Maine Department of Transportation
Highway Program
Geotechnical Group

Report of

SUBSURFACE INVESTIGATION FOR HIGHWAY IMPROVEMENTS ON MAIN STREET IN THE CITY OF LEWISTON, ANDROSCOGGIN COUNTY

Prepared by

Kitty Breskin, P.E.
Geotechnical Design Engineer

Androscoggin County PIN 13060.00 Soils Report 2012-114
Federal AC-STP-1306(000)X
February 22, 2012

MaineDOT Highway Program

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

Memorandum

To: Paul MacDonald, Project Manager
cc: Matt Swindells, Designer
From: Kitty Breskin, P.E.
Date: March 28, 2011
Subject: Lewiston, PIN 13060.00

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Project Information:

Project Overview

Maine DOT proposes improvements to Route 202 (Main Street) in the City of Lewiston. The project begins at the Pettengill Road and extends northerly 0.28 miles to Bearce Street. This road is classified as a Minor Arterial and it is not on the NHS. The existing roadway core will be preserved. The scope for this project includes widening the existing section to extend the southbound right turn lane for Libby Avenue and the Veterans' Memorial Bridge, and an overlay of the roadway. This report describes existing conditions for this project.

General Site Conditions

This area is fully developed urban land with a mix of residential and business properties. The existing highway has one northbound through lane and a northbound left turn lane at Strawberry Avenue, and one southbound through lane with a southbound right turn lane beginning approximately 250 feet north of Libby Avenue. This roadway is curbed and has an underdrain system.

Mapped Data

The Maine Geologic Survey Surficial Geology map for the Lewiston Quadrangle shows two soils types along this job. The native soils in this area include marine regressive sand deposits described as "Sand, silt, and minor gravel. . . as much as 3m (10 ft) thick." The other soil unit shown is artificial fill crossing the roadway in the area of Jepson Brook, which flows under the highway through a large culvert immediately south of Libby Avenue.

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 Adams loamy sand soils extending north to approximately Station 13+50 with Hartland fine sandy loam from 13+50 to the end of the project. Scantic silt loam is shown as the native soils surrounding Jepson Brook near Libby Avenue.

Subsurface Investigation

The purpose of the subsurface investigation was to determine how the existing highway was built, and the current thickness of the Hot Mix Asphalt pavement and gravel. The preliminary subsurface investigation for this project was conducted in February, 2007 and included two borings through the roadway and three pavement cores. Five additional cores were taken in December 2009. FWD testing and analysis was not done for this project because the scope is

to match the existing section, and underground utility trenches can introduce uncertainty into interpretation of FWD data. All borings are shown on the attached Geoplans.

Pavement

The existing pavement is in fair to poor condition. As-built plans are not available for this section of highway, but a nearby section north of this project was built in 1947 with 18" gravel subbase, 6" of stone base and 2" bituminous concrete surface. That section appears to be similar to the original conditions on the current project. This roadway has been overlaid a number of times; most recently an overlay project in 1999 extended from south of the bridge to Station 5+00, and in 1998 a project from Station 5+00 north reset curb, improve sidewalks and overlay. Eight pavement cores were taken for this project. The existing HMA encountered in our borings and cores is 5" to 9" thick. Photographs of pavement cores are attached to this memo.

Native soils were encountered at depths of 2.2 feet and 3 feet. The subbase soils are described as damp fine to medium sand with some gravel and small amounts of silt. No bedrock or groundwater was encountered in our borings. These soils do not meet MDOT Standard Specification 703.06, Aggregate for Base and Subbase. Native soils are olive, wet clay-silts of the Presumpscot Formation.

Recommendations:

Retaining Walls

Small, low retaining walls will be needed to minimize Right of Way impacts to abutting properties. A wet-cast landscape block wall system should be used to provide an appropriate appearance in this developed, urban area. Although the walls are low, reinforcement will be required to meet the manufacturer's recommendations for any wall higher than 2.5 feet; this height includes a minimum embedment of 1 foot. The maximum embedded wall height for this project is 4.5 feet. Native soils are olive, silty Clay, and may be wet. Factored bearing resistance of 3.3 ksf should be used in the design of all retaining walls on this project.

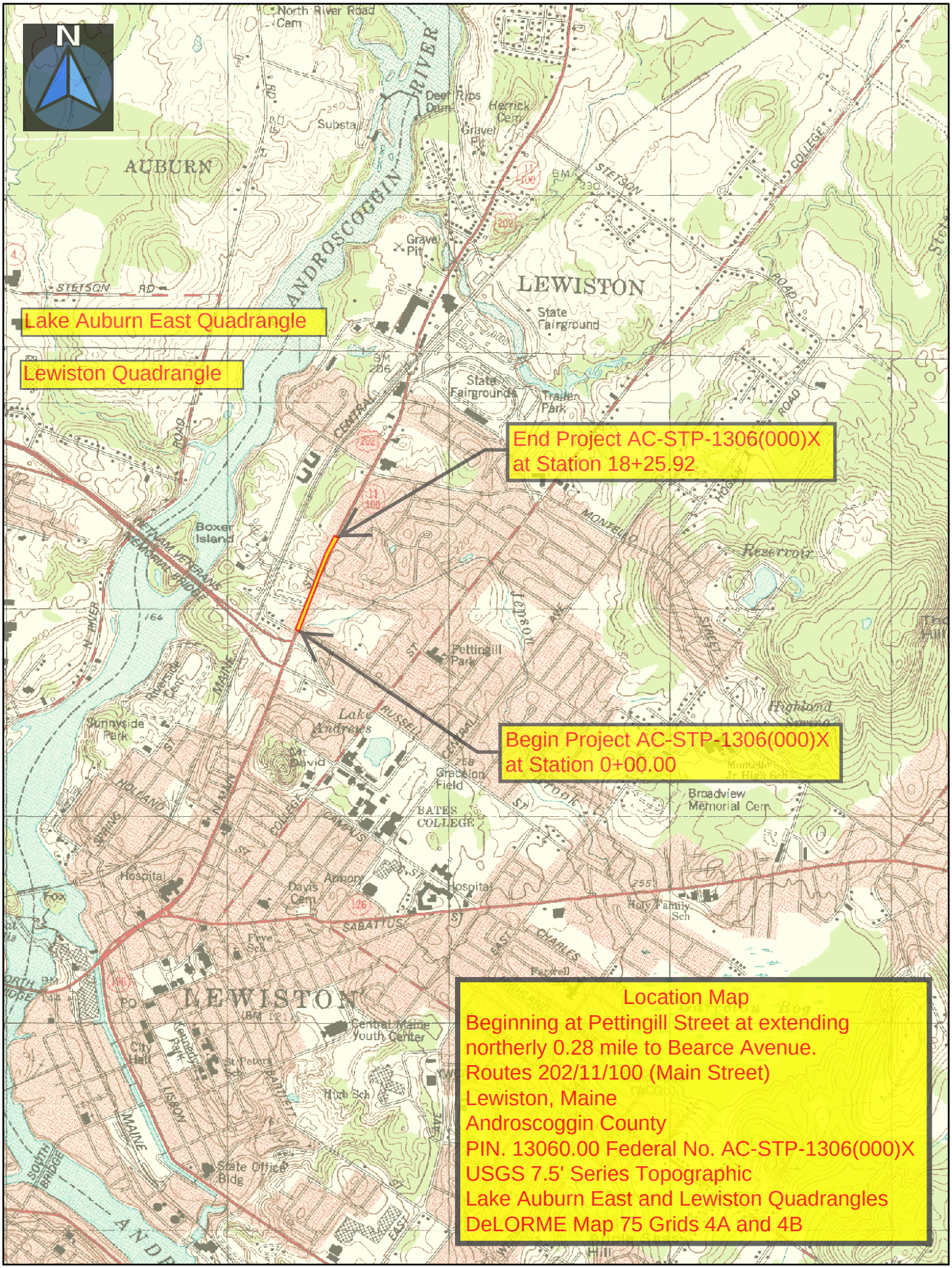
No loadings will be required in design of the walls at Stations 7+50 abd 8+00. A retaining wall will support the sidewalk and roadway at the corner of Strawberry Avenue. This wall should be treated as a retaining wall rather than a landscape wall, and a geotechnical design will be required. It may be necessary to include traffic loadings in design of the wall due to the proximity of right turning traffic to the back of the wall.

Frost Depth

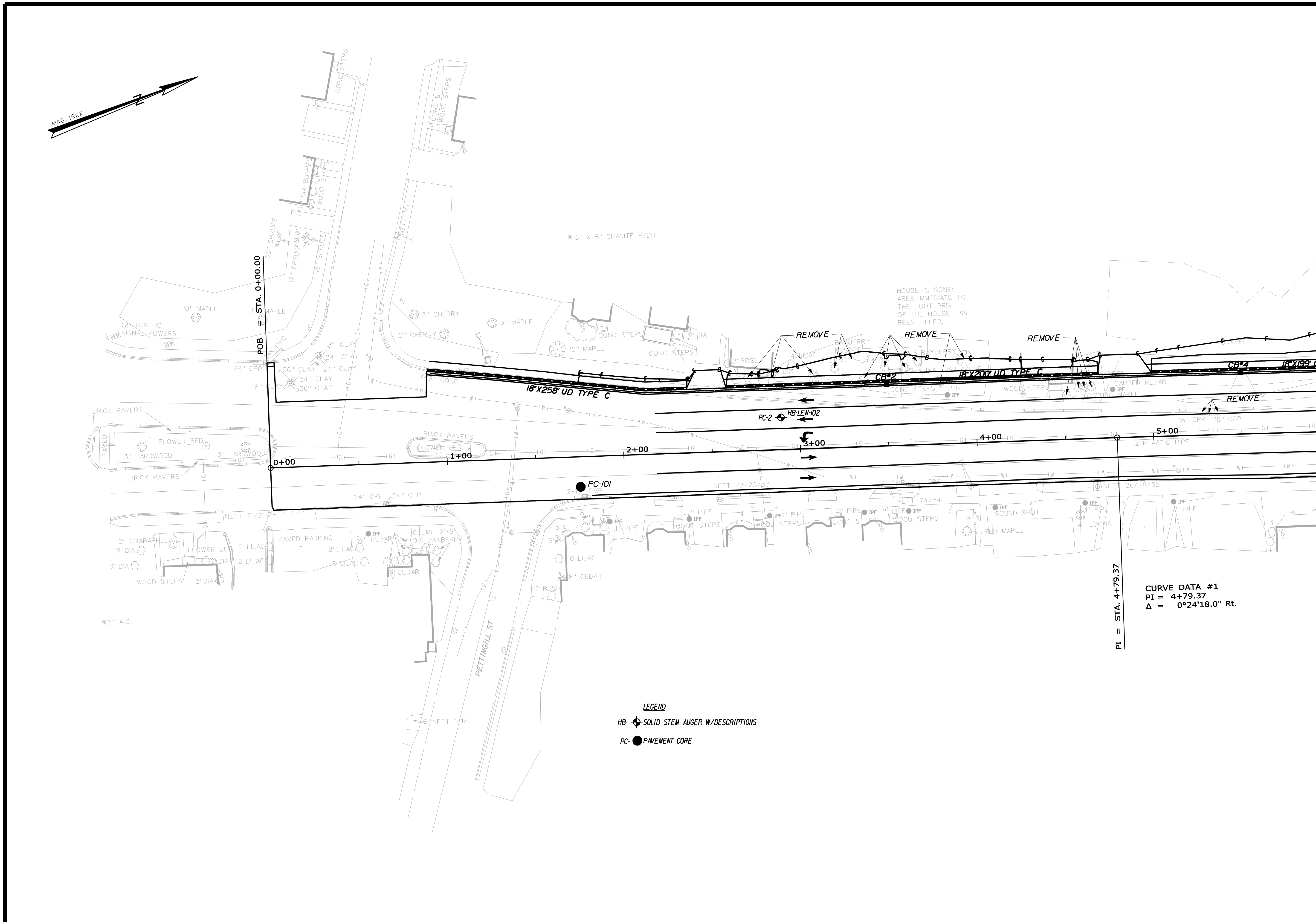
The design freezing index in Lewiston is 1400. The subgrade soils are frost susceptible, and the design depth of frost under snow-free pavement for these conditions is 46 inches. Any new drainage system should be deep enough to drain any groundwater or infiltrated surface water to below this depth to protect soils in the pavement structure.

Attachments:

- Site Location Map
- Geoplans
- Surficial Geology Map
- NRCS map
- Boring logs
- Lab testing summary sheet
- Grain Size curve
- Pavement core summary sheet
- Pavement core photographs



Map Scale 1:24000



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

AC-STP-1306(000)X

PIN 13060.00

HIGHWAY PLANS

	BY	DATE
PROJ. MANAGER		
DESIGN-DETAILED	K.BRESKIN	DEC 2009
CHECKED-REVIEWED	T.WHITE	
DESIGN2-DETAILED2		
DESIGN3-DETAILED3		
REVISIONS 1		
REVISIONS 2		
REVISIONS 3		
REVISIONS 4		
FIELD CHANGES		

SIGNATURE

P.E. NUMBER

DATE

LEWISTON
MAIN STREET

GEOPLANS

SHEET NUMBER

1

OF 3

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

AC-STP-1306(000)X

PIN
13060.00

HIGHWAY PLANS

MAG. 19XX

CURVE DATA #1
PI = 0+37.89
Δ = 2°55'41.7" Lt.

CURVE DATA #2
PI = 8+35.33
Δ = 0°22'22.5" Lt.

PI = STA. 8+35.33

POE = STA. 0+92.54

POB = STA. 0+00.00

STA. 10+53.91 MAIN ST. =
STA. 0+00.00 STRAWBERRY AVE.

PC = STA. 10+93.66

CURVE DATA #1
PI = 4+79.37
Δ = 0°24'18.0" Rt.

CURVE DA
PI = 12+
D = 1°
Δ = 6°
R = 3200
L = 350.
T = 175.
E = 4.79

PROJ. MANAGER	----------	----------
DESIGN-DETAILED	K.BRESKIN	DEC 2009
CHECKED-REVIEWED	-----	-----
DESIGN2-DETAILED2	----------	----------
DESIGN3-DETAILED3	----------	----------
REVISIONS 1	----------	----------
REVISIONS 2	----------	----------
REVISIONS 3	----------	----------
REVISIONS 4	----------	----------
FIELD CHANGES	----------	----------

BY | DATE

SIGNATURE

P.E. NUMBER

DATE

LEWISTON
MAIN STREET

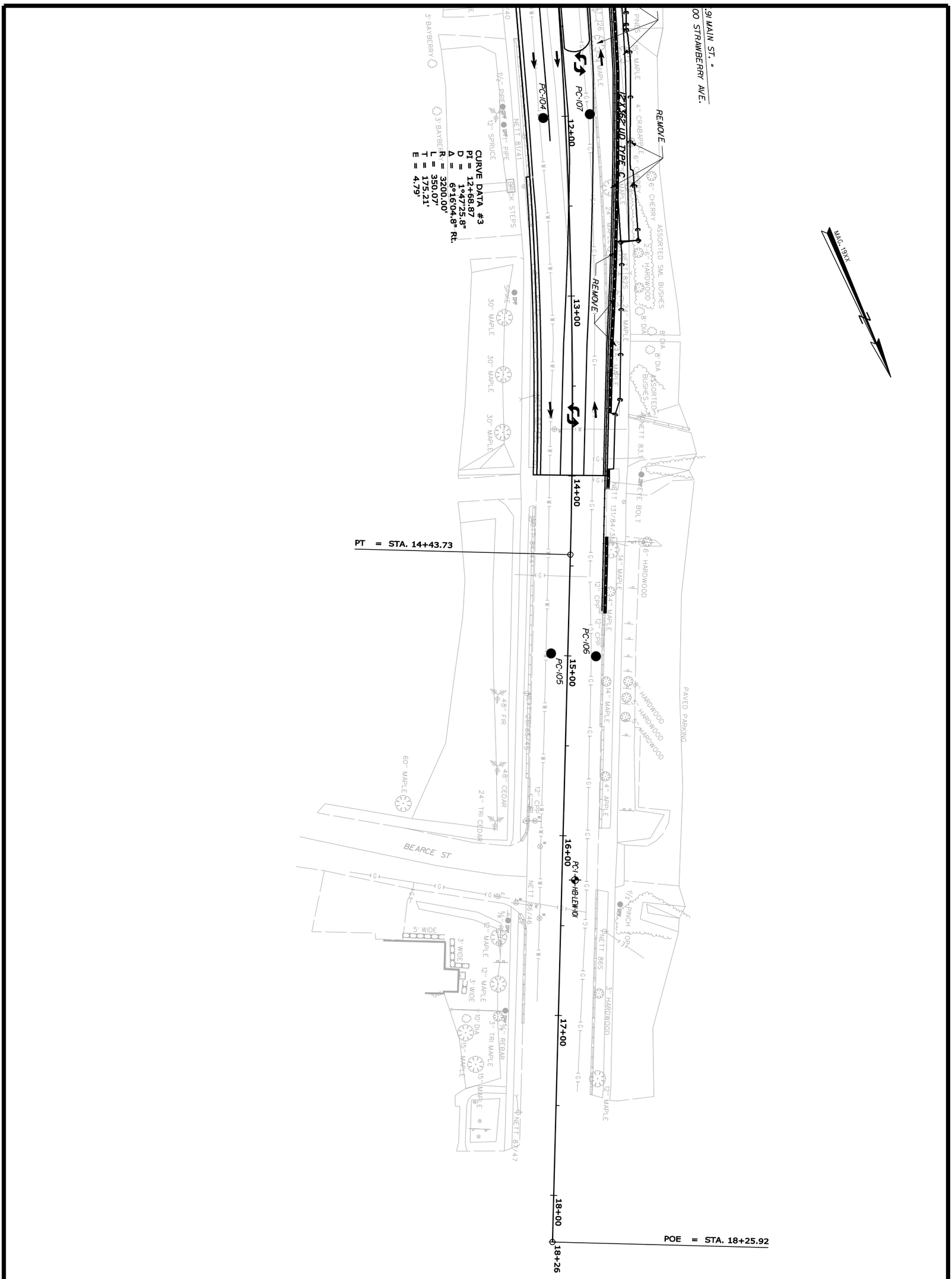
GEOPLANS

SHEET NUMBER

2

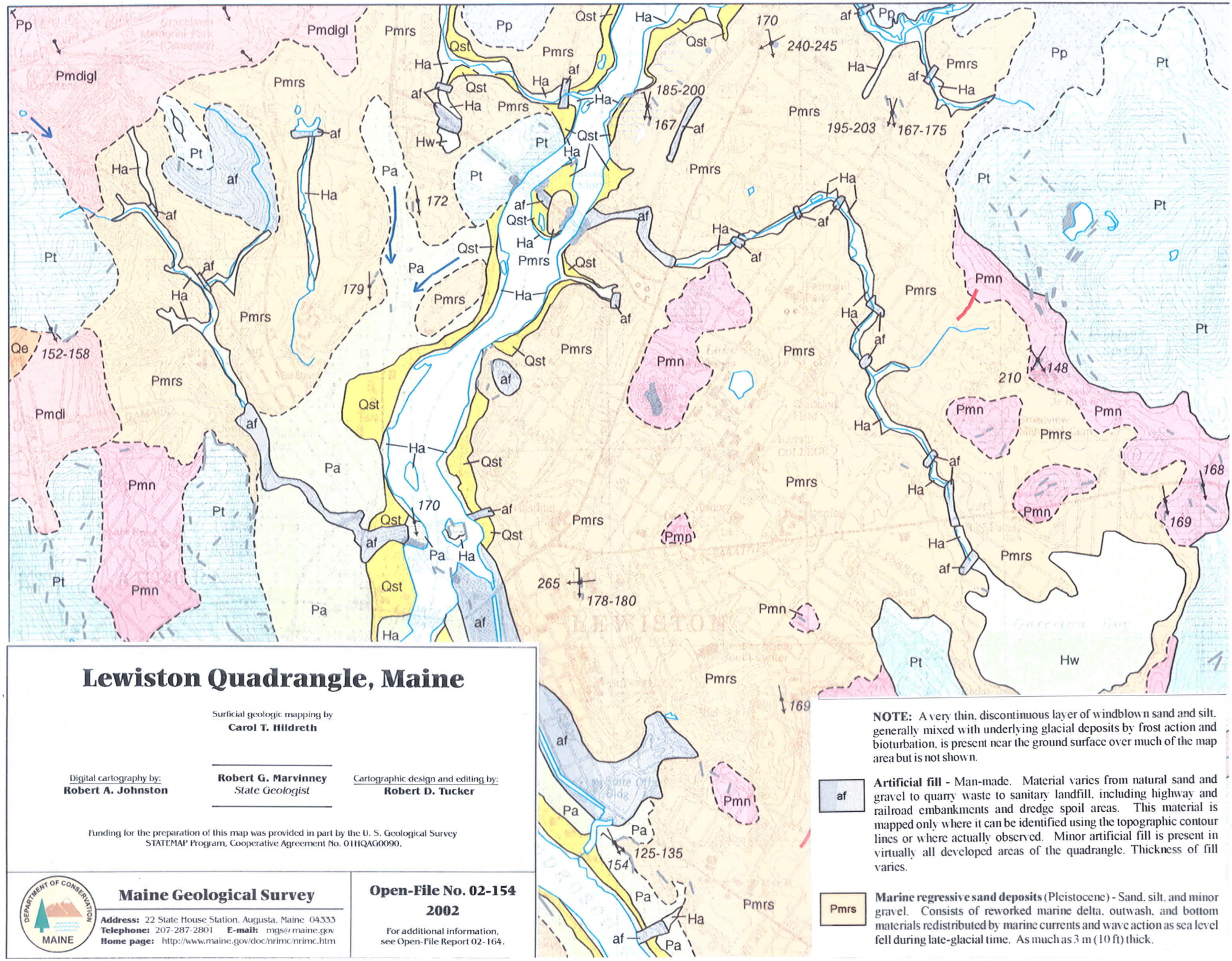
OF 3

Filename: ...\geotech\mst0\002_Geoplan2.dgn Division: GEOTECH Username: terry.white Date:4/12/2011



SHEET NUMBER 3 OF 3	LEWISTON MAIN STREET	PROJ. MANAGER	BY / DATE
	GEOPLANS	DESIGN-DETAILED: K.BRESKIN	T.WHITE / DEC 2009
		CHECKED-REVIEWED	SIGNATURE
		DESIGN2-DETAILED2	
		DESIGN3-DETAILED3	P.E. NUMBER
		REVISIONS 1	
		REVISIONS 2	DATE
		REVISIONS 3	
		REVISIONS 4	
		FIELD CHANGES	

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
AC-STP-1306(000)X
PIN 13060.00 HIGHWAY PLANS



Lewiston Quadrangle, Maine

Surficial geologic mapping by
Carol T. Hildreth

Digital cartography by:
Robert A. Johnston

Robert G. Marvinney
State Geologist

Cartographic design and editing by:
Robert D. Tucker

Funding for the preparation of this map was provided in part by the U. S. Geological Survey STATEMAP Program, Cooperative Agreement No. 01HQAG0090.

Maine Geological Survey

Address: 22 State House Station, Augusta, Maine 04333
Telephone: 207-287-2801 **E-mail:** mgs@maine.gov
Home page: http://www.maine.gov/doc/nrimc/nrimc.htm

Open-File No. 02-154
2002

For additional information, see Open-File Report 02-164.

NOTE: A very thin, discontinuous layer of windblown sand and silt, generally mixed with underlying glacial deposits by frost action and bioturbation, is present near the ground surface over much of the map area but is not shown.

af — **Artificial fill** - Man-made. Material varies from natural sand and gravel to quarry waste to sanitary landfill, including highway and railroad embankments and dredge spoil areas. This material is mapped only where it can be identified using the topographic contour lines or where actually observed. Minor artificial fill is present in virtually all developed areas of the quadrangle. Thickness of fill varies.

Pmrs — **Marine regressive sand deposits** (Pleistocene) - Sand, silt, and minor gravel. Consists of reworked marine delta, outwash, and bottom materials redistributed by marine currents and wave action as sea level fell during late-glacial time. As much as 3 m (10 ft) thick.

Soil Map—Androscoggin and Sagadahoc Counties, Maine
(Main Street, PIN 13060)

70° 12' 39"
70° 12' 11"
44° 7' 7"
44° 7' 7"

44° 6' 40"
44° 6' 40"

70° 12' 38"
70° 12' 10"

Map Scale: 1:3,950 if printed on A size (8.5" x 11") sheet.

N

Meters
0 35 70 140 210

Feet
0 150 300 600 900

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: 1:3,950 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

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: Androscoggin and Sagadahoc Counties, Maine
Survey Area Data: Version 13, Jul 27, 2009

Date(s) aerial images were photographed: 4/29/1998

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

Androscoggin and Sagadahoc Counties, Maine (ME606)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AaB	Adams loamy sand, 0 to 8 percent slopes	20.1	30.2%
BgB	Belgrade very fine sandy loam, 2 to 8 percent slopes	1.3	2.0%
HfB	Hartland very fine sandy loam, 2 to 8 percent slopes	29.3	44.2%
HkC	Hinckley gravelly sandy loam, 8 to 15 percent slopes	0.4	0.6%
HrB	Hollis fine sandy loam, 0 to 8 percent slopes	2.1	3.1%
NgB	Ninigret fine sandy loam, 0 to 8 percent slopes	5.7	8.6%
ScA	Scantic silt loam, 0 to 3 percent slopes	7.5	11.3%
Totals for Area of Interest		**66.4**	**100.0%**

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Routes 202,11,100 (Main Street)

Location: Lewiston, Maine

Boring No.: HB-LEW-101

PIN: 13060.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	E. Giguere	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	2/28/07; 09:00-09:30	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	16+24.5, 7.3' 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

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		0.70 - 3.00			SSA	-0.70		PAVEMENT. Core taken (PC-1)	
									Brown, damp, fine to medium SAND, some silt.	
							-3.00			
	S2		3.00 - 5.00						Olive, wet, clayey-SILT, trace fine sand.	
5							-5.00			
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Boring location opposite lane in West Lane.

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: Routes 202,11,100 (Main Street)

Location: Lewiston, Maine

Boring No.: HB-LEW-102

PIN: 13060.00

Driller:	MaineDOT	**Elevation (ft.)**		**Auger ID/OD:**	5" Dia.
Operator:	E. Giguere	**Datum:**	NAVD 88	**Sampler:**	Off Flights
Logged By:	B. Wilder	**Rig Type:**	CME 45C	**Hammer Wt./Fall:**	N/A
Date Start/Finish:	2/28/07; 09:30-10:00	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	2+89.6, 18.2' 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

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		0.70 - 2.20			SSA	-0.70		PAVEMENT. Core taken (PC-2) 0.70	
									Brown, damp, fine to medium SAND, little silt.	G#176409 A-1-b, SM WC=3.1%
	S4		2.20 - 5.00				-2.20		2.20 Olive, wet, silty-CLAY.	
5							-5.00		5.00 **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Boring location 150' North of Pettingill Lane in West Lane.

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

Laboratory Testing Summary Sheet

Town(s): Lewiston — Project Number: 13060.00

Boring & Sample Identification Number	Station (Feet)	Offset (Feet)	Depth (Feet)	Reference Number	G.S.D.C. Sheet	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
HB-LEW-102, S3	2+89.6	18.2 Lt.	0.70-2.2	176409	1	3.1			SM	A-1-b	II

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)

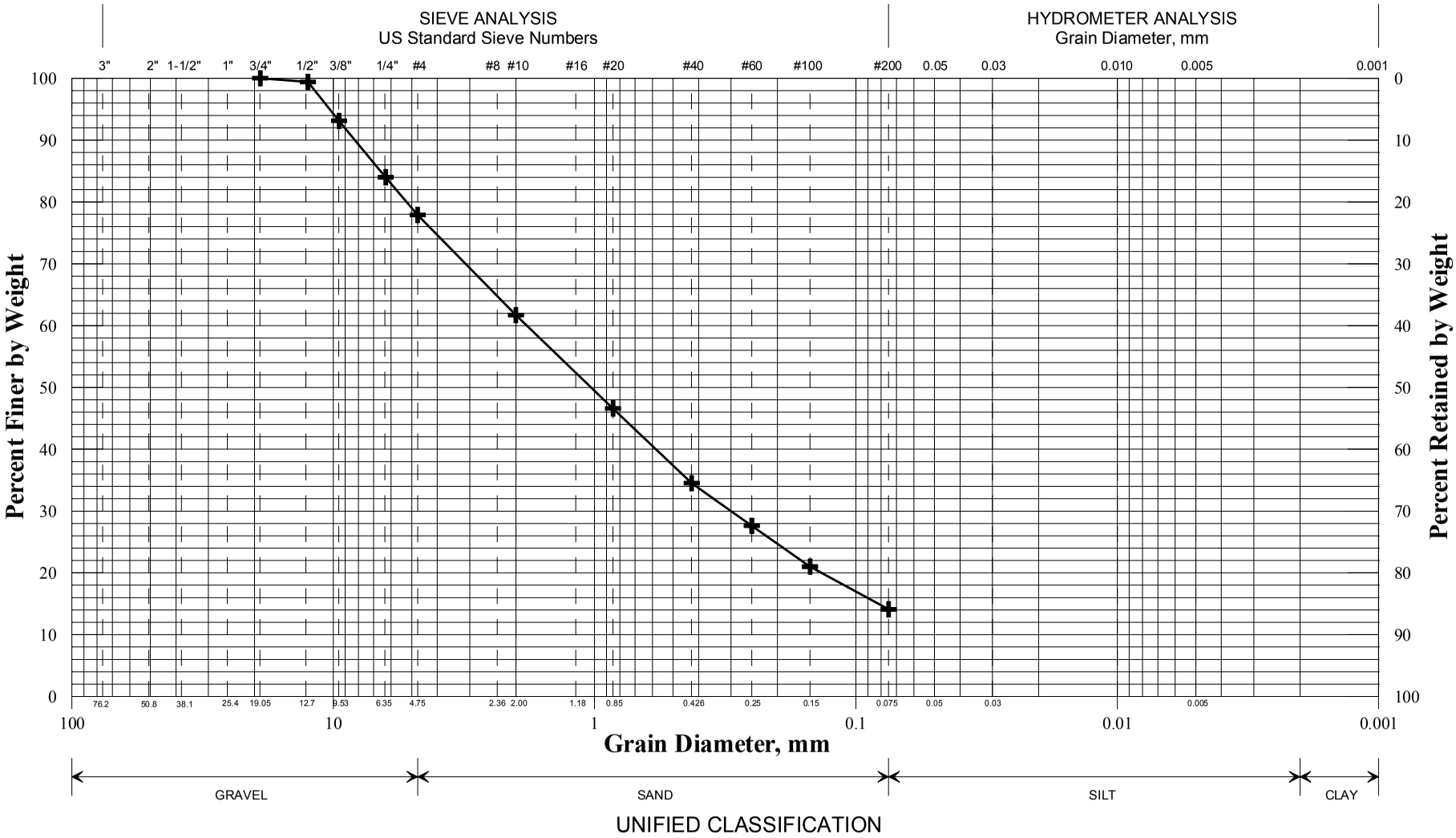
WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

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-LEW-102/S3	2+89.6	18.2 LT	0.70-2.2	SAND, some gravel, little silt.	3.1			
◆									
■									
●									
▲									
✕									

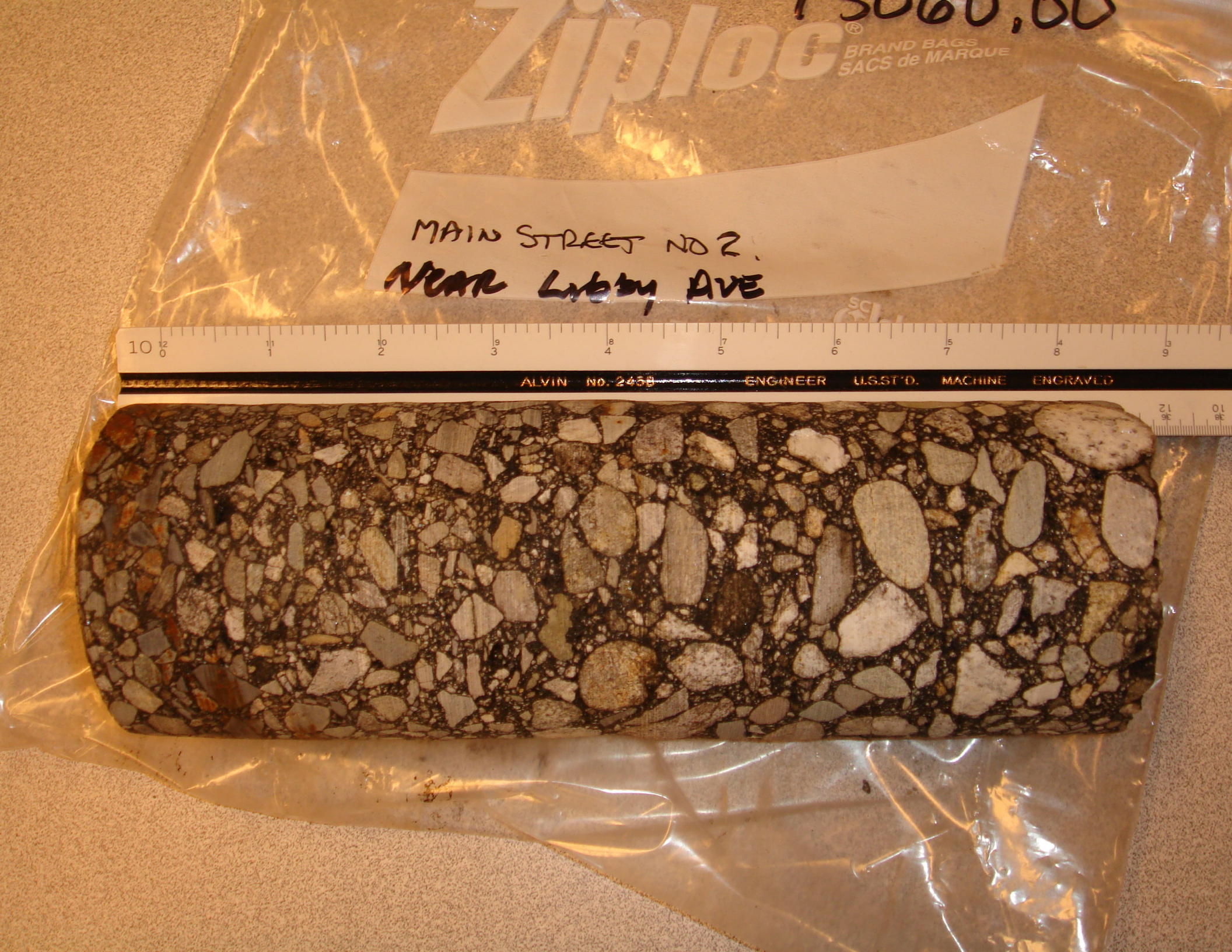
PIN
013060.00
Town
Lewiston
Reported by/Date
WHITE, TERRY A 4/9/2007

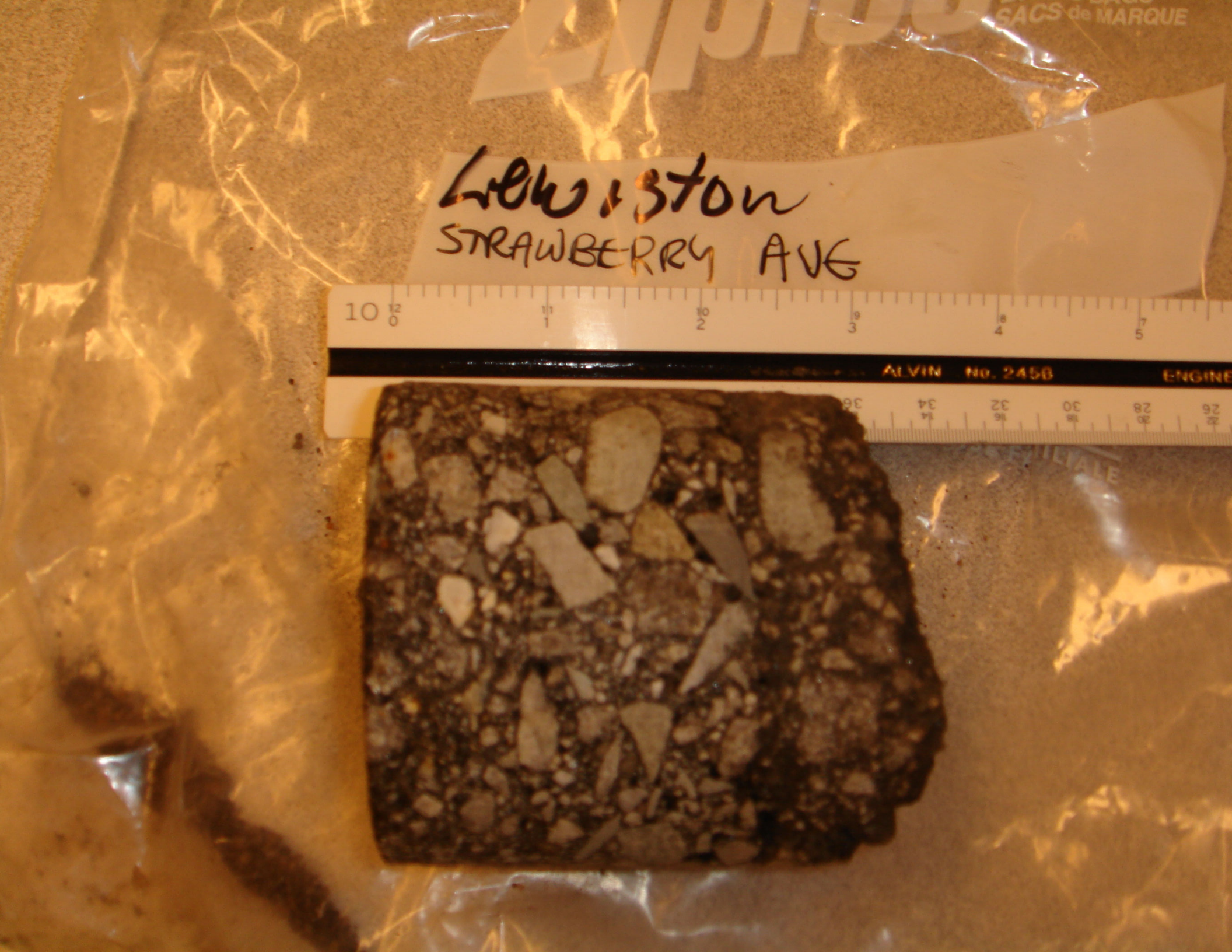
State of Maine - Department of Transportation

Pavement Core Summary Sheet

Town(s): Lewiston Project Number: 13060.00

Station (Feet)	Offset (Feet)	Pavement Depth (Feet)	Unbound Pavement	PC-Number	Saved Core	Comments / Date 12/14/2009
1+75	17.0 Rt.	0.60		101	yes	
6+00	16.0 Rt.	0.40		102	no	
9+00	14.0 Rt.	0.80		103	yes	
12+00	14.0 Rt.	0.60		104	yes	
15+00	14.0 Rt.	0.60		105	yes	
15+00	11.0 Lt.	0.70		106	yes	
12+00	12.0 Lt.	0.60		107	yes	
8+50	9.0 Lt.	0.65		108	yes	
16+24.5	7.3 Lt.	0.70		1	yes	HB-LEW-101
2+89.6	18.2 Lt.	0.70		2	yes	HB-LEW-102


Ziploc
BRAND BAGS
SACS de MARQUE
MAIN STREET NO 2.
NEAR Libby AVE
ALVIN NO. 2458 ENGINEER U.S.S.T'D. MACHINE ENGRAVED


Lewiston
STRAWBERRY AVE
ALVIN No. 2458


MAIN STREET NO 1
ALVIN NO. 2458 ENGINEER U.S.STD. MACHINE ENGRAVED


1500
M'R+
12.14.09
DATE:
CONTENTS:
LEWISTON
1366.0
PL 105
10THS & 1 100THS FT. 2 PAT.NO. 3 2,713,206 4 5 6 7 8
13 2:59PM


Lewiston
13060.11
12-14a
PCL 104
12+00
14' Rt
10THS & .1 100THS FT. .2 PAT.NO. .3 2,718,206 .4 .5 .6 .7 .8
13 3:00PM


12+00 12' LT
12/14/09
Kingston
13060.00
PG-107
10THS & .1
100THS FT.
.2
PAT.NO.
.3
2,713,208
.4
.5
.6
.7
.8
13 3:00PM


Lewiston
1306000
12/14/07
PC-101
1+75
17'2+
13 3:01PM


15700 11'4
Houston
13000.00
10THS & .1
100THS FT. .2
PAT.NO. .3 2,713,208
.4
.5
.6
.7
.8
13 3:01PM


PC-103
13 3:02PM