OK



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Project Summary

General:	CHPE HDD 60 P4A Start Date: 06-07-2023 End Date: 06-07-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA
Designer:	MDB BCE Amherst, MA
Description:	HDD 60 Reversed Conduit 1 10-inch DR9 ALT

Input Summary

Start Coordinate	(0.00, 0.00, 231.00) ft
End Coordinate	(1335.00, 0.00, 235.00) ft
Project Length	1335.00 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), SM

From Assistant

Unit Weight: 105.0000 (dry), 132.8832 (sat) [lb/ft³]

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

Soil Layer #2 USCS, Clay (C), CH

From Assistant

Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft³]

Phi: 0.00, S.M.: 300.00, Coh: 5.50 [psi]

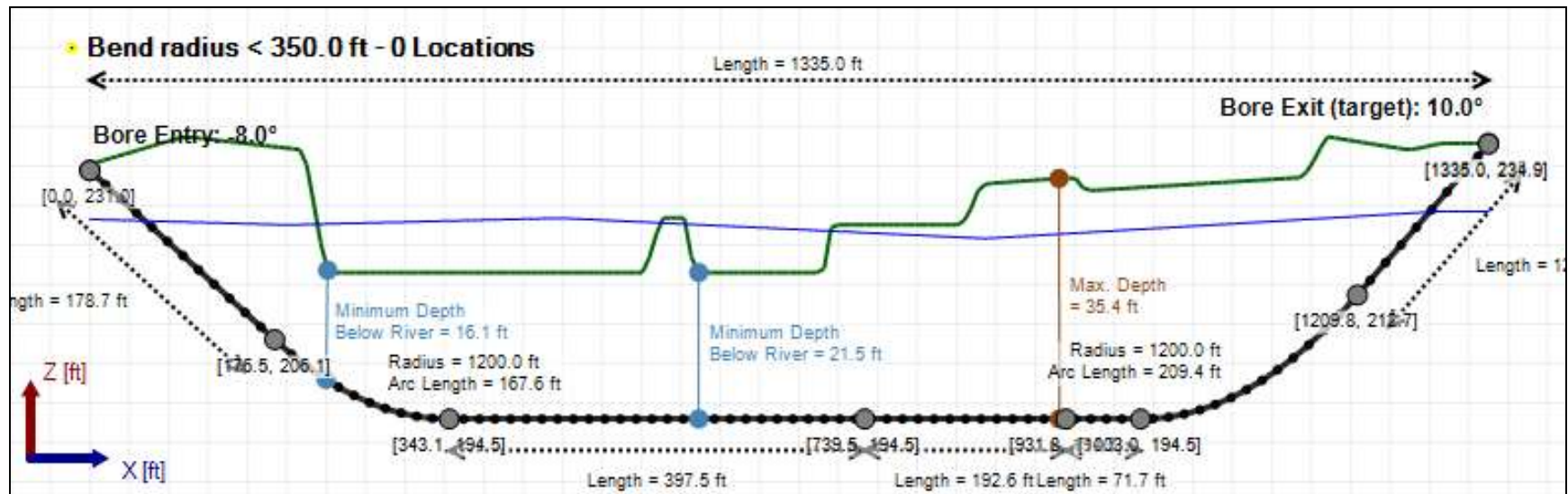
Soil Layer #3 USCS, Sand (S), SM

From Assistant

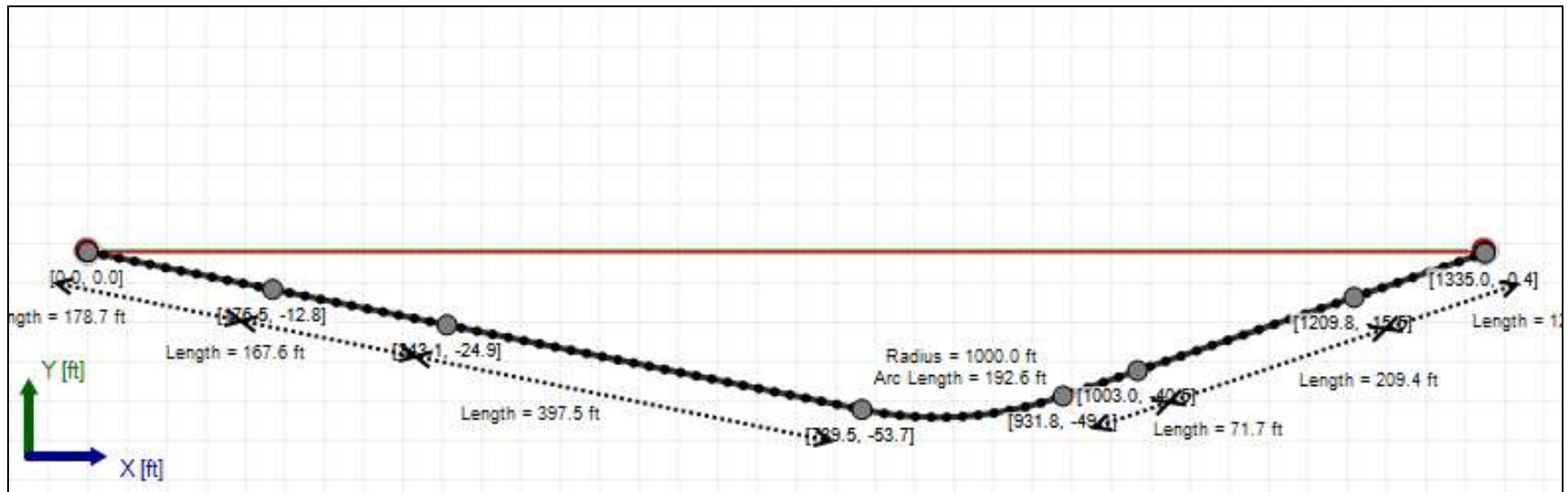
Unit Weight: 130.0000 (dry), 140.0000 (sat) [lb/ft³]

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

Bore Cross-Section View



Bore Plan View



Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 10" (10.75")
Pipe DR: 9
Pipe Length: 1350.00 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	22.1
Water Pressure	12.1	11.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.9	33.9
Deflection		
Earth Load Deflection	1.354	6.005
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.486	6.137
Compressive Stress [psi]		
Compressive Wall Stress	76.2	152.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	22473.1	22473.1
Pullback Stress [psi]	626.7	626.7
Pullback Strain	1.090E-2	1.090E-2
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	626.7	646.5
Tensile Strain	1.090E-2	1.162E-2

Net External Pressure = 28.0 [psi]

Buoyant Deflection = 0.1

Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.486	7.5	5.0	OK
Unconstrained Collapse [psi]	26.8	120.9	4.5	OK
Compressive Wall Stress [psi]	76.2	1150.0	15.1	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	36.8	217.4	5.9	OK
Tensile Stress [psi]	646.5	1200.0	1.9	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	190.031 psi	190.031 psi
1	8.00 in	12.00 in	188.810 psi	188.810 psi
2	12.00 in	16.13 in	187.092 psi	187.092 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): 120.00 US (liquid) gallon/min

Drill Fluid Density: 68.700 lb/ft³

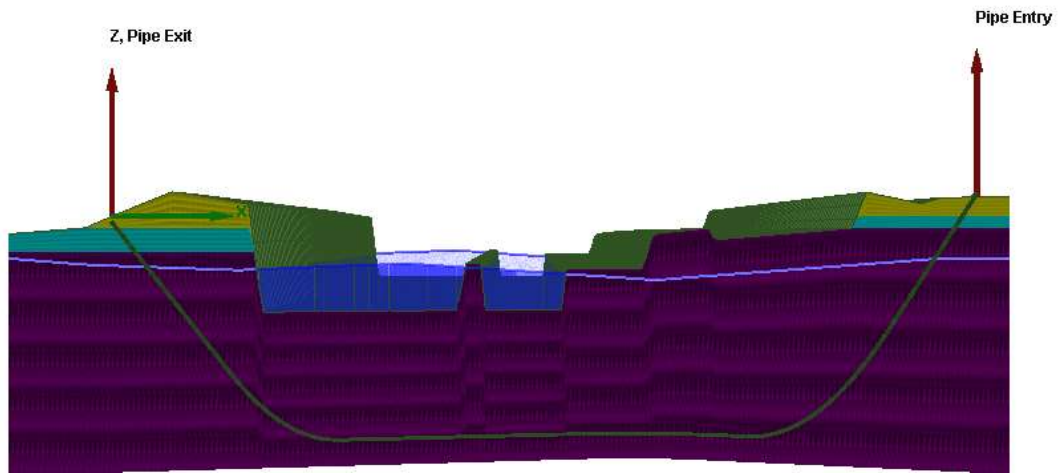
Rheological model: Bingham-Plastic

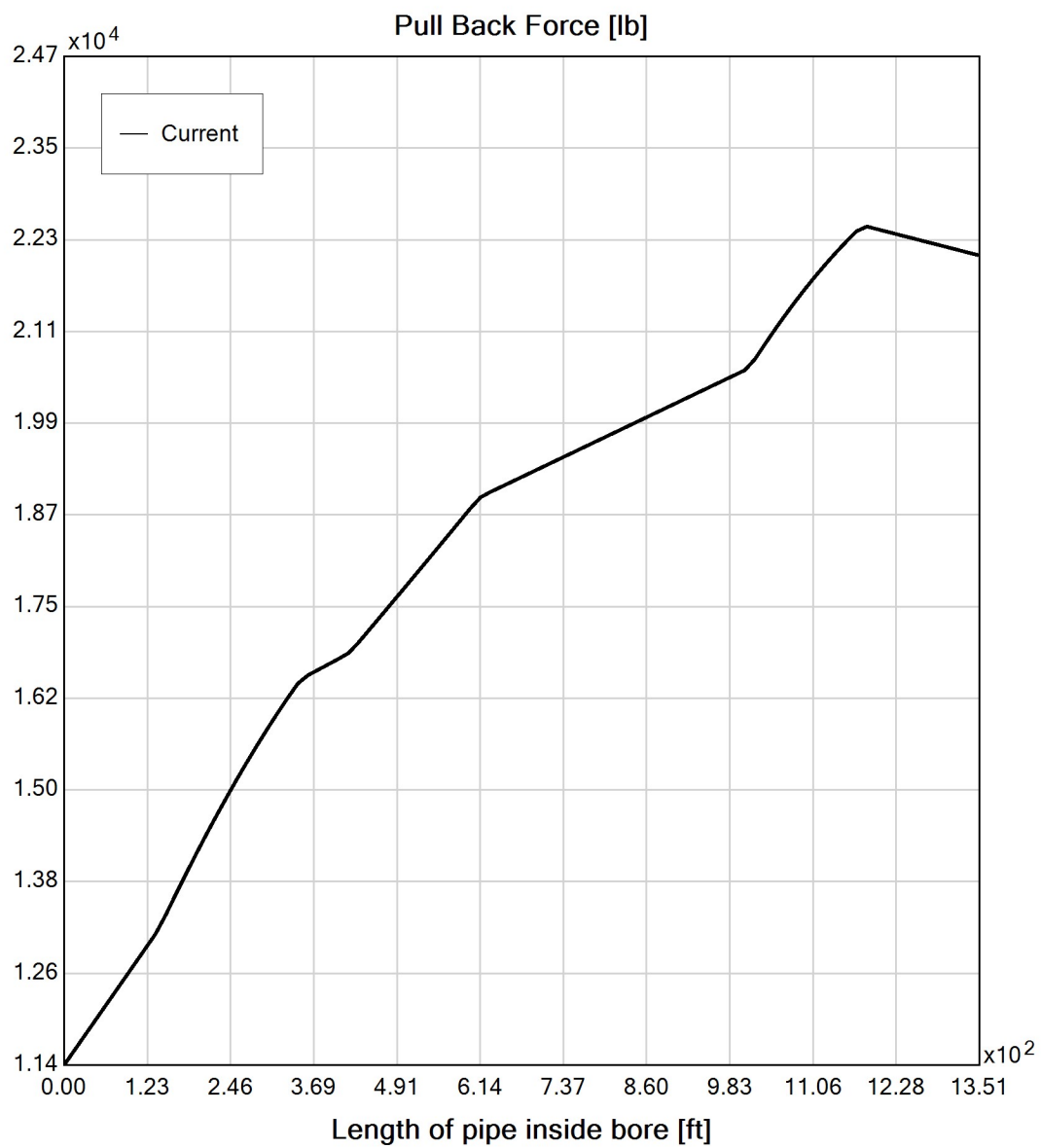
Plastic Viscosity (PV): 25.53

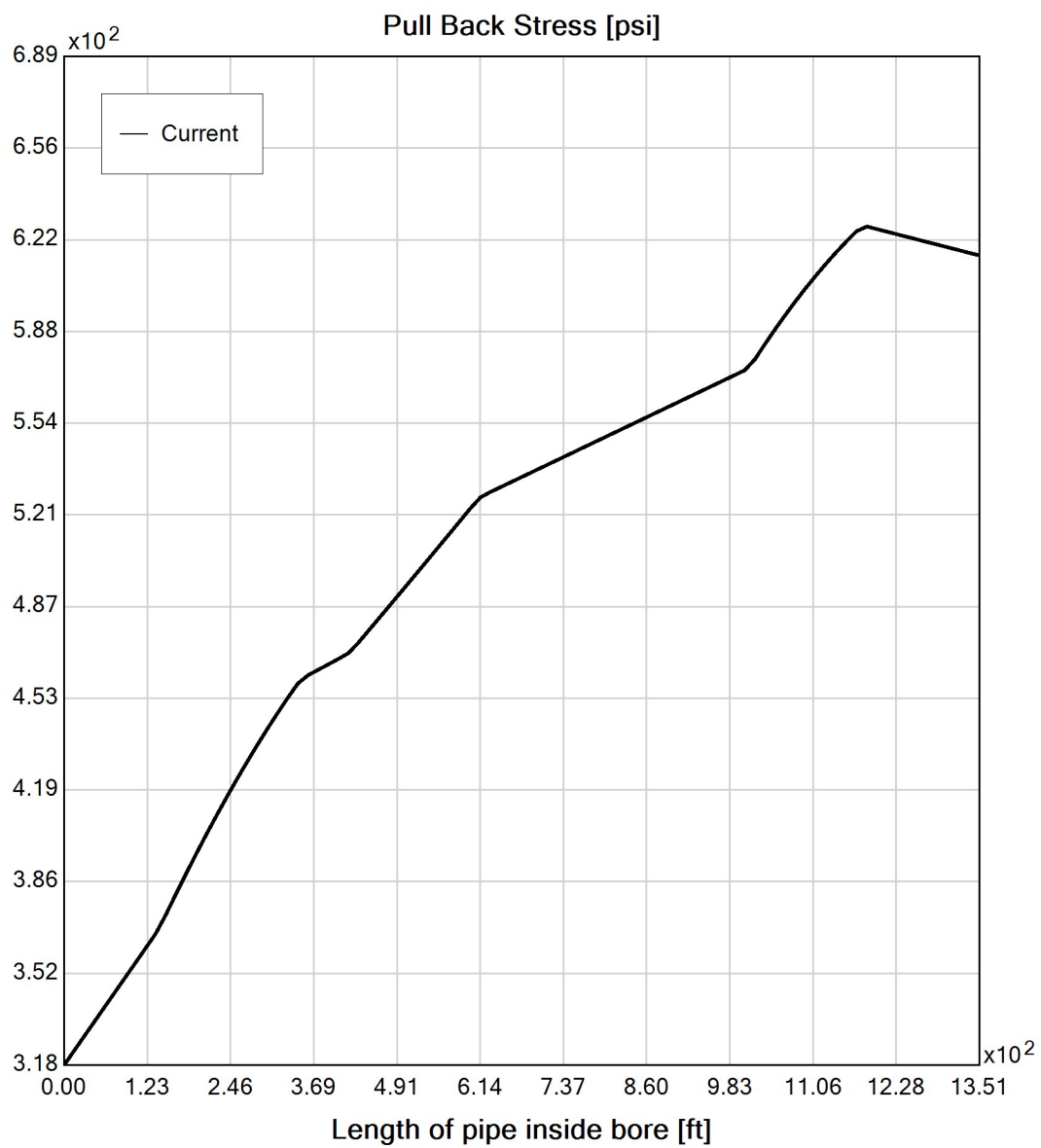
Yield Point (YP): 16.49

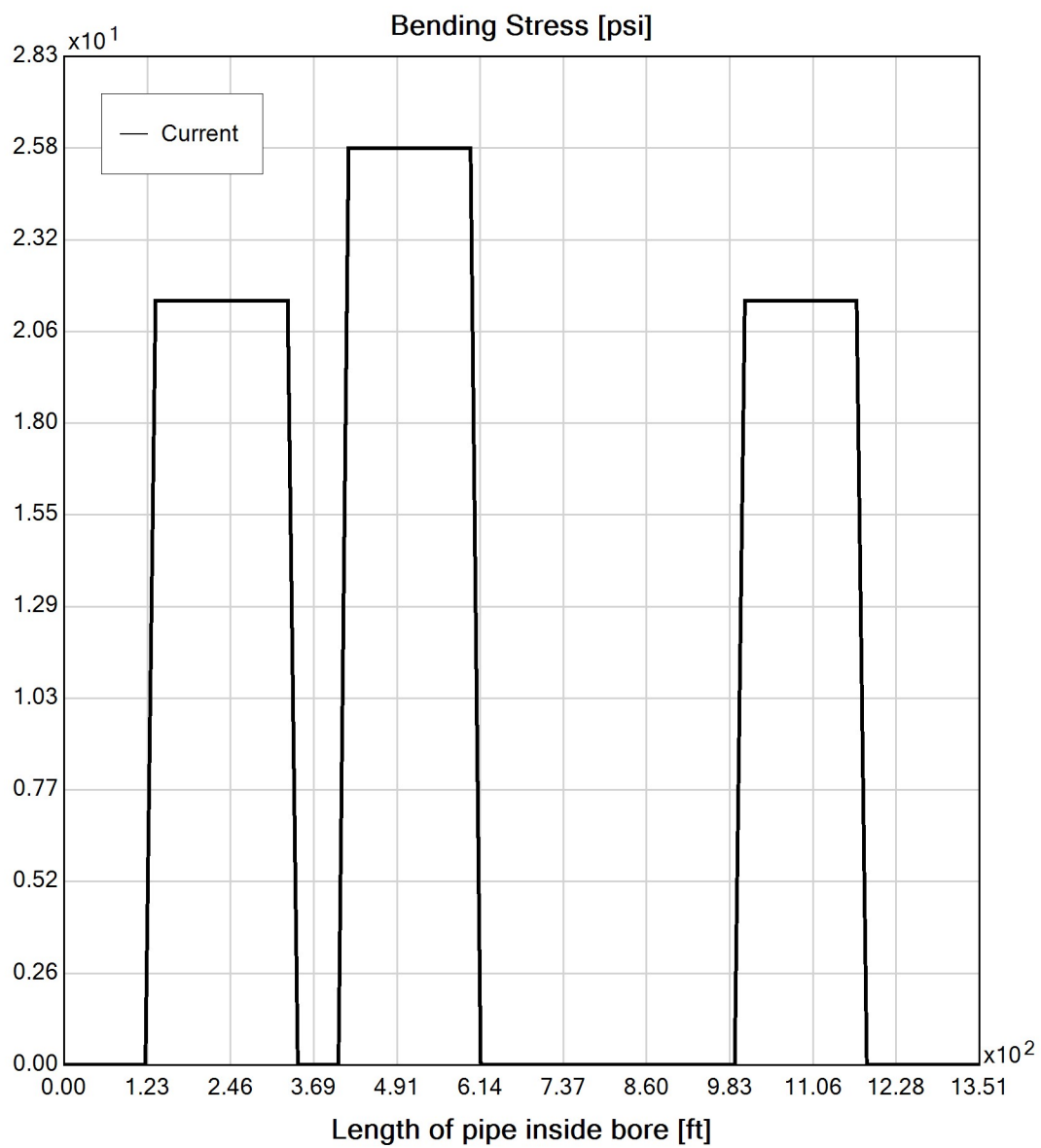
Effective Viscosity (cP): 417.7

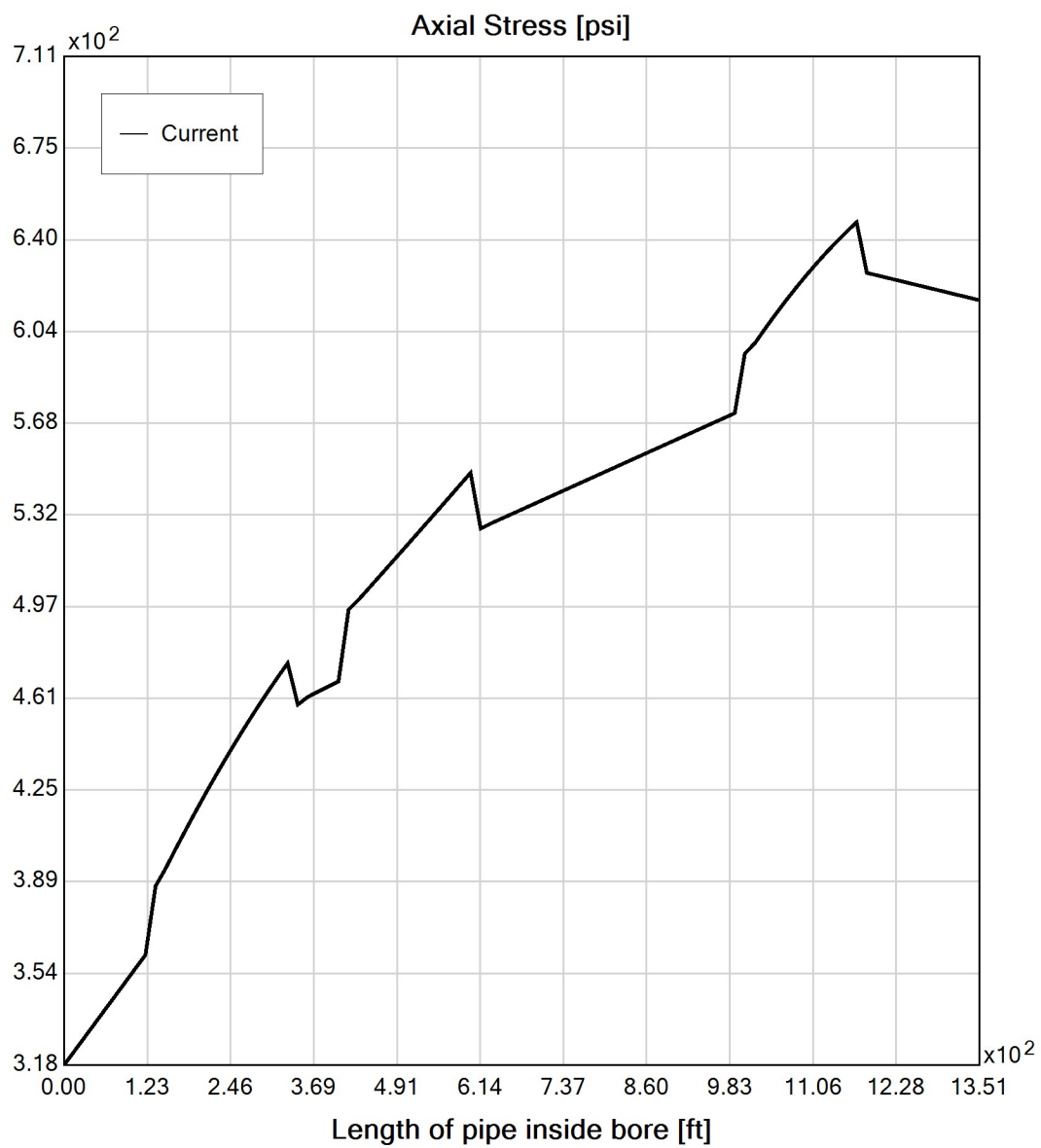
Virtual Site

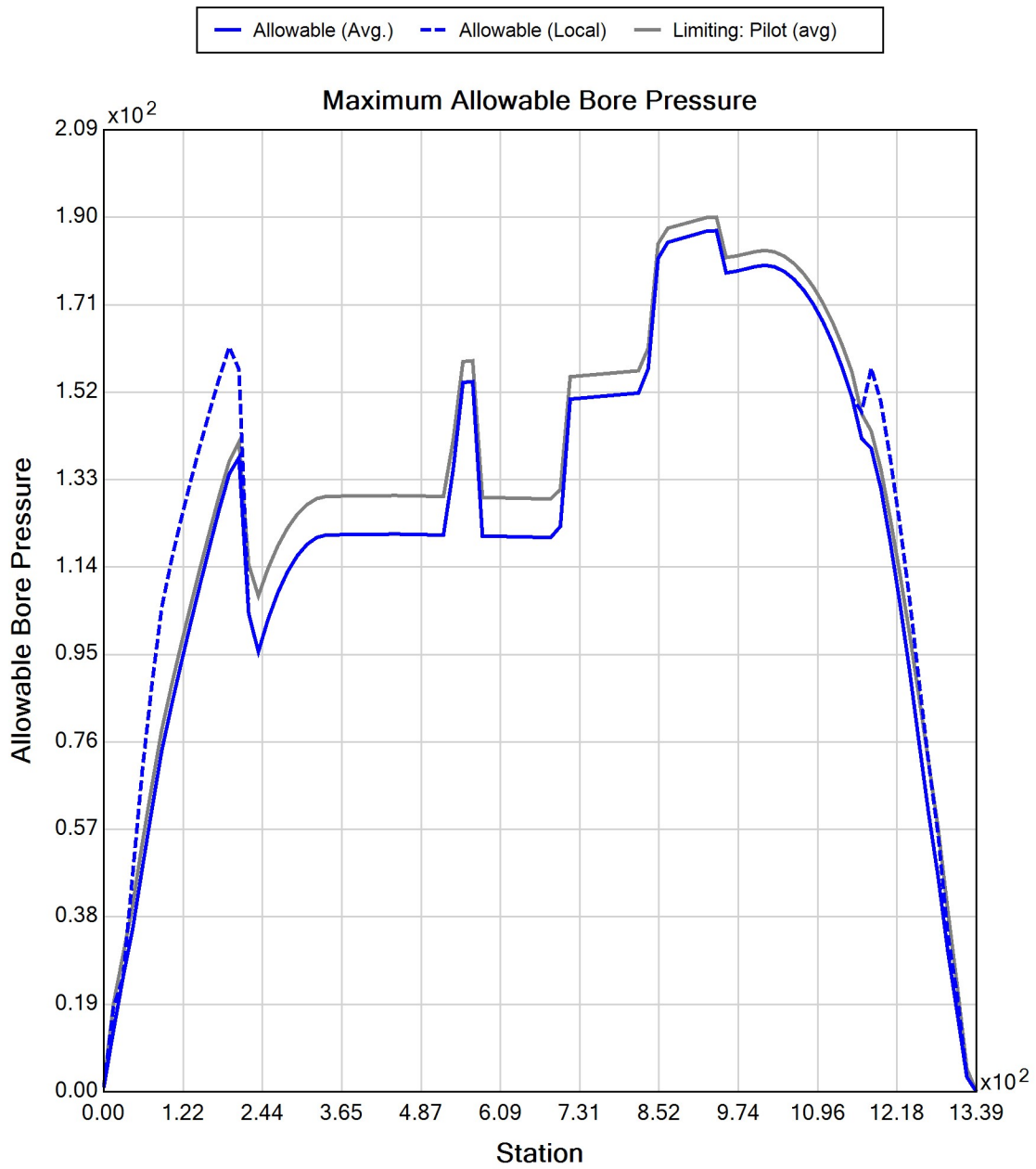


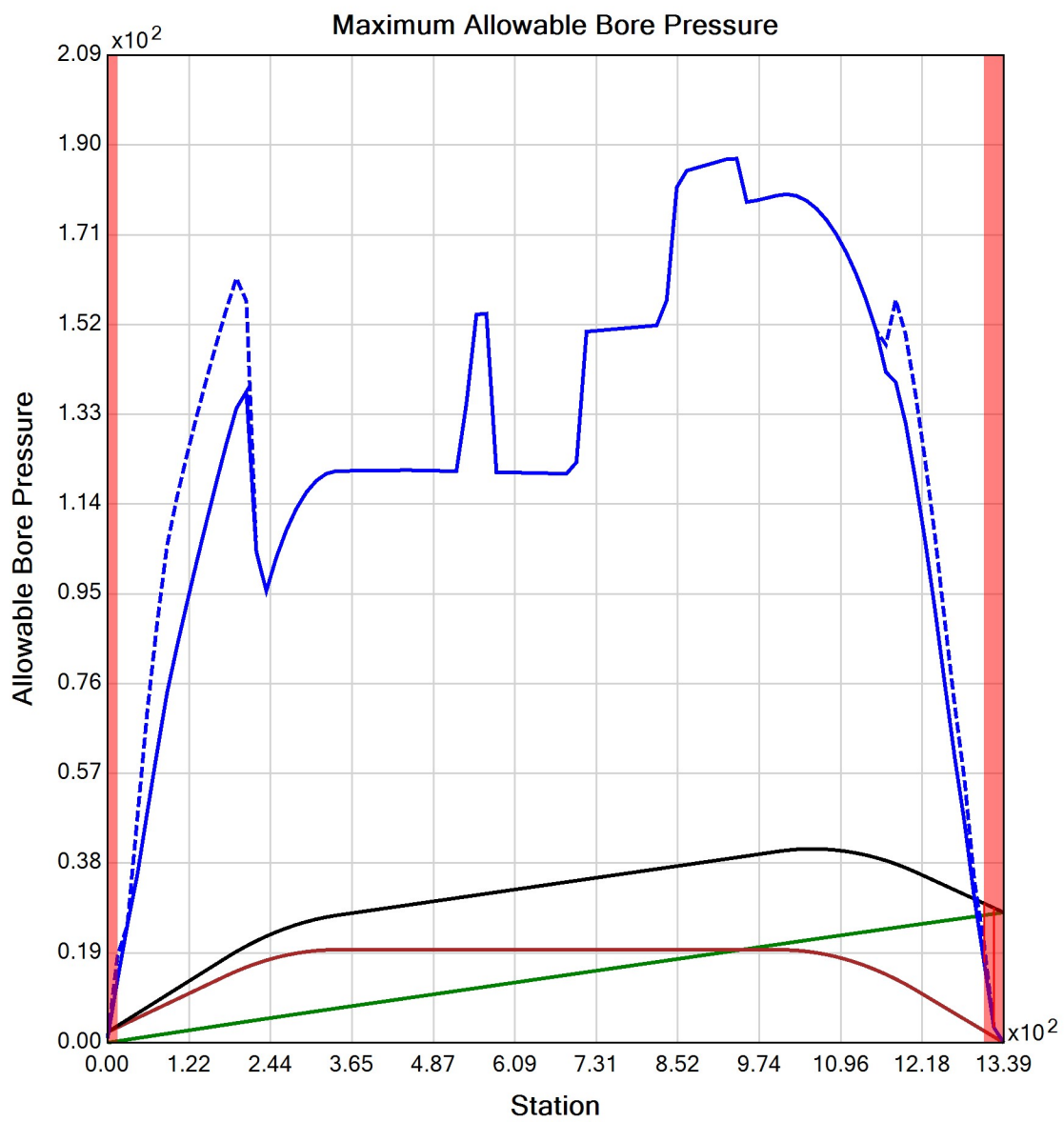














Generated Output



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Project Summary

General:	CHPE HDD 60 P4A Start Date: 06-07-2023 End Date: 06-07-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA
Designer:	MDB BCE Amherst, MA
Description:	HDD 60 Reversed Conduit 1 2-inch DR9 ALT

Input Summary

Start Coordinate	(0.00, 0.00, 231.00) ft
End Coordinate	(1335.00, 0.00, 235.00) ft
Project Length	1335.00 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: 1350.00 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	1.7	22.1
Water Pressure	12.8	11.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	14.5	33.9
Deflection		
Earth Load Deflection	0.600	6.005
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.629	6.035
Compressive Stress [psi]		
Compressive Wall Stress	65.3	152.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1206.5	1206.5
Pullback Stress [psi]	689.4	689.4
Pullback Strain	1.199E-2	1.199E-2
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	689.4	692.4
Tensile Strain	1.199E-2	1.212E-2

Net External Pressure = 28.0 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.629	7.5	11.9	OK
Unconstrained Collapse [psi]	26.8	131.2	4.9	OK
Compressive Wall Stress [psi]	65.3	1150.0	17.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	36.8	214.9	5.8	OK
Tensile Stress [psi]	692.4	1200.0	1.7	OK



Generated Output



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Project Summary

General: HDD #61
P4A
Start Date: 12-10-2021
End Date: 12-10-2021

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

Designer:
Description: HDD 61 10-inch DR 9

Input Summary

Start Coordinate	(0.00, 0.00, 233.50) ft
End Coordinate	(684.50, 0.00, 233.00) ft
Project Length	684.50 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: 4

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

From Assistant

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

Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

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

From Assistant

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

Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #3 USCS, 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]

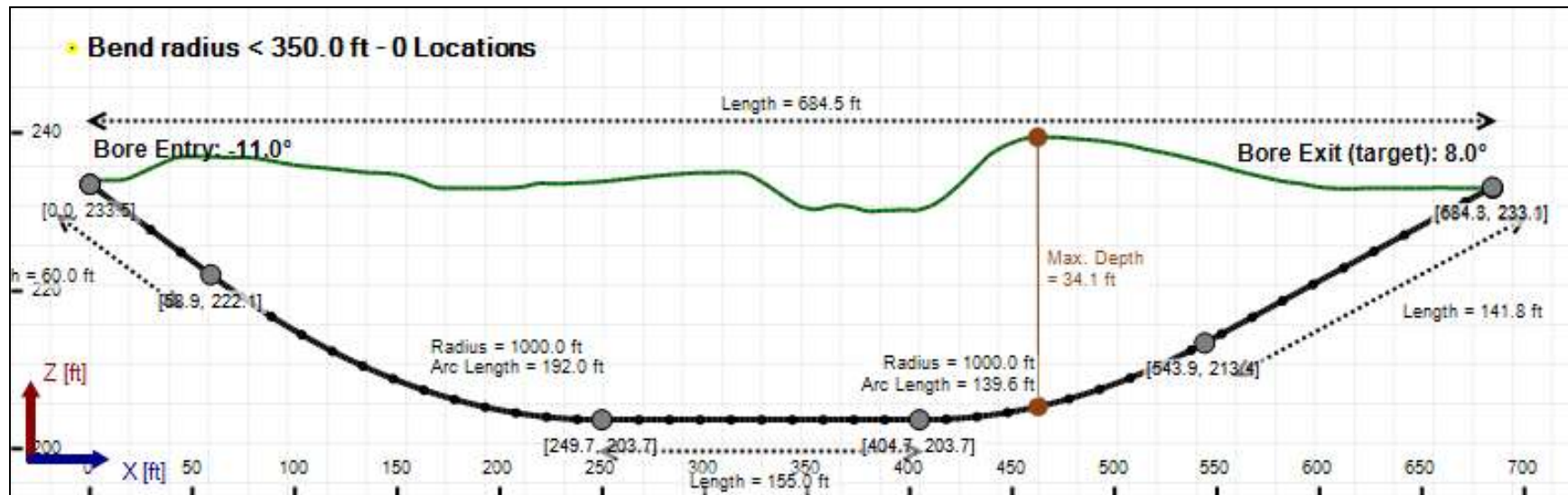
Soil Layer #4 USCS, Sand (S), SM

From Assistant

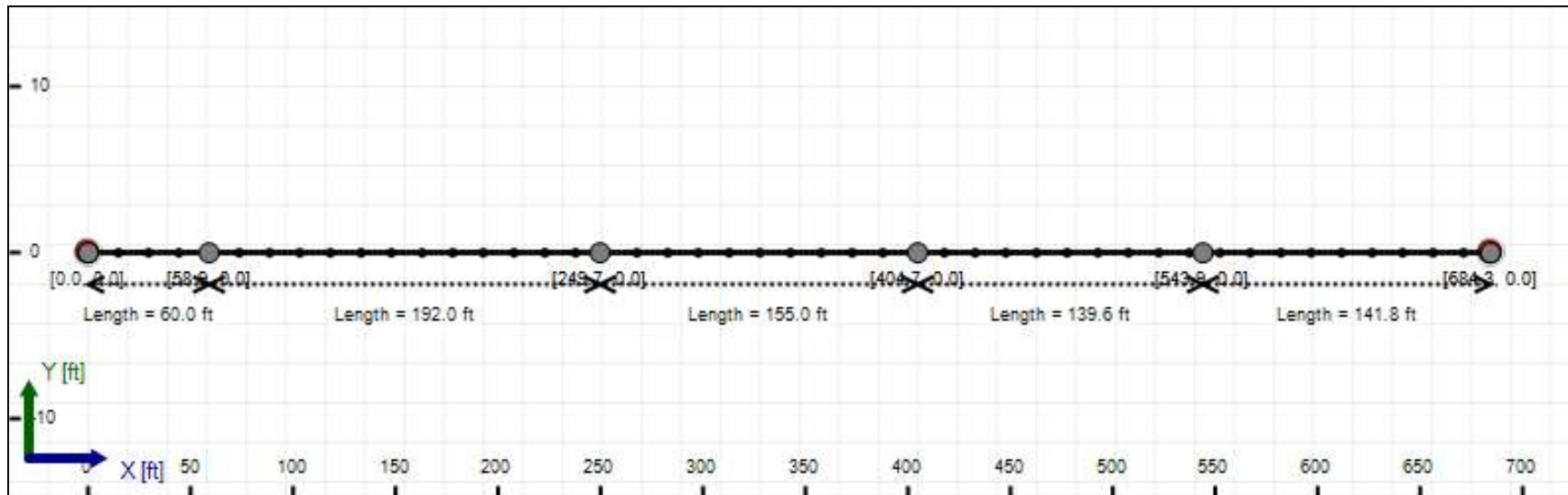
Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3]

Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

Bore Cross-Section View



Bore Plan View



Load Verifier Input Summary:

Pipe Application: Electrical Cable
Pipe Type: HDPE
Classification: IPS
Pipe OD: 10" (10.75")
Pipe DR: 9
Pipe Length: 690.00 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	5.9	26.1
Water Pressure	0.0	0.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	5.9	26.1
Deflection		
Earth Load Deflection	1.597	7.097
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.729	7.229
Compressive Stress [psi]		
Compressive Wall Stress	26.4	117.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	11519.5	11519.5
Pullback Stress [psi]	321.3	321.3
Pullback Strain	5.587E-3	5.587E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	321.3	345.8
Tensile Strain	5.587E-3	6.462E-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 [%]	1.729	7.5	4.3	OK
Unconstrained Collapse [psi]	19.4	119.1	6.1	OK
Compressive Wall Stress [psi]	26.4	1150.0	43.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	29.3	236.6	8.1	OK
Tensile Stress [psi]	345.8	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	92.554 psi	92.554 psi
1	8.00 in	12.00 in	92.466 psi	92.466 psi
2	12.00 in	16.13 in	92.338 psi	92.338 psi

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

Estimated Circulating Pressure Summary

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

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

Drill Fluid Density: 68.700 lb/ft³

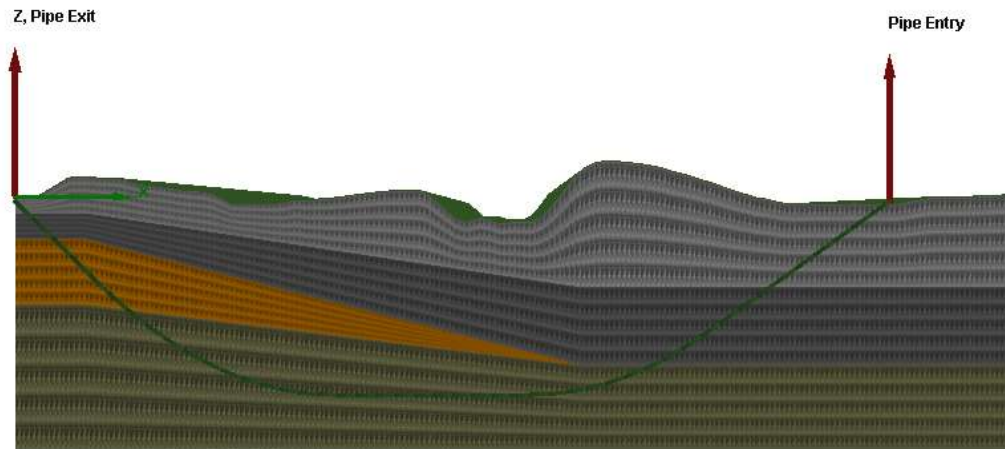
Rheological model: Bingham-Plastic

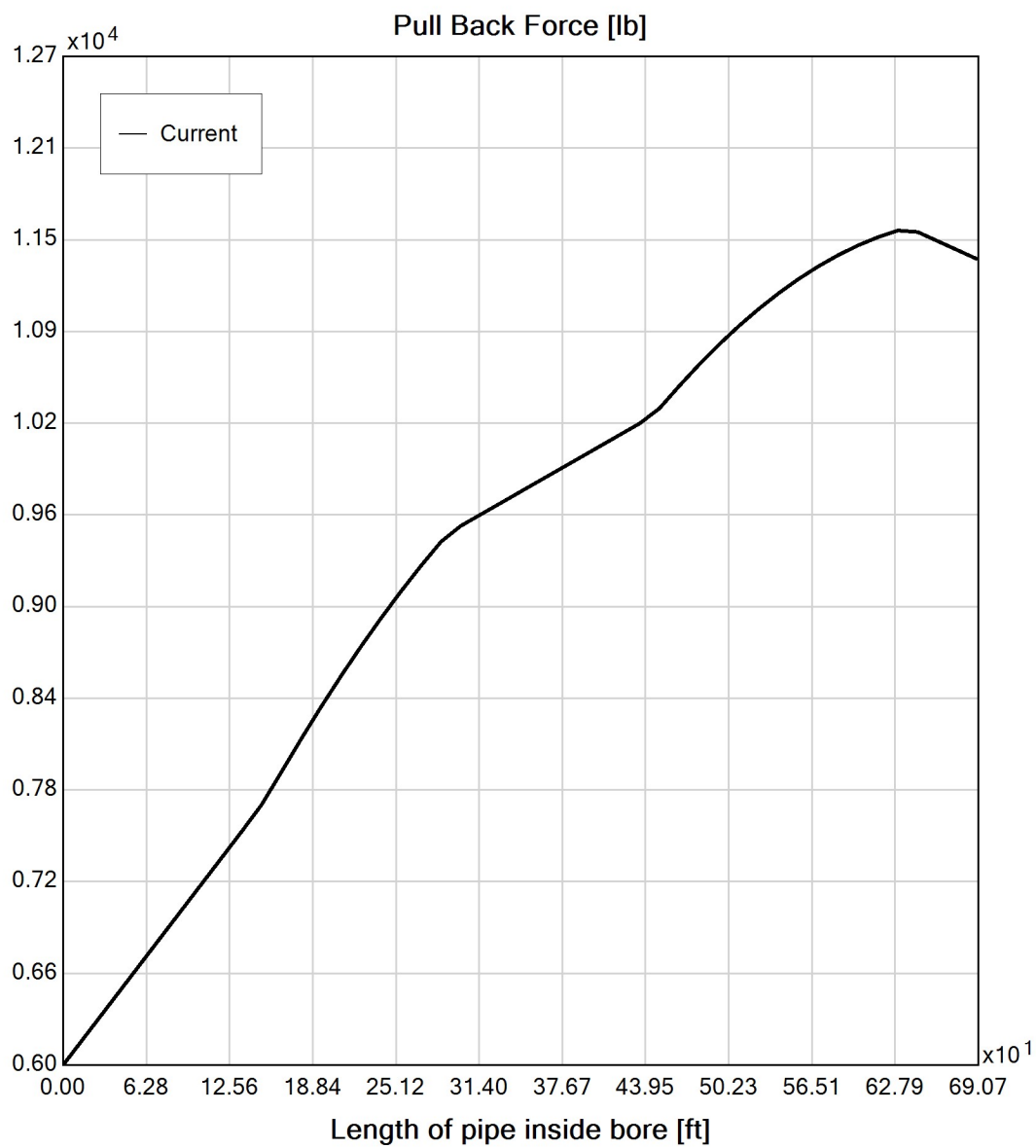
Plastic Viscosity (PV): 25.53

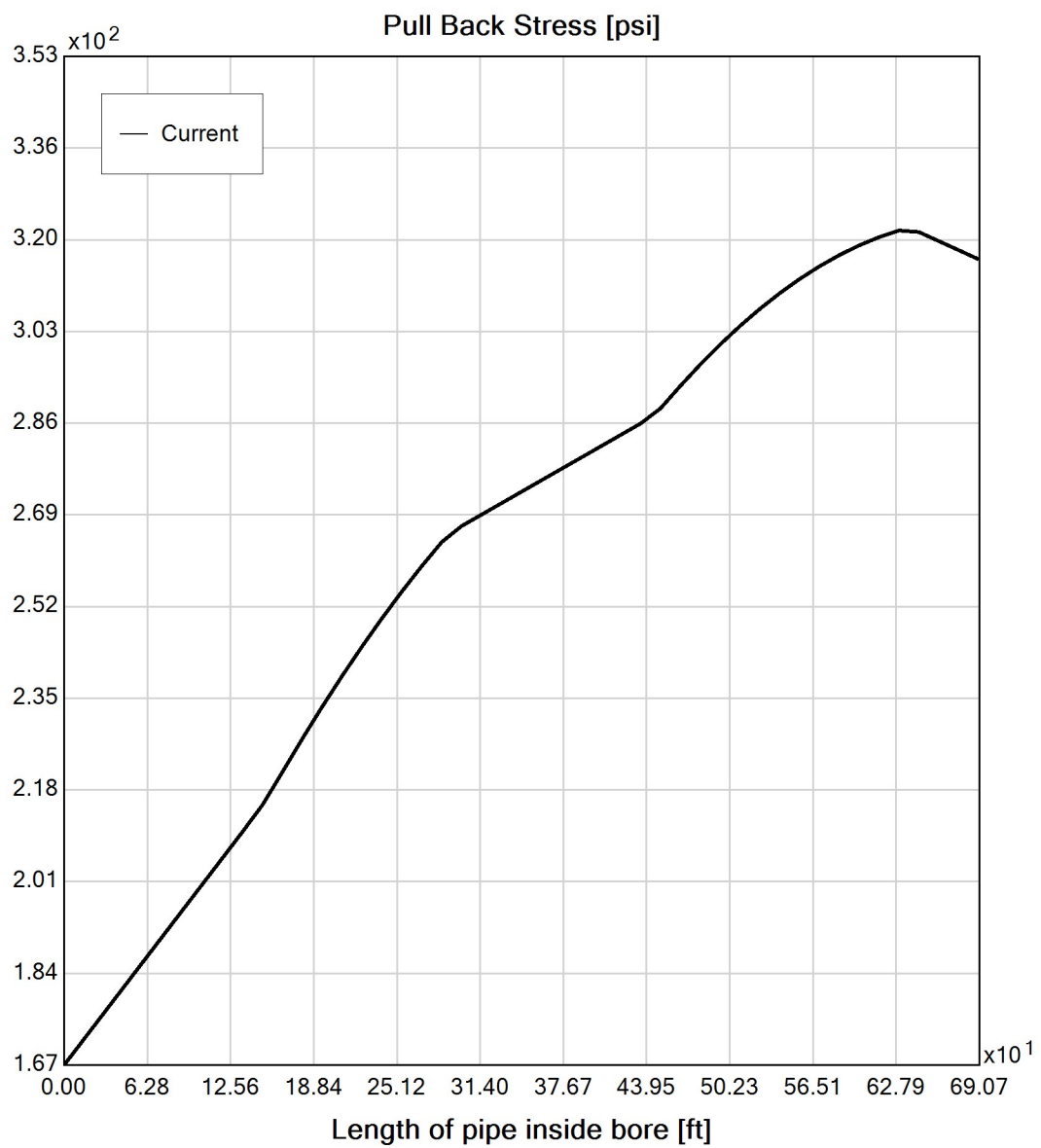
Yield Point (YP): 16.49

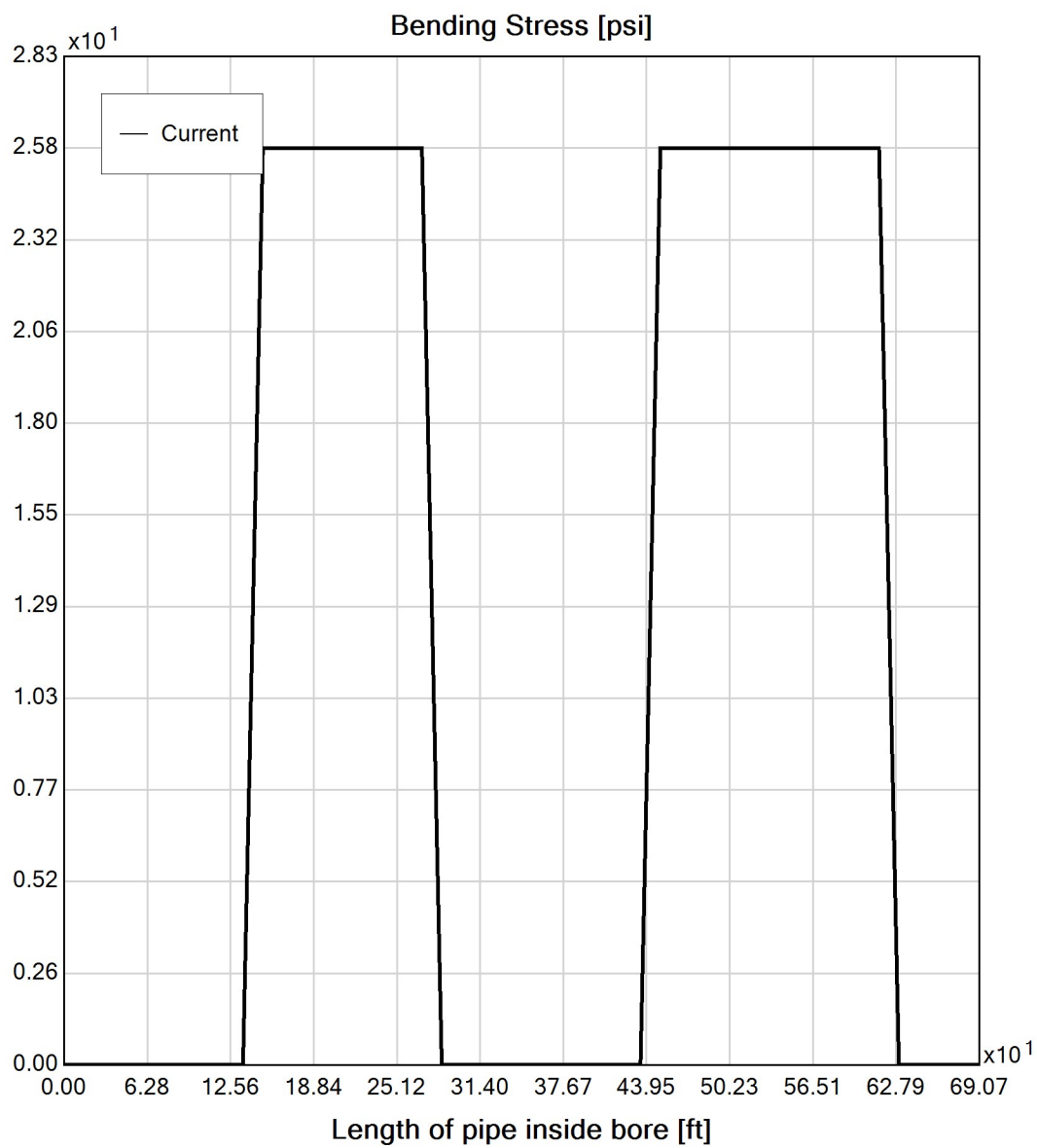
Effective Viscosity (cP): 1202.0

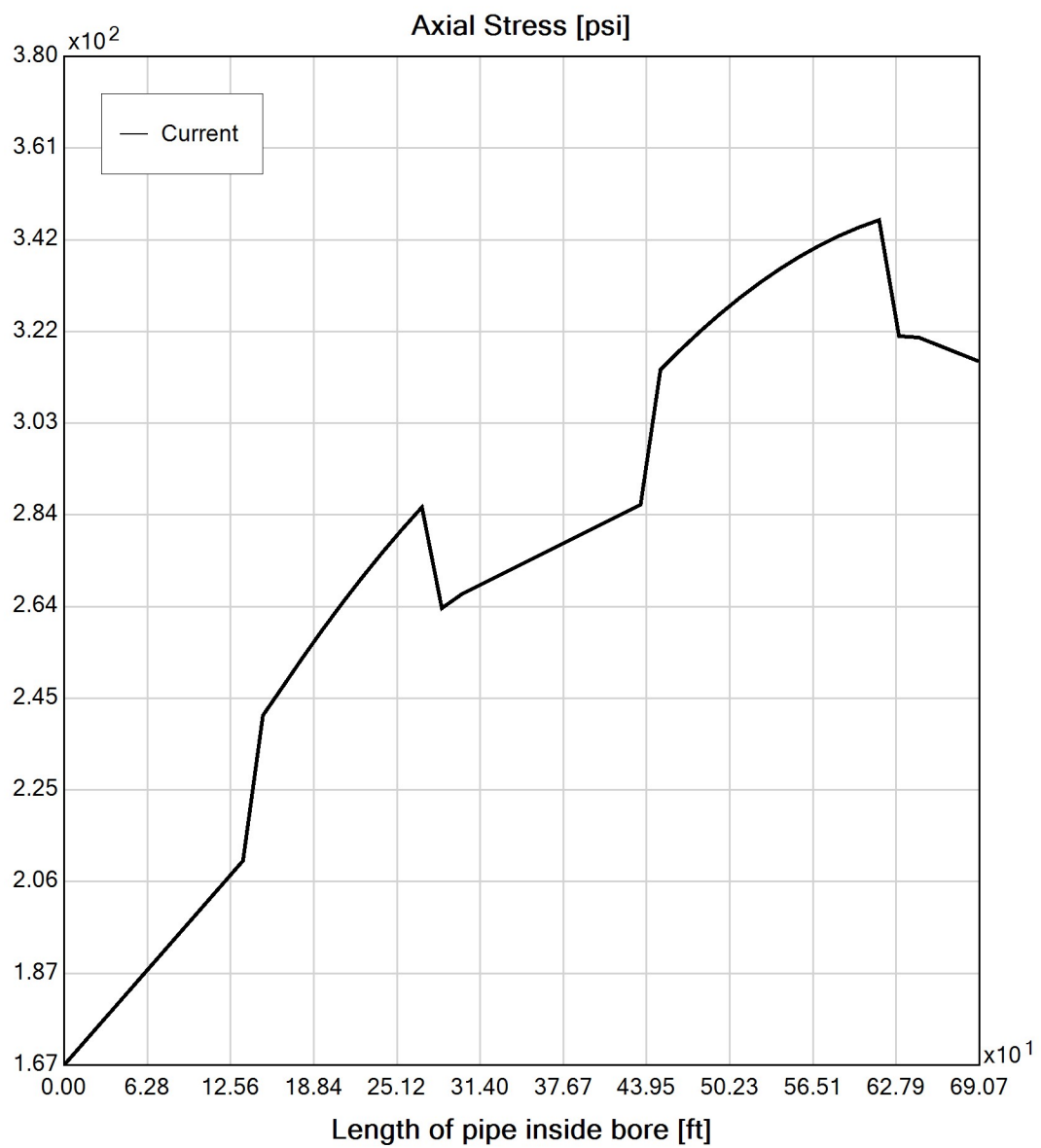
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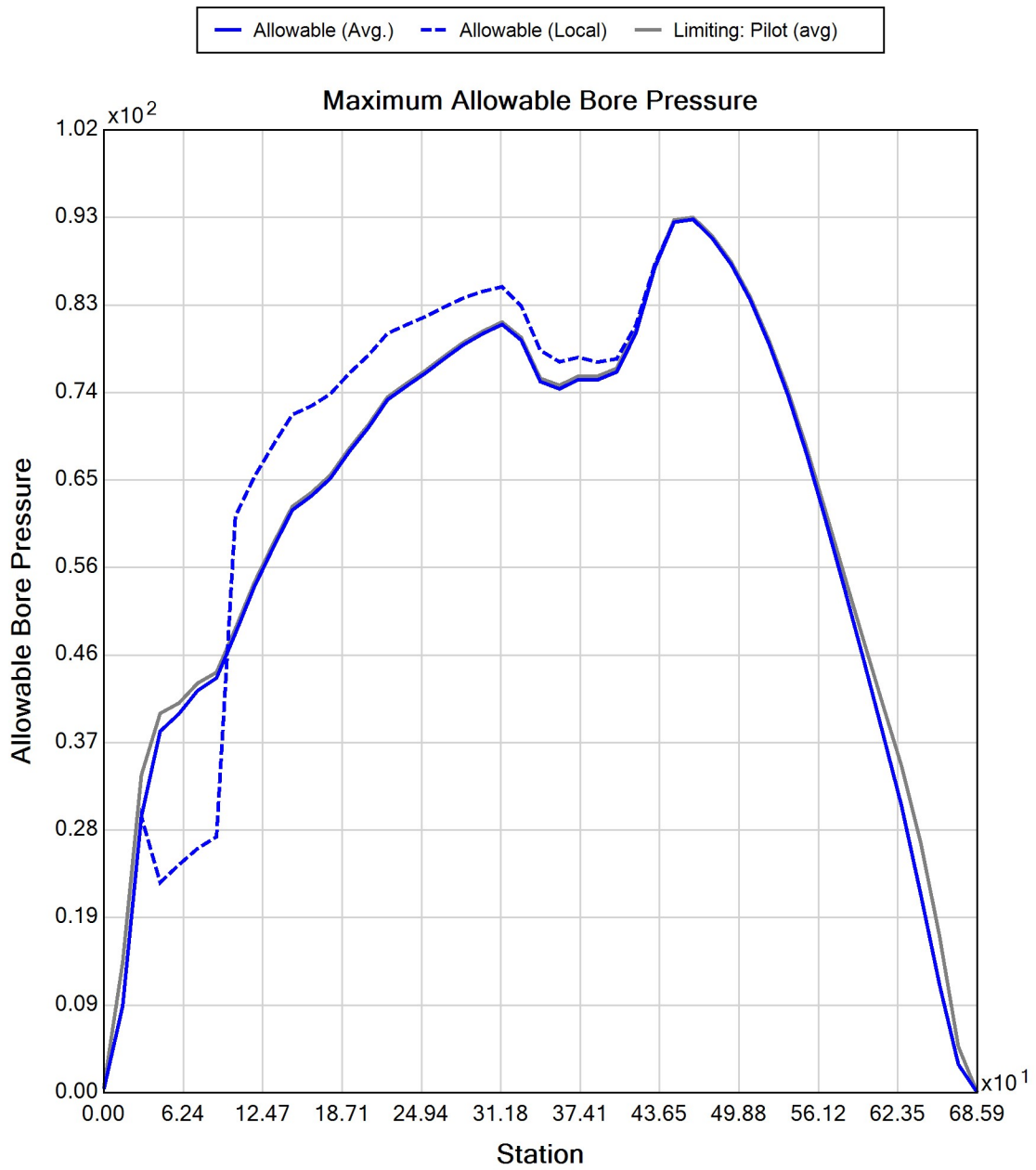


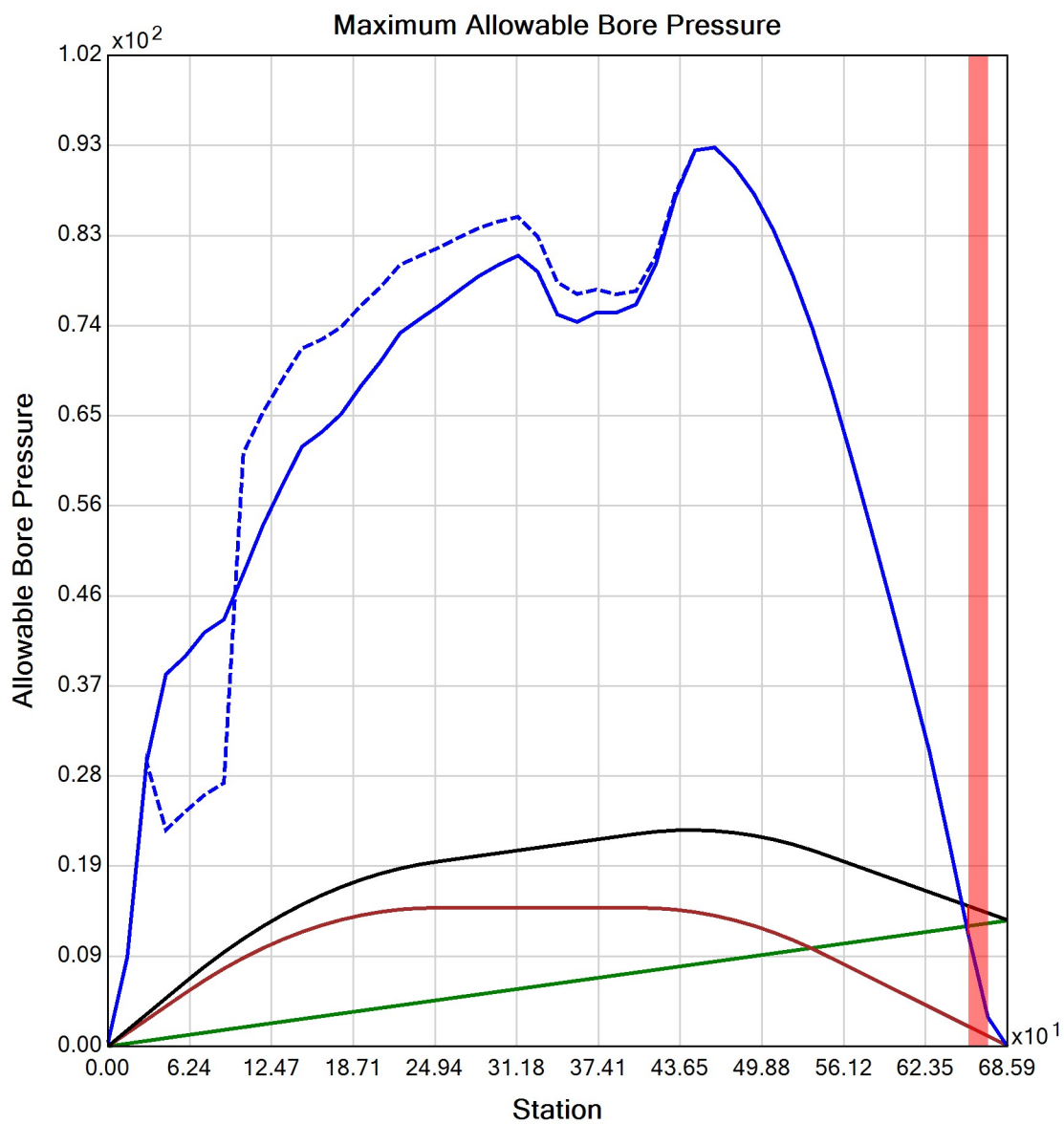














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P4A
Start Date: 12-10-2021
End Date: 12-10-2021

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

Designer:
Description: HDD 61 2-inch DR 9

Input Summary

Start Coordinate	(0.00, 0.00, 233.50) ft
End Coordinate	(684.50, 0.00, 233.00) ft
Project Length	684.50 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: 690.00 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	2.3	26.1
Water Pressure	0.0	0.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	2.3	26.1
Deflection		
Earth Load Deflection	0.639	7.097
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.668	7.126
Compressive Stress [psi]		
Compressive Wall Stress	10.6	117.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	671.9	671.9
Pullback Stress [psi]	383.9	383.9
Pullback Strain	6.676E-3	6.676E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	383.9	388.3
Tensile Strain	6.676E-3	6.853E-3

Net External Pressure = 17.4 [psi]

Buoyant Deflection = 0.0

Hydrokinetic Force = 137.3 lb

In-service Analysis

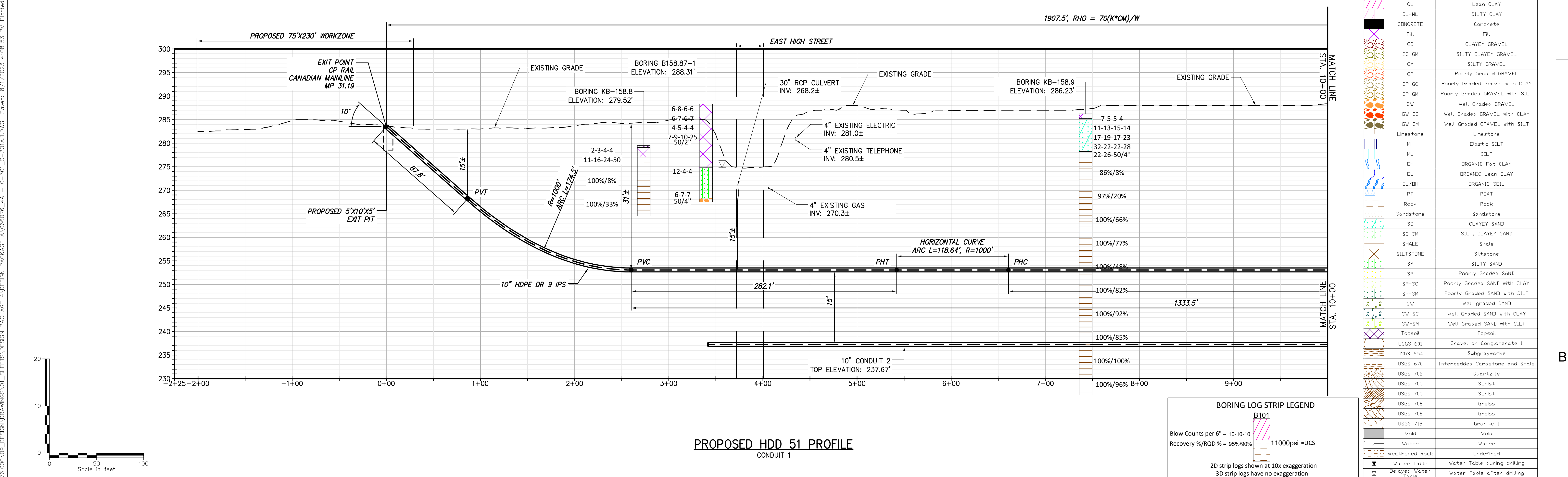
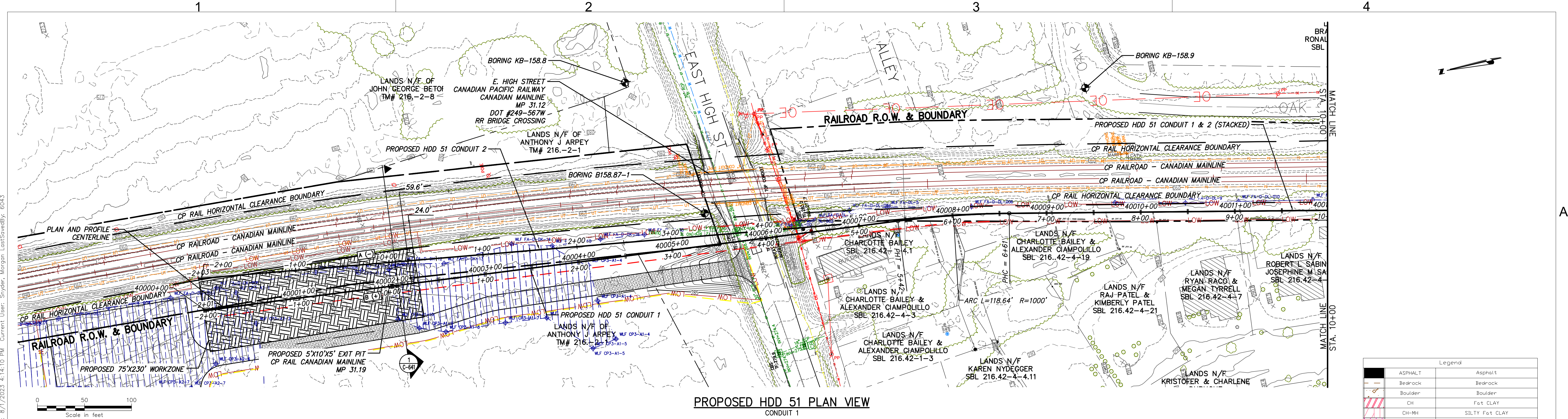
	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.668	7.5	11.2	OK
Unconstrained Collapse [psi]	19.4	130.3	6.7	OK
Compressive Wall Stress [psi]	10.6	1150.0	108.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	29.3	234.9	8.0	OK
Tensile Stress [psi]	388.3	1200.0	3.1	OK

Appendix E

HDD Design Drawings



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

Champlain Hudson Power Express

Kiewit

CHA

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

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0	08/03/2023	ISSUED FOR CONSTRUCTION SUBMISSION	SPB	JEO
No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP

CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
PLAN AND PROFILE - HDD 51, CONDUIT 1

KIEWIT PROJECT NO. 21162
CHA PROJECT NO. 068076
DRAWING NO. C-301

DRAWN BY: JAS
DESIGNED BY: JAS
APPROVED BY: JEO

SCALE AS NOTED
REV. NO. 1

DATE 8/03/2023
SH.NO.

File: V:\PROJECTS\ANY\6\066076_00\09\DESIGN\DRAWINGS\01_SHEETS\DESIGN PACKAGE 4\DESIGN PACKAGE 4\066076_4A - C-301_C-301A1.DWG Saved: 8/7/2023 4:08:53 PM Plotted: 8/7/2023 4:15:37 PM Current User: Snyder, Morgan LastSavedBy: 6043



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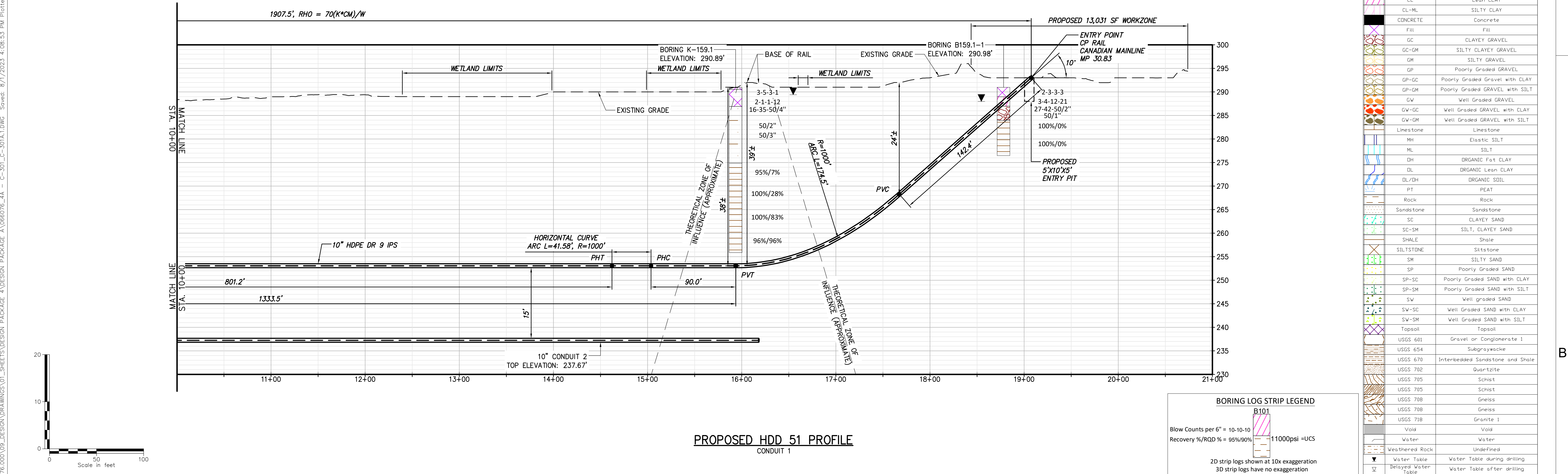
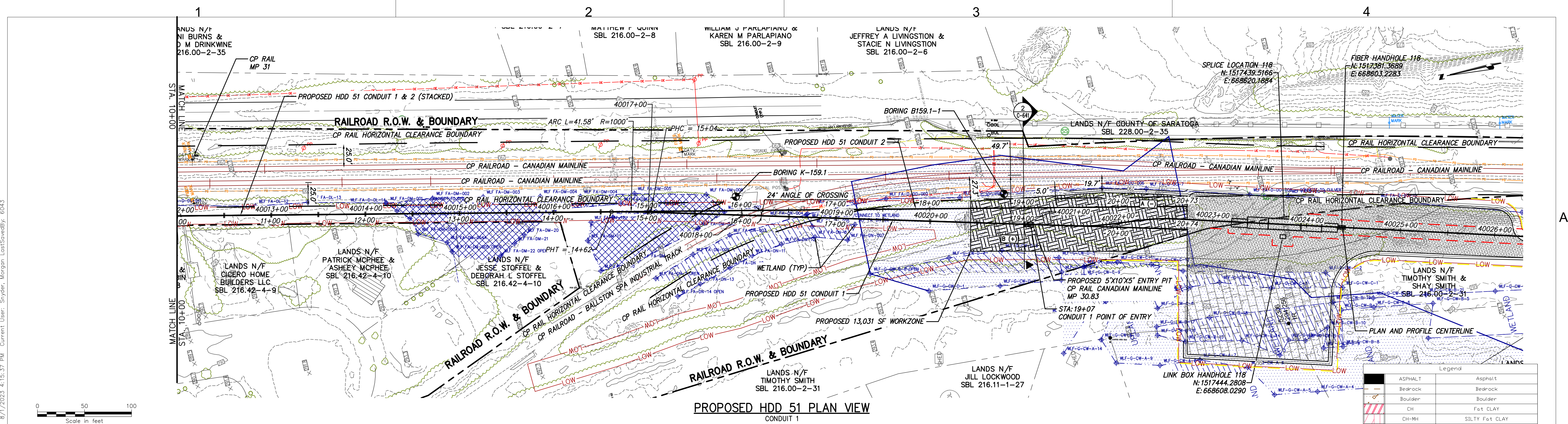
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PLAN AND PROFILE - HDD 51, CONDUIT 1

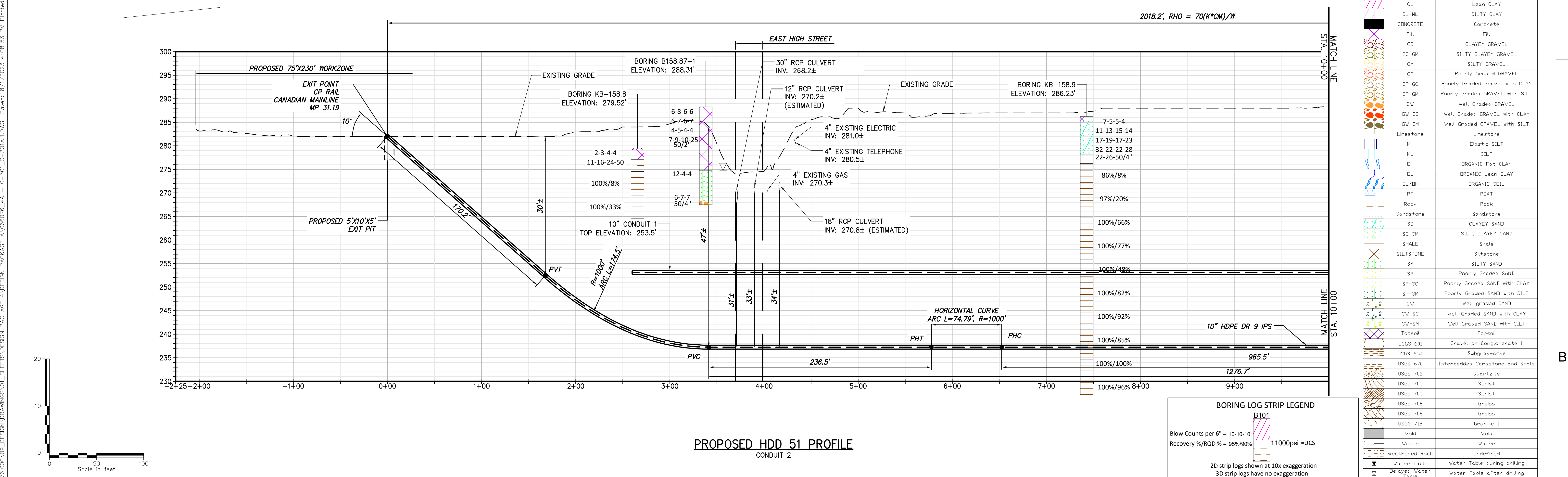
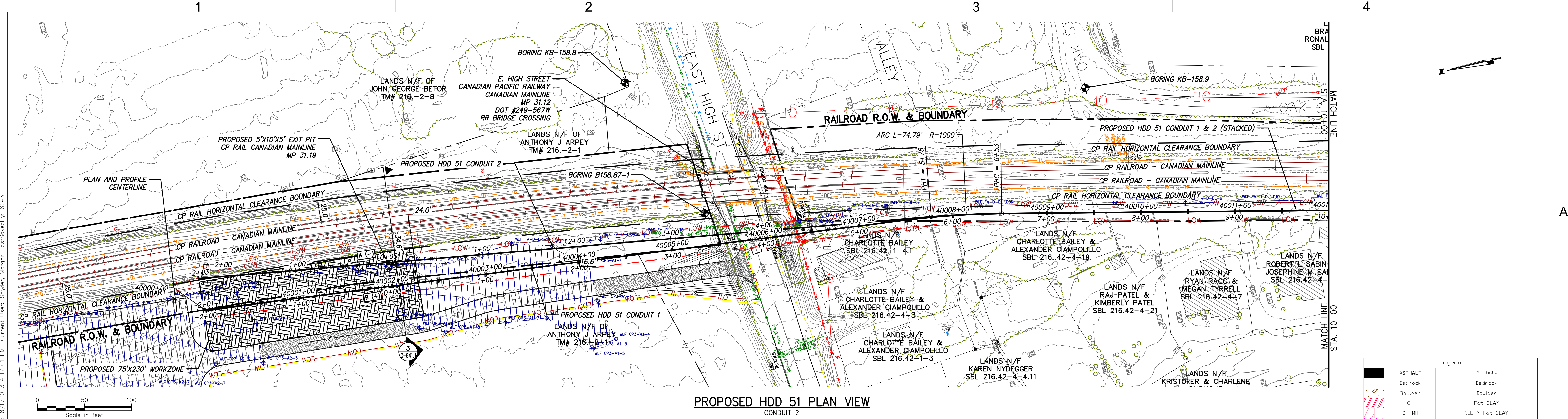
DRAWN BY:	JAS	DESIGNED BY:	JAS	APPROVED BY:	JEO	SCALE	AS NOTED	DATE	8/03/2023
REV. NO.	1	SH.NO.							




KIEWIT PROJECT NO.
21162
CHA PROJECT NO.
066076
DRAWING NO.

C-301.1



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





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Albany, NY 12205-0269
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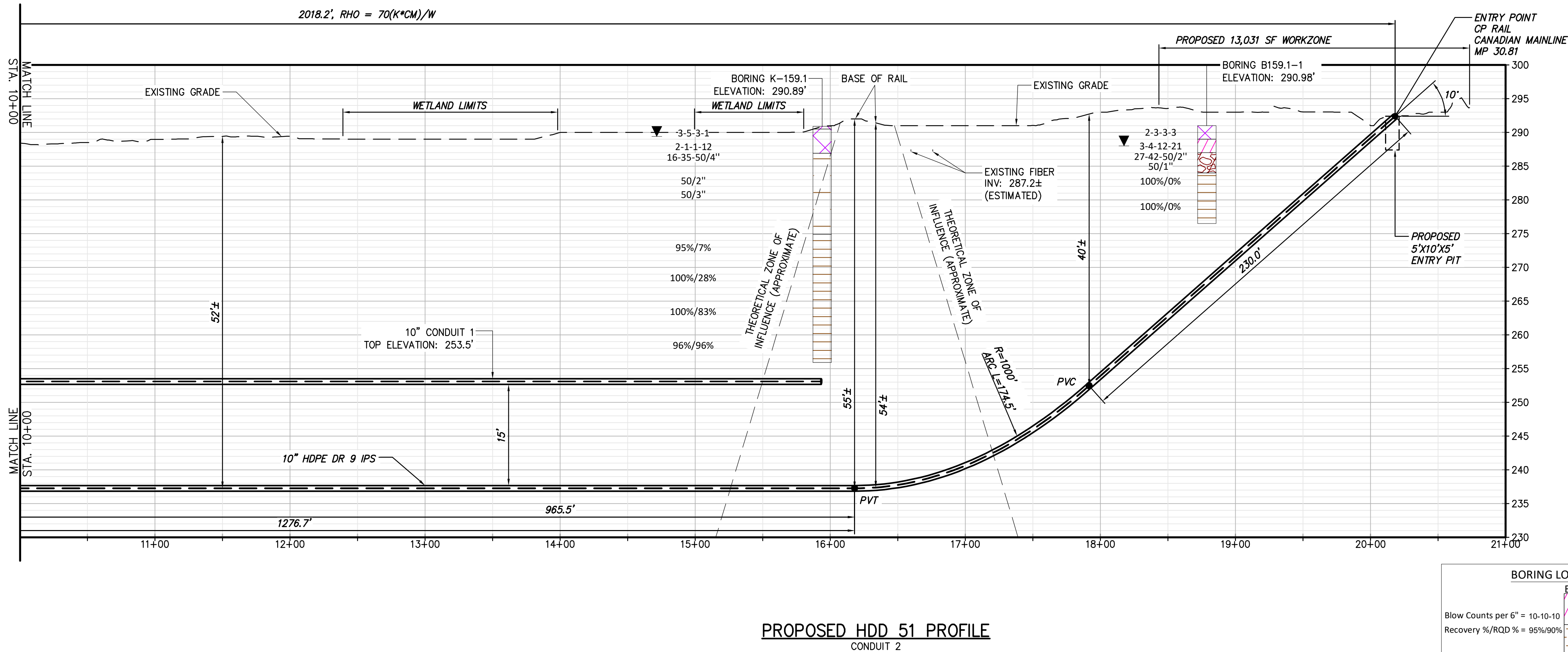
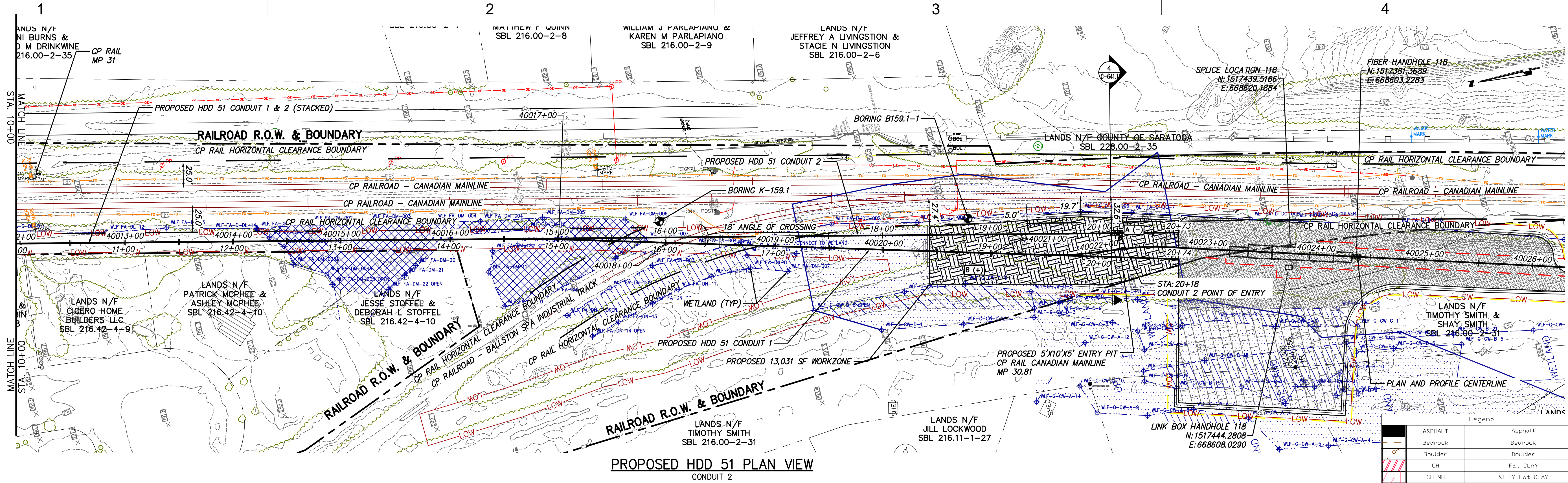
No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP
0	08/03/2023	ISSUED FOR CONSTRUCTION SUBMISSION	SPB	JEO

DRAWN BY: JAS DESIGNED BY: JAS APPROVED BY: JEO SCALE AS NOTED DATE 8/03/2023

CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
PLAN AND PROFILE - HDD 51, CONDUIT 2

KIEWIT PROJECT NO. 21162
CHA PROJECT NO. 086076
DRAWING NO. C-301A

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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
	Poorly Graded GRAVEL with SILT
	Well Graded GRAVEL
	Well Graded GRAVEL with CLAY
	Well Graded GRAVEL with SILT
	Limestone
	Elastic SILT
	SILT
	ORGANIC Fat CLAY
	ORGANIC Lean CLAY
	ORGANIC SOIL
	PEAT
	Rock
	Sandstone
	CLAYEY SAND
	SILT, CLAYEY SAND
	Shale
	Siltstone
	SILTY SAND
	Poorly Graded SAND
	Poorly Graded SAND with CLAY
	Poorly Graded SAND with SILT
	Well graded SAND
	Well Graded SAND with CLAY
	Well Graded SAND with SILT
	Topsoil
	Gravel or Conglomerate 1
	Subgraywacke
	Interbedded Sandstone and Shale
	Quartzite
	Schist
	Schist
	Gneiss
	Gneiss
	Granite 1
	Void
	Water
	Undefined
	Water Table during drilling
	Water Table after drilling

CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
PLAN AND PROFILE - HDD 51, CONDUIT 2

KIEWIT PROJECT NO.
21162
CHA PROJECT NO.
066076
DRAWING NO.

C-301A.1

0	08/03/2023	ISSUED FOR CONSTRUCTION SUBMISSION	SPB	JEO
No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP

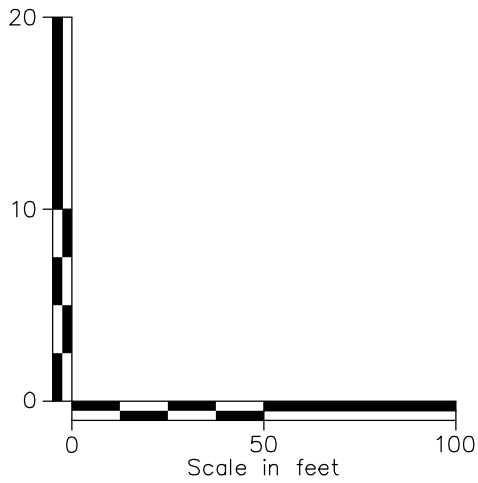
DRAWN BY:	JAS	DESIGNED BY:	JAS	APPROVED BY:	JEO	SCALE	AS NOTED	DATE	8/03/2023
						REV. NO.	X	SH.NO.	




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No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP

DRAWN BY:	JAS	DESIGNED BY:	JAS	APPROVED BY:	JEO	SCALE	AS NOTED	DATE	8/03/2023
						REV. NO.	X	SH.NO.	



BORING LOG STRIP LEGEND



B101

11000psi = UCS

Blow Counts per 6" = 10-10-10

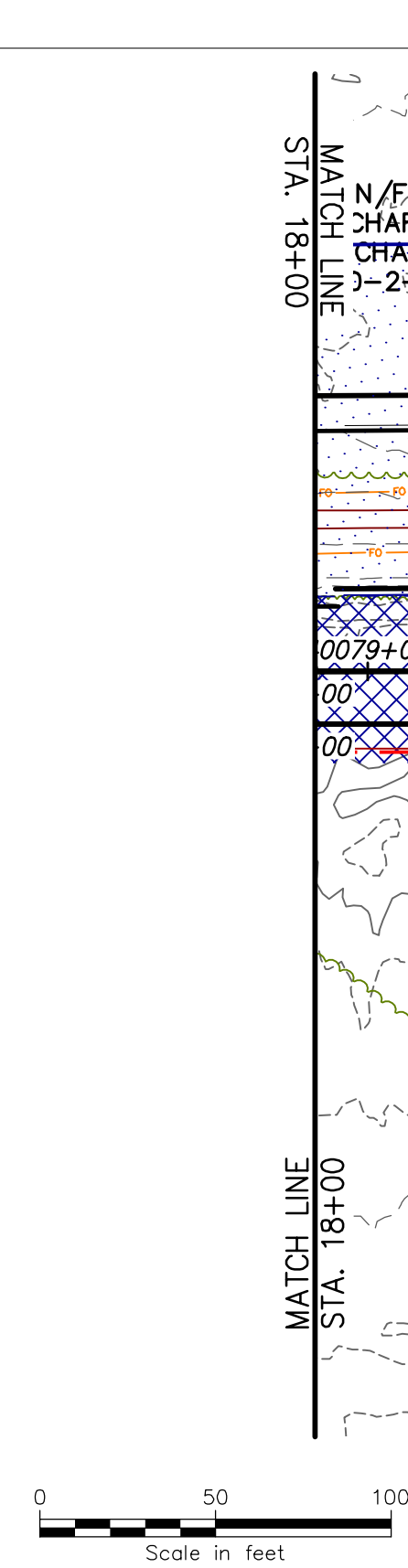
Recovery %/RQD % = 95%/90%

2D strip logs shown at 10x exaggeration
3D strip logs have no exaggeration

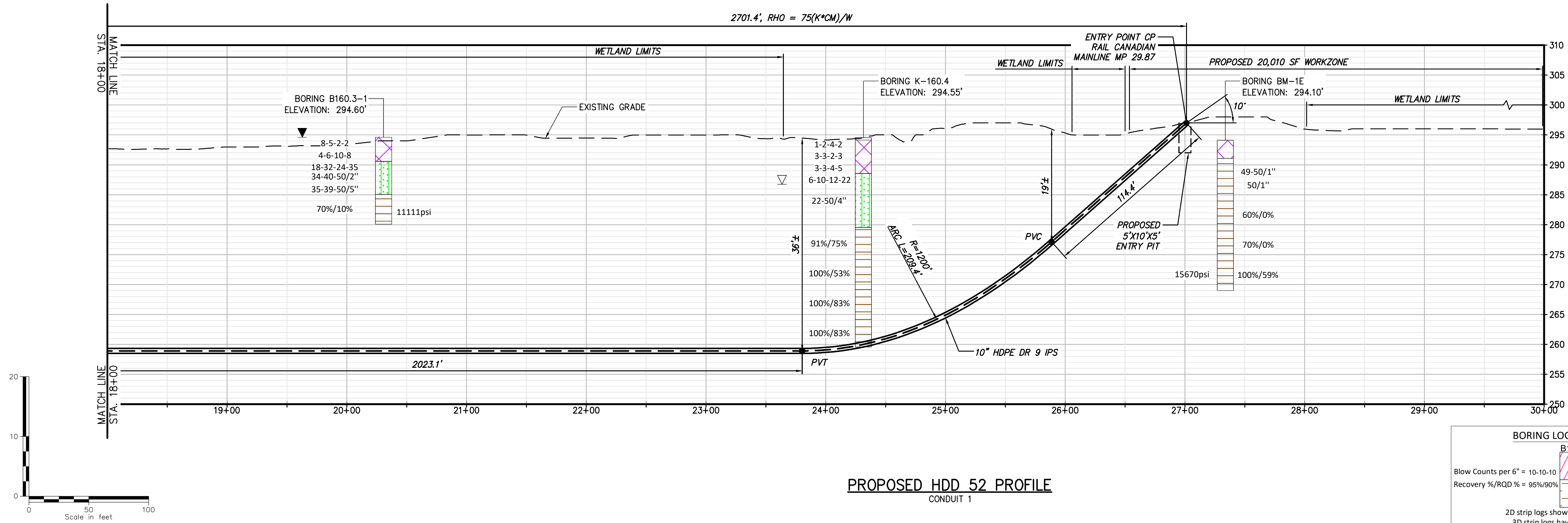
Legend		
	ASPHALT	Asphalt
	Bedrock	Bedrock
	Boulder	Boulder
	CH	Fat CLAY
	CH-MH	SILTY Fat CLAY
	CL	Lean CLAY
	CL-ML	SILTY CLAY
	CDNCRETE	Concrete
	Fill	Fill
	GC	CLAYEY GRAVEL
	GC-QM	SILTY CLAYEY GRAVEL
	GM	SILTY GRAVEL
	GP	Poorly Graded GRAVEL
	GP-GC	Poorly Graded Gravel with CLAY
	GP-QM	Poorly Graded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

DRAWN BY: CJL	DESIGNED BY: CJL	APPROVED BY: JEO	SCALE	AS NOTED	DATE	8/03/2017
			REV. NO.	X	SH. NO.	

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PROPOSED HDD 52 PLAN VIEW
CONDUIT 1



PROPOSED HDD 52 PROFILE
CONDUIT 1

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

BORING LOG STRIP LEGEND

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



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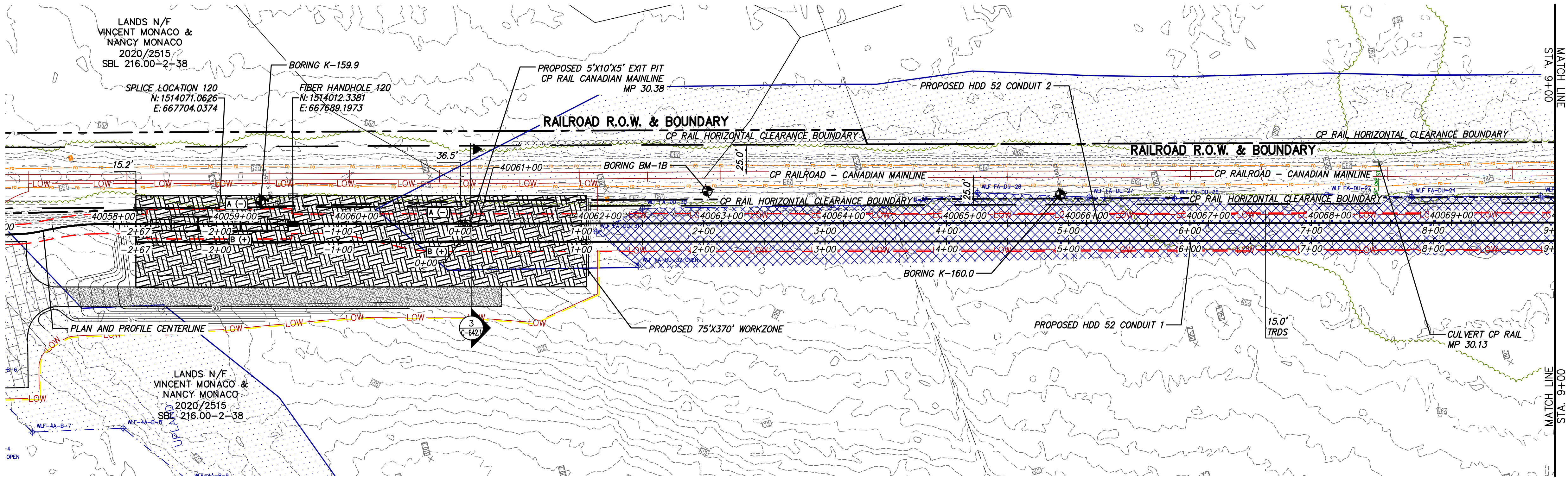
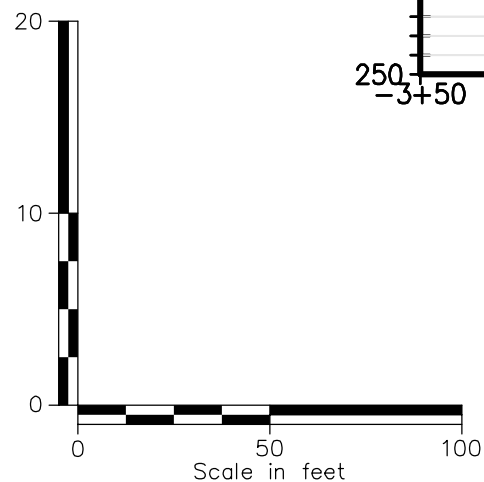
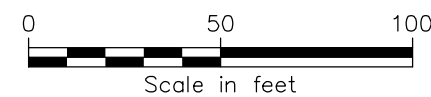
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No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP

CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
PLAN AND PROFILE - HDD 52, CONDUIT 1

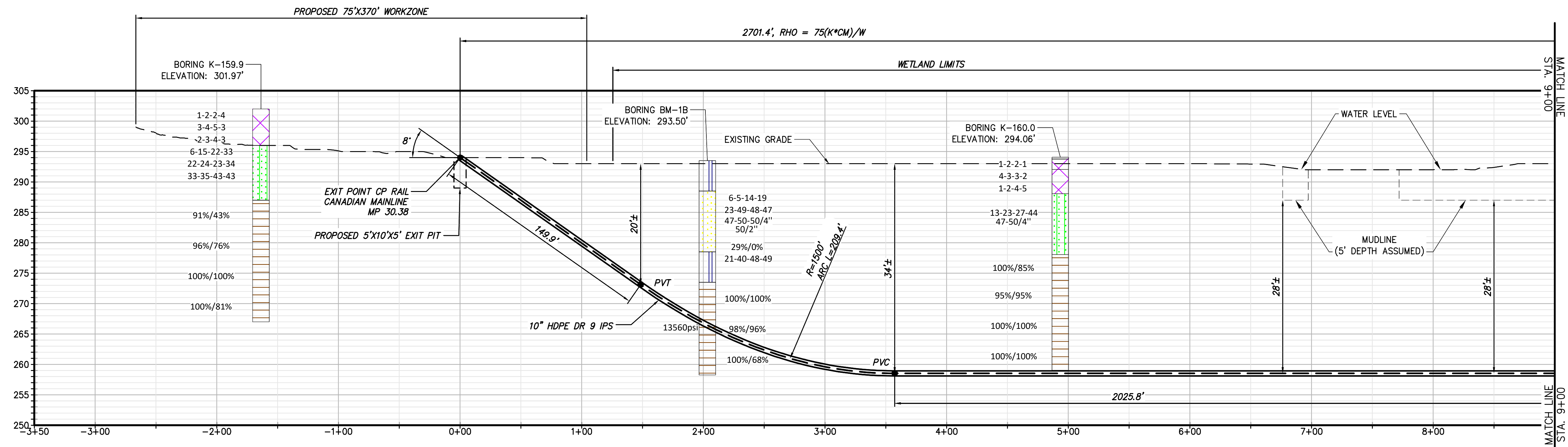
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KIEWIT PROJECT NO. 21162
CHA PROJECT NO. 066076
DRAWING NO. C-302.2

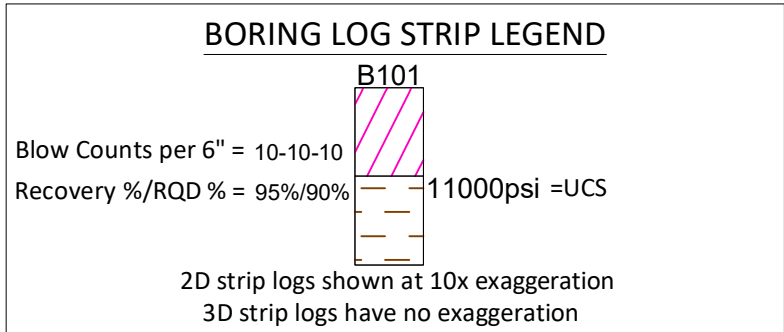
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PROPOSED HDD 52 PLAN VIEW
CONDUIT 2



PROPOSED HDD 52 PROFILE
CONDUIT 2



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



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No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP

CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
PLAN AND PROFILE - HDD 52, CONDUIT 2

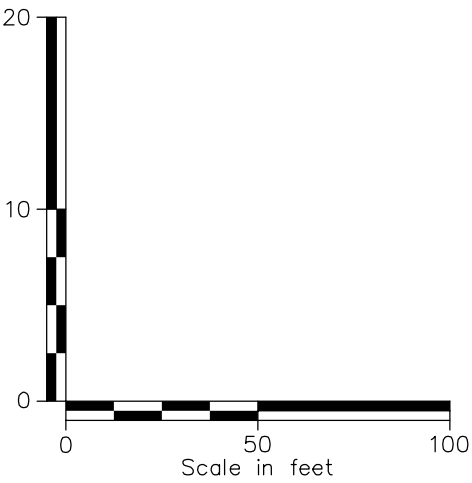
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REV. NO.	X	SH.NO.							

KIEWIT PROJECT NO.
21162
CHA PROJECT NO.
066076
DRAWING NO.


C-302A



A scale bar labeled "Scale in feet" with markings at 0, 50, and 100 feet. The bar is divided into segments, with the first 50 feet marked by alternating black and white squares, and the remaining 50 feet marked by solid black squares.



BORING LOG STRIP LEGEND



Blow Counts per 6" = 10-10-10

Recovery %/RQD % = 95%/90%

2D strip logs shown at 10x exaggeration

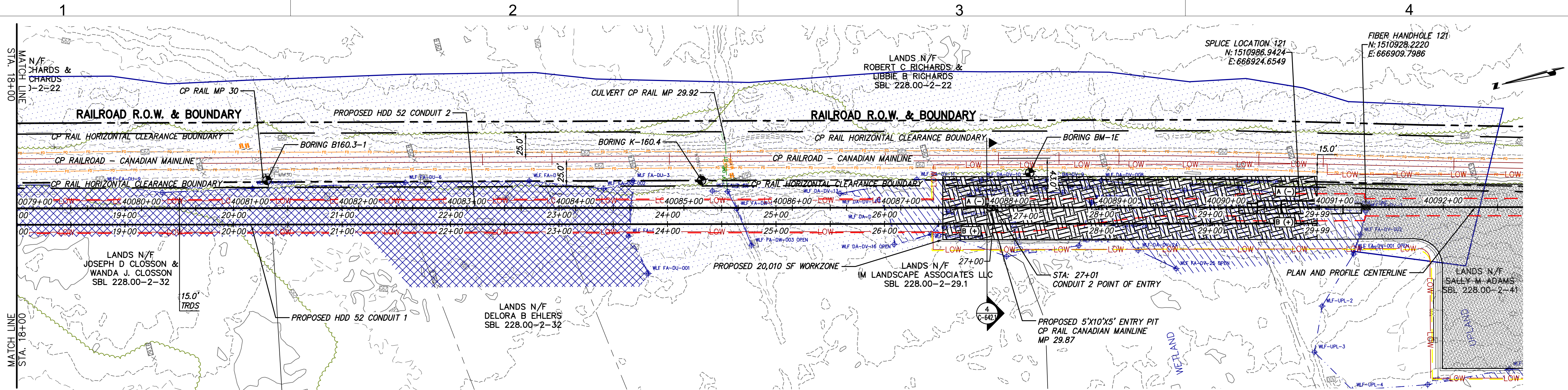
3D strip logs have no exaggeration

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

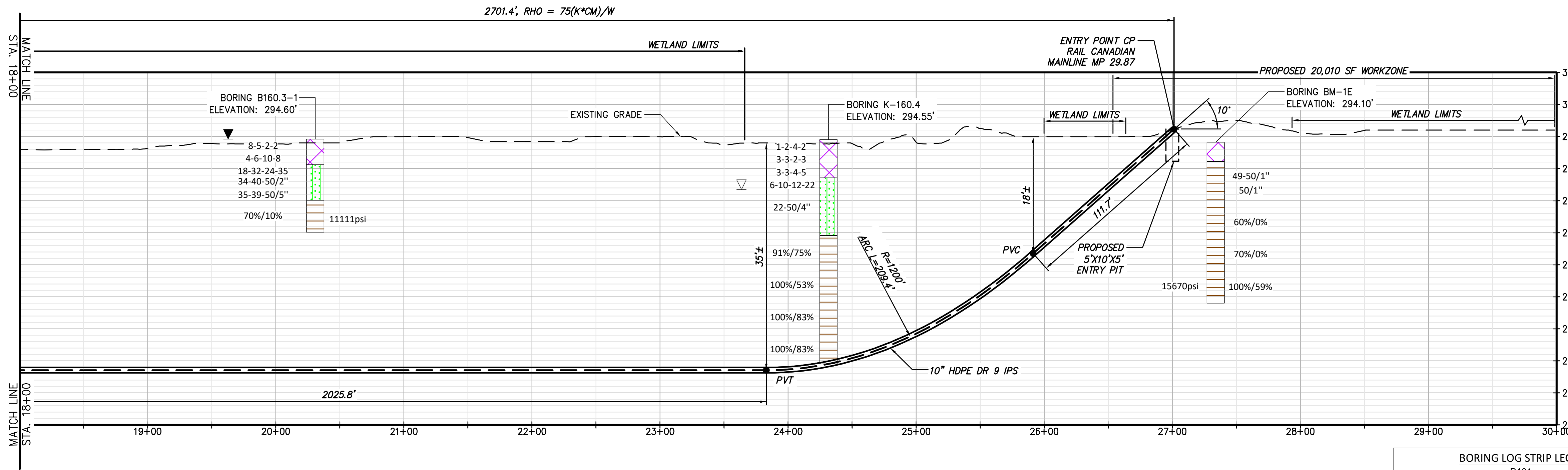
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DRAWN BY: CJL	DESIGNED BY: CJL	APPROVED BY: JEO	SCALE	AS NOTED	DATE	8/03/2023
			REV. NO.	X	SH. NO.	

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PROPOSED HDD 52 PLAN VIEW
CONDUIT 2



PROPOSED HDD 52 PROFILE
CONDUIT 2

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

BORING LOG STRIP LEGEND	
Blow Counts per 6" = 10-10-10	
Recovery %/RQD % = 95%/90%	
11100psi = UCS	
2D strip logs shown at 10x exaggeration	
3D strip logs have no exaggeration	



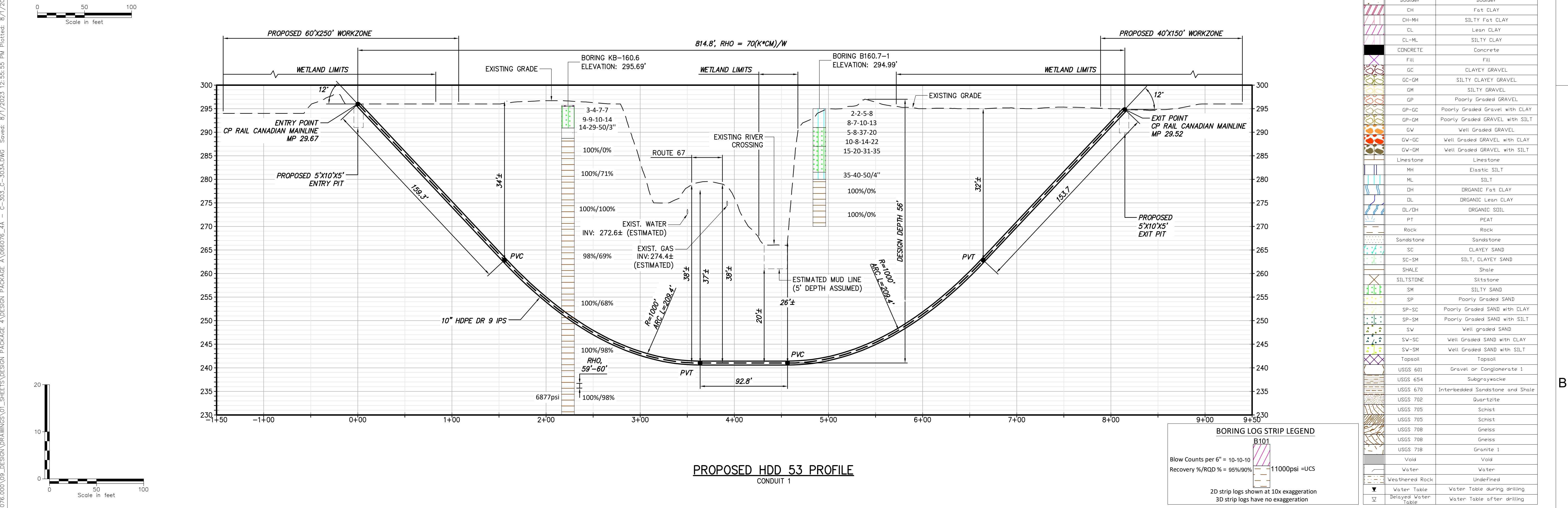
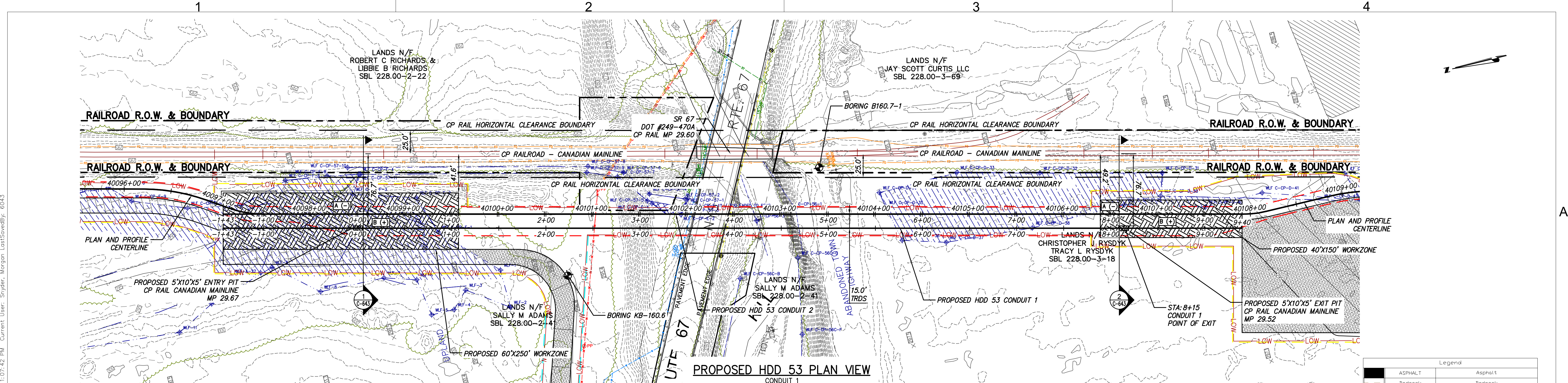
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE 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	08/03/2023	ISSUED FOR CONSTRUCTION SUBMISSION	SPB	JEO
No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP

CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
PLAN AND PROFILE - HDD 52, CONDUIT 2


DRAWN BY: CJL DESIGNED BY: CJL APPROVED BY: JEO SCALE AS NOTED
REV. NO. X SH.NO.

KIEWIT PROJECT NO. 21162
CHA PROJECT NO. 066076
DRAWING NO. C-302A.2
DATE 8/03/2023






Champlain Hudson
Power Express



Kiewit



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CHAMPLAIN HUDSON POWER EXPRESS
SEGMENT 6 (PACKAGE 4A) - CP: BALLSTON TO GLENVILLE
PLAN AND PROFILE - HDD 53, CONDUIT 1

KIEWIT PROJECT NO. 21162	CHA PROJECT NO. 086076	DRAWING NO. C-303
DRAWN BY: CKZ	DESIGNED BY: CKZ	APPROVED BY: JEO
SCALE REV. NO.	AS NOTED	DATE 8/03/2023