

Maine Department of Transportation
Highway Program

GEOTECHNICAL SERIES 100 REPORT
Route 156
Chesterville – Farmington, Maine

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Franklin County

PIN 12774.10
Federal Number STP-1277(410)X
February 26, 2007

Soils Report No. 2007-104
TEDOCS#1105990

Highway Program

Jeff Adams, Program Manager

Memorandum

DATE: February 26, 2007
DEPT: Region 3

TO: Heath Cowan
DEPT: Highway Program

FROM: Scott A. Hayden
DEPT: Highway Program

SUBJECT: Final Soils Memo – Chesterville – Farmington, Rte. 156, Pin 12774.10
No. 2007-104

Site Description

A subsurface investigation has been completed for a 2.7 mile portion of Route 156 in the towns of Chesterville and Farmington. The project begins at the intersection of Route 41 and extends southwest 2.7 miles.

The investigation included the use of a drill rig and falling weight deflectometer (FWD). Project stationing was marked in the field by Region 3 survey. A distance measuring instrument (DMI) was used to locate specific boring and FWD locations based upon several survey points marked in the field. The beginning of the project (intersection of Rte. 41/156) was designated as station 10+00. All offsets used in this investigation are referenced from the existing roadway centerline.

FWD Results

The entire FWD results are included as a separate attachment to this memo. A summary of the FWD results follows:

% of project found to be deficient	99 %
Range of Recommended Overlay Thickness	1 – 9 inches
Average Recommended Overlay Thickness	4 inches

The subgrade resilient modulus is very low (< 3000psi) for approximately 67 % of the project length (See FWD Summary Sheet and PDS). It is anticipated that this is due to the presence of moist to wet silty sands and sandy clay silt soils. These areas could be soft especially during the spring. Depending on the conditions at the time of construction the use of geosynthetics and/or additional base material may be necessary to enable these soils to support traffic during construction. Construction operations should take this into consideration. The greatest continuous concentration of low subgrade modulus values was encountered between stations 55+00 – 80+00 and 87+50 – 145+00. The subgrade resilient modulus is lowest between stations 60+00 – 77+50 (ave. 1,900 psi) and 92+50 – 97+50 (ave. 1,900 psi). A complete list of areas with a low modulus is listed on Table 1.

Table 1.
Low Subgrade Modulus Areas (< 3000 psi)

Station	Soil Type	Water Content %	% Passing # 200	Ave Modulus/1000
10+00 – 20+00	SaClSi with organics	29	70	2.3
28+00 – 32+00	SiSa (wet)	23	42	2.9
55+00 – 80+00	SiSa/SaClSi (wet)	29 - 60	46-70	2.1
87+50 – 145+00	SiSa/SaClSi (wet)	24 - 28	44-87	2.3

Boring Information

The subsurface investigation consisted of 10 power auger borings and 24 pavement cores (See Boring Logs and Pavement Core Summary Sheet). Boring locations were determined based upon FWD deflection results and visual observations during an on-site visit. Soils were described and sampled in the field. Samples of the existing base material and subgrade soils were collected and analyzed in the Bangor lab. Testing results are summarized on the attached Laboratory Testing Summary Sheet.

Pavement Conditions

Pavement conditions vary from fair to poor. The project area was overlaid 2-3 years ago using a maintenance surface treatment. Six power auger borings and five pavements cores encountered an unbound pavement layer beneath a solid pavement. For a detail listing of pavement measurements refer to the “Pavement Depth Information” sheet included with this memo. A pavement thickness summary follows:

When an unbound layer is encountered

Range of Solid Pavement Thickness: 3.0” – 7.2”
Average Solid Pavement Thickness: 5”

Range of Unbound Pavement Thickness: 1.2” – 3.6”
Average Unbound Pavement Thickness: 2”

Range of Combined Pavement Thickness: 6.0” – 8.4”
Average Combined Pavement Thickness: 7”

When no unbound layer is encountered

Range of Solid Pavement Thickness: 3.6” – 9.6”
Average Solid Pavement Thickness: 5.5”

Note: Pavement thickness estimates are based upon 36 sample locations. Measurements were taken from boring holes and pavement cores. Actual pavement thickness may vary. The maximum sample spacing is 1750 feet.

Base Material

Existing Base Material Type:	Silty Gravelly Sand, Gravelly Silty Sand
Percent Passing #200:	9 %-15 %
Range of Base Material Thickness:	9" – 50"
Quality of Drainage (AASHTO):	Poor - Fair
Estimated Existing Permeability:	4-16 ft/day

The existing base material consists of silty gravelly sand or gravelly silty sand. This material has approximately 9%-15% passing the #200 sieve. The high percentage of fines has seriously affected the permeability of the existing base layer. Based on permeability calculations using grain size distribution, a permeability range of 4 to 16 feet/day is anticipated. This provides a fair to poor quality of drainage. As a comparison, base material providing an excellent quality of drainage provides a minimum permeability of 1000 ft/day.

These limited performance characteristics and the lack of adequate thickness should be taken into consideration when developing performance expectations related to strength and drainage.

Subgrade Soils

The subgrade soils along this project vary from silty gravelly sands, silty sands and sandy clay silt. These soils are outwash and lacustrine sediments.

Gravelly Silty Sands

Samples of the gravelly silty sands indicate a silt content of 8 % - 14 % passing the # 200 sieve. The gravelly silty sands are classified as (ASSHTO) A-1-a and A-1-b soils. These soils are very similar to the existing base material. These soils will perform well as a subgrade soil.

Silty Sands

Silty sands were encountered along the entire project area. Samples indicate a silt content ranging between 41 % - 50 % passing the # 200 sieve. These soils are classified as A-4 soils using the ASSHTO classification system. These soils can perform adequately with proper moisture and compaction. However, they can swell and lose much of their stability unless properly compacted and drained. Careful field control of moisture content and pneumatic-tired rollers are normally required for proper compaction. These soils are highly frost susceptible.

Sandy Clay Silts

Sandy clay silt was encountered at several locations. This material is very silty with 70 – 87 % passing the # 200 sieve. With increasing clay content, these soils may be plastic in some locations. These soils commonly have a high dry strength and can be compacted under proper moisture conditions. However, these soils will lose much of this strength upon absorbing water. These soils will shrink and swell with changes in moisture content. They do not drain well and may absorb water by capillary action.

Due to a combination of silt content and moist to wet conditions, a low subgrade modulus value (<3000 psi) was encountered throughout 67% of the project length (See above FWD Results Section, Table I and PDS Sheet). These areas could become problematic during construction if moist to wet conditions exist when the existing pavement is removed. The importance of drainage throughout the project area cannot be over emphasized. Although these subgrade soil types are not performing well in the low subgrade modulus areas, these soils can perform adequately if they are well drained.

A summary of the anticipated subgrade soil type is provided below. This summary is derived from boring logs, FWD deflections, and visual observations. Actual conditions may vary.

Summary of the anticipated subgrade soil type

Station	Soil Type	AASHTO	Sample	% #200	Subgrade Modulus x1000	Average RM x1000
10+00 – 20+00	SiSa/ClSi	A-4	S2,3,4	41-70	1.5 – 2.9	2.3
20+00 – 35+00	SiSa (Wet)	A-4	S5	42	2.6 – 3.2	3.0
35+00 – 54+00	SiGSa	A-1-b	S7	8-14	3.9 – 5.3	4.3
54+00 – 68+00	SiSa (Wet)	A-4	S10	46	1.9 – 3.0	2.3
68+00 – 81+00	SaClSi (Wet)	A-4	S4	70	1.5 – 2.0	1.7
81+00 – 91+00	SiSa	A-4	S13	50	2.4 – 3.7	3.0
91+00 – 112+50	ClSi	A-7-5	S14	87	1.8 – 3.3	2.2
112+50 – 141+00	SiSa (Wet)	A-4	S16, S17	44 - 47	1.0 – 3.2	2.3
141+00 – 146+00	SaClSi	A-4	S4	70	2.3 – 3.5	2.7
146+00 – 154+00	SiSa	A-4	S16, S17	44 - 47	3.0 – 4.0	3.4

Shaded areas represent areas of low subgrade modulus.

Bedrock

No bedrock was encountered in any of the borings. It is anticipated that bedrock will not be encountered.

Performance Data Summary

A Performance Data Summary (PDS) sheet has been provided as a separate attachment to this memo. The PDS indicates that the majority of the project fails to meet at least two of the four minimum performance data criteria. In many areas the project fails to meet three of the four minimum performance data criteria. The existing structural number fails to meet the future traffic structural number throughout the entire project. In addition, a low subgrade resilient modulus value was encountered throughout 67% of the project length. Additional base material and/or pavement will be required if future performance expectations are to be met.

The following table lists the areas of greatest concern. Please refer to the Performance Data Summary Sheet for a detailed listing of performance criteria expectations throughout the entire project.

Areas of greatest concern

Area of Concern	Comments
10+00 – 25+00 28+00 – 32+00 55+00 – 60+00	Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations. Low subgrade resilient modulus values. These areas could be problematic during construction if moist to wet conditions exist. Additional base and/or geosynthetics may be required to facilitate construction.
60+00 – 77+50	Very low subgrade resilient modulus values. This area could be especially problematic during construction if moist to wet conditions exist. Additional base and/or geosynthetics may be required to facilitate construction. Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations.
77+50 – 80+00 87+50 – 92+50	Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations. Low subgrade resilient modulus values. These areas could be problematic during construction if moist to wet conditions exist. Additional base and/or geosynthetics may be required to facilitate construction.
92+50 – 97+50	Very low subgrade resilient modulus values. This area could be especially problematic during construction if moist to wet conditions exist. Additional base and/or geosynthetics may be required to facilitate construction. Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations.
97+50 – 112+50	Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations. Low subgrade resilient modulus values. This area could be problematic during construction if moist to wet conditions exist. Additional base and/or geosynthetics may be required to facilitate construction.
112+50 – 117+50	Very low subgrade resilient modulus values. This area could be especially problematic during construction if moist to wet conditions exist. Additional base and/or geosynthetics may be required to facilitate construction. Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations.
117+50 – 145+00	Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations. Low subgrade resilient modulus values. This area could be problematic during construction if moist to wet conditions exist. Additional base and/or geosynthetics may be required to facilitate construction.

Recommendations

1. It is recommended that additional base material be considered between stations 55+00 and 145+00 be considered due to varying existing base thickness and very low subgrade resilient modulus values. The areas of greatest concern are between stations 60+00 – 77+50 and 92+50 – 97+50.
2. It is recommended that the entire project area be drained with aggressive ditching wherever possible. Ditching should extend a minimum of 3 feet below finished grade whenever possible. Drainage is most critical between the following stations:

55+00 – 80+00

87+50 – 147+50

The need to drain these soils cannot be overstated. Low subgrade resilient modulus values and poor roadway conditions were encountered throughout much of the project area. If performance expectations are to be met using minimum design standards, drainage is critical. If the drainage is not addressed adequately, performance expectations will not be achieved.

**Falling Weight Deflectometer (FWD)
Summary Sheet**

Project #: 12774.10
Town(s): Chesterville-Farmington
Route(s): #156
Date Tested: 05/24/2006
Requested By: S. Hayden
Direction of Testing: North

Of FWD tests: 57
Design Life: 12 Yrs
Initial Serviceability: 4.5
Reliability Level: 95%

Of Power Augers/Spoons 11/0
Future 18-kip ESALs (Design Life): 1,217,640
Terminal Serviceability: 2.5
Overall Standard Deviation: .45

Locations

Distance (Feet)

Description

Comments:

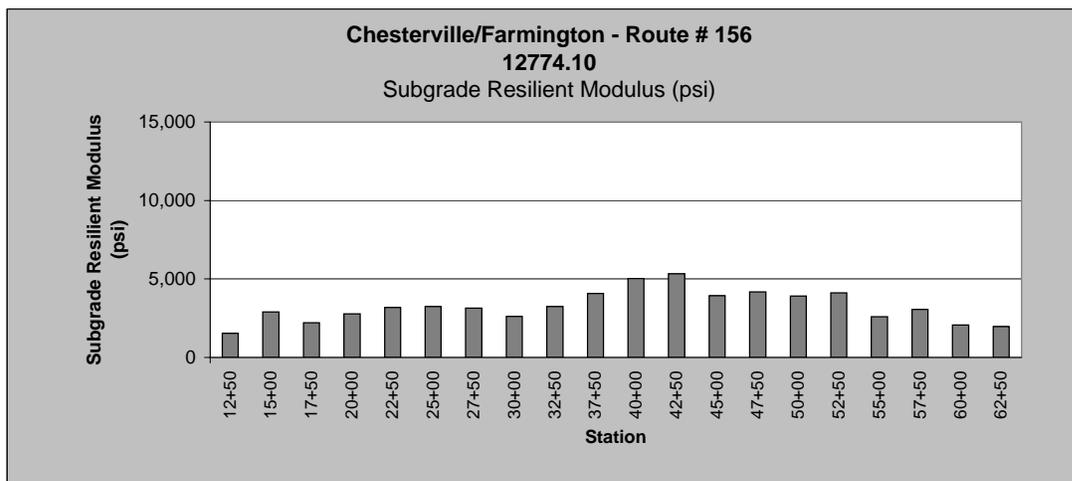
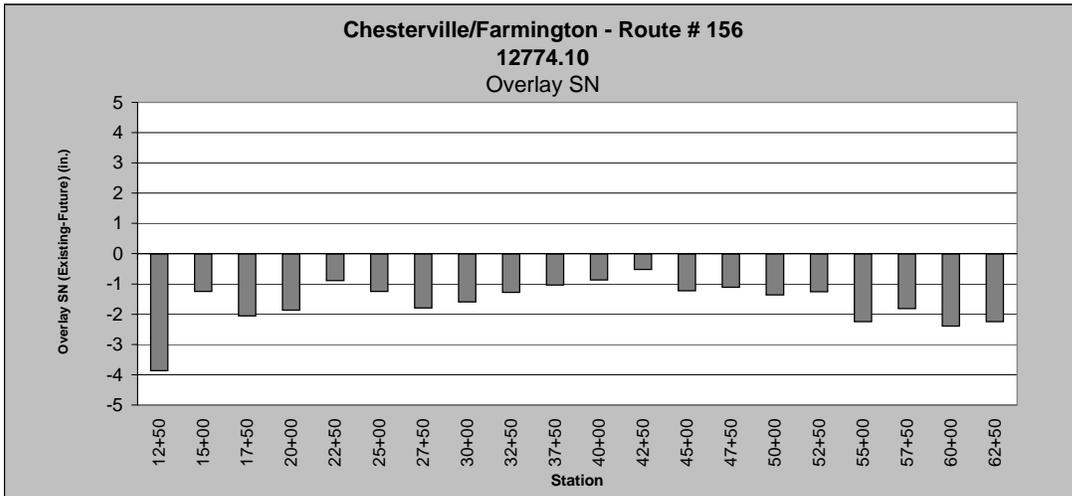
Chesterville/Farmington - Route # 156
12774.10

Station (Feet)	Existing Structural Number (in.)	Future Traffic Structural Number (in.)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (in.)	Pavement Modulus (psi)	Subgrade Resilient Modulus (psi)	Pavement Depth (in)	* Combined Pavement/Gravel Depth Used for Calculation (in)
12+50	2.3	6.16	-3.86	8.77	27,697	1,531	3.6	16.9
15+00	3.81	5.06	-1.25	2.84	54,771	2,904	6	22.3
17+50	3.45	5.51	-2.06	4.68	40,581	2,215	6	22.3
20+00	3.27	5.14	-1.87	4.25	34,487	2,773	6	22.3
22+50	4.02	4.91	-0.89	2.02	64,289	3,187	6	22.3
25+00	3.64	4.89	-1.25	2.84	47,683	3,244	6	22.3
27+50	3.14	4.93	-1.79	4.07	30,652	3,148	6	22.3
30+00	3.65	5.24	-1.59	3.61	48,099	2,606	6	22.3
32+50	3.6	4.88	-1.28	2.91	46,100	3,250	6	22.3
37+50	3.49	4.53	-1.04	2.36	67,860	4,080	4.2	19
40+00	3.36	4.23	-0.87	1.98	60,716	5,031	4.2	19
42+50	3.62	4.14	-0.52	1.18	75,858	5,340	4.2	19
45+00	3.37	4.59	-1.22	2.77	61,146	3,923	4.2	19
47+50	3.39	4.5	-1.11	2.52	62,114	4,170	4.2	19
50+00	3.24	4.6	-1.36	3.09	53,648	3,906	4.8	19.1
52+50	3.26	4.52	-1.26	2.86	54,377	4,121	4.8	19.1
55+00	3	5.24	-2.24	5.09	42,312	2,601	4.8	19.1
57+50	3.16	4.97	-1.81	4.11	49,648	3,070	4.8	19.1
60+00	3.24	5.63	-2.39	5.43	31,591	2,060	3	22.8
62+50	3.47	5.71	-2.24	5.09	38,687	1,976	3	22.8

Weak Subgrade

Strong Subgrade

* For actual Gravel Depths, see logdraft forms



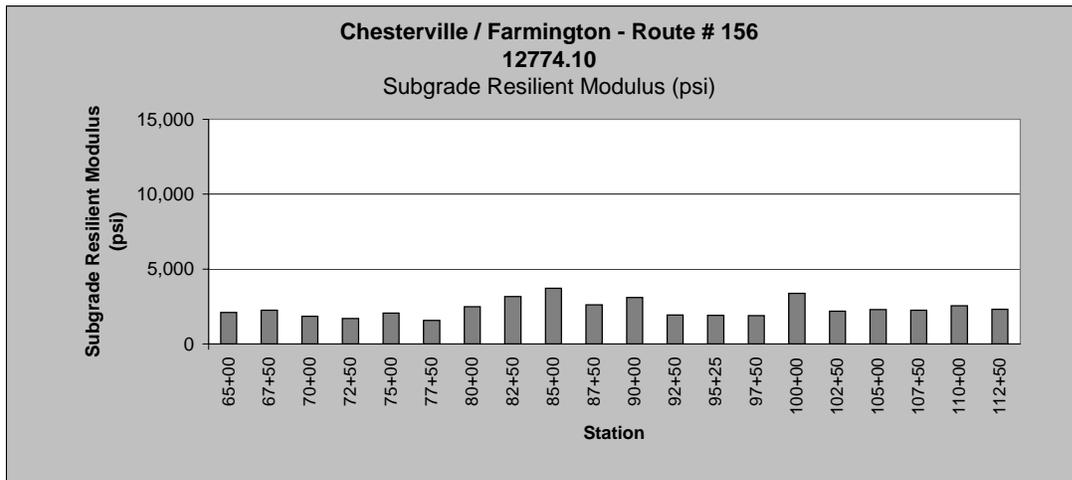
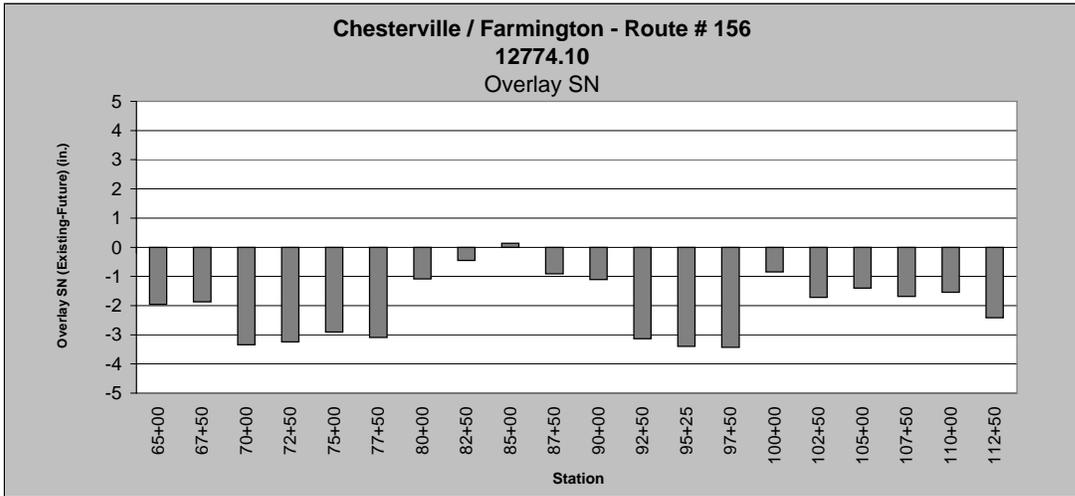
Chesterville/ Farmington - Route # 156
12774.10

Station (Feet)	Existing Structural Number (in.)	Future Traffic Structural Number (in.)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (in.)	Pavement Modulus (psi)	Subgrade Resilient Modulus (psi)	Pavement Depth (in)	* Combined Pavement/Gravel Depth Used for Calculation (in)
65+00	3.64	5.6	-1.96	4.45	44,702	2,102	3	22.8
67+50	3.62	5.49	-1.87	4.25	43,823	2,242	3	22.8
70+00	2.49	5.83	-3.34	7.59	23,601	1,843	6	19.3
72+50	2.73	5.97	-3.24	7.36	31,013	1,701	6	19.3
75+00	2.72	5.63	-2.91	6.61	30,557	2,067	6	19.3
77+50	3.01	6.1	-3.09	7.02	41,579	1,582	6	19.3
80+00	4.22	5.31	-1.09	2.48	44,743	2,492	6	26.4
82+50	4.48	4.93	-0.45	1.02	53,449	3,163	6	26.4
85+00	4.82	4.68	0.14	-	66,714	3,711	6	26.4
87+50	4.32	5.23	-0.91	2.07	47,949	2,619	6	26.4
90+00	3.85	4.96	-1.11	2.52	34,083	3,102	6	26.4
92+50	2.61	5.75	-3.14	7.14	68,295	1,926	6	14.2
95+25	2.36	5.76	-3.4	7.73	50,578	1,914	6	14.2
97+50	2.36	5.79	-3.43	7.8	50,333	1,887	6	14.2
100+00	3.97	4.82	-0.85	1.93	57,810	3,382	6	22.8
102+50	3.81	5.53	-1.72	3.91	51,234	2,186	6	22.8
105+00	4.06	5.46	-1.4	3.18	61,891	2,284	6	22.8
107+50	3.8	5.48	-1.68	3.82	50,673	2,252	6	22.8
110+00	3.73	5.27	-1.54	3.5	48,009	2,556	6	22.8
112+50	3.01	5.43	-2.42	5.5	37,386	2,322	7.2	20

Weak Subgrade

Strong Subgrade

* For actual Gravel Depths, see logdraft forms



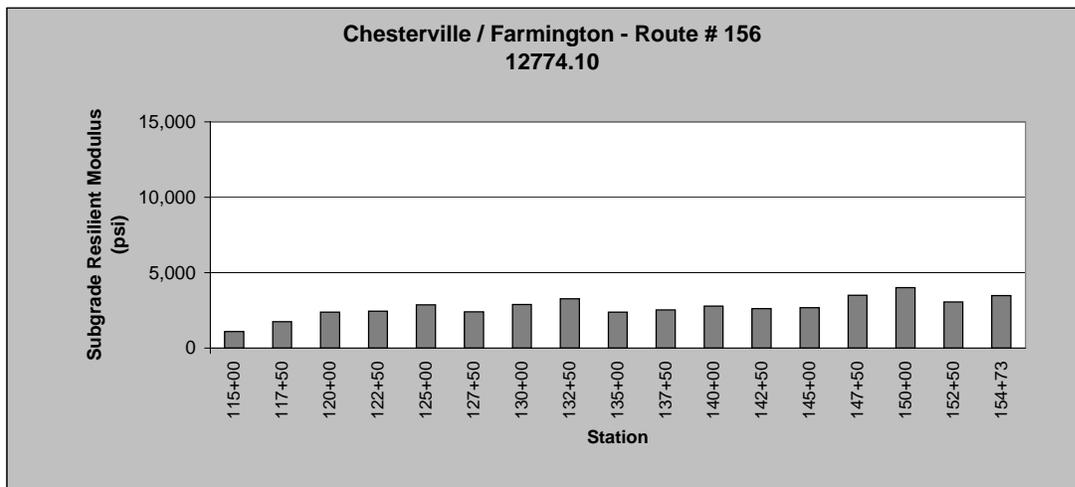
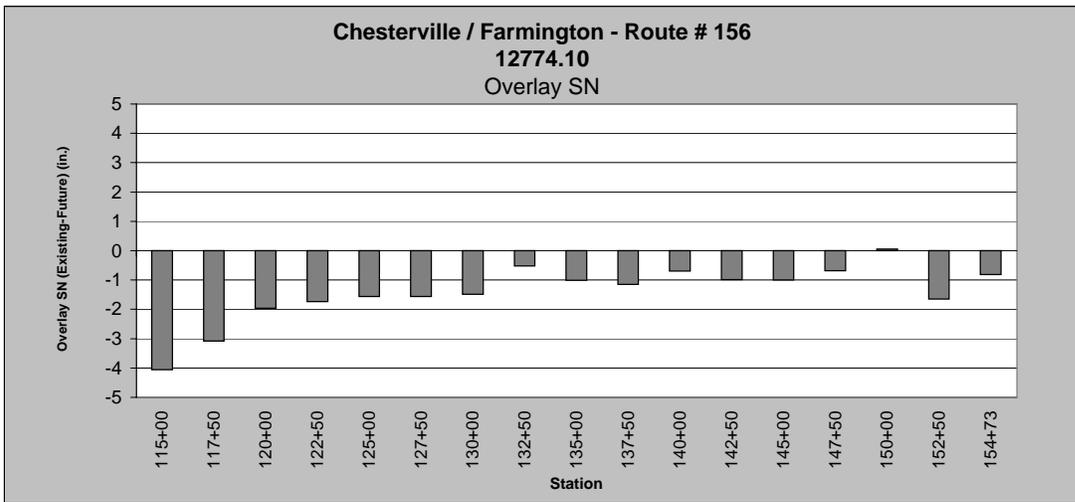
Chesterville / Farmington - Route # 156
12774.10

Station (Feet)	Existing Structural Number (in.)	Future Traffic Structural Number (in.)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (in.)	Pavement Modulus (psi)	Subgrade Resilient Modulus (psi)	Pavement Depth (in)	* Combined Pavement/Gravel Depth Used for Calculation (in)
115+00	2.75	6.81	-4.06	9.23	28,657	1,090	7.2	20
117+50	2.83	5.91	-3.08	7	30,951	1,759	7.2	20
120+00	3.42	5.38	-1.96	4.45	31,779	2,392	6	24
122+50	3.6	5.34	-1.74	3.95	36,922	2,456	6	24
125+00	3.53	5.09	-1.56	3.55	34,941	2,860	6	24
127+50	3.81	5.37	-1.56	3.55	44,032	2,408	6	24
130+00	3.58	5.07	-1.49	3.39	36,311	2,880	6	24
132+50	4.35	4.87	-0.52	1.18	42,535	3,272	6.6	27.7
135+00	4.37	5.38	-1.01	2.3	43,053	2,393	6.6	27.7
137+50	4.13	5.28	-1.15	2.61	36,382	2,538	6.6	27.7
140+00	4.44	5.13	-0.69	1.57	45,322	2,779	6.6	27.7
142+50	4.25	5.24	-0.99	2.25	39,526	2,609	6.6	27.7
145+00	4.19	5.19	-1	2.27	37,993	2,677	6.6	27.7
147+50	4.09	4.77	-0.68	1.55	35,235	3,500	6.6	27.7
150+00	4.61	4.56	0.05	-	50,523	4,007	6.6	27.7
152+50	3.33	4.98	-1.65	3.75	19,017	3,058	6.6	27.7
154+73	3.97	4.78	-0.81	1.84	32,412	3,481	6.6	27.7

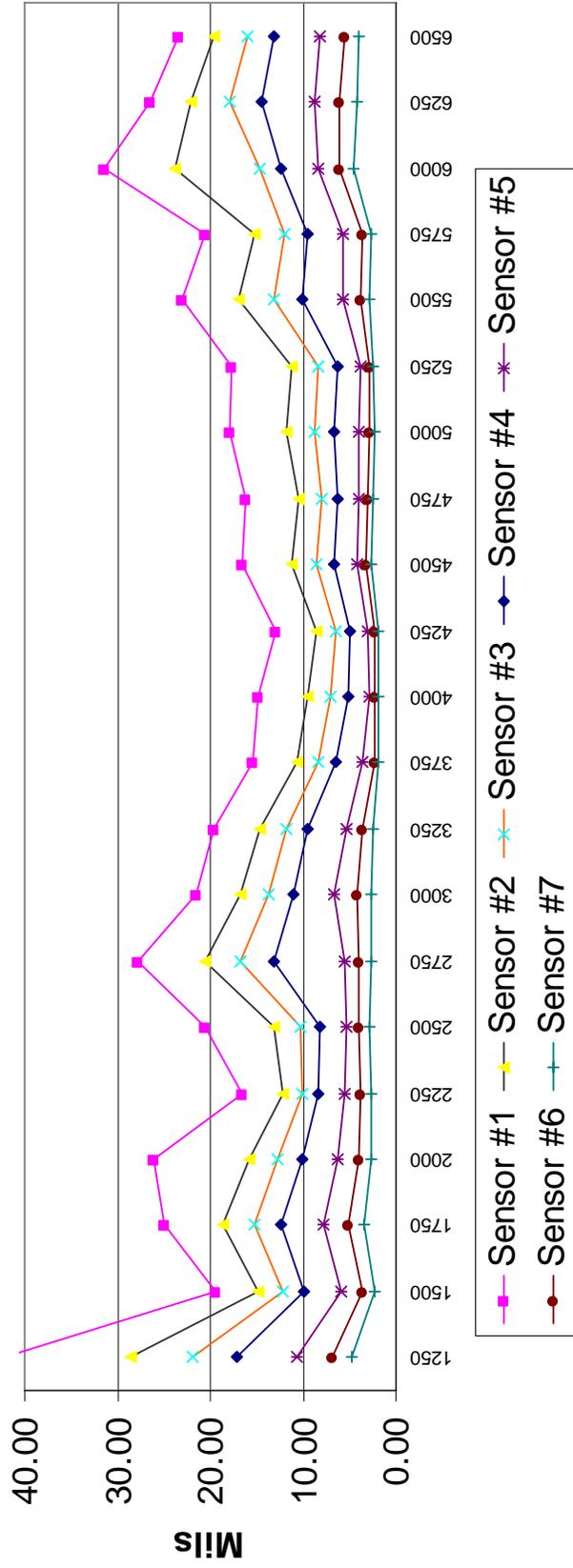
Weak Subgrade

Strong Subgrade

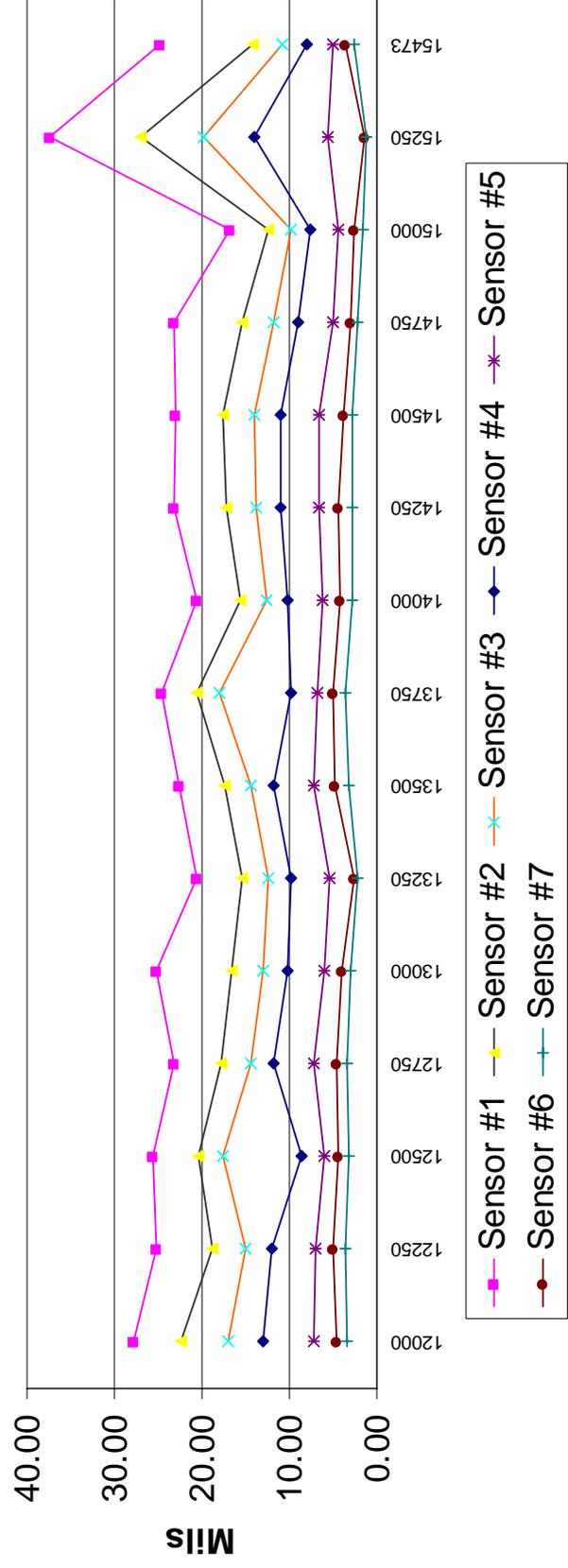
* For actual Gravel Depths, see logdraft forms



12774.10 Chesterville-Farmington



12774.10 Chesterville-Farmington



Performance Data Summary Sheet

Chesterville- Farmington Rte 156
CHIP
12744.10

Station (FWD)	D E F	Minimum Performance Data Criteria				Boring Location (Plan View)	Base Material		Subgrade Soils			
							AASHTO Class	% #200	AASHTO Class	% #200		
					KEY							
Station		Red – Fail Green - Met				Solid Pave Thick Unbound Pave - UP Base Thickness (inches)	Soil Type AASHTO Sample #	% 200 Frost Moisture	Soil Type AASHTO Sample #	% 200 Frost Moisture		
					CL							
12+50	3				3.6 SP 2.4 UP 13.2	SiGSa A-1-b S1	14 II Damp	SiSa/ClSi A-4 S2,3,4	41-70 IV Moist			
15+00	3											
17+50	3											
20+00	3											
22+50	2											
25+00	1											
27+50	1	Pavement Thickness (4 inches)	Base Thickness (18 inches)	Subgrade Modulus (3000 psi)	6.0 SP 2.4 UP 16.8	SiGSa A-1-b S1	14 II Damp	SiSa A-4 S5	42 III Wet 3.3'			
30+00	2											
32+50	1				Bridge 35+00							
37+50	1											
40+00	1											
42+50	1											
45+00	1							4.2 SP 1.8 UP 42.0	GSiSa A-2-4 S6	15 II Damp	SiGSa A-1-b S7	14 II Damp
47+50	1											
50+00	1							4.8 SP - 50.4	GSiSa A-2-4 S6	15 II Damp	SiSaG A-1-a S8	8 0 Damp
52+50	1											
55+00	2	Whittier Rd 54+25										
57+50	2											
60+00	2				3.0 SP 3.6 UP 27.0	GSiSa A-2-4 S6	15 II Damp	SiSa A-4 S10	46 III Wet 3.6'			
62+50	2											
65+00	2											
67+50	3											

- * SP = Solid Pavement Layer
- * UP = Unbound Pavement Layer
- SP+UP = Total Pavement Thickness
- * Base Thickness = Red indicates presence of “treated base”

Performance Data Summary Sheet

Chesterville- Farmington Rte 156
CHIP
12744.10

Station (FWD)	D E F	Minimum Performance Data Criteria				Boring Location (Plan View)	Base Material		Subgrade Soils					
							AASHTO Class	% #200	AASHTO Class	% #200				
					KEY									
Station		Red - Fail Green - Met				Solid Pave Thick Unbound Pave - UP Base Thickness (inches)	Soil Type AASHTO Sample #	% 200 Frost Moisture	Soil Type AASHTO Sample #	% 200 Frost Moisture				
					CL									
70+00	3													
72+50	3					6.0 SP 2.4 UP 13.2	SiGSa A-1-b S11	10 0 Damp	SaClSi A-4 S4	70 IV Wet 3.5'				
75+00	3													
77+50	3													
80+00	3													
82+50	1													
85+00	0					6.0 SP 2.4 UP 22.8	SiGSa A-1-b S12	14 II Damp	SaSi A-4 S13	50 III Moist				
87+50	2	Pavement Thickness (4 inches)	Base Thickness (18 inches)	Subgrade Modulus (3000 psi)	Darwin Results									
90+00	2													
92+50	3													
95+25	3									6.0 SP - 9.6	SiGSa A-1-b S12	14 II Damp	ClSi A-7-5 S14	87 IV Moist
97+50	3													
100+00	3													
102+50	3													
105+00	3													
107+50	3									6.0 SP - 16.8	SiGSa A-1-a S15	9 0 Damp	ClSi A-7-5 S14	87 IV Moist
110+00	3													
112+50	3													
115+00	3					7.2 SP - 14.4	SiGSa A-1-b S12	14 II Damp	SiSa A-4 S16	44 III Wet 3.1'				
117+50	3													
120+00	3													
122+50	3													

- * SP = Solid Pavement Layer
- * UP = Unbound Pavement Layer
- SP+UP = Total Pavement Thickness
- * Base Thickness = Red indicates presence of "treated base"

PAVEMENT DEPTH INFORMATION

Chesterville - Farmington

Rte. 156

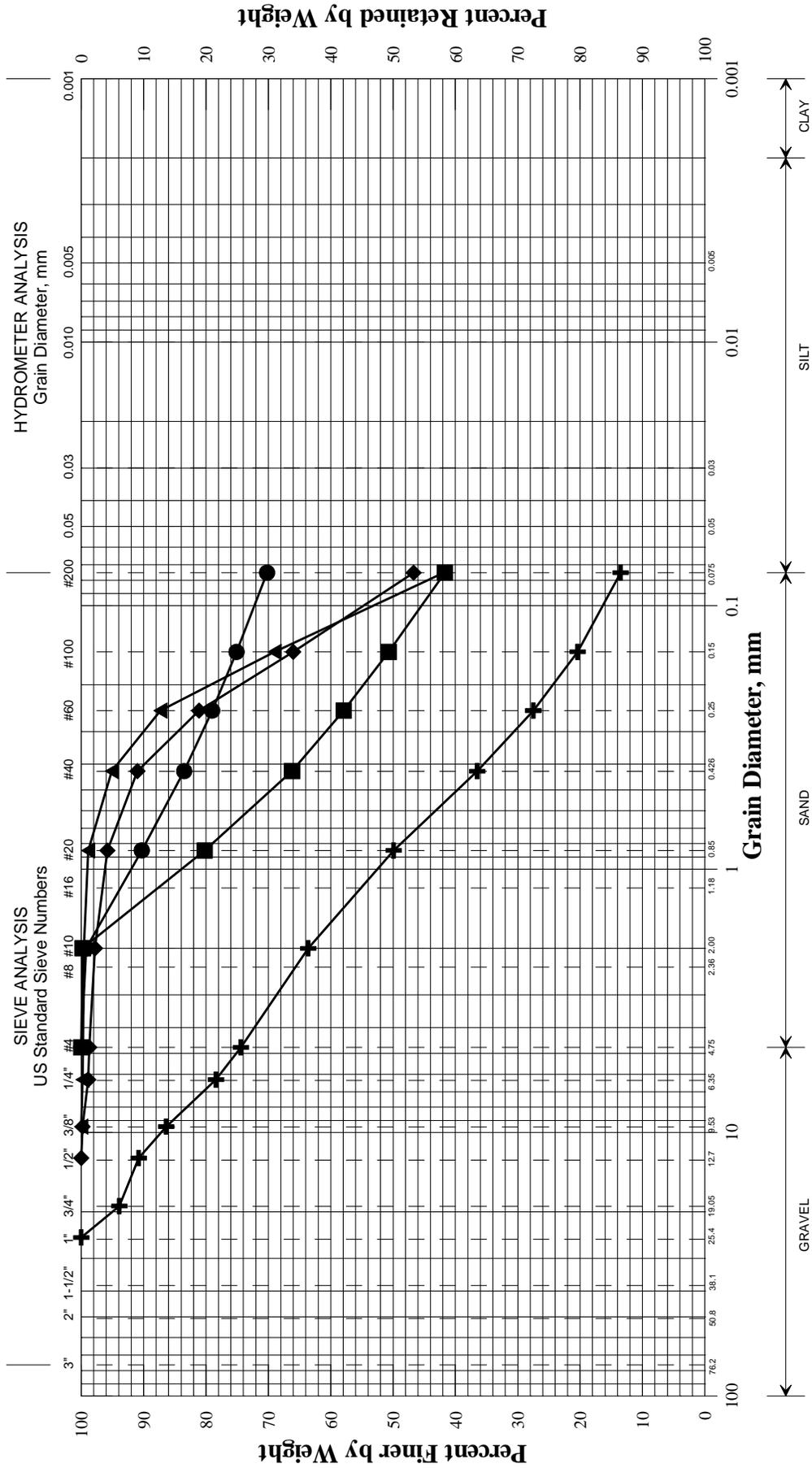
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STATION	LEFT			CL	RIGHT		
	15'	10'	5'		5'	10'	15'
12+50						(8.3') 3.6 SP <u>2.4 UP</u> 6.0	
27+50		9.6 SP - 9.6	6.0 SP - 6.0	(1.0' Lt) 7.8 SP - 7.8	7.2 SP - 7.2	(8.3') 6.0 SP <u>2.4 UP</u> 8.4	
45+00						(8.3') 4.2 SP <u>1.8 UP</u> 6.0	
50+00		(9.0') 4.2 SP - 4.2	3.6 SP - 3.6	(1.0' Lt) 4.2 SP - 4.2	4.2 SP - 4.2	(8.3') 4.8 SP - 4.8	
60+00						(9.2') 3.0 SP <u>3.6 UP</u> 6.6	
72+50		7.2 SP <u>1.2 UP</u> 8.4	4.8 SP <u>1.2 UP</u> 6.0	4.2 SP <u>1.8 UP</u> 6.0	5.4 SP <u>1.2 UP</u> 6.6	(8.5') 6.0 SP <u>2.4 UP</u> 8.4	
85+00						(7.5') 6.0 SP <u>2.4 UP</u> 8.4	
95+25		6.6 SP <u>1.8 UP</u> 8.4	3.6 SP - 3.6	4.8 SP - 4.8	4.8 SP - 4.8	(8.5') 6.0 SP - 6.0	
107+50		6.6 SP - 6.6	4.2 SP - 4.2	(1.0' Rt) 5.4 SP - 5.4	6.0 SP - 6.0	(9.0') 6.0 SP - 6.0	

* SP = Solid Pavement Layer, * UP = Unbound Pavement Layer,
SP+UP = Total Pavement, (7.7') = actual offset

Non shaded data obtained from power auger borings, shaded data obtained from coring

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE

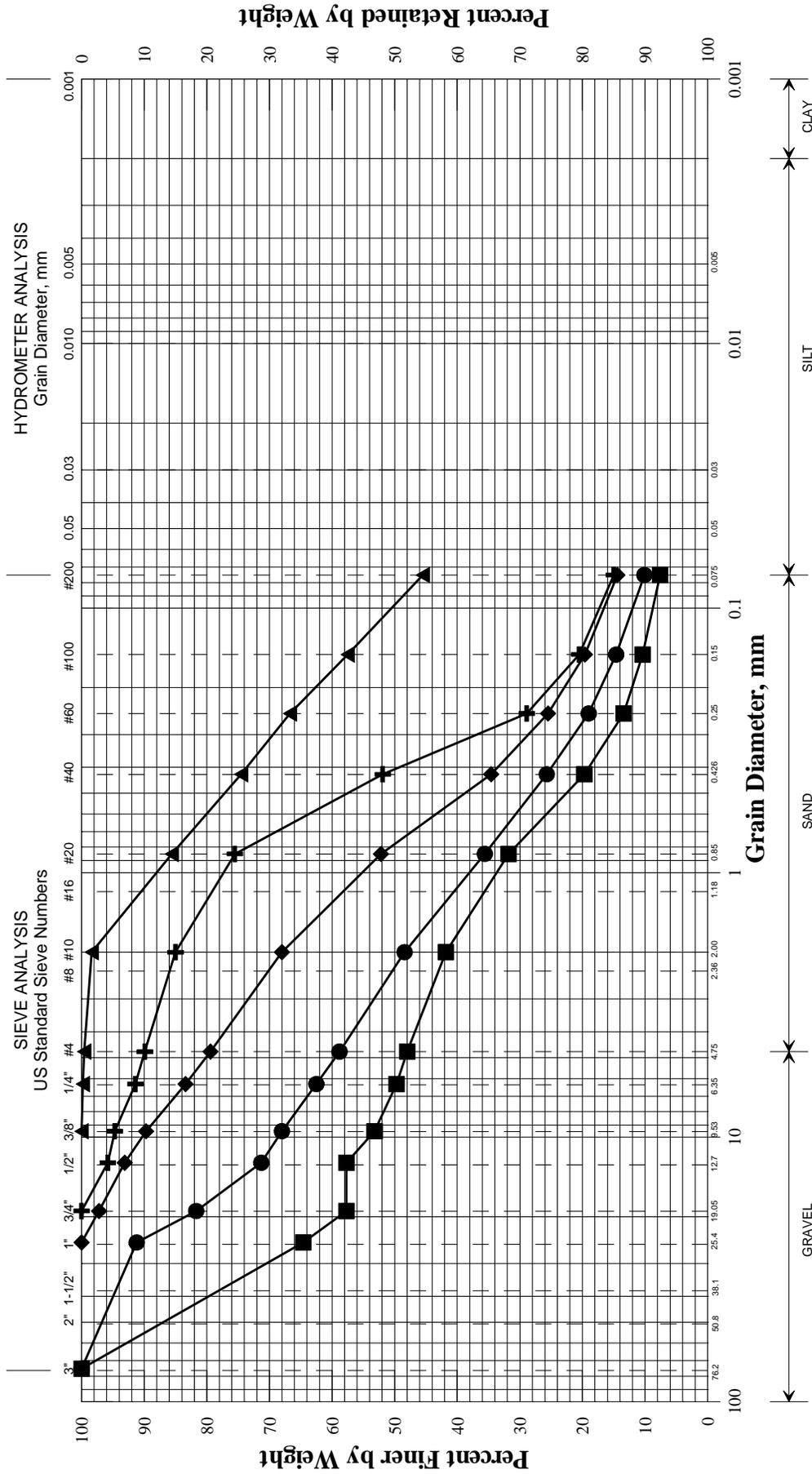


UNIFIED CLASSIFICATION

Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
+	12+50	8.0 RT	0.5-1.6	SAND, some gravel, little silt.	5.2			
◆	12+50	8.0 RT	1.6-3.5	Silty SAND, small trace gravel with clay.	25.2			
■	12+50	8.0 RT	3.5-4.3	Silty SAND with clay.	20.0			
●	12+50	8.0 RT	4.3-5.0	SILT, some sand with clay.	28.6			
×	27+50	8.3 RT	3.3-5.0	Silty SAND, small trace gravel.	23.2			

PIN	012774.10
Town	Chesterville, Farmington
Reported by/Date	WHITE, TERRY A 1/11/2007

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE

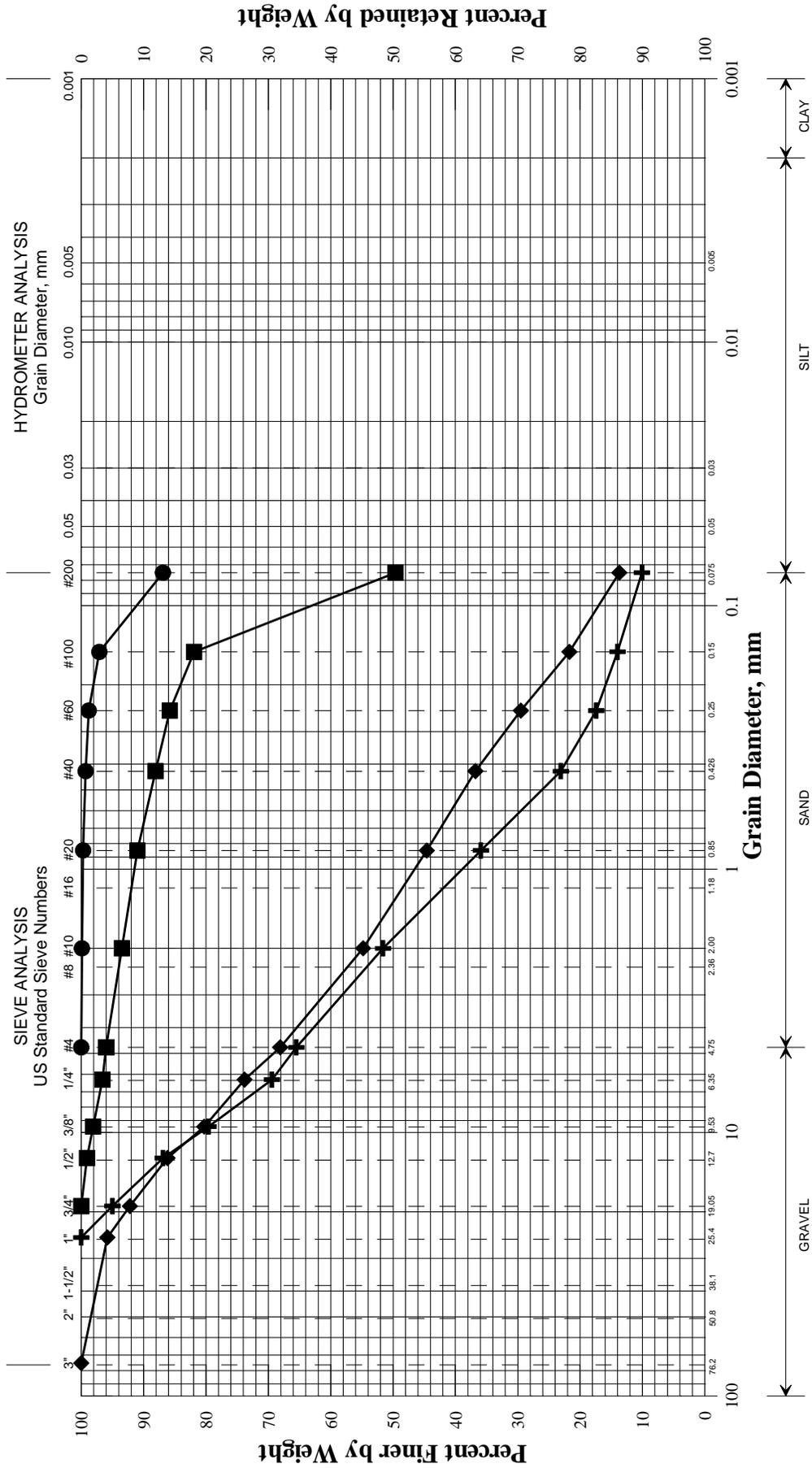


UNIFIED CLASSIFICATION

Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
+ HB-CHFA-103/S6	45+00	8.3 RT	0.8-4.0	SAND, little silt, trace gravel.	4.1			
◆ HB-CHFA-103/S7	45+00	8.3 RT	4.5-5.0	SAND, some gravel, little silt.	4.9			
■ HB-CHFA-104/S8	50+00	8.3 RT	2.5-5.0	Sandy GRAVEL, trace silt.	3.7			
● HB-CHFA-105/S9	60+00	9.2 RT	0.55-1.3	Gravelly SAND, little silt.	5.2			
× HB-CHFA-105/S10	60+00	9.2 RT	2.8-3.6	Silty SAND, small trace gravel with clay.	59.6			

012774.10	PIN
Chesterville, Farmington	Town
Reported by/Date	WHITE, TERRY A 1/11/2007

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE

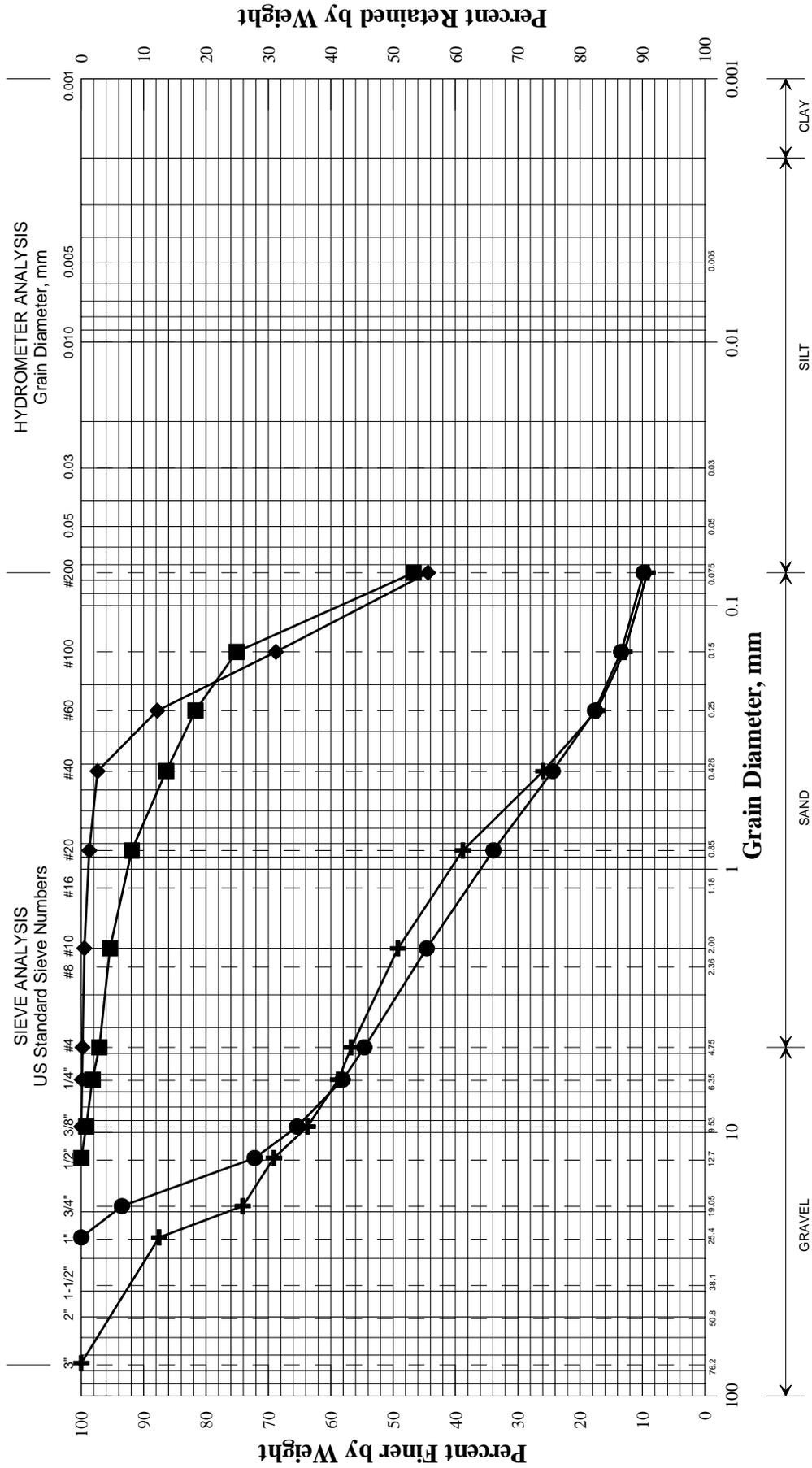


UNIFIED CLASSIFICATION

Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
+	72+50	8.5 RT	0.7-1.8	SAND, some gravel, little silt.	5.5			
◆	85+00	7.5 RT	0.7-2.2	SAND, some gravel, little silt.	3.1			
■	85+00	7.5 RT	2.2-5.0	Sandy SILT, trace gravel.	13.0			
●	95+25	8.5 RT	2.1-5.0	SILT, little sand.	24.7			
▲								
×								

PIN	Town	Reported by/Date
012774.10	Chesterville, Farmington	WHITE, TERRY A 1/11/2007

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
+	107+50	9.0 RT	0.5-1.9	Gravelly SAND, trace silt.	4.5			
◆	107+50	9.0 RT	2.7-5.0	Silty SAND, small trace gravel.	28.1			
■	115+00	7.2 RT	1.8-3.1	Silty SAND, trace gravel.	24.2			
●	142+50	7.5 RT	2.2-3.5	Sandy GRAVEL, trace silt.	5.4			
▲								
×								

PIN
012774.10
Town
Chesterville, Farmington
Reported by/Date
WHITE, TERRY A 1/11/2007

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS		Project: Route 156	Boring No.: HB-CHFA-103
		Location: Chesterville-Farmington, Maine	PIN: 12774.10
Driller: MaineDOT	Elevation (ft.)		Auger ID/OD: 5" Dia.
Operator: E. Giguere	Datum: NAVD 88		Sampler: Off Flights
Logged By: G. Lidstone	Rig Type: Truck Mounted CME 45C		Hammer Wt./Fall: N/A
Date Start/Finish: 11/16/06-11/16/06	Drilling Method: Solid Stem Auger		Core Barrel: N/A
Boring Location: 45+00, 8.3' 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	
		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							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-value	Casing Blows					
0	S6		0.80 - 4.00			SSA	-0.35 -0.50 -0.80		PAVEMENT. Unbound PAVEMENT.	G#209793 A-2-4, SM WC=4.1%	
									GRAVEL, little brown, fine to coarse sand, (Fill). Brown, damp, fine to medium SAND, little gravel, trace coarse sand, trace silt, (Fill).		
5	S7		4.50 - 5.00				-4.00 -4.50 -5.00		Cobble from 4.0-4.5' bgs., (Fill). Brown, damp, fine to coarse SAND, some gravel, little silt, (Fill).	G#209794 A-1-b, SM WC=4.9%	
									NO REFUSAL		
10											
15											
20											
25											

Remarks: Offsets measured from existing centerline.

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS		Project: Route 156	Boring No.: HB-CHFA-105
		Location: Chesterville-Farmington, Maine	PIN: 12774.10
Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.	
Operator: E. Giguere	Datum: NAVD 88	Sampler: Off Flights	
Logged By: G. Lidstone	Rig Type: Truck Mounted CME 45C	Hammer Wt./Fall: N/A	
Date Start/Finish: 11/16/06-11/16/06	Drilling Method: Solid Stem Auger	Core Barrel: N/A	
Boring Location: 60+00, 9.2' Rt.	Casing ID/OD: N/A	Water Level*: 3.6' bgs.	
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	
		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							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-value	Casing Blows					
0	S9		0.55 - 1.30				SSA	-0.25 -0.55	PAVEMENT. Unbound PAVEMENT.	G#209796 A-1-a, SW-SM WC=5.2%	
	S10		2.80 - 3.60					-1.30 -2.80 -3.60	Damp, GRAVEL, some brown, fine to coarse sand, trace silt, (Fill). Brown, damp, fine to medium SAND, little gravel, trace coarse sand, trace silt, (Fill). ≈S6 Brown, moist, sandy SILT, trace clay.	G#209797 A-4, SC-SM WC=59.6%	
5								-5.00	Brown, wet, silty fine SAND. ≈S5		
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL		
10											
15											
20											
25											

Remarks: Offsets measured from existing centerline.

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS		Project: Route 156 Location: Chesterville-Farmington, Maine	Boring No.: HB-CHFA-106 PIN: 12774.10
Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.	
Operator: E. Giguere	Datum: NAVD 88	Sampler: Off Flights	
Logged By: G. Lidstone	Rig Type: Truck Mounted CME 45C	Hammer Wt./Fall: N/A	
Date Start/Finish: 11/16/06-11/16/06	Drilling Method: Solid Stem Auger	Core Barrel: N/A	
Boring Location: 72+50, 8.5' Rt.	Casing ID/OD: N/A	Water Level*: 3.5' bgs.	
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	
		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							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-value	Casing Blows					
0	S11		0.70 - 1.80				SSA	-0.50 -0.70 -1.80 -3.50 -5.00		G#209798 A-1-b, SW-SM WC=5.5%	
5									<p align="center">Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL</p>		
10											
15											
20											
25											

Remarks: Offsets measured from existing centerline.

Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: E. Giguere	Datum: NAVD 88	Sampler: Off Flights
Logged By: G. Lidstone	Rig Type: Truck Mounted CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 11/27/06-11/27/06	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 85+00, 7.5' 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_u = Unconfined Compressive Strength (ksf) $S_{u(lab)}$ = Lab Vane Shear Strength (psf) WOH = weight of 140lb. hammer WOR = weight of rods	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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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-value	Casing Blows						
0	S12		0.70 - 2.20						-0.50		G#209799 A-1-b, SM WC=3.1% G#209800 A-4, SM WC=13.0%	
									-0.70			
	S13		2.60 - 5.00						-2.60			
									-5.00			
5										Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL		
10												
15												
20												
25												

Remarks: Offsets measured from existing centerline.

Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: E. Giguere	Datum: NAVD 88	Sampler: Off Flights
Logged By: G. Lidstone	Rig Type: Truck Mounted CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 11/27/06-11/27/06	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 95+25, 8.5' 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_u = Unconfined Compressive Strength (ksf) $S_{u(lab)}$ = Lab Vane Shear Strength (psf) WOH = weight of 140lb. hammer WOR = weight of rods	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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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-value	Casing Blows					
0							SSA	-0.50		G#209680 A-7-5, CL WC=24.7%	
	S14		2.10 - 5.00				-1.30				
							-2.10				
							-5.00				
5									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL		
10											
15											
20											
25											

Remarks: Offsets measured from existing centerline.

Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.
Operator: E. Giguere	Datum: NAVD 88	Sampler: Off Flights
Logged By: G. Lidstone	Rig Type: Truck Mounted CME 45C	Hammer Wt./Fall: N/A
Date Start/Finish: 11/27/06-11/27/06	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 107+50, 9.0' Rt.	Casing ID/OD: N/A	Water Level*: 2.7' bgs.

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	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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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-value	Casing Blows						
0	S15		0.50 - 1.90			SSA			-0.50	PAVEMENT.		
									-1.90	Damp, GRAVEL, some brown, fine to coarse sand, trace silt, (Fill).	G#209681 A-1-a, SW-SM WC=4.5%	
	S16		2.70 - 5.00						-2.70	Olive, moist, fine sandy SILT. ≈ S14		
									-2.70	Brown, wet, silty fine SAND, trace medium sand.	G#209682 A-4, SM WC=28.1%	
5									-5.00	Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL		
10												
15												
20												
25												

Remarks: Offsets measured from existing centerline.

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS		Project: Route 156 Location: Chesterville-Farmington, Maine	Boring No.: HB-CHFA-110 PIN: 12774.10
Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.	
Operator: E. Giguere	Datum: NAVD 88	Sampler: Off Flights	
Logged By: G. Lidstone	Rig Type: Truck Mounted CME 45C	Hammer Wt./Fall: N/A	
Date Start/Finish: 11/27/06-11/27/06	Drilling Method: Solid Stem Auger	Core Barrel: N/A	
Boring Location: 115+00, 7.2' Rt.	Casing ID/OD: N/A	Water Level*: 3.1' bgs.	
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	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							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-value	Casing Blows					
0									PAVEMENT.		
	S17		1.80 - 3.10				SSA	-0.60		Damp, GRAVEL, some brown, fine to coarse sand, trace silt, (Fill) \approx S15	
								-0.90		Brown, damp, fine to medium SAND some gravel, trace coarse sand, trace silt, (Fill) \approx S12	
								-1.80		Brown, moist, silty fine SAND.	
								-3.10		Brown, wet, silty fine SAND, trace medium sand. \approx S16	
5								-5.00		Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10											
15											
20											
25											

Remarks: Offsets measured from existing centerline.

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS		Project: Route 156 Location: Chesterville-Farmington, Maine	Boring No.: HB-CHFA-111 PIN: 12774.10
Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.	
Operator: E. Giguere	Datum: NAVD 88	Sampler: Off Flights	
Logged By: G. Lidstone	Rig Type: Truck Mounted CME 45C	Hammer Wt./Fall: N/A	
Date Start/Finish: 11/27/06-11/27/06	Drilling Method: Solid Stem Auger	Core Barrel: N/A	
Boring Location: 127+50, 9.0' Rt.	Casing ID/OD: N/A	Water Level*: 3.8' bgs.	
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	
		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								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-value	Casing Blows						
0						SSA			-0.50	PAVEMENT.		
									-2.00	Damp, GRAVEL, some brown, fine to coarse sand, trace silt, (Fill) ≈S15		
									-3.80	Brown, moist, silty fine SAND. ≈S17		
									-5.00	Brown, wet, silty fine SAND, trace medium sand. ≈S16		
5										Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL		
10												
15												
20												
25												

Remarks: Offsets measured from existing centerline.

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS		Project: Route 156 Location: Chesterville-Farmington, Maine	Boring No.: HB-CHFA-112 PIN: 12774.10
Driller: MaineDOT	Elevation (ft.):	Auger ID/OD: 5" Dia.	
Operator: E. Giguere	Datum: NAVD 88	Sampler: Off Flights	
Logged By: G. Lidstone	Rig Type: Truck Mounted CME 45C	Hammer Wt./Fall: N/A	
Date Start/Finish: 11/27/06-11/27/06	Drilling Method: Solid Stem Auger	Core Barrel: N/A	
Boring Location: 142+50, 7.5' 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	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							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-value	Casing Blows					
0							SSA	-0.55	PAVEMENT.		
								-0.90	Damp, GRAVEL, some brown, fine to coarse sand, trace silt, (Fill). ≈S15		
	S18		2.20 - 3.50					-2.20	Brown, damp, fine to medium SAND some gravel, trace coarse sand, trace silt, (Fill). ≈S12		G#209684 A-1-a, GP-GM WC=5.4%
								-3.50	Moist GRAVEL, some brown, fine to coarse sand, little silt, (Fill).		
								-5.00	Brown, moist, clay SILT. ≈S4		
5									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL		
10											
15											
20											
25											

Remarks: Offsets measured from existing centerline.