December 8, 2020

Bread Loaf Corporation
Attn: Stephen Rooney, AIA
1293 Route 7 South
Middlebury, VT 05753

Re: Fill investigation for the proposed DPW-Police Facility located at 80 Pine Street in Bristol, VT.

Dear Steve:

This is to report our interpretation of the fill conditions at the site of the proposed DPW-Police Facility located at 80 Pine Street in Bristol, VT. Our findings are based upon 4 soil borings (B-1 thru B-4) performed by Mike's Boring & Coring (MB&C) from East Barre, Vermont. DIG-SAFE was contacted by your firm to locate public utilities near the proposed borings (DIG-SAFE #2020-470-9127).

Attached are copies of the 4 soil borings. Some of the information has been plotted on the site plan provided by your office.

No attempt was made by Knight Consulting Engineers to investigate for the presence, extent or nature of hazardous or toxic substances.

We appreciate the opportunity to conduct this geotechnical investigation, and stand ready to assist in future phases of this project.

Sincerely,

Eric Goddard

Eric Goddard, P.E.
Senior Vice President
Bristol DPW-Police Fill Investigation Report (12-08-2020).doc

DESCRIPTION OF EXPLORATION PROGRAM

The fill investigation was comprised of 4 soil borings along the northerly and westerly sides of the proposed DPW-Police Facility site located at 80 Pine Street in Bristol, Vermont. Two of the soil borings (B-2 & B-4) were drilled into native soil and two of the soil borings (B-1 & B-3) encountered refusal on probable concrete or boulders. All soil borings were performed using Standard Penetration Test (SPT) split-spoon sampling procedures.

Hollow-stem augers were first advanced to a pre-determined depth. Then a standard 2" OD split spoon sampler was attached to the end of the drill rod and driven into the soil. The SPT value (units are blows per foot) were recorded as the sum of the number of blows of a 140 pound hammer, free falling 30 inches, required to drive the sampler over the second and third of four 6 inch increments. Once the SPT value was recorded and a disturbed sample obtained, the sampler was advanced to the next sampling depth and the process was repeated.

It should be noted that the information reported on the boring logs is a field visual interpretation and does not always match the description based upon laboratory analysis of the submitted samples.

The boring locations and elevations are depicted on the **Soil Boring Locations & Elevations Plan.**

The bottom of fill elevations are depicted on the **Bottom of Fill Elevations Plan**.

SITE OVERVIEW

The site of the proposed DPW-Police Facility is located at 80 Pine Street in Bristol, Vermont. The existing plateau slopes gradually from southeast to northwest with approximate elevations ranging from 0 feet to -3 feet. The site is bordered by steeply-sloped dumped fills along the northerly and westerly perimeter. The fill slopes range from 65% to 80%. An old landfill is located at the toe of these fill slopes. Surface runoff currently flows toward the fill slope and is causing erosion of the unprotected slope face.

A DPW employee indicated that the on-site fill materials contain ditch cleaning debris and concrete sidewalks among other items. The same employee also reported that in 2018 there was a localized slope failure involving a 10'-wide wedge of soil north of Soil Boring B-3. It is unclear whether this failure was triggered by erosion, soil saturation or some other cause. It was reported by Bread Loaf that there has been a history of settlement of the existing building located at the NW corner of the site.

SUBSURFACE CONDITIONS

Based upon the soil borings, the on-site fill materials appear to be a very loose-to-medium dense mixture of sand, gravel, topsoil, roots, concrete, brick, cinders, asphalt and wood. Silty peat was encountered at Soil Boring B-1; glass and porcelain were encountered at Soil Boring B-2. Below is a summary of the fill depth results:

Boring	Boring Elevation	Bottom of Fill Depth	Bottom of Fill Elev.
B-1	-3.0'	>15.25'	<-18.25'
B-2	-3.0'	23.0'	-26.0'
B-3	-2.75'	>18.25'	<-21.0' (1)
B-4	0.0'	13.0'	-13.0'
ww-tp1	-2.25'	4.75'	-7.0'
ww-tp4	-8.3'	1.3'	-9.6'

Note (1): Bottom of fill was predicted to be at -20'+/- based upon the existing fill slopes.

FINDINGS AND CONCLUSIONS:

New Buildings: Based upon the soil boring results, the existing fill materials should be either: 1) stabilized in-place using GEOPIER's, or 2) completely removed and replaced with structural fill compacted to 95% of the Modified Proctor density. A potential complication with the installation of GEOPIER's is the possibility of obstructions above the bottom of the fill elevation. This may necessitate pre-drilling for installation of the piers or excavating to remove the obstructions when encountered. More refined fill information will likely be needed in order to perform detailed design of the GEOPIER's.

New Parking Lots: Based upon the soil boring results, new parking lots should remain unpaved if the existing fill materials are left in-place. Paved parking lots should have the existing fill materials completely removed and replaced with structural fill compacted to 95% of the Modified Proctor density. GEOPIER's are typically not a cost-effective approach for stabilizing parking lots.

Slope Stability: The existing fill slopes should be protected from future erosion by diverting runoff away from the northerly slope face or adding a stabilized channel to transport the runoff down the slope face. There will likely be periodic sloughing and localized failures of the existing slopes due to the inherent instability of the fill materials. Preliminary setbacks for 1.25 and 1.50 Factors-of-Safety are plotted on the **Preliminary Slope Factors-of-Safety Limits Plan.** It should be noted that these limits are intended as planning guidelines based upon the toes of the existing steep fill slopes depicted on the plans and the assumption of mostly granular soil properties. Further erosion may impact these limits. One design consideration is to cut back the top of slope to achieve a flatter (more stable) slope face and protecting the face with vegetation and erosion control matting. A more detailed slope analysis is recommended to be included in the final design of the site.

TP-1
PROPOSED TEST PITS

ww-tp5
PREVIOUS 1989 WASTE WATER PERMIT TEST PITS

APPROX. 1FT CONTOURS

OPTIONAL IF NEEDED

PROPOSED DIESEL TANK

PROPOSED RELOCATED DOG POUND

SEPTIC FIELD

64'-0"

+(-4.0')

18'-7 1/4"

42'-5 1/4"

54'-2"

38'-2 1/4"

+(-3.0')

TP-3

B-2 (-3')

B-3 (-2.75')

(-8.3')

ww-tp4

ww-tp6

ww-tp5

23'-3"

40'-0"

GREY GARAGE +(-2.6')

ww-tp1

(-2.25')

ww-tp2

+(-2.0')

ww-tp3

+(-1.0')

B-4 (0')

+0.0'

42'-7 3/4"

17'-0"

10'-8 3/4"

GREEN GARAGE +0.0'

109'-5 3/4"

157'

E.O. NEW PAVE

137'

F.O. NEW FNTDN

B-1 (-3')

114'

F.O. NEW FNDTN

135'

E.O NEW PAVE

Reference 0' Elevation

PINE ST.

IRON PIPE BENCHMARK

APPROX. BOUNDARY LINES

46'
E.O. NEW PAVE

149'
F.O. NEW FNDTN.

123'
F.O. NEW FNDTN

Graphic Scale: 1 inch = 40 feet

0 40' 80' 120' 160'

Soil Boring Locations & Elevations

Bristol Public Works and Police Dept. Building Site and Needs Analysis

CONCEPT DESIGN

11/10/20

BreadLoaf
Architects
Planners
Builders

TP-1
PROPOSED TEST PITS

ww-tp5
PREVIOUS 1989 WASTE WATER PERMIT TEST PITS

APPROX. 1FT CONTOURS

OPTIONAL IF NEEDED

PROPOSED DIESEL TANK

PROPOSED RELOCATED DOG POUND

SEPTIC FIELD

64'-0"

+(-4.0')

18'-7 1/4"

42'-5 1/4"

54'-2"

38'-2 1/4"

+(-3.0')

TP-3

B-2 (-26')

B-3 (<-21')

(-9.6')

ww-tp4

ww-tp6

ww-tp5

23'-3"

40'-0"

GREY GARAGE +(-2.6')

ww-tp1

(-7.0')

+(-2.0')

ww-tp2

+(-1.0')

B-4 (-13')

+0.0'

42'-7 3/4"

17'-0"

10'-8 3/4"

ww-tp3

GREEN GARAGE +0.0'

B-1 (<-18.3')

157'

E.O. NEW PAVE

137'

F.O. NEW FNTDN

109'-5 3/4"

114'

F.O. NEW FNDTN

135'

E.O NEW PAVE

Reference 0' Elevation

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Graphic Scale: 1 inch = 40 feet

0 40' 80' 120' 160'

Bottom of Fill Elevations

Bristol Public Works and Police Dept. Building Site and Needs Analysis

CONCEPT DESIGN

11/10/20

BreadLoaf
Architects
Planners
Builders

TP-1
PROPOSED TEST PITS

ww-tp5
PREVIOUS 1989 WASTE WATER PERMIT TEST PITS

APPROX. 1FT CONTOURS

OPTIONAL IF NEEDED

PROPOSED DIESEL TANK

SEPTIC FIELD

F.O.S.=1.25

F.O.S.=1.5

B-1

B-2

B-3

B-4

64'-0"

+(-4.0')

19'-7 1/4"

42'-5 1/4"

54'-2"

38'-2 1/4"

+(-3.0')

23'-3"

40'-0"

157'

E.O. NEW PAVE

137'

F.O. NEW FNTDN

GREY GARAGE +(-2.6')

ww-tp1

ww-tp2

+(-2.0')

ww-tp3

+(-1.0')

+0.0'

42'-7 3/4"

GREEN GARAGE +0.0'

17'-0"

10'-8 3/4"

109'-5 3/4"

114'

F.O. NEW FNDTN

135'

E.O NEW PAVE

ww-tp4

ww-tp6

ww-tp5

PINE ST.

IRON PIPE BENCHMARK

APPROX. BOUNDARY LINES

46'
E.O. NEW PAVE

149'
F.O. NEW FNDTN.

123'
F.O. NEW FNDTN

Graphic Scale: 1 inch = 40 feet

0 40' 80' 120' 160'

Preliminary Slope Factors-of-Safety Limits

Bristol Public Works and Police Dept. Building Site and Needs Analysis

CONCEPT DESIGN

11/10/20

BreadLoaf
Architects
Planners
Builders

MIKE'S BORING & CORING LLC.
PO Box 75 ° East Barre, Vermont 05649 ° 802 476-5073

TO: Eric Goddard Knight Consulting Engineers 183 Commerce Lane Williston, VT 05495	PROJECT NAME: Proposed DPW-Police Bldg LOCATION: Bristol, VT MBC JOB #: 202074	SHEET: 1 DATE: 11-30-2020 HOLE #: B- 1 LINE & STA. OFFSET:	

Ground Water Observations NWTD at 0 Hours	Augers-Size I.D. 3.25" Split Spoon 2" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: -3'+/- Date Started: 11-30-2020 Date Completed: 11-30-2020 Boring Foreman: Mike McGinley Inspector: Eric Goddard Soils Engineer: Eric Goddard

LOCATION OF BORING: As staked-

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No. Rec.	Sample Pen. Inches	Sample Inches
5'-7'	Dry	1/1/1/1	Moist/damp	6'	Very loose brown sand and gravel into silty peat - fill	1	24	8
10'-12'	Dry	54/48/11/9	Damp/dry		Very dense-to-medium dense brown cmf sand with concrete - fill	2	24	8
15'-17'	Dry	100 for 3"			Fill	3	3	0
				15'-3"	Refusal on probable concrete			

Ground Surface to 15' Used 3.25" Auger Then SS to 8' refusal at 15'3"

Earth Boring	15'3"
Rock Coring	
Samples:	3
HOLE NUMBER	B-1

MIKE'S BORING & CORING LLC.
PO Box 75 ° East Barre, Vermont 05649 ° 802 476-5073

TO: Eric Goddard Knight Consulting Engineers 183 Commerce Lane Williston, VT 05495	PROJECT NAME: Proposed DPW-Police Bldg LOCATION: Bristol, VT MBC JOB #: 202074	SHEET: 2 DATE: 11-30-2020 HOLE #: B- 2 LINE & STA. OFFSET:	

Ground Water Observations NWTD at 0 Hours	Augers-Size I.D. 3.25" Split Spoon 2" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: -3'+/- Date Started: 11-30-2020 Date Completed: 11-30-2020 Boring Foreman: Mike McGinley Inspector: Eric Goddard Soils Engineer: Eric Goddard

LOCATION OF BORING: As staked-

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No. Rec.	Sample Pen. Inches	Sample Inches
5'-7'	Dry	2/2/2/2	Damp		Very loose-to-loose brown silt & f sand, tr roots, cinders and brick - fill	1	24	6
10'-12'	Dry	3/5/9/12	Damp		Loose-to-medium dense brown silt & f sand, tr roots - fill	2	24	4
14'-16'	Dry	5/5/6/9	Damp		Loose-to-medium dense brown mf sand, some concrete & asphalt, tr silt - fill	3	24	10
16'-18'	Dry	7/8/12/9	Damp		Medium dense brown silt & f sand, some brick and cinders - fill	4	24	15
18'-20'	Dry	17/5/7/6	Damp	18.5'	Loose-to-medium dense brown silt & f sand, some cinders, porcelain, glass & concrete - fill	5	24	9
20'-22'	Dry	2/17/15/8	Damp	20.5'	Medium dense sand, cinders, brick & concrete - fill	6	24	10
22'-2'4'	Dry	6/8/7/9	Damp/moist	23'	Loose-to-medium dense sand, cinders, brick & concrete (fill) into medium dense brown cmf sand & f gravel, tr silt (native soil)	7	24	11

Ground Surface to 22' Used 3.25" Auger Then SS to 24'

Earth Boring	24'
Rock Coring	
Samples:	7
HOLE NUMBER	B-2

MIKE'S BORING & CORING LLC.
PO Box 75 ° East Barre, Vermont 05649 ° 802 476-5073

TO: Eric Goddard Knight Consulting Engineers 183 Commerce Lane Williston, VT 05495	PROJECT NAME: Proposed DPW-Police Bldg LOCATION: Bristol, VT MBC JOB #: 202074	SHEET: 2 DATE: 11-30-2020 HOLE #: B- 3 LINE & STA. OFFSET:	

Ground Water Observations NWTD at 0 Hours	Augers-Size I.D. 3.25" Split Spoon 2" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: -2.75'+/- Date Started: 11-30-2020 Date Completed: 11-30-2020 Boring Foreman: Mike McGinley Inspector: Eric Goddard Soils Engineer: Eric Goddard	

LOCATION OF BORING: As staked-

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen. Rec. Inches	Sample Inches
4'-6'	Dry	7/3/3/3	Moist	5.5'	Loose brown silty fine sand into loose black cmf sand, tr roots - fill	1	24	8
6'-8'	Dry	4/3/4/5	Moist		Loose mixture of brown & dark brown cmf sand, some f gravel, tr silt - fill	2	24	6
8'-10'	Dry	11/26/8/3	Moist/damp	9.5'	Medium dense black/brown silty cmf sand, some f gravel, tr roots - fill	3	24	8
10'-12'	Dry	4/2/3/2	Moist		Very loose-to-loose oxidized brown cmf sand, tr f gravel, silt & roots - fill	4	24	7
12'-14'	Dry	2/4/8/12	Damp	13'	Very loose-to-medium dense brown silty cmf sand, some f gravel, tr asphalt & roots - fill	5	24	3
14'-16'	Dry	13/11/19/8	Damp		Medium dense brown silty cmf sand, some f gravel (layer of asphalt at 15') - fill	6	24	8
16'-18'	Dry	5/2/2/3	Damp	17'	Loose brown silty cmf sand into very loose orange/brown organics (rotten wood) & black cinders - fill	7	24	12
18'-20'	Dry	100 for 3"	Damp		Pink/brown cmf sand, some f gravel, tr silt - fill	8	24	2
				18'-3"	Refusal on probable boulder or concrete			

Ground Surface to 18' Used 3.25" Auger Then SS to refusal at 18'3"

Earth Boring	18'3"
Rock Coring	
Samples:	8
HOLE NUMBER	B-3

MIKE'S BORING & CORING LLC.
PO Box 75 ° East Barre, Vermont 05649 ° 802 476-5073

TO: Eric Goddard Knight Consulting Engineers 183 Commerce Lane Williston, VT 05495	PROJECT NAME: Proposed DPW-Police Bldg LOCATION: Bristol, VT MBC JOB #: 202074	SHEET: 4 DATE: 11-30-2020 HOLE #: B-4 LINE & STA. OFFSET:	

Ground Water Observations NWTD at 0 Hours	Augers-Size I.D. 3.25" Split Spoon 2" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: 0'+/- Date Started: 11-30-2020 Date Completed: 11-30-2020 Boring Foreman: Mike McGinley Inspector: Eric Goddard Soils Engineer: Eric Goddard

LOCATION OF BORING: As staked-

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No. Rec.	Sample Pen. Inches	Sample Inches
0'-2'	Dry	9/9/11/13	Moist		Medium dense brown cmf sand & mf gravel, tr silt - fill	1	24	13
2'-4'	Dry	11/9/8/5	Moist	3.5'	Medium dense brown cmf sand, some f gravel, tr silt - fill	2	24	10
4'-6'	Dry	3/4/7/4	Moist		Loose-to-medium dense brown cmf sand, some f gravel, tr silt - fill	3	24	10
6'-8'	Dry	3/4/2/3	Moist		Loose brown cmf sand, some f gravel, tr silt - fill	4	24	10
8'-10'	Dry	5/6/9/7	Moist	10'	Medium dense brown cmf sand, some f gravel, tr silt into possible cinders @ 10' - fill	5	24	10
10'-12'	Dry	5/9/11/8	Moist		Medium dense black/brown cmf sand & f gravel, tr silt (possible cinders) - fill	6	24	9
12'-14'	Dry	6/8/8/9	Moist	13'	Medium dense black/brown cmf sand & f gravel, tr silt with possible cinders (fill) into medium dense oxidized brown cmf sand & f gravel, tr silt (native soil)	7	24	15
15'-17'	Dry	12/16/9/13	Moist		Medium dense brown cmf sand & mf gravel, tr silt (pushed stone) - native soil	8	24	4

Ground Surface to 15' Used 3.25" Auger Then SS to 17'

Earth Boring	17'
Rock Coring	
Samples:	8
HOLE NUMBER	B-4