

Maine Department of Transportation
Highway Program
Geotechnical Group

Report of

**SUBSURFACE INVESTIGATION FOR
INTERSECTION IMPROVEMENTS IN MADISON
ROUTE 201 AT ROUTE 148**

Prepared by

Kitty Breskin, P.E.
Geotechnical Design Engineer

Somerset County

PIN 15685.00
Federal STP-1568(500)X
June 15, 2011

Soils Report No. 2011-112



Brad Foley, Program Manager
Rich Crawford & Heath Cowan, Assistant Program Managers
Phone: 624-3480 Fax: 624-3481

Memorandum

To: Paul MacDonald, Project Manager
cc: Rhobe Moulton, Designer
From: Kitty Breskin, P.E.
Date: June 6, 2011
Subject: Madison, PIN 15685.00

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Project Information:

Project Overview

Maine DOT proposes improvements to Route 201 at the intersection of Route 148 in the Town of Madison. This is a safety project to add a left turn lane on Route 201, northbound. New construction will widen the existing pavement section. This report describes existing conditions for this project.

Mapped Data

The Maine Geologic Survey Surficial Geology map for the Anson Quadrangle shows soils at this intersection to be Till, with adjacent Aeolian deposits of sand. The Surficial Materials map shows a single well with a depth to bedrock of 40 feet, approximately 400 feet east of this intersection.

NRCS maps include information on soils for the upper five feet below the ground surface; deeper soils are not discussed. NRCS mapping for this area shows Dixmont silt loam soils, which are described as poorly drained. These soils are described as USCS category ML with 59% silt, 34% sand, and groundwater within approximately 18" of the ground surface.

Subsurface Investigation

The purpose of the subsurface investigation was to determine how the existing shoulders were built, and the current thickness of the Hot Mix Asphalt pavement and gravel. The subsurface investigation for this project was conducted August, 2010. The investigation included five borings and 3 pavement cores. All explorations are shown on the attached Geoplans. The following summary table shows the results of our investigation:

Table 1
Pavement and Subbase Depth

Boring	Station	Offset	HMA Depth	Subbase Depth	Subgrade
HB-MADI-101	11+50	19.0 Rt	0.3	0.9	Silt
HB-MADI-102	10+20	20.0 Rt	0.4	0.9	Silt
HB-MADI-103	31+00	16.5 Lt	0.4	3.2	Silt
HB-MADI-104	31+90	14.0 Rt	0.5	3.1	Silt
HB-MADI-105	9+75	47.0 Lt	0.5	0.7	Silt



Pavement

This section of Route 201 was originally built in 1938. The typical sections show pavement section depths of 16" and 22". Records of improvements since that time are not available. Route 148 was originally built in 1954 with sections of 18" gravel base, sections of variable gravel, and sections of 24" gravel base. It was rebuilt in 1981 with an overlay at the intersection of Route 201. The existing pavement is in fair to poor condition.

Native Soils

Subgrade soils consist of silt with small amounts of fine sand. Groundwater was not encountered, but soils under Route 201 were described as moist and under Route 148 wet soils were encountered under the pavement section. A boring at Station 9+75, 47 feet Left, encountered refusal at a depth of 8.8 feet. This is outside of the project area, but it might indicate that shallow bedrock could be discovered during construction of the underdrain system.

Recommendations:

Pavement

This project is scoped as a safety project, and the budget does not allow full reconstruction of the pavement section. Traffic loadings are high, and we recommend a 30" section for widening to include 22" of gravel and 8" of Hot Mix Asphalt. It appears from our pavement cores that existing HMA depth is adequate to mill off the surface and place new mix across the full width of the new lane and shoulder.

Drainage

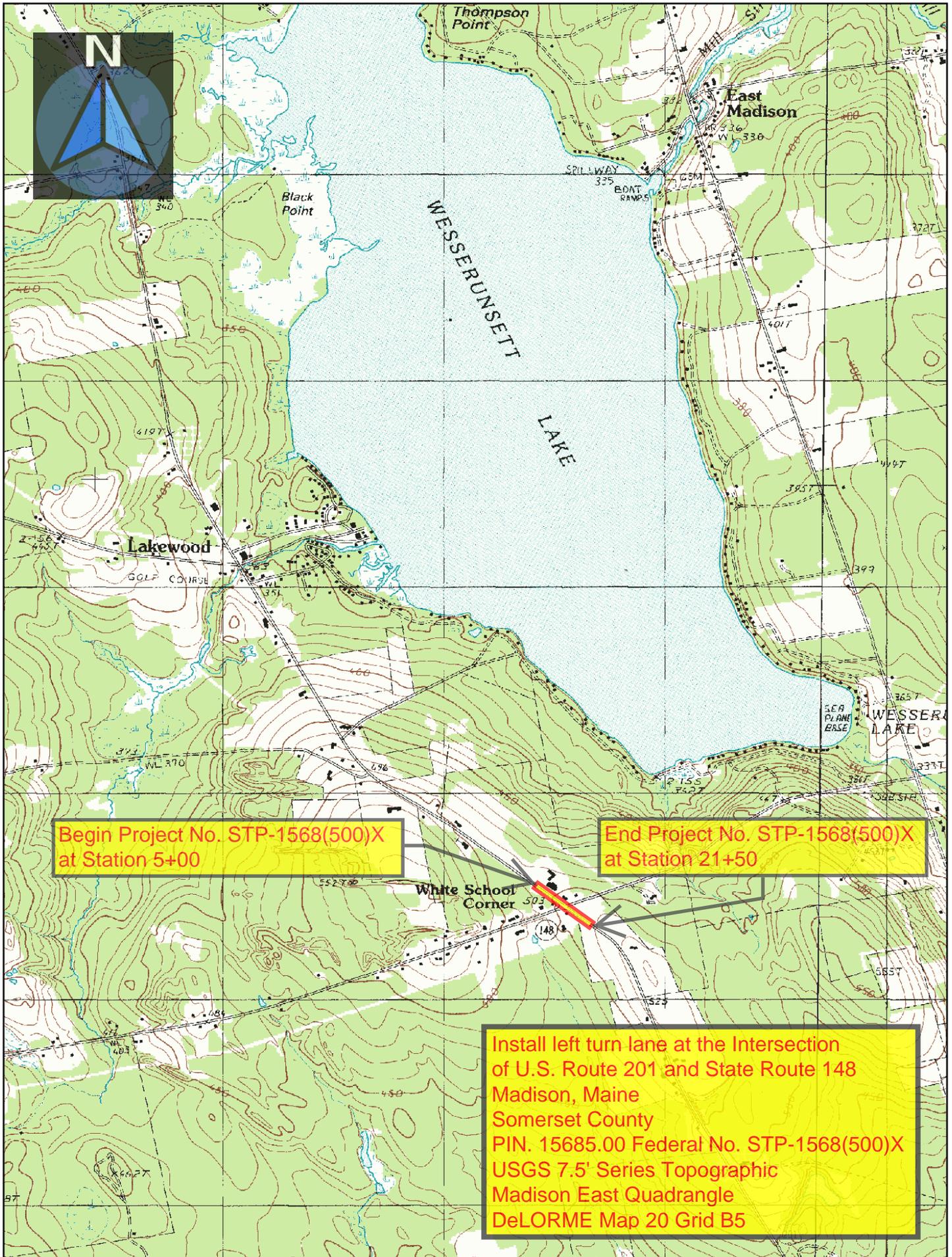
A curb section will be constructed to minimize Right of Way impacts, and underdrain will be needed to drain the pavement section.

Frost Depth

The design freezing index in Madison is 1700. The subgrade soils are frost susceptible granular soils, and the design depth of frost under snow-free pavement with a 30" total pavement section thickness for these conditions is approximately 5 feet. If the outlet elevations allow it, any new drainage system should be deep enough to drain any groundwater or infiltrated surface water to below this depth to protect soils in the pavement structure.

Attachments:

- Site Location Map
- Geoplans
- Surficial Geology Map
- NRCS map
- Boring logs



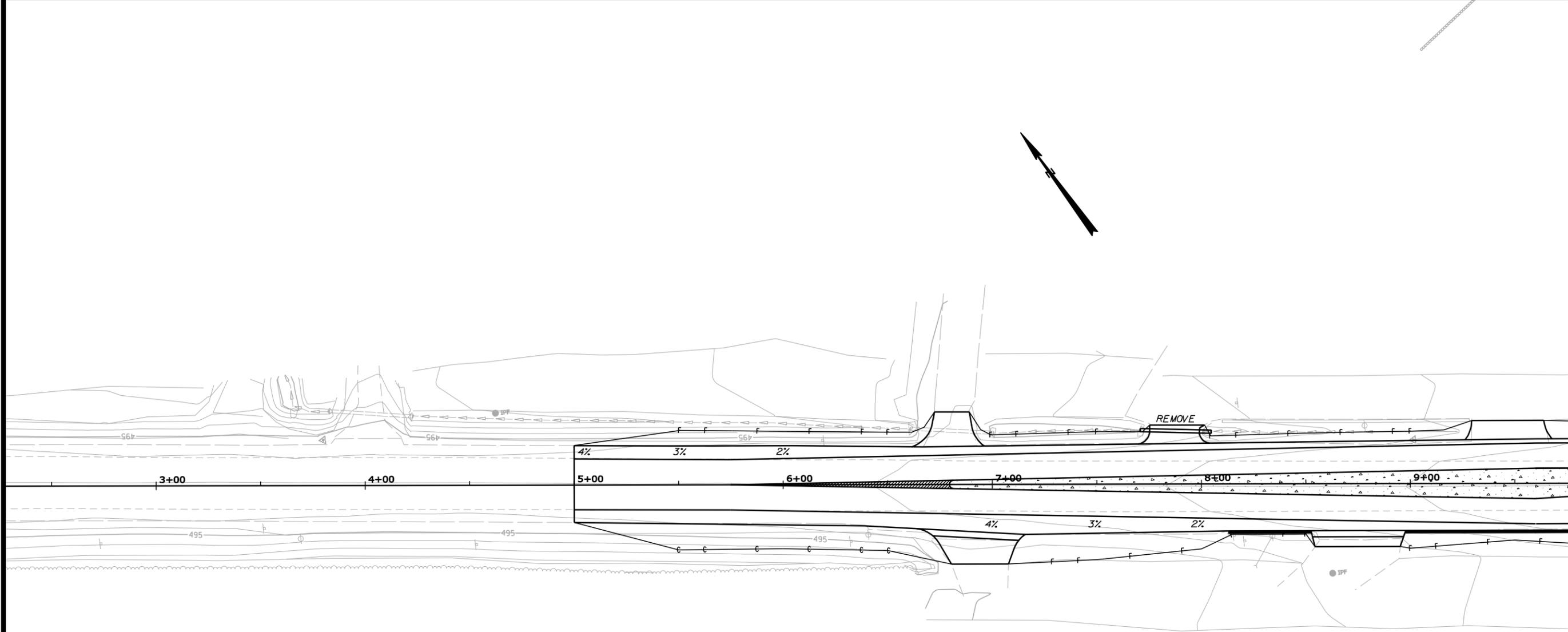
Begin Project No. STP-1568(500)X
at Station 5+00

End Project No. STP-1568(500)X
at Station 21+00

Install left turn lane at the Intersection
of U.S. Route 201 and State Route 148
Madison, Maine
Somerset County
PIN. 15685.00 Federal No. STP-1568(500)X
USGS 7.5' Series Topographic
Madison East Quadrangle
DeLORME Map 20 Grid B5

Map Scale 1:24000

The Maine Department of Transportation provides this publication for information only. Reliance upon this information is at user risk. It is subject to revision and may be incomplete depending upon changing conditions. The Department assumes no liability if injuries or damages result from this information. This map is not intended to support emergency dispatch. Road names used on this map may not match official road names.



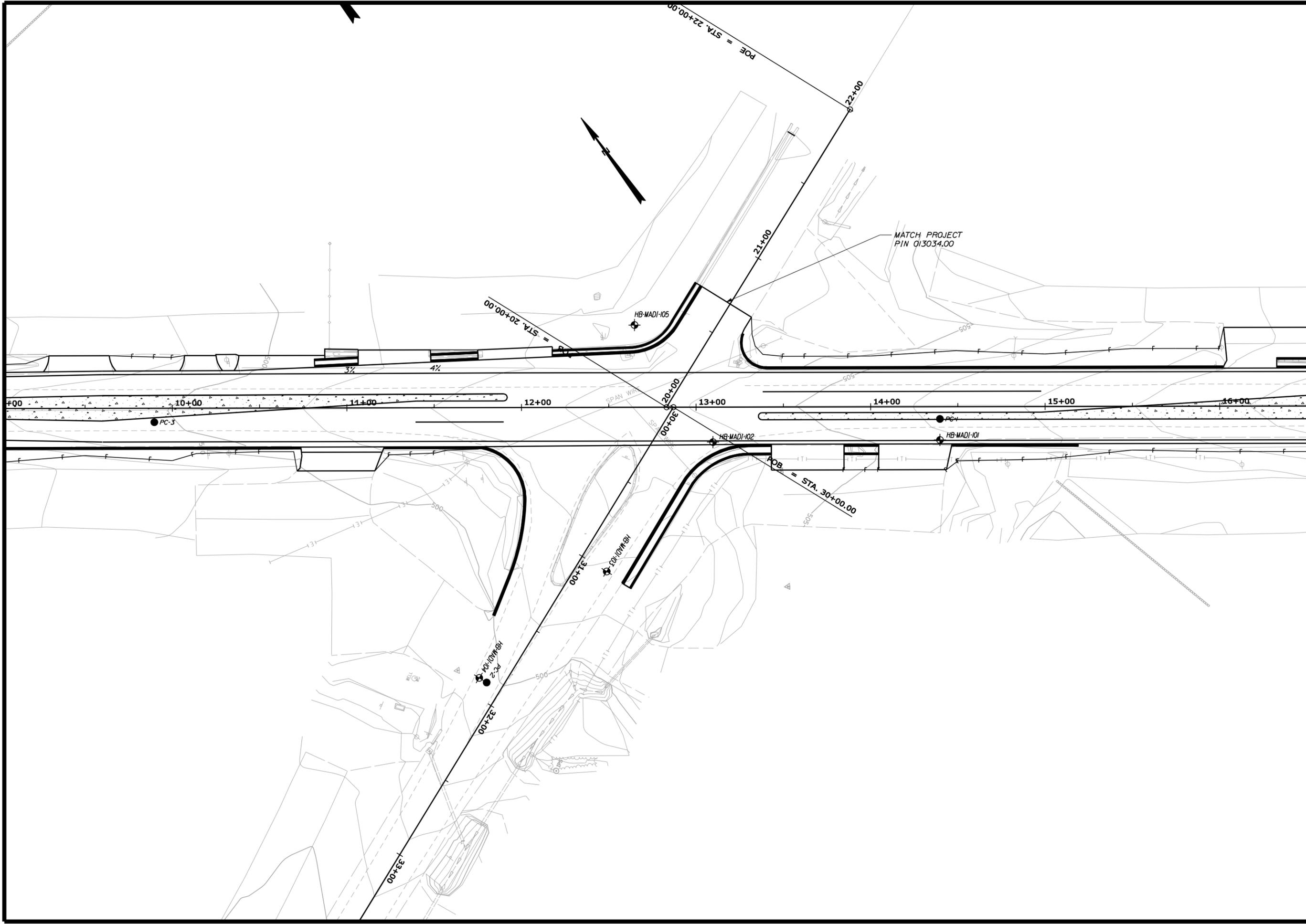
SHEET NUMBER
1
OF 4

MADISON
U.S. ROUTE 201A & S.R. 148
GEOPLANS

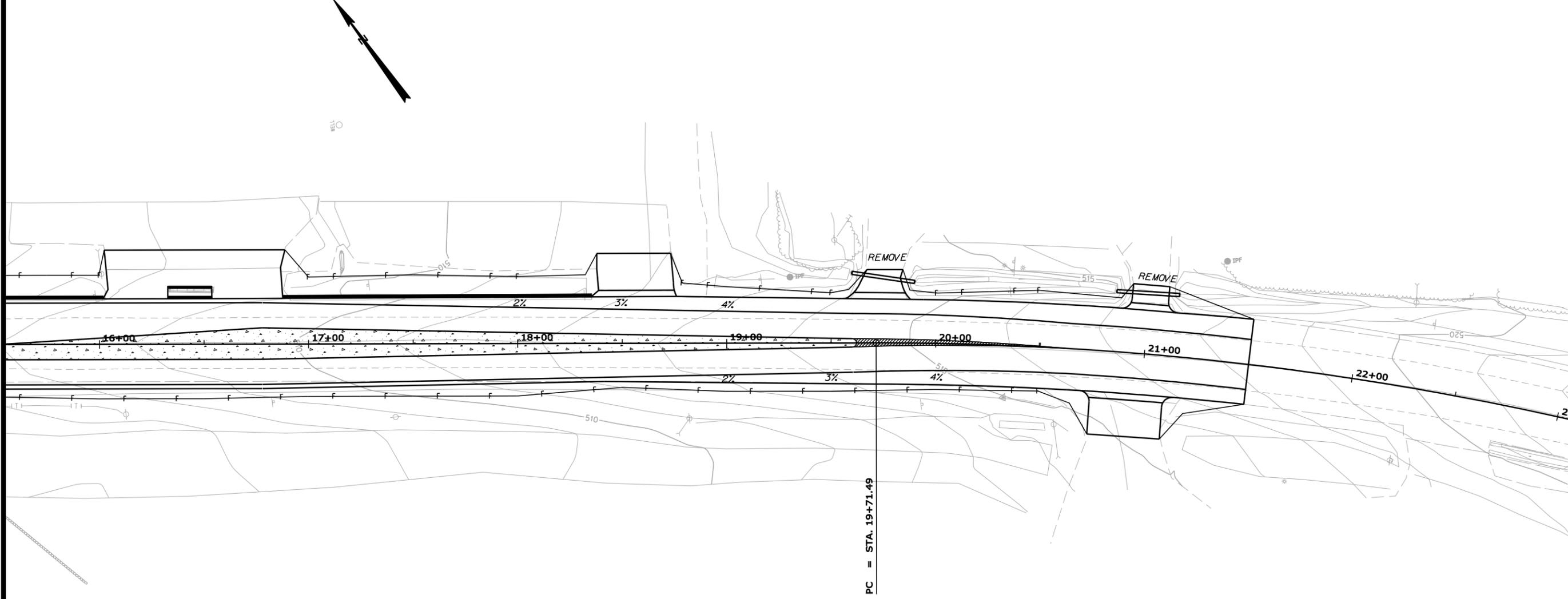
PROJ. MANAGER	E.M.	BY	DATE
DESIGN DETAILED	K. BRESNIN	T. WHITE	AUG 2010
CHECKED-REVIEWED			
DESIGNS DETAILED			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

SIGNATURE	P.E. NUMBER	DATE

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
STP-1568(500)X
PIN 15685.00
HIGHWAY PLANS



STATE OF MAINE		DEPARTMENT OF TRANSPORTATION	
MADISON		STP-1568(500)X	
U.S. ROUTE 201A & S.R. 148		PIN 15685.00	
GEOPLANS		HIGHWAY PLANS	
SHEET NUMBER		SIGNATURE	
2		P.E. NUMBER	
OF 4		DATE	
PROJ. MANAGER	E.M.	BY	DATE
DESIGN DETAILED	K. BRESNIN	T. WHITE	AUG 2010
CHECKED-REVIEWED			
DESIGNS DETAILED			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			



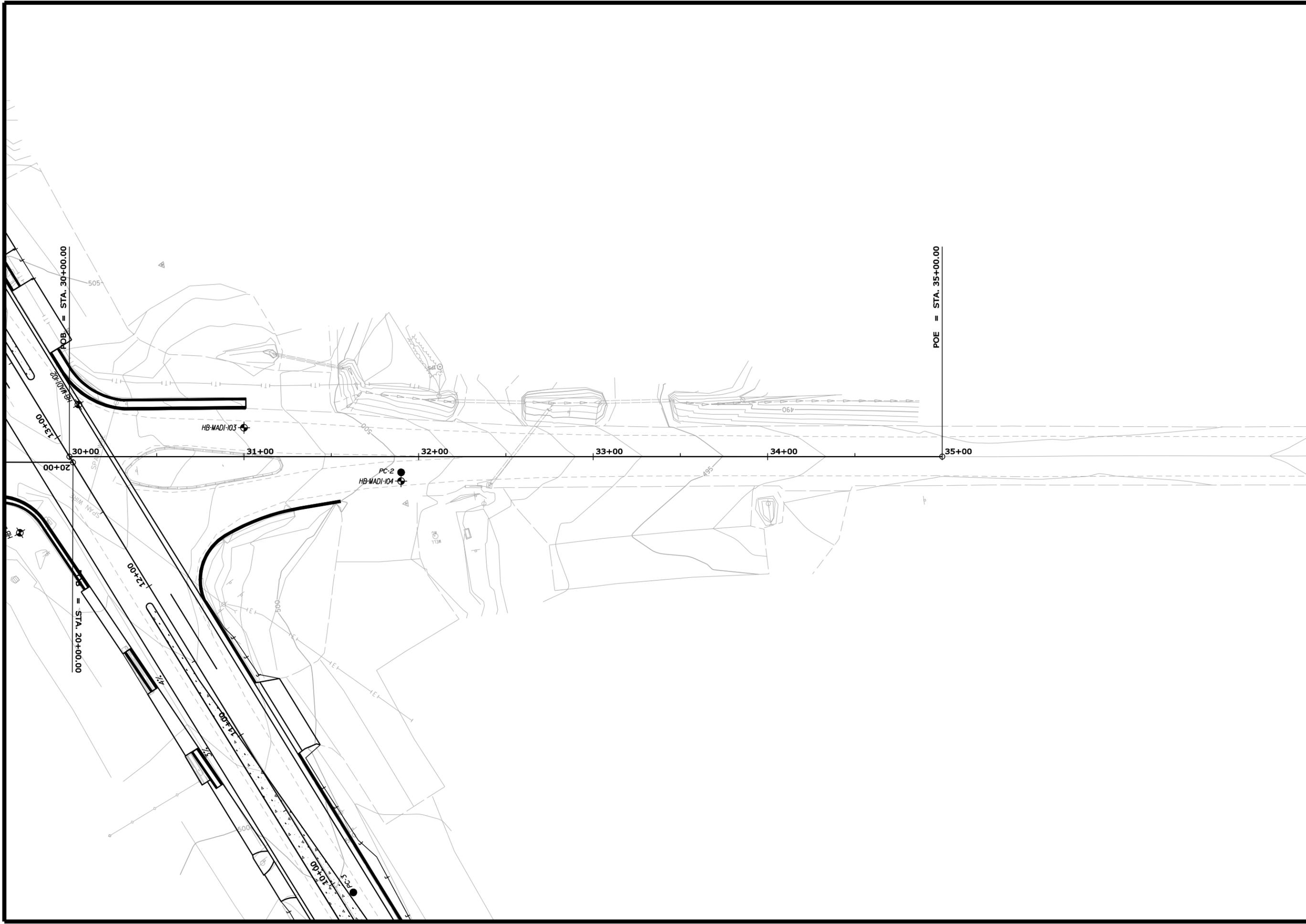
SHEET NUMBER
3
 OF 4

MADISON
 U.S. ROUTE 201A & S.R. 148
 GEOPLANS

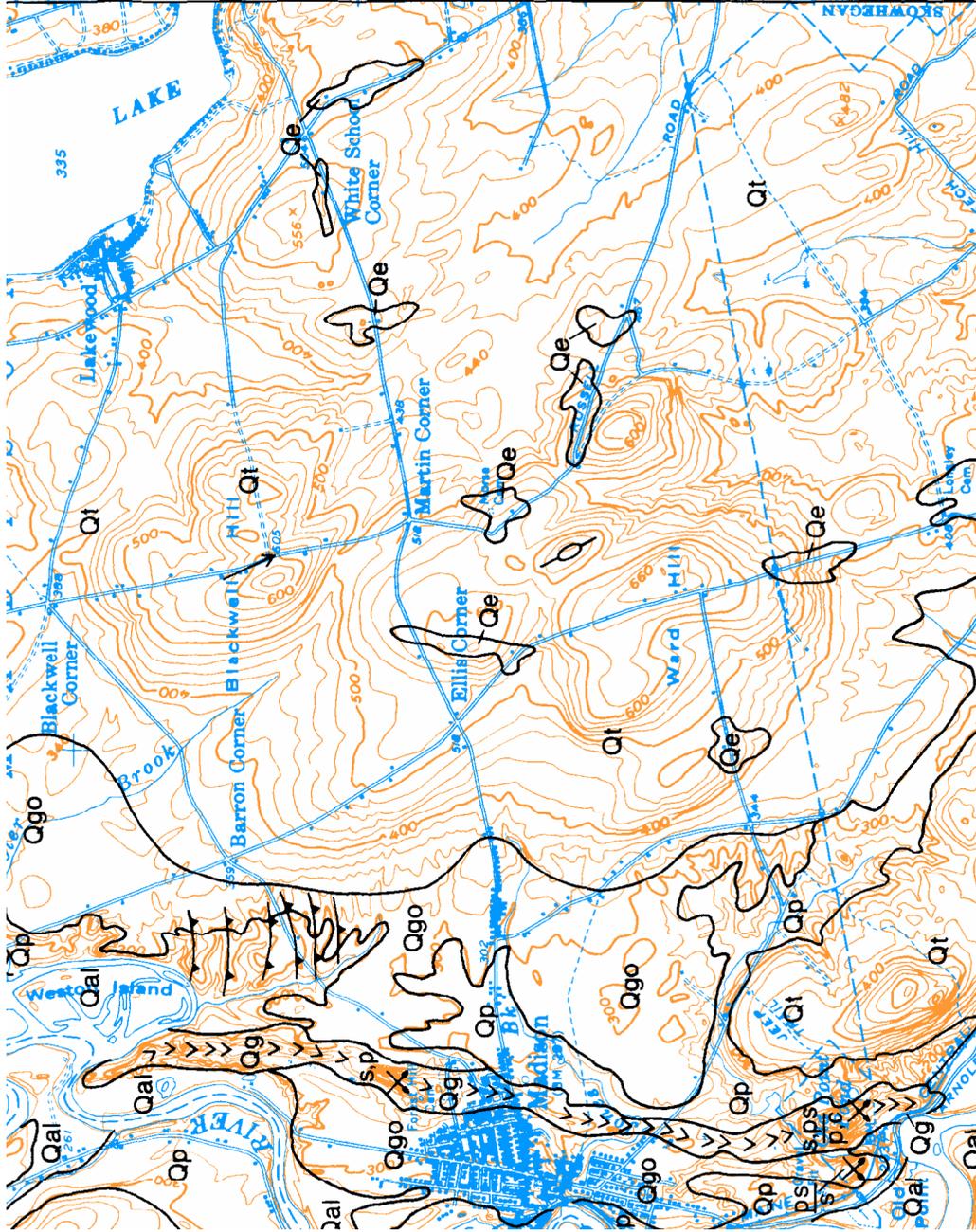
PROJ. MANAGER	E.M.	BY	DATE
DESIGN DETAILED	K. BRESNIN	T. WHITE	AUG 2010
CHECKED-REVIEWED			
DESIGNS DETAILED			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

STATE OF MAINE
 DEPARTMENT OF TRANSPORTATION
 STP-1568(500)X
 PIN 15685.00
 HIGHWAY PLANS

SIGNATURE	P.E. NUMBER	DATE



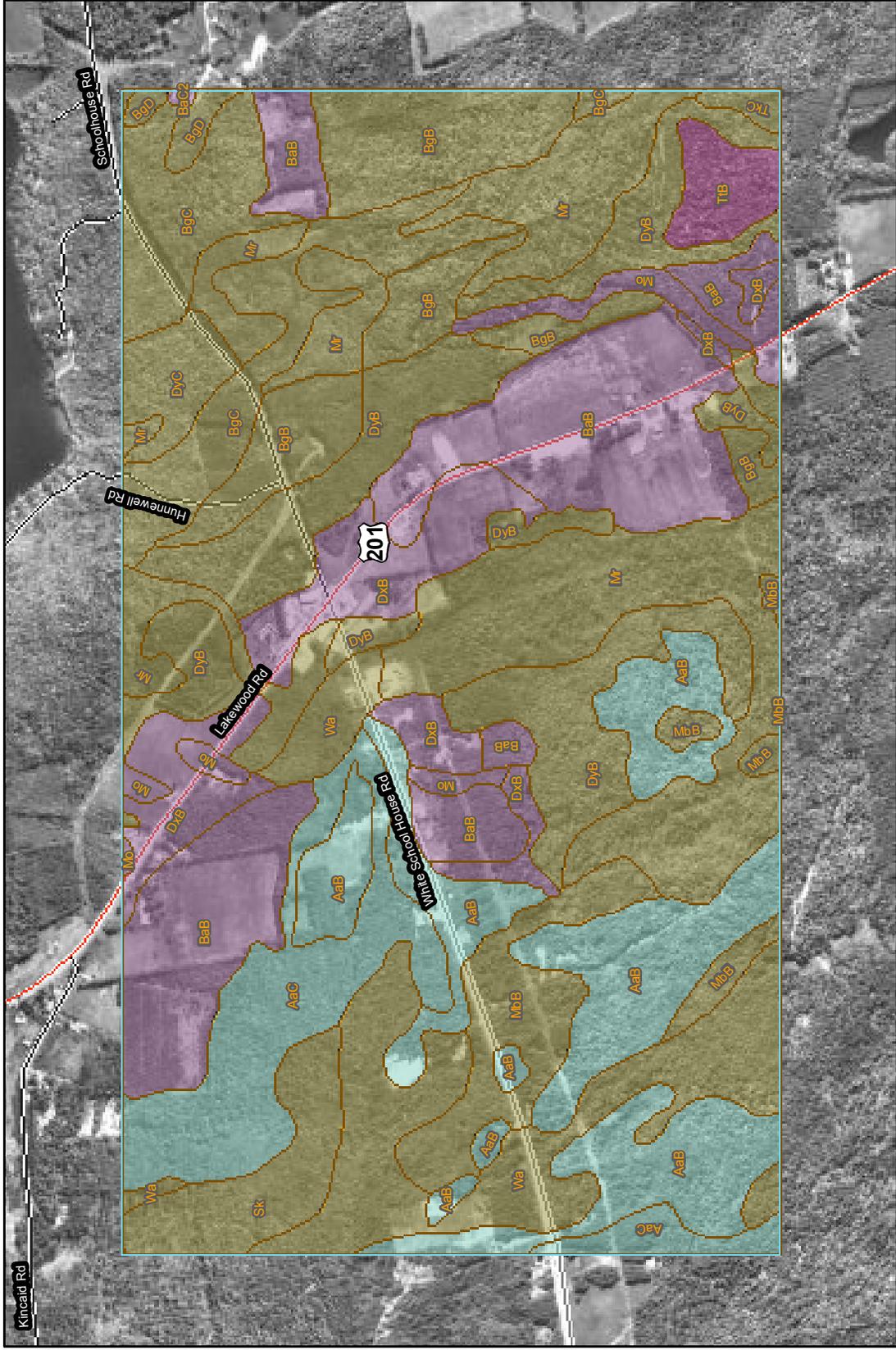
STATE OF MAINE		DEPARTMENT OF TRANSPORTATION	
MADISON		15685.00	
U.S. ROUTE 201 & S.R. 148		PIN 15685.00	
GEOPLANS		HIGHWAY PLANS	
SHEET NUMBER		SIGNATURE	
4		P.E. NUMBER	
OF 4		DATE	
PROJ. MANAGER	P. MACDONALD	BY	DATE
CHECKED-REVIEWED	R. MOULTON	R. MOULTON	SEP 2011
DESIGNS-DETAILED	K. BRESLIN	T. WHITE	
DESIGNS-DETAILED			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			



Unified Soil Classification (Surface)—Somerset County, Maine, Southern Part
(Madison, PIN 15685.00)

69° 44' 42"

44° 49' 20"



69° 47' 15"

44° 49' 19"

69° 44' 41"

44° 48' 7"

Map Scale: 1:16,000 if printed on A size (8.5" x 11") sheet.



69° 47' 14"

MAP INFORMATION

Map Scale: 1:16,000 if printed on A size (8.5" x 11") sheet.
 The soil surveys that comprise your AOI were mapped at 1:20,000.
 Please rely on the bar scale on each map sheet for accurate map measurements.
 Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: UTM Zone 19N NAD83
 This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.
 Soil Survey Area: Somerset County, Maine, Southern Part
 Survey Area Data: Version 11, Jul 27, 2009
 Date(s) aerial images were photographed: 6/7/1997
 The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

MAP LEGEND

 Area of Interest (AOI)	 ML	 Interstate Highways
 Area of Interest (AOI)	 ML-A (proposed)	 US Routes
 Soils	 ML-K (proposed)	 Major Roads
 Soil Map Units	 ML-O (proposed)	 Local Roads
 Soil Ratings	 ML-T (proposed)	
 CH	 OH	
 CL	 OH-T (proposed)	
 CL-A (proposed)	 OL	
 CL-K (proposed)	 PT	
 CL-ML	 SC	
 CL-O (proposed)	 SC-SM	
 CL-T (proposed)	 SM	
 GC	 SP	
 GC-GM	 SP-SC	
 GM	 SP-SM	
 GP	 SW	
 GP-GC	 SW-SC	
 GP-GM	 SW-SM	
 GW	 Not rated or not available	
 GW-GC		
 GW-GM	Political Features	
 MH	 Cities	
 MH-A (proposed)	 Oceans	
 MH-K (proposed)	 Streams and Canals	
 MH-O (proposed)	Transportation	
 MH-T (proposed)	 Rails	

Unified Soil Classification (Surface)

Unified Soil Classification (Surface)— Summary by Map Unit — Somerset County, Maine, Southern Part				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AaB	Adams loamy sand, 0 to 8 percent slopes	SM	146.7	12.3%
AaC	Adams loamy sand, 8 to 15 percent slopes	SM	78.9	6.6%
BaB	Bangor silt loam, 3 to 8 percent slopes	ML	165.9	13.9%
BaC2	Bangor silt loam, 8 to 15 percent slopes, eroded	ML	0.7	0.1%
BgB	Bangor very stony silt loam, 3 to 8 percent slopes	PT	85.1	7.1%
BgC	Bangor very stony silt loam, 8 to 15 percent slopes	PT	82.8	6.9%
BgD	Bangor very stony silt loam, 15 to 25 percent slopes	PT	6.0	0.5%
DxB	Dixmont silt loam, 0 to 8 percent slopes	ML	75.4	6.3%
DyB	Dixmont very stony silt loam, 0 to 8 percent slopes	PT	137.5	11.5%
DyC	Dixmont very stony silt loam, 8 to 20 percent slopes	PT	16.7	1.4%
MbB	Madawaska fine sandy loam, 0 to 8 percent slopes	PT	51.3	4.3%
Mo	Monarda silt loam	ML	17.2	1.4%
Mr	Monarda very stony silt loam	PT	177.3	14.9%
Sk	Skowhegan loamy fine sand	PT	31.6	2.6%
TkC	Thorndike very rocky silt loam, 3 to 15 percent slopes	PT	3.6	0.3%
TtB	Thorndike-Bangor silt loams, 0 to 8 percent slopes	GM	15.6	1.3%
Wa	Walpole fine sandy loam	PT	99.8	8.4%
Totals for Area of Interest			1,192.2	100.0%

Description

The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The representative classification is shown here for the surface layer of the soil.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Layer Options: Surface Layer

Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: Giguere/Giles/Daggett	Datum: NAVD88	Sampler: Off Flights
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 8/10/10-8/10/10	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 11+50, 19.0 Rt.	Casing ID/OD: N/A	Water Level*: None Observed

Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample attempt U = Thin Wall Tube Sample R = Rock Core Sample V = Insitu Vane Shear Test SSA = Solid Stem Auger	Definitions: S _u = Insitu Field Vane Shear Strength (psf) T _v = Pocket Torvane Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) S _u (lab) = Lab Vane Shear Strength (psf) WOH = weight of 140lb. hammer WOR = weight of rods. WOC = weight of casing	Definitions: WC = water content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test
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Sample Information										Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
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			
0	S1		0.30 - 1.20			SSA	-0.30		PAVEMENT.		
	S2		1.20 - 5.00				-1.20		Black, damp, fine to coarse SAND, little gravel, trace silt.		
									Light brown, moist, SILT, little fine sand.		
5							-5.00		Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL		
10											
15											
20											
25											

Remarks:
 PC-1, (Pavement Core) Station 11+50, 7.0' Rt.
 PC-3, (0.65' Pavement Core) Station 7+00, 8.0' Rt.

Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: Giguere/Giles/Daggett	Datum: NAVD88	Sampler: Off Flights
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 8/10/10-8/10/10	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 10+20, 20.0 Rt.	Casing ID/OD: N/A	Water Level*: None Observed

Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample attempt U = Thin Wall Tube Sample R = Rock Core Sample V = Insitu Vane Shear Test SSA = Solid Stem Auger	Definitions: S _u = Insitu Field Vane Shear Strength (psf) T _v = Pocket Torvane Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) S _u (lab) = Lab Vane Shear Strength (psf) WOH = weight of 140lb. hammer WOR = weight of rods. WOC = weight of casing	Definitions: WC = water content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test
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Sample Information										Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
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			
0	S3		0.40 - 1.30			SSA	-0.40		PAVEMENT. Brown, damp, gravelly, fine to coarse SAND, trace silt. Light brown, moist, SILT, little fine sand. ≈S2	-0.40 -1.30	
5						↓	-5.00		Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	-5.00	
10											
15											
20											
25											

Remarks:

Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: Giguere/Giles/Daggett	Datum: NAVD88	Sampler: Off Flights
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 8/10/10-8/10/10	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 31+00, 16.5 Lt.	Casing ID/OD: N/A	Water Level*: None Observed

Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample attempt U = Thin Wall Tube Sample R = Rock Core Sample V = Insitu Vane Shear Test SSA = Solid Stem Auger	Definitions: S _u = Insitu Field Vane Shear Strength (psf) T _v = Pocket Torvane Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) S _u (lab) = Lab Vane Shear Strength (psf) WOH = weight of 140lb. hammer WOR = weight of rods. WOC = weight of casing	Definitions: WC = water content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test
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Sample Information										Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
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			
0						SSA	-0.40		PAVEMENT. Brown, damp, gravelly, fine to coarse SAND, trace silt. ≈S3	-0.40	
	S4		3.60 - 10.00				-3.60		Olive, wet, SILT, trace fine sand.	-3.60	
5											
10							-10.00		Bottom of Exploration at 10.00 feet below ground surface. NO REFUSAL	-10.00	
15											
20											
25											

Remarks:

Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: Giguere/Giles/Daggett	Datum: NAVD88	Sampler: Off Flights
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 8/10/10-8/10/10	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 31+90, 14.0 Rt.	Casing ID/OD: N/A	Water Level*: None Observed

Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample attempt U = Thin Wall Tube Sample R = Rock Core Sample V = Insitu Vane Shear Test SSA = Solid Stem Auger	Definitions: S _u = Insitu Field Vane Shear Strength (psf) T _v = Pocket Torvane Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) S _u (lab) = Lab Vane Shear Strength (psf) WOH = weight of 140lb. hammer WOR = weight of rods. WOC = weight of casing	Definitions: WC = water content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test
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Sample Information											Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
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				
0	S5		0.50 - 3.60			SSA	-0.50		PAVEMENT.		-0.50	
									Brown, damp, gravelly, fine to coarse SAND, trace silt.			
							-3.60		Olive, wet, SILT, trace fine sand. ≈S4		-3.60	
5							-5.00		Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL		-5.00	
10												
15												
20												
25												

Remarks:
 PC-2 (0.6' Pavement Core) Station 31+90, 9.0' Rt.

