AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Bob Klinfelter, P.E., Structures Project Manager

END CEE

From: Eric Denardo, P.E., Geotechnical Engineer, via Callie Ewald, P.E., Geotechnical Engineering Manager

Date: May 30, 2023

Subject: Poultney BF 0145(13) – Subsurface Investigation

1.0 INTRODUCTION

As requested, we have completed our geotechnical and geological subsurface investigation for the proposed replacement of Bridge No. 4 located on VT Route 31 over the Poultney River in Poultney, Vermont. The borings were completed to determine the soil strata and depth to bedrock to aid in design of a replacement structure. Contained herein are the results of our field sampling and testing, laboratory analyses of soil and rock samples, as well as attached boring logs.

2.0 FIELD INVESTIGATION

The field investigation was conducted between April 10, and April 25, 2023. Five standard penetration borings were drilled to evaluate the subsurface profile to aid in the design and construction of the replacement structure. The boring locations were provided by Bob Klinfelter as part of the Geotechnical Request Form dated October 25, 2022. A summary of the boring locations can be found in Table 2.1 as well as on the attached Boring Location Plan.

The values for the Northings and Eastings are based on the Vermont State Plane Grid Coordinate System NAD 83 and were located by a VTrans Survey Crew. The elevations for the borings are based on the North American Vertical Datum, NAVD88 and were taken from a VTrans' survey file, z21j164sv.dgn, dated May 24, 2022. Due to drill rig access, B-101 was moved from the original location. B-101 and B-101A were located in the field using ties. The locations 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	Station	Offset (ft)	Northing (ft)	Easting (ft)	Elevation (ft)	Bedrock Elevation (ft)
B-101	12+77	-12.1	369995.6	1445857.8	423.5	-
B-101A	12+76	-12.1	369998.6	1445858.4	423.5	384.7
B-102	13+00	8.0	370014.2	1445882.9	424.6	384.0
B-103	14+35	-40.0	370156.4	1445865.6	416.6	389.4
B-104	14+48	8.0	370158.1	1445915.1	424.6	379.1

The borings were performed in general accordance with AASHTO T206, *Standard Method of Test for Penetration Test and Split-Barrel Sampling of Soils.* During the boring operations, split spoon samples and standard penetration tests (SPT) were taken continuously to 20 feet (ft) below ground surface (bgs), then at 5 ft intervals to bedrock. When bedrock was encountered, NX rock cores

were taken 10 ft into rock to collect 5 ft core sample runs to confirm the presence of bedrock. During the drilling operations of B-101, the boring was advanced and split spoon samples and SPT tests were taken until refusal on what was believed to be bedrock. The augers broke at approximately 30 ft bgs and 10 ft of augers remain in the ground between approximately 25 and 40 ft bgs. B-101A was advanced next to B-101 without soil sampling and bedrock was confirmed with NX rock cores.

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 Laboratory for testing and further evaluation. Upon completion of the laboratory testing of select representative samples, the borings 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 drilling crew.

Details of the bedrock coring were recorded on the boring logs when applicable. Cores were then placed in core boxes and returned to the VTrans Construction and Materials Bureau Laboratory for further evaluation and testing, where applicable. The boring logs were revised to reflect the classification and description of the bedrock cores.

3.0 FIELD AND LABORATORY TESTS

The standard penetration resistance of the in-situ soil is calculated as the number of blows required to drive a 2-inch(in) outside diameter (OD) split-barrel sampler 24 in into the soil by a 140-pound hammer dropped from a height of 30 in, in accordance with procedures specified in AASHTO T206. The number of blows required to drive the sampler each 6 in increment is recorded and the Standard Penetration Resistance (N-Value) is calculated as the sum of the blows over the second and third 6-in intervals.

The SPT N-value is commonly used with established correlations to estimate several 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. VTrans has determined a hammer correction value, C_E, to account for the efficiency of the SPT hammers on its drill rigs. For the borings, an Acker Renegade Track Rig was used. Because this is a new drill rig, a hammer energy correction factor has yet to be determined. As a result, a conservative C_E value of 1.3, based on a standard value for an automatic hammer, should be used in all soil parameter calculations.

Geotechnical laboratory tests were performed to assist with soil classification and evaluate engineering properties of the soil. Grain size analyses were performed on select representative soil samples in accordance with AASHTO T 88, *Standard Method of Test for Particle Size Analysis of Soils*.

A detailed description of the rock cores is presented on the boring logs including run length, drill times, recovery, and Rock Quality Designation (RQD). Recovery is defined as the length of core obtained expressed as a percentage of the total length cored. In accordance with ASTM D6032, *Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core*, RQD is the total length of core pieces, 4 inches or greater in length, expressed as a percentage of the total

length cored. RQD provides an indication of the integrity of the rock mass and relative extent of seams, jointing and bending planes. The Rock Mass Rating (RMR) is also included on the logs. RMR is AASHTO's (LRFD Bridge Design Specification) recommended method of classifying rock and is based on five different parameters that all have relative ratings which combine to form the RMR. These parameters include rock strength, RQD, joint spacing, joint condition, and groundwater (AASHTO Section 10.4.6.4).

4.0 SOIL PROFILE

Review of the laboratory data, field testing, and boring logs revealed the following information pertaining to the soil strata. It should be noted that groundwater elevations are subject to change. Because groundwater elevations can fluctuate seasonally and are affected by temperature and precipitation, groundwater may be encountered during construction when not previously noted in the logs.

B-101/B-101A: The ground surface elevation at B-101 is approximately 423.5 ft. Groundwater was encountered after removing the augers on April 25, 2023, at a depth of 17 ft bgs corresponding to an approximate groundwater elevation of 406.5 ft. Groundwater was encountered in B-101A after coring rock at a depth of 4.7 ft bgs corresponding to an approximate groundwater elevation of 418.8 ft.

Table 4.1: B-101/B-101A Soil Strata

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 10 ft	Loose GRAVEL and Sand, some to trace Silt
10 – 18 ft	Loose SAND, some Silt, some to little Gravel
18 – 38.8 ft	Very loose low plasticity SILT
> 38.8 ft	Bedrock (SLATE)

B-102: The ground surface elevation at B-102 is approximately 424.5 ft. Groundwater was encountered after drilling operations on April 10 and April 11, 2023, at a depth of 14.3 ft bgs corresponding to an approximate groundwater elevation of 410.2 ft.

Table 4.2: B-102 Soil Strata

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 0.8 ft	Asphalt Pavement
0.8 – 5 ft	Medium dense GRAVEL, some Sand, trace Silt
5 – 22.5 ft	Loose to medium dense SAND and Gravel
22.5 – 40.5 ft	Loose low plasticity SILT
> 40.5 ft	Bedrock (SLATE)

B-103: The ground surface elevation at B-103 is approximately 416.6 ft. Groundwater was encountered before drilling operations on April 14, 2023, at a depth of 6.7 ft bgs corresponding to an approximate groundwater elevation of 409.9 ft.

Table 4.3: B-103 Soil Strata

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 6 ft	Medium dense SAND, some Silt some Gravel
6 – 10 ft	Medium dense GRAVEL, some Sand, trace Silt
10 – 33.2 ft	Very loose to loose low plasticity SILT
> 33.2 ft	Bedrock (SLATE)

B-104: The ground surface elevation at B-104 is approximately 424.6 ft. Groundwater was encountered before drilling operations on April 24, 2023, at a depth of 3.1 ft bgs corresponding to an approximate groundwater elevation of 421.5 ft.

Table 4.4: B-104 Soil Strata

Depth (Below Ground Surface Elevation)	Soil Profile
0 – 0.5 ft	Asphalt Pavement
0.5 – 21.5 ft	Dense GRAVEL and SAND, little to trace Silt
21.5 – 45.5 ft	Very loose to loose low plasticity SILT
> 45.5 ft	Bedrock (SLATE)

Material encountered in each boring starting from depths of 10 ft bgs to 22.5 ft bgs and extending to bedrock was described in the field as Silt and Clay. Based on the results from the lab testing, this material was determined to be non-plastic to slightly plastic Silt.

5.0 CONCLUSION

If you have any questions, or you would like to discuss this report, please contact us via email. Please let us know when more information is available and if you'd like assistance with foundation analyses and design. Typed boring logs are attached and are available in the CADD design files: M:\Projects\21j164\MaterialsResearch

Attachments: Boring Layout
Boring Logs (8 pages)
cc: Read File/MG
Project File/CEE
END

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.Q.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 1⅜" 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 1⅛"
BX	Core Size 1⅝"
NX	Core Size 2⅛"
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
Sa	Sand
Si	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
RQD	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.

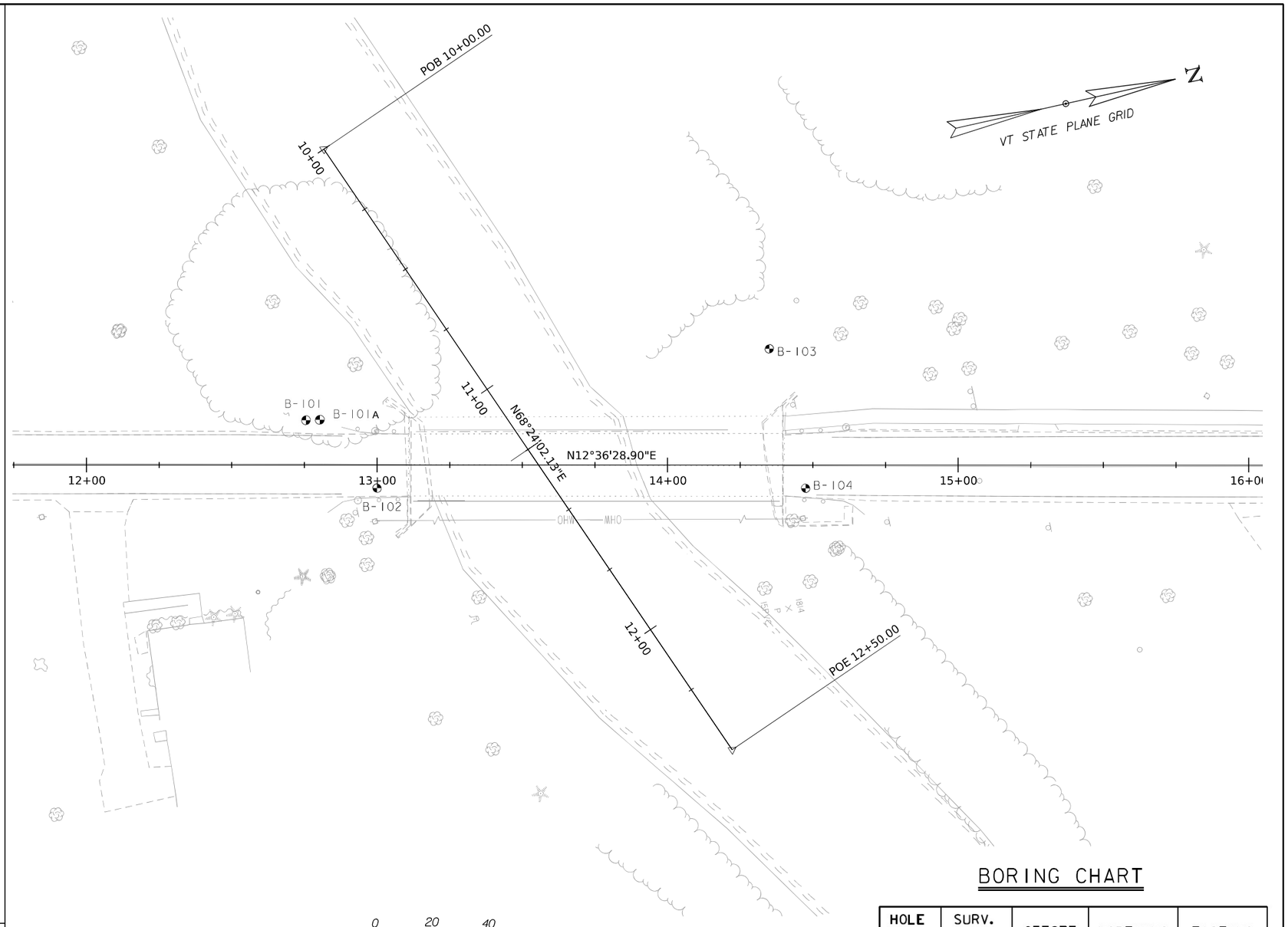
MUCK - Soft organic soil (containing > 10% organic material.

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 __/__/____ and __/__/____ 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.

BORING CHART

HOLE NO.	SURV. STATION	OFFSET	NORTHING	EASTING
B-101	12+77	-12.1	369995.6	1445857.8
B-101A	12+76	-12.1	369998.6	1445858.4
B-102	13+00	8.0	370014.2	1445882.9
B-103	14+35	-40	370156.4	1445865.6
B-104	14+48	8.0	370158.1	1445915.1

VTrans

PROJECT NAME: POULTNEY
PROJECT NUMBER: BF 0145(13)

FILE NAME: z21j164_bor.dgn
PROJECT LEADER: A.P. GUYETTE
DESIGNED BY: R.H. BARNES
BORING INFORMATION SHEET

PLOT DATE: 24-OCT-2022
DRAWN BY: M.F. NEMETH
CHECKED BY: R.H. BARNES
SHEET 1 OF 1

STATE OF VERMONT
AGENCY OF TRANSPORTATION
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BORING LOG

Poultney
BF 0145(13)
BR 4 VT 31

Boring No.: **B-101**
Page No.: 1 of 1
Pin No.: 21J164
Checked By: END

Boring Crew: MCGINLEY, MONETTE, DENARDO
Date Started: 4/24/23 Date Finished: 4/25/23
VTSPG NAD83: N 369995.60 ft E 1445857.80 ft
Station: 12+77.00 Offset: -12.10
Ground Elevation: 423.5 ft

	Casing	Sampler
Type:	H.S.A.	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:	Acker Track	C_E =

Groundwater Observations

Date	Depth (ft)	Notes
04/24/23		See Note 3
04/25/23	17.0	WT augers removed

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
		Field Description:, GRAVEL some Sand, trace Silt, brn, Moist, Rec. = 0.2 ft	1-1-2-1 (3)						
		Field Description:, GRAVEL and Sand, some Silt, brn, Moist, Rec. = 0.8 ft	2-2-4-1 (6)						
5		Field Description:, GRAVEL and Sand, some Silt, brn, Moist, Rec. = 0.5 ft	5-2-2-2 (4)						
		Field Description:, GRAVEL, Sand, some Silt, brn, Moist, Rec. = 0.4 ft	2-3-4-4 (7)						
		Field Description:, GRAVEL and Sand, brn, Moist, Rec. = 0.2 ft	3-2-1-2 (3)						
10		A-2-4, Lab Classification: SAND, some Silt, little Gravel, brn/gry, Moist, Rec. = 1.7 ft	2-4-4-6 (8)	15.1	18.3	52.5	29.2		
		Field Description:, SAND and Gravel, trace Silt, brn, MTW, Rec. = 0.9 ft	4-5-5-4 (10)						
15		A-2-4, Lab Classification: SAND, some Silt, some Gravel, brn, MTW, Rec. = 1.1 ft	3-7-3-2 (10)	19.3	20.9	48.6	30.5		
		Field Description:, SAND and Silt, trace Clay, brn, MTW, Rec. = 1.4 ft	4-1-1-2 (2)						
		A-4, Lab Classification: SILT, brn/gry, Wet, Rec. = 1.5 ft	WOH-WOH-WOH-2 (WOH)	29.9	3.9	3.5	92.6		
20									
25		A-4, Lab Classification: Low plasticity SILT. Rollercone cleanout 21.0'-30.0', gry, MTW, Rec. = 2.0 ft	WOH-WOH-WOH-2 (WOH)	41.4		0.1	99.9	28	3
30		Field Description:, CLAY, gry, MTW, Rec. = 2.0 ft	WOH-WOH-WOH-WOH (WOH)						
35		A-4, Lab Classification: SILT, little Sand, trace Gravel, gry, MTW, Rec. = 1.8 ft	WOH-5-6-9 (11)	23.9	3.2	14.8	82.0		
		Field Description:, SAND and Gravel, gry, MTW, Rec. = 0.2 ft							
40		Hole stopped @ 40.0 ft							
45									

Remarks:
1. Hole Stopped at 40'.
2. Augers broke at 30', 10' of auger left in hole located between 25 and 40'.
3. No WT to 21'. Material in auger at 21'.

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.

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STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
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CENTRAL LABORATORY

BORING LOG

Poultney
BF 0145(13)
BR 4 VT 31

Boring No.: **B-101A**
Page No.: 1 of 1
Pin No.: 21J164
Checked By: END

Boring Crew: MCGINLEY, MONETTE, DENARDO
Date Started: 4/25/23 Date Finished: 4/25/23
VTSPG NAD83: N 369998.60 ft E 1445858.40 ft
Station: 12+76.00 Offset: -12.10
Ground Elevation: 423.5 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:	Acker Track	C_E =

Groundwater Observations

Date	Depth (ft)	Notes
04/25/23	4.7	WT after drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		0.0 ft - 38.8 ft, Advanced casing to refusal at 38.8'.								
40		38.8 ft - 42.5 ft, Gray to black, Calcarceous SLATE, with calcite veins. Rock is highly fractured. From 40 ft to 42.5 ft, rock is severly weathered and weak. Pieces can be crumbled by finger pressure. Soft to very soft, Severely weathered, Poor rock, NXDC, RMR = 28	R-1 (20-40)	73 (32)	4 11 9 8					
		42.5 ft - 47.5 ft, Gray to black, Calcarceous SLATE, with few calcite veins. rock is highly fratured and granular. Pieces break easily with fingure pressure. Soft to very soft, Severely to moderately weathered, Poor rock, NXDC, RMR = 17	R-2 (20-30)	60 (0)	6 11 14 20 13					
		Hole stopped @ 47.5 ft								

Top of Bedrock @ 38.8 ft

Remarks:
1. Moved boring next to B-101 advanced to bedrock without sampling.
2. Hole collapsed at 33.8'.

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.

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BORING LOG

Poultney
BF 0145(13)
BR 4 VT 31

Boring No.: **B-102**
Page No.: 1 of 2
Pin No.: 21J164
Checked By: END

Boring Crew: MCGINLEY, BROCHU, ARLES
Date Started: 4/10/23 Date Finished: 4/12/23
VTSPG NAD83: N 370014.20 ft E 1445882.90 ft
Station: 13+00.00 Offset: 8.00
Ground Elevation: 424.5 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:	Acker Track	C_E =

Groundwater Observations

Date	Depth (ft)	Notes
04/10/23	14.3	WT after drilling
04/11/23	14.3	WT after drilling
04/12/23		No WT to depth

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
		Asphalt 0.0'-0.8', 0.0 ft - 0.8 ft										
		Field Description:, Well graded GRAVEL and Sand, trace Silt. Gravel in end of sampler, brn, Moist, Rec. = 1.0 ft				14-14-10-8 (24)						
		A-1-a, Lab Classification: GRAVEL, some Sand, trace Silt, brn, Moist, Rec. = 0.9 ft				6-4-3-4 (7)	9.4	57.9	33.3	8.8		
5		A-1-b, Lab Classification: GRAVEL and Sand, little Silt, brn, Moist, Rec. = 0.8 ft				4-3-3-4 (6)	10.3	45.0	43.6	11.4		
		Field Description:, Poorly graded SAND, Gravel in end of sampler, brn, MTW, Rec. = 0.2 ft				5-5-4-14 (9)						
10		Field Description:, GRAVEL and Sand. Gravel in end of sampler. Rollerone cleanout 10.0'-11.0', brn, Moist, Rec. = 0.6 ft				7-5-6-10 (11)						
		Field Note:, No recovery				6-11-12-8 (23)						
		Field Description:, GRAVEL, some Sand. Gravel in end of sampler. Rollercone cleanout 14.5'-15.0'. Minor rig chatter, brn, Wet, Rec. = 0.4 ft				6-6-4-2 (10)						
15		A-1-b, Lab Classification: SAND and Gravel, trace Silt, brn/gry, Moist, Rec. = 0.6 ft				6-3-2-3 (5)	14.9	44.2	48.7	7.1		
		Field Description:, SAND, trace Gravel. Gravel in end of sampler. Rollercone cleanout 24.5'-25.0', gry, Moist, Rec. = 0.85 ft				5-11-26-16 (37)						
20												
25		A-4, Lab Classification: Low plasticity SILT, trace Sand, gry, Wet, Rec. = 1.3 ft				1-1-WOH-1 (1)	39.7	0.8	3.9	95.3	31	8

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.

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BORING LOG

Poultney
BF 0145(13)
BR 4 VT 31

Boring No.: **B-102**
Page No.: 2 of 2
Pin No.: 21J164
Checked By: END

Boring Crew: MCGINLEY, BROCHU, ARLES
Date Started: 4/10/23 Date Finished: 4/12/23
VTSPG NAD83: N 370014.20 ft E 1445882.90 ft
Station: 13+00.00 Offset: 8.00
Ground Elevation: 424.5 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:	Acker Track	C_E =

Groundwater Observations

Date	Depth (ft)	Notes
04/10/23	14.3	WT after drilling
04/11/23	14.3	WT after drilling
04/12/23		No WT to depth

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
		Field Description:, CLAY transitions to Sand, some Silt in end of sampler, gry, Wet, Rec. = 0.9 ft				1-1-4-2 (5)						
35		A-4, Lab Classification: Low plasticity SILT, trace Sand, gry, Wet, Rec. = 0.5 ft				2-2-7-8 (9)	30.1	0.2	5.0	94.8	22	1
40												
		40.5 ft - 45.5 ft, Gray to black, Calcareous and non-calcareous SLATE, with calcite veins. Fractures are fresh. No joints present in run. Soft, Unweathered, Fair rock, NXDC, RMR = 43	R1 (10-30)	78 (76)	5 9 6 7 7	Top of Bedrock @ 40.5 ft						
45		45.5 ft - 47.0 ft, No recovery. NXDC	R2	0 (0)	14 13							
		47.0 ft - 48.0 ft, Gray, QUARTZITE, and black non-calcarous SLATE. Hard, Unweathered, NXDC, Poor core recovery. No RMR calculated	R3	20 (0)	10							
		48.0 ft - 53.0 ft, Gray to black, Weakly calcareous SLATE, and PHYLLITE with calcite veins. Breaks are fresh unweathered and mostly mechanical. Soft, Unweathered, Poor rock, NXDC, RMR = 29	R4 (20-30)	92 (0)	5 5 5 6 6							
50												
		Hole stopped @ 53.0 ft										
55		Remarks: 1. Hole collapsed at 12.8'. 2. Lost water return advancing casing 15'-25'.										

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.

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STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

Poultney
BF 0145(13)
BR 4 VT 31

Boring No.: **B-103**
Page No.: 1 of 2
Pin No.: 21J164
Checked By: END

Boring Crew: MCGINLEY, BROCHU, ZOTTOLA
Date Started: 4/13/23 Date Finished: 4/14/23
VTSPG NAD83: N 370156.40 ft E 1445865.60 ft
Station: 14+35.00 Offset: -40.00
Ground Elevation: 416.6 ft

	Casing	Sampler
Type:	H.S.A.	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:	Acker Track	C_E =

Groundwater Observations

Date	Depth (ft)	Notes
04/13/23	7.5	WT after drilling
04/14/23	6.4	WT after drilling
04/14/23	6.7	WT before drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Field Description:, SAND and Gravel, some organics, brn, MTD, Rec. = 1.3 ft				3-6-6-5 (12)				
		Field Description:, SAND, some Silt, trace Gravel, brn, Moist, Rec. = 1.1 ft				1-1-3-1 (4)				
5		A-2-4, Lab Classification: SAND, some Gravel, and some Silt, brn/gry, Moist, Rec. = 1.2 ft				4-6-10-9 (16)	11.4	29.0	43.2	27.8
		Field Description:, SAND some Gravel. Rock in end of sampler, Lt brn, Moist, Rec. = 1.3 ft				10-10-9-11 (19)				
		A-1-a, Lab Classification: GRAVEL, some Sand, trace Silt, brn, Moist, Rec. = 0.9 ft				11-10-15-10 (25)	9.2	72.9	20.7	6.4
10		A-4, Lab Classification: SILT, little Gravel, little Sand, brn, Wet, Rec. = 2.0 ft				WOH-1-2-3 (3)	25.1	18.1	15.8	66.1
		Field Description:, SILT and Clay, some Sand, brn, Wet, Rec. = 1.3 ft				2-2-4-4 (6)				
15		Field Description:, SILT and Clay, gry, Wet, Rec. = 1.6 ft				3-2-3-2 (5)				
		Field Description:, CLAY some Silt, gry, Wet, Rec. = 2.0 ft				WOH-2-1-1 (3)				
		A-4, Lab Classification: SILT trace Sand , trace Gravel. Sample tested non-plastic, gry, Wet, Rec. = 2.0 ft				WOH-WOH-1-1 (1)	36.0	1.6	5.3	93.1
20										
		Field Description:, CLAY, gry, Wet, Rec. = 2.0 ft				WOH-1-1-1 (2)				
25										
		Field Description:, CLAY, gry, Wet, Rec. = 2.0 ft				WOH-WOH-2-1 (2)				

Notes:
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BORING LOG

Poultney
BF 0145(13)
BR 4 VT 31

Boring No.: **B-103**
Page No.: 2 of 2
Pin No.: 21J164
Checked By: END

Boring Crew: MCGINLEY, BROCHU, ZOTTOLA
Date Started: 4/13/23 Date Finished: 4/14/23
VTSPG NAD83: N 370156.40 ft E 1445865.60 ft
Station: 14+35.00 Offset: -40.00
Ground Elevation: 416.6 ft

	Casing	Sampler
Type:	H.S.A.	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:	Acker Track	C_E =

Groundwater Observations

Date	Depth (ft)	Notes
04/13/23	7.5	WT after drilling
04/14/23	6.4	WT after drilling
04/14/23	6.7	WT before drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Field Description:, Broken rock. Refusal at 33.2' (50 blows/0.5"), gry, MTD, Rec. = 0.2 ft	R1 (60-70)	98 (83)	3	R(0.5") (R)				
		Top of Bedrock @ 33.2 ft								
35		33.2 ft - 38.2 ft, Gray to black, Calcareous SLATE, with calcite veins. Breaks are fresh, unweathered and mostly mechanical. Soft, Unweathered, Fair rock, NXDC, RMR = 43			4 4 4 4					
		38.2 ft - 43.2 ft, Gray to black, Calcareous SLATE, with calcite veins. Breaks are fresh, unweathered and mostly mechanical. Soft, Unweathered, Fair rock, NXDC, RMR = 46	R2 (60-70)	90 (90)	4					
40					4 4 4 4					
		Hole stopped @ 43.2 ft								
45		Remarks: Hole collapsed at 6.7'.								
50										
55										

Notes:
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BORING LOG

Poultney
BF 0145(13)
BR 4 VT 31

Boring No.: **B-104**
Page No.: 1 of 2
Pin No.: 21J164
Checked By: END

Boring Crew: MCGINLEY, BROCHU, MONETTE, ZOTTOLA
Date Started: 4/19/23 Date Finished: 4/24/23
VTSPG NAD83: N 370158.10 ft E 1445915.10 ft
Station: 14+48.00 Offset: 8.00
Ground Elevation: 424.6 ft

	Casing	Sampler
Type:	H.S.A.	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:	Acker Track	C_E =

Groundwater Observations

Date	Depth (ft)	Notes
04/24/23	3.1	WT before drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
		Asphalt 0.0'-0.5', 0.0 ft - 0.5 ft										
		A-1-b, Lab Classification: GRAVEL and Sand, little Silt, brn, Dry, Rec. = 1.4 ft				7-11-9-7 (20)	5.8	44.3	40.0	15.7		
		Field Description:, SAND, some Gravel. Rock in end of sampler, brn, Dry, Rec. = 0.2 ft				5-4-4-3 (8)						
5		Field Description:, Broken rock, GRAVEL, some Sand, brn, Dry, Rec. = 0.4 ft				4-11-5-10 (16)						
		Field Description:, Broken rock, GRAVEL, some Sand, brn/gry, Dry, Rec. = 0.9 ft				6-8-28-49 (36)						
		A-1-a, Lab Classification: GRAVEL, some Sand, trace Silt, brn, Dry, Rec. = 0.9 ft				24-11-48-R@1" (59)	2.7	73.8	20.4	5.8		
10		Field Description:, Broken rock, GRAVEL, some Sand. Refusal at 10.1' (100 blows), brn/gry, Dry, Rec. = 1.4 ft				12-39-35-R@2" (74)						
		Field Description:, SAND and Gravel, some Silt, Dk/brn-gry, Moist, Rec. = 1.1 ft				11-35-12-4 (47)						
15		A-1-a, Lab Classification: GRAVEL, some Sand, trace Silt, brn, Wet, Rec. = 0.7 ft				17-7-10-12 (17)	12.3	69.4	22.7	7.9		
		Field Description:, SAND, some Gravel, some Silt, brn, Wet, Rec. = 1.0 ft				8-8-10-24 (18)						
20		Field Description:, SAND and Gravel, little Silt, brn, Wet, Rec. = 1.3 ft				20-14-12-12 (26)						
		A-4, Lab Classification: SILT, some Gravel, little Sand, brn/gry, Wet, Rec. = 1.2 ft				7-5-3-6 (8)	22.8	29.9	15.4	54.7		
25		Field Description:, CLAY, gry, Wet, Rec. = 2.0 ft				WOH-1-WOH-1						

Notes:
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BORING LOG

Poultney
BF 0145(13)
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Boring No.: **B-104**
Page No.: 2 of 2
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Boring Crew: MCGINLEY, BROCHU, MONETTE, ZOTTOLA
Date Started: 4/19/23 Date Finished: 4/24/23
VTSPG NAD83: N 370158.10 ft E 1445915.10 ft
Station: 14+48.00 Offset: 8.00
Ground Elevation: 424.6 ft

	Casing	Sampler
Type:	H.S.A.	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:	Acker Track	C_E =

Groundwater Observations

Date	Depth (ft)	Notes
04/24/23	3.1	WT before drilling

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %	LL %	PI %
						(1)						
		A-4, Lab Classification: Low plasticity SILT, trace Sand, gry, Wet, Rec. = 2.0 ft				WOH-WOH-WOH-WOH (WOH)	32.7	0.3	4.8	94.9	28	6
35												
		Field Description:, SAND, some Silt, some Clay, gry, Wet, Rec. = 2.0 ft				WOH-1-3-3 (4)						
40												
		Field Description:, SAND, some Gravel, some Silt, gry, Wet, Rec. = 0.7 ft				29-R@2" (R)						
45												
		45.5 ft - 49.8 ft, Gray to black, Calcareous SLATE, with calcite veins. Rock is moderately shattered along foliation planes. some faint weathering/staining on fracture surfaces (brown/rust. Soft, Slightly weathered, Poor rock, NXDC, RMR = 29	R1 (10-20)	84 (21)	3 2 2 8		Top of Bedrock @ 45.5 ft					
50		49.8 ft - 54.8 ft, Gray to black, Calcareous SLATE, with calcite veins. Rock is mostly intact. Faint brown/rust staining along some natural fractures and along foliation. Soft to medium hard, Slightly weathered, Fair rock, NXDC, RMR = 44	R2 (10-40)	100 (74)	3 2 2 2 3							
55		Hole stopped @ 54.8 ft										

Remarks:
Hole collapsed at 12.8'.

Notes:
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