



BORING LOG

Highgate RD 144B (4S)
(GeoDesign #730-08.16)
Bridge #25, Highgate, VT

Boring No.: 0-101
Page No.: 1 of 2
Pin No.: P00171
Checked By: JFM/SPK

Boring Crew: J. Barrowbridge (CCO), A. Barthelet (GeoDesign)
Date Started: 8/18/14 Date Finished: 8/18/14
VTSFG INCHES: N 085191.00 N E 1514017.00 N
Station: 12+17 Offset: -0.00
Ground Elevation: 221 N

Casing Sampler
Type: H.S.A. SS
I.D.s: 3.25 in 1.38 in
Hammer Mt: H.A. 140 lb.
Hammer Fall: H.A. 30 in.
Hammer/Red Type: Safety/MUJ
Rig: CMT 43C 200 CE = 1

Groundwater Observations (3)

Date	Depth (ft)	Notes
08/18/14		None observed.

Depth (ft)	Strat(1)	CLASSIFICATION OF INTERIALS (Description)	S _u (kPa)	S _v (lb/ft ³)	S _u (lb/ft ²)	S _v (lb/ft ³)	S _u (lb/ft ²)	S _v (lb/ft ³)	S _u (lb/ft ²)	S _v (lb/ft ³)	S _u (lb/ft ²)	S _v (lb/ft ³)
2.5		S1 (0.5'-2'): Sand, light brown fine to coarse S&SB, little fine to coarse Gravel, little SH, mat. (RWD BNC) (ASHMO W145 Classification: A-1-b.) Res. = 1.2 N			27-18-17 (35)	5.1	31.2	51.3	17.5			
5.0		S2 (2'-6'): Medium dense, brown and light brown fine to coarse Sand, little fine Gravel, trace SH, mat. (RWD BNC) Res. = 1.1 N (ASHMO W145 Classification: A-1-b.)			11-8-7-6 (15)	4.5	27.0	63.3	9.7			
7.5		S3 (4'-6'): Loose, brown with orange and tan mottling (possible layering) fine to coarse Sand, some SH, little fine Gravel, mat. (FLL) Res. = 1.2 N (ASHMO W145 Classification: A-2-4.)			4-3-2-3 (7)	15.0	19.0	35.3	25.7			
10.0		S4 (6'-8'): Medium dense, brown fine to medium Sand, some SH, little fine Gravel, trace wood (decayed), mat. (FLL) Res. = 0.3 N (ASHMO W145 Classification: A-2-4.)			2-3-7-13 (16)	10.0	10.0	58.7	24.4			
12.5		S5 (8'-8.5'): Refusal, no recovery. Res. = 0.0 N C1) Very poor quality, moderately hard, slightly weathered, gray with white bedding, fine-grained SLATE. Fracturing approximately horizontal to 30 degrees.	C1	44 (0)	0.13 (0)							
15.0		Inferred Soil Below Abutment										
17.5		Wet stopped @ 13.2 N Terminated in boulder/abutment RM.										

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



BORING LOG

Highgate RD 144B (4S)
(GeoDesign #730-08.16)
Bridge #25, Highgate, VT

Boring No.: 0-101
Page No.: 2 of 2
Pin No.: P00171
Checked By: JFM/SPK

Boring Crew: J. Barrowbridge (CCO), A. Barthelet (GeoDesign)
Date Started: 8/18/14 Date Finished: 8/18/14
VTSFG INCHES: N 085191.00 N E 1514017.00 N
Station: 12+17 Offset: -0.00
Ground Elevation: 221 N

Casing Sampler
Type: H.S.A. SS
I.D.s: 3.25 in 1.38 in
Hammer Mt: H.A. 140 lb.
Hammer Fall: H.A. 30 in.
Hammer/Red Type: Safety/MUJ
Rig: CMT 43C 200 CE = 1

Groundwater Observations (3)

Date	Depth (ft)	Notes
08/18/14		None observed.

Depth (ft)	Strat(1)	CLASSIFICATION OF INTERIALS (Description)	S _u (kPa)	S _v (lb/ft ³)	S _u (lb/ft ²)	S _v (lb/ft ³)	S _u (lb/ft ²)	S _v (lb/ft ³)	S _u (lb/ft ²)	S _v (lb/ft ³)	S _u (lb/ft ²)	S _v (lb/ft ³)
22.5		REMARKS: 1) Auger grinding from 6.5 to 8.0 feet deep with more significant grinding/hammer between 7.5 and 8.0 feet deep. 2) Mud observed in auger cuttings during advance between 8 and 8.5 feet deep. 3) Switch to 4" FJ casing in the same borehole. Casing refusal @ 7.5 feet. 4) Clear borehole with the roller bit and advance casing to 8.2 feet prior to attempting core. 5) Much water return brown during casing with water less noted at approximately 5 feet during advance. 6) Complete loss of return for ~30 seconds at 9.5 feet deep. Return began at approximately 10.5' deep, light gray-brown in color. 7) Note total loss of water between 12 and 13.2 feet deep. 8) Remove core barrel and advance roller bit to 12 feet with a total loss of water during advance. Observed water flowing from face of stone abutment. Inferred that core was from boulder/part of abutment. Abandoned borehole. 9) Rock core obtained using a 10" size rock core barrel.										
25.0												
27.5												
30.0												
32.5												
35.0												
37.5												

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



STATE OF VERMONT
 AGENCY OF TRANSPORTATION
 MATERIALS & RESEARCH SECTION
 SUBSURFACE INFORMATION

BORING LOG

Highgate BO 1448 (43)
 (GeoDesign #750-09.16)
 Bridge #25, Highgate, VT

Boring No.: B-102
 Page No.: 1 of 1
 Pin No.: PS0171
 Checked By: JFW/SPK

Boring Crew: J. Burrowbridge (OQA), A. Baribault (GeoDesign)
 Date Started: 8/18/14 Date Finished: 8/18/14
 VTSPG NAD83: N 885188.00 ft E 1514011.00 ft
 Station: 12+14 Offset: -3.00
 Ground Elevation: 221 ft

Type: _____
 I.D.: _____
 Hammer Wt: _____
 Hammer Fall: _____
 Hammer/Rod Type: _____
 Rig: _____

Casing _____
 Sampler _____
 S.S.A _____
 N.A. _____
 N.A. _____
 N.A. _____
 Safety/N/A _____
 CE = _____

Groundwater Observations (3)

Date	Depth (ft)	Notes
08/18/14		None observed.

Depth (ft)	Strat(1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)(2)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 12.5		Cuttings: Light brown fine to coarse SAND, little fine to coarse Gravel, little Silt, moist.					
12.5		Hole stopped @ 12.0 ft SSAR					
15.0							
17.5							

Remarks:

- Slight grinding noted from 3 to 3.5 feet deep on possible cobble. Grinding observed from 6 to 8 feet deep with the auger deflecting at an approximately 10° angle (cutler head east, top west). Auger likely deflected around boulder.
- Offset hole to the east and advanced auger to refusal at 12.0 feet deep.

Notes:

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

GEODESIGN BORING LOG 750-09.16 HIGHGATE BRIDGE 25 BO 1448(S)10P1 VERMONT AGENCY OF TRANSPORTATION 2/11/15



STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Highgate BO 1448 (43)
(GeoDesign #750-09.16)
Bridge #25, Highgate, VT

Boring No.: B-103
Page No.: 1 of 1
Pin No.: PS0171
Checked By: JFW/SPK

Boring Crew: J. Burrowbridge (OCCA), A. Baribault (GeoDesign)
Date Started: 8/18/14 Date Finished: 8/18/14
VTSPG NAD83: N 885183.00 ft E 1514014.00 ft
Station: 12+18 Offset: 1.00
Ground Elevation: 221 ft

Type: _____
I.D.: _____
Hammer Wt: _____
Hammer Fall: _____
Hammer/Rod Type: _____
Rig: _____

Casing: H.S.A. Sampler: SS
3.25 in 1.38 in
N.A. 140 lb.
N.A. 30 in.
Safety/AWJ
CME 45C SKID CE = 1

Groundwater Observations (3)		
Date	Depth (ft)	Notes
08/18/14		None observed.

Depth (ft)	Strat(1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)(2)	Moisture Content %	Gravel %	Sand %	Fines %
		3" Asphalt					
2.5	x x x	S1 (0.5'-2'): Medium dense, brown fine to coarse SAND, little fine Gravel, little Silt, moist. (ROAD BASE) Rec. = 1.1 ft (AASHTO M145 Classification: A-1-b.)	17-13-15 (28)	4.7	31.3	56.5	12.2
2.5	x x x	S2 (2'-4'): Medium dense, brown fine to coarse SAND, little fine Gravel, little Silt, moist. (ROAD BASE) Rec. = 1.3 ft (AASHTO M145 Classification: A-1-b.)	13-9-8-8	5.6	26.3	62.2	11.5
5.0	x x x	S3 (4'-6'): Loose, brown with gray fine to coarse SAND, little Silt, trace fine Gravel, moist. (FILL) Rec. = 1.3 ft (AASHTO M145 Classification: A-2-4.)	6-5-4-4 (9)	7.4	20.9	59.6	19.5
7.5	x x x	S4 (6'-8'): Loose, brown with dark brown fine to coarse SAND, some Silt, little fine Gravel, trace Root Fibers, moist. (FILL) Rec. = 0.4 ft (AASHTO M145 Classification: A-2-4.)	4-3-2-2 (5)	15.9	25.0	48.9	26.1
10.0	x x x	S5 (8'-10'): Loose, brown fine to coarse SAND, some Silt, little fine Gravel, trace Wood (live Root), moist. (FILL) Rec. = 0.2 ft (AASHTO M145 Classification: A-2-4.)	1-1-2-1 (3)	22.6	20.8	59.2	20.0
10.0		S6 (10'-12'): Medium dense, brown fine to medium SAND, some Silt, trace fine Gravel, moist. Rec. = 0.4 ft (AASHTO M145 Classification: A-2-4.)	7-7-5-7 (12)	17.7	11.0	62.4	26.6

Hole stopped @ 12.0 ft
HSAR - See Remark 3.

Remarks:

- 1) Sample S2 not performed in accordance with ASTM D 1586, (borehole not cleared with HSA prior to sampling).
- 2) Auger grinding/chatter from 9 to 10.5 feet deep
- 3) After sampling S6 from 10 to 12 feet deep, encountered HSA refusal at 10.5 deep while trying to advance augers to continue sampling. Infer auger refusal to be on abutment boulders. Exploration was terminated as a result of auger refusal.

Notes:

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

GEODESIGN BORING LOG 750-09.16 HIGHGATE BRIDGE 25 BO 1448(43).DPT 2/11/15
 VERMONT AGENCY OF TRANSPORTATION



STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Highgate BO 1448 (43)
(GeoDesign #750-09.16)
Bridge #25, Highgate, VT

Boring No.: B-104
Page No.: 1 of 1
Pin No.: PS0171
Checked By: JFW/SPK

Boring Crew: J. Leonhardt (OCCA), A. Baribault (GeoDesign)
Date Started: 8/20/14 Date Finished: 8/20/14
VTSPG NAD83: N 885137.00 ft E 1514173.00 ft
Station: 13+85 Offset: -21.00
Ground Elevation: 223 ft

Casing Sampler
Type: FJ N.A.
I.D.: 3 in 1.38 in
Hammer Wt: 140 lb. N.A.
Hammer Fall: 30 in. N.A.
Hammer/Rod Type: N.A./NWJ
Rig: CME 45C SKID CE = 1

Groundwater Observations (3)		
Date	Depth (ft)	Notes
08/20/14	27.0	River surface.

Depth (ft)	Strat(1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (ROD %)	Drill Rate minutes/ft	Blows/6" (N Value)(2)	Moisture Content %	Gravel %	Sand %	Fines %
0		Bridge Deck to Water Surface								
28		River								
29		Boulders/Cobbles (Inferred)								
29.7		C1A (29' - 29.7'): BOULDERS/COBBLES.	C1	83 (0)	2.2					
29.7		C1B (29.7' - 31') Very poor quality, moderately hard, slightly weathered, gray with white banding, fine-grained SLATE. Fracturing approximately 30 to 80 degrees above horizontal.	C2	0 (0)	4.3					
31		C2 (31'-32'): No recovery.	C3	89 (59)	2.5					
32		C3 (32'-36.5'): Fair quality, moderately hard slightly weathered to fresh, fine-grained gray with white banding SLATE. Fracturing approximately laterally 30 to 60 degrees			3					
36.5		C4 (36.5'-40.5'): Good quality, moderately hard to hard, fresh to slightly weathered fine grained gray with larger gray and white banding SLATE. Fracturing approximately 50 to 45 degrees from horizontal. Possible Pyrite inclusions.	C4	100 (81)	3.3					
40.5		Hole stopped @ 40.5 ft			4.2					
40.5					3.5					
40.5					3.8					

Remarks:
 1) Boring performed through 6" diameter hole cored through the bridge deck (deck thickness 8").
 2) Advanced casing with a spin shoe approximately 1 foot into a boulder located immediately at the river bottom (28 to 29 feet below bridge deck). Began coring at 29 feet below the bridge deck.
 3) Wash water return light gray, with a total loss of return at approximately 29.5 feet below bridge deck during core.
 4) Advance spin casing past the bottom of the boulder to seat into bedrock at 31 feet below bridge deck. Attempt core C2 beginning at 31 feet below bridge deck but stopped due to oscillations and re-set casing to 32 feet below bridge deck prior to core attempting C3 advance.
 5) Lost water during coring of C3 at approximately 36 feet below bridge deck. Water return was not observed for the remainder of the borehole. Infer being lost through rock fractures.
 6) Bedrock cores were obtained with a NX-size rock core barrel.

GEODESIGN BORING LOG 750-09.16 HIGHGATE BRIDGE 25 BO 1448(43) GP J VERMONT AOTL DOT 2/11/15

Notes:
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 2. If Values have not been corrected for hammer energy, CE is the hammer energy correction factor.
 3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.



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 MATERIALS & RESEARCH SECTION
 SUBSURFACE INFORMATION

BORING LOG

Highgate BO 1448 (43)
 (GeoDesign #750-09.16)
 Bridge #25, Highgate, VT

Boring No.: B-106
 Page No.: 1 of 1
 Pin No.: PS0171
 Checked By: JFW/SPK

Boring Crew: J. Leonhardt (OCQA), A. Baribault (GeoDesign)
 Date Started: 8/19/14 Date Finished: 8/19/14
 VTSPG NAD83: N 885094.00 ft E 1514304.00 ft
 Station: 15+25 Offset: -10.00
 Ground Elevation: 221.5 ft

Casing Sampler
 Type: S.S.A N.A.
 I.D.: 2.25 in
 Hammer Wt: N.A. N.A.
 Hammer Fall: N.A. N.A.
 Hammer/Rod Type: N.A./N.A.
 Rig: CME 550X ATV CE =

Groundwater Observations (3)

Date	Depth (ft)	Notes
08/19/14		None observed.

Depth (ft)	Strata(1)	CLASSIFICATION OF MATERIALS (Description)	Blows/ft (N Value)(2)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 7.5		Overburden Soils (Inferred)					
7.5 - 12.5		Possible Weathered Bedrock (Inferred)					
12.5 - 17.5		Hole stopped @ 12.5 ft SSAR					
17.5 - 22.5		Remarks: 1) Auger grinding consistently between 8 and 12.5 feet deep on inferred weathered bedrock. 2) Auger refusal at 12.5 feet deep. 3) Brown auger cuttings noted to approximately 10 feet deep, becoming light gray to refusal at 12.5 feet deep.					

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

GEODESIGN BORING LOG 750-09.16 HIGHGATE BRIDGE 25 BO 1448(43).DPJ VERMONT AOT.LOBT 2/11/15



STATE OF VERMONT
 AGENCY OF TRANSPORTATION
 MATERIALS & RESEARCH SECTION
 SUBSURFACE INFORMATION

BORING LOG

Highgate 80 1448 (43)
 (GeoDesign #750-09.16)
 Bridge #25, Highgate, VT

Boring No.: 8-107
 Page No.: 1 of 1
 Pin No.: PS0171
 Checked By: JFW/SPK

Boring Crew: J. Leonhardt (QCOA), A. Baribault (GeoDesign)
 Date Started: 8/19/14 Date Finished: 8/19/14
 VTSPG NAD83: N 885090.00 ft E 1514298.00 ft
 Station: 15+20 Offset: -5.00
 Ground Elevation: 221.5 ft

Type: S.S.A Sampler N.A.
 I.D.: 2.25 in
 Hammer Wt: N.A. N.A.
 Hammer Fall: N.A. N.A.
 Hammer/Rod Type: N.A./N.A.
 Rig: CME 550X ATV CE =

Groundwater Observations (3)

Date	Depth (ft)	Notes
08/19/14		None observed.

Depth (ft)	Strat(1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)(2)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 8.5		Overburden Soils (Inferred)					
8.5 - 10.5		Possible Weathered Bedrock (Inferred)					
10.5 - 17.5		Hole stopped @ 10.5 ft SSAR					

- Remarks:
- 1) Auger grinding on inferred weathered bedrock between 8.5 and 10.5 feet deep.
 - 2) Auger refusal at 10.5 feet deep.
 - 3) Cuffings observed to be brown in color to refusal.

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

GEODESIGN BORING LOG 750-09.16 HIGHGATE BRIDGE 25 80 1448(43).OPJ VERMONT.AOT.DOT 2/11/15



BORING LOG

Highgate RD 1448 (43)
(GeoDesign #730-08.16)
Bridge #25, Highgate, VT

Boring No.: 0-108
Page No.: 1 of 2
Pin No.: P90171
Checked By: JFW/SPK

Boring Crew: J. Leachard (COO), A. Baribault (GeoDesign)
Date Started: 8/19/14 Date Finished: 8/19/14
VDPG MARKS: N 885804.00 N E 1514383.00 N
Station: 15+25 Offset: 0.00
Ground Elevation: 221.5 N

Casing Sampler
Type: FJ SS
I.D.: 4 in 1.38 in
Hammer Mt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Red Type: Auto/IMPJ
Rig: CME SSBK ATV CE = 1.5

Groundwater Observations (S)

Date	Depth (ft)	Notes
08/20/14		None observed.

Depth (ft)	Strat (ft)	CLASSIFICATION OF MATERIALS (Description)	Unit Weight (pcf)	Comp. Mod. (ksf)	Swell (mm/ft)	Shrinkage (%)	Moisture Content (%)	Gravel %	Sand %	Fines %
2.5	0-2	S1 (0.5'-2'): Medium dense, brown (light gray/brown upper 4") fine to coarse SAND, little fine GRAD, little SIL, mat. (ROAD SIDE) (ARNDT W145 Classification: A-1-b.) Res. = 1.0 N								
5.0	2-4	S2 (2'-4'): Loose, brown fine to coarse SAND, little SIL, trace fine GRAD, trace shells (in lower 6"), mat. (FILL) Res. = 1.5 N (ARNDT W145 Classification: A-1-b.)								
5.0	4-6	S3 (4'-6'): Loose, brown fine to coarse SAND, some (+) SIL, little fine GRAD, trace shells, sat. (FILL) Res. = 0.7 N (ARNDT W145 Classification: A-2-A.)								
7.5	6-8	S4 (6'-8'): Loose, brown fine to coarse SAND, some (+) SIL, little fine GRAD, mat. Res. = 0.9 N (ARNDT W145 Classification: A-2-A.)								
10.0	8-10	S5 (8'-10'): Very dense, gray fine to coarse GRNCL (friable) and fine to coarse SAND, trace SIL, mat. to sat. SSB (lower 8"): gray with white and orange fine GRNCL (friable) and fine to coarse SAND, little SIL, mat. (WEATHERED ROCK) Res. = 1.2 N (ARNDT W145 Classification: A-1-a.)								
10.0	10-12	S6 (10'-12'): Very dense, gray fine to coarse GRNCL (friable) and fine to coarse SAND, little SIL, mat. (WEATHERED ROCK) (ARNDT W145 Classification: A-1-b.) Res. = 1.8 N								
12.5	12-12.5	S7 (12'-12.5'): Refusal, gray fine GRNCL (friable) and fine to coarse SAND, trace SIL, mat. (WEATHERED ROCK) Res. = 0.5 N (ARNDT W145 Classification: A-1-a.)								
15.0	13-17.5	C1 (13'-17.5'): Fair quality, moderately hard with soft cores, slightly to moderately weathered, fine-grained gray with light gray/white banding and orange weathering SLATE. Fracturing approximately 80 to 90 degrees from horizontal. Strong reaction to dilute HCl in white bands. CTS1 UCS (10.1" deep) 6,070 psi.	C1	78 (54)	0.43					
17.5	17.5-31.5	C2 (17.5'-31.5'): Fair quality, moderately hard, slightly weathered, fine-grained gray with white banding/strips, SLATE. Fracturing approximately 30 degrees and 80-90 degrees from horizontal. Strong reaction to dilute HCl in white bands.	C2	100 (87)	0.50					

Notes: 1. Stratification lines represent approximate boundary between material types. Variation may be greater.
2. If values have not been corrected for hammer energy, CE is the hammer energy correction factor.
3. All test results have been made of fines and water conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.



Highgate RD 1448 (43)
(GeoDesign #730-08.16)
Bridge #25, Highgate, VT

Boring No.: 0-108
Page No.: 2 of 2
Pin No.: P90171
Checked By: JFW/SPK

Boring Crew: J. Leachard (COO), A. Baribault (GeoDesign)
Date Started: 8/19/14 Date Finished: 8/19/14
VDPG MARKS: N 885804.00 N E 1514383.00 N
Station: 15+25 Offset: 0.00
Ground Elevation: 221.5 N

Casing Sampler
Type: FJ SS
I.D.: 4 in 1.38 in
Hammer Mt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Red Type: Auto/IMPJ
Rig: CME SSBK ATV CE = 1.5

Groundwater Observations (S)

Date	Depth (ft)	Notes
08/20/14		None observed.

Depth (ft)	Strat (ft)	CLASSIFICATION OF MATERIALS (Description)	Unit Weight (pcf)	Comp. Mod. (ksf)	Swell (mm/ft)	Shrinkage (%)	Moisture Content (%)	Gravel %	Sand %	Fines %
22.5	21.5-28.5	C3 (21.5'-28.5'): Fair quality, moderately hard, slightly weathered to fresh, fine-grained, gray with white stripes, SLATE; fracturing approximately 80 degrees above horizontal. Strong reaction to dilute HCl in white bands.	C3	85 (85)	0.67					
25.0					0.67					
25.0					0.71					
25.0					0.53					
25.0					0.4					
27.5		Hole stopped @ 28.5 N								
30.0		Hole stopped @ 28.5 N								
32.5		Hole stopped @ 28.5 N								
35.0		Hole stopped @ 28.5 N								
37.5		Hole stopped @ 28.5 N								

Remarks:
1) Drove 4" casing through asphalt prior to sampling.
2) Sample S2 not performed in accordance with ASTM D1586 (barrel not cleared with roller bit prior to sampling)
3) Moisture descriptions may not accurately reflect in situ conditions due to wash-dry drilling methods.
4) Casing set to 11.5 feet deep prior to clearing boring with roller bit to 13 feet deep.
5) Wash water return gray-dark gray during core C1. Total loss of water from 15.5 to 17.5 feet deep. Estimate ~150 gallons lost over 2" core.
6) No return water observed during C2 or C3 advances.
7) Bedrock cores were obtained with a 1 1/2" size rock core barrel.

Notes: 1. Stratification lines represent approximate boundary between material types. Variation may be greater.
2. If values have not been corrected for hammer energy, CE is the hammer energy correction factor.
3. All test results have been made of fines and water conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.



BORING LOG

Highgate RD 1448 (43)
(Coeledge #730-00.16)
Bridge #25, Highgate, VT

Boring No.: 0-100
Page No.: 1 of 2
Pin No.: P90171
Checked By: JTW/SPK

Boring Crew: J. Barrowsbridge (OCOA), A. Barbauff (Coeledge)
Date Started: 8/19/14 Date Finished: 8/20/14
VTSPG INFO: N 005104.00 N E 1514000.00 N
Station: 12+00 Offset: -7.00
Ground Elevation: 221 N

Coring Sampler
Type: U.S.A. SS
I.D.: 3.25 in. 1.38 in.
Hammer Wt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Safety/MIU
Rig: CME 45 TRUCK CE = 1

Groundwater Observations (3)

Date	Depth (ft)	Notes
08/20/14		None observed.

Depth (ft)	Strat (ft)	CLASSIFICATION OF MATERIALS (Description)	Unit Wt (pcf)	S _w (%)	S _u (lb/ft ²)	S _u (lb/ft ²)	S _u (lb/ft ²)	S _u (lb/ft ²)	S _u (lb/ft ²)	S _u (lb/ft ²)	
											Comp. No. 25 (ft)
2.5		S1 (0.5-2'): Sand, light brown fine to coarse SAND, little fine gravel, little SH, moist. (ROAD BRSE) (ASHMO N145 Classification: A-1-b.) Res. = 1.1 N			22-18-14 (35)	4.3	32.8	51.9	15.5		
5.0		S2 (2-4'): Medium dense, brown fine to coarse SAND, trace fine gravel, little SH, moist. (ROAD BRSE) Res. = 0.8 N (ASHMO N145 Classification: A-1-b.)			14-0-0-5	4.0	30.2	62.8	7.0		
5.0		S3 (0-6'): Medium dense, brown fine to coarse SAND, some SH, trace fine gravel, trace (-) rounded wood, sat. (FILL) Res. = 0.7 N (ASHMO N145 Classification: A-2-4.)			13-10-7 (17)	18.4	27.0	40.2	23.0		
7.5		S4 (0-8'): Loose, brown fine to coarse SAND, some SH, trace fine gravel trace (-) wood/wood fibers, sat. (FILL) Res. = 0.5 N (ASHMO N145 Classification: A-2-4.)			7-5-4-7	14.0	12.7	63.1	24.2		
10.0		S5 (8-10'): Medium dense, light brown fine to coarse SAND, and SILT, little fine to coarse gravel (friable, platy-silty), moist to sat. Res. = 0.8 N (ASHMO N145 Classification: A-2-4.)			12-10-14-16 (24)	16.0	33.7	30.9	35.4		
12.5		S6 (10-12'): Sand, light brown fine to coarse SAND and fine GRAVEL (friable), some SH, moist. (RECOMPOSED ROCK) Res. = 1.1 N (ASHMO N145 Classification: A-1-b.)			12-21-23-18 (24)	12.4	43.3	30.2	20.5		
15.0		S7 (12-14'): Sand, light brown/orange and gray fine to coarse SAND and fine to coarse GRAVEL (friable, platy), some SH, moist to sat. (RECOMPOSED ROCK) Res. = 1.0 N (ASHMO N145 Classification: A-1-b.)			24-22-23-18 (24)	14.5	52.2	27.4	20.4		
17.5		S8 (14-16'): Very dense, tan and gray fine to coarse SAND, some fine to coarse gravel, some SH, moist. (WEATHERED ROCK) Res. = 1.3 N (ASHMO N145 Classification: A-2-4.)			15-17-31-25 (38)	12.1	41.7	20.5	20.8		
20.0		S9 (16-17.7'): Very dense, tan and gray fine to coarse SAND, some fine GRAVEL (friable, broken), some SH, moist. Darker gray rock in spoon shov. (WEATHERED ROCK) Res. = 1.0 N (ASHMO N145 Classification: A-1-b.)			47-37-10-18-18-18 (35)	10.7	47.8	20.3	23.0		
22.5		S10 (18-18.5'): Refractory gray fine to coarse SAND, some fine GRAVEL (friable, broken), some SH, sat. (from drilling fluid). (WEATHERED ROCK) (ASHMO N145 Classification: A-2-4.) Res. = 0.2 N			100/4 (5)	0.8	44.0	24.7	31.3		
25.0		C1 (20-24.8'): Very poor quality, soft to moderately hard, (partly friable), slightly to moderately weathered, fine-grained gray with occasional white stripes SLATE. Fracturing approximately 30 degrees.	C1		50 (9)	0.3					
25.0						5.0					Top of Bedrock @ 20.0 N
27.5						13					
30.0						12					
32.5						0.6					

Notes: 1. Stratification lines represent approximate boundary between material types. Variation may be gradual.
2. If there are not three cores for moisture energy, CE is the lowest energy correction factor.
3. Water level readings have been made of time and under conditions stated. Fluctuations of ground-water may occur due to other factors than those present at the time measurements were made.



BORING LOG

Highgate RD 1448 (43)
(Coeledge #730-00.16)
Bridge #25, Highgate, VT

Boring No.: 0-100
Page No.: 2 of 2
Pin No.: P90171
Checked By: JTW/SPK

Boring Crew: J. Barrowsbridge (OCOA), A. Barbauff (Coeledge)
Date Started: 8/19/14 Date Finished: 8/20/14
VTSPG INFO: N 005104.00 N E 1514000.00 N
Station: 12+00 Offset: -7.00
Ground Elevation: 221 N

Coring Sampler
Type: U.S.A. SS
I.D.: 3.25 in. 1.38 in.
Hammer Wt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Safety/MIU
Rig: CME 45 TRUCK CE = 1

Groundwater Observations (3)

Date	Depth (ft)	Notes
08/20/14		None observed.

Depth (ft)	Strat (ft)	CLASSIFICATION OF MATERIALS (Description)	Unit Wt (pcf)	S _w (%)	S _u (lb/ft ²)	S _u (lb/ft ²)	S _u (lb/ft ²)	S _u (lb/ft ²)	S _u (lb/ft ²)	S _u (lb/ft ²)	
											Comp. No. 25 (ft)
27.5		C2 (24.8'-28.8'): Very poor quality, soft to moderately hard, slightly to moderately weathered, fine-grained gray with white banding and white SLATE. Fracturing approximately 45 degrees from horizontal.	C2		85 (7)	7.0					
30.0		C3 (28.8'-34.3'): Poor quality, light/dark gray and white, moderately hard to hard, slightly weathered, fine-grained gray and white with white and black SLATE. Fracturing approximately 45 degrees from horizontal. C3SE UCS (31.5' deep) 4,650 psi.	C3		85 (37)	5.5					
32.5						0.3					
35.0						14					
37.5						20					
35.0		Hole stopped @ 34.3 N									
40.0		Remarks: 1) Boring performed ~10' East of 0-1. 2) Material descriptions may not accurately reflect in situ conditions due to wash-dry drilling methods. 3) Samples S2 and S4 were not performed according to ASTM D1586 (barrel not cleared with the roller bit prior to sampling). 4) Observed auger grinding/shatter from approximately 10 feet to 13 feet deep. 5) Saturated drill rig on 8/20 to a CME 5500 with auto hammer (assumed Co = 1.5) and began sampling with S0 at 16 feet deep. 6) Prior to beginning coring, clear hole with roller bit and set 4" casing of 20 feet deep. 7) Wash water returns during core light gray/gray. Slight loss (~25 gallons) noted between 10 and 21 feet deep. 8) Total loss of water (partially from leaking rig) from core C1 at end of run; ended core with 4.5' penetration. 9) Wash water returns dark gray & light gray during coring of C3. Some loss of water, but could be attributed to leaking hose on rig. 10) Bottom of C3 possible test due to broken core exterior. 11) Bedrock cores obtained with a 60-size rock core barrel.									

Notes: 1. Stratification lines represent approximate boundary between material types. Variation may be gradual.
2. If there are not three cores for moisture energy, CE is the lowest energy correction factor.
3. Water level readings have been made of time and under conditions stated. Fluctuations of ground-water may occur due to other factors than those present at the time measurements were made.



STATE OF VERMONT
 AGENCY OF TRANSPORTATION
 MATERIALS & RESEARCH SECTION
 SUBSURFACE INFORMATION

BORING LOG

Highgate RD 1448 (43)
 (GeoDesign #750-09.16)
 Bridge #25, Highgate, VT

Boring No.: B-110
 Page No.: 1 of 1
 Pin No.: PS0171
 Checked By: JFW/SPK

Boring Crew: J. Burrowbridge (QCQA), A. Baribault (GeoDesign)
 Date Started: 8/19/14 Date Finished: 8/19/14
 VTSPG NAD83: N 885190.00 ft E 1514009.00 ft
 Station: 12+11 Offset: -3.00
 Ground Elevation: 221 ft

Casing Sampler
 Type: S.S.A N.A.
 I.D.: 2.25 in
 Hammer Wt: N.A. N.A.
 Hammer Fall: N.A. N.A.
 Hammer/Rod Type: N.A./N.A.
 Rig: CME 45 TRUCK CE =

Groundwater Observations (3)

Date	Depth (ft)	Notes
08/19/14	16.0	Wet augers.

Depth (ft)	Strata(1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)(2)	Moisture Content %	Gravel %	Sand %	Fines %
0.0 - 18.0		Overburden Soil (Inferred)					
18.0		Hole stopped @ 18.0 ft SSAR					
22.5		Remarks: 1) Slight grinding noted below approximately 10 feet deep. Soil cuttings noted to be brown in color. 2) Water was observed on the augers during removal at approximately 16 feet deep. 3) Solid stem auger refusal at 18 feet deep on inferred bedrock.					

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

GEODESIGN BORING LOG 750-09.16 HIGHGATE BRIDGE 25 RD 1448(43)OP1 VERMONT.MAT.GDT 2/11/15



BORING LOG

Highgate RD 144B (43)
(GeoDesign #730-08.16)
Bridge #25, Highgate, VT

Boring No.: 0-111
Page No.: 1 of 2
Pin No.: P20171
Checked By: JFW/SJK

Boring Crew: J. Barrenbridge (COO), A. Baribault (GeoDesign)
Date Started: 8/21/14 Date Finished: 8/21/14
VTSFG NUMBERS: N 085184.00 H E 1514085.00 H
Station: 12+10 Offset: 3.00
Ground Elevation: 221 ft

Casing Sampler
Type: FJ SS
I.O.S.: 4 in 1.30 in
Hammer Mt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Auto/SMJ
Rig: ONE SSBK ATV CE = 1.5

Groundwater Observations (3)		
Date	Depth (ft)	Notes
08/21/14		None observed.

Depth (ft)	Sheet (1)	CLASSIFICATION OF MATERIALS (Description)	Avg. (ft)	No. of Cuts (ft)	No. of Samples (ft)	Moisture Content (%)	Gravel (%)	Sand (%)	Fines (%)
2.5		S1 (0.5'-2'): Medium dense, light brown fine to coarse SAND, some fine Gravel, little SILT, trace asphalt fragments (from above), metal. (ROUND BRSE) Res. = 0.7 ft (ANSIMO W145 Classification: A-1-b.)			10-5-5 (16)	4.5	48.7	37.8	15.5
5.0		S2 (2'-4'): Loose, light brown fine to medium SAND, little fine Gravel, trace SILT (more in lower 4'), metal. (ROUND BRSE) Res. = 1.2 ft (ANSIMO W145 Classification: A-1-b.)			4-3-3-4	6.2	28.8	63.8	8.3
7.5		S3 (4'-6'): Loose brown fine to coarse SAND, some SILT, little fine to coarse Gravel, wet. (FILL) Res. = 0.8 ft (ANSIMO W145 Classification: A-1-b.)			3-3-2-2 (5)	14.5	35.7	44.0	20.3
10.0		S4 (6'-8'): Loose, brown fine to coarse SAND, little fine Gravel, little SILT, wet. (FILL) Res. = 0.5 ft (ANSIMO W145 Classification: A-1-b.)			3-3-3-2 (8)	16.8	38.0	57.8	12.2
12.5		S5 (8.5'-10'): Loose, brown with orange fine to coarse SAND, some fine Gravel, some SILT, wet. (FILL) Res. = 0.5 ft (ANSIMO W145 Classification: A-1-b.)			4-3-4 (7)	15.0	40.4	38.5	23.1
15.0		S6 (10'-12'): Medium dense, light brown with orange and gray fine to coarse SAND and SILT, some fine to coarse Gravel, metal to wet. Res. = 1.5 ft (ANSIMO W145 Classification: A-4.)			0-0-0-0 (15)	14.5	28.8	33.8	38.8
17.5		S7 (12'-14'): Medium dense, light brown fine to coarse SAND and fine to coarse GRANUL, little SILT, wet. Res. = 1.2 ft (ANSIMO W145 Classification: A-1-b.)			0-11-0 (18)	11.8	38.3	31.5	18.2
		S8 (14'-16'): Medium dense, light brown fine to coarse SAND, some SILT, some fine to coarse Gravel (friable, platy), metal to wet. Res. = 1.4 ft (ANSIMO W145 Classification: A-2-4.)			15-11-0 (31)	16.8	33.4	34.1	32.5
		S9 (16'-17.4'): Relaxed, light brown, orange and gray fine to coarse SAND, some SILT, some fine Gravel (friable, platy), metal. Gray Rock fragments in open area (lower 2" of sample). Res. = 1.0 ft (ANSIMO W145 Classification: A-2-4.)			0-10-0 (10)	16.4	37.0	29.8	33.1
		S10 (18' - 18.8'): Relaxed, gray fine to coarse SAND and fine GRANUL (friable), little SILT, wet. (POSSIBLE WEATHERED ROCK) (ANSIMO W145 Classification: A-1-b.) Res. = 0.8 ft			20-11-0 (16)	14.7	51.1	28.8	22.1

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



BORING LOG
Highgate RD 144B (43)
(GeoDesign #730-08.16)
Bridge #25, Highgate, VT

Boring No.: 0-111
Page No.: 2 of 2
Pin No.: P20171
Checked By: JFW/SJK

Boring Crew: J. Barrenbridge (COO), A. Baribault (GeoDesign)
Date Started: 8/21/14 Date Finished: 8/21/14
VTSFG NUMBERS: N 085184.00 H E 1514085.00 H
Station: 12+10 Offset: 3.00
Ground Elevation: 221 ft

Casing Sampler
Type: FJ SS
I.O.S.: 4 in 1.30 in
Hammer Mt: 140 lb. 140 lb.
Hammer Fall: 30 in. 30 in.
Hammer/Rod Type: Auto/SMJ
Rig: ONE SSBK ATV CE = 1.5

Groundwater Observations (3)		
Date	Depth (ft)	Notes
08/21/14		None observed.

Depth (ft)	Sheet (1)	CLASSIFICATION OF MATERIALS (Description)	Avg. (ft)	No. of Cuts (ft)	No. of Samples (ft)	Moisture Content (%)	Gravel (%)	Sand (%)	Fines (%)
22.5		C1 (20.2'-24'): Very poor quality, moderately hard, fine-grained, slightly weathered gray with white/light gray banding SLATE. Fracturing approximately 30 degrees from horizontal.	C1	78 (9)	0.14				
25.0		C2 (24'-28.7'): Very poor quality, moderately hard, fine-grained, slightly weathered gray with white/light gray banding SLATE. Fracturing approximately 30 degrees from horizontal.	C2	67 (24)	0.18				
27.5					0.17				
30.0					0.23				
32.5					0.13				
35.0					0.08				
37.5					0.06				
					0.15				
					0.15				
					0.12				
		Note stopped @ 31.8 ft							

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

- Remarks:
- 1) Hammer energy correction factor is assumed.
 - 2) Moisture descriptions may not accurately reflect in-situ conditions due to wash-drive drilling methods.
 - 3) Sample S2 not performed according to ASTM D1526 (soil was not cleared with the roller bit prior to sampling).
 - 4) Casing driven to 0.5 feet deep prior to sampling S3. Loss of water observed from approximately 6 to 0.5 feet deep.
 - 5) Casing driven to 18 feet deep prior to S10. Roller bit advanced ahead of casing to 20.2 feet; followed by the casing driven to 20.2 feet prior to core.
 - 6) Core barrel block of 3' 10" in core run C1.
 - 7) Wash water return light brown, turning gray during coring of C1. Some water loss may be due to leak on rig.
 - 8) Bedrock cores obtained with a 31/2" dia rock core barrel.