UTS of Massachusetts, Inc.
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Stoneham, MA 02180
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MEMORANDUM

TO: DRW Construction Services, Inc.
2 Brawley Avenue
Fairhaven, Massachusetts 02719

FROM: Kevin Martin, P.E.
Geotechnical Engineer

DATE: April 12, 2016
July 19, 2016

RE: **GEOTECHNICAL SUMMARY**
SEMALA SLAUGHTERHOUSE
291 STATE ROAD
WESTPORT, MASSACHUSETTS

This memorandum serves as a geotechnical summary report for the referenced project. The contents of this report are subject to the attached ***Limitations***.

SITE & PROJECT DESCRIPTION

The project site includes an undeveloped, wooded of land. The site is located along the eastern side of a hillside contour. Based on review of the *Site Plan*, site grades vary from about elevation ≈95-125 ft possessing a gradual downward slope to the east. Site grades in the project limits vary from elevation ≈105-120 ft. Lower lying wetlands are delineated near elevation ≈100 ft. Snow covered the site at the time of this study. UTS has no knowledge of past construction, use and/or development of the site except what is visible.

The project includes a new slaughterhouse. We understand the building will include a single-story, steel and concrete masonry framed structure about 8,500 ft² in footprint. It is intended to support the building on a conventional spread footing foundation with a concrete slab-on-grade (no basement) The first floor elevation (FFE) is noted to be elevation 116.5 ft. As such, expansive fill about ≈3-8 ft will be necessary to achieve final floor grade.

The purpose of this study is to review the subgrade conditions and provide a geotechnical evaluation related to foundation design and construction as required by the *Massachusetts State Building Code*. This report does not include an environmental assessment relative to oil, gasoline, solid waste and/or other hazardous materials. The environmental conditions of the property should be addressed by others as necessary. This study also does not include review of site design or construction issues such as infiltration systems, dry wells, retaining walls, detentions ponds, septic systems, cranes pads, steepened slopes, excavation support, underground utilities, temporary shoring, erosion control, etc. unless specifically addressed herein.

SUBSURFACE EXPLORATION PROGRAM

Test Borings

The exploration program for the project included five (5) test borings throughout the building pad. The test borings (B1 to B5) were advanced to depths of ≈21-22 ft utilizing 4¼ inch continuous flight hollow stem augers. Soil samples were typically retrieved at no greater than 5 ft intervals with a 2 inch diameter split-spoon sampler. Standard Penetration Tests (SPTs) were performed at the sampling intervals in general accordance with ASTM-D1586 (*Standard Method for Penetration Test and Split-Barrel Sampling of Soils*). Field descriptions and penetration resistance of the soils encountered, observed depth to groundwater, depth to refusal and other pertinent data are contained on the attached *Test Boring Logs*. The attached *Sketch* shows the test bore locations. These locations were referenced to survey by others.

SUBSURFACE CONDITIONS

The subsurface conditions below (1) the surface Organic layers include (2) Glacial Till then (3) apparent Bedrock refusal.

An organic forest mat and/or topsoil measured to be approximately ≈3-6 inches in thickness covers the majority of site. This layer consists of a black organic Silt & Sand with humus and root structure. Underlying the Forest Mat is the Subsoil horizon to depths of approximately ≈24-28 inches. The Subsoil consists of an orange to rust brown, loose, Silt & Fine Sand with trace to little gravel and cobbles. Minor root structure and loamy organic constituent are embedded in this layer as leached from the surface.

The predominant overburden across the site consists of a stable Glacial Till. This deposit generally consists of an olive to tan to brown, well-graded, fine to medium Sand with some to little silt and gravel. Occasional cobbles and boulders are embedded in this deposit. The glacial deposit is stable and compact. The silty composition of the Till renders it poor-draining, moisture sensitive and frost susceptible.

Apparent Bedrock refusal was encountered about ≈20 ft below grade in a few test holes. Bedrock is not expected to impact the project.

Groundwater was encountered in the test bores for this study at depths of ≈8-9 ft below grade. The groundwater is expected to be impacted by the shallow wetlands. It should be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, utilities, flooding and other factors differing from the time of the measurements. This study was completed at a time of seasonally normal groundwater.

FOUNDATION SUBGRADE RECOMMENDATIONS

The subgrade conditions are favorable for supporting the proposed building on a conventional spread footing foundation with a concrete floor slab. The Organic laden soils (topsoil, forest mat, subsoil, stump holes, etc) are **not** suitable for foundation support. As such, these soils should be removed from the entire building pad plus ≈10 ft laterally beyond the foundation perimeter. There is expected to be at least ≈2 ft of site stripping or grubbing in this regard. Structural Fill necessary to achieve foundation grade should conform to the *Specifications* (Table 1).

The parent subgrade soils (Glacial) should be exposed in the foundation areas prior to casting the footings or placing structural fill. It is recommended that the parent subgrade be proof-rolled with vibratory densification and exhibit stable and compact conditions. Recommended proof-rolling should involve at least 5-6 passes with a vibratory compactor (minimum 850 pound static weight) operating at peak energy. During the proof rolling process, the subgrade should be observed by an Engineer to identify areas exhibiting weaving or instability. It will be necessary to remove weakened or unstable soils and replace with a Structural Fill or crushed stone. Proper groundwater control and storm water management are also necessary to maintain site stability. Groundwater (or a wet subgrade) may be an issue if construction occurs during the wetter winter or spring season. The drier summer months are more favorable for groundwater control.

The bearing subgrade should ultimately be stable, dewatered, protected from frost and compact throughout construction. Bearing subgrades that become weakened or disturbed due to wet conditions or other reason will be rendered unsuitable for structural support. The Contractor shall ultimately be responsible for the means and methods of temporary groundwater control, subgrade protection and site stability during construction. An Engineer from UTS should be scheduled to review the foundation subgrade conditions and preparation during construction.

FOUNDATION DESIGN RECOMMENDATIONS

The footings are expected to gain bearing support atop the parent Glacial Soils and/or compacted Structural Fill (Table 1). Footings may be designed using an allowable bearing capacity of 4 ksf (FS=3). The allowable bearing capacity may be increased a third (⅓) when considering transient loads such as wind or seismic. The bearing capacity is contingent upon the perimeter strip footings and isolated column footings being no less than 2 ft and 3 ft in width respectively. For footings less

than 3 ft in lateral dimension, the net allowable bearing capacity should be reduced to one-third and multiplied by the least lateral footing dimension in feet. Foundation settlement should be less than 1 inch with differential settlement less than ½ inch. The settlement should be elastic and occur during construction. Exterior footings shall be provided with at least 4 ft of frost protection. Proper frost protection should be necessary during winter construction.

The subsurface conditions were reviewed with respect to seismic criteria set forth in the ***Massachusetts State Building Code (Eighth Edit)***. Based on the relative density of the soils and the depth to groundwater, the site does not appear susceptible to liquefaction in the event of an earthquake (*Section 1804.6*). Based on interpretation of the *Building Code*, the *Site Classification* is "D" (Stable Soil Profile).

Recommendations for the lateral earth pressure against the unbalanced walls and drainage control are outlined on Table 2. Proper drainage behind the unbalanced foundation walls will also be necessary as summarized on Table 2.

It is recommended that a minimum 8-inch base of *Clean Granular Fill* (Table 1) be placed below the concrete floor slab for moisture and frost control. The gravel base shall be increased to no less than 12 inches for exterior concrete slabs exposed to frost (≈20 inches at ramps, entrances, aprons). A subgrade modulus of 150 pci may be used for design of the floor slab. The subgrade modulus may be increased 25 pci for every 2 inch increase in additional gravel base thickness (ie: 200 pci @ 12 inch gravel base) as necessary. A vapor retarder should be used below the floor slab dependent upon the floor treatment. A vapor barrier should be specified by others per ACI Standards. A typical vapor retarder may include minimum 10-mil polyethylene or StegoWrap™ with joints lapped at least 10 inches.

Structural fill necessary within and below the foundation should also conform to the attached *Specifications* (Table 1). The Glacial Till should **not** be re-used for Structural Fill within the building pad. The Glacial Till soils should be suitable for Common Fill outside the building pad and away from retaining walls provided they are segregated from organic soils, screened of large stones and conform to the gradation specifications. These soils are moisture sensitive and will need to be protected accordingly to achieve proper compaction and stability.

CONSTRUCTION CONCERNS

The contractor should be required to maintain a stable-dewatered subgrade for the building foundations and other concerned areas during construction. Subgrade disturbance may be influenced by excavation methods, moisture, precipitation, groundwater control and construction activities. The site soils (Glacial Till) are considered moisture sensitive and may become weakened and/or softened if exposed to wet conditions and construction activities. The moisture concerns are related to the high percentage of fines (Silt) which retain water. The contractor should understand these concerns and take precautions to reduce subgrade disturbance. Such precautions may include diverting storm run-off away from construction areas, reducing traffic in sensitive areas, minimizing the extent of

exposed subgrade if inclement weather is forecast, backfilling footings as soon as practicable and maintaining an effective dewatering program. Soils exhibiting weaving or instability should be over-excavated to a competent bearing subgrade then replaced with a free draining structural fill or crushed stone. The moisture concerns are typically more problematic if construction takes place during the winter to spring season or other periods of inclement weather. A protective base of ¾-inch minus crushed stone may be placed ≈6-8 inches below and laterally beyond the footing limits for protection during construction. The stone base is to protect the site soils, facilitate any necessary dewatering and provide a dry/stable base upon which to progress foundation construction. The protective base should be considered elective and dependent upon the site conditions. The stone base should be considered necessary if wet conditions are encountered at footing grade. The protective stone base shall be tamped with a plate compactor and exhibit stable conditions.

The groundwater table or ponded storm water will need to be controlled during construction to complete work in dry conditions and protect the competency of the subgrade soils. The groundwater table, where encountered, should be continuously maintained at least one foot below construction grade until backfilling is complete. The groundwater is expected to be controlled with conventional filtered sumps and submersible pumps. Adequate dewatering and storm water management are considered necessary for maintaining the competency of the site soils.

The bearing subgrade should ultimately be stable, dewatered, protected from frost and compact throughout construction. Bearing subgrades that become weakened or disturbed due to wet conditions or other reason will be rendered unsuitable for structural support. The Contractor shall ultimately be responsible for the means and methods of temporary groundwater control, subgrade protection and site stability during construction. An Engineer from UTS should be scheduled to review the foundation subgrade conditions and preparation during construction.

CONSTRUCTION MONITORING

It is recommended that a qualified engineer or representative be retained to review earthwork activities such as the preparation of the foundation bearing subgrade and the placement/compaction of Structural Fill. It is recommended that UTS be retained to provide construction monitoring services. This is to observe compliance with the design concepts presented herein.

We trust the contents of this memorandum report are responsive to your needs at this time. Should you have any questions or require additional assistance, please do not hesitate to contact our office.

kmm50/uts16/WestportSlaughterhouse.wpd

LIMITATIONS

Explorations

1. The analyses, recommendations and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.

3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.

5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by UTS of Massachusetts, Inc.

Construction

6. It is recommended that this firm be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

7. This report has been prepared for the exclusive use of DRW Construction Services, Inc. n accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

8. This report has been prepared for this project by UTS of Massachusetts, Inc. This report was completed for geotechnical design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to preliminary geotechnical design considerations.

TABLE 1

Proposed Slaughterhouse
291 State Road
Westport, MA

Recommended Soil Gradation & Compaction Specifications

Clean Granular Fill
(Select Gravel Fill)

SIEVE SIZE	PERCENT PASSING BY WEIGHT
3 inch	100
3/4 inch	60-90
No. 4	20-70
No. 200	2-8

NOTE: For minimum 8-inch base below Concrete Floor Slabs (in heated areas)
For minimum 12-inch base for concrete slabs exposed to frost
For minimum 20-inch base at entrances, ramps, aprons, etc
A ¾-inch crushed stone may be used in lieu of gravel
Shall have less than 12% fines (No. 200 sieve) based on the Sand fraction
Compact to at least 95% relative compaction per ASTM D1557

Structural Fill
(Gravelly SAND, little Silt)

SIEVE SIZE	PERCENT PASSING BY WEIGHT
5 inch	100
3/4 inch	60-100
No. 4	20-80
No. 200	0-10

NOTE: For use as structural load support below the foundations
For use as backfill behind unbalanced foundation/retaining walls
A ¾-inch crushed stone may be used in wet conditions
Compact to at least 95% relative compaction per ASTM D1557

TABLE 1
(Page 2 of 2)

Proposed Slaughterhouse
291 State Road
Westport, MA

Recommended Soil Gradation & Compaction Specifications

Common Fill
(Silty SAND, little Gravel)

SIEVE SIZE	PERCENT PASSING BY WEIGHT
6-8 inch	100
3/4 inch	60-100
No. 4	20-85
No. 200	0-20

NOTE: For use as roadway embankment fill is deep pavement areas.
Maximum stone size should be ⅔ the maximum lift thickness
Shall have less than 20% fines based on the Sand fraction
Compact to at least 93% relative compaction per ASTM D1557

Structural Fill placed beneath the foundation should include the *Footing Zone of Influence* which is defined as that area extending laterally one foot from the edge of the footing then outward and downward at a 1H:1V splay. Structural Fill should be placed in loose lifts not exceeding 12 inches for heavy vibratory rollers and 8 inches for vibratory plate compactors. All Structural Fill should be compacted to at least 95 percent of maximum dry density as determined by the Modified Proctor Test (ASTM-D1557). The Clean Granular Fill and Structural Fill should be compacted within ±3% of optimum moisture content. The adequacy of the compaction efforts should be verified by field density testing which is also a requirement of the *Massachusetts State Building Code*.

TABLE 2

Proposed Slaughterhouse
291 State Road
Westport, MA

Recommended Lateral Earth Pressures & Drainage for Unbalanced Walls

Lateral earth pressures for the structural design and stability analysis of unbalanced foundation walls (basement walls, retaining walls, elevator pit, etc) are provided herein. The following table outlines the recommended lateral earth pressure coefficients and equivalent fluid weights:

WALL CONDITION	LATERAL TRANSLATION (Δ/H)	EARTH PRESSURE COEFFICIENT (K)	EQUIVALENT FLUID WEIGHT (γ_{EFW})
restrained	0	K_o	60 pcf
no restraint	0.002	K_a	35 pcf
no restraint	0.02	K_p (FS=3)	125 pcf
seismic	n/a	K_{eq}	see note

where: Δ = movement at top of wall by tilting or lateral translation
H = height of wall

The above lateral earth pressures are based upon:

1. Rankine earth pressure theory;
2. Retaining wall backfilled with Structural Fill (Table 1)
3. Unit weight of backfill less than 125 pcf
4. No hydrostatic pressures
5. No surcharge loading;
6. A level backfill in front and behind of wall;
7. Seismic loads distributed as an inverse triangle over the height of wall (*MSBC*);
8. Dynamic/compaction stresses accounted for with seismic pressures;
9. Soil backfill densified with plate compactors within 3 ft lateral distance of wall;
10. Top 2 ft should not be considered for passive resistance.

The lateral load due to seismic pressure shall be in accordance with *Section 9.5.2.9* of the *MSBC* (8th Edition). *Equation 9.5.2.9* shall be used to estimate the seismic force (F_w). The unit weight of the backfill used in this equation is 125 pcf (Structural Fill). There are no soils subject to liquefaction below and/or behind the wall.

The lateral resistance of retaining walls should also accommodate surcharge loads. Uniformly distributed loads should be superimposed along the face of the wall at a magnitude equal to the surcharge pressure multiplied by the appropriate earth pressure coefficient. Surcharge loads should be considered where they are located within a horizontal distance equivalent to 1.0 times the height of the wall. Anticipated point or line loads situated behind the wall should be evaluated in accordance with linear elastic theory.

For frost and drainage concerns, it is recommended that *Structural Fill* (Table 1) be placed directly behind the unbalanced walls. The ground surface immediately adjacent to the unbalanced foundation should be sloped away from the building to allow for positive drainage. It is also recommended that the surficial materials adjacent to the building be relatively impermeable to reduce the volume of precipitation infiltrating into the subgrade. Such impermeable materials include Portland cement concrete, bituminous concrete, or a vegetated silty topsoil. The purpose of the low permeable soils or barriers is to mitigate storm water flow towards the embedded foundation.

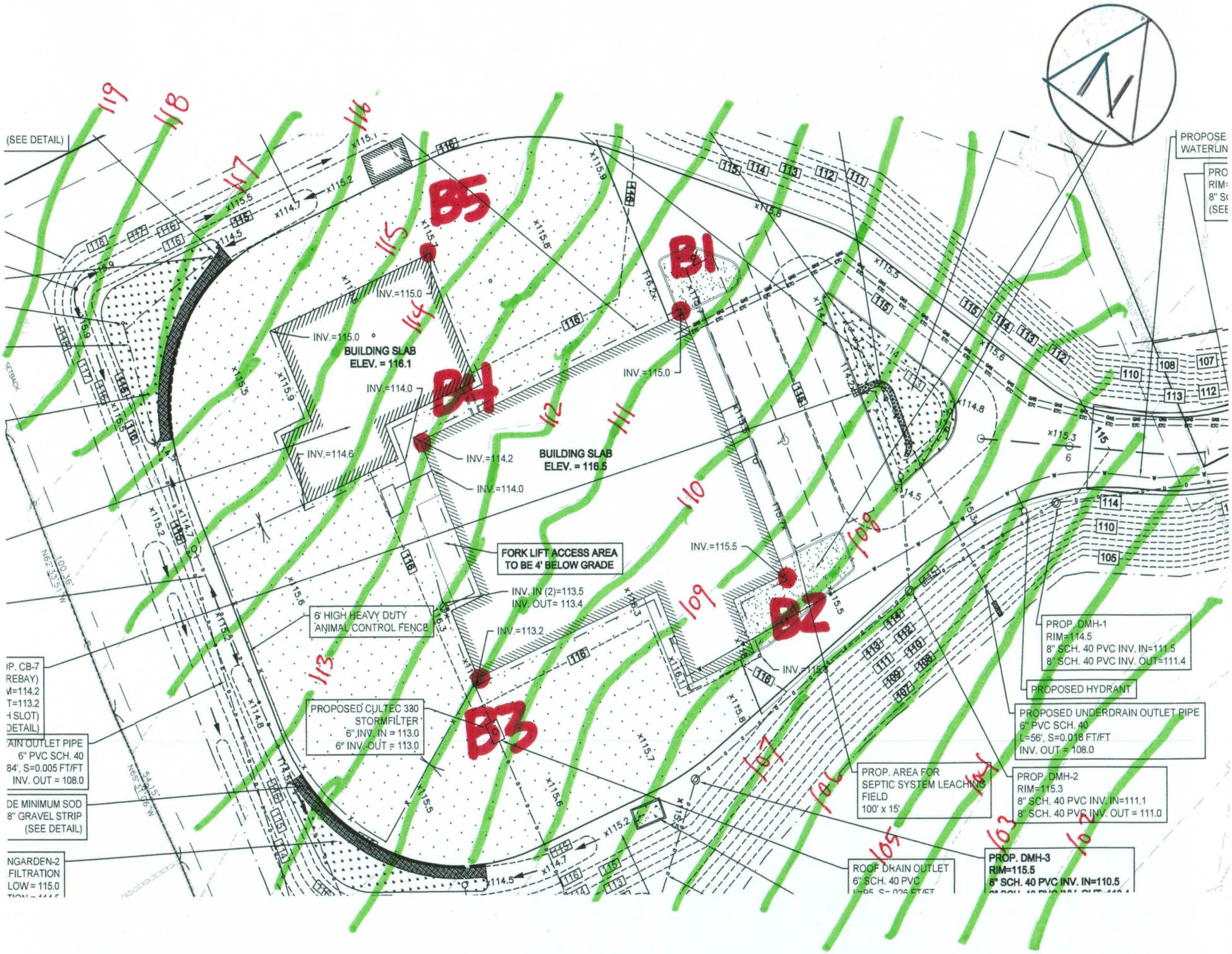
Unbalanced walls should be provided with adequate footing drains per the *MSBC*. The drains should consist of minimum 4 inch diameter, perforated PVC-SDR 35 drain pipe encased within 12 inches of ¾-inch stone and wrapped with a filter fabric such as Mirafi 140N or equal. The drains may discharge via gravity to a storm drain line or day light if permissible. The Site Engineer should review the discharge of the drains. The drains should be provided with permanent clean-outs at convenient locations to facilitate access to all sections of the system. Clean-outs should be located at bends and no greater than 150 ft on-center. Roof gutters and other storm collection should not be discharged to the foundation drains. Recharge systems, infiltrators and/or dry wells shall be kept away from the basement level to prevent hydrostatic surcharge.

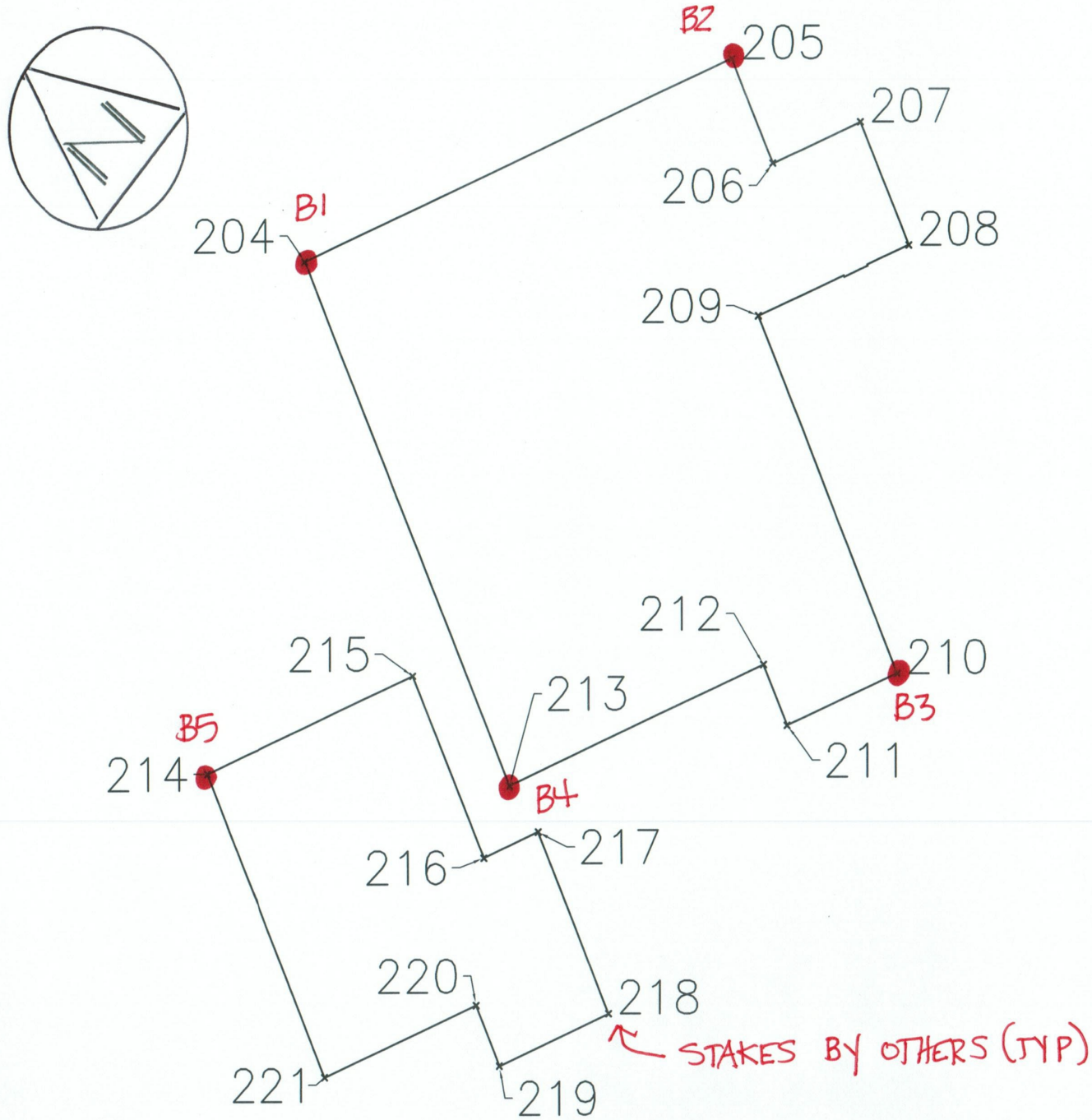
The recommended friction factors to be used for retaining wall design are as follows:

<u>Recommended Friction Factor (f)</u>
$f = \tan(\delta)$, where δ is the interface friction angle

- Concrete against the following soils

Structural Fill (Table 1)	0.50
Glacial Soils	0.50


(SEE DETAIL)
B5
B1
B4
B2
B3
BUILDING SLAB
ELEV. = 116.1
BUILDING SLAB
ELEV. = 116.5
INV.=115.0
INV.=114.0
INV.=114.6
INV.=114.2
INV.=115.5
INV.=113.2
FORK LIFT ACCESS AREA
TO BE 4' BELOW GRADE
INV. IN (2)=113.5
INV. OUT= 113.4
6' HIGH HEAVY DUTY
ANIMAL CONTROL FENCE
PROPOSED CULTEC 330
STORMFILTER
6" INV. IN = 113.0
6" INV. OUT = 113.0
PROP. DMH-1
RIM=114.5
8" SCH. 40 PVC INV. IN=111.5
8" SCH. 40 PVC INV. OUT=111.4
PROPOSED HYDRANT
PROPOSED UNDERDRAIN OUTLET PIPE
6" PVC SCH. 40
L=56', S=0.018 FT/FT
INV. OUT = 108.0
PROP. AREA FOR
SEPTIC SYSTEM LEACHING
FIELD
100' x 15'
PROP. DMH-2
RIM=115.3
8" SCH. 40 PVC INV. IN=111.1
8" SCH. 40 PVC INV. OUT = 111.0
ROOF DRAIN OUTLET
6" SCH. 40 PVC
PROP. DMH-3
RIM=115.5
8" SCH. 40 PVC INV. IN=110.5
6" PVC SCH. 40
84', S=0.005 FT/FT
INV. OUT = 108.0
8" GRAVEL STRIP
(SEE DETAIL)
FILTRATION
LOW = 115.0


B2
205
207
206
208
B1
204
209
212
210
215
213
B3
B5
211
214
B4
217
216
220
218
STAKES BY OTHERS (TYP)
221
219

TEST BORING LOG

SHEET 1

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Slaughter House
Site: 291 State Road
Westport, MA

BORING B-1 (204)

PROJECT NO. 16-0405

DATE: April 7, 2016

Ground Elevation:
Date Started: April 5, 2016
Date Finished: April 5, 2016
Driller: PG
Soil Engineer/Geologist: LC

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
4/5/16	8 ft	n/a	

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Forest Matter
1		1	12"	0-2'0"	1-1-1-1	2'	Orange, loamy, Fine Sand & Silt (SUBSOIL)
		2	21"	2'0"-4'0"	8-11-16-17		Olive, fine to medium Sand, some silt, little gravel
5		3	18"	5'0"-7'0"	10-10-12-13		Olive, fine to medium Sand, some silt, little gravel
10		4	21"	10'0"-12'0"	13-14-14-15		Tan, Fine Sand, some gravel, little-trace silt (GLACIAL)
15		5	9"	15'0"-15'10"	17-100/4"		Olive-Tan, fine to medium Sand, some silt, little gravel, cobbles
20		6	12"	20'0"-21'1"	39-47-100/1"		Tan, fine to medium Sand, little gravel, little silt, cobbles
25							End at 22 ft Groundwater @ 8 ft
30							
35							

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 2

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Slaughter House
Site: 291 State Road
Westport, MA

BORING B-2 (205)

PROJECT NO. 16-0405

DATE: April 7, 2016

Ground Elevation:
Date Started: April 5, 2016
Date Finished: April 5, 2016
Driller: PG
Soil Engineer/Geologist: LC

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
4/5/16	9 ft	n/a	

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						4"	Forest Mat
1		1	15"	0-2'0"	1-1-1-1	2'	Orange, loamy, Fine Sand & Silt, roots (SUBSOIL)
		2	15"	2'0"-4'0"	11-13-14-21		Tan, fine to medium Sand, some silt, little gravel.
5		3	18"	5'0"-7'0"	25-38-21-14		Olive-Brown, mottled, fine to medium Sand, some gravel, some silt
10		4	18"	10'0"-12'0"	9-10-10-12		Tan, Fine Sand, little gravel, little silt (GLACIAL)
15		5	15"	15'0"-17'0"	8-8-9-11		Tan, Fine Sand, little silt, trace gravel
20		6	21"	20'0"-22'0"	14-25-33-40		Tan, fine to medium Sand, little gravel, little silt
							End at 22 ft Groundwater @ 9 ft
25							
30							
35							

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 3

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Slaughter House
Site: 291 State Road
Westport, MA

BORING B-3 (210)

PROJECT NO. 16-0405

DATE: April 7, 2016

Ground Elevation:
Date Started: April 5, 2016
Date Finished: April 5, 2016
Driller: PG
Soil Engineer/Geologist: LC

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
4/5/16	9 ft		

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Forest Mat
1		1	9"	0-2'0"	1-1-1-1	2'	Orange, loamy, Fine Sand & Silt, roots (SUBSOIL)
		2	21"	2'0"-4'0"	15-18-13-11		Olive-Brown, fine to medium Sand, some silt, little gravel
5		3	15"	5'0"-7'0"	16-16-13-15		Olive, fine to medium Sand, some silt, trace gravel
10		4	15"	10'0"-12'0"	11-10-8-9		Tan, fine to medium Sand, some gravel, little silt (GLACIAL)
15		5	18"	15'0"-17'0"	13-16-17-33		Tan, fine to medium Sand & Silt, trace gravel
20		6	6"	20'0"-20'7"	57-100/1"		Tan, fine to medium Sand, little silt, trace gravel
							End at 21 ft Groundwater @ 9 ft
25							
30							
35							

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 4

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Slaughter House
Site: 291 State Road
Westport, MA

BORING B-4 (213)

PROJECT NO. 16-0405

DATE: April 7, 2016

Ground Elevation:
Date Started: April 5, 2016
Date Finished: April 5, 2016
Driller: PG
Soil Engineer/Geologist: LC

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
4/5/16	8 ft	n/a	

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						4"	Forest Mat
1		1	15"	0-2'0"	1-1-1-1	2'	Orange, loamy, Fine Sand & Silt, roots (SUBSOIL)
		2	18"	2'0"-4'0"	11-13-13-15		Olive, mottled, fine to medium Sand & Silt
5		3	21"	5'0"-7'0"	11-10-13-17		Olive, fine to medium Sand, some gravel, little silt
							(GLACIAL)
10		4	15"	10'0"-12'0"	8-8-11-10		Tan, fine to medium Sand, little silt, trace gravel
15		5	21"	15'0"-17'0"	10-11-13-14		Tan, fine to medium Sand, little silt, trace gravel
20		6	3"	20'0"-20'5"	100/5"		Tan, fine to medium Sand, some silt, little gravel
							End at 22 ft Groundwater @ 8 ft
25							
30							
35							

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 5

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Slaughter House
Site: 291 State Road
Westport, MA

BORING B-5 (214)

PROJECT NO. 16-0405

DATE: April 7, 2016

Ground Elevation:
Date Started: April 5, 2016
Date Finished: April 5, 2016
Driller: PG
Soil Engineer/Geologist: LC

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
4/5/16	8 ft	n/a	

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						4"	Forest Mat
1		1	9"	0-2'0"	2-3-3-2	2'	Orange, loamy, Fine Sand & Silt, roots (SUBSOIL)
		2	18"	2'0"-4'0"	15-17-13-11		Olive, fine to medium Sand, some silt, little gravel
5		3	3"	5'0"-7'0"	12-10-8-10		Olive, fine to medium Sand, some gravel, some silt
							(GLACIAL)
10		4	21"	10'0"-12'0"	7-9-11-10		Tan, fine to medium Sand, some gravel, trace silt
15		5	21"	15'0"-17'0"	16-20-21-18		Tan, fine to medium Sand, some silt, trace gravel
20		6	1"	20'0"-20'3"	100/3"		Fractured ledge.
							End at 20 ft - Refusal Groundwater @ 8 ft
25							
30							
35							

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
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	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
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