

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

To: Mike Hedges, P.E, Asset Management and Performance Bureau, Budget and Programming Manager

From: Alex Flinn, Rotation Engineer via Callie Ewald, P.E., Geotechnical Engineering Manager

Date: June 21st, 2017

Subject: Johnson-Morristown STP 2919(1) –Geotechnical Data Report

1.0 INTRODUCTION

As requested, we have completed an additional geotechnical investigation for a potential full-depth reclamation project along VT Route 15 located in the towns of Johnson, Hyde Park, and Morristown, Vermont. Borings were also performed on a section of Historic VT Route 100 and VT Route 15A in Morristown. This investigation included 64 pavement cores along VT 15, three roadway borings with pavement cores along Historic VT 100, and seven roadway borings with pavement cores along VT 15A.

The original investigation was performed by Terracon Consultants of Manchester, NH and consisted of 67 roadway borings, five test pits, visual pavement observations, and laboratory testing for the 8.548 mile section of VT 15 between Johnson and Morristown. The results of the previous subsurface investigation can be found in the geotechnical report provided to Callie Ewald dated December 30, 2016. Our additional investigation was performed to confirm the original pavement thickness measurements and to provide subsurface data for the additional roadway sections along Historic VT Route 100 and VT Route 15A.

Contained herein are the results of field measurements, sampling, testing, and laboratory analyses of soil borings performed in the roadway.

2.0 FIELD INVESTIGATION

The field investigation was conducted between May 15th and 19th, 2017 and consisted of a total of 74 pavement cores and ten solid-stem auger borings. The solid stem auger borings were performed in general accordance with AASHTO test method T 306, *Processing Auger Borings for Geotechnical Explorations*. 64 of the 74 pavement cores (C-1 to C-16, C-18 to C-42, and C-44 to C-66) were collected along VT 15 between Johnson and Morristown, in the vicinity of the original roadway borings performed by Terracon in September 2016. These cores were performed to measure pavement thickness. Some locations could not be cored due to traffic control issues (C-17 and C-43).

The remaining ten pavement cores were collected from seven locations along VT 15A (B-200 to B-206) and three locations along Historic VT 100 (B-207 to B-209). Once the pavement core was extracted, a 4-inch solid stem auger flight was rotary drilled through each of these ten pavement cores to 5 feet below the top of the roadway at each location. The auger was then removed so that a visual observation of the soil profile could be made. This method has proven to be an efficient and reasonably accurate way to view changes in strata and obtain samples off the auger flights. A summary of the locations and results of the pavement cores for VT 15, VT

15A, and VT 100 can be found in Tables 2.1,2.2, and 2.3, respectively, as well as attached to this report.

Table 2.1: Pavement Core Locations on VT 15

Town	Boring No.	Approx. Mile Marker	Offset from C/L (ft.)	Asphalt Pavement Thickness (ft.)
Johnson	C-1	4.43	9.6	0.49
Johnson	C-2	4.56	-8.5	0.54
Johnson	C-3	4.70	8.9	0.70
Johnson	C-4	4.84	-7.4	0.37
Johnson	C-5	4.96	-9.8	0.35
Johnson	C-6	5.10	8.8	Not Measured*
Johnson	C-7	5.27	-7.7	0.37
Johnson	C-8	5.39	-8.4	0.38
Johnson	C-9	5.50	-10.4	0.36
Johnson	C-10	5.67	7.1	0.31
Johnson	C-11	5.81	7.7	0.30
Johnson	C-12	5.95	7.8	0.45
Johnson	C-13	6.10	-8.1	0.34
Johnson	C-14	6.25	7.2	0.28
Johnson	C-15	6.39	-6.0	0.28
Johnson	C-16	6.53	8.7	0.45
Johnson	C-17	6.67	Not Measured	Not Cored**
Johnson	C-18	6.81	6.1	0.32
Hyde Park	C-19	0.17	-8.0	0.31
Hyde Park	C-20	0.25	7.5	0.29
Hyde Park	C-21	0.38	-5.1	0.27
Hyde Park	C-22	0.54	9.7	0.60
Hyde Park	C-23	0.67	-9.2	0.55
Hyde Park	C-24	0.83	9.6	0.57
Hyde Park	C-25	0.99	-8.6	0.56
Hyde Park	C-26	1.12	9.9	0.54
Hyde Park	C-27	1.26	-8.2	0.61
Hyde Park	C-28	1.39	10.9	0.70
Hyde Park	C-29	1.55	-9.3	0.21
Hyde Park	C-30	1.69	10.0	0.38
Hyde Park	C-31	1.99	10.3	0.56
Hyde Park	C-32	2.14	-9.2	0.20
Hyde Park	C-33	2.27	11.0	0.22

Town	Boring No.	Approx. Mile Marker	Offset from C/L (ft.)	Asphalt Pavement Thickness (ft.)
Hyde Park	C-34	2.43	-7.9	0.30
Hyde Park	C-35	2.55	10.2	0.28
Hyde Park	C-36	2.69	-9.7	0.71
Hyde Park	C-37	2.76	8.9	0.36
Morristown	C-38	0.09	-9.3	0.40
Morristown	C-39	0.21	9.7	0.30
Morristown	C-40	0.33	-10.0	0.29
Morristown	C-41	0.47	9.8	0.31
Morristown	C-42	0.62	-9.0	0.70
Morristown	C-43	0.77	Not Measured	Not Cored**
Morristown	C-44	0.93	Not Measured	0.56
Morristown	C-45	1.06	7.0	0.25
Morristown	C-46	1.22	-6.0	0.29
Morristown	C-47	1.34	8.0	0.26
Morristown	C-48	1.47	-7.3	0.29
Morristown	C-49	1.65	6.1	0.26
Morristown	C-50	1.79	-8.6	0.21
Morristown	C-51	1.92	7.8	0.30
Morristown	C-52	2.09	-7.4	0.29
Morristown	C-53	2.20	7.6	0.46
Morristown	C-54	2.33	-7.8	0.33
Morristown	C-55	2.47	6.9	0.35
Morristown	C-56	2.66	-9.1	0.31
Morristown	C-57	2.81	5.7	0.31
Morristown	C-58	2.95	-6.7	0.29
Morristown	C-59	3.08	6.4	0.58
Morristown	C-60	3.23	-8.4	0.83
Morristown	C-61	3.37	6.0	0.90
Morristown	C-62	3.53	-6.8	0.79
Morristown	C-63	3.66	5.2	0.83
Morristown	C-64	3.75	-7.0	0.92
Morristown	C-65	3.96	6.0	0.69
Morristown	C-66	4.05	-7.5	0.77

*C-6 was stuck in the core barrel and could not be removed for measurement

** C-17 and C-43 locations were not cored due to traffic control constraints

Table 2.2: Pavement Core Locations on VT-15A

Town	Boring No.	Route Number	Approx. Mile Marker	Offset from C/L (ft.)	Asphalt Pavement Thickness (ft.)
Morristown	B-200	VT-15A	0.36	8.7	1.25
Morristown	B-201	VT-15A	0.55	-7.4	0.30
Morristown	B-202	VT-15a	0.76	8.0	0.55
Morristown	B-203	VT-15A	0.96	-6.7	0.50
Morristown	B-204	VT-15A	1.17	7.5	0.50
Morristown	B-205	VT-15a	1.38	-7.5	0.47
Morristown	B-206	VT-15A	1.52	8.1	0.85

Table 2.2: Pavement Core Locations on VT-100

Town	Boring No.	Route Number	Approx. Mile Marker	Offset from C/L (ft.)	Asphalt Pavement Thickness (ft.)
Morristown	B-207	VT-100	6.20	11.0	0.70
Morristown	B-208	VT-100	6.40	-12.6	0.63
Morristown	B-209	VT-100	6.55	15.6	0.65

All pavement cores were performed using the Acker trailer-mounted coring machine and the roadway auger borings were performed using the Mobile truck-mounted auger rig.

For each auger boring, soil samples were visually identified and taken back to the Construction and Materials Bureau Central Laboratory for testing and classification. Pavement cores were measured in the field and were not saved for testing.

3.0 FIELD AND LABORATORY TESTING

3.1 Pavement Cores

Pavement cores were measured in the field to the nearest hundredth of a foot. Care was taken to separate any Reclaimed-Stabilized Base (RSB) material from the pavement cores that may have adhered to the pavement and could affect accurate pavement thickness measurements. It should be noted that the coring of the RSB material was attempted, however, the material would typically crumble upon coring and extraction.

3.2 Pavement Auger Borings

Laboratory tests were conducted on samples to evaluate grain size, moisture content, and percent finer than No. 200 sieve. This testing, along with field descriptions, was conducted on all of the soil samples and can be found on the attached drilling notes.

4.0 SUBSURFACE PROFILE

4.1 Pavement Cores

Review of the field measurements of pavement cores revealed the following subsurface information:

For the VT 15 section of the project, the thickness of bituminous pavement varied from a minimum of 0.20 feet (2.4 inches) at location C-32 (mile marker 2.14 in Hyde Park) to a maximum of 0.92 feet (11 inches) at location C-64 (mile marker 3.75 in Morristown). The average thickness of pavement for the VT 15 section was 0.44 feet (5.3 inches).

For the additional sections of the project, the thickness of bituminous pavement varied from a minimum of 0.30 feet (3.6 inches) at location B-201 (mile marker 0.55 on VT 15A in Morristown) to a maximum of 1.25 feet (15 inches) at location B-200 (mile marker 0.36 on VT 15a in Morristown). The average thickness of pavement for the additional sections was 0.64 feet (7.7 inches). Pavement thickness measurements varied widely across the section of VT 15A but were consistent at about 0.65 feet along the section of VT 100.

4.2 Roadway Auger Borings

Review of the lab data, borings, and field testing revealed the following information about soil strata for the roadway auger borings:

Soils underlying the pavement along VT 15A generally consisted of brown silty sandy gravel in borings B-200 to B-203 and brown gravelly silty sand in borings B-204 to B-206. A sandy silt layer was encountered at a depth of 4 feet in boring B-203 but was not observed in other borings. Groundwater was not encountered during drilling, however the moisture contents of the 4 to 5 foot samples in B-203 and B-204 both exceeded 20 percent.

Soils underlying the pavement along VT 100 consisted of brown silty sand that appeared to be of mostly uniform structure in each boring but with slightly higher silt percentages in B-209. Groundwater was not encountered during drilling.

The attached drilling notes contain specific information regarding particle percentages, depths, and additional tests, if applicable. Visual representations of the various strata are provided in the attached subsurface profiles.

5.0 CONCLUSION

We have also provided the boring locations and important information in a spreadsheet that has been requested by the pavement management section for other projects. If any further analysis is needed or you would like to discuss this report, please contact us at (802) 828-1235.

Attachments: Drilling Notes (3 pages)
Boring Locations (3 pages)
Boring Profile Sheet (1 page)

cc: Mike Fowler, P.E., Pavement Management
Electronic Read File/DJH
Project File/CEE
AKF

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Report\Johnson-Morristown STP 2919(1) Geotechnical Data Report.docx

**VERMONT AGENCY OF TRANSPORTATION
CONSTRUCTION & MATERIALS BUREAU
GEOTECHNICAL ENGINEERING SECTION
DRILLING NOTES**

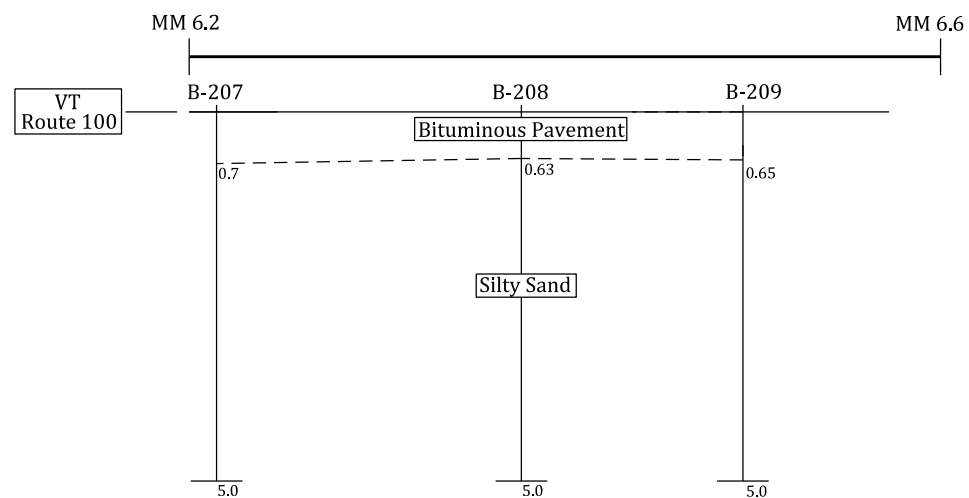
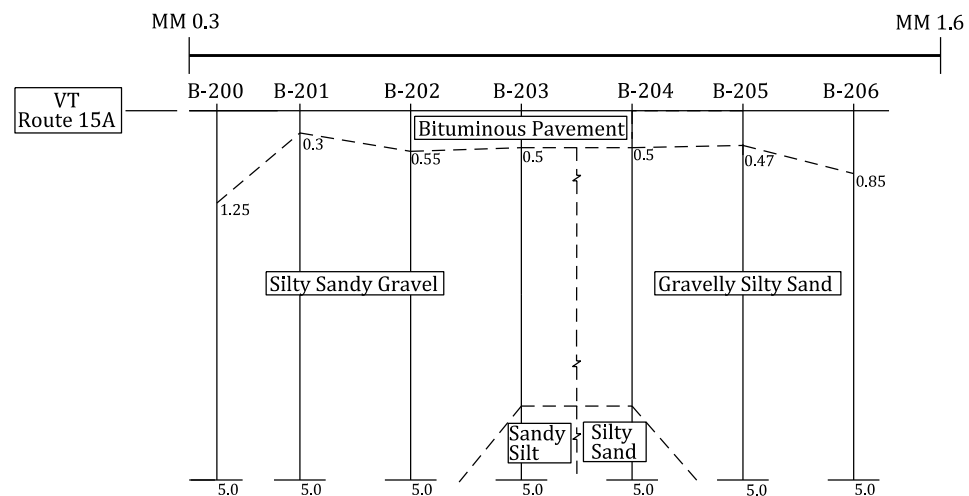
						Laboratory Results (provided for locations where performed)							
Boring ID	Boring Location (MM)	Offset from C/L (ft)	Northing	Easting	Reported Asphalt Depth (ft)	Depth (ft)	% Moisture	AASHTO Classification	% Gravel	% Sand	% Fines	Liquid Limit	Plastic Limit
C-1	4.43 J	9.6	777531.436	1594699.449	0.49								
C-2	4.56 J	-8.5	776494.388	1594638.076	0.54								
C-3	4.70 J	8.9	775879.954	1594477.745	0.70								
C-4	4.84 J	-7.4	775188.114	1594083.298	0.37								
C-5	4.96 J	-9.8	774566.288	1594364.361	0.35								
C-6	5.10 J	8.8	774141.915	1594686.444	NM - stuck in core barrel								
C-7	5.27 J	-7.7	773977.677	1595347.527	0.37								
C-8	5.39 J	-8.4	773640.092	1596099.155	0.38								
C-9	5.50 J	-10.4	773075.472	1596763.128	0.36								
C-10	5.67 J	7.1	772542.269	1597321.453	0.31								
C-11	5.81 J	7.7	772148.282	1597910.869	0.30								
C-12	5.95 J	7.8	771371.512	1598375.694	0.45								
C-13	6.10 J	-8.1	770964.541	1598925.657	0.34								
C-14	6.25 J	7.2	770433.995	1599625.423	0.28								
C-15	6.39 J	-6.0	770138.476	1600063.854	0.28								
C-16	6.53 J	8.7	769679.511	1600753.707	0.45								
C-17	6.67 J	Not Cored											
C-18	6.81 J	6.1	768898.123	1602025.210	0.32								
C-19	0.17 H	-8.0	768385.236	1602719.654	0.31								
C-20	0.25 H	7.5	767702.119	1603153.117	0.29								
C-21	0.38 H	-5.1	766985.098	1603476.921	0.27								
C-22	0.54 H	9.7	766469.622	1604014.843	0.60								
C-23	0.67 H	-9.2	766096.418	1604485.748	0.55								
C-24	0.83 H	9.6	765787.976	1605178.142	0.57								
C-25	0.99 H	-8.6	765479.968	1606105.682	0.56								
C-26	1.12 H	9.9	765394.462	1606721.963	0.54								
C-27	1.26 H	-8.2	765315.551	1607216.485	0.61								
C-28	1.39 H	10.9	764904.649	1607811.762	0.70								
C-29	1.55 H	-9.3	764657.972	1608517.997	0.21								
C-30	1.69 H	10.0	764488.139	1609236.590	0.38								
C-31	1.99 H	10.3	764118.753	1610710.384	0.56								
C-32	2.14 H	-9.2	763560.670	1611353.073	0.20								

						Laboratory Results (provided for locations where performed)							
Boring ID	Boring Location (MM)	Offset from C/L (ft)	Northing	Easting	Reported Asphalt Depth (ft)	Depth (ft)	% Moisture	AASHTO Classification	% Gravel	% Sand	% Fines	Liquid Limit	Plastic Limit
C-33	2.27 H	11.0	763028.639	1611899.732	0.22								
C-34	2.43 H	-7.9	762397.038	1612483.594	0.30								
C-35	2.55 H	10.2	761675.617	1612993.580	0.28								
C-36	2.69 H	-9.7	761313.115	1613283.704	0.71								
C-37	2.76 H	8.9	760896.297	1613547.239	0.36								
C-38	0.09 M	-9.3	759957.037	1614001.903	0.40								
C-39	0.21 M	9.7	759370.406	1614434.382	0.30								
C-40	0.33 M	-10.0	758648.236	1614913.643	0.29								
C-41	0.47 M	9.8	758107.586	1615051.263	0.31								
C-42	0.62 M	-9.0	757394.427	1615386.443	0.70								
C-43	0.77 M	Not Cored											
C-44	0.93 M	NM	756449.661	1616509.118	0.56								
C-45	1.06 M	7.0	755847.339	1617191.595	0.25								
C-46	1.22 M	-6.0	755417.996	1617756.582	0.29								
C-47	1.34 M	8.0	754768.798	1618213.465	0.26								
C-48	1.47 M	-7.3	754240.793	1618545.113	0.29								
C-49	1.65 M	6.1	753776.867	1619324.698	0.26								
C-50	1.79 M	-8.6	753793.867	1619694.936	0.21								
C-51	1.92 M	7.8	753739.632	1620682.640	0.30								
C-52	2.09 M	-7.4	753533.639	1621770.466	0.29								
C-53	2.20 M	7.6	753484.657	1622187.799	0.46								
C-54	2.33 M	-7.8	753359.745	1622843.534	0.33								
C-55	2.47 M	6.9	753048.476	1623426.890	0.35								
C-56	2.66 M	-9.1	753039.475	1624393.588	0.31								
C-57	2.81 M	5.7	753026.350	1625196.510	0.31								
C-58	2.95 M	-6.7	753197.880	1625904.414	0.29								
C-59	3.08 M	6.4	753373.681	1626645.602	0.58								
C-60	3.23 M	-8.4	753612.078	1627340.834	0.83								
C-61	3.37 M	6.0	753791.430	1627899.391	0.90								
C-62	3.53 M	-6.8	753887.830	1628518.795	0.79								
C-63	3.66 M	5.2	753847.965	1629262.547	0.83								
C-64	3.75 M	-7.0	753832.299	1630007.990	0.92								

[illegible]

JOHNSON-MORRISTOWN STP 2919(1)

- Auger Borings -



NOTES:

1. Lithologic descriptions are broad descriptions of soils encountered in the borings conducted for this report (B-200 through B-209). Lithologic conditions between borings may vary.
2. See Drilling Notes for individual bore hole information.
3. Vertical depths in feet.
4. Groundwater was not encountered during drilling.

*Not to horizontal scale