MAINE DEPARTMENT OF TRANSPORTATION
HIGHWAY PROGRAM
GEOTECHNICAL SECTION
AUGUSTA, MAINE

GEOTECHNICAL DESIGN REPORT

For the Rehabilitation of

ROUTE 109
ACTON, MAINE

Prepared by:
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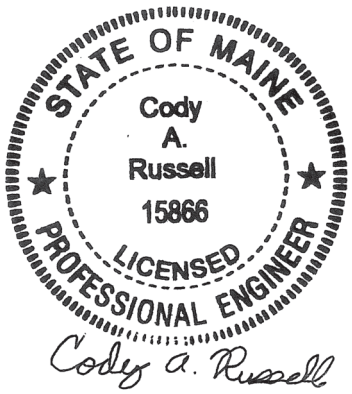

Reviewed by:
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York County
WIN 20267.00

Soils Report 2024-16
Federal Project No. STP-2026(700)

July 24, 2024

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Appendices

1.0 INTRODUCTION

The purpose of this Geotechnical Design Report is to present subsurface information and make geotechnical design and construction recommendations for the rehabilitation of an approximately 2.21-mile portion of Route 109 in Acton, as shown on Sheet 1 – Location Map. The project is needed to improve drainage and safety. The scope includes grading, base, pavement, drainage improvements, realignment in some areas, one (1) large culvert replacement, and a small retaining wall replacement. Route 109 is a Highway Corridor Priority 2 road.

2.0 GEOLOGIC SETTING

According to the Surficial Geology Great East Lake Quadrangle, Maine, Open File No. 97-46 (1997) published by the Maine Geological Survey (MGS), the surficial soils along the project length consist of:

- Glacial fluvial sand and gravel of the Horn Pond area.
- Glacial lacustrine deposits of the Delta of the Wilson Lake area consisting of sand and gravel.
- Glacial Till consisting of silt, sand, and gravel with cobbles and boulders.

According to the MGS map titled Bedrock Geologic Map of Maine (1985) the bedrock along the project consists of interbedded pelite and limestone and/or dolostone of the Rindgemere Formation lower member.

3.0 SUBSURFACE INVESTIGATION

Subsurface conditions at the site were explored by drilling a total of twenty (20) borings and seventy (70) probes.

Borings HB-ACT-101 through HB-ACT-110 and sixty-nine (69) unnamed probes were drilled on July 15 and 16, 2015. Borings HB-ACT-201 through HB-ACT-207, HB-ACT-209 through HB-ACT-211 and probe HB-ACT-208 were drilled on June 12, 2019 and June 17, 2019. All explorations were drilled by the MaineDOT drill crew. The borings were drilled to depths ranging from approximately 2.4 to 28.0 feet below ground surface (bgs) using solid stem auger, open hole, cased wash boring, and rock core drilling techniques. The probes were drilled to depths ranging from approximately 1.6 to 25.5 feet bgs using solid stem auger drilling techniques. Boring and probe locations are shown on Sheets 2 through 19 Boring Location Plans. The boring logs are presented in Appendix A.

Soil samples were obtained off the auger flights in nine (9) 100-series borings. Soil descriptions were recorded but no soil sampling was done in one (1) 100-series borings. Soil samples were obtained in the 200-series borings at standard 5-foot intervals using Standard Penetration Testing (SPT). No soil sampling was done in the probes and no soil descriptions were recorded.

The MaineDOT calibrated automatic hammer delivers approximately 55 percent more energy during driving than the standard rope and cathead system. All N-values discussed in this report are corrected values (N_{60}) computed by applying an average energy transfer factor of 0.928 to the raw field N-values.

Details and sampling methods used, field data obtained, and soil and groundwater conditions encountered are shown in the Boring Logs in Appendix A. The MaineDOT Geotechnical Team member selected the boring locations, drilling methods, designated type and depth of sampling, reviewed field logs for accuracy and identified field and laboratory testing requirements. A North East Transportation Training and Certification Program (NETTCP) certified subsurface inspector logged the subsurface conditions encountered. The boring and probes were located in the field by taping to site features after completion of the drilling program.

4.0 LABORATORY TESTING

A laboratory testing program was conducted on select soil samples obtained in the test borings to assist in soil classification, evaluation of engineering properties of the soils and geologic assessment of the project site. Laboratory testing consisted of twenty-seven (27) standard grain size analyses and natural water content, and one (1) loss on ignition test. The results of the laboratory tests are in Appendix B – Laboratory Test Results. Laboratory test results are also summarized on the boring logs in Appendix A.

5.0 SUBSURFACE CONDITIONS

Subsurface conditions encountered at the test borings and probe generally consisted of pavement and fill soils consisting of sand and gravel underlain by layers of native sand, silt, and sandy silt. Layers of peat and organic silt were encountered near the end of the project limits. The boring locations are shown on Sheets 2 through 19 - Boring Location Plans. The boring logs are presented in Appendix A – Boring Logs.

5.1 Pavement and Fill Soils

The subsurface investigations found areas of pavement and roadway fill soils along the project. Where present, the pavement thickness ranged from approximately 5.0 to 12.0 inches. The fill soils consisted of:

- Brown, damp, sandy gravel, trace silt, occasional cobble.
- Brown, damp to moist, fine to coarse sand, trace to some gravel, trace to little silt, occasional cobble.
- Brown, damp, gravelly fine to coarse sand, trace to some silt, occasional cobble.

The thickness of the fill encountered in the borings ranged from approximately 0.4 to 10.0 feet. The full thickness of the fill was not fully penetrated in all of the explorations. Eleven (11) SPT N_{60}-values obtained in the fill ranged from 5 to 34 blows per foot (bpf) indicating that the fill is loose to dense in consistency.

Water contents from samples obtained within the fill range from approximately 3.0% to 12.8%. Grain size analyses conducted on samples of the fill resulted in the soil being classified as an A-1-a. A-1-b, or A-2-4 under the AASHTO Soil Classification System and a GW-GM, SW-SM, or SM under the Unified Classification System.

5.2 Native Soils

The fill soils are underlain by layers of native soils consisting of sand, gravelly sand, silty sand, and sandy silt and three (3) areas where peat and organic silt were encountered.

5.2.1 Native Sand, Gravelly Sand, Silty Sand, and Sandy Silt

The native sand, gravelly sand, silty sand, and sandy silt encountered in the borings consisted of:

- Light brown, damp to moist, fine to coarse sand, little to some silt, trace to little gravel.
- Brown, moist, gravelly fine to coarse sand, little silt.
- Light brown, moist, silty fine to coarse sand, trace gravel, occasional cobbles.
- Grey, wet, fine to coarse sandy silt, trace gravel.

The thickness of the native sand and gravelly sand ranged from approximately 2.6 to 17.0 feet. The full depth of the native sand and gravelly sand was not encountered or fully penetrated in all of the explorations. Sixteen (16) SPT N_{60}-values obtained in the native sand and gravelly sand ranged from 5 to 79 bpf indicating that the native sand and gravelly sand are loose to very dense in consistency. The thickness of the silty sand ranged from approximately 2.5 to 6.0 feet where encountered. One (1) SPT N_{60} value obtained in the silty sand layer was >50 bpf but was likely influenced by the presence of cobbles. The thickness of the sandy silt was approximately 3.0 feet where encountered. One (1) SPT N_{60}-value obtained in the sandy silt was 6 bpf, indicating that the sandy silt is medium stiff in consistency.

Water contents from samples obtained within the native sand and gravelly sand range from approximately 7.2% to 37.8%. Grain size analyses conducted on samples of the native sand and gravelly sand resulted in the soil being classified as an A-1-b or A-2-4 under the AASHTO Soil Classification System and an SM or SW under the Unified Classification System. Water contents from samples obtained within the silty sand range from approximately 11.1% to 20.1%. Grain size analysis conducted on two (2) samples of silty sand resulted in the soil being classified as an A-4 under the AASHTO Soil Classification System and a SM under the Unified Classification System
One (1) water content from a sample obtained within the sandy silt was approximately 41.4% Grain size analysis conducted on one (1) sample of sandy silt resulted in the soil being classified as an A-4 under the AASHTO Soil Classification System and a CL under the Unified Classification System

5.3 Organic Silt and Peat

Layers of organic silt and peat were encountered in three (3) of the borings. The layers identified in the field consisted of:

- Black or dark brown organic silt, trace to some fine sand.
- Dark brown peat.
-

The following table summarizes the locations and elevations were the organic silt and peat were encountered:

Boring Number / Approximate Station Location	Approximate thickness of Organic Silt and/or Peat Layer (feet)	Approximate Elevation of Top of Layer (feet)
HB-ACT-207 / 156+10	1.0	577.0
HB-ACT-209 / 169+50	1.0	575.3
HB-ACT-210 / 171+00	1.3	571.3

No SPT N_{60} -values were obtained in the organic silt or peat layers.

A loss on ignition test was conducted on one (1) sample of peat resulting in a 4.7% loss on ignition.

Water contents from two (2) samples obtained within the organic silt and peat were approximately 45.3% and 172.4%. Grain size analyses conducted on one (1) sample of organic silt resulted in the soil being described as sand, some gravel, little silt and classified as an A-1-b under the AASHTO Soil Classification System and an SM under the Unified Classification System.

5.4 Bedrock and Refusal Surfaces

Refusal surfaces were encountered at varying depths along the project. Refusal of the drilling tools varied from a depth of approximately 1.6 feet to 9.9 feet bgs. The table below summarizes the refusal surfaces encountered.

Approximate Station/Offset	Approximate Elevation of Top of Refusal Surface (feet)
98+75/12.0 ft RT	712.8 (bedrock cored)
99+40/9.5 ft LT	714.4 (bedrock cored
105+50/9.0 ft RT	738.4
109+00/8.0 ft RT	730.6
109+00/7.0 ft LT	735.5
110+00/9.0 ft RT	734.4
110+00/8.0 ft LT	734.6
111+00/9.0 ft RT	733.2
112+00/7.0 ft RT	733.0
112+00/12.0 ft LT	732.5
113+00/7.0 ft RT	725.7
113+00/12.5 ft LT	725.6
113+75/15.0 ft LT	716.1 (bedrock cored)
118+00/10.5 ft RT	703.7
118+00/9.0 ft RT	702.5
119+00/10.0 ft RT	702.2
119+00/9.0 ft LT	701.0
120+00/7.0 ft RT	702.1
120+00/8.0 ft LT	702.4
121+00/12.0 ft RT	691.4
121+00/9.0 ft LT	687.8
122+00/8.5 ft RT	683.4
145+00/8.0 ft RT	621.4
146+00/11.0 ft LT	619.5
148+00/9.0 ft LT	616.8
152+00/9.4 ft RT	603.4
184+15/4.9 ft RT	579.5
184+15/15.0 ft LT	579.9
185+15/5.0 ft RT	585.4
185+15/15.2 ft LT	584.2
186+15/9.0 ft RT	586.9
186+15/10.5 ft LT	585.7
187+15/10.1 ft RT	588.9
187+15/10.9 ft LT	585.1
188+15/10.1 ft RT	583.3
189+15/8.9 ft LT	575.7
194+15/10.5 ft RT	559.4

Bedrock was cored in three (3) of the borings where refusal was encountered. The exact nature of the refusal surface was not determined in the remaining explorations.

The bedrock consists of interbedded pelite and limestone and/or dolostone of the Sangerville Formation. The Rock Quality Designation (RQD) of the bedrock was determined to range from 58% to 67%, correlating to a Rock Quality of Fair. The approximate elevations of the top of bedrock or the refusal surface encountered at the boring locations are presented on the Boring Logs in Appendix A.

5.5 Groundwater

Groundwater level was observed in eight (8) borings at depths ranging from approximately 1.9 to 12.0 feet bgs. The water levels observed are indicated on the boring logs in Appendix A. Groundwater levels can be expected to fluctuate subject to seasonal variations, local soil conditions, topography, precipitation, and construction activity.

6.0 GEOTECHNICAL RECOMMENDATIONS

The following sections discuss the geotechnical-related design features of this project. Areas of geotechnical concern include the Wilson Lake Bridge box culvert, the proposed oversteepened slope from approximate stations 166+50 to 168+50, and a proposed retaining wall in the vicinity of Station 190+50.

6.1 Wilson Lake Bridge (Bridge #6700) at approximate Station 156+30

6.1.1 General Information

The existing structure at approximate Station 156+25 is a 28-inch diameter, approximately 61-foot long corrugated metal pipe (CMP) culvert. The proposed replacement structure is a 12-foot span, 8-foot rise, 94-foot long precast concrete box culvert on an approximately 17-degree skew to the roadway centerline with an inlet elevation of approximately 573.70 feet and an outlet elevation of approximately 572.66 feet.

One (1) boring (HB-ACT-207) and (1) probe (HB-ACT-208) were drilled in the roadway on each side of the proposed structure. The boring locations and the interpretive subsurface profile are shown on Sheet 20 – Boring Location Plan & Interpretive Subsurface Profile with Boring Logs. The boring logs are also provided in Appendix A – Boring Logs.

Boring HB-ACT-207 was drilled to a depth of approximately 28.0 feet bgs without encountering a refusal surface. The subsurface conditions encountered in the boring consisted of fill consisting of sand underlain by a 1-foot layer of peat, underlain by native sand. One SPT N_{60}-value obtained in the peat was 12 bpf indicating that the peat is mixed with sand and is medium dense in consistency. Two (2) SPT N_{60}-values obtained in the fill were 5 bpf and 22 bpf indicating that the fill is loose to medium dense in consistency. Two (2) SPT N_{60}-values obtained in the native sand were 62 bpf and 73 bpf indicating that the native sand is very dense in consistency. Probe HB-

ACT-208 was drilled to a depth of approximately 25.5 feet bgs without encountering a refusal surface.

6.1.2 Design and Construction – The proposed precast concrete box culvert shall be constructed in accordance with MaineDOT Standard Specification Section 534 and the Contract Plans. To facilitate fish passage, Habitat Connectivity Design elements will be used inside the proposed precast concrete box culvert as shown on the Special Details sheet in the Contract Plans.

The proposed precast concrete box culvert can be bedded on a 1-foot thick layer of Granular Borrow, Material for Underwater Backfill (MaineDOT Item 203.25, Granular Borrow). The bedding material should be placed in lifts of 6 to 8 inches loose measure and compacted to at least 95 percent of the AASHTO T-180 maximum dry density. The exposed subgrade shall be free of ponded water so that bedding material placement and compaction can be completed in the dry. The soils at the bedding elevation shall be excavated using a smooth-edged backhoe bucket to limit disturbance. Any disturbed soils at the bedding elevation resulting from excavation activities shall be removed by hand prior to placement of the bedding material. All subgrade surfaces should be protected from construction traffic in order to limit disturbance. Groundwater and surface water levels shall be depressed sufficiently to allow work in the dry.

The full nature of the culvert bearing surface will not become evident until the culvert excavation is made. The bottom elevation of the excavation shall take into account the wall thickness of the precast concrete box culvert and the required 1-foot layer of bedding material. Any loose or soft soils (peat or organic materials) in the excavations shall be removed and replaced with Granular Borrow Material for Underwater Backfill (MaineDOT 703.19) or Crushed Stone ¾-Inch (MaineDOT 703.13). Any cobbles or boulders encountered in excess of 6 inches shall be removed and replaced with compacted Granular Borrow Material for Underwater Backfill or Crushed Stone ¾-Inch.

The soil envelope and backfill shall consist of Granular Borrow (703.19) with a maximum particle size of 4 inches. The granular borrow backfill material shall be placed in lifts of 6 to 8 inches loose measure and compacted to the manufacturer's specifications or, in the absence of manufacturer's specifications, the bedding and backfill soil shall be compacted to at least 92 percent of the AASHTO T-180 maximum dry density.

6.1.3 Bearing Resistance

The factored bearing resistances for the precast concrete box culvert bearing on compacted granular bedding material placed on native soils at the service and strength limit states are presented in the table below. Supporting calculations in accordance with AASHTO LRFD Bridge Design Specifications 9th Edition 2020 (LRFD) are provided in Appendix C – Calculations.

Limit State	Resistance Factor φ_b	AASHTO LRFD Reference	Factored Bearing Resistance (ksf)
Service	1.0	Article 10.5.5.1	6.0
Strength	0.45	Table 10.5.5.2.2-1	9.0

6.1.4 Modulus of Subgrade Reaction

A modulus of subgrade reaction (k_s) equal to 140 pounds per cubic inch shall be used for the structural design of the box culvert's base slab. Calculations are included in Appendix C – Calculations.

6.1.5 Scour and Riprap

Both the inlet and outlet of the proposed precast concrete box culvert shall be armored with riprap conforming to MaineDOT Standard Specification Section 703.26 Plain and Hand Laid Riprap. Riprap slopes shall not be steeper than 2H:1V. The riprap on the slopes shall be underlain by a 1-foot layer of protective aggregate cushion conforming to MaineDOT Standard Specification 703.19 Granular Borrow Material for Underwater Backfill that is underlain by a non-woven Class 1 erosion control geotextile that meets the requirements for MaineDOT Standard Specification 722.03.

6.1.3 Seismic Design Considerations

In conformance with LRFD Article 3.10.1, seismic analysis is not required for buried structures, except where they cross active faults. There are no known active faults in Maine; therefore, seismic analysis is not required.

6.2 Oversteepened Slopes from Stations 166+50 to 168+50

A 1.5H:1V cut slope is proposed from Stations 166+50 to 168+50. In accordance with AASHTO LRFD Bridge Design Specifications 9th Edition 2020 (LRFD) Article 11.6.3.7 evaluation of earth slopes that do not support or contain a structural element should achieve a factor of safety of 1.3 (equivalent to a resistance factor of 0.75). Analysis of the proposed 1.5H:1V slopes using Geostudio Slope/W software determined that riprap armor was necessary for the slopes to achieve a factor of safety of 1.3 or greater. The critical slope was analyzed assuming 3-feet of plain riprap will armor the full height of the slope. The analysis of the proposed slope resulted in an acceptable factor of safety of 1.315. Appendix D – Slope Stability Analyses presents the stability results from this analysis. The stability analyses based on subsurface conditions encountered in borings drilled in the vicinity of the slopes.

The slope shall be armored with 3 feet of riprap conforming to MaineDOT Standard Specification Section 703.26 Plain Riprap and Hand Laid Riprap underlain by a 1-foot layer of protective aggregate cushion conforming to MaineDOT Standard Specification 703.19 Granular Borrow Material for Underwater Backfill that is underlain by a non-woven Class 1 erosion control geotextile that meets the requirements for MaineDOT Standard Specification 722.03.

6.3 Wet Cast Small Landscape Block Wall in the Vicinity of Station 190+50

The proposed replacement retaining wall shall be constructed as shown on the Contract Plans and shall meet the requirements of Standard Specification 673 Wet Cast Small Landscape Block Wall.

The proposed wall shall be supplier designed in accordance with AASHTO LRFD Bridge Design Specifications (LRFD) 9th Edition 2020 and Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Slopes (FHWA-NHI-10-024 and FHWA-NHI-10-025, March 2012).

The proposed retaining wall shall be designed to withstand lateral earth pressures. Earth loads may be calculated using an active earth pressure coefficient, K_a, calculated using Rankine or Coulomb Theory. Refer to LRFD Article 3.11.5.3 and Equations 3.11.5.3-1 and -2 for calculating Coulomb active earth pressure coefficient. Lateral earth pressure distributions for design of MSE walls are provided in LRFD Figures 3.11.5.8.1-1, -2 and -3. Passive earth pressure in front of the wall shall be neglected in the design.

The factored bearing resistances for the retaining wall bearing on a concrete leveling pad on native soils at the service and strength limit states are presented in the table below. No borings were drilled in the vicinity of the proposed retaining walls. Bearing resistance calculation assume medium dense sand as the foundation material. In no instance shall the bearing stress exceed the nominal resistance of the structural concrete which may be taken as $0.3f'_c$.

Limit State	Resistance Factor φ_b	AASHTO LRFD Reference	Factored Bearing Resistance (ksf)
Service	1.0	Article 10.5.5.1	5.0
Strength	0.45	Table 10.5.5.2.2-1	3.5

The following additional considerations should be addressed in the wall design:

- Traffic will be required in the design of the wall.
- Piped drainage shall be included in the design of the wall.
- A minimum embedment of 2.0 feet below finished grade is required for the wall design.
- The retaining wall design shall include a drainage system (swale) at the top of the wall to carry surface water runoff away from the face of the wall.

6.4 Settlement

No settlement issues are anticipated for either the roadway or the proposed precast concrete culvert. The installation of the proposed precast concrete box culvert will result in a net unloading of the site soils at the proposed structure location. Placement of fill soils at the location of the existing structure to be removed and in areas where the proposed roadway grade is higher than existing grades are not anticipated to exceed the past loading condition of the site soils.

6.5 Bedrock Removal

Refusal of the drilling tools was encountered in multiple borings and probes along the project (see Section 5.4). Bedrock removal is anticipated for drainage and subgrade installation near these locations. Additional shallow bedrock should be expected during construction at other locations.

Blasting, if required, shall be conducted in accordance with MaineDOT Standard Specifications Sections 105.2.7 and 203. The Contractor is required to conduct pre- and post-blast surveys, as

well as blast vibrations monitoring at nearby structures in accordance with industry standards at the time of the blast.

6.6 Additional Construction Considerations

Construction of the precast concrete box culvert will require soil excavation. Earth support systems will be required if laying back slopes is not feasible. Regardless of the method of excavation, all excavations and earth support systems shall meet all applicable OSHA regulations.

If organic silt or peat is encountered in the project excavations, the materials should be over excavated to be completely removed and replaced with Granular Borrow, Material for Underwater Backfill or Crushed Stone, ¾-Inch.

The Contractor shall control groundwater and surface water infiltration using temporary ditches, sumps, granular drainage blankets, stone ditch protection or hand-laid riprap with geotextile underlayment to divert groundwater and surface water to allow construction in the dry.

7.0 CLOSURE

This report has been prepared for the use of the MaineDOT Highway Program for specific application to the proposed rehabilitation of Route 109 in Acton, Maine in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

In the event that any changes in the nature, design, or location of the proposed project are planned, this report should be reviewed by a geotechnical engineer to assess the appropriateness of the conclusions and recommendations and to modify the recommendations as appropriate to reflect the changes in design. These analyses and recommendations are based in part upon a limited subsurface investigation at discrete exploratory locations completed at the site. If variations from the conditions encountered during the investigation appear evident during construction, it may also become necessary to re-evaluate the recommendations made in this report.

It is recommended that a geotechnical engineer be provided the opportunity for a review of the design and specifications in order that the earthwork and foundation recommendations and construction considerations presented in this report are properly interpreted and implemented in the design and specifications.

Sheets

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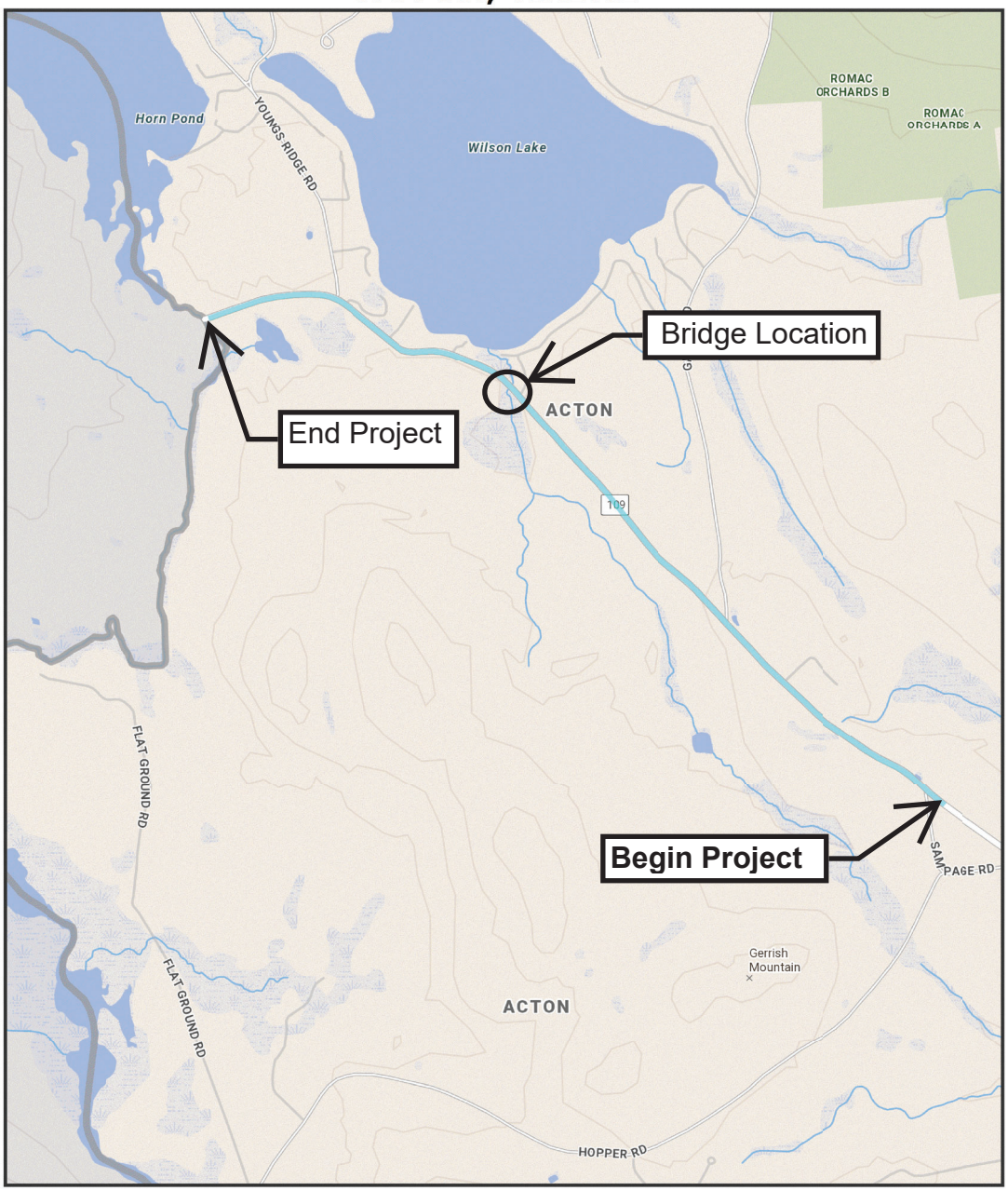
Division: GEOTECH

Username: Terry.White

ACTON, MAINE



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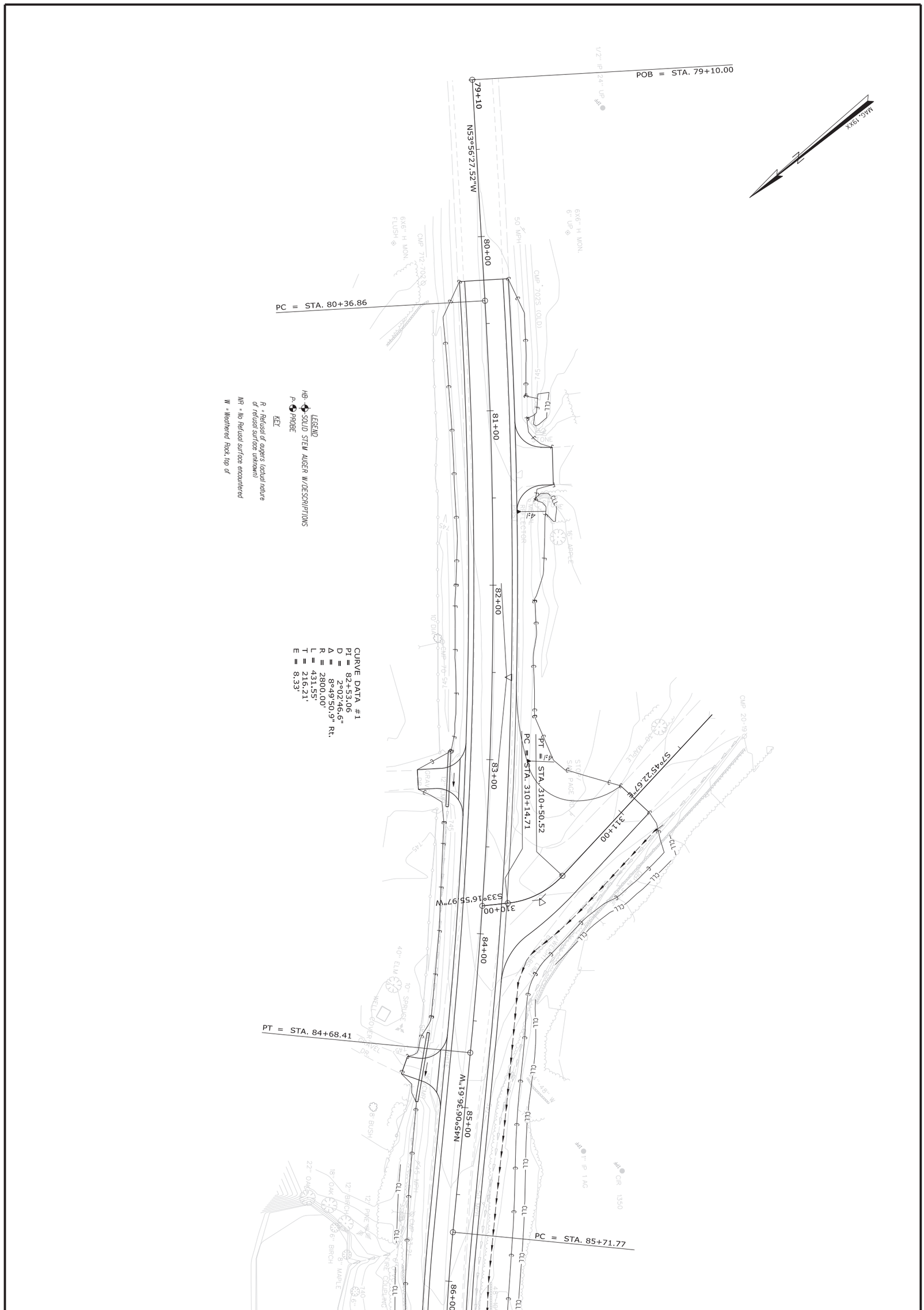

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ACTON
ROUTE 109

BORING LOCATION PLAN

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

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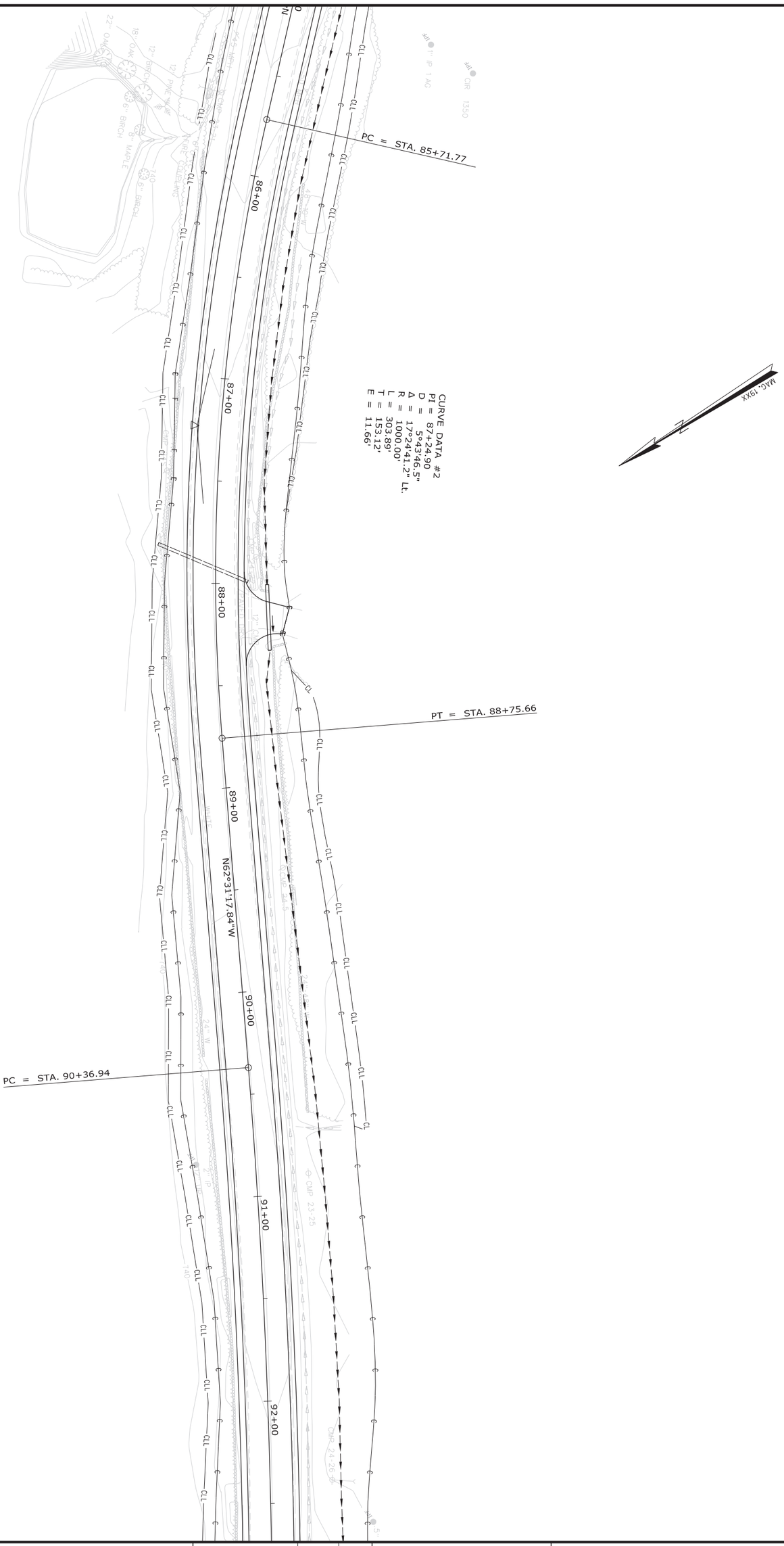

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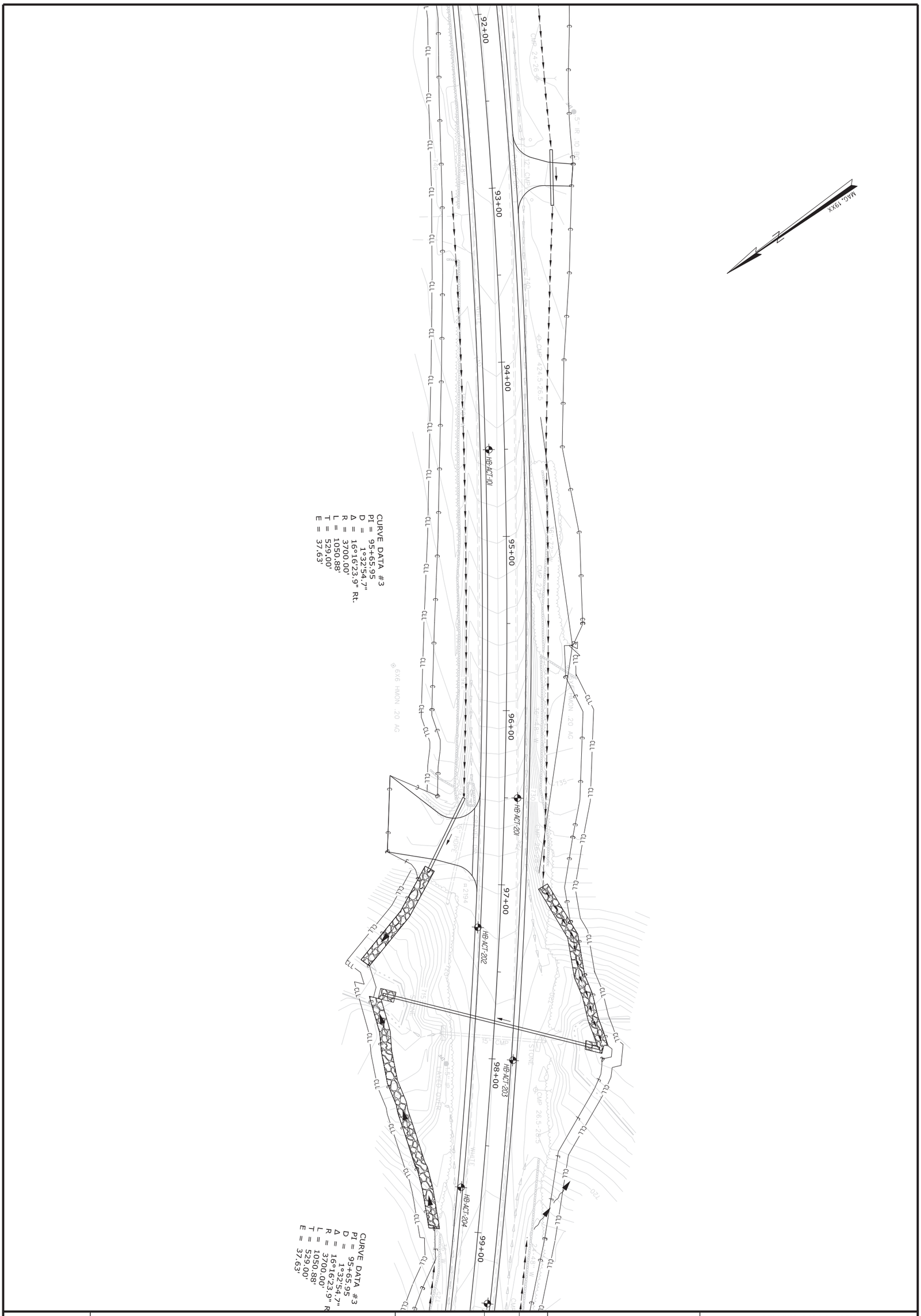

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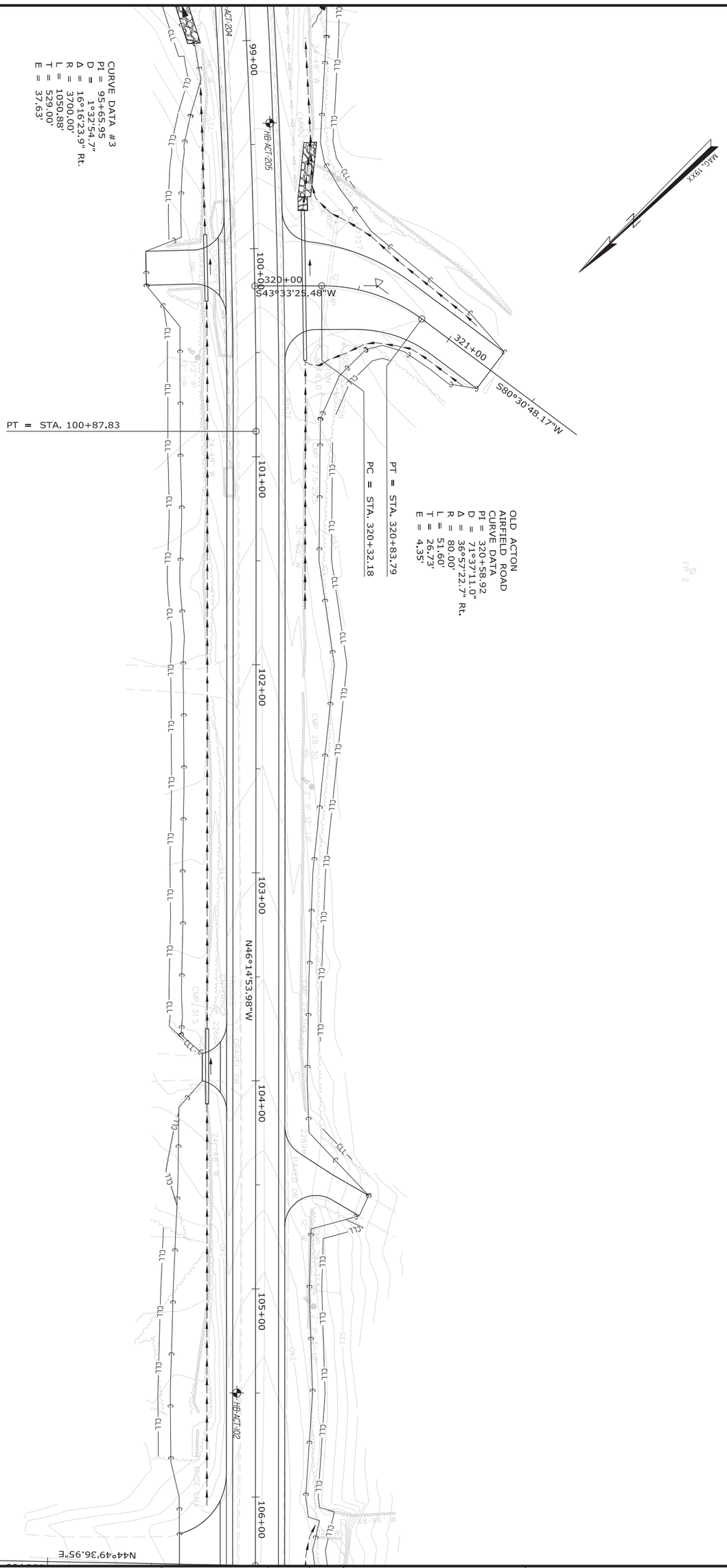

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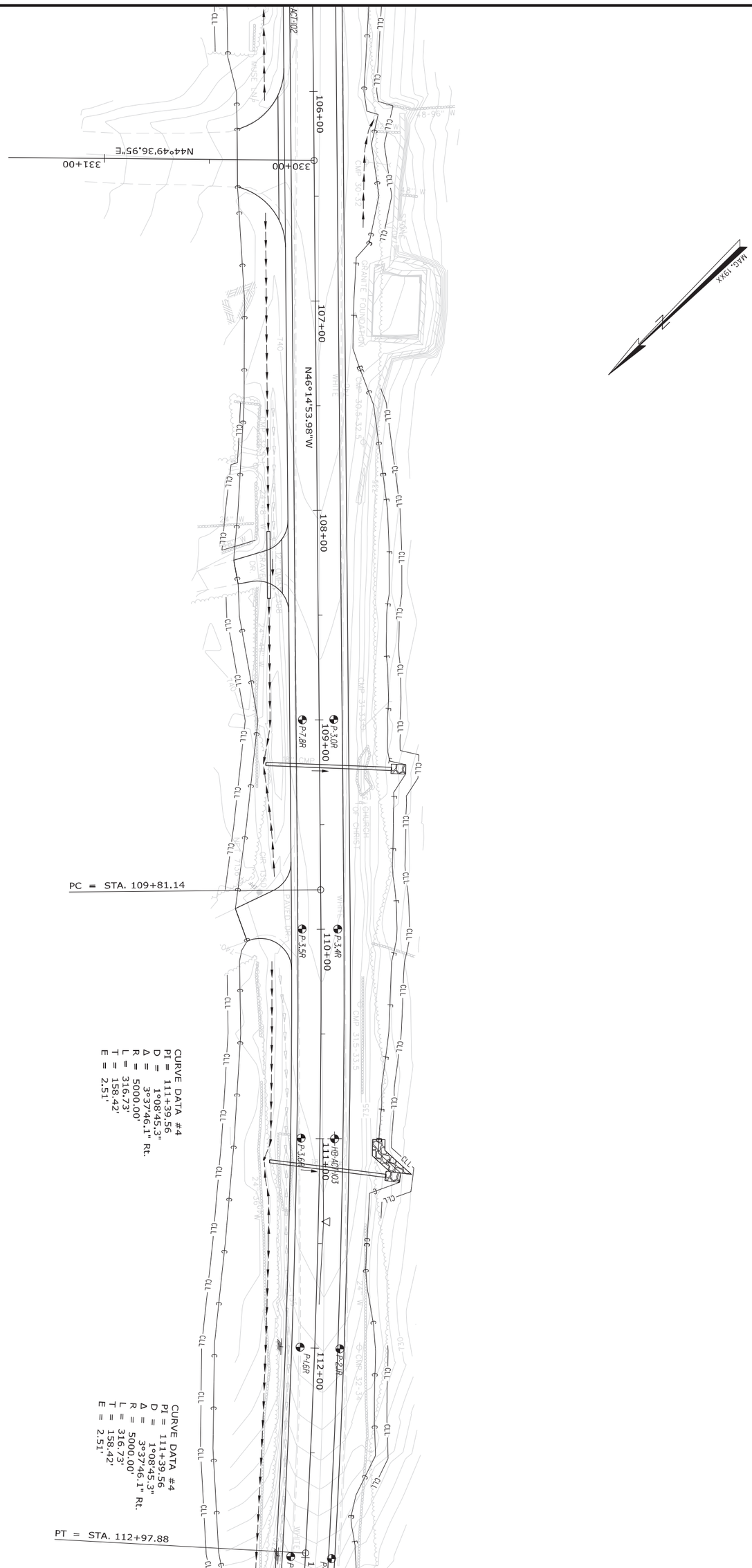

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REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN
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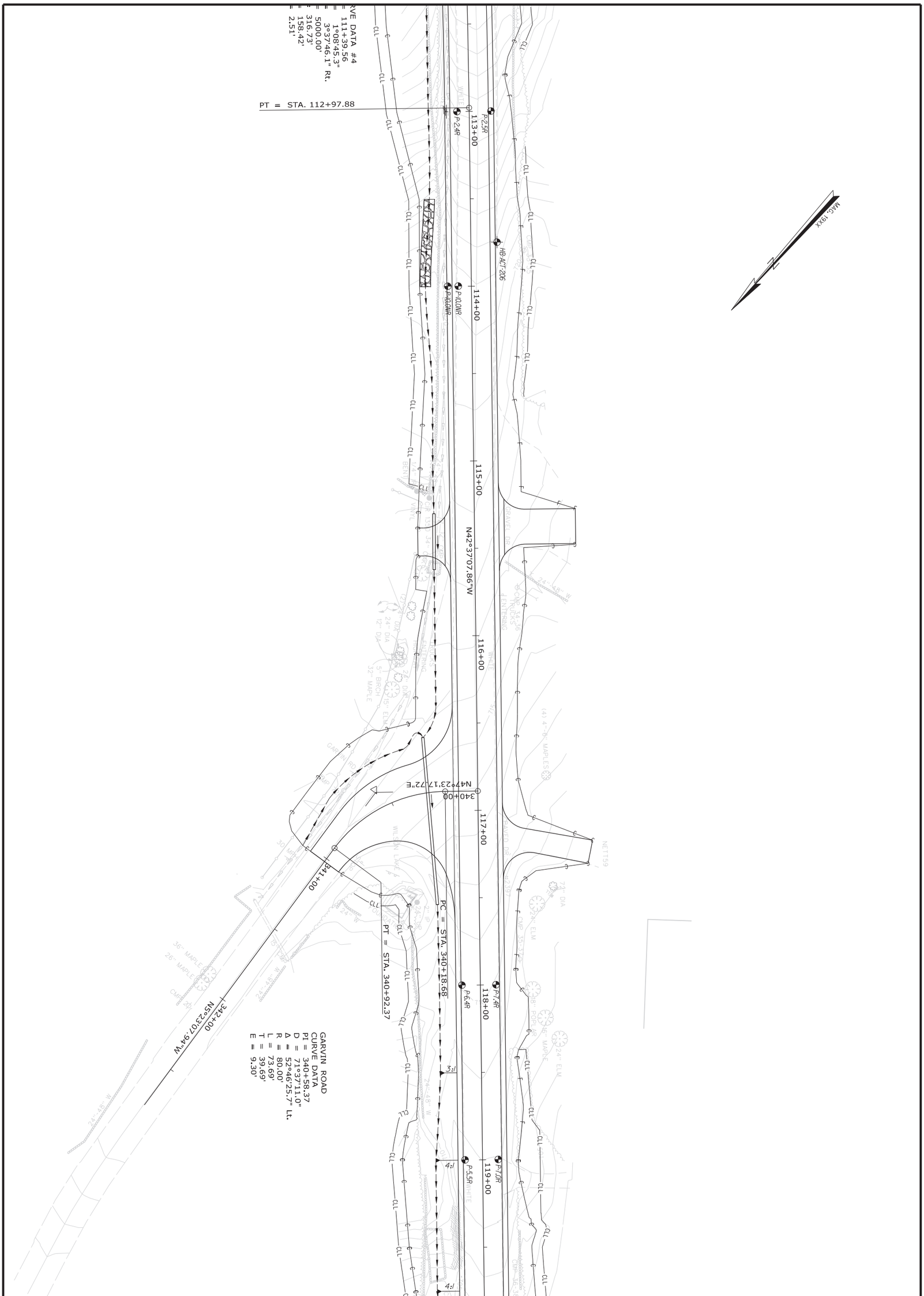

PROJ. MANAGER	D. LOVELY	BY	DATE	
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DESIGN2-DETAILED2	C.RUSSELL	T.WHITE	AUG 2024	
DESIGN3-DETAILED3				P.E. NUMBER
REVISIONS 1				
REVISIONS 2				
REVISIONS 3				DATE
REVISIONS 4				
FIELD CHANGES				

SHEET NUMBER 2 OF 20

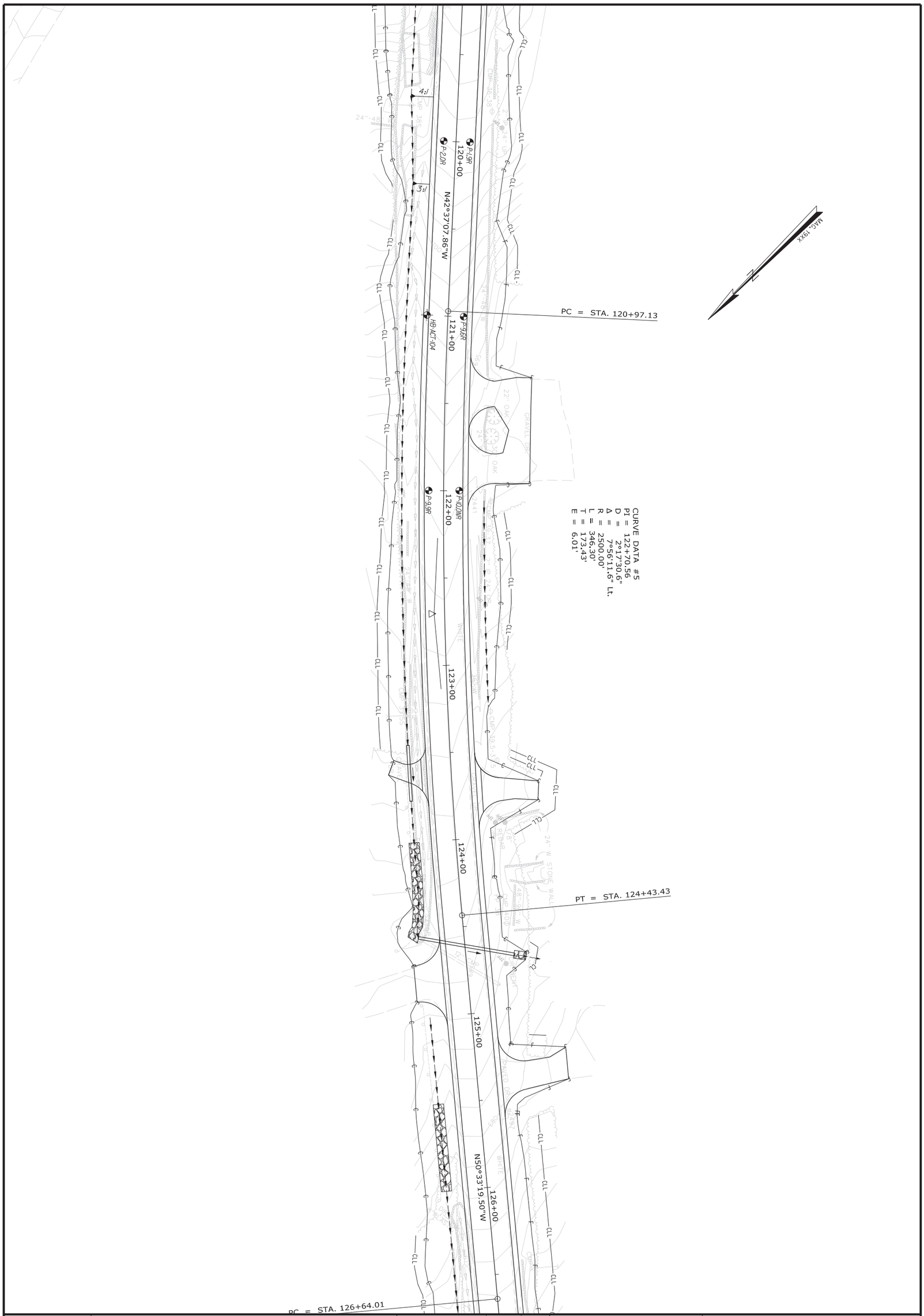
ACTON
ROUTE 109

BORING LOCATION PLAN

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN 020267.00 HIGHWAY PLANS



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DESIGN3-DETAILED3				P.E. NUMBER
REVISIONS 1				
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REVISIONS 4				
FIELD CHANGES				

SHEET NUMBER 8 OF 20

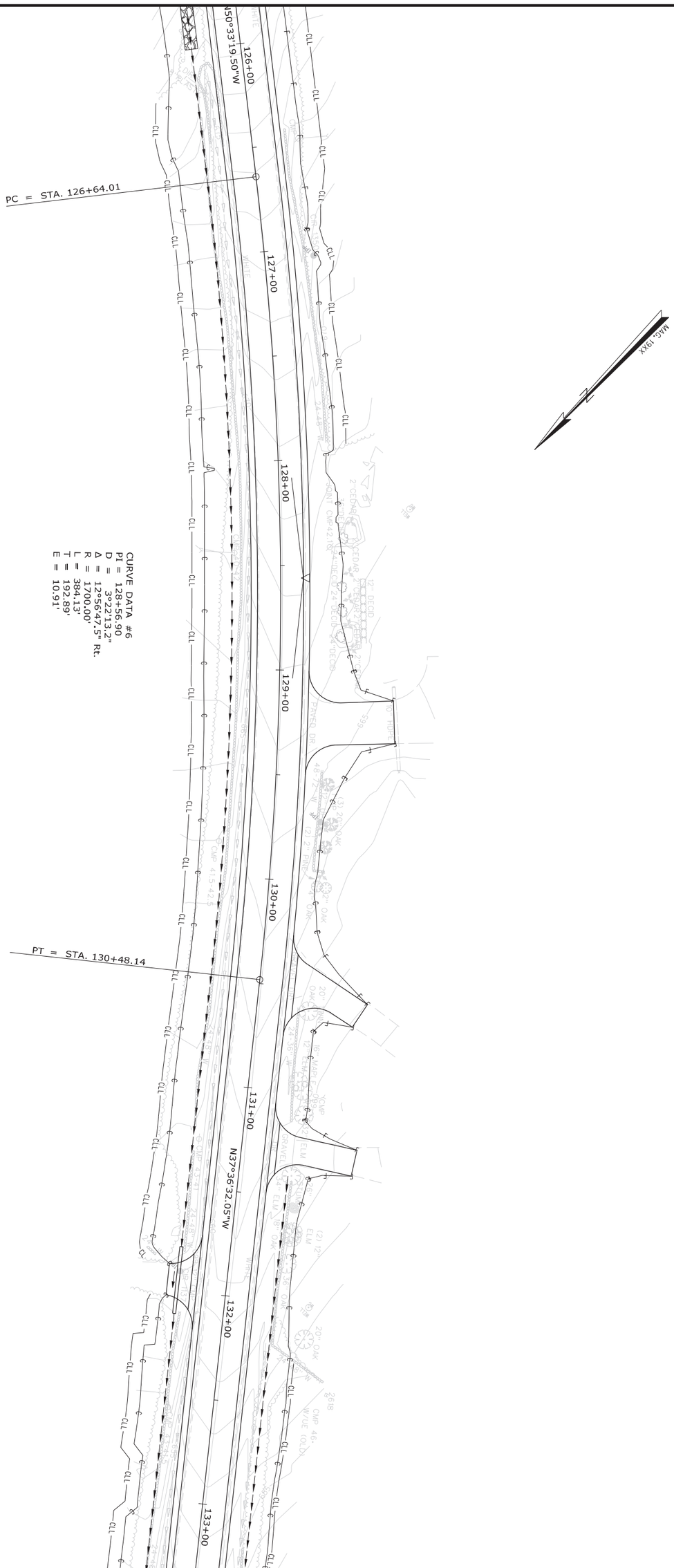
ACTON
ROUTE 109

BORING LOCATION PLAN

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN 020267.00 HIGHWAY PLANS



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DESIGN3-DETAILED3				P.E. NUMBER
REVISIONS 1				
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REVISIONS 3				DATE
REVISIONS 4				
FIELD CHANGES				

SHEET NUMBER 9 OF 20

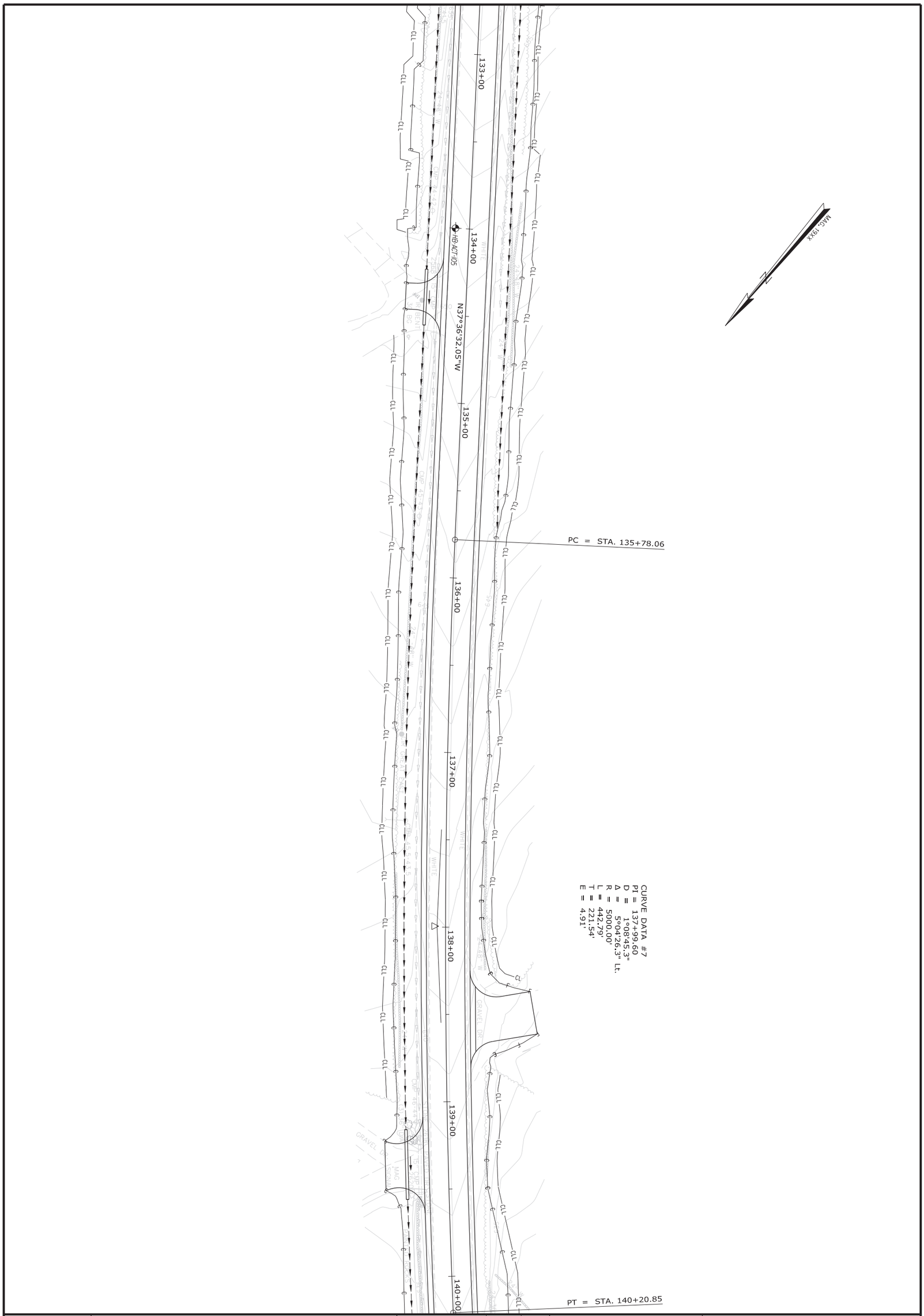
ACTON
ROUTE 109

BORING LOCATION PLAN

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN
020267.00 HIGHWAY PLANS



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DESIGN-DETAILED	R. BETZ		
CHECKED-REVIEWED			
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DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SHEET NUMBER 10 OF 20

ACTON
ROUTE 109

BORING LOCATION PLAN

SIGNATURE

P.E. NUMBER

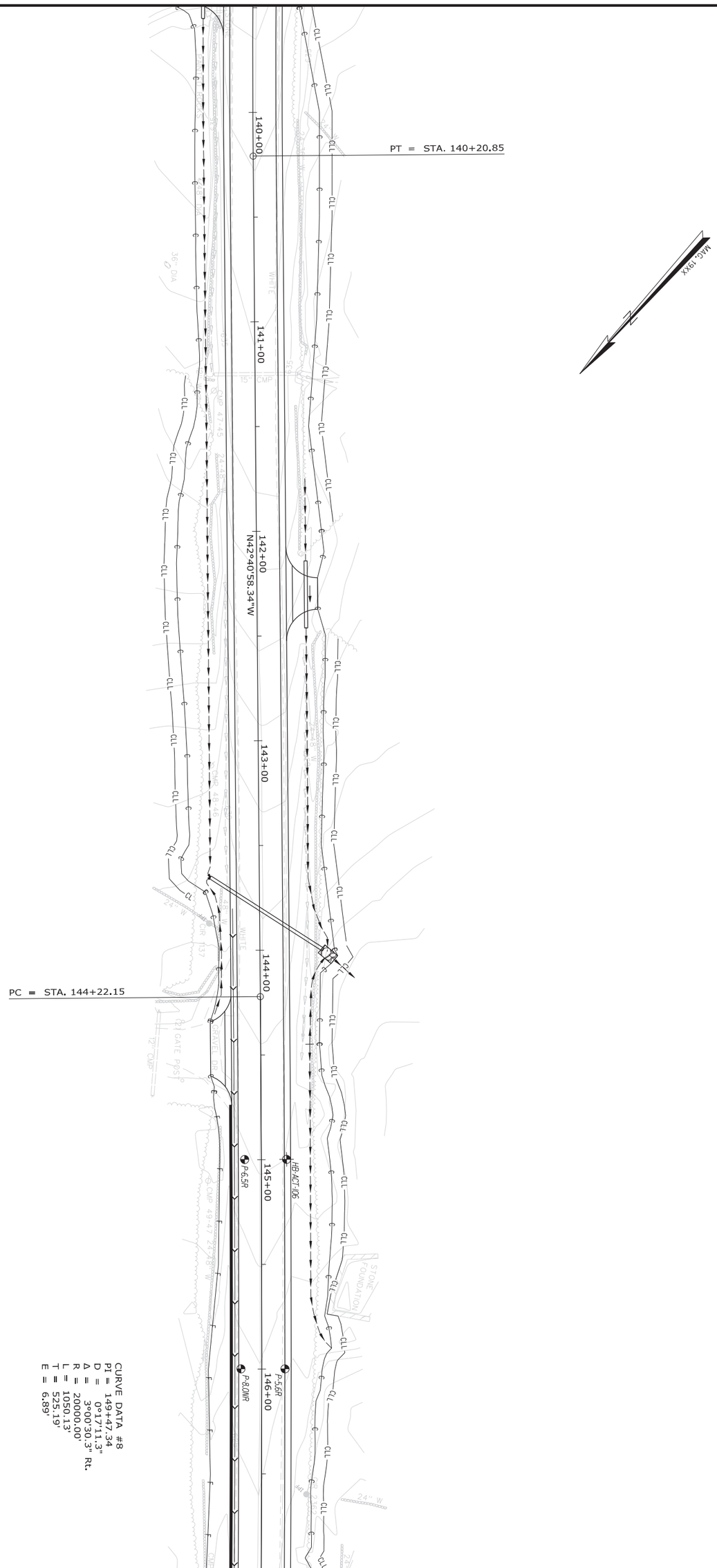
DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN
020267.00

HIGHWAY PLANS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PC = STA. 144+22.15
140+00
141+00
142+00
N42°40'58.34"W
143+00
144+00
145+00
146+00
P-6.5R
HB-ACT-106
P-8.0WR
P-5.6R
CURVE DATA #8
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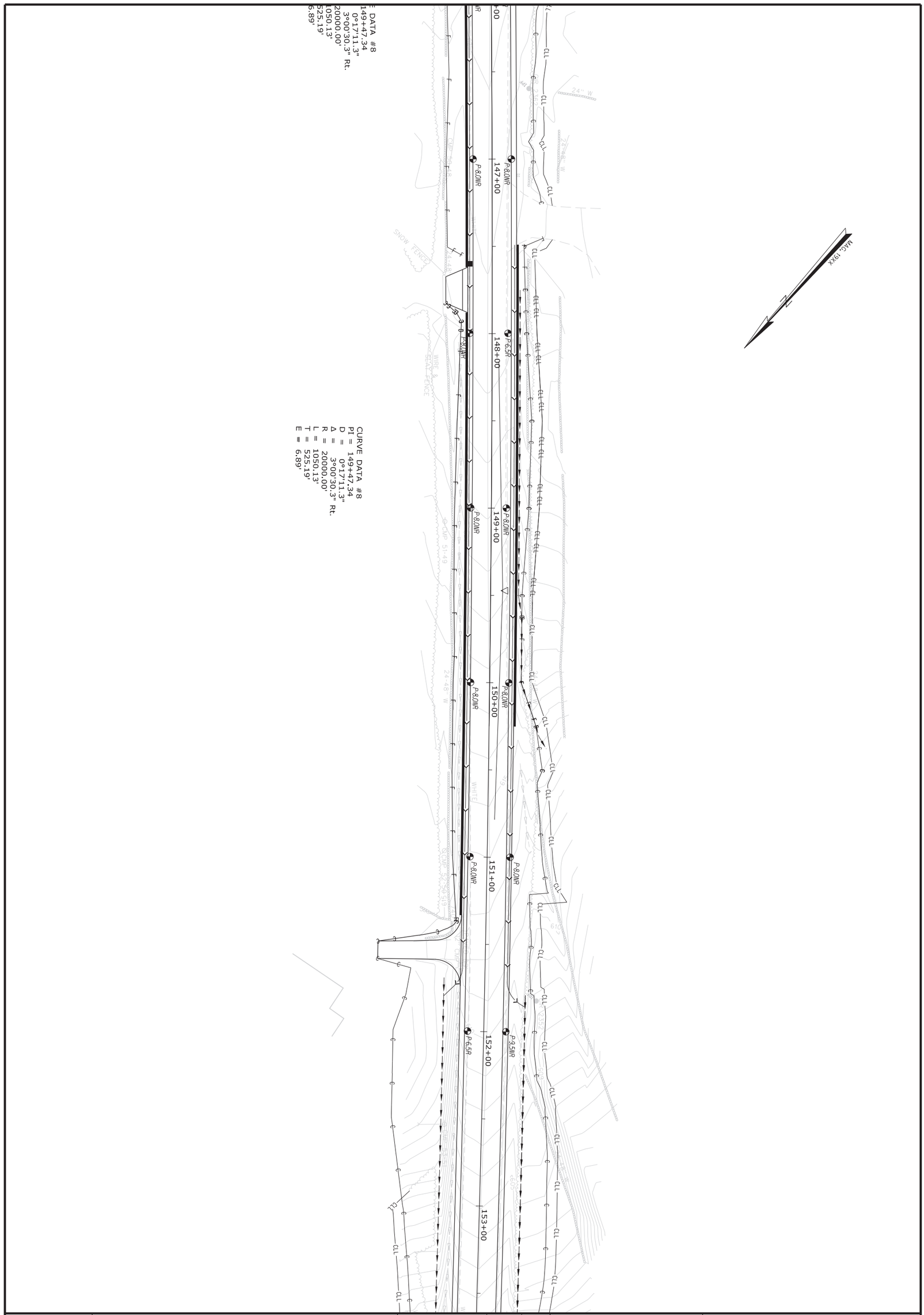
Δ = 3°00'30.3" Rt.
R = 20000.00'
L = 1050.13'
T = 525.19'
E = 6.89'



ACTON
ROUTE 109

BORING LOCATION PLAN

PROJ. MANAGER	D. LOVELY	BY	DATE
DESIGN-DETAILED	R. BETZ		
CHECKED-REVIEWED			
DESIGN2-DETAILED2	C.RUSSELL	T.WHITE	AUG 2024
DESIGN3-DETAILED3			
REVISIONS 1			
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REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

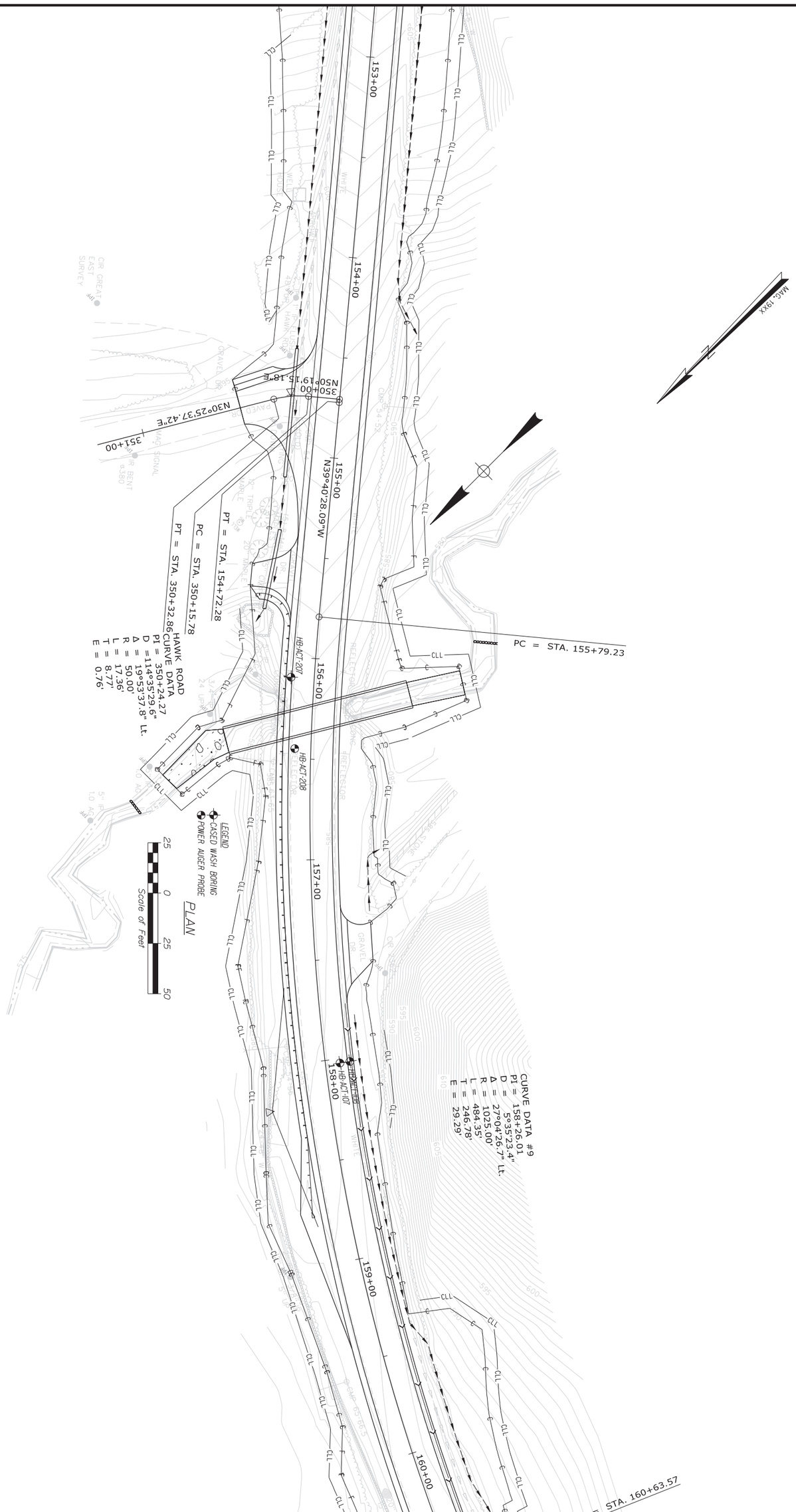
DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN 020267.00 HIGHWAY PLANS

SHEET NUMBER 12 OF 20



SHEET NUMBER 13 OF 20

ACTON
ROUTE 109

BORING LOCATION PLAN

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CHECKED-REVIEWED			
DESIGN2-DETAILED2	C.RUSSELL	T.WHITE	AUG 2024
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

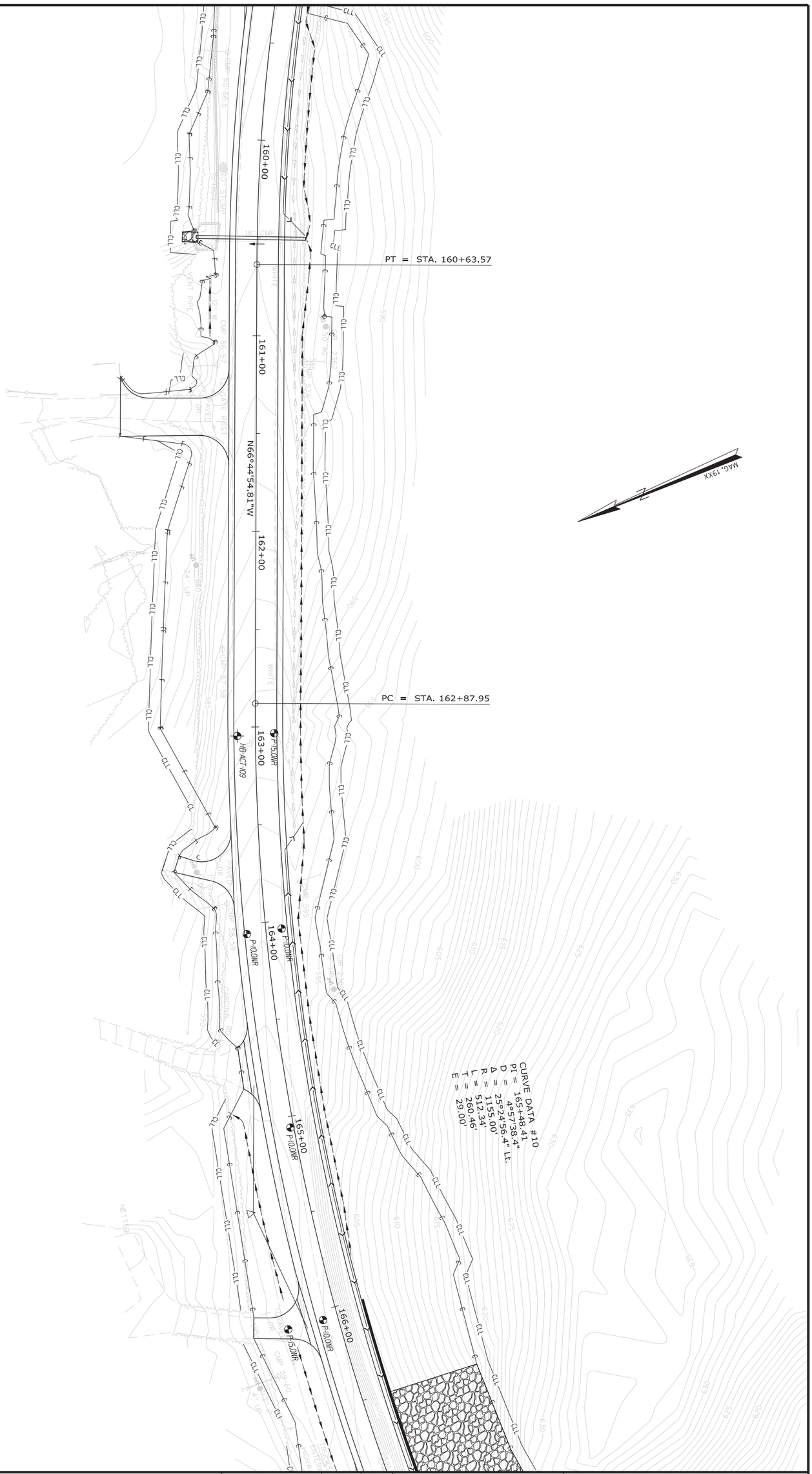
DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN
020267.00

HIGHWAY PLANS



PROJ. MANAGER	D. LOVELY	BY	DATE
DESIGN-DETAILED	R. BETZ		
CHECKED-REVIEWED			
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DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SHEET NUMBER 14 OF 20

ACTON
ROUTE 109

BORING LOCATION PLAN

SIGNATURE

P.E. NUMBER

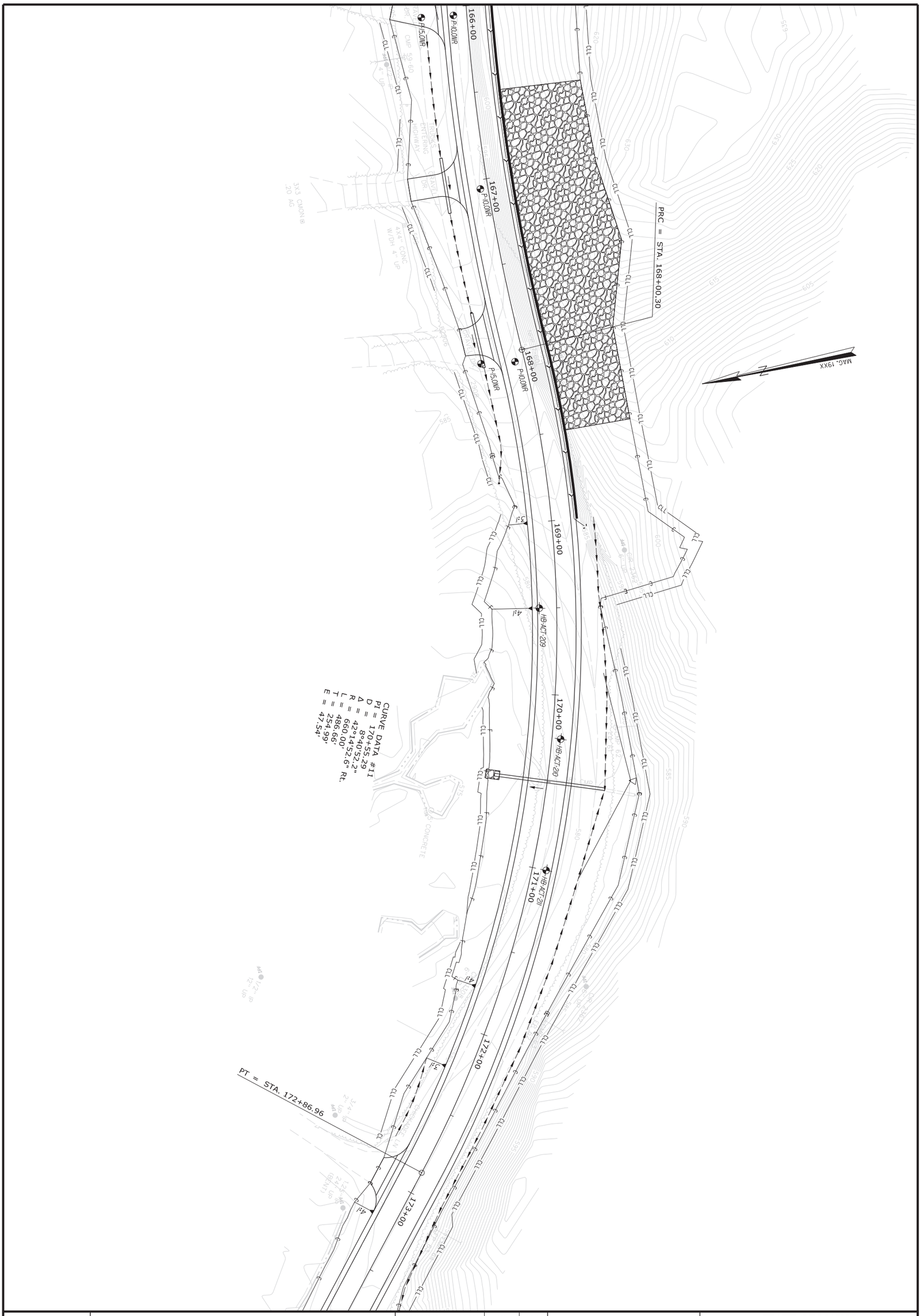
DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN 020267.00 HIGHWAY PLANS

Filename: ...\00\GEOTECH\MSTA\015_BLP14.dgn Division: GEOTECH Username: Cody.A.Russell Date:8/14/2024



PROJ. MANAGER	D. LOVELY	BY	DATE	
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CHECKED-REVIEWED				SIGNATURE
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DESIGN3-DETAILED3				P.E. NUMBER
REVISIONS 1				
REVISIONS 2				
REVISIONS 3				DATE
REVISIONS 4				
FIELD CHANGES				

SHEET NUMBER 15 OF 20

ACTON
ROUTE 109

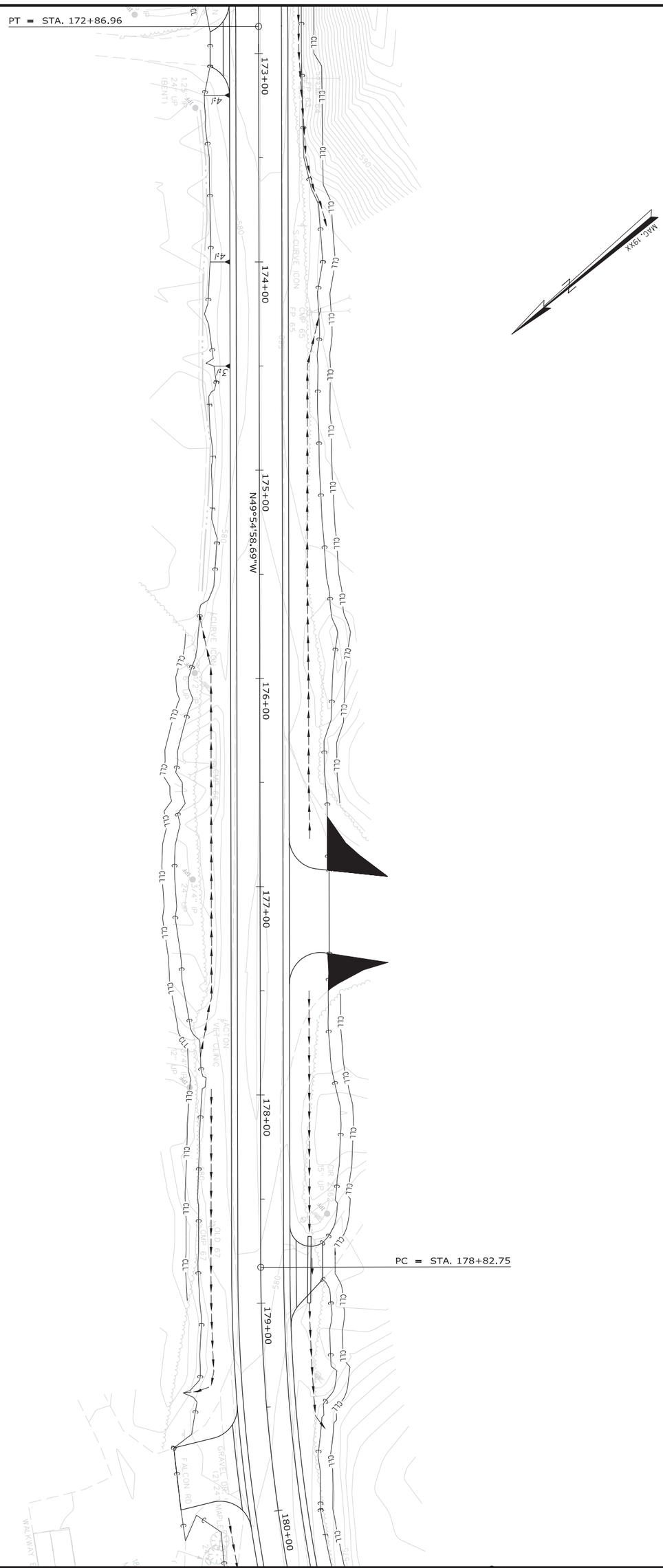
BORING LOCATION PLAN

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN
020267.00

HIGHWAY PLANS



SHEET NUMBER 16 OF 20

ACTON
ROUTE 109

BORING LOCATION PLAN

PROJ. MANAGER	D. LOVELY	BY	DATE
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CHECKED-REVIEWED			
DESIGN2-DETAILED2	C.RUSSELL	T.WHITE	AUG 2024
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

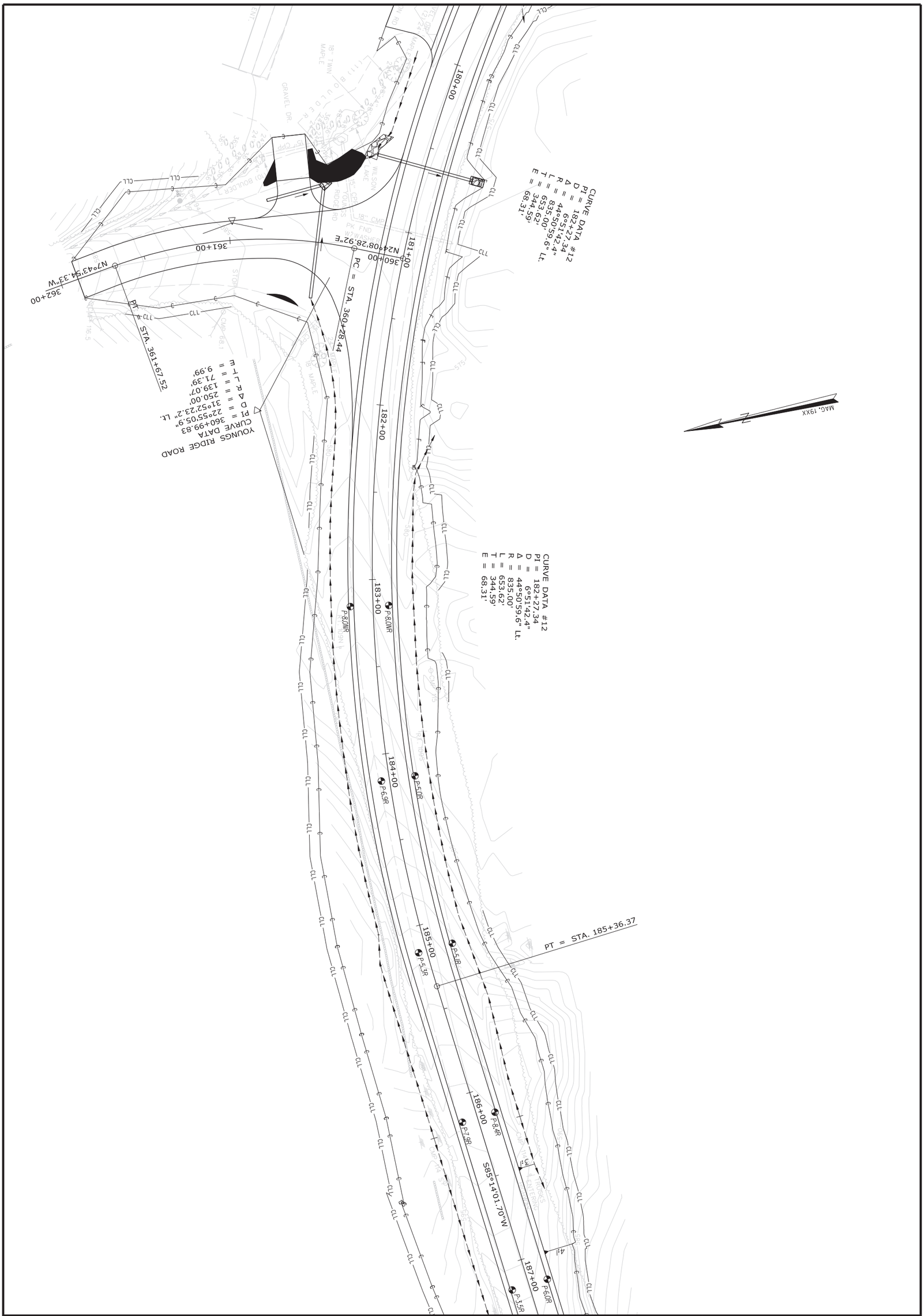
DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN 020267.00

HIGHWAY PLANS



PROJ. MANAGER	D. LOVELY	BY	DATE	
DESIGN-DETAILED	R. BETZ			
CHECKED-REVIEWED				SIGNATURE
DESIGN2-DETAILED2	C.RUSSELL	T.WHITE	AUG 2024	
DESIGN3-DETAILED3				P.E. NUMBER
REVISIONS 1				
REVISIONS 2				
REVISIONS 3				DATE
REVISIONS 4				
FIELD CHANGES				

SHEET NUMBER 17 OF 20

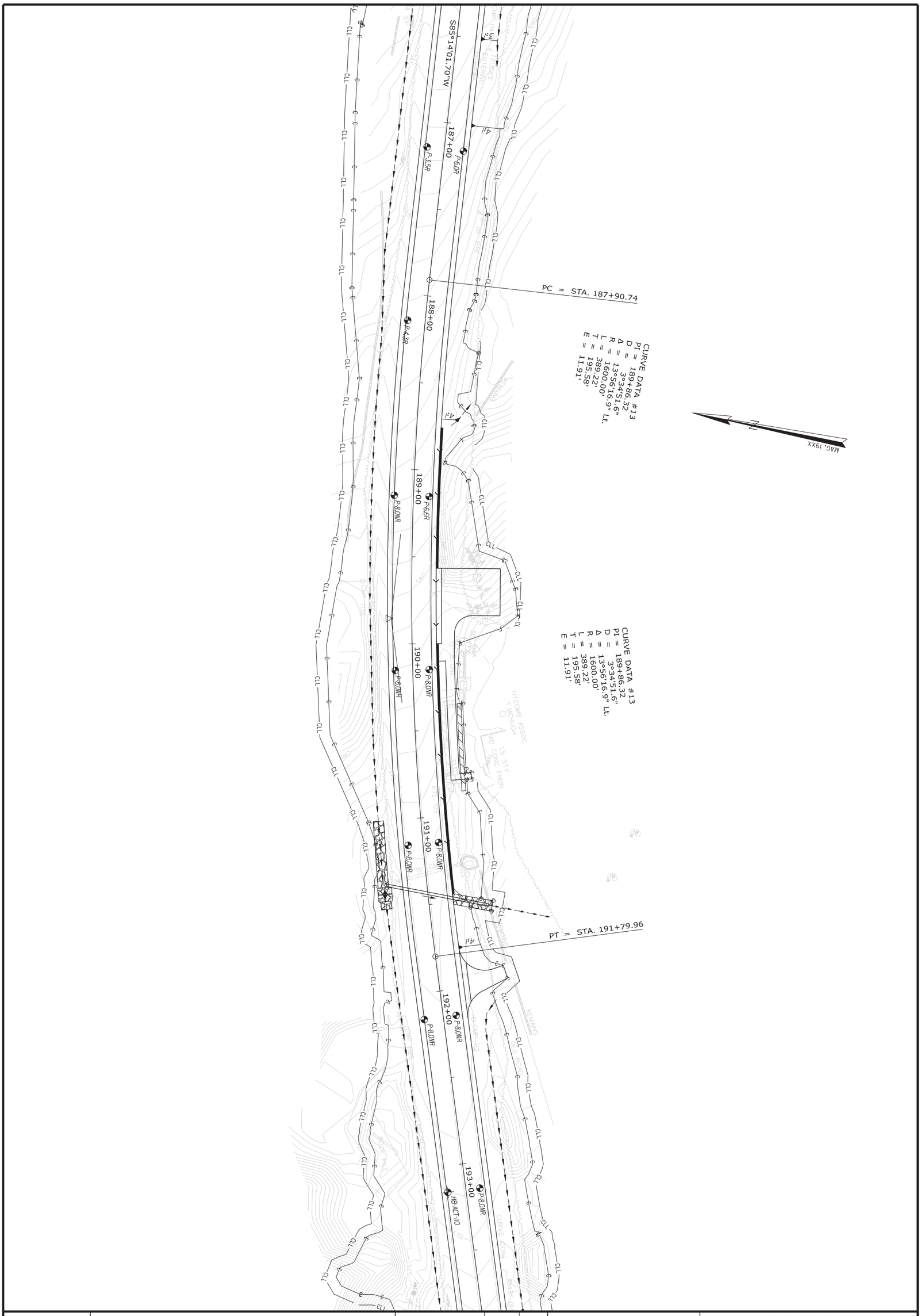
ACTON
ROUTE 109

BORING LOCATION PLAN

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN
020267.00 HIGHWAY PLANS



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CHECKED-REVIEWED				SIGNATURE
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DESIGN3-DETAILED3				P.E. NUMBER
REVISIONS 1				
REVISIONS 2				
REVISIONS 3				DATE
REVISIONS 4				
FIELD CHANGES				

SHEET NUMBER 18 OF 20

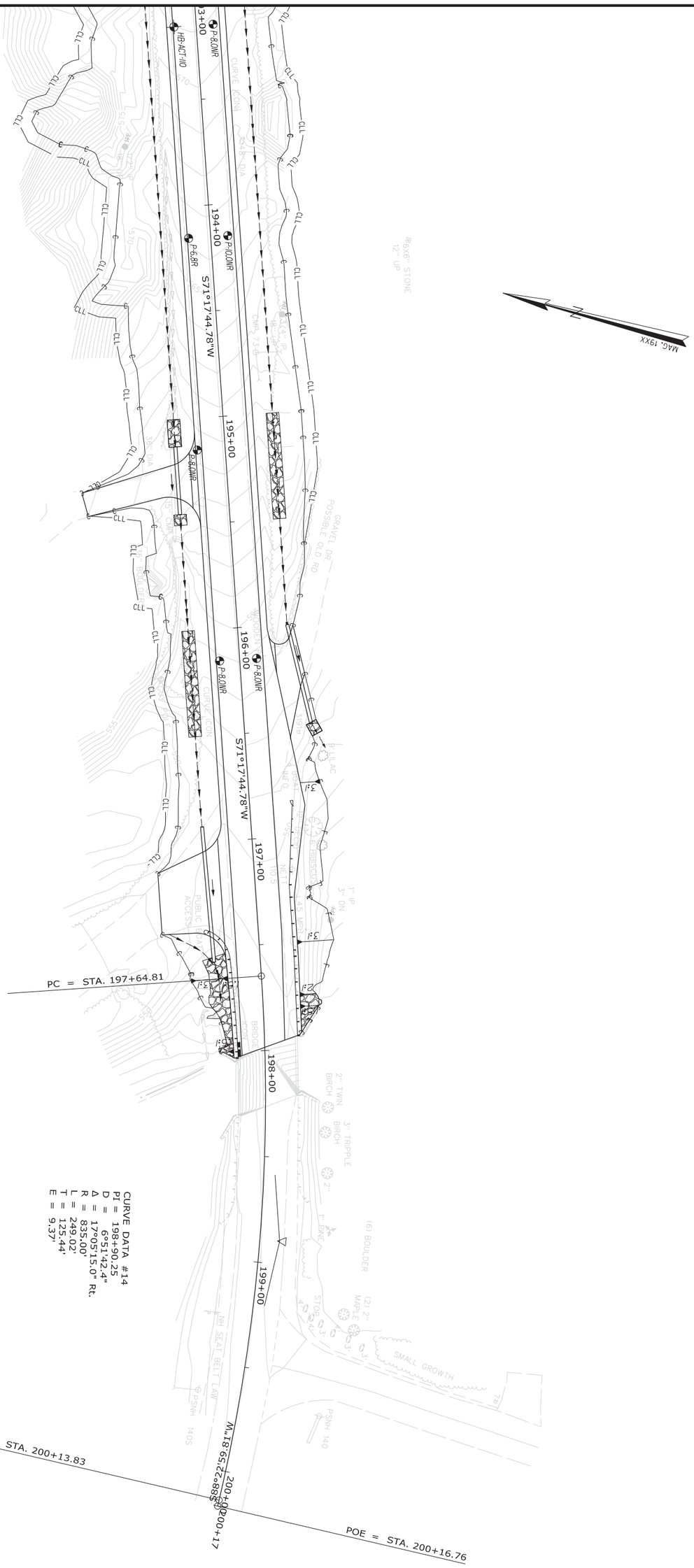
ACTON
ROUTE 109

BORING LOCATION PLAN

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN 020267.00 HIGHWAY PLANS



SHEET NUMBER 19 OF 20

ACTON
ROUTE 109

BORING LOCATION PLAN

PROJ. MANAGER	D. LOVELY	BY	DATE
DESIGN-DETAILED	R. BETZ		
CHECKED-REVIEWED			
DESIGN2-DETAILED2	C.RUSSELL	T.WHITE	AUG 2024
DESIGN3-DETAILED3			
REVISIONS 1			
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REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

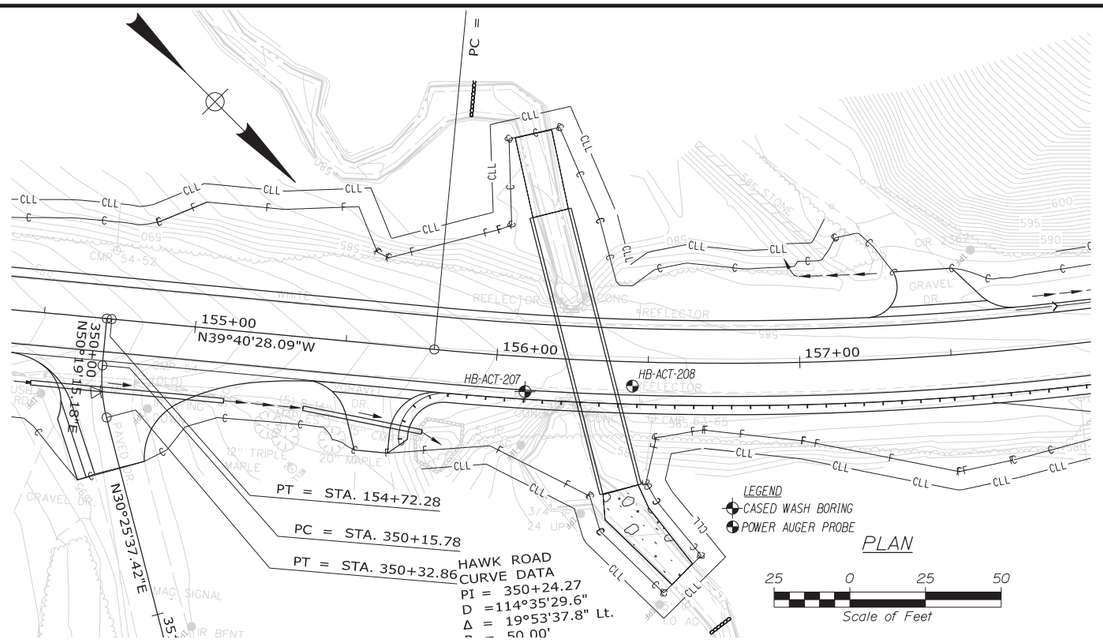
P.E. NUMBER

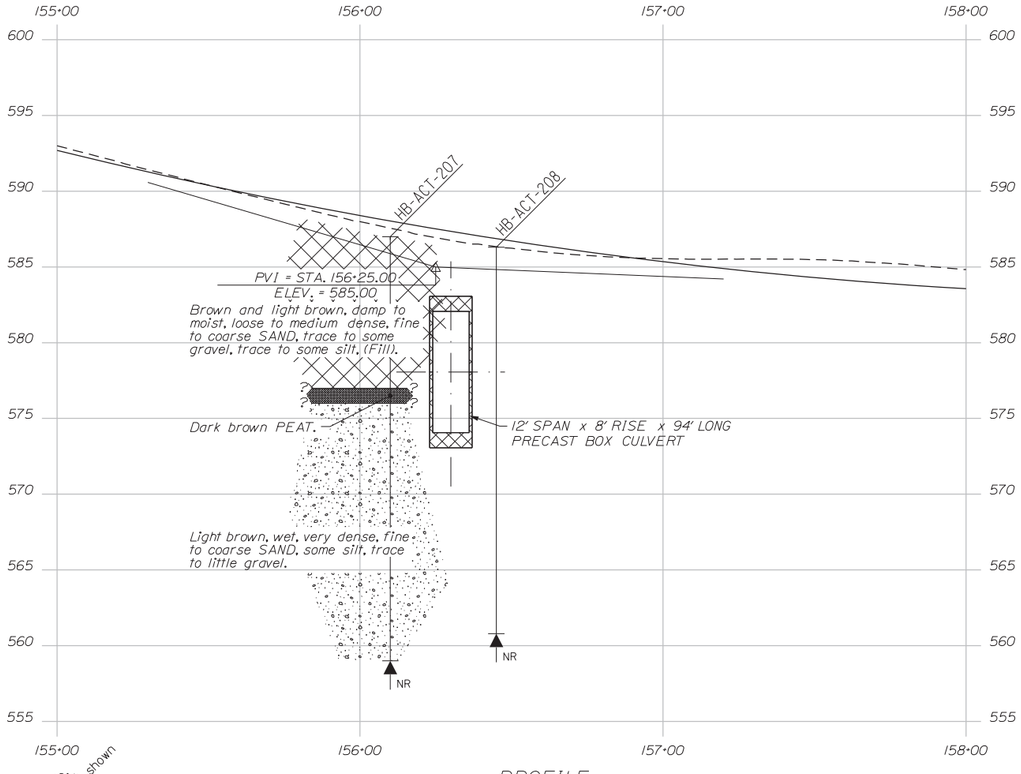
DATE

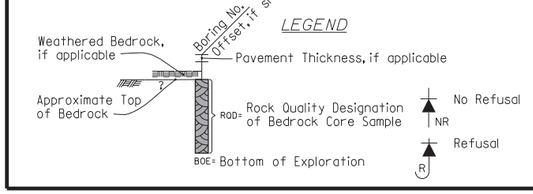
STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

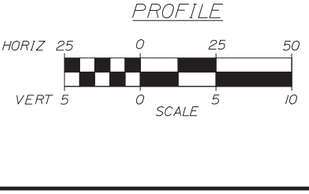
STP-2026(700)

WIN
020267.00 HIGHWAY PLANS









Note: This generalized interpretive soil profile is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and have been developed by interpretations of widely spaced explorations and samples. Actual soil and bedrock transitions may vary and are probably more erratic. For more specific information refer to the exploration logs.

Maine Department of Transportation
Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109
Location: Acton, Maine

Boring No.: HB-ACT-207
WIN: 20267.00

Drillers:	MaineDOT	Elevation (ft.): 587.0	Auger ID/OD: 5" Solid Stem
Operator:	Doggett/Niles	Datum: NAVD88	Sampler: Standard Split Spoon
Logged By:	B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: 140#/30"
Date Start/Finish:	6/17/2019; 08:45-10:45	Drilling Method: Cased Wash Boring	Core Barrel: N/A
Boring Location:	156+10, 11.5 ft Rt.	Casing ID/OD: NW-3"	Water Level*: 12.0 ft bgs.
Hammer Efficiency Factor: 0.928		Hammer Type: Automatic ☒ Hydraulic ☐	Rope & Cathead ☐

Definitions:
S = Split Spoon Sample
WO = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
WU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, FP = Pocket Penetrometer
WV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WOP = Weight of 1 Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(Lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
N-corrected = Raw Field SPT N-value corrected for Hammer Efficiency
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N-hammer Efficiency Factor/60%=N-uncorrected
T_v = Pocket Torvane Shear Strength (tsf)
MC = Water Content, percent
LL = Liquid Limit
PL = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Rec./Rec. (in.)	Sample Depth (ft.)	Blows / 6 in. Drive Strength (N-uncorrected or RQD %)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
0											
	S1	24/17	0.00 - 2.00	4/4/10/9	14	22	554			Brown, moist, medium dense, fine to coarse SAND, some gravel, trace silt. (Fill).	G#337347 A-1-b, SM-SM MC=4.8%
5	S2	24/15	5.00 - 7.00	1/1/2/3	3	5				Light brown, damp, loose, fine to coarse SAND, some silt, trace gravel. (Fill).	G#337348 A-2-4, SM MC=12.8%
10	S3	24/16	10.00 - 12.00	2/2/6/15	8	12	2	577.0		Dark brown PEAT.	10.0 G#337349 A-1-b, SM-SM MC=45.3%
							11	576.0		Brown, wet, medium dense, fine to coarse SAND, trace gravel, trace silt.	11.0 Loss on Ignition (4.7%)
							82				
							86				
15							107				
	S4	24/19	15.00 - 17.00	12/17/30/27	47	73	9			Light brown, wet, very dense, fine to coarse SAND, some silt, little gravel. Roller Coned ahead to 20.0 ft bgs.	G#337350 A-2-4, SM MC=12.5%
							26				
							27				
							38				
							77				
20	S5	24/18	20.00 - 22.00	15/21/19/22	40	62	39			Light brown, wet, very dense, fine to coarse SAND, some silt, trace gravel.	G#337351 A-2-4, SM MC=12.6%
							63				
							64				
							G100 DRIVE HOLE			0100 blows for 0.8 ft. Cobble from 23.8-24.2 ft bgs. Cobble from 24.6-24.9 ft bgs.	
25	S6	8.4/6	25.00 - 25.70	46/50(2.4")	---					Light brown, wet, very dense, fine to coarse SAND, some silt, trace gravel. Cobble from 25.7-26.0 ft bgs. Roller Coned ahead to 28.0 ft bgs.	G#337352 A-2-4, SM MC=9.2%
28								559.0			28.0

Remarks:
Bottom of Exploration at 28.0 feet below ground surface.
NO REFUSAL

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1
Boring No.: HB-ACT-207

Maine Department of Transportation
Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109
Location: Acton, Maine

Boring No.: HB-ACT-208
WIN: 20267.00

Drilling Contractor:	MaineDOT	Elevation (ft.): 586.3	Auger ID/OD: 5" Dia.
Operator:	Doggett/Niles	Datum: NAVD88	Sampler: N/A
Logged By:	B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish:	6/17/2019; 11:00-12:00	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location:	156+45, 8.0 ft Rt.	Casing ID/OD: N/A	Water Level*: None Observed

Definitions:
S = Split Spoon Sample
B = Bucket Sample off Auger Flights
WO = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
WU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, FP= Pocket Penetrometer
WV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WOP = Weight of 1 Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(Lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
T_v = Pocket Torvane Shear Strength (psf)
MC = Water Content, percent
LL = Liquid Limit
PL = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Rec./Rec. (in.)	Sample Depth (ft.)	Blows / 6 in. Drive Strength (N-uncorrected or RQD %)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class
0						554			Probe, no samples taken.	
5										
10										
15									Soils Similar to HB-ACT-207.	
20										
25							560.8			25.5

Remarks:
Bottom of Exploration at 25.5 feet below ground surface.
NO REFUSAL

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 1 of 1
Boring No.: HB-ACT-208

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-2026(700)

WIN 020267.00

HIGHWAY PLANS

PROJ. MANAGER	D. LOVELY	BY	DATE
DESIGN-DETAILED	R. BETZ	-----	-----
CHECKED-REVIEWED	C. RUSSELL	T. WHITE	AUG 2024
DESIGN2-DETAILED2	C. RUSSELL	T. WHITE	-----
DESIGN3-DETAILED3		-----	-----

REVISIONS	BY	DATE
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

DATE

ACTON
ROUTE 109

BORING LOCATION PLAN &
INTERPRETIVE SUBSURFACE PROFILE
WITH BORING LOGS

SHEET NUMBER
20
OF 20

Filename: ...\MSTA\020_BLP&ISPwBL.dgn Division: GEOTECH Username: Cody.A.Russell Date:8/26/2024

Appendix A

Boring Logs & Probe Summary Sheets

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS (more than half of material is larger than No. 200 sieve size)	GRAVELS (more than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVELS (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel sand mixtures, little or no fines.
		GRAVEL WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (more than half of coarse fraction is smaller than No. 4 sieve size)	CLEAN SANDS (little or no fines)	SW	Well-graded sands, Gravelly sands, little or no fines
			SP	Poorly-graded sands, Gravelly sand, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS (liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, Silty or Clayey fine sands, or Clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, Gravelly clays, Sandy clays, Silty clays, lean clays.
			OL	Organic silts and organic Silty clays of low plasticity.
	SILTS AND CLAYS (liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine Sandy or Silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
	HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.

Desired Soil Observations (in this order, if applicable):

Color (Munsell color chart)
Moisture (dry, damp, moist, wet)
Density/Consistency (from above right hand side)
Texture (fine, medium, coarse, etc.)
Name (Sand, Silty Sand, Clay, etc., including portions - trace, little, etc.)
Gradation (well-graded, poorly-graded, uniform, etc.)
Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic)
Structure (layering, fractures, cracks, etc.)
Bonding (well, moderately, loosely, etc.,)
Cementation (weak, moderate, or strong)
Geologic Origin (till, marine clay, alluvium, etc.)
Groundwater level

MODIFIED BURMISTER SYSTEM

Descriptive Term	Portion of Total (%)
trace	0 - 10
little	11 - 20
some	21 - 35
adjective (e.g. Sandy, Clayey)	36 - 50

TERMS DESCRIBING DENSITY/CONSISTENCY

Coarse-grained soils (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) Silty or Clayey gravels; and (3) Silty, Clayey or Gravelly sands. Density is rated according to standard penetration resistance (N-value).

Density of Cohesionless Soils	Standard Penetration Resistance N-Value (blows per foot)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

Fine-grained soils (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) Gravelly, Sandy or Silty clays; and (3) Clayey silts. Consistency is rated according to undrained shear strength as indicated.

Consistency of Cohesive soils	SPT N-Value (blows per foot)	Approximate Undrained Shear Strength (psf)	Field Guidelines
Very Soft	WOH, WOR, WOP, <2	0 - 250	Fist easily penetrates
Soft	2 - 4	250 - 500	Thumb easily penetrates
Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort
Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort
Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail
Hard	>30	over 4000	Indented by thumbnail with difficulty

Rock Quality Designation (RQD):

$$\text{RQD (\%)} = \frac{\text{sum of the lengths of intact pieces of core* > 4 inches}}{\text{length of core advance}}$$

*Minimum NQ rock core (1.88 in. OD of core)

Rock Quality Based on RQD

Rock Quality	RQD (%)
Very Poor	≤25
Poor	26 - 50
Fair	51 - 75
Good	76 - 90
Excellent	91 - 100

Desired Rock Observations (in this order, if applicable):

Color (Munsell color chart)
Texture (aphanitic, fine-grained, etc.)
Rock Type (granite, schist, sandstone, etc.)
Hardness (very hard, hard, mod. hard, etc.)
Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.)
Geologic discontinuities/jointing:
-dip (horiz - 0-5 deg., low angle - 5-35 deg., mod. dipping - 35-55 deg., steep - 55-85 deg., vertical - 85-90 deg.)
-spacing (very close - <2 inch, close - 2-12 inch, mod. close - 1-3 feet, wide - 3-10 feet, very wide >10 feet)
-tightness (tight, open, or healed)
-infilling (grain size, color, etc.)
Formation (Waterville, Ellsworth, Cape Elizabeth, etc.)
RQD and correlation to rock quality (very poor, poor, etc.)
ref: ASTM D6032 and FHWA NHI-16-072 GEC 5 - Geotechnical Site Characterization, Table 4-12
Recovery (inch/inch and percentage)
Rock Core Rate (X.X ft - Y.Y ft (min:sec))

Maine Department of Transportation
Geotechnical Section
Key to Soil and Rock Descriptions and Terms
Field Identification Information

Sample Container Labeling Requirements:

WIN
Bridge Name / Town
Boring Number
Sample Number
Sample Depth
Blow Counts
Sample Recovery
Date
Personnel Initials

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-101

WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	738.4	**Auger ID/OD:**	12" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/15/2015-7/15/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	94+50, 9.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing
WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	B1		0.79 - 1.50			SSA	737.6		9½" PAVEMENT 0.8	G#302216 A-1-a, GW-GM WC=5.3%
	S1		1.50 - 5.00				736.9		Brown, damp, fine to coarse Sandy GRAVEL, trace silt, occasional cobble, (Fill). 1.5	G#302217 A-2-4, SM WC=7.9%
									Light brown, moist, fine to coarse SAND, some silt, little gravel.	
5							733.4		5.0 **Bottom of Exploration at 5.0 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109
Location: Acton, Maine

Boring No.: HB-ACT-102
WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	740.8	**Auger ID/OD:**	5" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/15/2015-7/15/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	105+50, 9.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing
WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	S2		0.75 - 2.40			SSA	740.1		9" PAVEMENT (0.8)	G#302218 A-1-b, SM WC=6.5%
									Brown, moist, fine to coarse SAND, some gravel, little silt, (Fill).	
							738.4		(2.4)	
									Bottom of Exploration at 2.4 feet below ground surface. AUGER REFUSAL	
5										
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-103

WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	737.2	**Auger ID/OD:**	12" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/15/2015-7/15/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	111+00, 7.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing
WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA			12" PAVEMENT	
							736.2		1.0	
	B2		1.00 - 2.10						Brown, moist, fine to coarse SAND, some gravel, trace silt, (Fill).	G#302219 A-1-b, SW-SM WC=6.2%
	S3		2.10 - 5.00				735.1		2.1	
									Light brown, moist, Silty fine to coarse SAND, trace gravel.	G#302220 A-4, SM WC=20.1%
5							732.2		5.0	
									Bottom of Exploration at 5.0 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109
Location: Acton, Maine

Boring No.: HB-ACT-104
WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	697.3	**Auger ID/OD:**	12" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/15/2015-7/15/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	121+00, 12.0 ft Rt. Shoulder	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions: D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer; MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing; WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too; LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	B3		0.00 - 1.10			SSA			Brown, damp, fine to coarse SAND, some gravel, trace silt, (Fill).	G#302221 A-1-b, SW-SM WC=3.0%
	S4		1.10 - 5.90				696.2		1.1	
									Light brown, moist, fine to coarse SAND, little gravel, little silt.	G#302222 A-1-b, SM WC=7.2%
5							691.4		5.9	
									Bottom of Exploration at 5.9 feet below ground surface. AUGER REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109
Location: Acton, Maine

Boring No.: HB-ACT-105
WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	651.5	**Auger ID/OD:**	12" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/15/2015-7/15/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	134+00, 8.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing
WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	B4		0.92 - 2.40			SSA	650.6		11" PAVEMENT	
									0.9	G#302223 A-1-a, SW-SM WC=4.4%
									Brown, damp, Gravelly, fine to coarse SAND, trace silt, occasional cobble, (Fill).	
	S5		2.40 - 5.00				649.1		2.4	G#302224 A-2-4, SM WC=8.3%
									Light brown, moist, fine to coarse SAND, some silt, trace gravel.	
5							646.5		5.0	
									Bottom of Exploration at 5.0 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109
Location: Acton, Maine

Boring No.: HB-ACT-106
WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	627.9	**Auger ID/OD:**	12" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/15/2015-7/15/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	145+00, 12.0 ft Lt. Shoulder	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing
WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	B5		0.00 - 1.60			SSA			Brown, damp, fine to coarse SAND, some gravel, trace silt, (Fill).	G#302225 A-1-b, SW-SM WC=3.5%
	S6		1.60 - 8.00				626.3		1.6	
									Light brown, damp, fine to coarse SAND, some silt, little gravel.	G#302151 A-2-4, SM WC=11.2%
5										
							619.9		8.0	
10									**Bottom of Exploration at 8.0 feet below ground surface.** NO REFUSAL	
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109
Location: Acton, Maine

Boring No.: HB-ACT-107
WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	584.1	**Auger ID/OD:**	5" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/16/2015-7/16/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	158+00, 6.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions: D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer; MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing; WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too; LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	S7		0.83 - 1.30			SSA	583.3		10" PAVEMENT (0.8)	
	S8		1.30 - 5.00				582.8		Brown, damp, fine to coarse Sandy GRAVEL, trace silt, (Fill). (1.3)	G#302152 A-1-a, GW-GM WC=4.45%
									Light brown, moist, fine to coarse SAND, some silt, trace gravel.	G#302153 A-2-4, SM WC=20.3%
5							579.1		(5.0)	
									Bottom of Exploration at 5.0 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109
Location: Acton, Maine

Boring No.: HB-ACT-108
WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	583.6	**Auger ID/OD:**	5" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/16/2015-7/16/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	158+00, 1.0 ft Rt. Shoulder	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions: D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer; MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing; WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too; LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA	583.2		Brown, damp, fine to coarse Sandy GRAVEL, trace silt, (Fill). 0.4	
									Light brown, moist, fine to coarse SAND, some silt, trace gravel.	
5							578.6		5.0	
									Bottom of Exploration at 5.0 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-109

WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	589.4	**Auger ID/OD:**	12" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/15/2015-7/15/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	163+00, 11.1 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing
WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	B6		0.75 - 5.00			SSA	588.7		9" PAVEMENT (0.8)	
									Brown, damp, Gravelly, fine to coarse SAND, trace silt, occasional cobble, (Fill).	G#302154 A-1-a, SW-SM WC=3.0%
5							584.4		(5.0)	
									Bottom of Exploration at 5.0 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-110

WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	571.0	**Auger ID/OD:**	12" Dia.
Operator:	Giles/Daggett/Giles	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	7/15/2015-7/15/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	193+00, 10.5 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing
WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	B7		0.42 - 5.00			SSA	570.6		5" PAVEMENT (0.4) Brown, damp, fine to coarse Sandy GRAVEL, trace silt, (Fill).	G#302155 A-1-a, GW-GM WC=3.7%
5							566.0		(5.0) **Bottom of Exploration at 5.0 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-201

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	726.9	**Auger ID/OD:**	5" Solid Stem
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/12/2019; 06:30-08:15	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	N/A
Boring Location:	96+50, 7.5 ft Lt.	**Casing ID/OD:**	NW-3"	**Water Level*:**	1.9 ft bgs.
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
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V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	726.0		11" HMA.	
										0.9	
	1D	24/12	1.00 - 3.00	12/13/9/8	22	34				Brown, moist, medium dense, Silty fine to coarse SAND, trace gravel, old pavement, (Fill).	
								722.9		4.0	
5	2D	9.6/9.6	5.00 - 5.80	13/50(3.6")	---		[a]100			[a]100 blows for 0.8 ft. Brown, moist, dense, Silty fine to coarse SAND, trace gravel. Cobble from 5.8-6.3 ft bgs. Roller Coned ahead to 10.0 ft bgs. Cobble from 6.9-7.5 ft bgs.	G#337341 A-4, SM WC=11.1%
							OPEN HOLE				
10								716.9		10.0	
	3D	12/12	10.00 - 11.00	16/66	---					Brown, wet, very dense, Gravelly fine to coarse SAND, little silt, occasional cobble. Roller Coned ahead to 13.0 ft bgs. Cobble from 11.0-11.4 ft bgs.	
								713.9		13.0	
										Bottom of Exploration at 13.0 feet below ground surface. NO REFUSAL	
15											
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ACT-201

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-202

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	722.9	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/12/2019; 13:30-14:45	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	97+25, 12.5 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/14	0.00 - 2.00	4/5/5/7	10	15	SSA			Brown, moist, medium dense, fine to coarse SAND, some gravel, trace silt, (Fill).	G#337342 A-1-b, SW-SM WC=7.1%
								718.9		4.0	
5	2D	24/20	5.00 - 7.00	4/18/14/20	32	49				Brown, moist, dense, fine to coarse SAND, little gravel, little silt.	
										Cobble from 7.2-7.6 ft bgs.	
										Cobble from 8.1-8.5 ft bgs.	
								713.9		9.0	
10	3D	24/18	10.00 - 12.00	19/30/21/36	51	79				Brown, moist, very dense, Gravelly fine to coarse SAND, little silt.	
								710.9		12.0	
										Bottom of Exploration at 12.0 feet below ground surface. NO REFUSAL	
15											
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ACT-202

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-203

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	721.4	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/12/2019; 08:30-09:30	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	98+00, 12.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	9.0 ft bgs.
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/18	0.00 - 2.00	2/4/5/7	9	14	SSA			Brown, damp, medium dense, fine to coarse SAND, some gravel, trace silt, occasional cobble, (Fill).	
5	2D	24/20	5.00 - 7.00	5/5/7/9	12	19		716.4		5.0 Brown, moist, medium dense, fine to coarse SAND, some silt, trace gravel.	
10	3D	24/18	10.00 - 12.00	1/2/2/4	4	6		712.4		9.0 Grey, wet, medium stiff, fine to coarse Sandy SILT, trace gravel.	G#337343 A-4, CL WC=41.4%
15								709.4		12.0 **Bottom of Exploration at 12.0 feet below ground surface.** NO REFUSAL	
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ACT-203

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-204

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	720.8	**Auger ID/OD:**	5" Solid Stem
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/12/2019; 10:30-12:00	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	NQ-2"
Boring Location:	98+75, 12.0 ft Rt.	**Casing ID/OD:**	NW-3"	**Water Level*:**	1.9 ft bgs.
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/15	0.00 - 2.00	3/5/7/7	12	19	SSA			Brown, moist, medium dense, fine to coarse SAND, some gravel, trace silt, (Fill).	
								717.3		3.5	
5	2D	3.6/3.6	5.00 - 5.30	50(3.6")	---		[a]20			[a]20 blows for 0.5 ft. Very dense, COBBLES. Roller Coned ahead to 8.0 ft bgs.	
							OPEN HOLE				
								712.8		8.0	
	R1	60/60	8.00 - 13.00	RQD = 68%			NQ-2			Top of Bedrock at Elev. 712.8 ft. R1: Bedrock: Interbedded PELITE and LIMESTONE and/or DOLOSTONE [Rindgemere Formation]. Rock Quality = Fair R1: Core Times (min:sec) 8.0-9.0 ft (2:34) 9.0-10.0 ft (1:59) 10.0-11.0 ft (2:03) 11.0-12.0 ft (2:18) 12.0-13.0 ft (2:16) 100% Recovery	
10								707.8		13.0	
										Bottom of Exploration at 13.0 feet below ground surface.	
15											
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ACT-204

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-205

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	723.9	**Auger ID/OD:**	5" Solid Stem
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/12/2019; 09:30-10:30	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	NQ-2"
Boring Location:	99+40, 9.5 ft Lt.	**Casing ID/OD:**	NW-3"	**Water Level*:**	None Observed
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0							SSA	723.2		9" HMA.	
										0.8	
	1D	24/10	1.00 - 3.00	8/7/7/8	14	22				Brown, moist, medium dense, fine to coarse SAND, some gravel, trace silt, (Fill).	
								719.9		4.0	
5	2D	24/8	5.00 - 7.00	8/16/22/40	38	59				Brown, moist, very dense, fine to coarse SAND, little gravel, little silt.	
								714.4		[a]50 blows for 0.5 ft.	
	R1	60/60	9.50 - 14.50	RQD = 57%			[a]50 NQ-2			9.5	
10										Top of Bedrock at Elev. 714.4 ft. R1: Bedrock: Interbedded PELITE and LIMESTONE and/or DOLOSTONE [Rindgemere Formation]. Rock Quality = Fair R1: Core Times (min:sec) 9.5-10.5 ft (2:04) 10.5-11.5 ft (2:01) 11.5-12.5 ft (2:29) 12.5-13.5 ft (2:08) 13.5-14.5 ft (2:27) 100% Recovery	
								709.4		14.5	
15										**Bottom of Exploration at 14.5 feet below ground surface.**	
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-206

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	722.9	**Auger ID/OD:**	5" Solid Stem
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/17/2019; 06:30-08:30	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	NQ-2"
Boring Location:	113+75, 15.0 ft Lt.	**Casing ID/OD:**	NW-3"	**Water Level*:**	5.0 ft bgs.
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/14	0.00 - 2.00	4/3/2/2	5	8	SSA			Brown, moist, loose, fine to coarse SAND, some gravel, little silt, (Fill).	
								719.9		3.0	
5	2D	21.6/18	5.00 - 6.80	5/8/23/40(3.6")	31	48	15			Brown, wet, dense, Gravelly fine to coarse SAND, little silt, weathered rock in tip of spoon.	
	R1	60/60	6.80 - 11.80	RQD = 65%			NQ-2	716.1		6.8	
										Top of Bedrock at Elev. 716.1 ft. R1: Bedrock: Interbedded PELITE and LIMESTONE and/or DOLOSTONE [Rindgemere Formation]. Rock Quality = Fair R1: Core Times (min:sec) 6.8-7.8 ft (2:02) 7.8-8.8 ft (1:58) 8.8-9.8 ft (1:56) 9.8-10.8 ft (1:58) 10.8-11.8 ft (2:00) 100% Recovery	
10								711.1		11.8	
										Bottom of Exploration at 11.8 feet below ground surface.	
15											
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Boring No.: HB-ACT-206

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-207

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	587.0	**Auger ID/OD:**	5" Solid Stem
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/17/2019; 08:45-10:45	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	N/A
Boring Location:	156+10, 11.5 ft Rt.	**Casing ID/OD:**	NW-3"	**Water Level*:**	12.0 ft bgs.
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
				Sample Information							
0	1D	24/17	0.00 - 2.00	4/4/10/9	14	22	SSA			Brown, moist, medium dense, fine to coarse SAND, some gravel, trace silt, (Fill).	G#337347 A-1-b, SW-SM WC=4.8%
5	2D	24/15	5.00 - 7.00	1/1/2/3	3	5				Light brown, damp, loose, fine to coarse SAND, some silt, trace gravel, (Fill).	G#337348 A-2-4, SM WC=12.8%
10	3D	24/16	10.00 - 12.00	2/2/6/15	8	12	2	577.0		10.0	
							11			Dark brown PEAT.	G#337349 A-1-b, SW-SM WC=45.3% Loss on Ignition,(4.7%)
							82	576.0		11.0	
							86			Brown, wet, medium dense, fine to coarse SAND, trace gravel, trace silt.	
							107				
15	4D	24/19	15.00 - 17.00	12/17/30/27	47	73	9	572.0		15.0	
							26			Light brown, wet, very dense, fine to coarse SAND, some silt, little gravel. Roller Coned ahead to 20.0 ft bgs.	G#337350 A-2-4, SM WC=12.5%
							27				
							38				
							77				
20	5D	24/18	20.00 - 22.00	15/21/19/22	40	62	39			Light brown, wet, very dense, fine to coarse SAND, some silt, trace gravel.	G#337301 A-2-4, SM WC=12.6%
							63				
							64				
							a100			[a]100 blows for 0.8 ft.	
							OPEN HOLE			Cobble from 23.8-24.2 ft bgs.	
25										Cobble from 24.6-24.9 ft bgs.	

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-207

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	587.0	**Auger ID/OD:**	5" Solid Stem
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/17/2019; 08:45-10:45	**Drilling Method:**	Cased Wash Boring	**Core Barrel:**	N/A
Boring Location:	156+10, 11.5 ft Rt.	**Casing ID/OD:**	NW-3"	**Water Level*:**	12.0 ft bgs.
Hammer Efficiency Factor: 0.928		**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140 lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_V = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25	6D	8.4/6	25.00 - 25.70	46/50(2.4")	---					Light brown, wet, very dense, fine to coarse SAND, some silt, trace gravel. Cobble from 25.7-26.0 ft bgs. Roller Coned ahead to 28.0 ft bgs.	G#337302 A-2-4, SM WC=9.2%
								559.0		28.0 **Bottom of Exploration at 28.0 feet below ground surface.** NO REFUSAL	
30											
35											
40											
45											
50											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-208

WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	586.3	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	N/A
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	6/17/2019; 11:00-12:00	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	156+45, 8.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample; S = Sample off Auger Flights; B = Bucket Sample off Auger Flights; MD = Unsuccessful Split Spoon Sample Attempt; U = Thin Wall Tube Sample; MV = Unsuccessful Field Vane Shear Test Attempt; V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample Attempt; R = Rock Core Sample; SSA = Solid Stem Auger; HSA = Hollow Stem Auger; RC = Roller Cone; WOH = Weight of 140lb. Hammer; WOR/C = Weight of Rods or Casing
WO1P = Weight of 1 Person; S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf); $S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf); q_p = Unconfined Compressive Strength (ksf); N-value = Raw Field SPT N-value; T_v = Pocket Torvane Shear Strength (psf); WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; G = Grain Size Analysis; C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA			Probe, no samples taken.	
5										
10										
15									Soils Similar to HB-ACT-207.	
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-208

WIN: 20267.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	586.3	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	N/A
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	6/17/2019; 11:00-12:00	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	156+45, 8.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	None Observed

Definitions:
D = Spilt Spoon Sample
S = Sample off Auger Flights
B = Bucket Sample off Auger Flights
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MV = Unsuccessful Field Vane Shear Test Attempt
V = Field Vane Shear Test, PP= Pocket Penetrometer
MU = Unsuccessful Thin Wall Tube Sample Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of 1 Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-value = Raw Field SPT N-value
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent ≅ = Similar or Equal too
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
25							560.8		25.5	
									Bottom of Exploration at 25.5 feet below ground surface. NO REFUSAL	
30										
35										
40										
45										
50										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-209

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	580.3	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/17/2019; 13:00-13:30	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	169+50, 10.0 ft Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	3.5 ft bgs.
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample Attempt
V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/13	0.00 - 2.00	3/4/5/5	9	14	SSA			Brown, wet, medium dense, fine to coarse SAND, some gravel, little silt, (Fill).	
5	2D/A	24/18	5.00 - 7.00	3/2/9/16	11	17		575.3		5.0 2D (5.0-6.0 ft bgs.) Black Organic SILT, fine sand. 2D/A (6.0-7.0 ft bgs.) Brown, wet, medium dense, fine to coarse SAND, some gravel, little silt.	G#337344 A-1-b, SM WC=172.4%
								571.8		8.5	
10	3D	24/19	10.00 - 12.00	2/5/14/17	19	29				Light brown, wet, medium dense, fine to medium SAND, trace silt.	
								568.3		12.0 **Bottom of Exploration at 12.0 feet below ground surface.** NO REFUSAL	
15											
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-210

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	578.7	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/17/2019; 11:30-14:00	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	170+25, 5.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	2.5 ft bgs.
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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MD = Unsuccessful Split Spoon Sample Attempt
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R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/16	0.00 - 2.00	4/6/4/4	10	15	SSA			Brown, wet, medium dense, fine to coarse SAND, some gravel, trace silt, (Fill).	G#337345 A-1-b, SW-SM WC=9.6%
								574.0		4.7	
5	2D	24/17	5.00 - 7.00	4/7/9/12	16	25		573.7		Layer of Black Organics. 5.0	
										Brown, wet, medium dense, fine to coarse SAND, some gravel, trace silt.	
10	3D	24/6	10.00 - 12.00	8/13/10/12	23	36				Brown, wet, dense, fine to coarse SAND, some gravel, trace silt.	
								566.7		12.0	
										Bottom of Exploration at 12.0 feet below ground surface. NO REFUSAL	
15											
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: HB-ACT-210

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 2.17 mile portion of Route 109

Location: Acton, Maine

Boring No.: HB-ACT-211

WIN: 20267.00

Driller:	MaineDOT	**Elevation (ft.)**	578.3	**Auger ID/OD:**	5" Dia.
Operator:	Daggett/Niles	**Datum:**	NAVD88	**Sampler:**	Standard Split Spoon
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	140#/30"
Date Start/Finish:	6/17/2019; 14:30-15:30	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	171+00, 8.0 ft Lt.	**Casing ID/OD:**	N/A	**Water Level*:**	4.0 ft bgs.
Hammer Efficiency Factor:	0.928	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample Attempt
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V = Field Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Field Vane Shear Test Attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = Weight of 140lb. Hammer
WOR/C = Weight of Rods or Casing
WO1P = Weight of One Person
S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf)
$S_{u(lab)}$ = Lab Vane Undrained Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw Field SPT N-value
Hammer Efficiency Factor = Rig Specific Annual Calibration Value
N_{60} = SPT N-uncorrected Corrected for Hammer Efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
T_v = Pocket Torvane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/14	0.00 - 2.00	4/5/6/5	11	17	SSA			Brown, moist, medium dense, fine to coarse SAND, some gravel, trace silt, (Fill).	
								573.8		4.5	
5	2D	24/4	5.00 - 7.00	2/2/5/5	7	11				Brown, wet, medium dense, fine to coarse SAND, little gravel, trace silt.	
								571.3		7.0	
										Dark brown Organic SILT on auger flight.	
								570.0		8.3	
10	3D	24/6	10.00 - 12.00	1/1/2/3	3	5				Brown, wet, loose, fine to coarse SAND, trace gravel, trace silt, trace organics.	G#337346 A-1-b, SW WC=37.8%
								566.3		12.0	
										Bottom of Exploration at 12.0 feet below ground surface. NO REFUSAL	
15											
20											
25											

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

State of Maine - Department of Transportation

Probe Summary Sheet

Town(s): Acton Project Number: 20267.00

Station (Feet)	Offset (Feet)	Top of Boring Elev. (Feet)	Refusal (Feet)	No Refusal (Feet)	Bottom of Boring Elev. (Feet)	Comments / Date 7/15-16/2015
109+00	8.0 Rt.	738.4	7.8		730.6	Probe
109+00	7.0 Lt.	738.5	3.0		735.5	Probe
110+00	9.0 Rt.	737.9	3.5		734.4	Probe
110+00	8.0 Lt.	738.0	3.4		734.6	Probe
111+00	9.0 Rt.	736.8	3.6		733.2	Probe
112+00	7.0 Rt.	734.6	1.6		733.0	Probe
112+00	16.0 Rt.	736.5				Bedrock Outcrop
112+00	12.0 Lt.	734.6	2.1		732.5	Probe
113+00	7.0 Rt.	728.1	2.4		725.7	Probe
113+00	13.0 Rt.	728.1				Bedrock Outcrop
113+00	12.5 Lt.	728.1	2.5		725.6	Probe
114+00	7.5 Rt.	721.6		10.0	711.6	Probe
114+00	13.5 Rt.	720.9		10.0	710.9	Probe
118+00	10.5 Rt.	710.1	6.4		703.7	Probe
118+00	9.0 Lt.	709.9	7.4		702.5	Probe
119+00	10.0 Rt.	707.7	5.5		702.2	Probe
119+00	9.0 Lt.	708.0	7.0		701.0	Probe
120+00	7.0 Rt.	704.1	2.0		702.1	Probe
120+00	8.0 Lt.	704.3	1.9		702.4	Probe
121+00	9.0 Lt.	697.4	9.6		687.8	Probe
122+00	8.5 Rt.	693.3	9.9		683.4	Probe
122+00	9.0 Lt.	693.1		10.0	683.1	Probe
145+00	8.0 Rt.	627.9	6.5		621.4	Probe
146+00	10.0 Rt.	625.6		8.0	617.6	Probe
146+00	11.0 Lt.	625.1	5.6		619.5	Probe
147+00	11.0 Rt.	624.3		8.0	616.3	Probe
147+00	11.0 Lt.	623.7		8.0	615.7	Probe
148+00	13.0 Rt.	623.4		8.0	615.4	Probe
148+00	9.0 Lt.	623.3	6.5		616.8	Probe
149+00	12.0 Rt.	620.9		8.0	612.9	Probe
149+00	8.5 Lt.	620.6		8.0	612.6	Probe
150+00	11.0 Rt.	617.4		8.0	609.4	Probe
150+00	11.0 Lt.	617.1		8.0	609.1	Probe
151+00	10.0 Rt.	613.9		8.0	605.9	Probe
151+00	13.3 Lt.	613.2		8.0	605.2	Probe
152+00	9.4 Rt.	609.9	6.5		603.4	Probe
152+00	12.8 Lt.	609.5		9.5	600.0	Probe
163+03	9.7 Lt.	590.0		15.0	575.0	Probe
164+05	9.8 Rt.	593.5		10.0	583.5	Probe
164+04	8.1 Lt.	593.6		10.0	583.6	Probe
165+05	1.8 Rt.	595.6		10.0	585.6	Probe
166+05	7.8 Rt.	595.1		10.0	585.1	Probe
166+05	26.1 Rt.	596.3		15.0	581.3	Probe
167+05	4.5 Rt.	592.9		10.0	582.9	Probe
168+03	24.5 Rt.	590.3		15.0	575.3	Probe
168+06	5.4 Rt.	589.5		10.0	579.5	Probe

MaineDOT Drill Crew
Logged By: B. Wilder
Drill Rig: CME 45C

5" Solid Stem Auger

State of Maine - Department of Transportation

Probe Summary Sheet

Town(s): Acton Project Number: 20267.00

Station (Feet)	Offset (Feet)	Top of Boring Elev. (Feet)	Refusal (Feet)	No Refusal (Feet)	Bottom of Boring Elev. (Feet)	Comments / Date 7/15-16/2015
183+15	13.1 Rt.	583.3		8.0	575.3	Probe
183+15	9.1 Lt.	581.9		8.0	573.9	Probe
184+15	4.9 Rt.	586.4	6.9		579.5	Probe
184+15	15.0 Lt.	584.9	5.0		579.9	Probe
185+15	5.0 Rt.	590.7	5.3		585.4	Probe
185+15	15.2 Lt.	589.3	5.1		584.2	Probe
186+15	9.0 Rt.	594.8	7.9		586.9	Probe
186+15	10.5 Lt.	594.1	8.4		585.7	Probe
187+15	10.1 Rt.	592.4	3.5		588.9	Probe
187+15	10.9 Lt.	591.1	6.0		585.1	Probe
188+15	10.1 Rt.	587.6	4.3		583.3	Probe
189+15	11.2 Rt.	583.2		8.0	575.2	Probe
189+15	8.9 Lt.	582.3	6.6		575.7	Probe
190+15	10.1 Rt.	578.0		8.0	570.0	Probe
190+15	9.5 Lt.	577.2		8.0	569.2	Probe
191+15	8.6 Rt.	574.2		8.0	566.2	Probe
191+15	9.0 Lt.	573.8		8.0	565.8	Probe
192+15	11.1 Rt.	572.8		8.0	564.8	Probe
192+15	7.7 Lt.	572.6		8.0	564.6	Probe
193+15	8.0 Lt.	570.8		8.0	562.8	Probe
194+15	10.5 Rt.	566.2	6.8		559.4	Probe
194+15	7.9 Lt.	566.2		10.0	556.2	Probe
195+15	13.2 Rt.	560.4		8.0	552.4	Probe
196+15	9.7 Rt.	553.8		8.0	545.8	Probe
196+15	8.0 Lt.	553.8		8.0	545.8	Probe

MaineDOT Drill Crew
Logged By: B. Wilder
Drill Rig: CME 45C

5" Solid Stem Auger

Appendix B

Laboratory Test Results

State of Maine - Department of Transportation

Laboratory Testing Summary Sheet

Town(s): Acton Work Number: 20267.00

Boring & Sample Identification Number	Station (Feet)	Offset (Feet)	Depth (Feet)	Reference Number	G.S.D.C. Sheet	W.C.	% Passing 200 Sieve	Classification		
								Unified	AASHTO	Frost
HB-ACT-101, B1	94+50	9.0 Rt.	0.79-1.5	302216	1	5.3	6.8	GW-GM	A-1-a	0
HB-ACT-101, S1	94+50	9.0 Rt.	1.5-5.0	302217	1	7.9	32.4	SM	A-2-4	II
HB-ACT-102, S2	105+50	9.0 Rt.	0.75-2.4	302218	1	6.5	19.1	SM	A-1-b	II
HB-ACT-103, B2	111+00	7.0 Lt.	1.0-2.1	302219	1	6.2	10.2	SW-SM	A-1-b	0
HB-ACT-103, S3	111+00	7.0 Lt.	2.1-5.0	302220	1	20.1	37.7	SM	A-4	III
HB-ACT-104, B3	121+00	12.0 Rt.	0.0-1.1	302221	2	3.0	8.2	SW-SM	A-1-b	0
HB-ACT-104, S4	121+00	12.0 Rt.	1.1-5.9	302222	2	7.2	13.2	SM	A-1-b	II
HB-ACT-105, B4	134+00	8.0 Rt.	0.92-2.4	302223	2	4.4	6.7	SW-SM	A-1-a	0
HB-ACT-105, S5	134+00	8.0 Rt.	2.4-5.0	302224	2	8.3	32.5	SM	A-2-4	II
HB-ACT-106, B5	145+00	12.0 Lt.	0.0-1.6	302225	2	3.5	9.6	SW-SM	A-1-b	0
HB-ACT-106, S6	145+00	12.0 Lt.	1.6-8.0	302151	2	11.2	29.9	SM	A-2-4	II
HB-ACT-107, S7	158+00	6.0 Rt.	0.83-1.3	302152	3	4.4	8.9	GW-GM	A-1-a	0
HB-ACT-107, S8	158+00	6.0 Rt.	1.3-5.0	302153	3	20.3	31.4	SM	A-2-4	II
HB-ACT-109, B6	163+00	11.1 Rt.	0.75-5.0	302154	3	3.0	7.7	SW-SM	A-1-a	0
HB-ACT-110, B7	193+00	10.5 Rt.	0.42-5.0	302155	3	3.7	7.1	GW-GM	A-1-a	0
HB-ACT-201, 2D	96+50	7.5 Lt.	5.0-5.8	337341	4	11.1	36.8	SM	A-4	III
HB-ACT-202, 1D	97+25	12.5 Rt.	0.0-2.0	337342	4	7.1	8.8	SW-SM	A-1-b	0
HB-ACT-203, 3D	98+00	12.0 Lt.	10.0-12.0	337343	4	41.4	53.1	CL	A-4	IV
HB-ACT-207, 1D	156+10	11.5 Rt.	0.0-2.0	337347	5	4.8	8.2	SW-SM	A-1-b	0
HB-ACT-207, 2D	156+10	11.5 Rt.	5.0-7.0	337348	5	12.8	25.4	SM	A-2-4	II
HB-ACT-207, 3D	156+10	11.5 Rt.	10.0-12.0	337349	5	45.3	8.4	SW-SM	A-1-b	0
HB-ACT-207, 4D	156+10	11.5 Rt.	15.0-17.0	337350	5	12.5	29.5	SM	A-2-4	II
HB-ACT-207, 5D	156+10	11.5 Rt.	20.0-22.0	337301	5	12.6	28.0	SM	A-2-4	II
HB-ACT-207, 6D	156+10	11.5 Rt.	25.0-25.7	337302	5	9.2	23.1	SM	A-2-4	II
HB-ACT-209, 2D	169+50	10.0 Rt.	5.0-6.0	337344	6	172	12.3	SM	A-1-b	II
HB-ACT-210, 1D	170+25	5.0 Lt.	0.0-2.0	337345	6	9.6	6.9	SW-SM	A-1-b	0
HB-ACT-211, 3D	171+00	8.0 Lt.	10.0-12.0	337346	6	37.8	4.1	SW	A-1-b	0
						Loss on Ignition, % (T 267)				
HB-ACT-207, 3D	156+10	11.5 Rt.	10.0-12.0	337349	5	4.7				

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

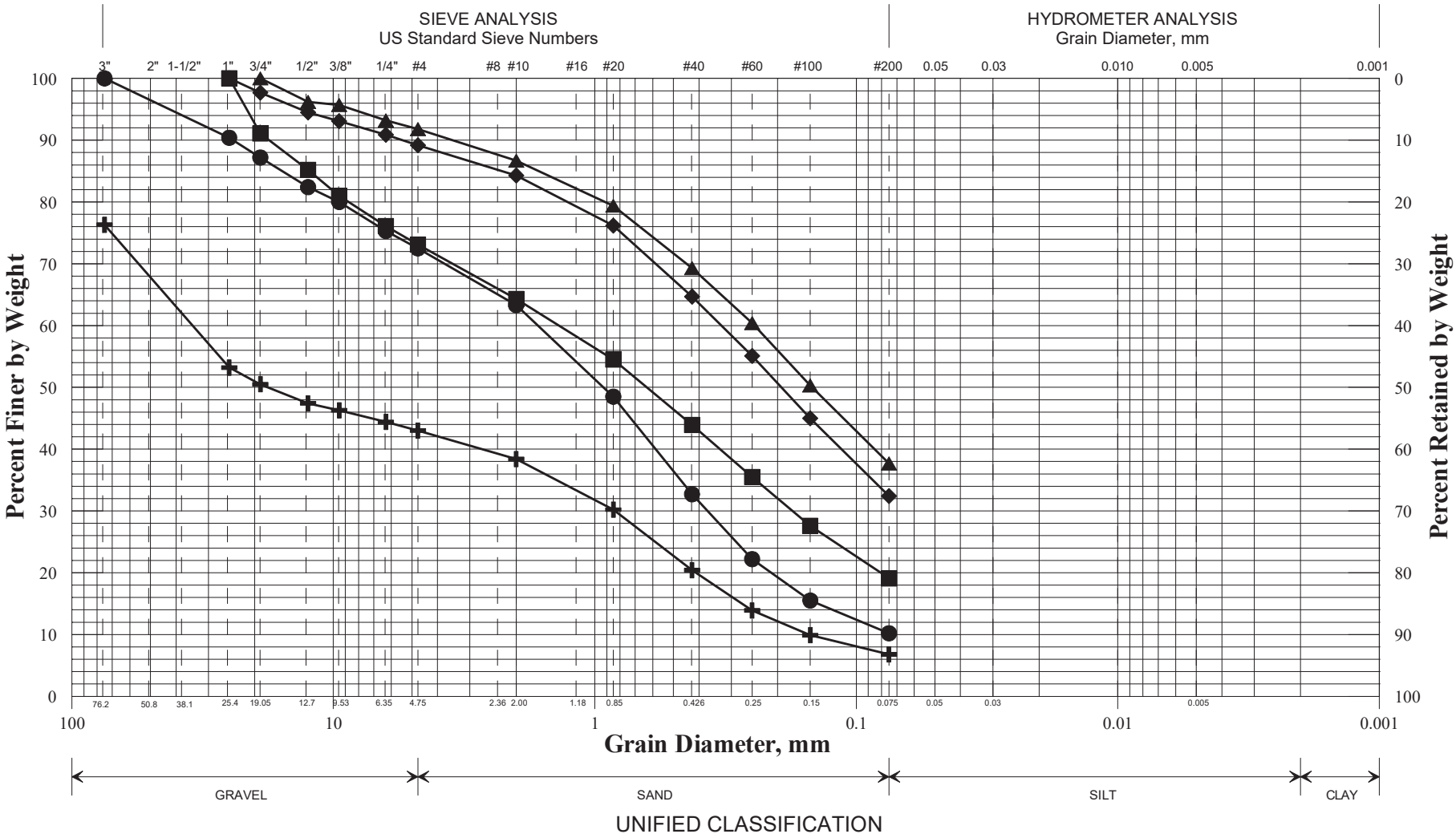
WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

State of Maine Department of Transportation

GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-ACT-101/B1	94+50	9.0 RT	0.79-1.5	Sandy GRAVEL, trace silt.	5.3			
◆	HB-ACT-101/S1	94+50	9.0 RT	1.5-5.0	SAND, some silt, little gravel.	7.9			
■	HB-ACT-102/S2	105+50	9.0 RT	0.75-2.4	SAND, some gravel, little silt.	6.5			
●	HB-ACT-103/B2	111+00	7.0 RT	1.0-2.1	SAND, some gravel, trace silt.	6.2			
▲	HB-ACT-103/S3	111+00	7.0 LT	2.1-5.0	Silty SAND, trace gravel.	20.1			
✖									

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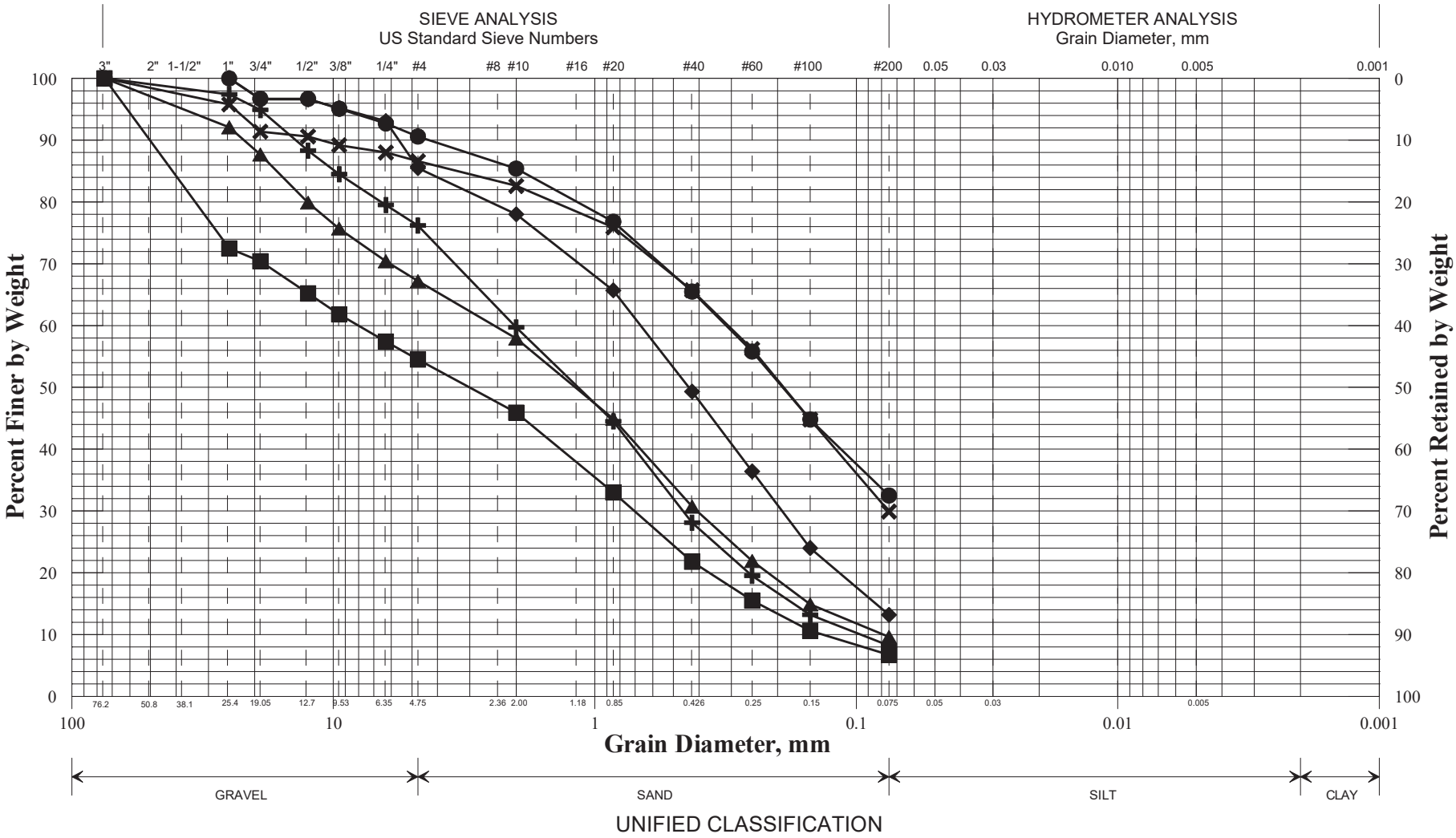
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-ACT-104/B3	121+00	12.0 RT	0.0-1.1	SAND, some gravel, trace silt.	3.0			
◆	HB-ACT-104/S4	121+00	12.0 RT	1.1-5.9	SAND, little gravel, little silt.	7.2			
■	HB-ACT-105/B4	134+00	8.0 RT	0.92-2.4	Gravelly SAND, trace silt.	4.4			
●	HB-ACT-105/S5	134+00	8.0 RT	2.4-5.0	SAND, some silt, trace gravel.	8.3			
▲	HB-ACT-106/B5	145+00	12.0 LT	0.0-1.6	SAND, some gravel, trace silt.	3.5			
✖	HB-ACT-106/S6	145+00	12.0 LT	1.6-8.0	SAND, some silt, little gravel.	11.2			

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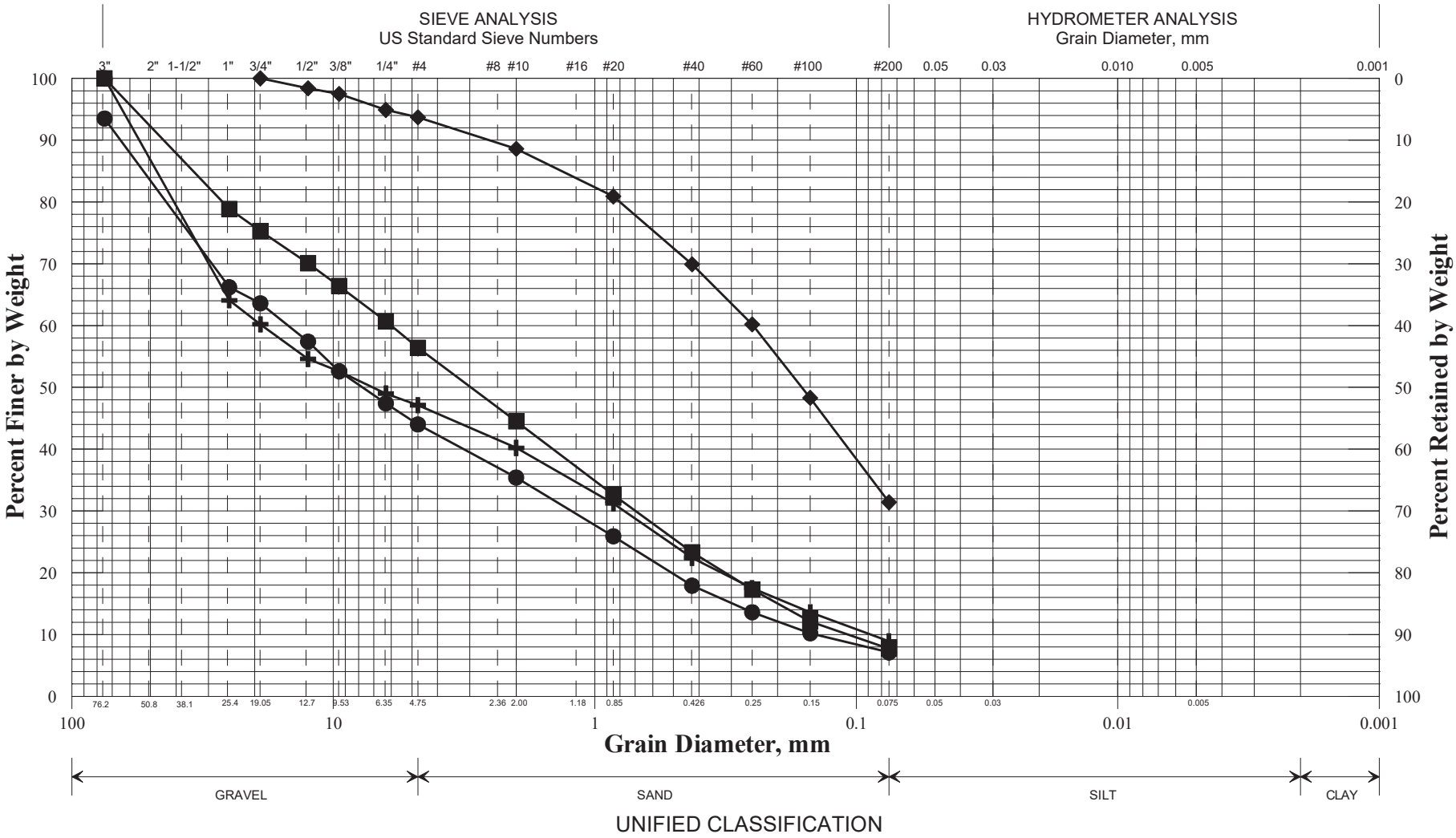
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-ACT-107/S7	158+00	6.0 RT	0.83-1.3	Sandy GRAVEL, trace silt.	4.4			
◆	HB-ACT-107/S8	158+00	6.0 RT	1.3-5.0	SAND, some silt, trace gravel.	20.3			
■	HB-ACT-109/B6	163+00	11.1 RT	0.75-5.0	Gravelly SAND, trace silt.	3.0			
●	HB-ACT-110/B7	193+00	10.5 RT	0.42-5.0	Sandy GRAVEL, trace silt.	3.7			
▲									
✖									

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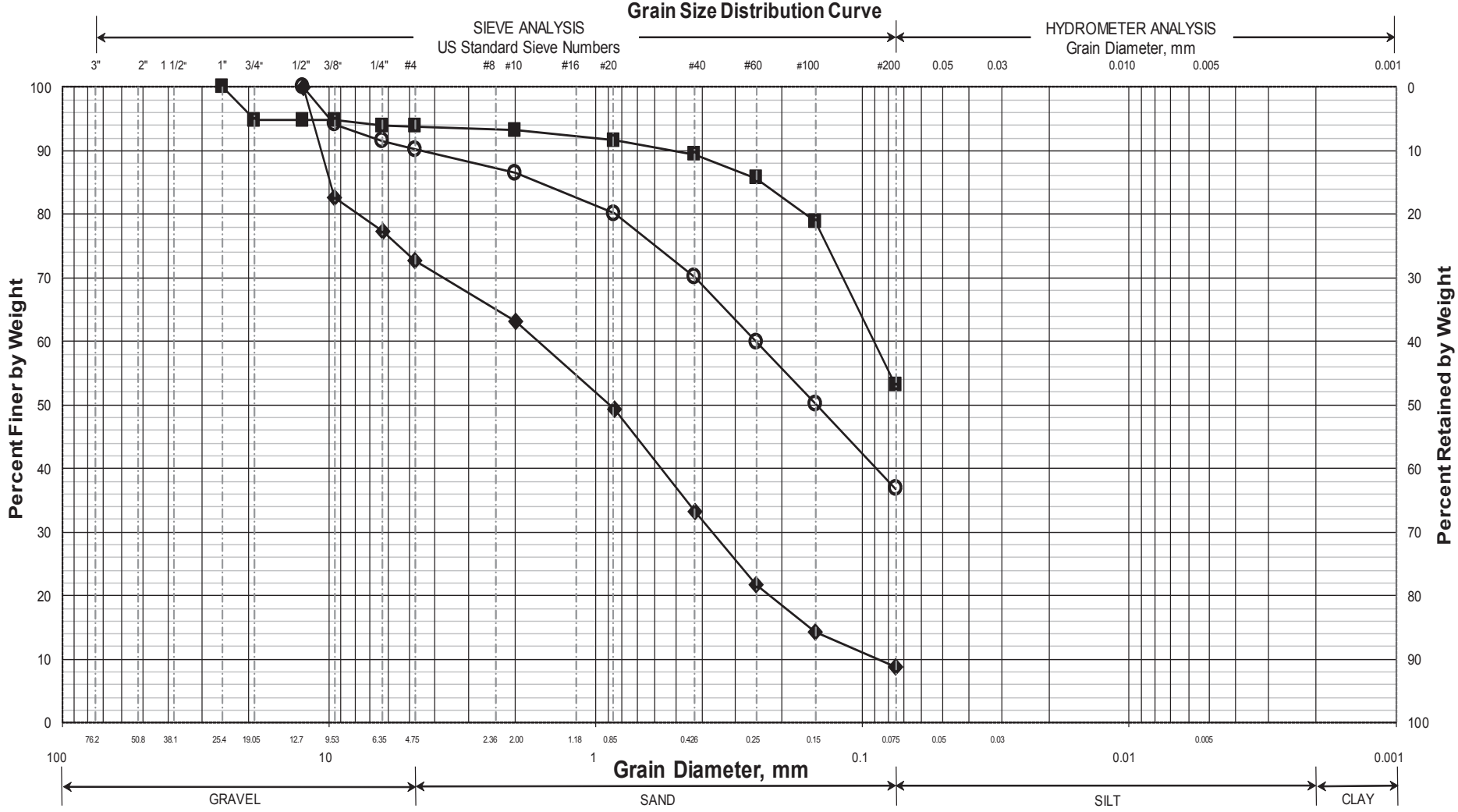
Grain Size Distribution Curve



UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	HB-ACT-201/2D	96+50	7.5 LT	5.0-5.8	Silty SAND, trace gravel.	11.1			
◆	HB-ACT-202/1D	97+25	12.5 RT	0.0-2.0	SAND, some gravel, trace silt.	7.1			
■	HB-ACT-203/3D	98+00	12.0 LT	10.0-12.0	Sandy SILT, trace gravel.	41.4			
●									
▲									
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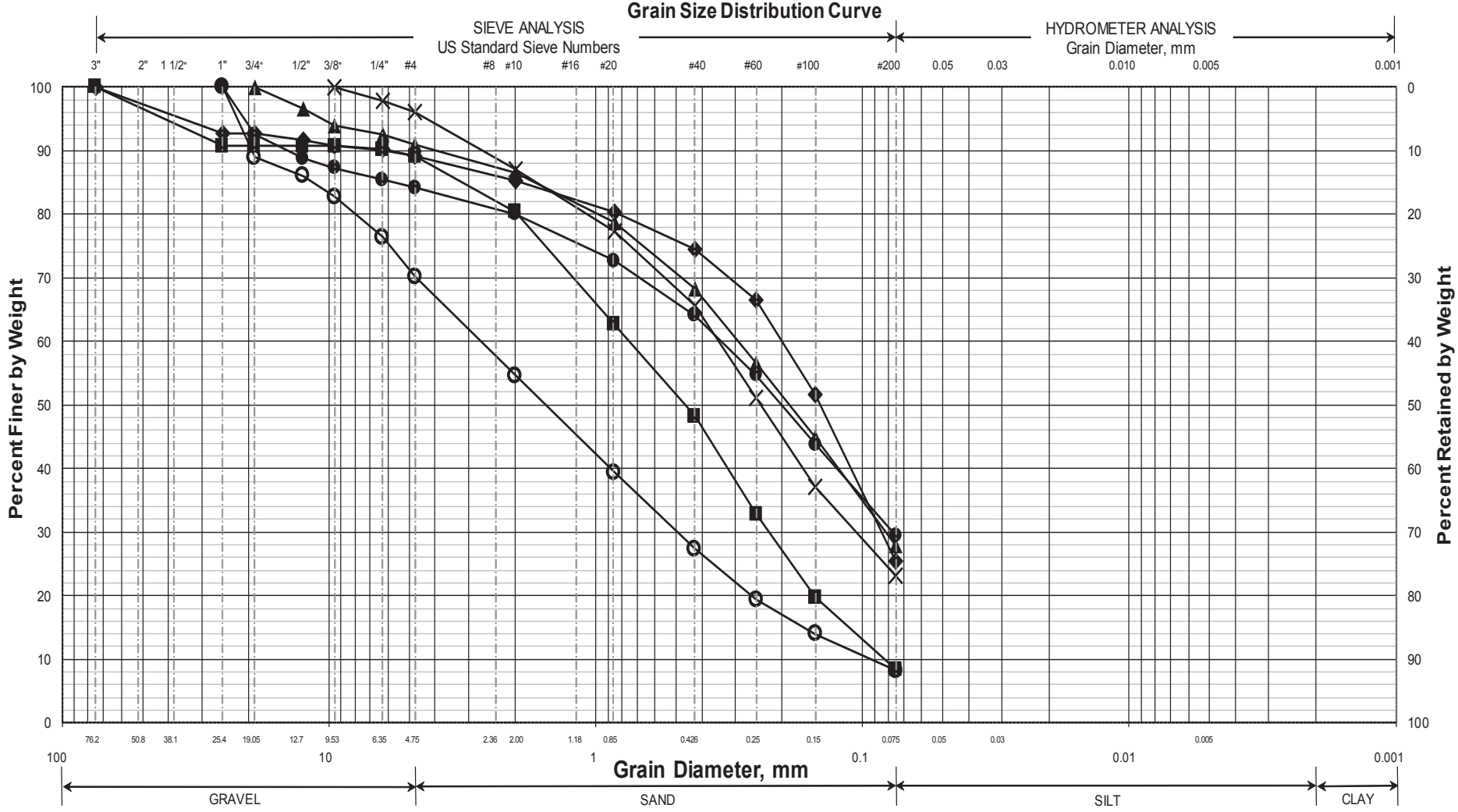
Grain Size Distribution Curve



UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	HB-ACT-207/1D	156+10	11.5 RT	0.0-2.0	SAND, some gravel, trace silt.	4.8			
◆	HB-ACT-207/2D	156+10	11.5 RT	5.0-7.0	SAND, some silt, trace gravel.	12.8			
■	HB-ACT-207/3D	156+10	11.5 RT	10.0-12.0	SAND, trace gravel, trace silt.	45.3			
●	HB-ACT-207/4D	156+10	11.5 RT	15.0-17.0	SAND, some silt, little gravel.	12.5			
▲	HB-ACT-207/5D	156+10	11.5 RT	20.0-22.0	SAND, some silt, trace gravel.	12.6			
×	HB-ACT-207/6D	156+10	11.5 RT	25.0-25.8	SAND, some silt, trace gravel.	9.2			

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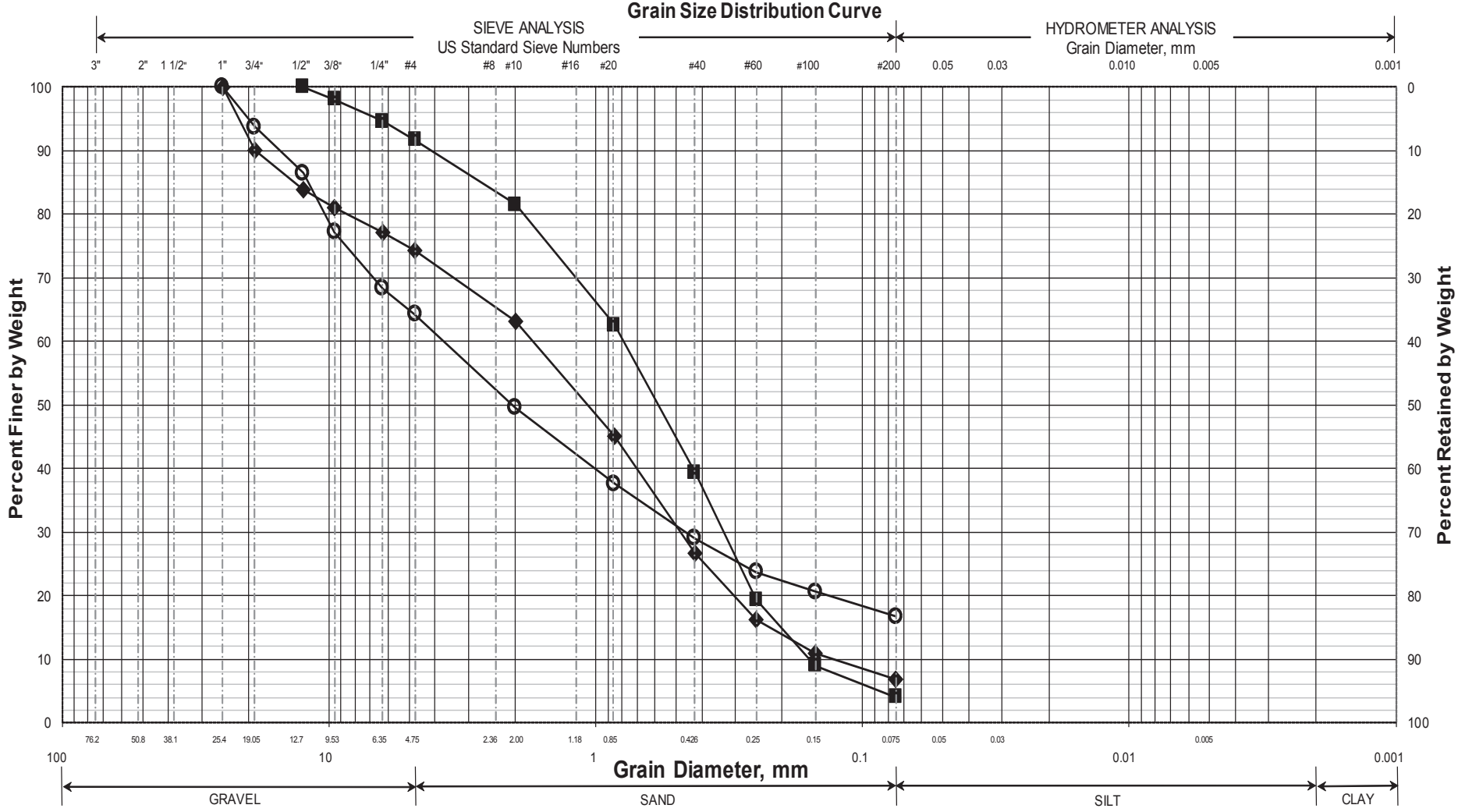

UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
○	HB-ACT-209/2D	169+50	10.0 RT	5.0-6.0	SAND, some gravel, little silt.	172.4			
◆	HB-ACT-210/1D	170+25	5.0 LT	0.0-2.0	SAND, some gravel, trace silt.	9.6			
■	HB-ACT-211/3D	171+00	8.0 LT	10.0-12.0	SAND, trace gravel, trace silt.	37.8			
●									
▲									
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Appendix C

Calculations

Bearing Resistance - Box Culvert on Native Soils:

Part 1 - Service Limit State

Nominal and factored Bearing Resistance - Box Culvert on Sand

Presumptive Bearing Resistance for Service Limit State ONLY

Reference: AASHTO LRFD Bridge Design Specifications 9th Edition 2020
Table C10.6.2.6.1-1 Presumptive Bearing Resistances for Spread Footings at the Service Limit State Modified after US Department of Navy (1982)

Type of Bearing Material: Sand (SM)

Based on N-values, soils are dense near the bearing elevation

Density In Place: very dense

Bearing Resistance: Ordinary Range (ksf) 6 to 10

Recommended Value of Use: $q_{nom} := 6 \cdot ksf$

Resistance factor at the **service limit state** = 1.0 (LRFD Article 10.5.5.1) $\phi_{service\_bc} := 1.0$

$q_{factored\_service\_bc} := q_{nom} \cdot \phi_{service\_bc}$ $q_{factored\_service\_bc} = 6 \cdot ksf$

Note: This bearing resistance is settlement limited (1 inch) and applies only at the service limit state.

Part 2 - Strength Limit State

Nominal and factored Bearing Resistance - Box Culvert on Sand

Reference: AASHTO LRFD Bridge Design Specifications 9th Edition 2020 - Article 10.6.3.1

Assumptions:

1. The box will be founded at ~ Elev 243.3 feet

   Bottom of Construction will be 2 feet below box invert $D_{footing} := 2.0 \cdot ft$

2. Assumed parameters for fill soils:

   Saturated unit weight: $\gamma_s := 125 \cdot pcf$

   Internal friction angle: $\phi_{ns} := 32 \cdot deg$

   Undrained shear strength: $c_{ns} := 0 \cdot psf$

3. Box Culvert parameters

   Width of box culvert, B $B_{box} := 12 \cdot ft$

   Length of box culvert, L $L_{box} := 94 \cdot ft$

Nominal Bearing Resistance per LRFD Equation 10.6.3.1.2a-1

$$q_n = cN_{cm} + \gamma D_f N_{qm} C_{wq} + 0.5\gamma B N_{\gamma m} C_{w\gamma}$$

Bearing Capacity Factors - LRFD Table 10.6.3.1.2a-1

For ϕ=32 deg $N_c := 35.5$ $N_q := 23.2$ $N_\gamma := 30.2$

Shape Correction Factors LRFD Table 10.6.3.1.2a.-3

for ϕ=32 degrees

$$s_c := 1 + \left(\frac{B_{box}}{L_{box}}\right)\left(\frac{N_q}{N_c}\right) \qquad s_c = 1.08$$

$$s_\gamma := 1 - 0.4\left(\frac{B_{box}}{L_{box}}\right) \qquad s_\gamma = 0.9489$$

$$s_q := 1 + \left(\frac{B_{box}}{L_{box}} \cdot \tan(\phi_{ns})\right) \qquad s_q = 1.08$$

Load Inclination Factors:
Assume all are 1.0 (LRFD Article C10.6.3.1.2a)

$i_c := 1.0$ $i_q := 1.0$ $i_\gamma := 1.0$

Depth Correction Factor $d_q := 1 + 2 \cdot \tan(\phi_{ns}) \cdot (1 - \sin(\phi_{ns}))^2 \cdot \tan\left(\frac{D_{footing}}{B_{box}}\right)^{-1}$ $d_q = 2.6416$ LRFD Eq. 10.6.3.1.2a-10

$N_{cm} := N_c \cdot s_c \cdot i_c$ $N_{cm} = 38.4617$ LRFD Eq. 10.6.3.1.2a-2

$N_{qm} := N_q \cdot s_q \cdot d_q \cdot i_q$ $N_{qm} = 66.17$ LRFD Eq. 10.6.3.1.2a-3

$N_{\gamma m} := N_\gamma \cdot s_\gamma \cdot i_\gamma$ $N_{\gamma m} = 28.66$ LRFD Eq. 10.6.3.1.2a-4

Coefficients for Groundwater Depths LRFD Table 10.6.3.1.2a-2

Depth the water table: $D_w := 0 \cdot ft$ $C_{wq} := 0.5$ $C_{w\gamma} := 0.5$

$$q_{nominal} := c_{ns} \cdot N_{cm} + \gamma_s \cdot D_{footing} \cdot N_{qm} \cdot C_{wq} + 0.5(\gamma_s) B_{box} \cdot N_{\gamma m} \cdot C_{w\gamma}$$

$q_{nominal} = 19 \cdot ksf$

Factored Bearing Resistance for Strength Limit State

Resistance Factor: $\phi_b := 0.45$ LRFD Table 10.5.5.2.2-1

$q_{factored} := q_{nominal} \cdot \phi_b$

$q_{factored} = 8.6 \cdot ksf$

Recommend a limiting factored bearing resistance of 9.0 ksf for the Strength Limit State.

Modulus of Subgrade Reaction - Box Culvert on Native Soil:

Reference: Foundation Analysis and Design 5th Edition JE Bowles Section 9-6

Width of box culvert, B $B_{box} = 12\ ft$

Length of box culvert, L $L_{box} = 94\ ft$

Thickness of box culvert, t $t_{box} := 12 \cdot in$ assumed

Depth of box, D $D_{box} := 14.2 \cdot ft$

Bearing Resistance: $q_{factored\_service\_bc} = 6 \cdot ksf$ Calculated above

Modulus of Elasticity: Site soils at bearing elevation are Sand. Use values for Sand (dense)
From Bowles Table 2-8 Modulus Es for Sand, dense ranges from 1000 - 1700 ksf

Use Modulus of Elasticity, Es . $E_s := 1200 \cdot ksf$

Poisson's Ratio: Site conditions at bearing elevation are Sand Use values for Sand, gravelly sand.
From Bowles Table 2-7 Poisson's Ration μ for Sand, gravelly sand ranges from 0.3 - 0.4

Use Possion's Ratio, μ . $\mu := 0.35$

$E_{prime\_s} := \frac{1 - \mu^2}{E_s}$ $E_{prime\_s} = 0.000731 \cdot \frac{ft^2}{kip}$

Analyze corner:

Take H as 5*B as recommended in Bowles Chapter 5

$H_{inf} := \frac{5 \cdot B_{box}}{B_{box}}$ $H_{inf} = 5$ N in Table 5-2

$\frac{L_{box}}{B_{box}} = 7.8333$ M in Table 5-2

From Table 5-2 for N=5 and M=7.8333

$I_1 := 0.541$

$I_2 := 0.132$ by interpolation

Determine Steinbrenner influence factor - Bowles Section 5-6:

$I_s := I_1 + \left[\frac{1 - (2 \cdot \mu)}{1 - \mu}\right] \cdot I_2$ $I_s = 0.6019$

Determine Influence factor for footing depth - Bowles Figure 5-7

Depth ratio: $\frac{D_{box}}{B_{box}} = 1.1833$ $\frac{L_{box}}{B_{box}} = 7.8333$ $\mu = 0.35$ $I_F := 0.80$

Calculate modulus of subgrade reaction - Bowles Eq. 9-7

$k_s := \frac{1}{B_{box} \cdot E_{prime\_s} \cdot I_s \cdot I_F}$ Bowles Eq. 9-7

$k_s = 137 \cdot pci$

Recommend Modulus of Subgrade Reaction of 140 pci

Bearing Resistance - Retaining Wall on Native Soils:

Part 1 - Service Limit State

Nominal and factored Bearing Resistance - block wall on sand

Presumptive Bearing Resistance for Service Limit State ONLY

Reference: AASHTO LRFD Bridge Design Specifications 9th Edition 2020
Table C10.6.2.6.1-1 Presumptive Bearing Resistances for Spread Footings at the Service Limit State Modified after US Department of Navy (1982)

Type of Bearing Material: Sand (SM)

Assume soils are medium dense at bearing elevation

Consistency In Place: medium dense

Bearing Resistance: Ordinary Range (ksf) 4 to 8

Recommended Value of Use: $q_{nom} := 5 \cdot ksf$

Resistance factor at the **service limit state** = 1.0 (LRFD Article 10.5.5.1) $\phi_{service\_bc} := 1.0$

$q_{factored\_service\_bc} := q_{nom} \cdot \phi_{service\_bc}$ $q_{factored\_service\_bc} = 5 \cdot ksf$

Part 2 - Strength Limit State

Nominal and factored Bearing Resistance - block wall on sand

Reference: Foundation Engineering and Design by JE Bowles Fifth Edition

Assumptions:

1. The walls will be founded at ~ Elev 570 feet

   Bottom of Construction will be 2 feet below grade for. $D_{footing} := 2.0 \cdot ft$

2. Assumed parameters for fill soils: (Ref: Bowles 5th Ed Table 3-4)

   Saturated unit weight: $\gamma_s := 125 \cdot pcf$

   Dry unit weight: $\gamma_d := 120 \cdot pcf$

   Internal friction angle: $\phi_{ns} := 32 \cdot deg$

   Undrained shear strength: $c_{ns} := 0 \cdot psf$

3. Use Terzaghi strip equations as L>B
4. Effective stress analysis footing on ϕ-c soil (Bowles 5th Ed. Example 4-1 pg 231)

Depth to the water table: Assume $D_w := 8 \cdot ft$ Unit Weight of water: $\gamma_w := 62.4 \cdot pcf$

Effective stress at bearing level:

$q_{eff} := (D_{footing}) \cdot (\gamma_s)$ $q_{eff} = 0.25 \cdot ksf$

Maximum block width is 18 inches $B := 18 \cdot in$

Terzaghi Shape factors from Table 4-1 For a strip footing: $s_c := 1.0$ $s_\gamma := 1.0$

Meyerhof Bearing Capacity Factors - Bowles 5th Ed. table 4-4 pg 223

For ϕ=32 deg $N_c := 35.47$ $N_q := 23.2$ $N_\gamma := 22$

Nominal Bearing Resistance per Terzaghi equation (Bowles 5th Ed. Table 4-1 pg 220)

$q_{nominal} := c_{ns} \cdot N_c \cdot s_c + q_{eff} \cdot N_q + 0.5(\gamma_s)B \cdot N_\gamma \cdot s_\gamma$ $q_{nominal} = 7.9 \cdot ksf$

Factored Bearing Resistance for Strength Limit State

Resistance Factor: $\phi_b := 0.45$ AASHTO LRFD Table 10.5.5.2.2-1

$q_{factored} := q_{nominal} \cdot \phi_b$

$q_{factored} = 3.5 \cdot ksf$ $B = 18 \cdot in$

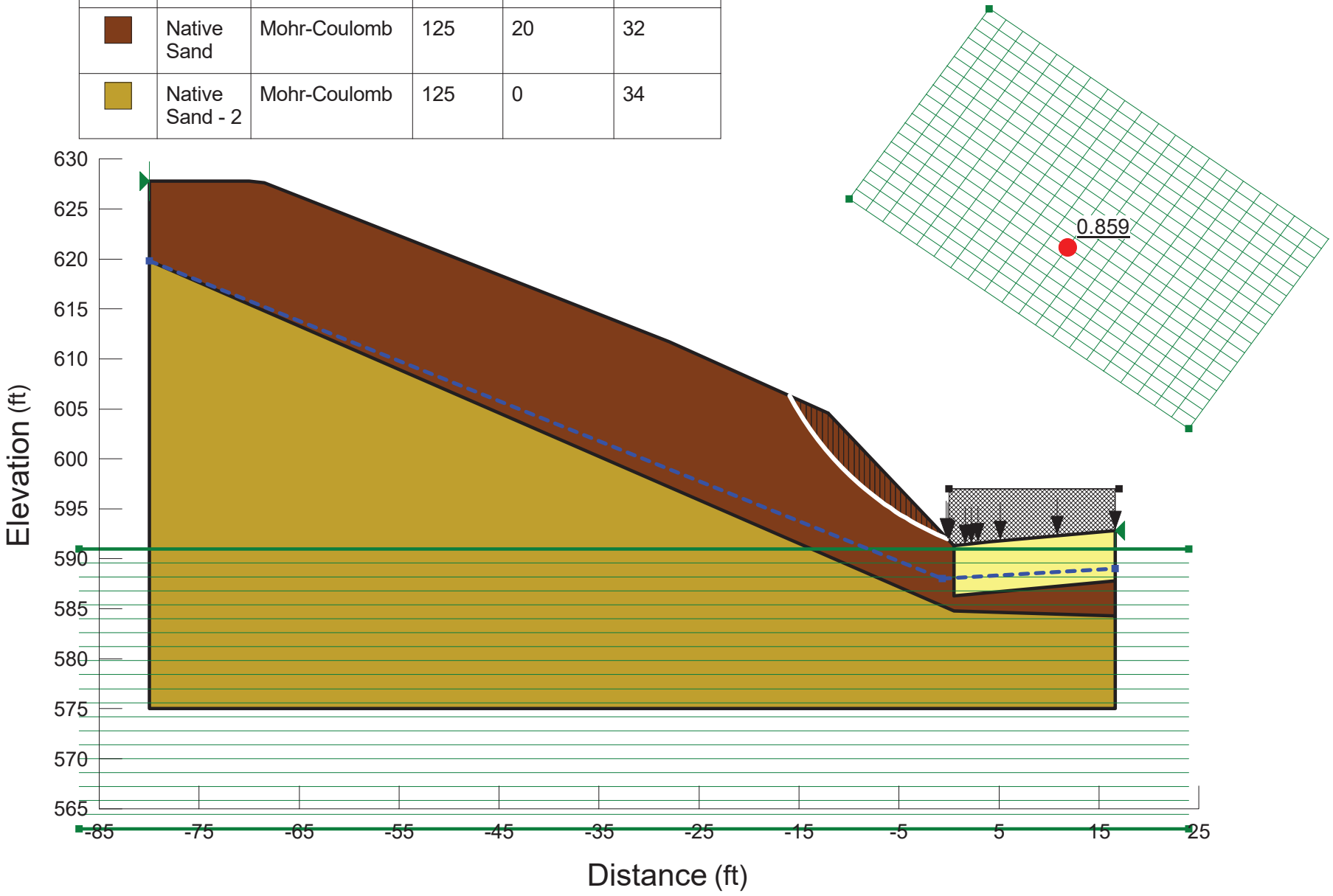
Recommend a limiting factored bearing resistance of 3.5 ksf for the Strength Limit State.

Appendix D

Slope Stability Analyses

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Fill	Mohr-Coulomb	125	0	32
	Native Sand	Mohr-Coulomb	125	20	32
	Native Sand - 2	Mohr-Coulomb	125	0	34

167+50 Existing Slope.gsz



167+50 Proposed Slope.gsz

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Fill	Mohr-Coulomb	125	0	34
	Native Sand	Mohr-Coulomb	125	0	32
	Native Sand - 2	Mohr-Coulomb	125	0	34
	Riprap	Mohr-Coulomb	145	0	44