Highway Program

Jeff Adams, Program Manager

Memorandum

DATE: April 3, 2007

TO: Heath Cowan **DEPT:** Region 3

FROM: Scott A. Hayden **DEPT:** Highway Program

SUBJECT: Final Soils Memo – Jay-Wilton, Rte. 156, Pin 12774.00
No. 2007-105

Site Description

A subsurface investigation has been completed for a 1.8 mile portion of Route 156 in the towns of Jay and Wilton. The project begins at the intersection of Route 133 and extends west 1.8 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. 133/156) 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	73 %
Range of Recommended Overlay Thickness	0.5" – 5"
Average Recommended Overlay Thickness	2.5"

The subgrade resilient modulus is very low (< 3000psi) for approximately 12 % 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 silt soils. These areas could be soft especially during the spring. Depending on the conditions at the time of construction the use of 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 35+00 – 50+00. 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 Subgrade Modulus (psi)
14+00 – 16+00	SiSa	14	41	2758
34+00 – 36+00	SiSa	14	38-53	2109
38+00 – 43+00	SiSa	14	53	2651
46+00 – 51+00	SaSi	14	53	2600
69+00 – 72+00	SaSi	25	52	2600
94+00 – 97+00	SiSa	14	39	2700

Boring Information

The subsurface investigation consisted of 9 power auger borings and 16 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 poor to good. The good pavement conditions are limited to a 2000' section that was overlaid (state aid?) several years ago. The details of what actually took place and when could not be confirmed by the designer/resident engineer.

Four power auger borings and ten pavements cores encountered an unbound pavement layer beneath a solid pavement layer. For a detail listing of pavement measurements refer to the "Pavement Depth Information" sheet included with this memo. A pavement thickness summary follows:

Range of Solid Pavement (SP) Thickness:	3.6" – 7.8"
Average Solid Pavement Thickness:	5"
Range of Unbound Pavement UP) Thickness:	1.2" – 3.6"
Average Unbound Pavement Thickness:	2"
Range of Combined (SP+UP) Pavement Thickness:	3.6" – 9.6"
Average Combined Pavement Thickness:	6"

Note: Pavement thickness estimates are based upon 24 sample locations. Measurements were taken from boring holes and pavement cores. Actual pavement thickness may vary. The maximum sample spacing is 2250 feet.

Base Material

Existing Base Material Type:	SiGSa, SiSaG, SiSa
Percent Passing #200:	5 %-17 %
Range of Base Material Thickness:	6" – 20"
Average Base Thickness:	16"
Quality of Drainage (AASHTO):	Poor - Good
Estimated Existing Permeability:	4-160 ft/day

The existing base material consists of silty gravelly sand or silty sandy gravel, and silty sand. This material has approximately 5%-17% passing the #200 sieve. In the silty gravelly sands and silty sands, the high percentage of fines has affected the permeability. Permeability estimates based upon grain size distribution, are as low as 4 ft/day in areas.

These limited performance characteristics should be taken into consideration when developing performance expectations related to strength and drainage.

Subgrade Soils

The subgrade soils along this project consist of silty sands and sandy silts. These till soils may be very cobbly in areas. The sandy silts and silty sands are very similar. It may be difficult to distinguish between these two soil types in the field. Samples indicate a silt content ranging between 38 % - 53 % 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.

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 – 32+50	SiSa	A-4	S2,4	38 - 41	2.7 – 5.6	4.2
32+50 – 52+00	SaSi	A-4	S6	53	2.1 – 3.5	2.7
*52+00 – 67+50	SaSi	A-4	S6	53	4.4 – 5.6	5.3
67+50 – 105+00	SiSa/SaSi	A-4	S8,11	39 – 52	2.5 – 7.1	4.0
Shaded areas represent areas of low subgrade modulus. *Possible State Aid Section?						

Bedrock

No bedrock was encountered in any of the borings. It is anticipated that bedrock will not be encountered within 5' below the existing road surface. The subgrade modulus is quite high (8148 psi) in the vicinity of station 67+50. This could be indicative of the presence of a relatively shallow bedrock surface.

Performance Data Summary

A Performance Data Summary (PDS) sheet has been provided as a separate attachment to this memo. The PDS indicates that the first two thirds of the project (Sta. 10+00 - 72+00) fails to meet at least two of the four minimum performance data criteria.

A visual inspection of the pavement conditions between stations 52+00 – 75+00 (Davis Road) indicates that pavement is in good condition. However, the PDS indicates a lack of adequate base thickness and the existing structural number fails to meet the future traffic structural number. The good pavement conditions are likely because it appears that this section of roadway was recently overlaid or was part of a recent state aid reconstruction? (The designer could not confirm what was done in this area). Another likely factor contributing to the good pavement conditions is that this section is built upon fill and subgrade is well above the existing ground surface. In areas where the road is built upon native soils (cut sections), pavement distress is visible. Frequently, transverse cracks are present along the transition between the cut and fill sections. A power auger boring at station 62+50 indicates that the existing base material consist of silty sand with 17 % passing the #200 sieve rather than gravel. Although the pavement conditions are generally good at this time, this section (especially the cut areas) should be included for rehabilitation consideration.

The PDS indicates that the last third of the project (Sta.72+00 – 105+00) generally meets 3 or 4 of the minimum performance criteria. Borings indicate that adequate pavement and base thickness exists. However the pavement conditions are only fair. It is anticipated that this area is under performing due to age and the lack of drainage. Much of this section consists of a closed or box section without the existence of any underdrain system.

The following table is a summary of the PDS sheet. Please refer to the PDS Sheet for a detailed listing of existing conditions and minimum performance data criteria.

Station	Comments
10+00 – 32+50	Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations. Variable depth gravel placement between stations 12+50 – 20+00 could be considered.
32+50 – 52+00	Additional pavement, base and drainage improvements are required to meet the future structural number and performance expectations. Very low subgrade resilient modulus values (< 3000 psi) were encountered throughout much of this section. Some areas could be problematic during construction if moist to wet conditions exist. Improvements to the existing drainage will be very important. Variable depth gravel placement has been recommended.
52+00 – 75+00	Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations. Ditching within the existing cut sections will be important in approving performance. Variable depth gravel placement could be considered between stations 52+00 – 71+00.
75+00 – 90+00	Additional pavement and drainage improvements will be required to meet future performance expectations. Adequate ditching in this area is critical.
90+00 – 105+00	Additional pavement, base and drainage improvements may be required to meet the future structural number and performance expectations. Low subgrade resilient modulus. Underdrain is recommended throughout this section if adequate ditches cannot be established.

Recommendations

1. It is recommended that additional base material be considered between stations 32+50 and 52+00 due to varying existing base thickness, low subgrade resilient modulus values, and steep grade (slow moving loaded truck traffic).

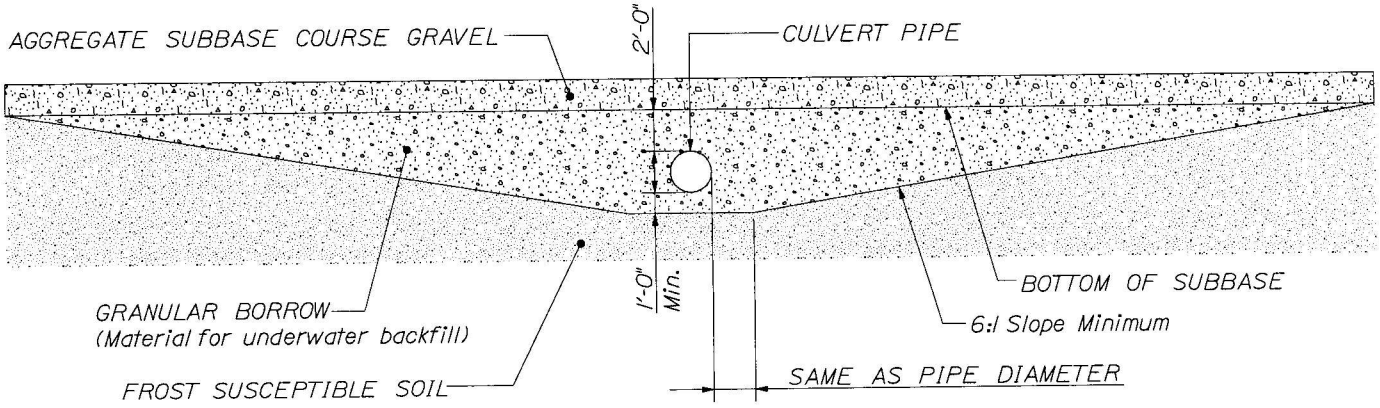
2. It is recommended that existing cross pipes be lowered to allow for adequate deepening of existing ditches as well as for the construction of new ditches. To aid in the prevention of differential heaving, it is recommended that the cross pipes be installed using the attached schematic for cross pipe installation in frost susceptible soils.

3. 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.

4. It is recommended that underdrain be installed between stations 90+00 and 105+00.

5. Due to the cobbly nature of the till soils, scarifying (6 inches) should be considered if the pavement is removed in any areas. It is anticipated that some of these cobbles may be present in the existing base layer.

CROSS CULVERT IN FROST SUSCEPTIBLE SOILS



February 6, 2007

Falling Weight Deflectometer (FWD)
Summary Sheet

Project #: 12774.00
Town(s): Jay-Wilton
Route(s): #156
Date Tested: 05/24/2006
Requested By: S. Hayden
Direction of Testing: North

# Of FWD tests: 38	# Of Power Augers/Spoons 9/0
Design Life: 12 Yrs	Future 18-kip ESALs (Design Life): 477,420
Initial Serviceability: 4.5	Terminal Serviceability: 2.5
Reliability Level: 95%	Overall Standard Deviation: .45

Locations

Distance (Feet)	Description

Comments:

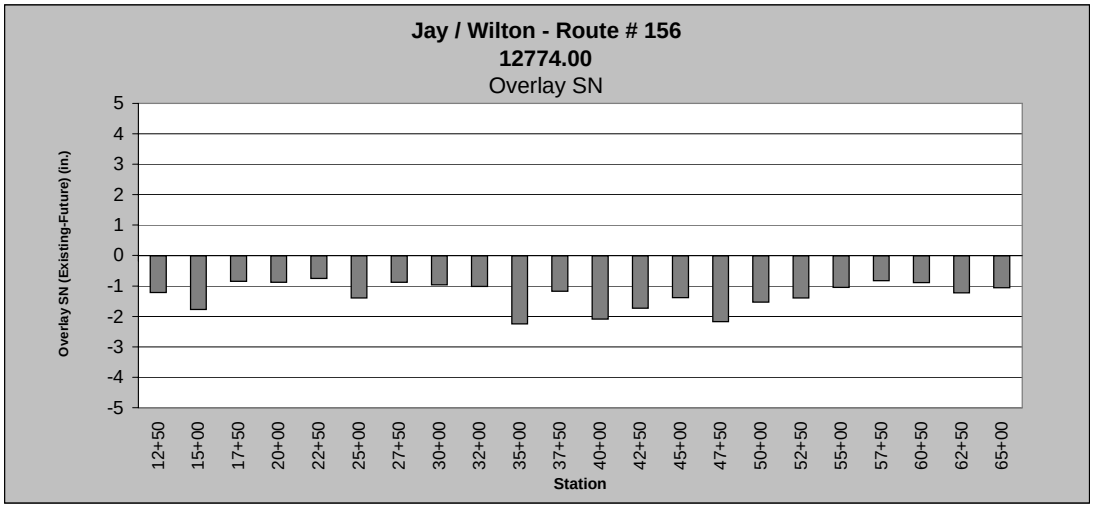
Jay/Wilton - Route #156
12774.00

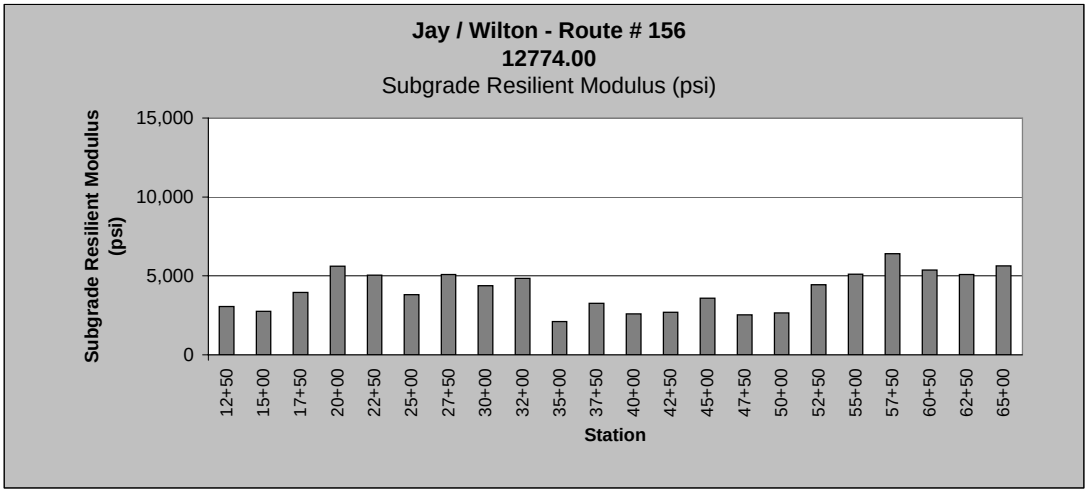
February 5, 2007

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	3.15	4.36	**-1.21**	**2.75**	70,740	3,066	3.6	**16.9**
15+00	2.75	4.52	**-1.77**	**4.02**	47,523	**2,758**	3.6	**16.9**
17+50	3.15	4	**-0.85**	**1.93**	72,295	3,958	3.6	**16.8**
20+00	2.66	3.54	**-0.88**	**2**	43,619	5,622	3.6	**16.8**
22+50	2.93	3.68	**-0.75**	**1.7**	58,310	5,038	3.6	**16.8**
25+00	2.66	4.05	**-1.39**	**3.16**	43,565	3,809	3.6	**16.8**
27+50	2.78	3.66	**-0.88**	**2**	49,703	5,094	3.6	**16.8**
30+00	2.9	3.86	**-0.96**	**2.18**	56,707	4,386	3.6	**16.8**
32+00	2.72	3.73	**-1.01**	**2.3**	46,423	4,849	3.6	**16.8**
35+00	2.68	4.93	**-2.25**	**5.11**	73,597	**2,109**	6	**14.2**
37+50	3.1	4.27	**-1.17**	**2.66**	114,690	3,254	6	**14.2**
40+00	2.52	4.61	**-2.09**	**4.75**	61,516	**2,599**	6	**14.2**
42+50	2.82	4.55	**-1.73**	**3.93**	85,966	**2,703**	6	**14.2**
45+00	2.76	4.14	**-1.38**	**3.14**	80,763	3,585	6	**14.2**
47+50	2.47	4.64	**-2.17**	**4.93**	58,028	**2,541**	6	**14.2**
50+00	3.04	4.57	**-1.53**	**3.48**	107,982	**2,659**	6	**14.2**
52+50	2.45	3.84	**-1.39**	**3.16**	86,918	4,440	4.2	**12.3**
55+00	2.61	3.66	**-1.05**	**2.39**	104,662	5,098	4.2	**12.3**
57+50	2.55	3.38	**-0.83**	**1.89**	97,322	6,400	4.2	**12.3**
60+50	2.71	3.6	**-0.89**	**2.02**	116,939	5,368	4.2	**12.3**
62+50	2.43	3.66	**-1.23**	**2.8**	84,166	5,092	4.2	**12.3**
65+00	2.48	3.54	**-1.06**	**2.41**	89,661	5,628	4.2	**12.3**

Weak Subgrade
Strong Subgrade

*** For actual Gravel Depths, see logdraft forms**





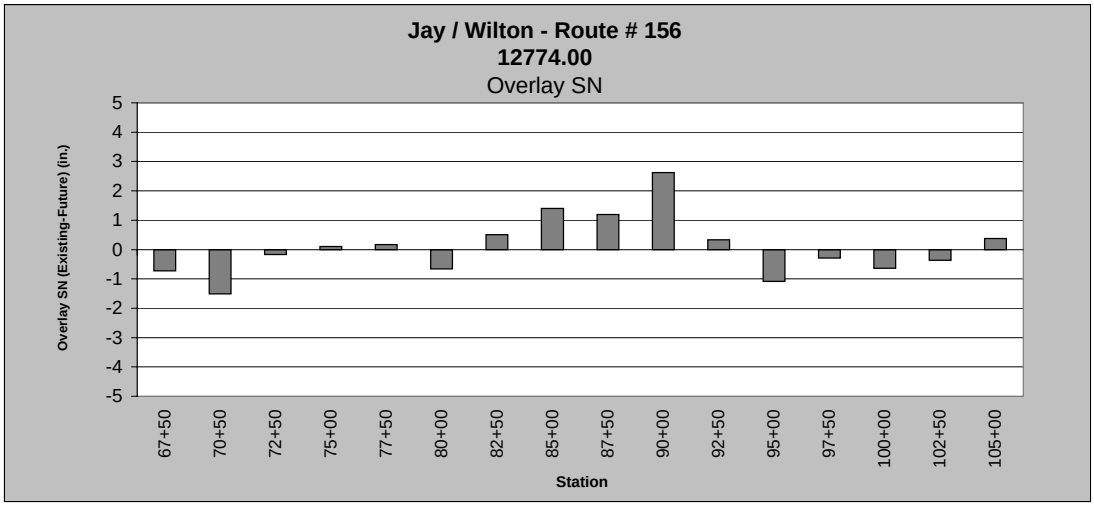
Jay/Wilton - Route #156
12774.00

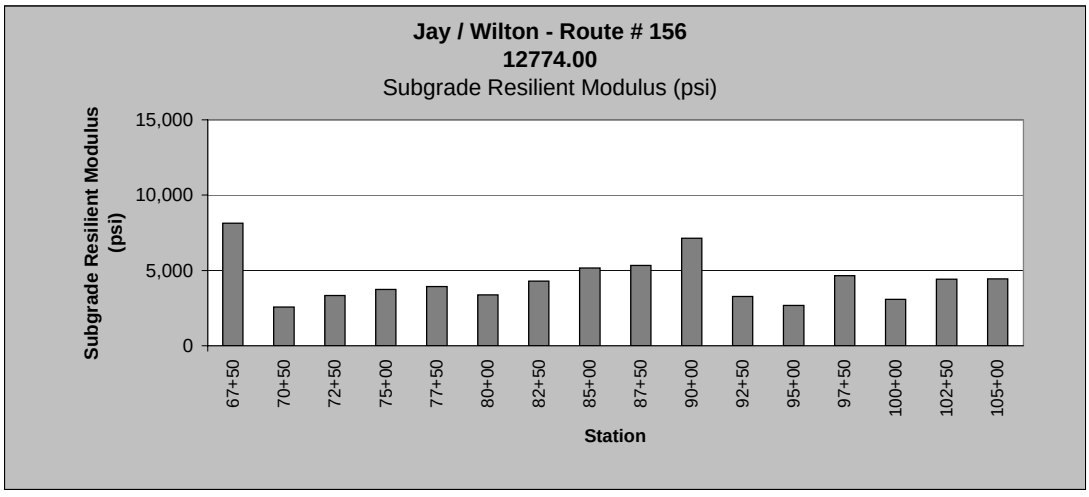
February 5, 2007

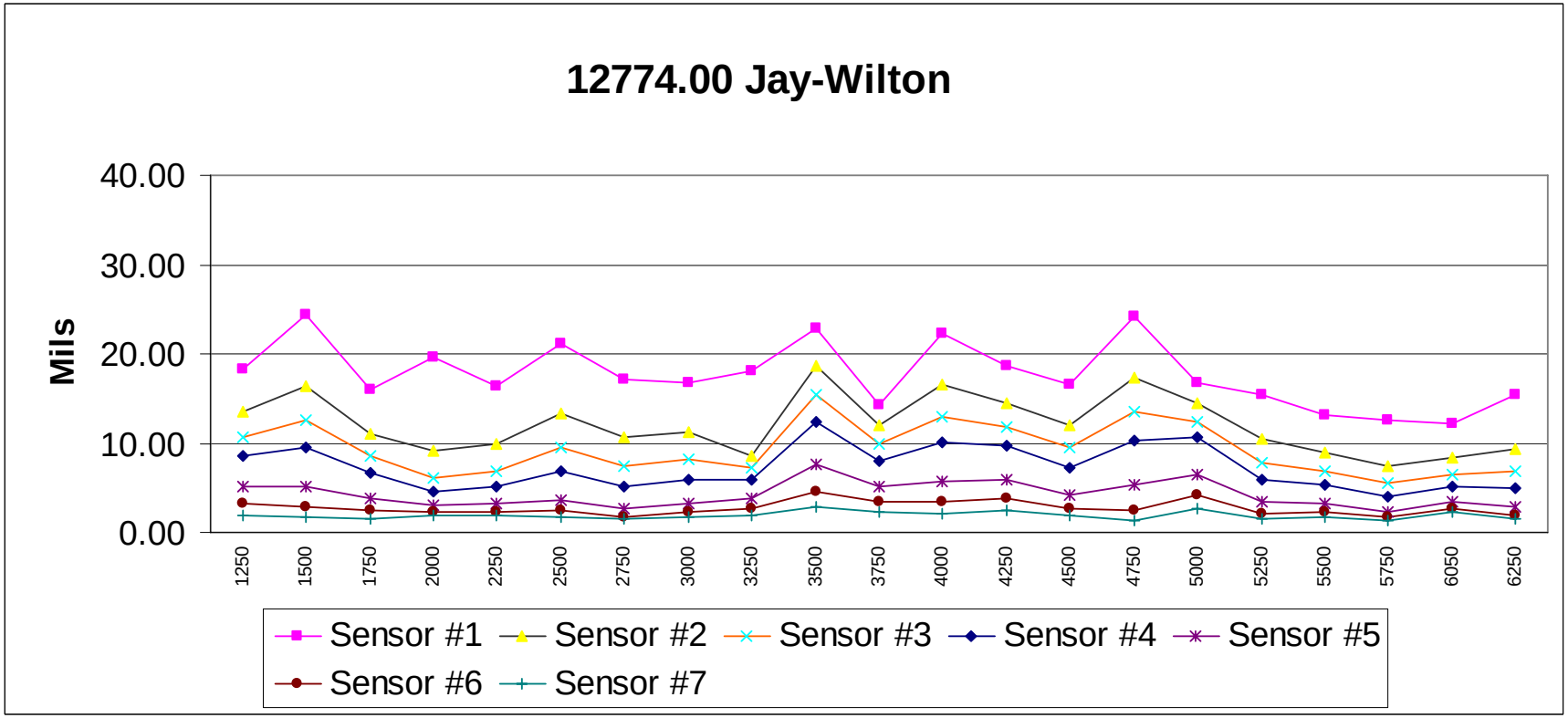
Station (Feet)	Existing Structural Number (in.)	Future Traffic Structural Number (in.)	Overlay Structural Number (Existing - Future)	Recommended Pavement Thickness (in.)	Pavement Modulus (psi)	Subgrade Resilient Modulus (psi)	Pavement Depth (in)	* Combined Pavement/Gravel Depth Used for Calculation (in)
67+50	2.38	3.1	**-0.72**	**1.64**	79,687	**8,148**	4.2	**12.3**
70+50	3.12	4.63	**-1.51**	**3.43**	35,318	**2,563**	4.6	21.1
72+50	4.07	4.24	**-0.17**	**0.39**	46,249	3,328	4.2	25.2
75+00	4.18	4.08	0.1	-	50,103	3,732	4.2	25.2
77+50	4.18	4.01	0.17	-	50,083	3,922	4.2	25.2
80+00	3.56	4.22	**-0.66**	**1.5**	30,971	3,385	4.2	25.2
82+50	4.4	3.89	0.51	-	41,803	4,299	4.2	28.2
85+00	5.04	3.64	1.4	-	62,669	5,168	4.2	28.2
87+50	4.8	3.61	1.19	-	54,239	5,326	4.2	28.2
90+00	5.87	3.25	2.62	-	99,224	7,129	4.2	28.2
92+50	4.59	4.26	0.33	-	57,494	3,276	7.8	26.4
95+00	3.49	4.57	**-1.08**	**2.45**	25,444	**2,670**	7.8	26.4
97+50	3.49	3.78	**-0.29**	**0.66**	46,469	4,647	6	21.6
100+00	3.72	4.36	**-0.64**	**1.45**	56,167	3,077	6	21.6
102+50	3.48	3.85	**-0.37**	**0.84**	46,001	4,417	6	21.6
105+00	4.22	3.84	0.38	-	81,655	4,446	6	21.6

Weak Subgrade
Strong Subgrade

*** For actual Gravel Depths, see logdraft forms**



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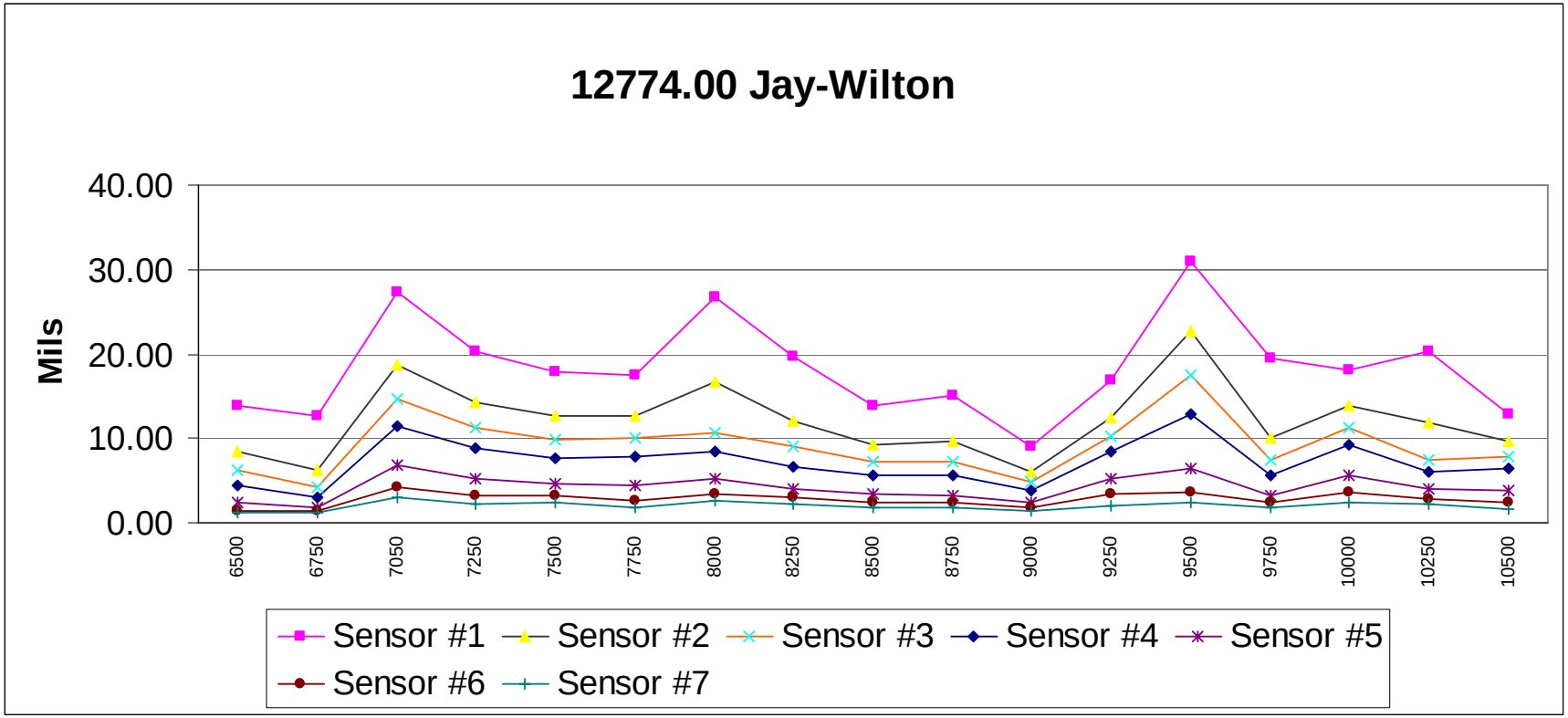
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Performance Data Summary Sheet

Jay – Wilton Rte 156
CHIP
11774.00

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	4						
15+00	4		3.6 SP 4.8UP 10.8	SiGSa A-1-b S1	5 0 Damp	SiSa A-4 S2	41 III Damp
17+50	3			15+91 cross pipe heaving			
20+00	2						
22+50	2						
25+00	2		3.6 SP - 20.4	SiSa A-2-4 S3	17 II Damp	GSiSa A-4 S4	38 III Moist
27+50	2						
30+00	2						
32+50	2						
35+00	3						
37+50	2						
40+00	3		6.0 SP 3.6 UP 6.0	SiGSA A-1-b S5	16 II Damp	GSaSi A-4 S6	53 IV Damp
42+50	3						
45+00	2			45+08 transverse cracking (heave?)			
47+50	3						
50+00	3						
52+50	2						
55+00	2						
57+50	2						
60+50	2						
62+50	2		4.2 SP - 16.2	SiSa A-2-4 S3	17 II Damp	GSaSi A-4 S6	53 IV Damp
65+00	2			62+87 transverse cracking (heave?)			
67+50	2			68+00 – 69+00 slight heaving in vicinity of cut/fill boundary			
70+50	3						

Pavement Thickness (4 inches)
Base Thickness (18 inches)
Subgrade Modulus (3000 psi)
Darwin Results

* 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

Jay – Wilton Rte 156
CHIP
11774.00

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+50	2					4.6 SP - 19.4	SiGSa A-1-b S7	12 0 Damp	SaSi A-4 S8	52 IV Wet 3.7'
72+50	1									
75+00	0									
77+50	0									
80+00	1					4.2 SP 3.0 UP 18.0	SiSaG A-1-a S10	8 0 Damp	SiSa A-4 S11	39 III Moist
82+50	0									
85+00	0									
87+50	0					4.2 SP 1.8 UP 20.4	SiSaG A-1-a S10	8 0 Damp	GSISa A-2-4 S12	26 II Moist
90+00	0									
92+50	0									
95+00	2					7.8 SP - 18.6	SiSaG A-1-a S10	8 0 Damp	SiSa A-4 S11	39 III Moist
97+50	2									
100+00	3									
102+50	2					6.0 SP - 15.6	SiSaG A-1-a S10	8 0 Damp	SiSa A-4 S11	39 III Moist
105+00	1									

Pavement Thickness (4 inches)
Base Thickness (18 inches)
Subgrade Modulus (3000 psi)
Darwin Results

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

PAVEMENT DEPTH INFORMATION
Jay - Wilton
Rte. 156
12774.00

STATION	LEFT			CL	RIGHT		
	15’	**10’**	**5’**		**5’**	**10’**	**15’**
15+00		6.0 SP 1.8 UP **7.8**	4.2 SP 3.0 UP **7.2**	5.4 SP 1.8 UP **7.2**	3.6 SP 3.6 UP **7.2**	(9’) 3.6 SP 4.8 UP **8.4**	
25+00					(7.5’) 3.6 SP - **3.6**		
40+00		6.0 SP 1.8 UP **7.8**	6.0 SP 1.2 UP **7.2**	5.4 SP 1.8 UP **7.2**	6.0 SP 1.8 UP **7.8**	(9’) 6.0 SP 3.6 UP **9.6**	
62+50		4.8 SP - **4.8**	3.6 SP - **3.6**	4.2 SP - **4.2**	3.6 SP - **3.6**	(8.0’) 4.2 SP - **4.2**	
70+50					(7.0’) 4.6 SP - **4.6**		
80+00					(6.5’) 4.2 SP 3.0 UP **7.2**		
87+50		4.8 SP 2.4 UP **7.2**	4.8 SP - **4.8**	5.4 SP - **5.4**	4.2 SP 1.8 UP **6.0**		
95+00					(6.8’) 7.8 SP - **7.8**		
102+50					(6.3’) 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

Pavement Core Summary Sheet

Town(s): Jay-Wilton Project Number: 12774.00

Station (Feet)	Offset (Feet)	Pavement Depth (Feet)	Unbound Pavement	PC-Number	Saved Core	Comments / Date 11/28/2006
15+00	10.0 Lt.	0.50	0.50-0.65		no	5" Solid Stem Auger
15+00	5.0 Lt.	0.35	0.35-0.60		no	
15+00	CL	0.45	0.45-0.60		no	
15+00	5.0 Rt.	0.30	0.30-0.60		no	
40+00	10.0 Lt.	0.50	0.50-0.65		no	
40+00	5.0 Lt.	0.50	0.50-0.60		no	
40+00	CL	0.45	0.45-0.60		no	
40+00	5.0 Rt.	0.50	0.50-0.65		no	
62+50	10.0 Lt.	0.40			no	
62+50	5.0 Lt.	0.30			no	
62+50	CL	0.35			no	
62+50	5.0 Rt.	0.30			no	
87+50	10.0 Lt.	0.40	0.40-0.60		no	
87+50	5.0 Lt.	0.40			no	
87+50	CL	0.45			no	
87+50	5.0 Rt.	0.35	0.35-0.50		no	

Logged By: G. Lidstone
MaineDOT Drill Crew
CME 45C

State of Maine - Department of Transportation

Laboratory Testing Summary Sheet

Town(s): Jay-Wilton Project Number: 12774.00

Boring & Sample Identification Number	Station (Feet)	Offset (Feet)	Depth (Feet)	Reference Number	G.S.D.C. Sheet	W.C.	% Passing 200 Sieve	Classification		
								Unified	AASHTO	Frost
HB-JAWI-101, S1	15+00	9.0 Rt.	0.70-1.6	209776	1	7.0	5.1	SP-SM	A-1-b	0
HB-JAWI-101, S2	15+00	9.0 Rt.	1.6-5.0	209777	1	14.1	40.8	SM	A-4	III
HB-JAWI-102, S3	25+00	7.5 Rt.	0.30-2.0	209778	1	6.2	17.1	SM	A-2-4	II
HB-JAWI-102, S4	25+00	7.5 Rt.	3.3-5.0	209779	1	14.3	37.9	SM	A-4	III
HB-JAWI-103, S5	40+00	9.0 Rt.	0.80-1.3	209780	1	6.5	15.9	SM	A-1-b	II
HB-JAWI-103, S6	40+00	9.0 Rt.	1.3-5.0	209781	1	12.7	52.9	ML	A-4	IV
HB-JAWI-105, S7	70+50	7.0 Rt.	0.38-2.0	209782	2	4.8	11.5	SW-SM	A-1-b	0
HB-JAWI-105, S8	70+50	7.0 Rt.	2.0-3.7	209783	2	24.7	51.6	ML	A-4	IV
HB-JAWI-105, S9	70+50	7.0 Rt.	3.7-5.0	209784	2	38.8	48.4	SM	A-4	III
HB-JAWI-106, S10	80+00	6.5 Rt.	0.60-2.1	209785	2	2.7	8.2	GW-GM	A-1-a	0
HB-JAWI-106, S11	80+00	6.5 Rt.	2.1-5.0	209786	2	13.8	39.3	SM	A-4	III
HB-JAWI-107, S12	87+50	5.4 Rt.	2.2-3.9	209787	2	14.5	25.8	SM	A-2-4	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

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 156
Location: Jay-Wilton, Maine

Boring No.: HB-JAWI-101
PIN: 12774.00

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:	11/28/06-11/28/06	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	15+00, 9.0' 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

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 - 1.60			SSA	-0.30		PAVEMENT.	
							-0.70		0.30	
	S2		1.60 - 5.00						Unbound PAVEMENT.	G#209776 A-1-b, SP-SM WC=7.0%
							-1.60		0.70	
									Dark brown, damp, fine to coarse SAND, some gravel, little silt, (Fill).	G#209777 A-4, SM WC=14.1%
									1.60	
									Brown, damp, sandy SILT, little gravel.	
5							-5.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface.	
									NO REFUSAL	
10										
15										
20										
25										

Remarks:

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: Route 156
Location: Jay-Wilton, Maine

Boring No.: HB-JAWI-102
PIN: 12774.00

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:	11/28/06-11/28/06	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	25+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_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: 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		0.30 - 2.00			SSA	-0.30		PAVEMENT.	
									0.30 — Brown, damp, fine to medium SAND, little gravel, trace silt.	G#209778 A-2-4, SM WC=6.2%
							-2.00		2.00 — Similar to above, but with cobbles.	
	S4		3.30 - 5.00				-3.30		3.30 — Brown, moist, silty fine to medium SAND, cobbles, little gravel, trace coarse sand.	G#209779 A-4, SM WC=14.3%
5							-5.00		5.00 — **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 156
Location: Jay-Wilton, Maine

Boring No.: HB-JAWI-103
PIN: 12774.00

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:	11/28/06-11/28/06	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	40+00, 9.0' 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

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	S5		0.80 - 1.30			SSA	-0.50		PAVEMENT.	
									0.50	
	S6		1.30 - 5.00				-0.80		Unbound PAVEMENT.	G#209780 A-1-b, SM WC=6.5%
							-1.30		0.80	
									Brown, damp, fine to medium SAND, some gravel, trace coarse sand, (Fill).	G#209781 A-4, ML WC=12.7%
									1.30	
									Brown, damp, sandy SILT, cobbles, little gravel.	
5							-5.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface.	
									NO REFUSAL	
10										
15										
20										
25										

Remarks:

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: Route 156
Location: Jay-Wilton, Maine

Boring No.: HB-JAWI-104
PIN: 12774.00

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:	11/28/06-11/28/06	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	62+50, 8.0' 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

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						SSA	-0.35		PAVEMENT.	
									0.35	
									Brown, damp, fine to medium SAND, little gravel, trace silt. ≅S3	
							-1.70		1.70	
									Brown, damp, sandy SILT, cobbles, little gravel. ≅S6	
5							-5.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface.	
									NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 156
Location: Jay-Wilton, Maine

Boring No.: HB-JAWI-105
PIN: 12774.00

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:	11/28/06-11/28/06	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	70+50, 7.0' Rt.	**Casing ID/OD:**	N/A	**Water Level*:**	3.7' 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

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	S7		0.38 - 2.00			SSA	-0.38		PAVEMENT.	
									0.38 Brown, damp, fine to coarse SAND, some gravel, trace silt, (Fill).	G#209782 A-1-b, SW-SM WC=4.8%
	S8		2.00 - 3.70				-2.00		2.00 Brown, moist, silty fine SAND.	G#209783 A-4, ML WC=24.7%
	S9		3.70 - 5.00				-3.70		3.70 Brown, wet, silty fine SAND.	G#209784 A-4, SM WC=38.8%
5							-5.00		5.00 **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 156
Location: Jay-Wilton, Maine

Boring No.: HB-JAWI-106
PIN: 12774.00

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:	11/28/06-11/28/06	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	80+00, 6.5' 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: 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	S10		0.60 - 2.10			SSA	-0.35		PAVEMENT.	
							-0.60		0.35	G#209785
									Unbound PAVEMENT.	A-1-a, GW-GM
									0.60	WC=2.7%
	S11		2.10 - 5.00				-2.10		Damp GRAVEL, some brown, fine to coarse sand, trace silt, (Fill).	G#209786
									2.10	A-4, SM
									Brown, moist, silty fine SAND, trace medium and coarse sand, trace gravel.	WC=13.8%
5							-5.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface.	
									NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 156
Location: Jay-Wilton, Maine

Boring No.: HB-JAWI-107
PIN: 12774.00

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:	11/28/06-11/28/06	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	87+50, 5.4' 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: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA	-0.35		PAVEMENT.	
							-0.50		0.35	
									Unbound PAVEMENT.	
									0.50	
									Damp GRAVEL, some brown, fine to coarse sand, trace silt, (Fill). ≅S10	
	S12		2.20 - 3.90				-2.20		2.20	G#209787 A-2-4, SM WC=14.5%
									Grey, damp, silty fine to coarse SAND, frequent cobbles, little gravel.	
							-3.90		3.90	
									Brown, moist, silty fine SAND, trace medium and coarse sand, trace gravel. ≅S11	
5							-5.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface.	
									NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 156
Location: Jay-Wilton, Maine

Boring No.: HB-JAWI-108
PIN: 12774.00

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:	11/28/06-11/28/06	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	95+00, 6.8' 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
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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						SSA	-0.65		PAVEMENT. 0.65	
									Damp GRAVEL, some brown, fine to coarse sand, trace silt, (Fill). ≅S10	
							-2.20		2.20	
									Brown, moist, silty fine SAND, trace medium and coarse sand, trace gravel. ≅S11	
5							-5.00		5.00	
									Bottom of Exploration at 5.00 feet below ground surface. NO REFUSAL	
10										
15										
20										
25										

Remarks:

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Route 156
Location: Jay-Wilton, Maine

Boring No.: HB-JAWI-109
PIN: 12774.00

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:	11/28/06-11/28/06	**Drilling Method:**	Solid Stem Auger	**Core Barrel:**	N/A
Boring Location:	102+50, 6.3' 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: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0						SSA	-0.50		PAVEMENT.	
									0.50 — Damp GRAVEL, some brown, fine to coarse sand, trace silt, (Fill). ≅S10	
							-1.80		1.80 — Brown, moist, silty fine SAND, trace medium and coarse sand, trace gravel. ≅S11	
5							-5.00		5.00 — **Bottom of Exploration at 5.00 feet below ground surface.** NO REFUSAL	
10										
15										
20										
25										

Remarks:

STRONG ODOR IN THIS BORING.

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.