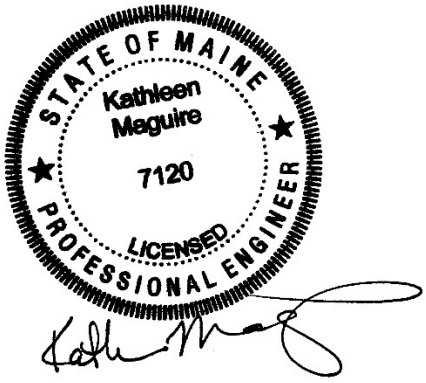
MAINE DEPARTMENT OF TRANSPORTATION
HIGHWAY PROGRAM
GEOTECHNICAL SECTION
AUGUSTA, MAINE

GEOTECHNICAL DATA REPORT

For the Reconstruction of:
STATE ROUTE 35
STANDISH, MAINE

Prepared by:
Kathleen Maguire, P.E.
Senior Geotechnical Engineer



Reviewed by:
Cody Russell, E.I.
Assistant Geotechnical Engineer

Cumberland County
WIN 18282.00

Soils Report 2017-50
Fed No. STP-1828(200)X

November 3, 2017

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1.0 INTRODUCTION

The purpose of this Geotechnical Data Report is to present subsurface information to support the reconstruction of State Route 35 in Standish, Maine. This report presents the results of a limited geotechnical investigation performed along the project site and the results of a limited laboratory testing program conducted on soils recovered during the geotechnical investigation. State Route 35 is a Highway Corridor Priority 1 road.

2.0 GEOLOGIC SETTING

The project begins approximately 0.67 of a mile northeasterly of Route 114 and extends northeasterly approximately 0.98 of a mile to approximately 0.11 of a mile northerly of Route 237 as shown on Sheet 1 – Location Map.

The Maine Geologic Survey (MGS) map Sebago Lake Quadrangle, Maine, Open-File No. 97-53 (1997) indicates the surficial soils along the project consist of glaciomarine delta and fan deposits. Glaciomarine delta and fan deposits may be comprised of sand and gravel with minor silt inclusions deposited in contact with or beyond adjacent ice as ice-contact marine delta and fan deposits from meltwater that flowed southward into the late-glacial sea. The specific soils at the south shore of Sebago Lake are mapped as the head outwash at south shore of the Lower Bay of Sebago Lake at about elevation 300-310 feet. This is the Sebago Lake Marine Delta that plugs pre-glacial southward drainage of the Sebago basin.

The "Bedrock Geology of the Portland 1:100,000 Quadrangle, Maine and New Hampshire" MGS Open-File No. 98-1 (1998) cites bedrock at the site as massive to well layered, gray to rusty-weathering, sillimanite-garnet-mica schist interlayered with feldspathic granofels of the Standish Formation.

3.0 SUBSURFACE INVESTIGATION

Subsurface conditions were explored by drilling ten (10) test borings along the project. The MaineDOT drill crew drilled borings HB-STAN-101 through HB-STAN-106 on June 18, 2013 and drilled borings HB-STAN-201 through HB-STAN-204 on October 6, 2015 using solid stem auger techniques. The exploration locations are show on Sheets 2 through 11 – Boring Location Plans.

No Standard Penetration Testing (SPT) was conducted in the borings. Soil sample were obtained from the auger flights for laboratory testing. No refusal surface was encountered in any of the borings. Details and sampling methods used, field data obtained, and soil conditions encountered are presented in the boring logs provided in Appendix A – Boring Logs.

A Northeast Transportation Training and Certification Program (NETTCP) Certified Subsurface Inspector logged the subsurface conditions encountered. The MaineDOT geotechnical engineer selected the boring location and drilling methods, designated type and depth of sampling techniques, reviewed boring logs and identified field testing requirements.

The borings were located in the field using taped measurements at the completion of the drilling program.

4.0 LABORATORY TESTING

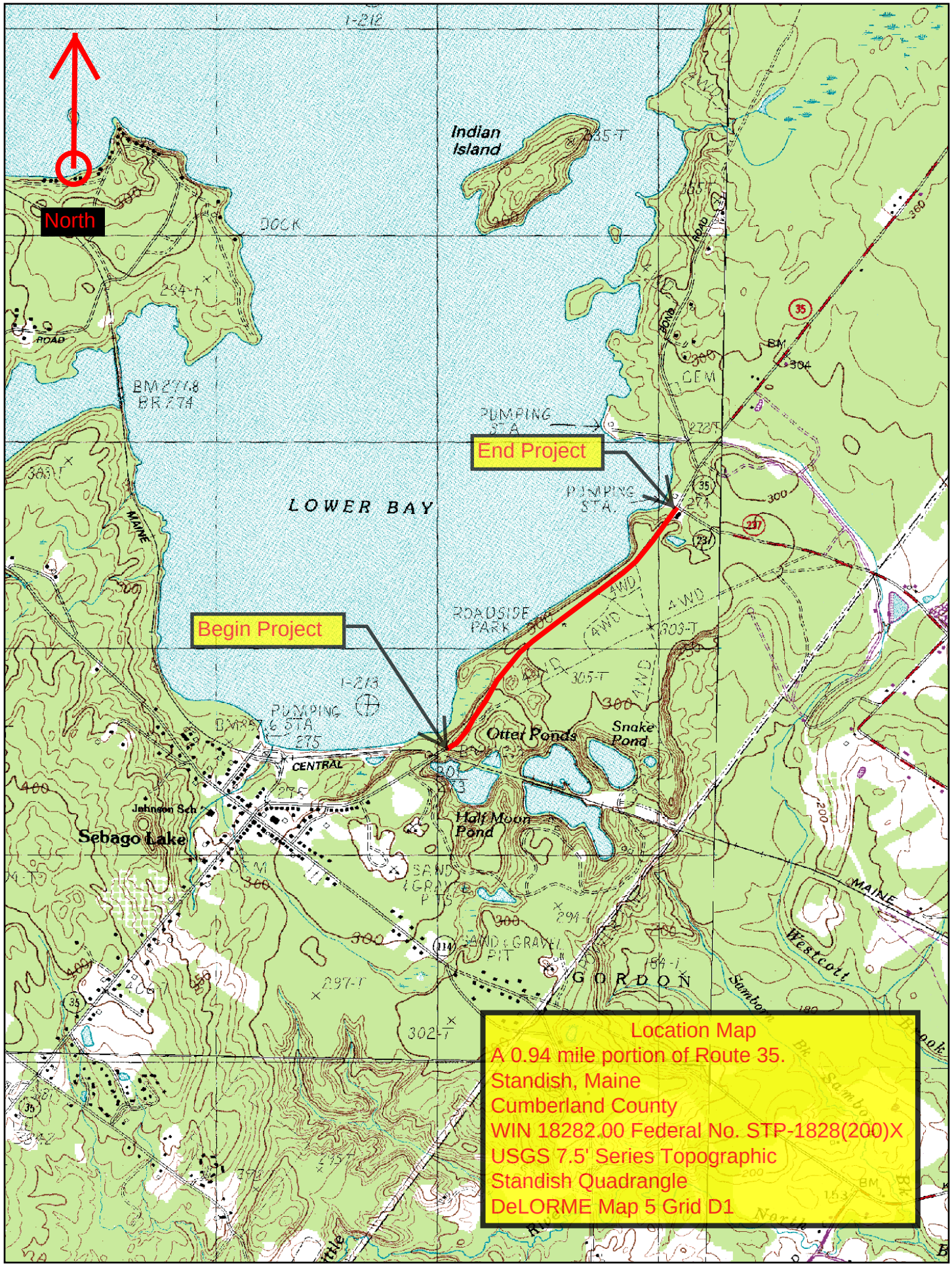
A laboratory testing program was conducted on selected soil samples recovered from the test boring to assist in soil classification, evaluation of engineering properties of the soils, and geologic assessment of the project site. Laboratory testing consisted of seventeen (17) standard grain size analyses with natural water content. The results of soil tests are included as Appendix B – Laboratory Test Results. Moisture content information and other soil test results are also shown on the boring logs provided in Appendix A – Boring Logs.

5.0 CLOSURE

This Geotechnical Data Report has been prepared for the use of the MaineDOT Highway Program for specific application to the proposed reconstruction of State Route 35 in Standish, Maine in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

MaineDOT conducted a limited number of soil explorations at discrete locations along the project and a limited number of laboratory tests. MaineDOT shall not be responsible for the Bidder's or Contractor's interpretations, estimates, or conclusions derived from the geotechnical information. Data provided may not be representative of the subsurface conditions between boring locations.

Sheets



Map Scale 1:24000

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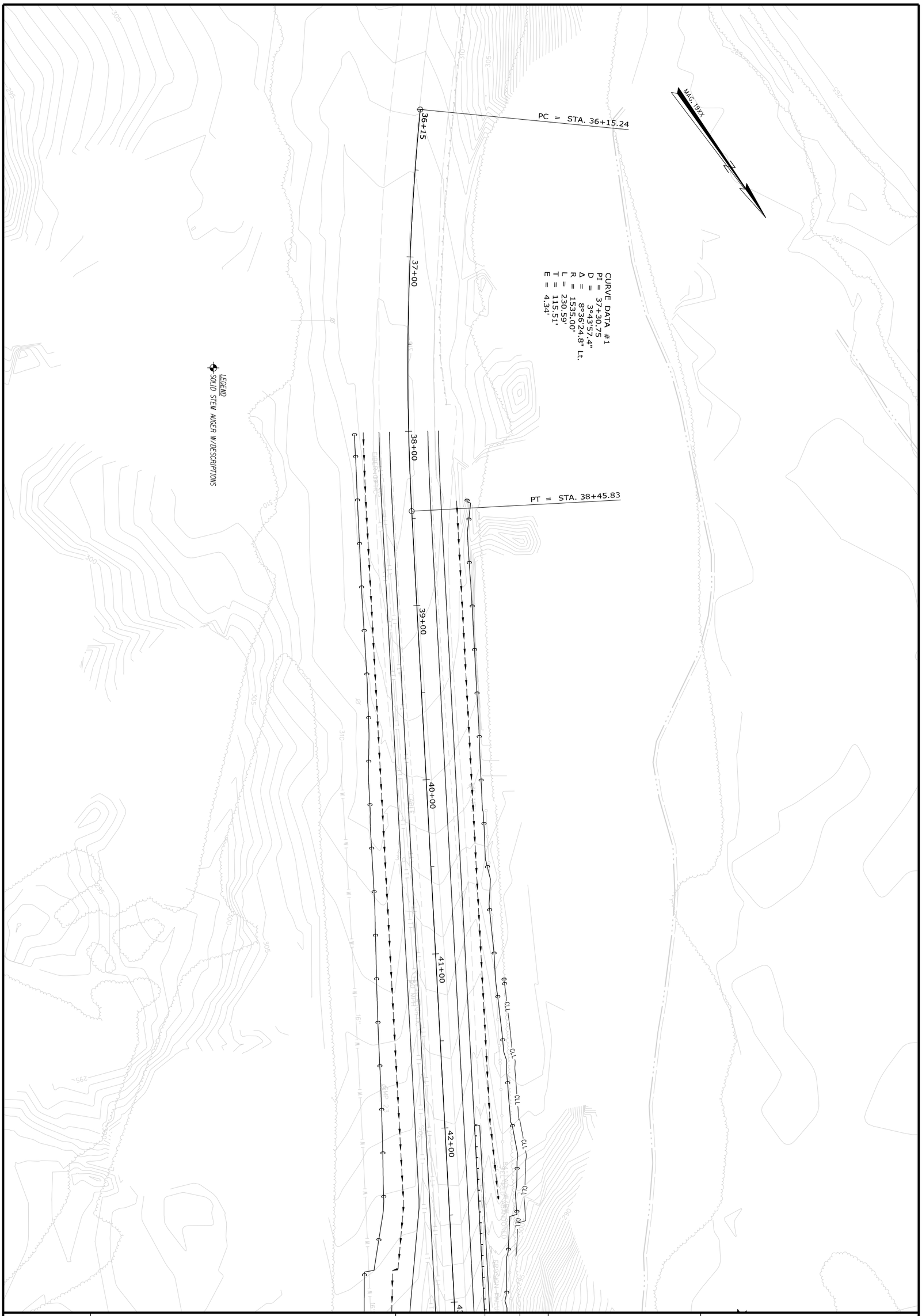

SHEET NUMBER 2 OF 11

STANDISH ROUTE 35

BORING LOCATION PLAN

		BY	DATE
PROJ. MANAGER			
DESIGN-DETAILED			
CHECKED-REVIEWED			
DESIGN2-DETAILED2	K.MAGUIRE	T.WHITE	OCT 2017
DESIGN3-DETAILED3			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

P.E. NUMBER

DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-1828(200)X

WIN 018282.00

HIGHWAY PLANS

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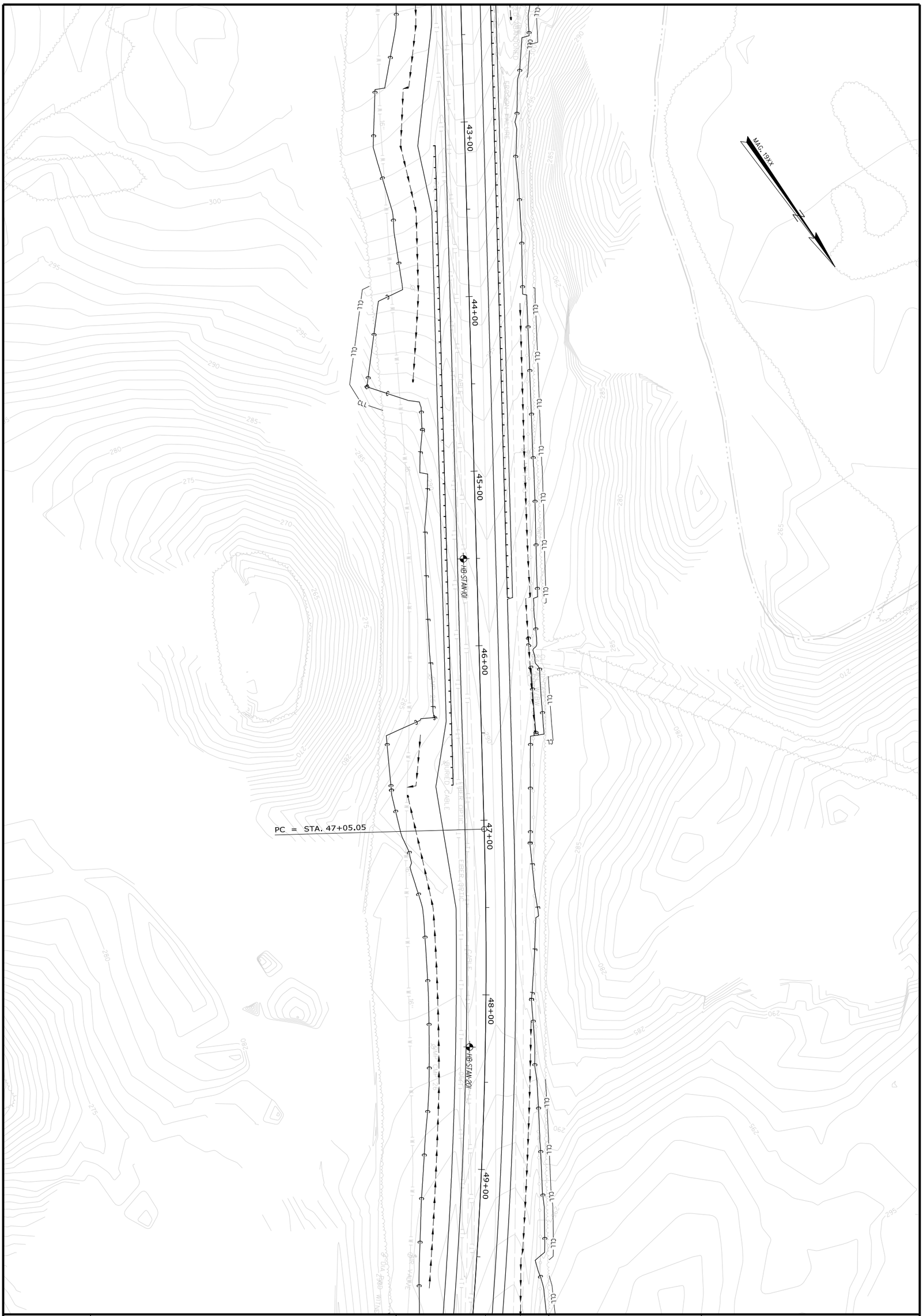

SHEET NUMBER 3 OF 11

STANDISH ROUTE 35

BORING LOCATION PLAN

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DEPARTMENT OF TRANSPORTATION

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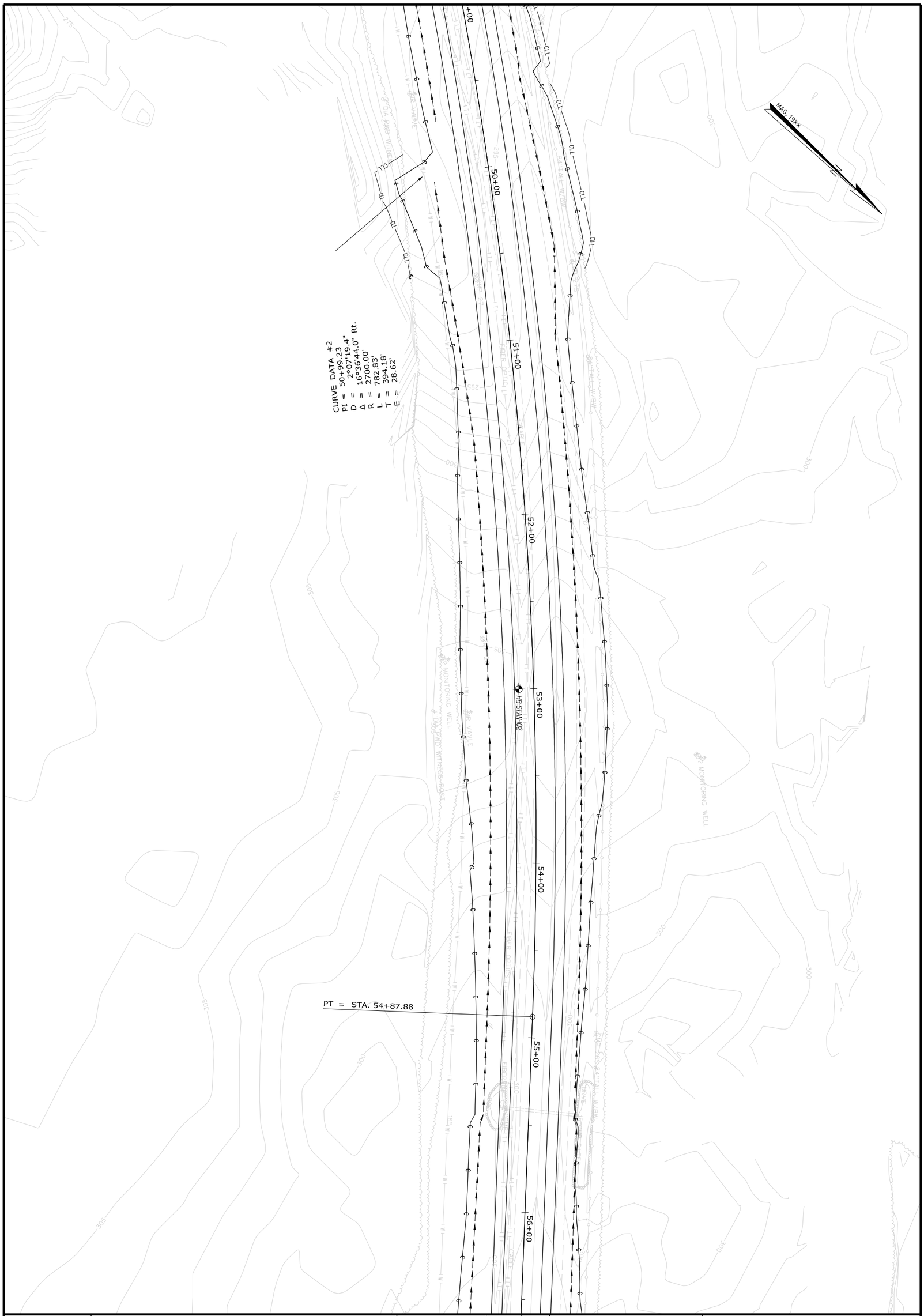

SHEET NUMBER 4 OF 11

STANDISH ROUTE 35

BORING LOCATION PLAN

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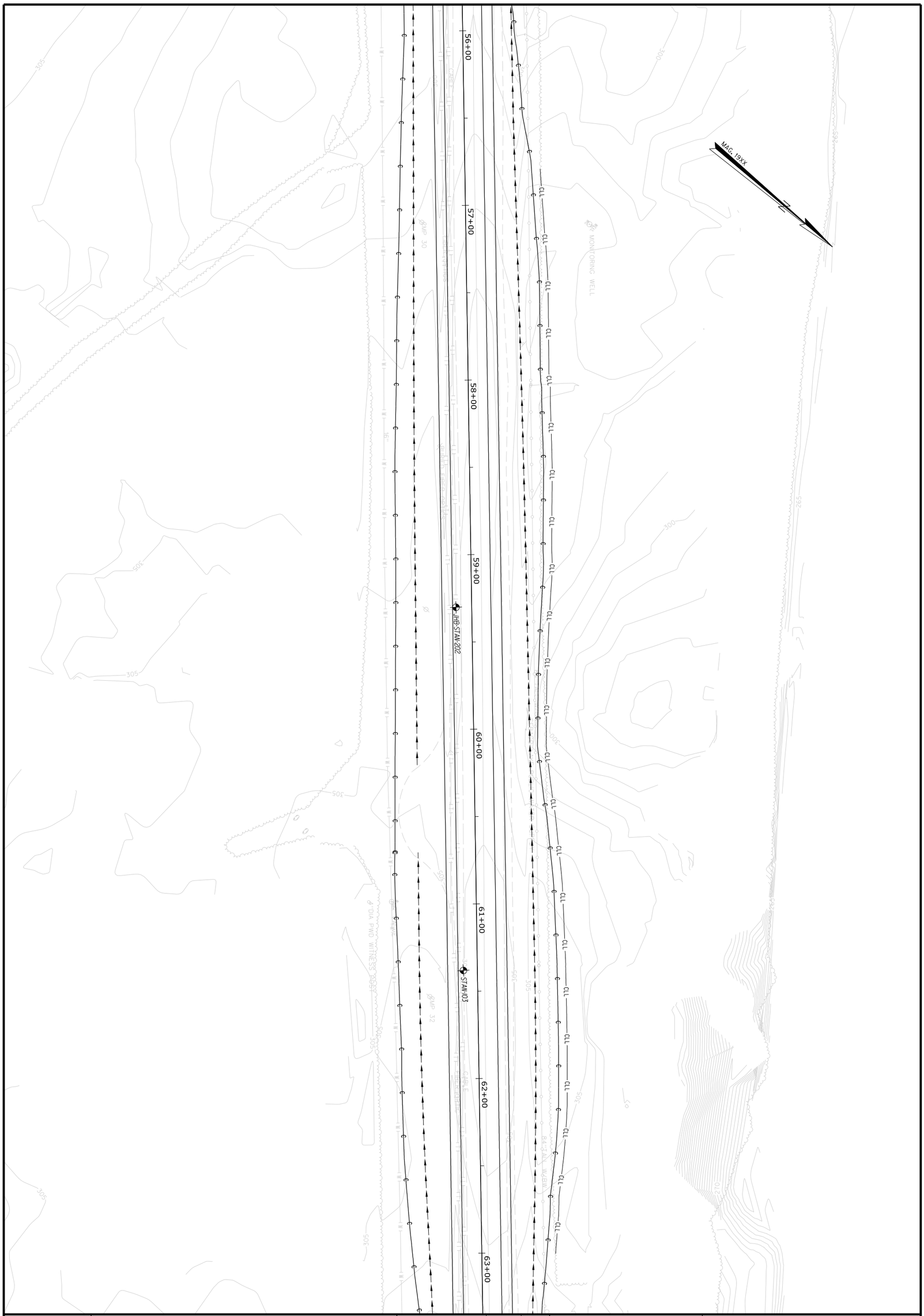

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STANDISH ROUTE 35

BORING LOCATION PLAN

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REVISIONS 4			
FIELD CHANGES			

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SHEET NUMBER 6 OF 11

STANDISH ROUTE 35

BORING LOCATION PLAN

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PROJ. MANAGER			
DESIGN-DETAILED			
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DESIGN2-DETAILED2	K.MAGUIRE	T.WHITE	OCT 2017
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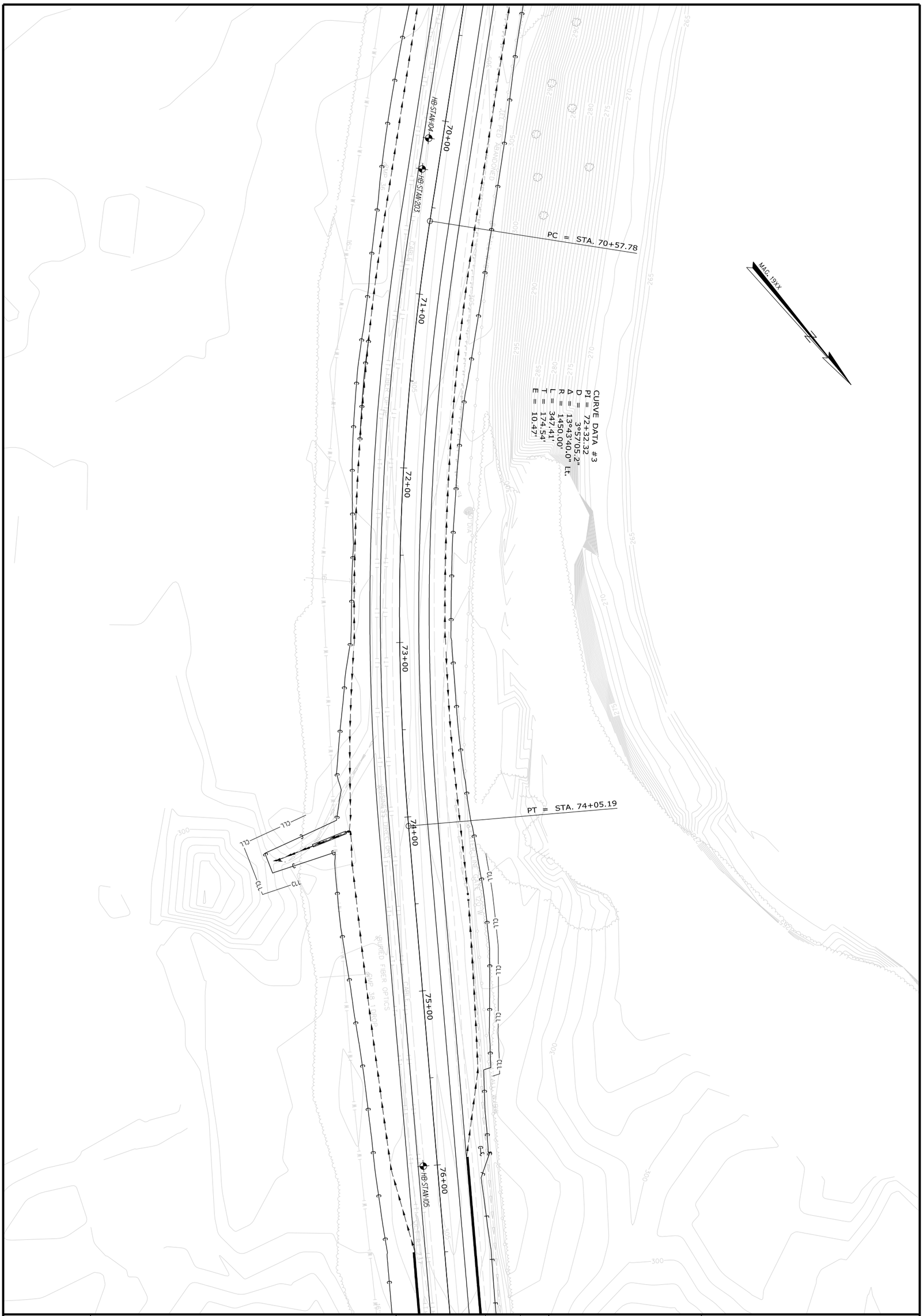

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REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE

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SHEET NUMBER 2 OF 11

STANDISH ROUTE 35

BORING LOCATION PLAN

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-1828(200)X

WIN 018282.00 HIGHWAY PLANS

SHEET NUMBER 8 OF 11

STANDISH ROUTE 35

BORING LOCATION PLAN

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PROJ. MANAGER			
DESIGN-DETAILED			
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DESIGN2-DETAILED2	K.MAGUIRE	T.WHITE	OCT 2017
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FIELD CHANGES			

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STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

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SHEET NUMBER 9 OF 11

STANDISH ROUTE 35

BORING LOCATION PLAN

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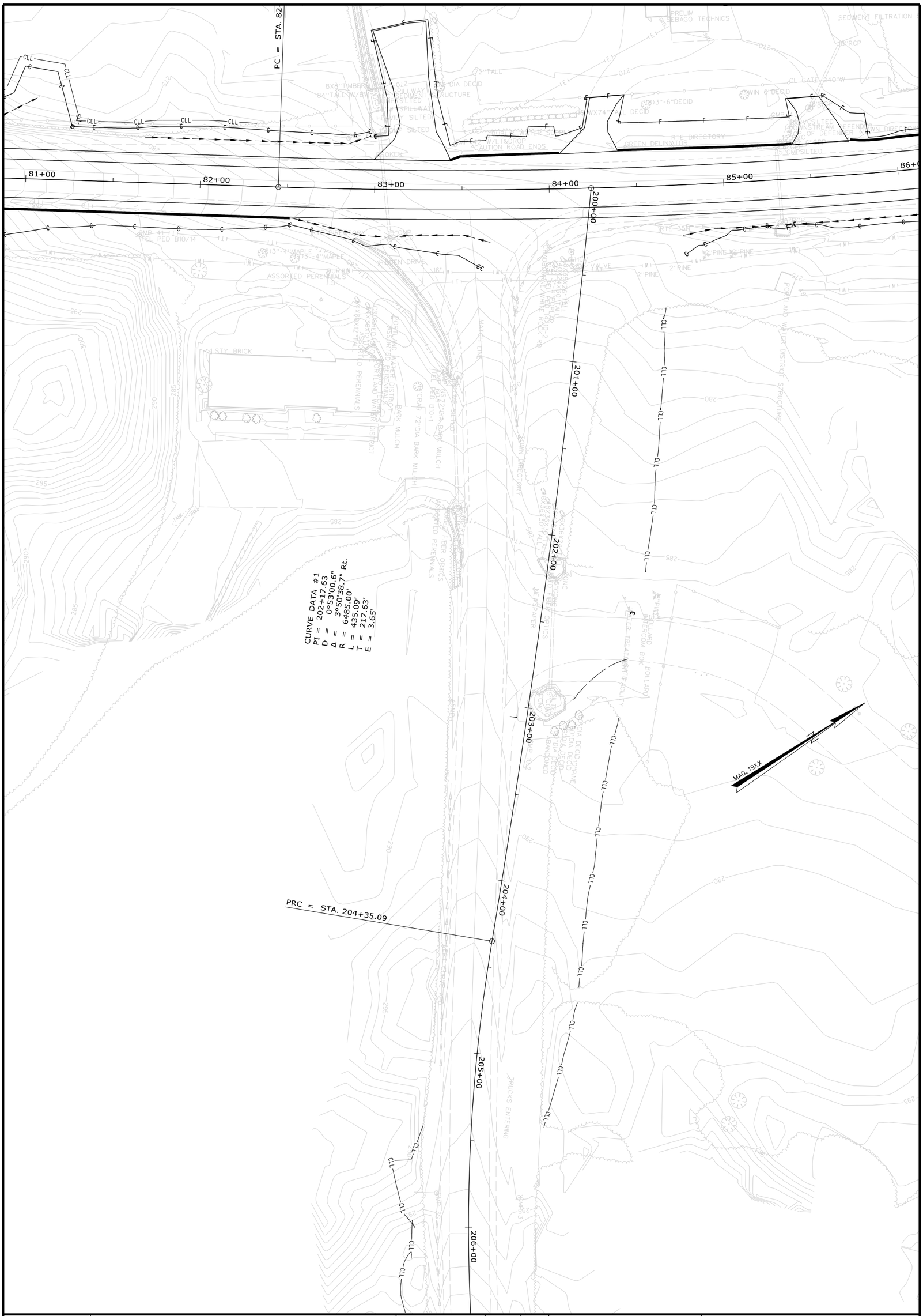

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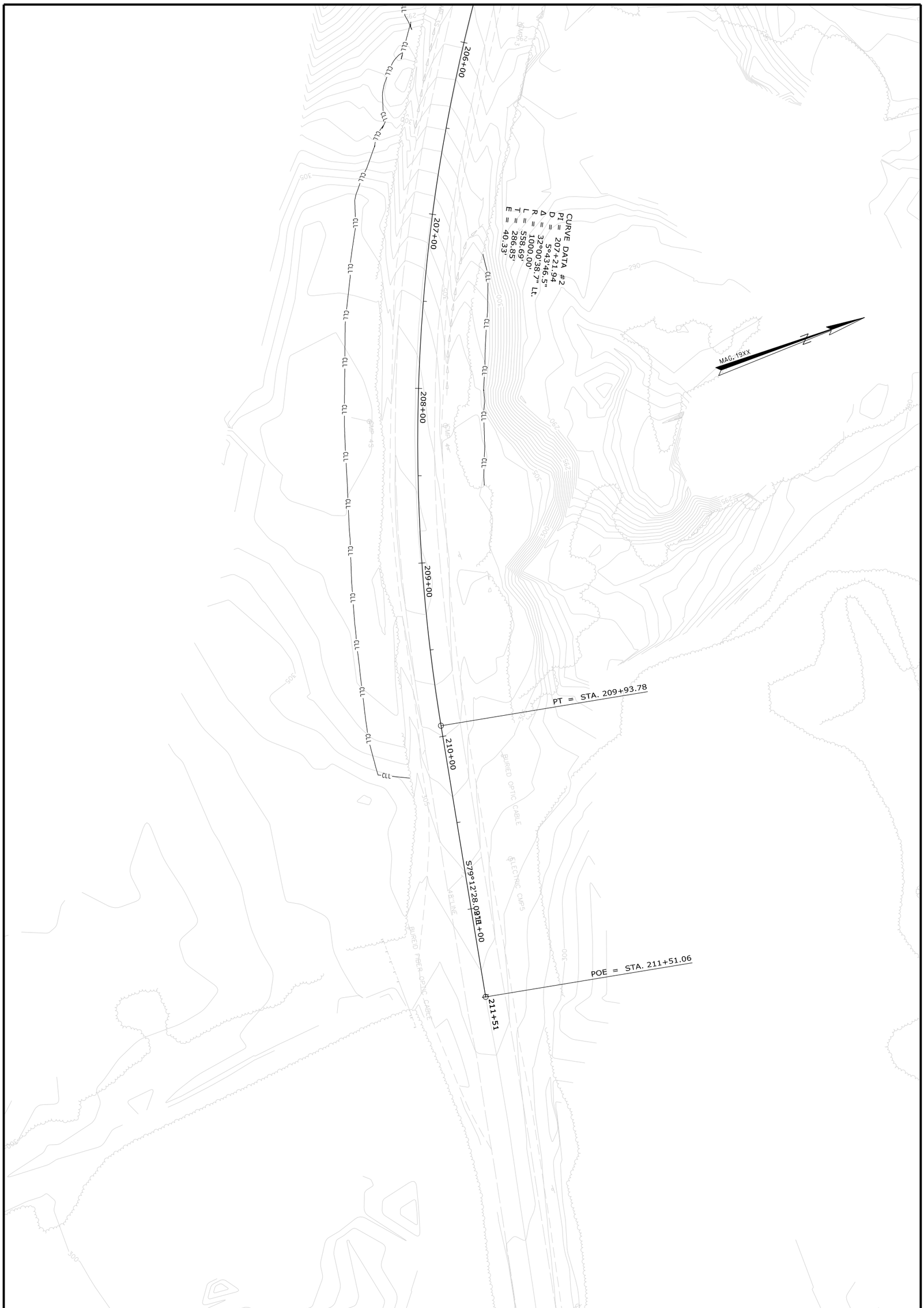

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BORING LOCATION PLAN

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REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

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STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STP-1828(200)X

WIN 018282.00

HIGHWAY PLANS

Appendix A

Boring Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS (more than half of material is larger than No. 4 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):

RQD (%) = sum of the lengths of intact pieces of core* > 4 inches / length of core advance

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

Correlation of RQD to Rock Mass Quality

Rock Mass 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 mass quality (very poor, poor, etc.)
ref: ASTM D6032 and AASHTO Standard Specification for Highway Bridges, 17th Ed. Table 4.4.8.1.2A
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 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-101

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	290.8	**Auger ID/OD:**	5" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	6/18/13-6/18/13	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	45+50, 7.5 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	S1		0.6 - 2.6			SSA	290.2		7" PAVEMENT	
									0.6 Dark brown, damp, fine to coarse SAND, little silt, trace gravel.	G#245355 A-1-b, SM WC=7.5%
	S2		2.6 - 5.0				288.2		2.6 Light brown, damp, fine to coarse SAND, trace silt, trace gravel.	G#245356 A-1-b, SP-SM WC=9.5%
5							285.8		5.0 **Bottom of Exploration at 5.0 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Offsets are from the Existing Roadway CL.

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 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-102

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	303.9	**Auger ID/OD:**	5" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	6/18/13-6/18/13	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	53+00, 8.5 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	S3		0.6 - 3.4			SSA	303.3		7" PAVEMENT	
									0.6 Brown, damp, fine to coarse SAND, little gravel, little silt.	G#245357 A-1-b, SW-SM WC=3.9%
	S4		3.4 - 10.0				300.5		3.4 Light brown, damp, fine to coarse SAND, little silt, trace gravel.	G#245358 A-1-b, SP-SM WC=3.5%
5										
10							293.9		10.0 **Bottom of Exploration at 10.0 feet below ground surface.** NO REFUSAL	
15										
20										
25										

Remarks:

Offsets are from the Existing Roadway CL.

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 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-103

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	304.9	**Auger ID/OD:**	5" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	6/18/13-6/18/13	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	61+38, 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 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	S5		0.6 - 2.0			SSA	304.3		7" PAVEMENT	
									0.6 Brown, damp, fine to coarse SAND, little silt, little gravel.	G#245359 A-1-b, SM WC=7.1%
	S6		2.0 - 10.0				302.9		2.0 Light brown, damp, fine to coarse SAND, little silt, trace gravel.	G#245360 A-1-b, SM WC=4.8%
5										
10							294.9		10.0 **Bottom of Exploration at 10.0 feet below ground surface.** NO REFUSAL	
15										
20										
25										

Remarks:

Offsets are from the Existing Roadway CL.

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 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-104

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	305.0	**Auger ID/OD:**	5" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	6/18/13-6/18/13	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	70+11, 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 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		0.5 - 1.7			SSA	304.5		6½" PAVEMENT	
									0.5	
	S8		1.7 - 10.0						Brown, damp, fine to coarse SAND, little silt, trace gravel.	G#245361 A-2-4, SM WC=6.7%
							303.3		1.7	
									Light brown, damp, fine to coarse SAND, little silt, trace gravel.	G#2145362 A-1-b, SM WC=2.4%
5										
10							295.0		10.0	
									Bottom of Exploration at 10.0 feet below ground surface. NO REFUSAL	
15										
20										
25										

Remarks:

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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 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-105

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	304.6	**Auger ID/OD:**	5" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	6/18/13-6/18/13	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	76+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 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	S9		0.5 - 1.5			SSA	304.1		6½" PAVEMENT	
									0.5	
	S10		1.5 - 10.0				303.1		Brown, damp, fine to coarse SAND, little gravel, little silt.	G#245363 A-1-b, SM WC=5.2%
									1.5	
									Gold, moist, fine to coarse SAND, trace silt, trace gravel.	G#245364 A-3, SP-SM WC=19.9%
5										
10							294.6		10.0	
									Bottom of Exploration at 10.0 feet below ground surface. NO REFUSAL	
15										
20										
25										

Remarks:

Offsets are from the Existing Roadway CL.

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 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-106

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	298.3	**Auger ID/OD:**	5" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	6/18/13-6/18/13	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	79+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						SSA	297.7		7" PAVEMENT (0.6)	
							296.9		Brown, damp, fine to coarse SAND, little gravel, little silt. (1.4)	
									Gold, moist, fine to coarse SAND, trace silt, trace gravel.	
5										
10							288.3		(10.0) **Bottom of Exploration at 10.0 feet below ground surface.** NO REFUSAL	
15										
20										
25										

Remarks:

Offsets are from the Existing Roadway CL.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-201

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	289.4	**Auger ID/OD:**	10" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	10/6/2015-10/6/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	48+30, 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	B1		0.8 - 4.5			SSA	289.0		5" PAVEMENT — 0.4	G#302107 A-1-b, SP WC=1.0%
							288.7		4" Unbound PAVEMENT. — 0.8	
									Light brown, moist, fine to coarse SAND, little gravel, trace silt.	
							284.9		4.5	
5									**Bottom of Exploration at 4.5 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Offsets are from the Existing Roadway CL.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: A 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-202

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	303.7	**Auger ID/OD:**	10" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	10/6/2015-10/6/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	59+30, 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	B2		0.9 - 2.2			SSA	303.1		7" PAVEMENT — 0.6	
							302.8		4" Unbound PAVEMENT. — 0.9	G#302106 A-1-b, SW-SM WC=3.8%
	S1		2.2 - 4.5				301.5		Brown, damp, Gravelly, fine to coarse SAND, trace silt. — 2.2	
									Light brown, damp, fine to coarse SAND, trace gravel, trace silt.	G#302109 A-3, SP WC=4.7%
							299.2		4.5	
5									**Bottom of Exploration at 4.5 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Offsets are from the Existing Roadway CL.

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* 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 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-203

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	304.9	**Auger ID/OD:**	10" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	10/6/2015-10/6/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	70+29, 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						SSA	304.2		8" PAVEMENT — 0.7	
							303.8		5" Unbound PAVEMENT. — 1.1	
	B3		1.1 - 2.0							G#302108 A-1-b, SM WC=4.6%
							302.9		Brown, damp, fine to coarse SAND, little silt, little gravel. — 2.0	
	S2		2.0 - 4.5						Light brown, moist, fine to coarse SAND, trace gravel, trace silt.	G#302110 A-1-b, SP WC=4.2%
							300.4		4.5	
5									**Bottom of Exploration at 4.5 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Offsets are from the Existing Roadway CL.

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* 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 0.94 mile portion of Route 35

Location: Standish, Maine

Boring No.: HB-STAN-204

WIN: 18282.00

Drilling Contractor:	MaineDOT	**Elevation (ft.)**	297.0	**Auger ID/OD:**	10" Dia.
Operator:	Giles/Daggett	**Datum:**	NAVD88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	10/6/2015-10/6/2015	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	79+42, 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	B4		0.9 - 2.0			SSA	296.3		8" PAVEMENT — 0.7	
							296.1		3" Unbound PAVEMENT. — 0.9	G#302105 A-1-a, SW WC=1.3%
	S3		2.0 - 4.5				295.0		Brown, moist, Gravelly, fine to coarse SAND, trace silt. — 2.0	G#302111 A-1-b, SP WC=11.9%
									Light brown, damp, fine to coarse SAND, trace gravel, trace silt.	
							292.5		4.5	
5									**Bottom of Exploration at 4.5 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Offsets are from the Existing Roadway CL.

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Appendix B

Laboratory Test Results

State of Maine - Department of Transportation

Laboratory Testing Summary Sheet

Town(s): Standish Work Number: 18282.00

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-STAN-101, S1	45+50	7.5 Rt.	0.58-2.6	245355	1	7.5	17.1	SM	A-1-b	II
HB-STAN-101, S2	45+50	7.5 Rt.	2.6-5.0	245356	1	9.5	10.3	SP-SM	A-1-b	0
HB-STAN-102, S3	53+00	8.5 Rt.	0.58-3.4	245357	1	3.9	11.1	SW-SM	A-1-b	0
HB-STAN-102, S4	53+00	8.5 Rt.	3.4-10.0	245358	1	3.5	11.7	SP-SM	A-1-b	0
HB-STAN-103, S5	61+38	8.0 Rt.	0.58-2.0	245359	1	7.1	19.1	SM	A-1-b	II
HB-STAN-103, S6	61+38	8.0 Rt.	2.0-10.0	245360	1	4.8	17.2	SM	A-1-b	II
HB-STAN-104, S7	70+11	8.0 Rt.	0.54-1.7	245361	2	6.7	19.0	SM	A-2-4	II
HB-STAN-104, S8	70+11	8.0 Rt.	1.7-10.0	245362	2	2.4	12.7	SM	A-1-b	II
HB-STAN-105, S9	76+00	8.0 Rt.	0.54-1.5	245363	2	5.2	14.4	SM	A-1-b	II
HB-STAN-105, S10	76+00	8.0 Rt.	1.5-10.0	245364	2	19.9	5.8	SP-SM	A-3	0
HB-STAN-201, B1	48+30	9.0 Rt.	0.75-4.5	302107	3	1.0	2.4	SP	A-1-b	0
HB-STAN-202, B2	59+30	9.0 Rt.	0.92-2.2	302106	3	3.8	9.6	SW-SM	A-1-b	0
HB-STAN-202, S1	59+30	9.0 Rt.	2.2-4.5	302109	3	4.7	3.2	SP	A-3	0
HB-STAN-203, B3	70+29	9.0 Rt.	1.08-2.0	302108	4	4.6	15.9	SM	A-1-b	II
HB-STAN-203, S2	70+29	9.0 Rt.	2.0-4.5	302110	4	4.2	3.9	SP	A-1-b	0
HB-STAN-204, B4	79+42	9.0 Rt.	0.92-2.0	302105	4	1.3	3.0	SW	A-1-a	0
HB-STAN-204, S3	79+42	9.0 Rt.	2.0-4.5	302111	4	11.9	2.8	SP	A-1-b	0

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)

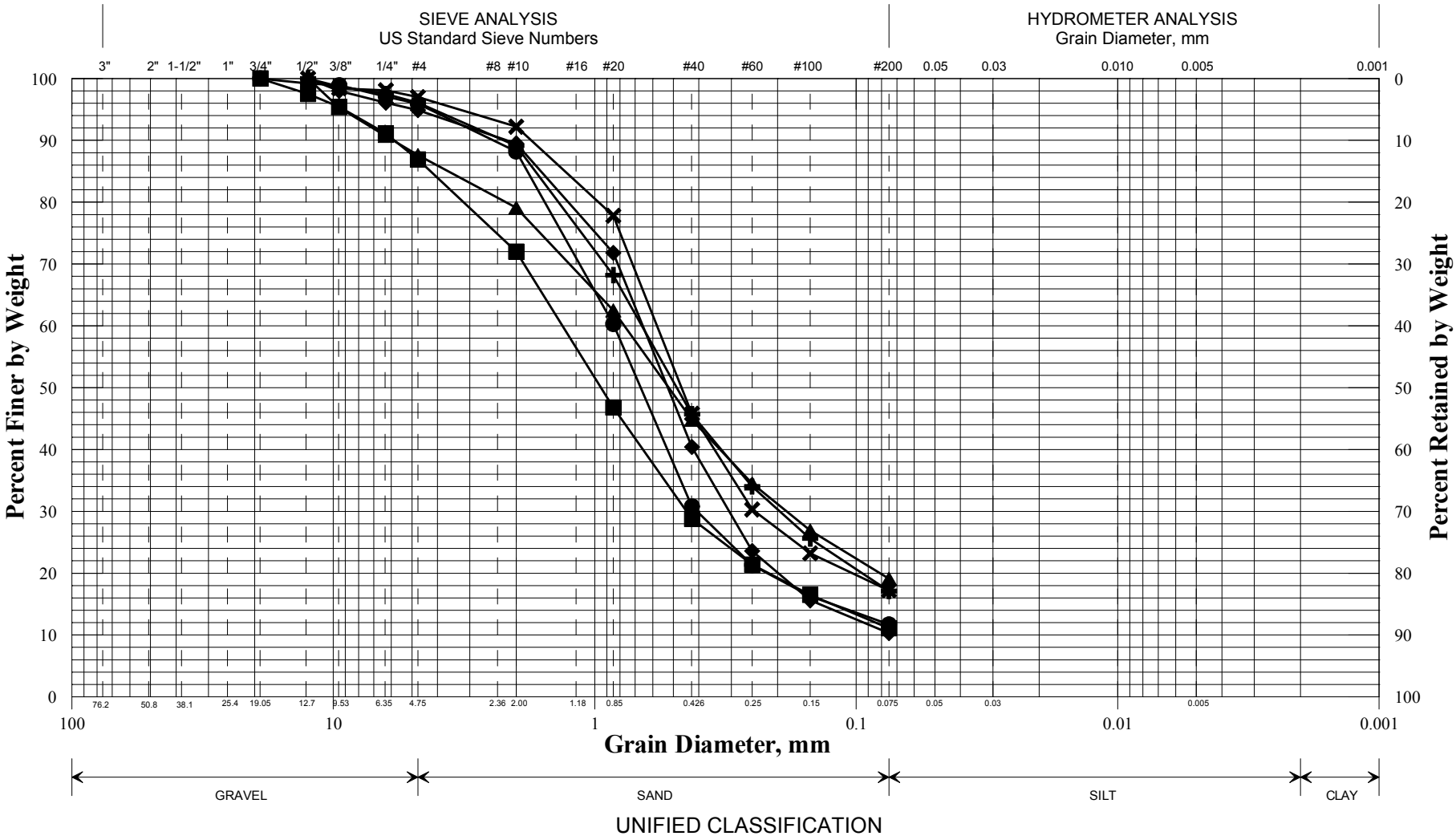
WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

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



UNIFIED CLASSIFICATION

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-STAN-101/S1	45+50	7.5 RT	0.58-2.6	SAND, little silt, trace gravel.	7.5			
◆	HB-STAN-101/S2	45+50	7.5 RT	2.6-5.0	SAND, trace silt, trace gravel.	9.5			
■	HB-STAN-102/S3	53+00	8.5 RT	0.58-3.4	SAND, little gravel, little silt.	3.9			
●	HB-STAN-102/S4	53+00	8.5 RT	3.4-10.0	SAND, little silt, trace gravel.	3.5			
▲	HB-STAN-103/S5	61+38	8.0 RT	0.58-2.0	SAND, little silt, little gravel.	7.1			
✖	HB-STAN-103/S6	61+38	8.0 RT	2.0-10.0	SAND, little silt, trace gravel.	4.8			

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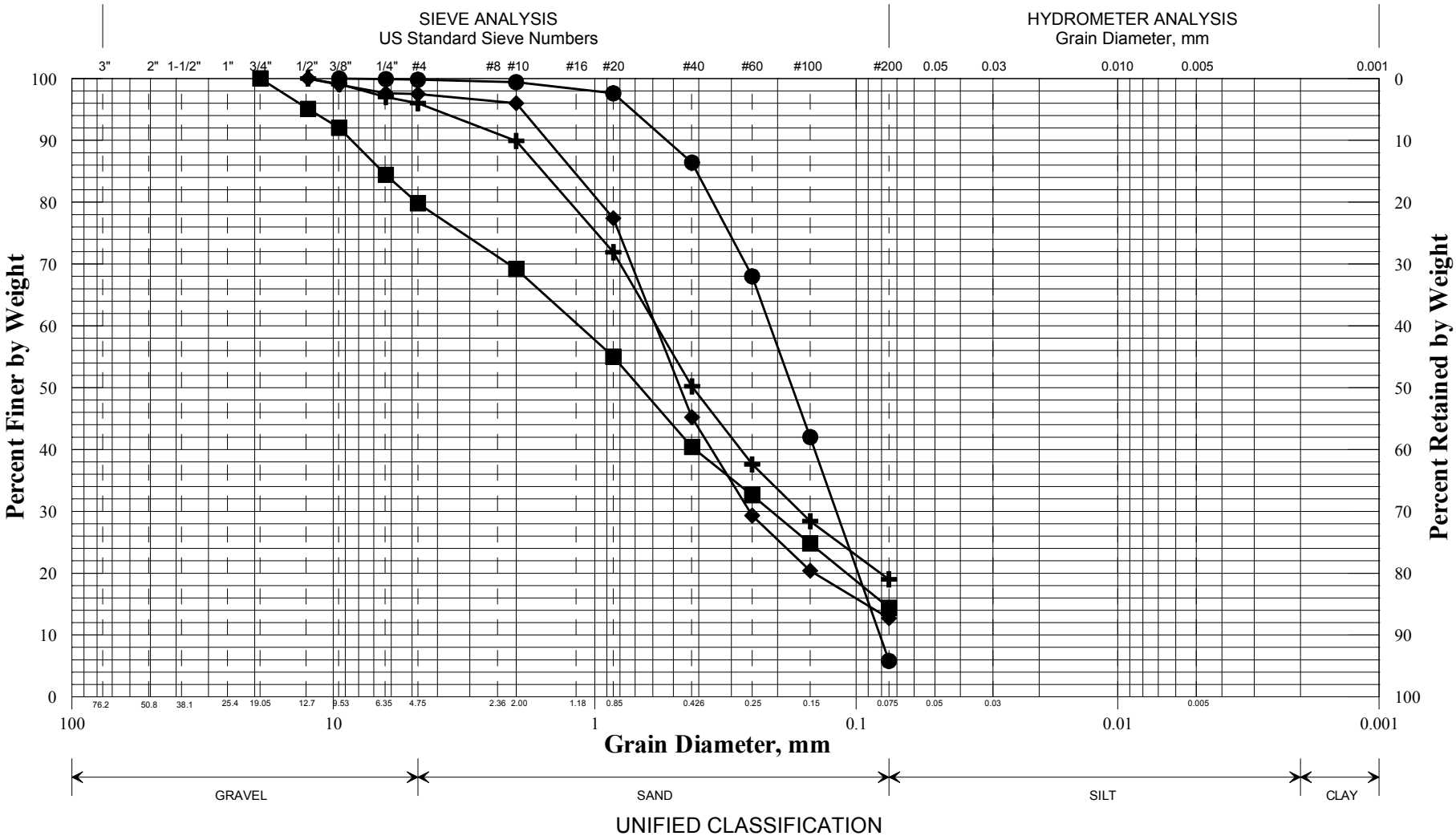
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-STAN-104/S7	70+11	8.0 RT	0.54-1.7	SAND, little silt, trace gravel.	6.7			
◆	HB-STAN-104/S8	70+11	8.0 RT	1.7-10.0	SAND, little silt, trace gravel.	2.4			
■	HB-STAN-105/S9	76+00	8.0 RT	0.54-1.5	SAND, little gravel, little silt.	5.2			
●	HB-STAN-105/S10	76+00	8.0 RT	1.5-10.0	SAND, trace silt, trace gravel.	19.9			
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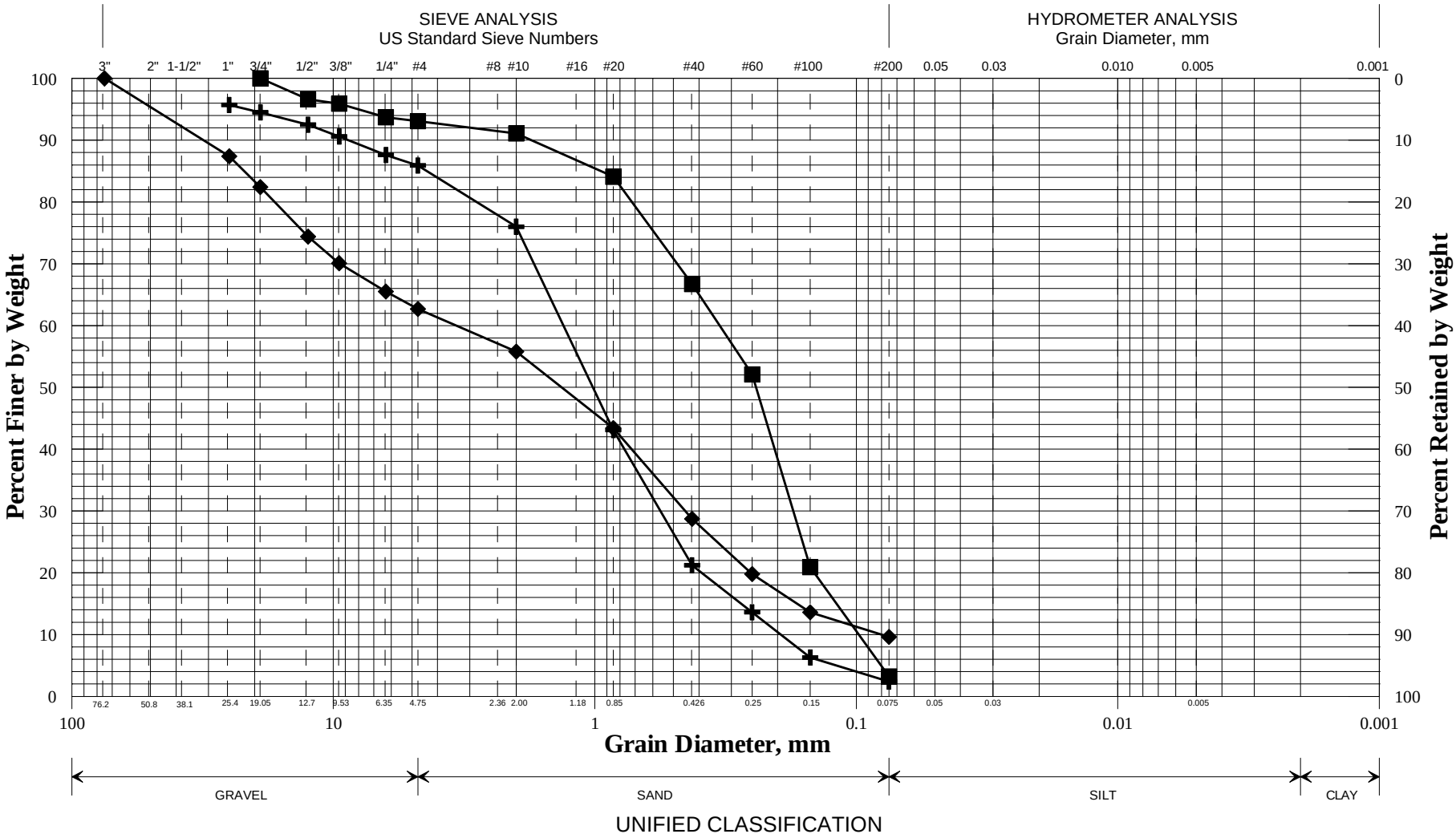

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-STAN-201/B1	48+30	9.0 RT	0.75-4.5	SAND, little gravel, trace silt.	1.0			
◆	HB-STAN-202/B2	59+30	9.0 RT	0.92-2.2	Gravelly SAND, trace silt.	3.8			
■	HB-STAN-202/S1	59+30	9.0 RT	2.2-4.5	SAND, trace gravel, trace silt.	4.7			
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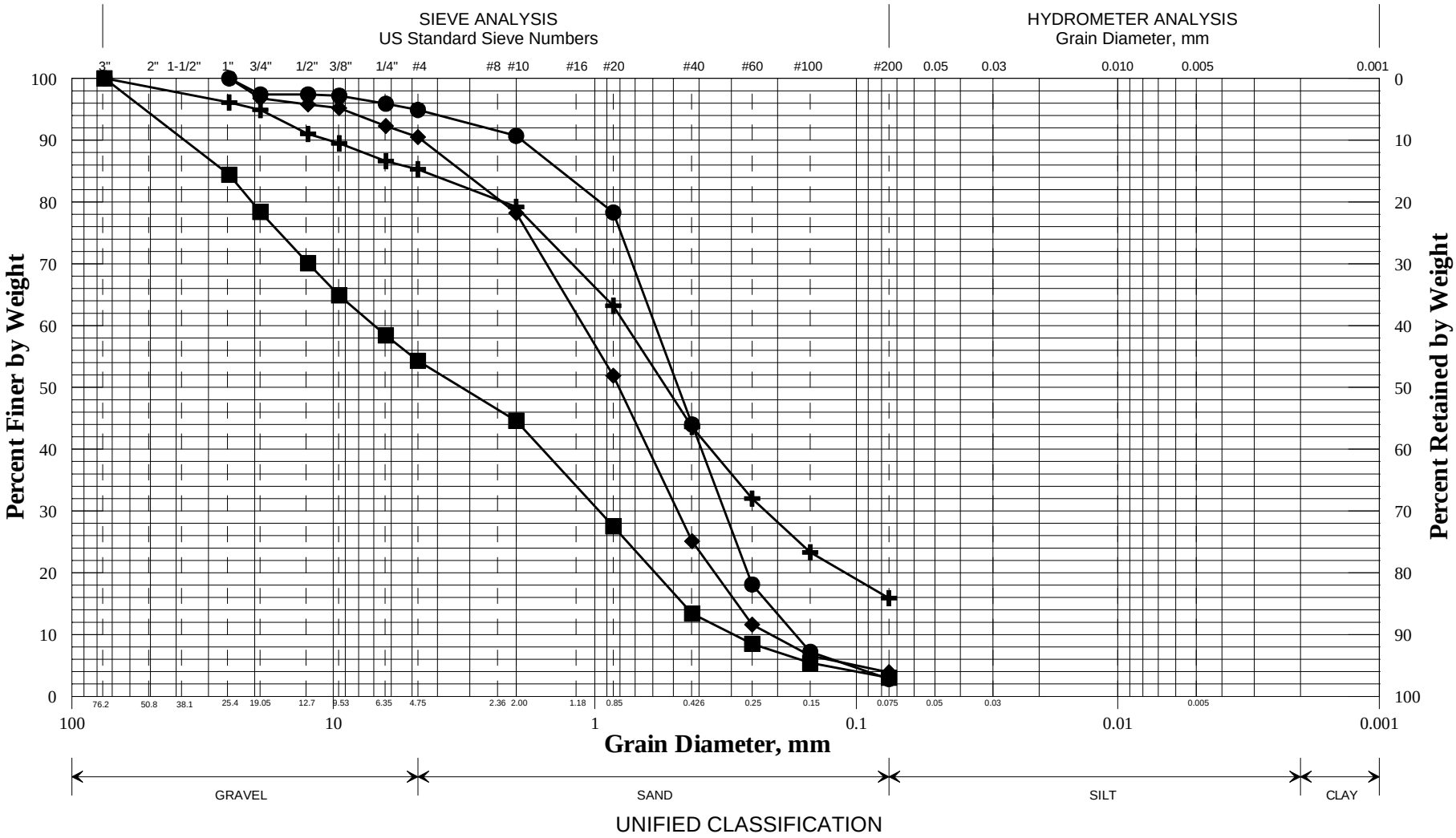
GRAIN SIZE DISTRIBUTION CURVE



	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
✚	HB-STAN-203/B3	70+29	9.0 RT	1.08-2.0	SAND, little silt, little gravel.	4.6			
◆	HB-STAN-203/S2	70+29	9.0 RT	2.0-4.5	SAND, trace gravel, trace silt.	4.2			
■	HB-STAN-204/B4	79+42	9.0 RT	0.92-2.0	Gravelly SAND, trace silt.	1.3			
●	HB-STAN-204/S3	79+42	9.0 RT	2.0-4.5	SAND, trace gravel, trace silt.	11.9			
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