

To: Robert Young, P.E., Structures Project Manager
SPM MLM

From: Stephen Madden, Geotechnical Engineer, via Marcy Montague, P. E., Senior Geotechnical Engineer

Date: September 29th, 2017

Subject: Cavendish BO 1442(38) Geotechnical Data Report

1.0 INTRODUCTION

As requested, we have completed our geotechnical subsurface investigation for the Cavendish BO 1442(38) project. This project consists of the replacement of Bridge No. 58 located on Town Highway 1 (Depot Street) over the Black River in the Town of Cavendish, VT. A previous Preliminary Subsurface Investigation Report was submitted by Marcy Meyers on July 31st, 2014 detailing a geotechnical and geological investigation and providing geotechnical parameters to be used in the design of the proposed structure, as well as recommendations for integral abutments supported on piles or spread footings supported on medium dense silty sand. For this report, additional borings were requested by the utility consultant to verify the soil conditions at the location of the proposed directional drilling. Probes were also requested behind the existing abutments to determine whether there will be interference with the existing structure or foundations during proposed pile driving operations. Contained herein are the results of our additional field sampling and testing, laboratory analysis of soil samples, and boring logs.

2.0 FIELD INVESTIGATION

The field investigation was conducted between August 23rd and August 29th, 2017. Two standard penetration borings and four exploratory probes were drilled to determine the exiting subsurface strata and identify potential obstructions to pile driving and directional drilling operations. A summary of the final location of each boring and corresponding ground surface elevation can be found in Table 2.1. The values for the Northings and Eastings are based on the Vermont State Plane Grid Coordinate System NAD 83, and were located in the field using a handheld GPS. Elevations for the borings were then taken off a VTrans survey file. The locations and elevations of the borings should be considered accurate only to the degree implied by the method used to determine them.

Table 2.1: Boring Locations

Boring Number	Station	Offset (ft)	Northing (ft)	Easting (ft)	Ground Elev. (ft)
B-201	21+26.2	45.4 LT	321029.66	1604244.81	930.6
B-204	22+79.3	48.4 LT	321127.25	1604145.44	928.3
P-301	21+57.0	11.2 LT	321071.13	1604257.45	931.0
P-302	21+66.0	17.1 RT	321095.99	1604273.49	931.2
P-303	22+54.6	13.4 LT	321136.16	1604187.35	930.1
P-304	22+59.8	15.8 RT	321161.01	1604203.40	930.2

The borings were performed in general accordance with AASHTO T206, *Standard Method of Test for Penetration Test and Split-Barrel Sampling of Soils*. During boring operations, split spoon samples and standard penetration tests (SPT) were taken for each boring. B-201 was sampled continuously to a depth of 30 feet below ground surface. B-204 was sampled continuously to a depth of 20 feet below ground surface.

Soil samples were visually identified in the field and SPT blow counts were recorded on the boring logs when applicable. Soil samples were preserved and returned to the VTrans Construction and Materials Bureau Central Laboratory for testing and further evaluation. Upon completion of the laboratory testing, the boring logs were revised to reflect the results of the laboratory classification analysis. The attached boring logs display the types of soil strata encountered and include the laboratory test data, SPT data, and any pertinent observations made by the boring crew.

Four exploratory probes were advanced behind the four corners of the existing bridge abutments. During drilling operations for these probes, no soil samples were collected and the casing was advanced through the soil stratum to a depth of 20 feet below the ground surface, or to a depth of 5 feet below the existing concrete footing where encountered. Although no samples were taken during the drilling of probes, thickness of pavement, concrete, and other possible obstructions were recorded as well as field descriptions of materials encountered.

3.0 FIELD AND LABORATORY TESTS

The standard penetration resistance of the in-situ soil is determined by the number of blows required to drive a 2 inch OD split barrel sampler into the soil with a 140 pound hammer dropped from a height of 30 inches, in accordance with procedures specified in AASHTO T206. During the standard penetration test (SPT), the sampler is driven for a total length of 2 feet, while counting the blows for each 6 inch increment. The SPT N-value, which is defined as the sum of the number of blows required to drive the sampler through the second and third increments, is

commonly used with established correlations to estimate a number of soil parameters, particularly the shear strength and density of cohesionless soils. The N-values provided on the boring logs are raw values and have not been corrected for energy, borehole diameter, rod length, or overburden pressure. The VT Agency of Transportation has determined a hammer correction value, C_E , to account for the efficiency of the SPT hammer on the drill rig. For this project, a new Diedrich 25 drill rig was used and an energy correction factor has not yet been determined for the hammer. Therefore, a hammer correction factor of 1.3, based on a standard practice value for an automatic hammer, should be used in calculations to determine soil parameters. Laboratory tests were conducted on all samples to evaluate grain size, moisture content, and percent finer than No. 200 sieve. Results from this testing can be found on the attached boring logs.

4.0 SOIL PROFILE

Review of laboratory data and boring logs revealed the following information pertaining to the soil strata. It should be noted that groundwater elevations are subject to change given the fact that boreholes were generally left open for a short period of time. Because groundwater elevations can fluctuate seasonally and are affected by temperature and precipitation, groundwater may be encountered during construction when not previously noted on the logs. It should be noted that soil samples were not collected during drilling operations for the probes, so soil descriptions are based on the drill crew's interpretation of observed drilling conditions and spoils.

4.1 Soil Borings

4.11 B-201: The ground surface elevation at B-201 was approximately 930.6 feet. Groundwater was encountered after drilling operations on August 24th, 2017 at a depth of 13.0 feet below ground surface corresponding to an approximate elevation of 917.6 feet.

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 4 feet	Loose Silty Gravelly Sand
4 – 10 feet	Med. Dense to Very Dense Gravelly Sand/Sandy Gravel with Broken Rock and Cobbles
10 – 30 feet	Loose to Med. Dense Sand/Silty Sand

4.12 B-204: The ground surface elevation at B-204 was approximately 928.3 feet. Groundwater was encountered during drilling operations on August 23th, 2017 at a depth of 11.4 feet below ground surface corresponding to an approximate elevation of 916.9 feet.

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 7 feet	Very Loose Gravelly Sand
7 – 12 feet	Loose to M. Dense Silty Gravelly Sand
12 – 16 feet	M. Dense to Dense Gravelly Sand/Sandy Gravel
16 – 20 feet	Loose Sand

4.2 Exploratory Probes

4.21 P-301: The ground surface elevation at P-301 was approximately 931.0 feet. Groundwater was encountered during drilling operations on August 25th, 2017 at a depth of 14.7 feet below ground surface corresponding to an approximate elevation of 916.3 feet.

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 0.45 feet	Asphalt Pavement
0.45 – 1.3 feet	Concrete
1.3 – 10.5 feet	Gravelly Sand
10.5 – 12 feet	Cobbles
12 – 17 feet	Sand
17 – 18 feet	Cobbles
18 – 30 feet	Sand

4.22 P-302: The ground surface elevation at P-302 was approximately 931.2 feet. Groundwater was encountered during drilling operations on August 25th, 2017 at a depth of 14.8 feet below ground surface corresponding to an approximate elevation of 916.4 feet.

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 0.3 feet	Asphalt Pavement
0.3 – 8.0 feet	Sandy Gravel
8 – 17 feet	Cobbles
17 – 19 feet	Wood
19 – 30 feet	Sand

4.23 P-303: The ground surface elevation at P-303 was approximately 930.1 feet. Groundwater was encountered after drilling operations on August 29th, 2017 at a depth of 13.9 feet below ground surface corresponding to an approximate elevation of 916.2 feet. As this probe was advanced through the existing footing the hole was backfilled with grout upon the completion of drilling activities.

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 0.6 feet	Asphalt Pavement
0.6 – 1.8 feet	Concrete
1.8 – 17 feet	Gravelly Sand/Sand
17 – 18 feet	Wood
18 – 21 feet	Concrete (Interpreted as existing footing)
21 – 26 feet	Sandy Gravel/Sand

4.24 P-304: The ground surface elevation at P-304 was approximately 930.2 feet. Groundwater was encountered during drilling operations on August 28th, 2017 at a depth of 12.9 feet below ground surface corresponding to an approximate elevation of 917.3 feet.

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 0.06 feet	Asphalt Pavement
0.06 – 0.56 feet	Concrete
0.56 – 5 feet	Sandy Gravel
5 – 14 feet	Cobbles
14 – 15 feet	Wood
15 – 18 feet	Sand
18 – 19 feet	Wood
19 – 30 feet	Sand

5.0 CONCLUSION

Based on the observations made during the advancement of the exploratory probes, the existing fill material behind the abutments contains wood fragments. This was interpreted as wood lagging that is likely to have remained in place following the original construction of the abutments. No wood was encountered in these probes below the approximate bottom of footing elevation, at a depth of roughly 20 feet below the roadway surface.

If you have any questions or would like to discuss this report, please contact us by phone at (802) 828-2561. Computer generated boring logs are attached and available in the <M:\Projects\13j302\MaterialsResearch> folder.

Enclosures: Boring Location Plan (1 Page)
Boring Logs (6 Pages)

cc: Jared Grigas, P.E., Structures Project Engineer
Electronic Read File
Project File/MLM
SPM

[Z:\Highways\CMB\GeotechEngineering\Projects\Cavendish BO 1442\(38\)\REPORTS\Cavendish BO 1442\(38\) Geotechnical Data Report.docx](Z:\Highways\CMB\GeotechEngineering\Projects\Cavendish BO 1442(38)\REPORTS\Cavendish BO 1442(38) Geotechnical Data Report.docx)

SOIL CLASSIFICATION

AASHTO

A1	Gravel and Sand
A3	Fine Sand
A2	Silty or Clayey Gravel and Sand
A4	Silty Soil - Low Compressibility
A5	Silty Soil - Highly Compressible
A6	Clayey Soil - Low Compressibility
A7	Clayey Soil - Highly Compressible

ROCK QUALITY DESIGNATION

R.O.D. (%)	ROCK DESCRIPTION
<25	Very Poor
25 to 50	Poor
51 to 75	Fair
76 to 90	Good
>90	Excellent

SHEAR STRENGTH

UNDRAINED SHEAR STRENGTH IN P.S.F.	CONSISTENCY
<250	Very Soft
250-500	Soft
500-1000	Med. Stiff
1000-2000	Stiff
2000-4000	Very Stiff
>4000	Hard

CORRELATION GUIDE OF "N" TO DENSITY/CONSISTENCY

DENSITY (GRANULAR SOILS)		CONSISTENCY (COHESIVE SOILS)	
N	DESCRIPTIVE TERM	N	DESCRIPTIVE TERM
<5	Very Loose	<2	Very Soft
5-10	Loose	2-4	Soft
11-24	Med. Dense	5-8	Med. Stiff
25-50	Dense	9-15	Stiff
>50	Very Dense	16-30	Very Stiff
		31-60	Hard
		>60	Very Hard

COMMONLY USED SYMBOLS

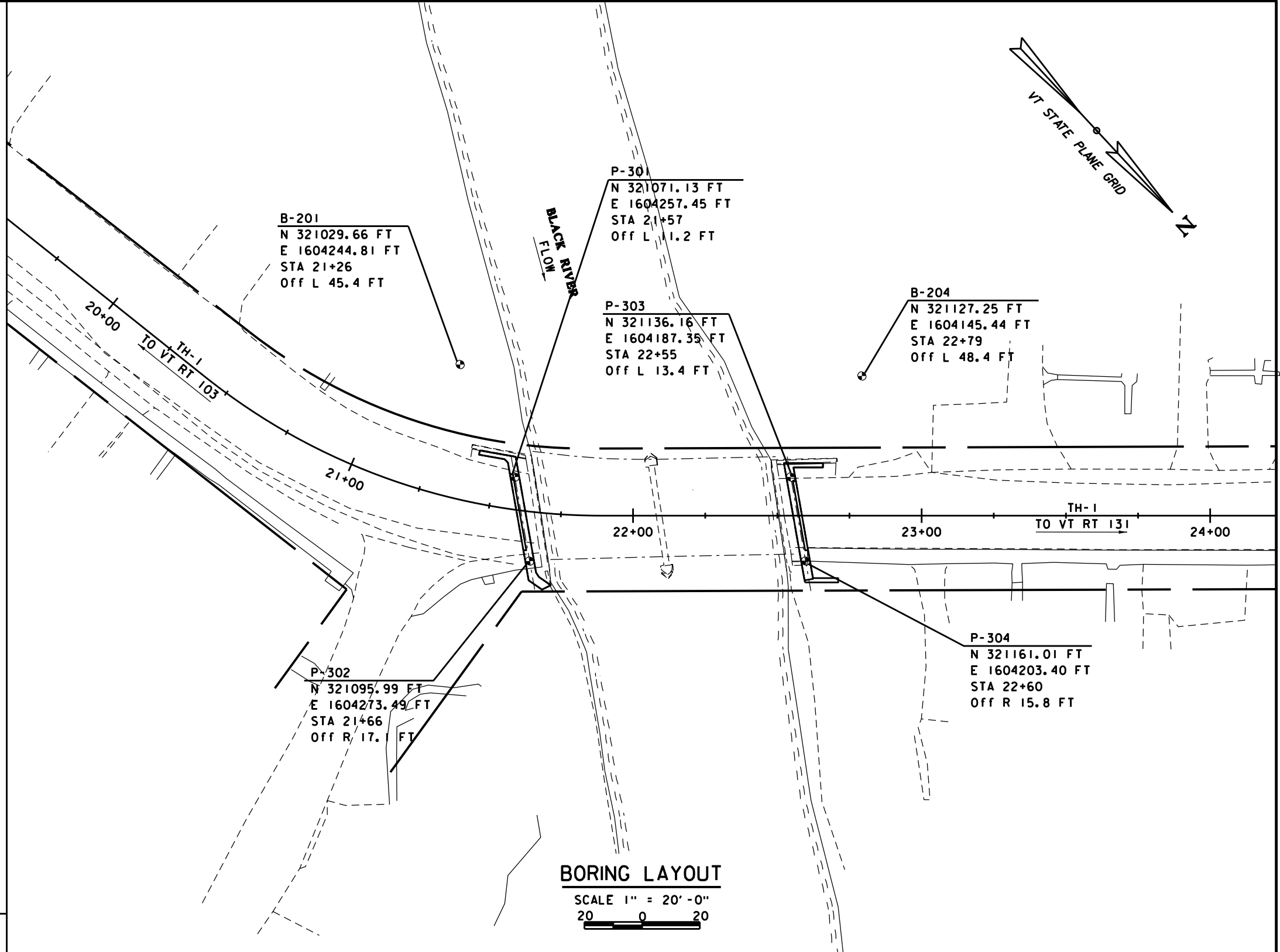
- ▼ Water Elevation
- ⊕ Standard Penetration Boring
- ⊗ Auger Boring
- ⊙ Rod Sounding
- S Sample
- N Standard Penetration Test
- Blow Count Per Foot For:
- 2" O.D. Sampler
- 1 3/8" I.D. Sampler
- Hammer Weight Of 140 Lbs.
- Hammer Fall Of 30"
- VS Field Vane Shear Test
- US Undisturbed Soil Sample
- B Blast
- DC Diamond Core
- MD Mud Drill
- WA Wash Ahead
- HSA Hollow Stem Auger
- AX Core Size 1 1/8"
- BX Core Size 1 3/8"
- NX Core Size 2 1/8"
- M Double Tube Core Barrel Used
- LL Liquid Limit
- PL Plastic Limit
- PI Plasticity Index
- NP Non Plastic
- w Moisture Content (Dry Wgt. Basis)
- D Dry
- M Moist
- MTW Moist To Wet
- W Wet
- Sat Saturated
- Bo Boulder
- Gr Gravel
- So Sand
- Sl Silt
- Cl Clay
- HP Hardpan
- Le Ledge
- NLTD No Ledge To Depth
- CNPF Can Not Penetrate Further
- TLOB Top of Ledge Or Boulder
- NR No Recovery
- Rec. Recovery
- %Rec. Percent Recovery
- ROD Rock Quality Designation
- CBR California Bearing Ratio
- < Less Than
- > Greater Than
- R Refusal (N > 100)
- VTSPG NAD83 - See Note 7

COLOR			
blk	Black	pnk	Pink
bl	Blue	pu	Purple
brn	Brown	rd	Red
dk	Dark	tn	Tan
gry	Gray	wh	White
gn	Green	yel	Yellow
lt	Light	mltc	Multicolored
or	Orange		

DEFINITIONS (AASHTO)

- BEDROCK (LEDGE)** - Rock in its native location of indefinite thickness.
- BOULDER** - A rock fragment with an average dimension > 12 inches.
- COBBLE** - Rock fragments with an average dimension between 3 and 12 inches.
- GRAVEL** - Rounded particles of rock < 3" and > 0.0787" (#10 sieve).
- SAND** - Particles of rock < 0.0787" (#10 sieve) and > 0.0029" (#200 sieve).
- SILT** - Soil < 0.0029" (#200 sieve), non or slightly plastic and exhibits no strength when air-dried.
- CLAY** - Fine grained soil, exhibits plasticity when moist and considerable strength when air-dried.

- VARVED** - Alternate layers of silt and clay.
- HARDPAN** - Extremely dense soil, cemented layer, not softened when wet.
- MUCK** - Soft organic soil (containing > 10% organic material).
- MOISTURE CONTENT** - Weight of water divided by dry weight of soil.
- FLOWING SAND** - Granular soil so saturated (loose) that it flows into drill casing during extraction of wash rod.
- STRIKE** - Angle from magnetic north to line of intersection of bed with a horizontal plane.
- DIP** - Inclination of bed with a horizontal plane.



GENERAL NOTES

1. The subsurface explorations shown herein were made between 8/23/17 and 8/29/2017 by the Agency.
2. Soil and rock classifications, properties and descriptions are based on engineering interpretation from available subsurface information by the Agency and may not necessarily reflect actual variations in subsurface conditions that may be encountered between individual boring or sample locations.
3. Observed water levels and/or conditions indicated are as recorded at the time of exploration and may vary according to the prevailing rainfall, methods of exploration and other factors.
4. Engineering judgment was exercised in preparing the subsurface information presented herein. Analysis and interpretation of subsurface data was performed and interpreted for Agency design and estimating purposes. Presentation of the information in the Contract is intended to provide the Contractor access to the same data available to the Agency. The subsurface information is presented in good faith and is not intended as a substitute for personal investigation, independent interpretation, independent analysis or judgment by the Contractor.
5. Pictorial structure details shown on the boring plan layout or soils profile are for illustrative purposes only and may not accurately portray final contract details.
6. Terminology used on boring logs to describe the hardness, degree of weathering, and spacing of fractures, joints and other discontinuities in the bedrock is defined in the AASHTO Manual on Subsurface Investigations, 1988.
7. Northing and Easting coordinates are shown in Vermont State Plane Grid North American Datum 1983 in meters and survey feet.

PROJECT NAME:	CAVENDISH
PROJECT NUMBER:	BO 1442(38)
FILE NAME:	sl3j276bdr_bor.dgn
PROJECT LEADER:	R. YOUNG
DESIGNED BY:	J. GRIGAS
BORING LAYOUT SHEET	
PLOT DATE:	9/21/2017
DRAWN BY:	S. MADDEN
CHECKED BY:	
SHEET	1 OF 1



STATE OF VERMONT
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BORING LOG

CAVENDISH
BO 1442(38)
TH-1 BR-58

Boring No.: B-201
Page No.: 1 of 1
Pin No.: 13J302
Checked By: SPM

Boring Crew: Gonyaw, Garrow, Emerson
Date Started: 8/24/17 Date Finished: 8/24/17
VTSPG NAD83: N 321029.66 ft E 1604244.81 ft
Station: 21+26.22 Offset: -45.40
Ground Elevation: 930.6 ft

Casing Sampler
Type: WB SS
I.D.: 3 in 1.5 in
Hammer Wt: N.A. 140 lb.
Hammer Fall: N.A. 30 in.
Hammer/Rod Type: Auto/AWJ
Rig: Diedrich D25 $C_E = \text{Unknown}$

Groundwater Observations

Date	Depth (ft)	Notes
08/24/17	13.0	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
5		A-2-4, GrSa, brn, Moist, Rec. = 0.7 ft, Lab Note: Plant material was within sample	WH-WH-5-3 (5)	11.0	23.6	61.7	14.7
		A-1-b, SiGrSa, brn, Moist, Rec. = 0.8 ft	2-2-4-6 (6)	7.0	29.3	49.9	20.8
		A-1-b, SaGr, Lt/brn, Moist, Rec. = 0.9 ft, Lab Note: Broken rock was within sample	9-8-6-9 (14)	2.7	45.6	42.5	11.9
		A-1-b, GrSa, brn, Moist, Rec. = 0.5 ft, Lab Note: Broken rock was within sample	12-19-R@3.5" (R)	11.0	40.7	43.9	15.4
10		Field Note: NXDC, Cleaned out casing, Cobbles					
		A-1-b, SaGr, brn, Moist, Rec. = 0.8 ft, Lab Note: Broken rock was within sample	12-18-22-21 (40)	8.6	54.9	29.3	15.8
		A-2-4, Sa, brn, Moist, Rec. = 0.7 ft	9-11-8-7 (19)	17.2	2.9	80.8	16.3
		A-2-4, Sa, brn, Moist, Rec. = 0.9 ft	6-5-6-5 (11)	19.4	3.4	83.4	13.2
15		A-2-4, Sa, brn, Moist, Rec. = 1.3 ft	4-4-4-5 (8)	23.8	0.9	86.4	12.7
		A-2-4, Sa, brn, Moist, Rec. = 1.1 ft	4-4-4-5 (8)	21.1	1.0	85.6	13.4
		A-2-4, Sa, brn, Moist, Rec. = 0.7 ft	5-3-4-4 (7)	24.2	4.5	81.5	14.0
		A-2-4, SiSa, brn, Moist, Rec. = 0.8 ft	4-3-5-6 (8)	26.9	1.2	74.7	24.1
25		Field Note: No Recovery, appears to be sand	10-8-6-9 (14)				
		A-2-4, Sa, brn, Moist, Rec. = 0.5 ft	8-10-10-9 (20)	24.1	1.5	86.0	12.5
		A-2-4, Sa, brn, Moist, Rec. = 0.7 ft	4-5-9-14 (14)	26.0	0.4	82.7	16.9
		Field Note: No Recovery, appears to be sand	15-13-13-13 (26)				
30		Hole stopped @ 30.0 ft					

Remarks:
Hole Collapsed at 30 feet.
1. Added bentonite to drilling operation at 20 feet due to sand.

- Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
 2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
 3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.

BORING LOG 2 CAVENDISH BO 1442(38) GP-J VERMONT AOT.GDT 9/28/17



STATE OF VERMONT
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 MATERIALS BUREAU
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BORING LOG

CAVENDISH
 BO 1442(38)
 TH-1 BR-58

Boring No.: B-204
 Page No.: 1 of 1
 Pin No.: 13J302
 Checked By: SPM

Boring Crew: Gonyaw, Garrow, Emerson
 Date Started: 8/23/17 Date Finished: 8/23/17
 VTSPG NAD83: N 321127.25 ft E 1604145.44 ft
 Station: 22+79.31 Offset: -48.40
 Ground Elevation: 928.3 ft

Casing: WB Sampler: SS
 Type: WB I.D.: 3 in 1.5 in
 Hammer Wt: N.A. 140 lb.
 Hammer Fall: N.A. 30 in.
 Hammer/Rod Type: Auto/AWJ
 Rig: Diedrich D25 C_E = Unknown

Groundwater Observations		
Date	Depth (ft)	Notes
08/23/17	11.4	W.T. during drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
2.5		A-1-b, GrSa, blk, Moist, Rec. = 0.5 ft, Lab Note: Plant roots were within sample	1-1-1-1 (2)	11.6	28.8	51.9	19.3
2.5		A-2-4, GrSa, blk, Moist, Rec. = 0.7 ft, Lab Note: Sticks and plant roots were within sample	1-1-1-1 (2)	5.2	21.7	58.8	19.5
5.0		A-2-4, GrSa, blk, Moist, Rec. = 0.5 ft, Lab Note: Broken rock and glass was within sample	2-1-1-1 (2)	5.4	31.5	51.4	17.1
7.5		A-1-b, GrSa, blk, Moist, Rec. = 0.5 ft	1-1-1-1 (2)	5.4	32.8	51.8	15.4
7.5		A-2-4, SiSa, Lt/brn, Moist, Rec. = 1.0 ft, Lab Note: Decomposing plant material was within sample		2.4	2.8	77.2	20.0
7.5		A-2-4, SiGrSa, blk, Moist, Rec. = 0.4 ft, Lab Note: A very small amount of organic material was within sample	6-5-3-2 (8)	25.4	24.5	52.6	22.9
10.0		A-2-4, GrSa, Lt/brn, Moist, Rec. = 1.0 ft, Lab Note: Broken rock was within sample	3-4-15-28 (19)	17.1	24.9	59.7	15.4
12.5		A-1-a, SaGr, Lt/brn, Moist, Rec. = 0.6 ft, Lab Note: A lot of broken rock was within sample	17-20-28-25 (48)	7.5	67.7	23.7	8.6
15.0		A-2-4, GrSa, Lt/brn, Moist, Rec. = 0.8 ft, Lab Note: Broken rock was within sample	14-9-6-4 (15)	14.8	30.7	55.8	13.5
15.0		Field Note:, BXDC, Cleaned out casing, Gravel					
17.5		A-3, Sa, Lt/brn, Moist, Rec. = 0.3 ft, Lab Note: A small amount of broken rock was within sample	4-4-4-5 (8)	22.3	15.2	76.8	8.0
20.0		A-2-4, Sa, Lt/brn, Moist, Rec. = 0.8 ft	3-4-4-5 (8)	24.8	3.0	81.1	15.9
20.0	Hole stopped @ 20.0 ft						
22.5	Remarks: Hole collapsed at 12.4 feet.						

BORING LOG 2 CAVENDISH BO 1442(38) GPJ VERMONT AOT.GDT 9/29/17

Notes: 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
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 3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.



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BORING LOG

**CAVENDISH
 BO 1442(38)
 TH-1 BR-58**

Boring No.: P-301
 Page No.: 1 of 1
 Pin No.: 13J302
 Checked By: SPM

Boring Crew: Gonyaw, Garrow, Emerson
 Date Started: 8/25/17 Date Finished: 8/25/17
 VTSPG NAD83: N 321071.13 ft E 1604257.45 ft
 Station: 21+57 Offset: -11.20
 Ground Elevation: 931.0 ft

Casing WB Sampler SS
 Type: WB SS
 I.D.: 4 in 1.5 in
 Hammer Wt: N.A. 140 lb.
 Hammer Fall: N.A. 30 in.
 Hammer/Rod Type: Auto/AWJ
 Rig: CME 45C SKID C_E = 1.42

Groundwater Observations		
Date	Depth (ft)	Notes
08/25/17	14.7	W.T. during drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 0.45		Asphalt Pavement, 0.0 ft - 0.45 ft					
0.45 - 1.3		Concrete, 0.45 ft - 1.3 ft					
1.3 - 10.0		Field Note:., Appears to be Gr Sa					
10.0 - 14.4		Field Note:., NXDC, Cleaned out casing, Appears to be cobbles					
14.4 - 18.0		Field Note:., Appears to be Sa					
18.0 - 20.0		Field Note:., NXDC, Cleaned out casing, Appears to be cobbles					
20.0 - 30.0		Field Note:., Appears to be Sa					
30.0		Hole stopped @ 30.0 ft					
Remarks:		Hole collapsed at 14.4 feet.					

BORING LOG 2 CAVENDISH BO 1442(38) GPJ VERMONT AOT.GDT 9/28/17

Notes:
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
 2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
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BORING LOG

**CAVENDISH
 BO 1442(38)
 TH-1 BR-58**

Boring No.: P-302
 Page No.: 1 of 1
 Pin No.: 13J302
 Checked By: SPM

Boring Crew: Gonyaw, Garrow, Emerson
 Date Started: 8/25/17 Date Finished: 8/25/17
 VTSPG NAD83: N 321095.99 ft E 1604273.49 ft
 Station: 21+66 Offset: 17.10
 Ground Elevation: 931.2 ft

Casing WB Sampler SS
 Type: WB SS
 I.D.: 4 in 1.5 in
 Hammer Wt: N.A. 140 lb.
 Hammer Fall: N.A. 30 in.
 Hammer/Rod Type: Auto/AWJ
 Rig: CME 45C SKID C_E = 1.42

Groundwater Observations		
Date	Depth (ft)	Notes
08/25/17	14.8	W.T. during drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 0.3		Asphalt Pavement, 0.0 ft - 0.3 ft Field Note:., Appears to be Sa Gr					
5		Field Note:., Appears to be cobbles					
10		Field Note:., Appears to be wood					
15		Field Note:., Appears to be Sa					
20		Field Note:., Appears to be Sa					
25							
30		Hole stopped @ 30.0 ft					
Remarks:		Hole collapsed at 12.8 feet.					

BORING LOG 2 CAVENDISH BO 1442(38) GPJ VERMONT AOT.GDT 9/28/17

Notes:
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
 2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
 3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.



STATE OF VERMONT
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BORING LOG

**CAVENDISH
 BO 1442(38)
 TH-1 BR-58**

Boring No.: P-303
 Page No.: 1 of 1
 Pin No.: 13J302
 Checked By: SPM

Boring Crew: Gonyaw, Garrow, Emerson
 Date Started: 8/28/17 Date Finished: 8/29/17
 VTSPG NAD83: N 321136.16 ft E 1604187.35 ft
 Station: 22+54.64 Offset: -13.40
 Ground Elevation: 930.1 ft

Casing WB Sampler SS
 Type: WB SS
 I.D.: 4 in 1.5 in
 Hammer Wt: N.A. 140 lb.
 Hammer Fall: N.A. 30 in.
 Hammer/Rod Type: Auto/AWJ
 Rig: CME 45C SKID C_E = 1.42

Groundwater Observations		
Date	Depth (ft)	Notes
08/29/17	13.9	W.T. after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 0.6		Asphalt Pavement, 0.0 ft - 0.6 ft					
0.6 - 1.8		Concrete, 0.6 ft - 1.8 ft					
1.8 - 15.0		Field Note:, Appears to be Gr Sa					
15.0 - 18.0		Field Note:, Appears to be Sa					
18.0 - 19.5		Field Note:, Appears to be wood					
19.5 - 20.5		Field Note:, Appears to be concrete					
20.5 - 22.5		Field Note:, Appears to be Sa Gr					
22.5 - 26.0		Field Note:, Appears to be Sa					
26.0 - 30.0		Hole stopped @ 26.0 ft					
30.0		Remarks: 1. Hole was grouted to the surface with bentonite/portland cement grout.					

BORING LOG 2 CAVENDISH BO 1442(38) GPJ VERMONT AOT.GDT 9/28/17

Notes:
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
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BORING LOG

**CAVENDISH
 BO 1442(38)
 TH-1 BR-58**

Boring No.: P-304
 Page No.: 1 of 1
 Pin No.: 13J302
 Checked By: SPM

Boring Crew: Gonyaw, Garrow, Emerson
 Date Started: 8/28/17 Date Finished: 8/28/17
 VTSPG NAD83: N 321161.01 ft E 1604203.40 ft
 Station: 22+59.78 Offset: 15.75
 Ground Elevation: 930.2 ft

Casing WB Sampler SS
 Type: WB SS
 I.D.: 4 in 1.5 in
 Hammer Wt: N.A. 140 lb.
 Hammer Fall: N.A. 30 in.
 Hammer/Rod Type: Auto/AWJ
 Rig: CME 45C SKID C_E = 1.42

Groundwater Observations		
Date	Depth (ft)	Notes
08/28/17	12.9	W.T. during drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
0.0		Asphalt Pavement, 0.0 ft - 0.06 ft					
0.06		Concrete, 0.06 ft - 0.56 ft					
0.56		Field Note:., Appears to be Sa Gr					
5		Field Note:., Appears to be Cobbles					
15		Field Note:., Appears to be Wood					
15		Field Note:., Appears to be Sa					
20		Field Note:., Appears to be Wood					
20		Field Note:., Appears to be Sa					
30		Hole stopped @ 30.0 ft					
		Remarks: Hole collapsed at 9.6 feet.					

BORING LOG 2 CAVENDISH BO 1442(38) GPJ VERMONT AOT.GDT 9/28/17

Notes:
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
 2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
 3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.