238 College Street Geotech Summary Report
(05/17/2015)

A. General:

1. Four (4) soil borings were taken at the locations depicted on the Boring Location Plan. Three (3) soil borings (B-1 thru B-3) were located in the existing basement footprints and were sampled using hand-driven equipment. One (1) soil boring (B-4) was located in the pavement near the NE addition corner and was sampled using a truck rig.

2. The subsurface soil conditions below the existing pavement are generally comprised of 6" of medium dense rushed gravel over 3 feet of medium dense brown fine sand (Fill - Damp) over 4 feet of very loose brown fine sand with some silt (Fill – Damp) over 2 feet of very loose olive gray fine sand with some silt (Fill – Wet) over 6 feet of loose-to-medium dense fine sand with some silt (Fill – Wet) over 18 feet of alternating layers of medium stiff olive gray silt with some clay and loose olive gray silt & fine sand (Wet) over at least 25 feet of dense olive gray non-plastic silt with a trace of very fine sand (Wet).

3. Both very loose ($N_{60}<4$) and loose ($N_{60}<10$) soils were encountered in all 4 of the soil borings. Below is a summary of the very loose ($N_{60}<4$) soil depths:

Boring	Est. Elev.	Est. G.W.T.	Bot. Very Loose Soil
B-1	84'+/-	82.3'+/-	83'+/-
B-2	84'+/-	82.3'+/-	82'+/-
B-3	83'+/-	82.0'+/-	82'+/-
B-4	90'+/-	82.5'+/-	80.5'+/-

4. Site Class "D" can be achieved under the North Addition by removing the very loose and liquefiable soils to the depths indicated in Section A.3 above and replacing with clean ¾" crushed stone wrapped in Mirafi 500X stabilization fabric. This work should be performed when the groundwater is below the bottom of the soil to be replaced.

51 Knight Lane | Williston, VT 05495 | Tel: 802-879-6343 | Fax: 802-879-6376 | kcevt.com

B. **<u>2012 IBC Seismic (Existing Building):</u>**
Site Class "D" (Average SPT_{100} = 15.0)
Ss=0.355 (Fa=1.516)
S1=0.106 (Fv=2.376)
Sds=0.359
Sd1=0.168

Site Class "D" results in Seismic Design Category "C" for Risk Categories 1, 2 & 3.

Because the site is not located directly over an active fault, the risk of surface rupture during a seismic event is relatively low. Using the SPT values contained in the boring logs, estimated & tested silt contents from the boring samples, and a (2% in 50-year) design 5.91 Magnitude earthquake (0.20g peak ground acceleration) obtained from the U.S.G.S. Probable Seismic Hazard Deaggregation, our firm calculated that the on-site soils should not be liquefiable based upon an estimated minimum Factor-of-Safety of 1.16. Seismic settlements are estimated to be approximately 0.90".

C. **<u>2012 IBC Seismic (North Addition):</u>**
Site Class "D" (Average SPT_{100} = 15.0)
Ss=0.355 (Fa=1.516)
S1=0.106 (Fv=2.376)
Sds=0.359
Sd1=0.168

The Site Class "D" is based upon removing the very loose and liquefiable soils to the depths indicated in Section A.3 above and replacing with clean crushed stone wrapped in Mirafi 500X stabilization fabric. Site Class "D" results in Seismic Design Category "C" for Risk Categories 1, 2 & 3.

Because the site is not located directly over an active fault, the risk of surface rupture during a seismic event is relatively low. Using the SPT values contained in the boring logs, estimated & tested silt contents from the boring samples, and a (2% in 50-year) design 5.91 Magnitude earthquake (0.20g peak ground acceleration) obtained from the U.S.G.S. Probable Seismic Hazard Deaggregation, our firm calculated that the on-site soils should not be liquefiable based upon an estimated minimum Factor-of-Safety of 1.16. Seismic settlements are estimated to be approximately 0.90".

D. **Design Bearing Pressures (Existing Building):**

Based upon the SPT data, pocket penetrometer data, visual classification of the soils, soils within the existing building should have sufficient strength to support conventional strip and spread footings with the following Allowable Net Foundation Loading:

Allowable Net Foundation Loading (Existing Building) (1) (2) (3) (5)

Shallow Interior Footings (FFE = 84'+/-, BOF = 83'+/-)

Footing width:	Strip Ftg.	Sq. Ftg.
B ≤ 3.0'	1000 PSF	1000 PSF
B = 4.0'	880 PSF	1000 PSF
B = 5.0'	790 PSF	1000 PSF
B = 6.0'	730 PSF	1000 PSF
B = 8.0'	650 PSF	900 PSF
B =10.0'	610 PSF	845 PSF
B =12.0'	580 PSF	800 PSF
B =15.0'	550 PSF	760 PSF
B =20.0'	520 PSF	720 PSF
B =25.0'	500 PSF	700 PSF
B =30.0'	490 PSF	680 PSF
B =40.0'	480 PSF	660 PSF
B =50.0'	470 PSF	650 PSF

E. **Design Bearing Pressures (North addition – Slab on Grade):**

The following bearing pressures are based upon the SPT data, pocket penetrometer data, visual classification of the soils and replacement of the very loose soils as outlined in Section A.4 above. In order to fully utilize the improved bearing capacity provided by the stone, our firm recommends keeping footing as shallow as possible. Accordingly, the interior footings are assumed to bear 2 feet below the slab and the perimeter interior footings are assumed to bear 4 feet below the slab. Reduce the bearing pressures by 50% when less than 7 feet horizontally from the existing building. If the edge-to-edge spacing between footings is less than 7 feet, consult the Geotechnical Engineer. With these provisions, the existing soils within the North Addition should have sufficient strength to support conventional strip and spread footings with the following Allowable Total Foundation Loading:

Allowable Total Foundation Loading (North Addition – Slab on Grade) (1) (2) (4) (6)

Shallow Interior Footings (FFE = 91'+/-, BOF = 89'+/-)

Footing width:	Strip Ftg.	Sq. Ftg.
B = 2.0'	3500 PSF	4000 PSF
B = 3.0'	2550 PSF	4000 PSF
B = 4.0'	2050 PSF	4000 PSF
B = 5.0'	1800 PSF	4000 PSF
B = 6.0'	1600 PSF	4000 PSF
B = 8.0'	1350 PSF	3600 PSF
B =10.0'	1200 PSF	2900 PSF
B =12.0'	1100 PSF	2500 PSF
B =15.0'	1020 PSF	2100 PSF
B =20.0'	925 PSF	1750 PSF
B =25.0'	865 PSF	1550 PSF
B =30.0'	825 PSF	1450 PSF
B =40.0'	780 PSF	1300 PSF
B =50.0'	750 PSF	1200 PSF

Std. Perimeter Ftgs. (FFE = 91' +/-, BOF = 87' +/-, FGR = 90' +/-)

Footing width:	Strip Ftg.	Sq. Ftg.
B = 2.0'	2900 PSF	4000 PSF
B = 3.0'	2150 PSF	4000 PSF
B = 4.0'	1750 PSF	4000 PSF
B = 5.0'	1550 PSF	4000 PSF
B = 6.0'	1400 PSF	3600 PSF
B = 8.0'	1200 PSF	2750 PSF
B =10.0'	1080 PSF	2300 PSF
B =12.0'	1010 PSF	2000 PSF
B =15.0'	925 PSF	1750 PSF
B =20.0'	860 PSF	1500 PSF
B =25.0'	815 PSF	1385 PSF
B =30.0'	785 PSF	1300 PSF
B =40.0'	750 PSF	1200 PSF
B =50.0'	725 PSF	1130 PSF

F. **Design Bearing Pressures (North addition – Basement):**

Based upon the SPT data, pocket penetrometer data, visual classification of the soils, the existing soils within the North Addition should not be used to directly support basement level foundations. Our firm would recommend supporting the structure on properly designed and spaced helical anchors. In order to create a suitable working pad and eliminate the possibility of future voids, our firm recommends replacement of the very loose soils as outlined in Section A.4 above.

Notes:

1. **Inspection:** Footing & subgrade conditions should be inspected prior to placement of the footing. Inspections should be performed by a qualified geotechnical engineer licensed in the State of Vermont.

2. **Strip and square footings**: At these design loads and footing depths, the bearing strength factor-of-safety should be a minimum of 3.0 and the projected differential and total settlements should be less than 0.6" and 1.0", respectively.

3. **Allowable Net Foundation Loading** includes the above-grade loads plus the displaced weight of the foundations (use approximately 20 to 50 PCF for the density difference between the concrete and the soil).

4. **Allowable Total Foundation Loading** includes the above-grade loads plus the full weight of the foundations along with the full weight of soil above the foundations.

5. **Existing Building:** The surface of the footing subgrade shall be tamped using jumping-jack tamper. Care should be taken to make sure that the groundwater elevation is deep enough so as not to pump during the tamping operation.

6. **North Addition:** The placement of the clean ¾" crushed stone wrapped in Mirafi 500X stabilization fabric should be performed when the groundwater is below the bottom of the soil to be replaced. All footings shall bear on the ¾" crushed stone.

G. Based upon the existing site conditions and anticipated soil replacement, some construction de-watering will likely be required in the deeper soil replacement areas. Care should be taken not to excavate in to the existing saturated silty sands as the resulting soil loss may affect nearby building foundations. Care should also be taken during construction to divert surface water away from open excavations and limit construction vibration on the loose wet silty sands.

H. The local frost depth is approximately 5.5 feet; unheated foundations and utilities should be designed accordingly or properly insulated. Heated foundations may be designed with a minimum exterior depth of 5 feet to the bottom of footing. Clean crushed stone below the footing (where applicable) can be counted as part of the footing depth relative to frost. For foundations to be considered heated, the space must be heated and there must be no insulation under the slab no on the interior face of the foundation walls.

I. Placement of ¾" Crushed Stone fill shall be compacted as follows:

1. Place Mirafi 500X stabilization fabric on smooth subgrade and extend up the sides of the excavation.
2. Place ¾" crushed stone up to 24" thick for the first lift. Minimize impact on the native soils (i.e. no equipment on less than 48" of crushed stone).
3. Compact at the 24" level using a small (200#) vibratory plate compactor.
4. Compact in 8" lifts from 24" up to 48" using a small (200#) vibratory plate compactor.
5. Compaction above 48" may be done in 12" lifts using a 600# vibratory plate compactor.
6. Cover the top of the crushed stone with Mirafi 500X stabilization fabric prior to switching to select materials under slabs.

J. Preservation of existing basement walls as shoring in North Addition:

1. Leave them in as temporary shoring during construction of either a basement or the stone replacement.
2. Remove only the northern half of the basement slab to place the first portion of the fabric and bottom stone fill.
3. After at least the bottom 12" of the old foundation wall is braced by the stone fill, remove the southerly portion of the basement slab.
4. Notch the old basement wall to provide at least a 24" gap below new footings bearing above.

K. Structural fill for slab subgrade should be compacted in 8" maximum lifts to at least 95% of the Standard Proctor dry density value.

L. Neither concrete rubble nor other construction debris should be used as structural fill or backfill.

M. Field density tests should be accomplished on each lift (excluding crushed stone materials) to verify that adequate compaction is achieved. A reasonable guideline would be to perform at least 1 test per 2000 SF per lift for bulk filling (4 minimum per lift); additional tests may be conducted on each lift at isolated excavation locations.

N. If construction is to take place during periods of freezing temperatures, the existing materials must be protected against freezing heave until they can be properly insulated or backfilled.

O. The existing surface soils are very frost-active. Perimeter foundations or isolated exterior foundations should be installed at least as deep as the local frost depth or properly insulated (see note "H"). Where minimizing frost heaving is critical, such as entry slabs or pads supporting equipment connected to buried piping or building piping, exterior structural slabs-on-grade should be constructed on 60" of clean crushed stone wrapped in filter fabric (Mirafi 500X) or on 30" of clean crushed stone wrapped in filter fabric (Mirafi 500X) on top of 3" of rigid insulation (extend the insulation out 3 feet beyond the edges of the slab).

P. Utilities susceptible to damage from frost should be installed at least 5.5 to 6 feet below grade or properly insulated to limit typical frost penetration to above the top of the utility.

Q. Excavation and trenching in excess of 4 feet should be kept to a maximum slope of 1.5 Horizontal to 1 Vertical (OSHA Class C). Where slopes are adjacent to critical structures, permanent (unsaturated) slopes should be 2.5 Horizontal to 1 Vertical or flatter.

R. Allowable resisting/bearing pressures may be increased 33% for wind loading.

S. The design internal friction angle for granular fill placed behind retaining walls should be assumed to be 30 degrees. The design coefficient of friction (ultimate, not factored) should be 0.51 for concrete cast on top of the native soils and 0.70 for concrete cast on top of clean crushed stone fill. Design soil unit weights should be in the range of 100 to 130 PCF for the native silty sand soils (unsaturated). Design soil unit weights should be in the range of 100 to 130 PCF for sand and silty sand fill (unsaturated) and 130 to 150 PCF for gravel fills (unsaturated). At 30 degrees, the following design lateral earth coefficients should be assumed:

Active (Ka): 0.333
At-rest (Ko): 0.500
Passive (Kp): 3.000

If design for permanent traffic or temporary construction traffic is applicable, our firm recommends a lateral surcharge pressure of 0.333q (100 PSF) for active earth conditions and a lateral surcharge pressure of 0.500q (150 PSF) for at-rest earth conditions. These values are based upon a 300 PSF effective surcharge. Retaining walls free to rotate at the top may be designed using active earth pressures; retaining walls restrained at the top should be designed using at-rest earth pressures. Perimeter drains should be properly designed to eliminate hydrostatic pressures on retaining structures where possible.

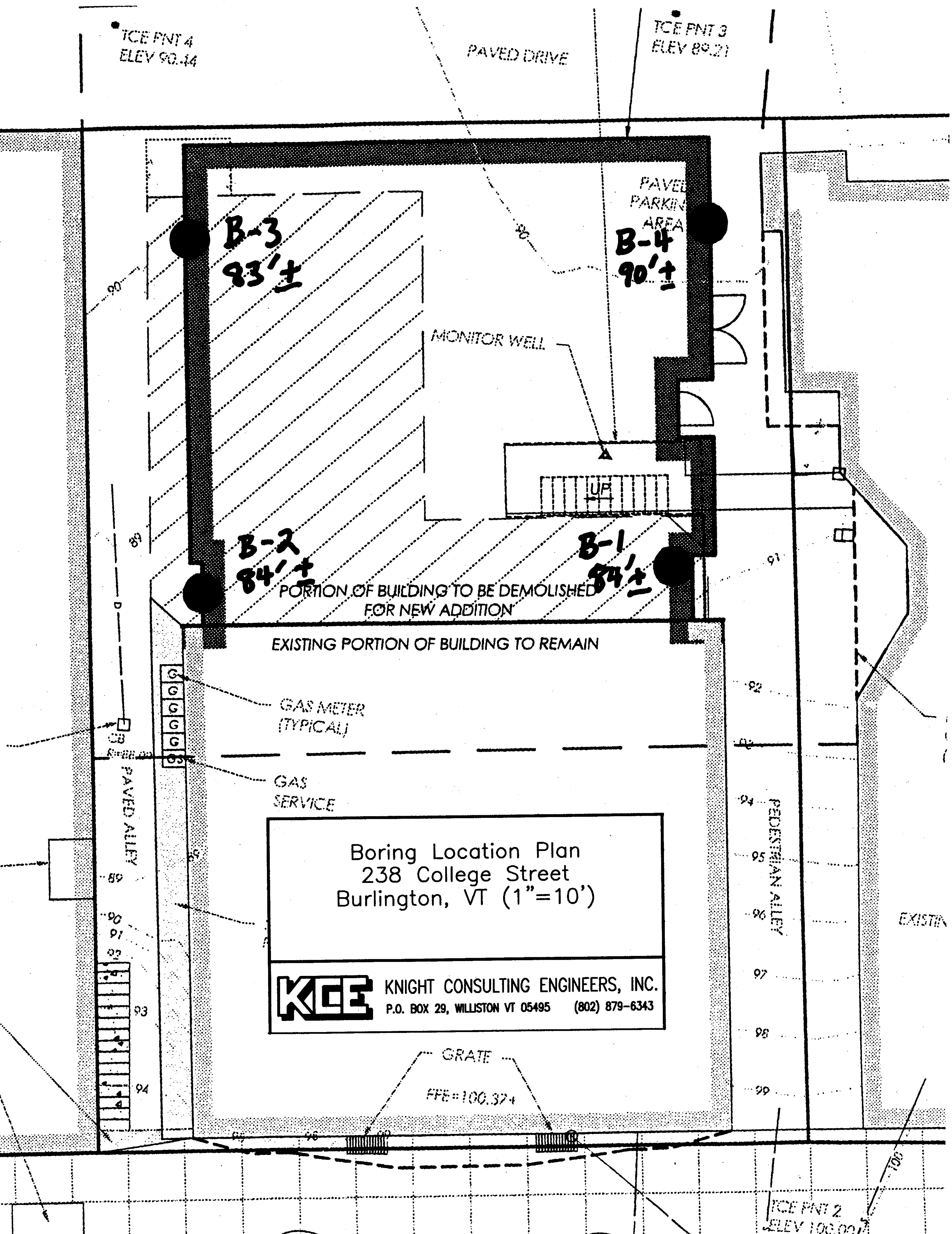
T. For permanent foundation walls designed to retain soil, the design passive pressure resistance should not exceed the at-rest lateral earth pressures for soils that will remain in-place during and after backfilling of these foundation walls. This requirement is to insure that excessive displacements are not experienced in an attempt to develop the passive resistance. The appropriate Factors-of-Safety (Resistance Forces/Driving Forces) shall be a minimum of 1.5 for sliding and 2.0 for overturning. For temporary sheeting/bracing systems where lateral displacement will not have significant adverse effects, the design passive pressure resistance should not exceed 50% to 67% of the full passive pressure value for soils that will remain during the entire use of these sheeting/bracing systems. At these values the Factors-of Safety (Resistance Forces/Driving Forces) should be in the range of approximately 1.5 to 2.0.

Submitted by,

Eric Goddard

Eric Goddard, P.E.
Senior Vice President

STATE OF VERMONT
ERIC H. GODDARD
No. 6035
REGISTERED
PROFESSIONAL ENGINEER



Boring Location Plan
238 College Street
Burlington, VT (1"=10')

KCE KNIGHT CONSULTING ENGINEERS, INC.
P.O. BOX 29, WILLISTON VT 05495 (802) 879-6343

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

TO: Eric Goddard Knight Consulting Engineers, Inc. 51 Knight Lane Williston, VT 05495	PROJECT NAME:	238 College Street	SHEET:	4
	LOCATION:	Burlington, VT	DATE:	5-4-15
	MBC JOB #:	15029	HOLE #:	B-4
			LINE & STA.	
			OFFSET:	

Ground Water Observations 7.5' Est. at 0 hours	Augers-Size I.D.	3.25	Surface Elevation:	90'+/-
	Split Spoon	2"	Date Started:	5-4-15
	Hammer Wt.	140#	Date Completed:	5-4-15
	Hammer Fall	30"	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. Inches	Sample Rec. Inches
0'-2'	Dry	12/6/8/5	Damp	6"	Crushed gravel into medium dense brown fine sand with cinders	1	24	16
5'-7'	Dry	2/1/1/3	Damp		Very loose brown mf sand, some silt, trace fine gravel (SM, w=13.9%)	2	24	15
8'-10'	Dry	1/1/1/6	Wet	9.5'	Very loose olive gray f sand & silt (SM, w=23.7%)	3	24	14
10'-12'	Dry	5/2/10/11	Wet/damp	11'	Loose-to-medium olive gray fine sand, some silt	4	24	20
15'-17'	Dry	2/1/3/4	Wet	15.5' 16.5'	Loose olive gray fine sand, some silt into medium stiff olive gray silt, some clay & stones (PP=0.73 TSF) into loose olive gray fine sand, some silt	5	24	16
20'-22'	Dry	3/2/3/3	Wet	20.5' 21' 21.5'	Loose olive gray mf sand into loose olive gray cmf sand into loose olive gray silt & fine sand into medium stiff olive gray silt, some clay & stones (PP=0.92 TSF)	6	24	20
25'-27'	Dry	8/5/5/8	Wet		Medium stiff-to-stiff olive gray silt, some clay (PP=0.79 TSF)	7	24	13
30'-32'	Dry	6/4/4/4	Wet		Loose-to-medium dense brown/gray fine sand, some silt, trace organics	8	24	23
35'-37'	Dry	7/12/16/23	Wet		Dense olive gray non-plastic silt, trace very fine sand	9	24	19
40'-42'	Dry	8/8/22/26	Wet		Dense olive gray non-plastic silt, trace very fine sand	10	24	22
45'-47'	Dry	12/18/35/50	Wet/damp		Dense olive gray non-plastic silt, little very fine sand	11	24	24
50'-52'	Dry	9/19/28/39	Wet		Dense gray silt, little very fine sand	12	24	24
55'-57'	Dry	-/8/11/20	Wet		Medium dense gray silt, little very fine sand (over-spun augers)	13	24	24

Ground Surface to 55' Used 3.25" augers: Then S.S. to 57'

Earth Borings	57'
Rock Coring	
Samples:	13
HOLE NUMBER	B-4

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

TO: Eric Goddard Knight Consulting Engineers, Inc. 51 Knight Lane Williston, VT 05495	PROJECT NAME: 238 College Street LOCATION: Burlington, VT GMB JOB #: 15029	SHEET: 1 DATE: 5-4-15 HOLE #: B-1 LINE & STA. OFFSET:

Ground Water Observations 21" Est. at 0 hours	Augers-Size I.D. N/A Solid Spoon 1.25" O.D. Hammer Wt. 34# Hammer Fall 24"	Surface Elevation: 84'+/- Date Started: 5-4-15 Date Completed: 5-4-15 Boring Foreman: Mike McGinley Inspector: Eric Goddard Soils Engineer: Eric Goddard

Comments: Adjust SPT values by reducing 50%.

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample		
						No.	Pen.	Rec.
0-3.5'	Dry	0/4/4/7/6/6/7	Damp/ wet	1.5"slab	Very loose brown fine sand & silt into loose gray fine sand & silt	1	42	24
3.5'-7'	Dry	6/8/8/10/9/6/6	Wet		Loose gray silt & very fine sand	2	42	24
7'-10'	Dry	9/17/13/25/22/25	Wet	8' 9'	Medium dense gray silt & very fine sand into medium dense saw dust into medium dense gray silt & very fine sand	3	36	36
10'-13'	Dry	13/18/22/18/21/22	Wet		Still gray silt, little clay (PP=1.06 TSF)	4	36	42

Ground Surface to 10'

Then SS to 13'

Earth Boring 13'
Rock Coring
Samples: 4
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, Inc. 51 Knight Lane Williston, VT 05495	PROJECT NAME: LOCATION: GMB JOB #:	238 College Street Burlington, VT 15029	SHEET: DATE: HOLE #: LINE & STA. OFFSET:	1 5-4-15 B-2

Ground Water Observations 21" Est. at 0 hours	Augers-Size I.D. Split Spoon Hammer Wt. Hammer Fall	N/A 1.25" O.D. 34# 24"	Surface Elevation: Date Started: Date Completed: Boring Foreman: Inspector: Soils Engineer:	84'+/- 5-4-15 5-4-15 Mike McGinley Eric Goddard Eric Goddard

Comments: Adjust SPT values by reducing 50%.

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample		
						No.	Pen.	Rec.
0-3.5'	Dry	0/0/0/5/6/4/5	Moist/ wet	1.5"slab	Very loose granular into loose brown/gray silt & very fine sand	1	42	11
3.5'-7'	Dry	6/7/5/8/19/17/23	Wet	5.5'	Loose olive gray silt & very fine sand	2	42	24
7'-10'	Dry	8/12/6/6/14/20	Wet	8' 9'	Loose-to-medium dense olive gray silt & very fine sand into loose saw dust into medium dense olive gray silt & very fine sand	3	36	42
10'-13'	Dry	11/11/9/7/9/19	Wet	11.5'	Loose olive gray silt & very fine sand into stiff olive gray silt, some clay (PP=1.37 TSF)	4	36	42

Ground Surface to 10'

Then SS to 13'

Earth Boring	13'
Rock Coring	
Samples:	4
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, Inc. 51 Knight Lane Williston, VT 05495	PROJECT NAME: LOCATION: GMB JOB #:	238 College Street Burlington, VT 15029	SHEET: DATE: HOLE #: LINE & STA. OFFSET:	1 5-4-15 B-3	

Ground Water Observations 12" Est. at 0 hours	Augers-Size I.D. Split Spoon Hammer Wt. Hammer Fall	N/A 1.25" O.D. 34# 24"	Surface Elevation: Date Started: Date Completed: Boring Foreman: Inspector: Soils Engineer:	83'+/- 5-4-15 5-4-15 Mike McGinley Eric Goddard Eric Goddard	

Comments: Adjust SPT values by reducing 50%.

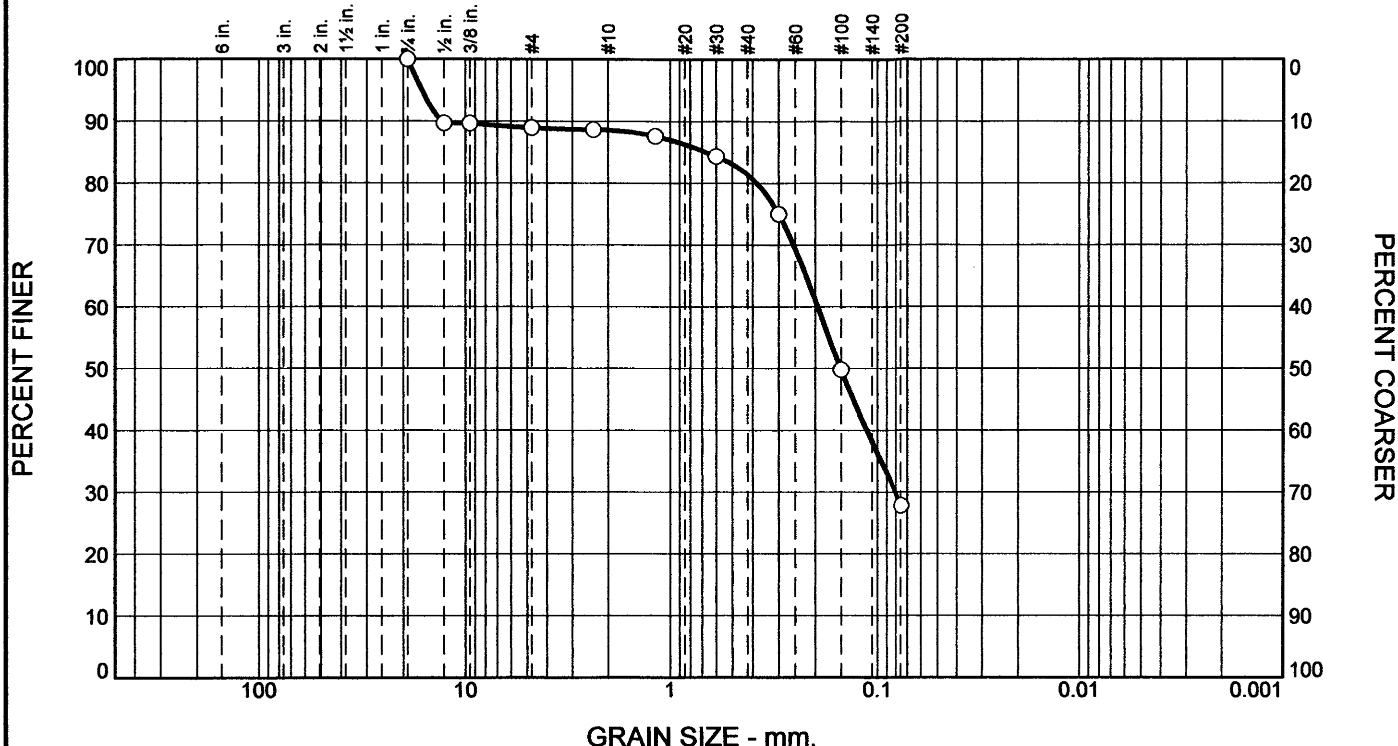
Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen.	Sample Rec.
0-3.5'	Dry	0/4/3/6/14/10/13	Wet	2.5"slab	Very loose-to-loose olive brown silt & very fine sand	1	42	24
3.5'-7'	Dry	8/9/9/10/9/10/9	Wet		Loose-to-medium dense olive brown silt & very fine sand	2	42	24
7'-10'	Dry	10/7/7/14/19/18	Wet	8.5' 9'	Loose-to-medium dense olive brown silt & very fine sand into loose-to-medium dense sawdust into stiff olive gray silt, some clay (PP=1.26 TSF)	3	36	36
10'-13'	Dry	6/6/5/6/7/6	Wet		Loose olive gray silt & very fine sand	4	36	40

Ground Surface to 10'

Then SS to 13'

Earth Boring	13'
Rock Coring	
Samples:	4
HOLE NUMBER	B-3

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	11	0	8	53	28	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100		
1/2"	90		
3/8"	90		
#4	89		
#8	89		
#16	88		
#30	84		
#50	75		
#100	50		
#200	28		

* (no specification provided)

Material Description

B-4 (5 to 7' Depth)

MF Sand, some silt, tr f Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=**

Coefficients

D_{90}= 13.0810 D_{85}= 0.6714 D_{60}= 0.1948
D_{50}= 0.1508 D_{30}= 0.0808 D_{15}=
D_{10}= C_u= C_c=

Remarks

Sampled and delivered by KCE on 5-6-15
As Received Moisture Content = 13.9%
F.M.=1.36

Date Received: 5-6-15 **Date Tested:** 5-8-15

Tested By: PHR

Checked By: P.Rixford

Title: Testing and Lab Coordinator

Source of Sample: Soil Borings **Date Sampled:** 5-6-15

Sample Number: 1

Knight Consulting Engineers, Inc. Williston, Vermont

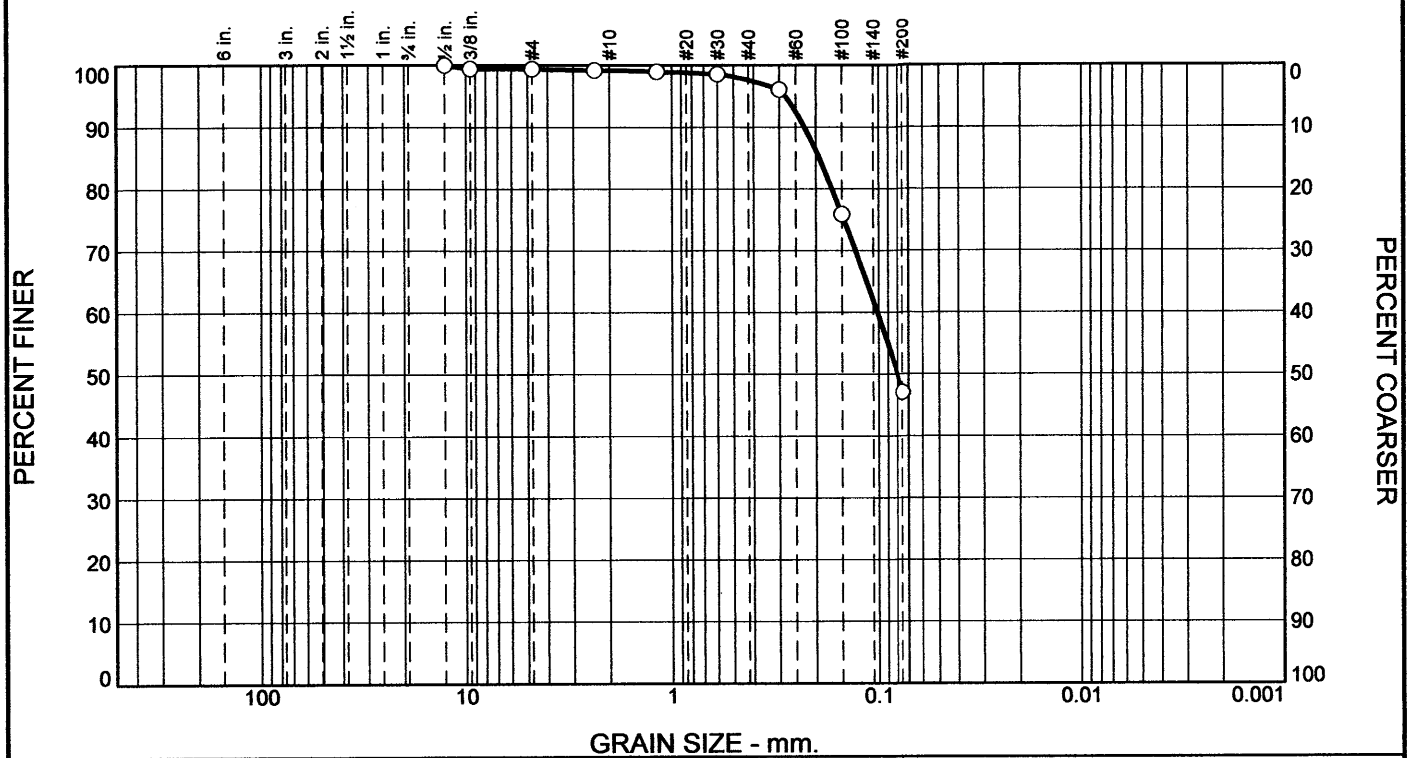
Client: Sisters & Brothers Investment Group

Project: 234 College Street, Burlington (Geotech)

Project No: 15166 **Figure** 1-2

Results reflect soil gradation only and not other specification requirements.

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	0	1	51	47	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100		
3/8"	99		
#4	99		
#8	99		
#16	99		
#30	99		
#50	96		
#100	76		
#200	47		

* (no specification provided)

Material Description

B-4 (8 to 10' Depth)
Fine sand & silt

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= 0.2269 D_{85}= 0.1928 D_{60}= 0.1014
D_{50}= 0.0802 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sampled and Delivered by KCE ON 5-6-15
As Recieved Moisture Content = 23.7%
F.M.=0.32

Date Received: 5-6-15 **Date Tested:** 5-8-15
Tested By: PHR
Checked By: P.Rixford
Title: Testing and Lab Coordinator

Source of Sample: Soil Borings **Date Sampled:** 5-6-15
Sample Number: 2

Knight Consulting Engineers, Inc.
Williston, Vermont

Client: Sisters & Brothers Investment Group
Project: 234 College Street, Burlington (Geotech)
Project No: 15166 **Figure** 2-2

Results reflect soil gradation only and not other specification requirements.