

MAINE DEPARTMENT OF TRANSPORTATION
HIGHWAY PROGRAM
GEOTECHNICAL GROUP
AUGUSTA, MAINE

**SUBSURFACE INVESTIGATION FOR
INTERSECTION IMPROVEMENTS AT ROUTE 1/9
AND ROUTE 191
IN BARING, WASHINGTON COUNTY**

Prepared by:

Kitty Breskin, P.E.
Geotechnical Design Engineer

Washington County
PIN 17289.00

Soils Report No. 2011-117

Federal NH-1728(900)E
November 1, 2011



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

Memorandum

To: Eyitayo Adande Kinti
cc: Paul MacDonald
From: Kitty Breskin
Date: October 26, 2011
Subject: Baring, PIN 17289.00

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Project Overview

Maine DOT proposes to rebuild the intersection of Route 1/9 and Route 191 in Baring, Washington County. A by-pass lane and shoulder will be added, but no changes in vertical alignment will be required. Thin fills over the existing side slopes will be required.

Mapped Data

The Maine Geologic Survey Surficial Geology map for the Calais area shows two soil types along this project. The soils immediately south and west of the intersection are shown as Till, with clay-silts of the Presumpscot Formation to the west and east.

NRCS maps include information on soils within five feet below the surface; deeper soils are not discussed. NRCS mapping for this area shows Lamoine Buxton clay-silt soils at this intersection with Scantic silts surrounding the stream to the west.

The National Wetland Inventory map of the area shows areas of wetlands on adjacent properties but not within the project limits. Portions of the Surficial Geology and NRCS maps are attached to this report.

Subsurface Investigation

The subsurface investigation for this project was conducted in June, 2011. Three borings and five probes were done, and two pavement cores were taken. Borings were extended to refusal. No FWD analysis was done because the existing pavement section will be widened with an overlay, but no reconstruction will be done.

Soils encountered in the borings for this project included a five to six foot thick layer of brown, damp dense fine to coarse sand. This was underlain by a four to five foot thick layer of olive, hard sandy silt or olive, dense silty sand.

Subsurface Bedrock

Bedrock outcrops are shown on the plans at the toe of slope on the north side of Route 1/9, from Station 14+50 to Station 19+20. Refusals were encountered in all borings and probes with a minimum depth to bedrock of 3.1 feet and a maximum depth of 9.0 feet below grade.



Groundwater

Standing water was not encountered in the borings, but the soils were described as wet at depths. NRCS mapping indicates shallow groundwater for this area, and groundwater can be expected to flow over the bedrock surface.

Sideslope Fills

Thin fills will be constructed on the north side of the highway. Benching will be needed to ensure that a slip plane is not created by this construction. All fill slopes are designed to be 2H:1V or flatter, with a loam and grassed surface, so with proper construction sideslopes should be stable as designed.

Bedrock Excavation

It appears from the contour plan that exposed bedrock will not extend into the ditchline to impede surface water flow in the area from 17+50 to 19+20, however the fill line extends to the edge of the outcrops. Small quantities of bedrock excavation may be required in areas where no explorations were done.

Attachments:

Location Map

MGS Surficial Geology

NRCS maps:

Soil Types

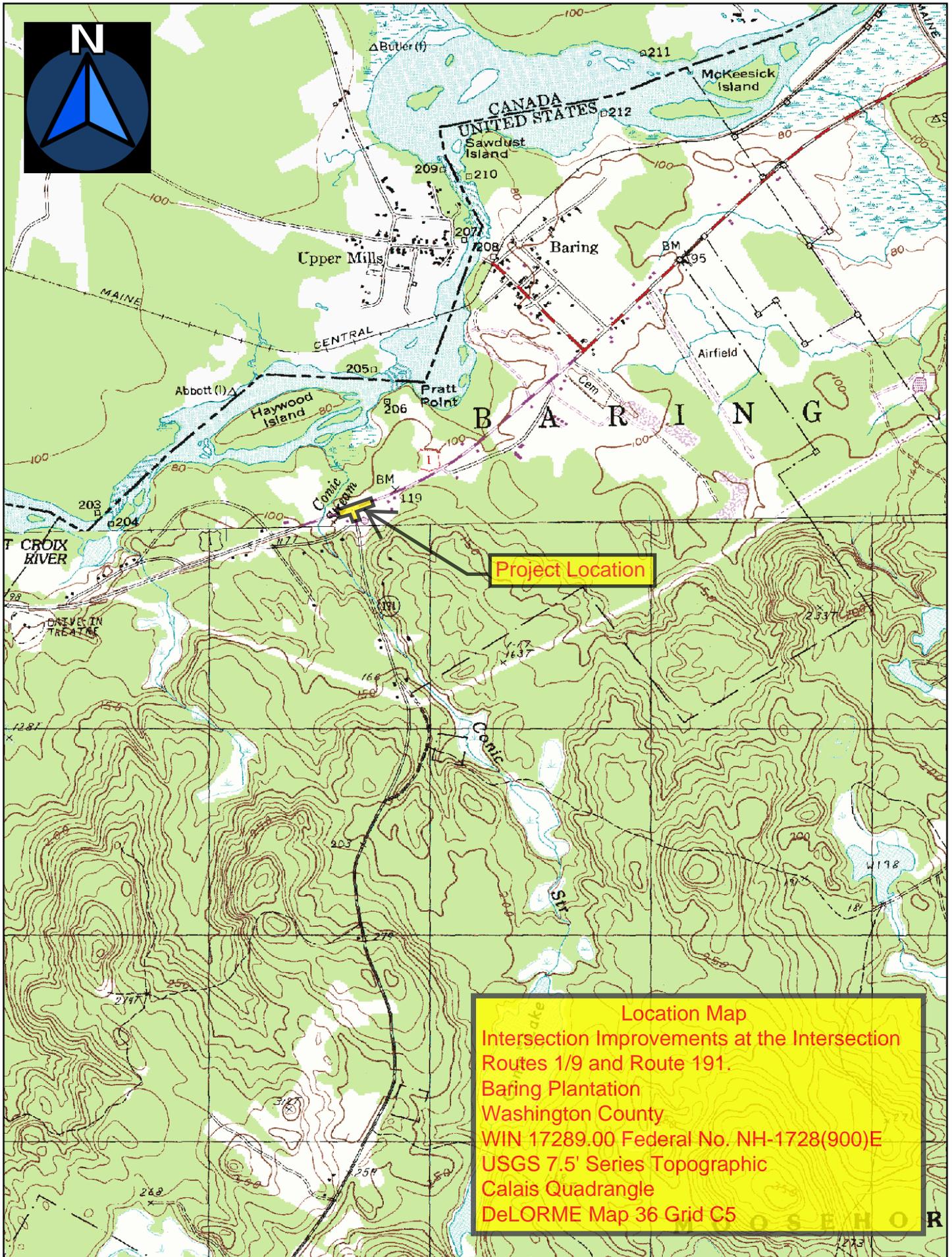
Depth to Water Table

Frost Action

Boring logs

Probe summary sheet

Geoplans

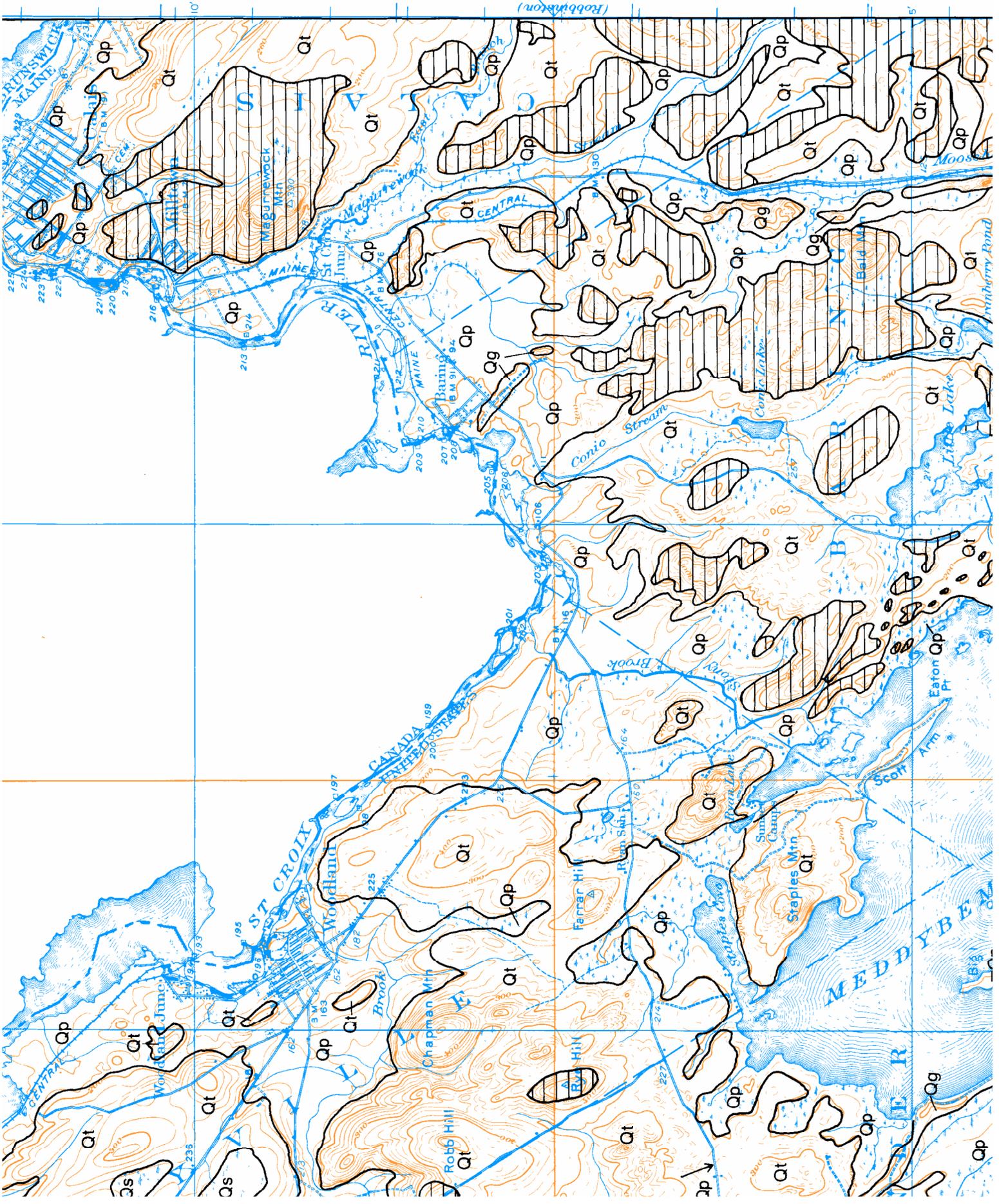


Project Location

Location Map
 Intersection Improvements at the Intersection
 Routes 1/9 and Route 191.
 Baring Plantation
 Washington County
 WIN 17289.00 Federal No. NH-1728(900)E
 USGS 7.5' Series Topographic
 Calais Quadrangle
 DeLORME Map 36 Grid C5

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.



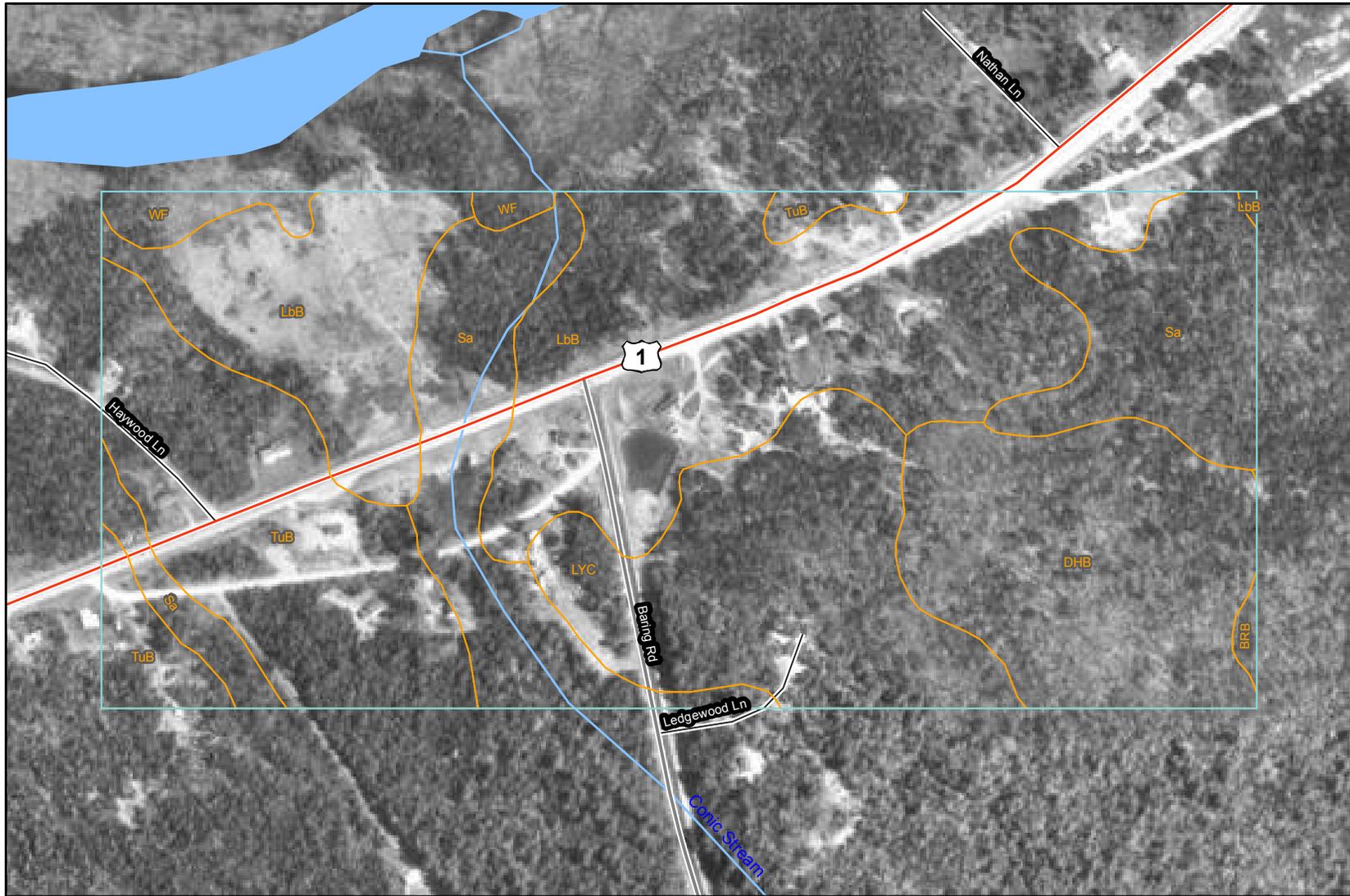
Soil Map—Washington County Area, Maine
(Baring, Rte 1/9 at Rte 191)

67° 19' 56"

67° 18' 58"

45° 7' 45"

45° 7' 44"



45° 7' 17"

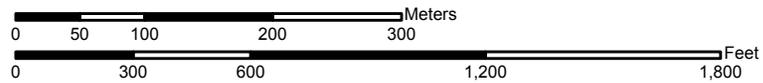
45° 7' 17"

67° 19' 57"

67° 18' 59"



Map Scale: 1:6,060 if printed on A size (8.5" x 11") sheet.



Soil Map—Washington County Area, Maine
(Baring, Rte 1/9 at Rte 191)

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot

-  Very Stony Spot
-  Wet Spot
-  Other

Special Line Features

-  Gully
-  Short Steep Slope
-  Other

Political Features

-  Cities

Water Features

-  Oceans
-  Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

MAP INFORMATION

Map Scale: 1:6,060 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

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: Washington County Area, Maine
Survey Area Data: Version 13, Oct 2, 2009

Date(s) aerial images were photographed: 5/15/1996

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 Unit Legend

Washington County Area, Maine (ME617)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BRB	Brayton-Colonel association, 0 to 8 percent slopes, very stony	0.4	0.3%
DHB	Dixfield-Colonel complex, 0 to 8 percent slopes, very stony	19.3	14.5%
LbB	Lamoine-Buxton complex, 0 to 8 percent slopes	44.5	33.4%
LYC	Lyman-Tunbridge-Abram complex, 3 to 15 percent slopes, very stony	19.5	14.7%
Sa	Scantic silt loam	24.8	18.6%
TuB	Tunbridge-Lyman complex, 3 to 8 percent slopes	22.3	16.7%
WF	Wonsqueak and Bucksport soils, frequently flooded	2.3	1.7%
Totals for Area of Interest		133.0	100.0%

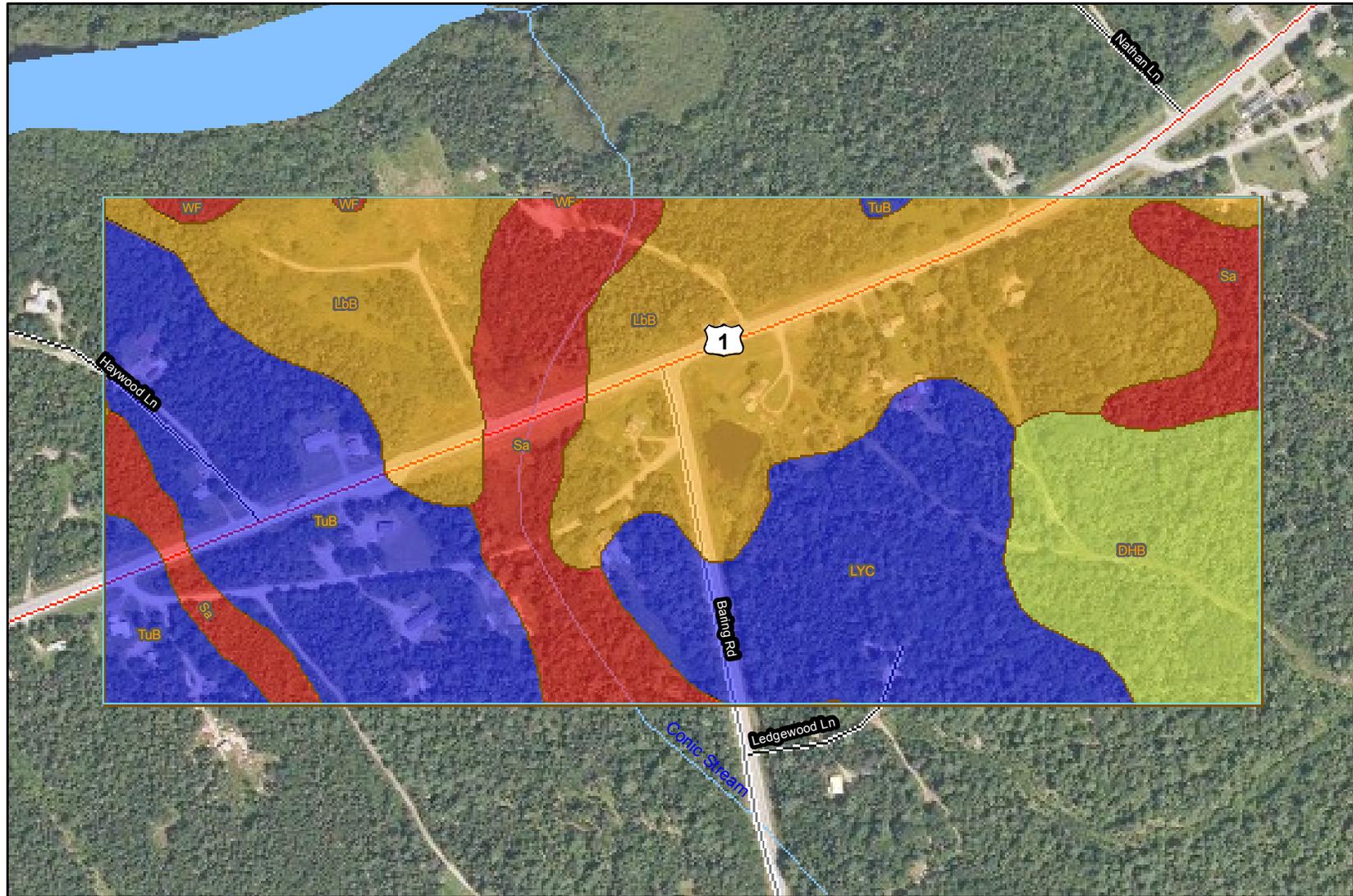
Depth to Water Table—Washington County Area, Maine

67° 19' 57"

67° 19' 4"

45° 7' 43"

45° 7' 43"



45° 7' 18"

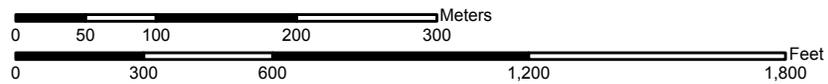
45° 7' 18"

67° 19' 58"

67° 19' 5"



Map Scale: 1:5,550 if printed on A size (8.5" x 11") sheet.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Soil Ratings

 0 - 25

 25 - 50

 50 - 100

 100 - 150

 150 - 200

 > 200

Political Features

 Cities

Water Features

 Oceans

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

MAP INFORMATION

Map Scale: 1:5,550 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

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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: Washington County Area, Maine
Survey Area Data: Version 13, Oct 2, 2009

Date(s) aerial images were photographed: Data not available.

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.

Depth to Water Table

Depth to Water Table— Summary by Map Unit — Washington County Area, Maine				
Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
DHB	Dixfield-Colonel complex, 0 to 8 percent slopes, very stony	58	11.9	10.9%
LbB	Lamoine-Buxton complex, 0 to 8 percent slopes	28	39.4	36.1%
LYC	Lyman-Tunbridge-Abram complex, 3 to 15 percent slopes, very stony	>200	18.4	16.8%
Sa	Scantic silt loam	15	16.8	15.4%
TuB	Tunbridge-Lyman complex, 3 to 8 percent slopes	>200	22.2	20.4%
WF	Wonsqueak and Bucksport soils, frequently flooded	8	0.4	0.4%
Totals for Area of Interest			109.2	100.0%

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

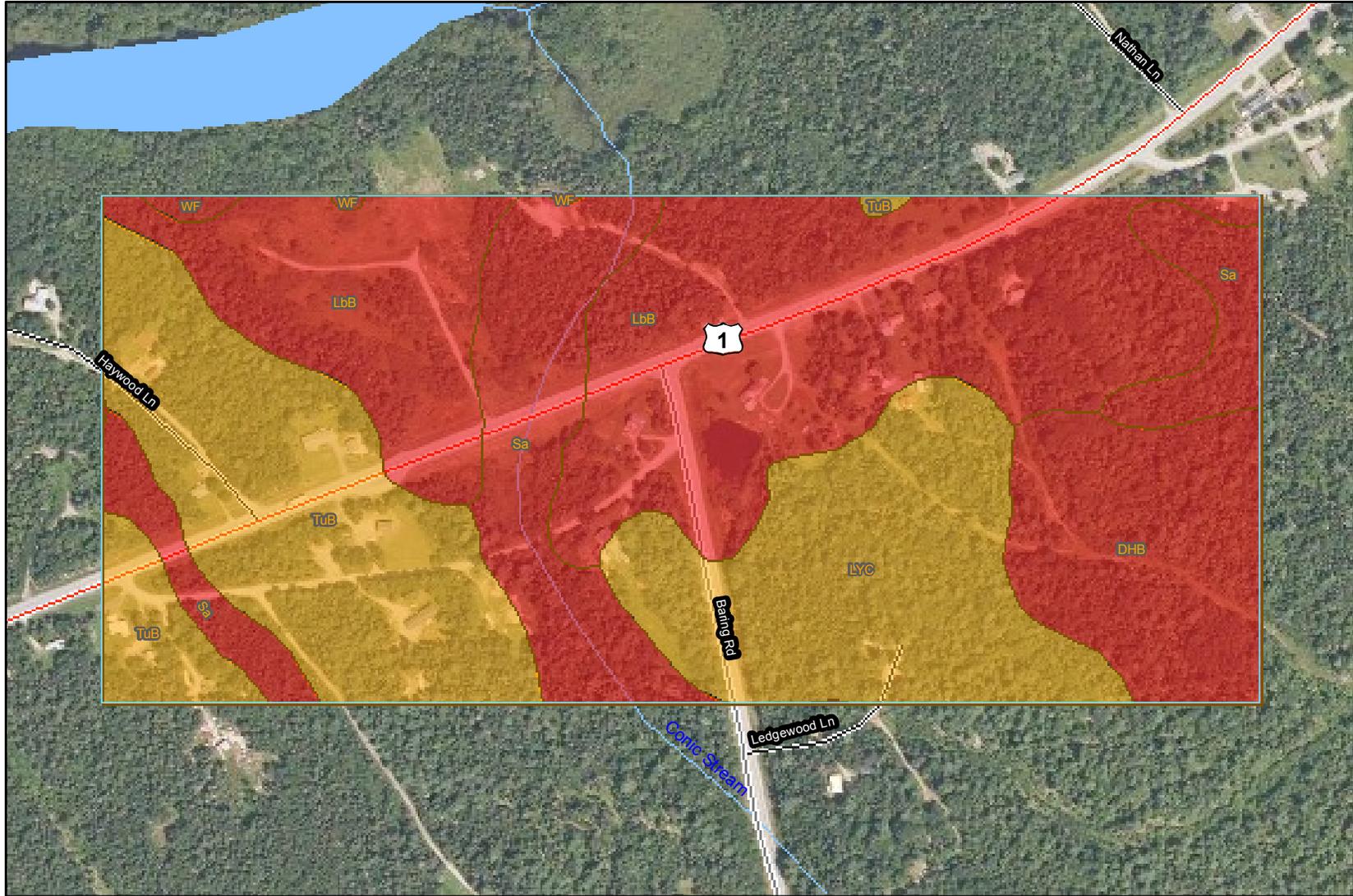
Ending Month: December

67° 19' 57"

67° 19' 4"

45° 7' 43"

45° 7' 43"



45° 7' 18"

45° 7' 18"

67° 19' 58"

67° 19' 5"



Map Scale: 1:5,550 if printed on A size (8.5" x 11") sheet.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Soil Ratings

 High

 Moderate

 Low

 None

 Not rated or not available

Political Features

 Cities

Water Features

 Oceans

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

MAP INFORMATION

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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: Washington County Area, Maine
Survey Area Data: Version 13, Oct 2, 2009

Date(s) aerial images were photographed: Data not available.

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.

Frost Action

Frost Action— Summary by Map Unit — Washington County Area, Maine				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DHB	Dixfield-Colonel complex, 0 to 8 percent slopes, very stony	High	11.9	10.9%
LbB	Lamoine-Buxton complex, 0 to 8 percent slopes	High	39.4	36.1%
LYC	Lyman-Tunbridge-Abram complex, 3 to 15 percent slopes, very stony	Moderate	18.4	16.8%
Sa	Scantic silt loam	High	16.8	15.4%
TuB	Tunbridge-Lyman complex, 3 to 8 percent slopes	Moderate	22.2	20.4%
WF	Wonsqueak and Bucksport soils, frequently flooded	High	0.4	0.4%
Totals for Area of Interest			109.2	100.0%

Description

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: Giguere/Giles/Daggett	Datum: NAVD88	Sampler: Standard Split Spoon
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: 140#/30"
Date Start/Finish: 6/16/11; 08:00-08:30	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 11+50, 30.0 ft Lt.	Casing ID/OD: N/A	Water Level*: None Observed

Hammer Efficiency Factor: 0.84 **Hammer Type:** Automatic Hydraulic Rope & Cathead
 Definitions: R = Rock Core Sample S_u = Insitu Field Vane Shear Strength (psf) S_{u(lab)} = Lab Vane Shear Strength (psf)
 D = Split Spoon Sample SSA = Solid Stem Auger T_v = Pocket Torvane Shear Strength (psf) WC = water content, percent
 MD = Unsuccessful Split Spoon Sample attempt HSA = Hollow Stem Auger q_p = Unconfined Compressive Strength (ksf) LL = Liquid Limit
 U = Thin Wall Tube Sample RC = Roller Cone N-uncorrected = Raw field SPT N-value PL = Plastic Limit
 MU = Unsuccessful Thin Wall Tube Sample attempt WOH = weight of 140lb. hammer Hammer Efficiency Factor = Annual Calibration Value PI = Plasticity Index
 V = Insitu Vane Shear Test, PP = Pocket Penetrometer WOR/C = weight of rods or casing N₆₀ = SPT N-uncorrected corrected for hammer efficiency G = Grain Size Analysis
 MV = Unsuccessful Insitu Vane Shear Test attempt WO1P = Weight of one person N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected C = Consolidation Test

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows					
0	1D	24/14	0.00 - 2.00	7/11/12/11	23	32	SSA			Brown, damp, medium dense, gravelly, fine to coarse SAND, little silt.		
5	2D	24/17	5.00 - 7.00	14/7/7/20	14	20			-5.50	Olive-brown, damp, medium dense, silty, fine to medium SAND, little gravel, (Till).		
									-8.50	Bottom of Exploration at 8.50 feet below ground surface. REFUSAL		
10												
15												
20												
25												

Remarks:

Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: Giguere/Giles/Daggett	Datum: NAVD88	Sampler: Standard Split Spoon
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: 140#/30"
Date Start/Finish: 6/16/11; 09:00-09:30	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 14+00, 8.5 ft Lt.	Casing ID/OD: N/A	Water Level*: None Observed

Hammer Efficiency Factor: 0.84 **Hammer Type:** Automatic Hydraulic Rope & Cathead

 Definitions: R = Rock Core Sample S_u = Insitu Field Vane Shear Strength (psf) S_{u(lab)} = Lab Vane Shear Strength (psf)
 D = Split Spoon Sample SSA = Solid Stem Auger T_v = Pocket Torvane Shear Strength (psf) WC = water content, percent
 MD = Unsuccessful Split Spoon Sample attempt HSA = Hollow Stem Auger q_p = Unconfined Compressive Strength (ksf)
 U = Thin Wall Tube Sample RC = Roller Cone N-uncorrected = Raw field SPT N-value
 MU = Unsuccessful Thin Wall Tube Sample attempt WOH = weight of 140lb. hammer Hammer Efficiency Factor = Annual Calibration Value
 V = Insitu Vane Shear Test, PP = Pocket Penetrometer WOR/C = weight of rods or casing N₆₀ = SPT N-uncorrected corrected for hammer efficiency
 MV = Unsuccessful Insitu Vane Shear Test attempt WO1P = Weight of one person N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected
 LL = Liquid Limit PL = Plasticity Index G = Grain Size Analysis C = Consolidation Test

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows					
0	PC-1								-0.58	7" PAVEMENT, core taken.		
	1D	24/20	1.00 - 3.00	22/23/23/28	46	64				Brown, damp, dense, fine to coarse SAND, some gravel, trace silt.		
5	2D/A	24/22	5.00 - 7.00	8/10/16/26	26	36			-6.00	2D (5.0-6.0 ft bgs). 2D/A (6.0-7.0 ft bgs) Olive, damp, hard, sandy SILT, trace gravel, (Till).		
10	3D	18/16	10.00 - 11.50	5/13/50	63	88			-11.50	Similar to above, except wet.		
										Bottom of Exploration at 11.50 feet below ground surface. SPOON REFUSAL		
15												
20												
25												

Remarks:

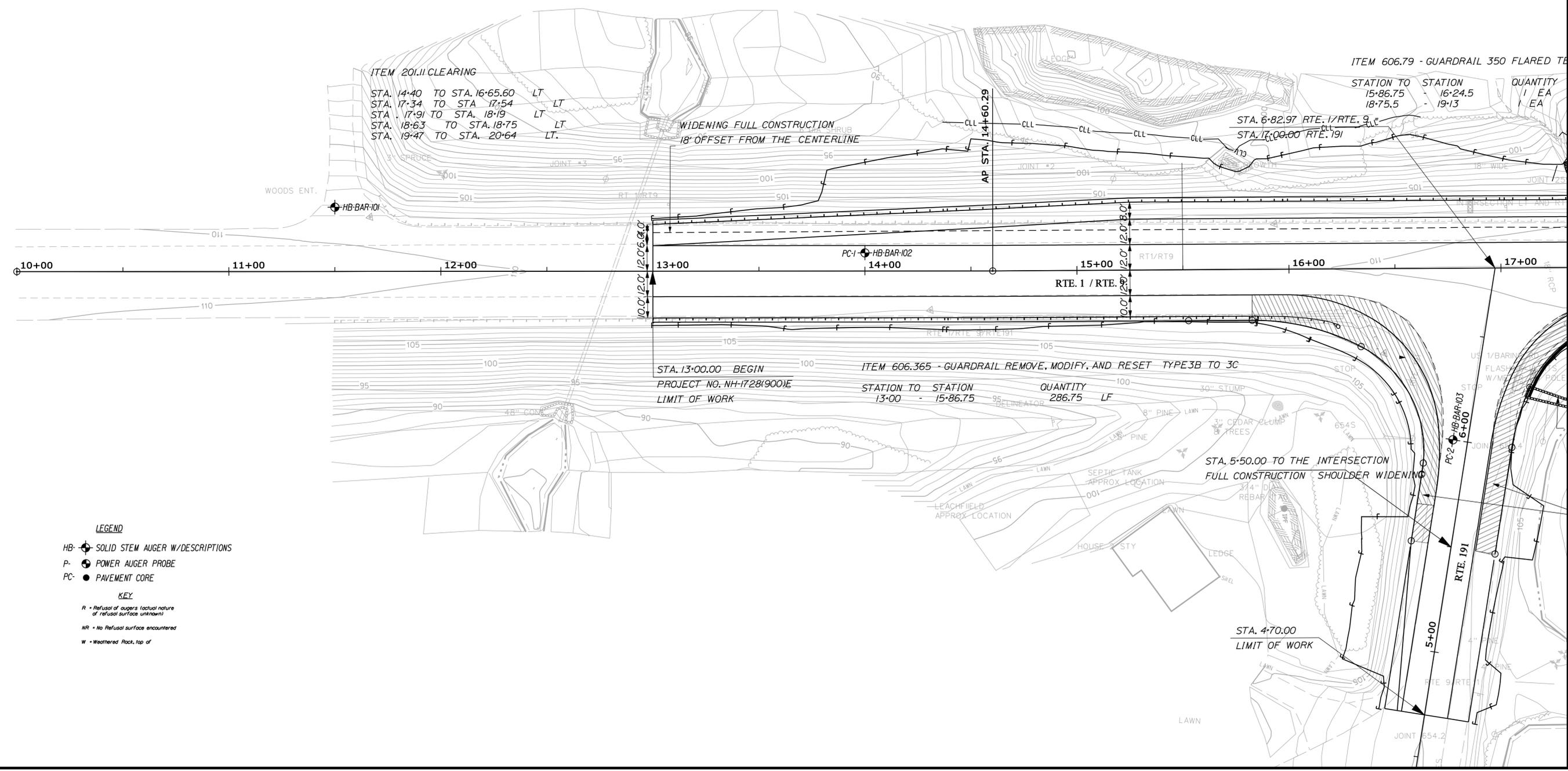
Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: Giguere/Giles/Daggett	Datum: NAVD88	Sampler: Standard Split Spoon
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: 140#/30"
Date Start/Finish: 6/16/11; 08:30-09:00	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 6+00, 7.0 ft Lt.	Casing ID/OD: N/A	Water Level*: None Observed

Hammer Efficiency Factor: 0.84 Hammer Type: Automatic Hydraulic Rope & Cathead

Definitions:
D = Split Spoon Sample R = Rock Core Sample S_u = In situ Field Vane Shear Strength (psf) S_{u(lab)} = Lab Vane Shear Strength (psf)
MD = Unsuccessful Split Spoon Sample attempt SSA = Solid Stem Auger T_v = Pocket Torvane Shear Strength (psf) WC = water content, percent
U = Thin Wall Tube Sample HSA = Hollow Stem Auger q_p = Unconfined Compressive Strength (ksf) LL = Liquid Limit
MU = Unsuccessful Thin Wall Tube Sample attempt RC = Roller Cone N-uncorrected = Raw field SPT N-value PL = Plastic Limit
V = In situ Vane Shear Test, PP = Pocket Penetrometer WOH = weight of 140lb. hammer Hammer Efficiency Factor = Annual Calibration Value PI = Plasticity Index
MV = Unsuccessful Insitu Vane Shear Test attempt WOR/C = weight of rods or casing N₆₀ = SPT N-uncorrected corrected for hammer efficiency G = Grain Size Analysis
WO1P = Weight of one person N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected C = Consolidation Test

Depth (ft.)	Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing	Blows				
0	PC-2							SSA	-0.58		7" PAVEMENT, core taken.	
	1D	24/20	1.00 - 3.00	7/27/23/23	50	70					Brown, damp, dense, gravelly, fine to coarse SAND, trace silt.	
5									-5.30		Olive-brown, damp, dense, silty, fine to coarse SAND, little gravel, (Till).	
	2D	24/18	5.00 - 7.00	8/15/23/17	38	53						
10									-9.90		Bottom of Exploration at 9.90 feet below ground surface. REFUSAL	
15												
20												
25												

Remarks:



- LEGEND**
- HB-⊕ SOLID STEM AUGER W/DESCRIPTIONS
 - P-⊕ POWER AUGER PROBE
 - PC-● PAVEMENT CORE
- KEY**
- R = Refusal of auger's tactical nature of refusal surface unknown
 - NR = No Refusal surface encountered
 - W = Weathered Rock, top of

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
NH-1728(900)E
PIN 17285.00
HIGHWAY PLANS

DATE	BY	SIGNATURE	P.E. NUMBER	DATE
JUN 2011	T. WHITE			
	K. BRESKIN			

BARING
ROUTES 1/9 & 191
GEOPLANS

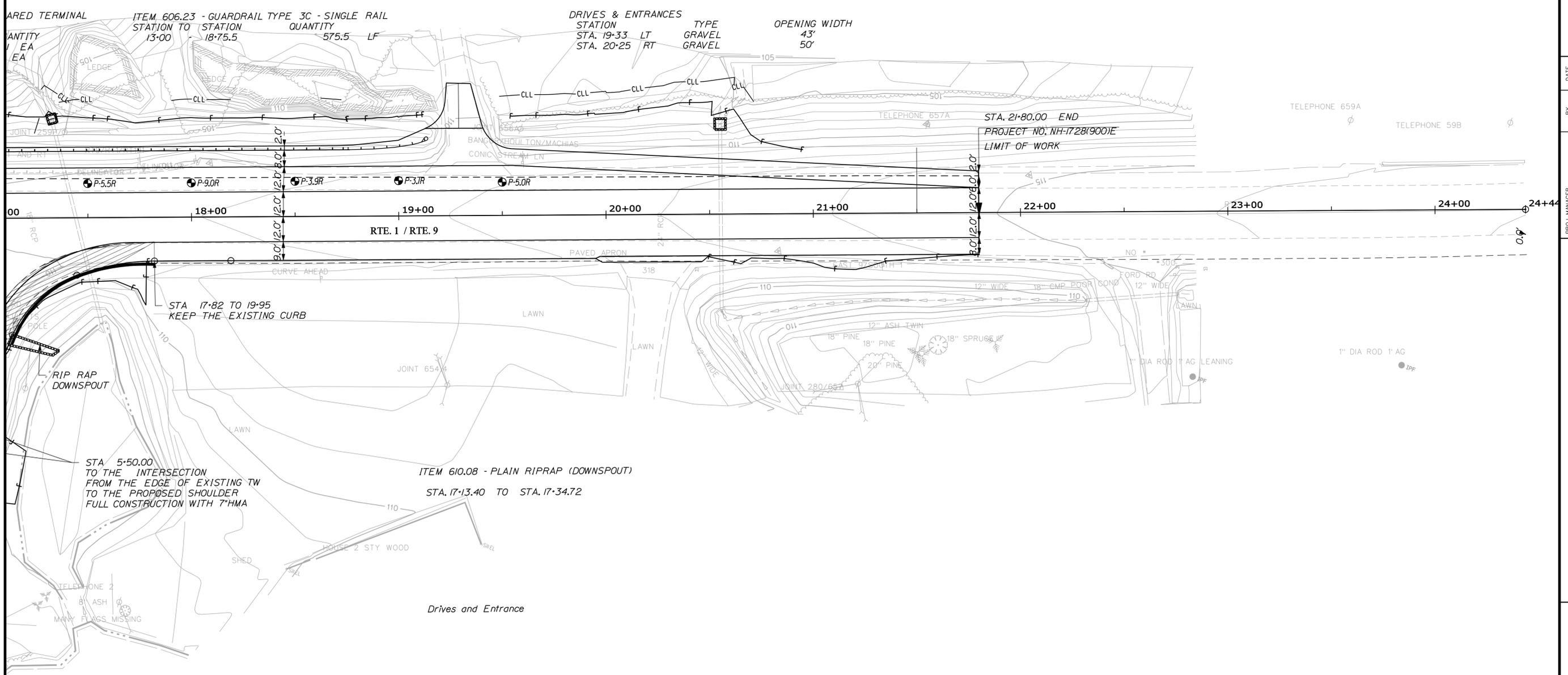
SHEET NUMBER
1
OF 4

Date: 10/18/2011

Username: terry.white

Division: GEOTECH

Filename: ... \geotech\msta\002_Geoplan2.dgn



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
NH-1728(900)E
PIN 17285.00
HIGHWAY PLANS

PROJ. MANAGER	BY	DATE	SIGNATURE
K. BRESKIN	T. WHITE	JUN 2011	
CHECKED/REVIEWED			
DESIGNED/DET AILED			
DESIGNED/DET AILED			
REVISIONS 1			
REVISIONS 2			
REVISIONS 3			
REVISIONS 4			
FIELD CHANGES			

BARING
ROUTES 1/9 & 191
GEOPLANS

SHEET NUMBER
2
OF 4

