RIVER VALLEY TESTING CORP.

REPORT OF GEOTECHNICAL EXPLORATION

PROPOSED DETENTION POND
RUEPING-MACY PROJECT
FOND DU LAC, WISCONSIN

EARTHTECH #103003
RVT #N08-113

Prepared for:

MS. CAROLINE BURGER
EARTHTECH, INC.

MARCH 20, 2008

RVT

RVT RIVER VALLEY TESTING CORP.

1060 Breezewood Lane, Suite 102
Neenah, WI 54956
Telephone: 920/886-1406
FAX: 920/886-1409

March 20, 2008

Ms. Caroline Burger
Earthtech, Inc.
1210 Fourier Drive
Madison, WI 53717

Subj: Report of Geotechnical Exploration
Proposed Detention Pond
Rueping-Macy Project
Fond du Lac, Wisconsin
Earthtech #103003
RVT #N08-113

Ms. Burger:

In compliance with your instructions, River Valley Testing Corp (RVT) has conducted a soils exploration program for the above referenced project. We have included the results of this exploration, together with our recommendations, in the attached report. We have transmitted three (3) copies (two bound and one unbound) of this report to you and two (2) copies to Mr. Rick Goding with the City of Fond du Lac. You authorized these services on January 17, 2008.

Portions of the soil samples will be held at RVT for a period of 30 days from the date of this report and then will be discarded unless requested to ship them to a location designated by you.

RVT has expressed its opinions in this report based on the conditions observed at the test boring locations. If the construction encounters different conditions than at the test boring locations, RVT requests notification so we can review these new conditions.

Respectfully Submitted,

RIVER VALLEY TESTING CORP.

Matthew A. Meyer, P.E.
Staff Geotechnical Engineer

MAM/mam
Attachments

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EXECUTIVE SUMMARY

We have prepared this executive summary solely to provide a general overview. ***Do not rely on this executive summary*** for any purpose except that for which it was prepared. ***Rely on the full report*** for information about findings, recommendations, and other concerns.

The results of the exploration program indicate the proposed pond site has generally suitable subsurface conditions for the expansion of the detention pond. However, based on the information obtained from the soil borings and the laboratory test results, in our opinion a partial pond liner will likely be necessary at this site because our borings encountered existing fill, some that contained sandy soil zones. Further, our test results indicate the lean clay and fat clay soils at the site should be suitable for use as liner/embankment fill.

General site preparation will require removing topsoil, and other material containing more than 5% organics from within the pond area. The "Construction Considerations" section of this report contains other recommendations concerning subgrade preparation and the intended construction.

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PROPOSED DETENTION POND
RUEPING – MACY PROJECT
FOND DU LAC, WISCONSIN

RVT #N08-113

1.0 INTRODUCTION

This report presents the results of the soil exploration program for the proposed detention pond to be constructed in Fond du Lac, Wisconsin. In fulfillment of the requested scope of services, RVT:

1. Performed four (4) standard penetration test soil borings in the vicinity of the proposed construction. In addition, we extended two (2) of the borings to a depth of 15' below the existing grade, and two (2) to auger refusal, which occurred at a depth of 12' and 21½' below the existing grade.

2. Classified the soils encountered in the soil borings and prepared soil boring logs illustrating the soil strata.

3. Performed a limited number of laboratory tests, as we deemed necessary, to aid in classifying the soils and in estimating their engineering properties.

4. Prepared a written report documenting the results of the field and laboratory test programs. We included the following in the report;

    a. Soil boring logs which document the encountered subsurface conditions.

    b. Our recommendations concerning detention pond liner recommendations.

    c. Construction considerations relative to the subsurface conditions.

The purpose of this report was to determine the various soil profile components, the engineering characteristics of the materials encountered, and to provide criteria for use by the design professionals in preparing the detention pond plans.

2.0 DESCRIPTION OF SITE

Site Location

The proposed construction, upon which this soils exploration has been made, is located in Fond du Lac, Wisconsin. Specifically, the site is located at the southwest corner of the intersection of Macy Street and Rees Street.

Site Topography

The site of the proposed construction consists of primarily groomed lawn. In addition, the site slopes gradually downward towards the Fond du Lac River located along the south side of the site. According to Earthtech, Inc., the elevations at the boring locations ranged from 756.6' at Boring 2-08 to 763.6' at Boring 4-08.

3.0 FIELD EXPLORATION

Drilling and Sampling Procedures

RVT advanced the soil borings on February 11 and 12, 2008, with an ATV mounted rotary drilling rig utilizing continuous flight hollow stem augers (HSA). Earthtech, Inc., determined the boring locations and depths. Earthtech, Inc., personnel also located the soil borings in the field and determined the surface elevations. We assume the elevations to be referenced to the National Vertical Geodetic (1929) Datum.

Field Penetration Tests

The drilling crew obtained field soil samples in accordance with American Society for Testing Materials (ASTM): D1586. Using this procedure, a 140 pound weight falling 30" drives a two inch outside diameter (OD) split barrel sampler into the soil using either a safety type manual hammer (MH) or an automatic hammer (AH). The "Method Section" of the boring logs indicates the hammer type in parentheses. After an initial set of six (6) inches, the standard penetration resistance or N-value describes the number of blows required to drive the sampler an additional 12 inches. The N-value provides an index of the relative density of cohesionless soils or the consistency of cohesive soils. This provides additional information as to the relative strength and compressibility characteristics of the subsoil.

Field Classification Tests

A hydrogeologist visually and manually classified the samples in the field in accordance with ASTM: D2488. Field personnel then collected representative soil samples and returned them to the laboratory for further examination and verification of the field classification. The soil boring logs located in the Appendix describe the depth and identification of the various strata, the N-value, the groundwater level and other pertinent information.

4.0 SUBSURFACE CONDITIONS

General

The stratification of the soils shown on the boring logs represent the soil conditions in the actual boring locations; however, other variations may occur between the borings. Lines of demarcation represent the approximate boundary between the soil types, but the transition may be gradual.

It should be pointed out, the subsurface conditions at other times and locations on the site may differ from those found at the test locations. If the contractor encounters different site conditions during construction, the design engineer or the contractor should request RVT review our recommendations in relation to the new information.

Subsurface Conditions

The soil boring logs in the Appendix illustrate the encountered soil and groundwater conditions at the test boring locations. The logs also indicate other pertinent information which includes the drilling method, sampling techniques, and laboratory testing.

The generalized soil profile indicated by the borings consisted of a 2" surficial topsoil layer overlying existing fill and possible fill to a depth of 6' to 21½' below the existing grade. Below the existing fill and possible fill soils, the borings encountered glacial till that extended to the boring termination depths. One exception to this profile occurred in Boring 3-08 and 4-08 because they did not encounter a surficial topsoil layer. In addition, Boring 3-08 and 4-08 did not encounter obvious

native soils and encountered auger refusal. A 5' rock core would be required to determine if auger refusal occurred on bedrock, a boulder, or other obstruction. However, based on the varied depths to refusal, the existing fill encountered in the borings, and historical records of former structures being on the site, in our opinion the auger refusals most likely occurred on an obstruction other than bedrock. The glacial till soils consisted of lean clay and the existing fill and possible fill soils consisted of lean clay, organic clay, and silty sand.

Standard penetration N-values indicated the native clay soils had a rather stiff consistency. In addition, the clayey existing fill and possible fill soils had a soft to very stiff consistency. Further, the sandy existing fill and possible fill soils had a medium dense to extremely dense relative density. The boring logs in the Appendix indicate the standard penetration N-values in the column titled "Total (N)".

Water Level Information

The drillers observed the water levels during drilling, and at the completion of each borehole. Only Boring 4-08 encountered groundwater during drilling operations and the drillers noted it at a depth of 20' below the existing grade. However, this boring did not encounter measurable groundwater at the completion of drilling.

Because the borings encountered poorly draining soils, in our opinion, the groundwater level may take days or weeks to stabilize. Therefore, the water level readings may not provide reasonable

estimates of the static groundwater level at the time of drilling. In addition, groundwater levels can fluctuate with time due to seasonal variations in precipitation, lateral drainage conditions, and from location to location. The time of year and the weather history during the advancement of the boring should be considered when estimating groundwater levels at other points in time.

5.0 LABORATORY TESTING PROGRAM

After completion of the field exploration, a Geotechnical Engineer visually and manually classified the samples in the laboratory in accordance with the Unified Soil Classification System (USCS). The classification included the major and minor soil type, grain-size, color, moisture content and consistency/relative density. The square-bracketed text below the classification indicates the probable geographic origin.

Further, RVT performed laboratory tests to determine in-situ moisture content (W), percent material passing the #200 sieve size (P200), organic content (Org), and Atterberg Limits (LL/PL). These laboratory test results can be found on the boring logs adjacent to the number of the tested sample. In addition, the drillers obtained calibrated spring penetrometer readings, P_q, for many of the clayey samples. The P_q test results can be found on the boring logs in the unconfined compressive strength (Q_u) column.

6.0 ENGINEERING REVIEW

Project Information

The following information represents RVT's understanding and assumptions of the proposed construction. It comprises an important part of our engineering review. If any changes occur in the nature, design, grades or locations of the proposed construction, after the completion of this report, the conclusions and recommendations in this report should not be considered valid unless RVT reviews these changes.

RVT understands the project includes the construction of a stormwater detention pond that will have a base elevation of about 744'. Because we understand the site has environmental concerns, we anticipate a clay liner will be required unless the native soils within 3' of the pond bottom have a hydraulic conductivity of less than 1×10^{-7} cm/sec.

If the borings encounter subsurface conditions that might be detrimental to the support of the proposed embankment structure, then RVT has assumed the owner will have an acceptable risk level if the detrimental material remains in place. With this in mind, this report assumes the owner would only be willing to accept a low risk for embankment settlement in excess of 2". *If these assumptions concerning the owner's acceptable risk level are incorrect, we should be immediately contacted so we can review our recommendations in light of the changed acceptable risk level.*

Discussion

Based primarily on information obtained from the soil borings, in RVT's opinion, the subsurface soil can provide suitable support for embankments. However, the existing fill and possible fill soils encountered in the borings present concerns for the support of embankment systems.

Existing Fill and Possible Fill

The presence of existing fill and possible fill soils encountered in the borings provides a concern for the support of embankments. This material extended from a depth of 6', to as deep as 21½' below the existing grade. For the possible fill, in the absence of deleterious material (such as organics, bricks or concrete), we often have difficulty distinguishing the difference between native soil and clean fill. However, the owner should be aware of the risk for total and/or differential settlement in excess of 2" associated with constructing embankments on undocumented fill. Undocumented fill has a risk for higher settlement because of potential variations in the density of this material. The risk also increases where the undocumented fill contains more than 5% organics.

Based primarily on the Standard Penetration N-values, in our opinion the risk of total and/or differential settlement in excess of 2" for foundations associated with the existing fill at this site would be moderate. However, in our opinion, the risk could be reduced to a low risk for foundations if field observations during construction indicate the soil to be native. If the owner cannot accept these risks, or if field observations indicate the possible fill soil to be existing fill, then RVT recommends removing all encountered existing fill from below embankments, and replacing it with a

compacted fill in accordance with the "Embankment/Liner" section of this report. In addition, if existing fill will remain below or along the sides of the pond, then we recommend placement of a clay liner in those areas because of the higher potential for undocumented fill to have a variable consistency.

Summary

Based on our assumption of the owner's acceptable risk level, as outlined in the "Project Information" section of this report, we recommend the following:

1. Over-excavate all encountered existing fill from below constructed embankments, and replace it with a compacted fill in accordance with the "Embankment/Liner" section of this report.
2. Where existing fill will be left in-place next to the pond, place a clay liner in accordance with the "Embankment/Liner" section of this report.
3. If field observations indicate the possible fill is native, not undocumented fill, then it could be left in place below the embankments providing it has suitable strength.

In addition, we ***strongly*** recommend RVT document the material exposed in the excavations does not exhibit obvious characteristics, which would adversely affect the performance of the embankment system.

Embankment/Liner

In RVT's opinion, after removal of all organic soil, and proof compaction of the subgrade, reworking of the embankment system that requires raising existing grades can be accomplished by placement of

structural fill on the native soils. In our opinion, a liner would not be necessary above the pool elevation for the two-year rainfall storm event, or in portions of the pond where the exposed soils consist of native lean clay soil. Based on the soil profile encountered in the borings and our laboratory test results, in our opinion a full liner will not likely be necessary for the proposed pond. However, because the borings encountered existing fill, including some layers of sandy soils, we anticipate a partial liner will be necessary. As a minimum, where the exposed native soil consists of suitable clay material, we recommend disking the upper 6" of it and recompacting it as noted below. In the zone of recompacted soil, we recommend screening out all gravel/cobbles larger than 3" in diameter.

As required by the Wisconsin Department of Natural Resources (WDNR), embankment/liner fill should consist of a clayey material meeting the following specifications:

Embankment Fill Specifications	
USCS Classification	CL or CH
% Passing the #200 Sieve	50-100
Liquid Limit (%)	20 Minimum 25 Average
Plasticity Index (%)	10 Minimum 12 Average
Recompacted Hydraulic Conductivity (cm/sec)	1×10^{-7} Maximum

If the site will be raised around the perimeter of the pond, or if construction encounters sandy or gravelly soil pockets requiring a partial liner, then the clay embankment and liner fill should be placed in maximum 8" loose lifts, and be compacted with a sheepsfoot or rubber tired compactor to a

minimum 95% of the Modified Proctor (ASTM D1557) density. The minimum compaction level could be reduced to 90% of the Modified Proctor density when using the clay fill only as a liner. Further, the moisture content of the fill should be at, to no more than 5% above, the optimum Modified Proctor moisture content prior to compaction. When placing liner material in partially lined areas, we recommend extending the liner over the adjacent clay soils a minimum of 2' to reduce the potential for leakage around the edge of the liner. Based primarily on our limited laboratory test results, in our opinion, the native lean clay and fat clay soil (USCS classification "CL" and "CH") encountered in the borings should meet the WDNR specifications for the clay embankment fill.

When sizing constructed embankments for bearing failure considerations, embankments constructed on the medium ($N \geq 6$ bpf) native soil could be proportioned for a net allowable bearing pressure of 2,000 psf, which assumes a factor of safety of at least 3. However, we cannot estimate the potential magnitude of total and differential settlement until additional project information becomes available.

If construction will occur during the winter months, we wish to note that excessive settlement may occur if the contractor incorporates frozen material in the embankment fill. Therefore, we recommend wasting any material which freezes prior to compaction.

7.0 CONSTRUCTION CONSIDERATIONS

Site Preparation

Based on the soil borings conducted for this exploration, RVT anticipates a moderate to significant amount of special subgrade preparation will be necessary prior to construction of the pond and placement of embankment/liner fill. This special preparation would include the removal of all existing fill from below constructed embankments and possibly from within the pond perimeter. In addition, where existing fill will remain in-place adjacent to the pond, we recommend placement of a clay liner. For the general site preparation, we recommend removing topsoil and other encountered near surface soils having more than 5% organics from within the pond area.

The clay soils at this site have a high susceptibility to strength loss when wet or when disturbed by construction activity. Therefore, we recommend maintaining site drainage away from excavations to minimize the amount of water entering or ponding in the excavations. Saturated or disturbed soil should be removed and replaced with structural fill in accordance with the "Embankment/Liner" section of this report.

Where excavations extend deeper than 5', we recommend maintaining excavation side slopes at a ratio no steeper than 1½' horizontal to 1' vertical. In addition, we wish to note that other OSHA requirements concerning excavation bracing may apply.

Groundwater Control

The subsurface exploration did not encounter measurable groundwater above the anticipated depth of the proposed excavations. However, seasonal variations in precipitation and site drainage conditions can cause the accumulation of free water in the upper soils. In RVT's opinion, groundwater seepage into excavations should be suitably controlled using sump pits and pumps.

Please note, at least a very low risk will always exists that the site would require a more substantial dewatering system (such as a temporary well point system). Therefore, RVT wishes to emphasize that lowering the static groundwater level can have detrimental effects on nearby structures. With this in mind, RVT recommends any dewatering schemes be reviewed by a contractor who specializes in this type of work prior to its implementation.

Testing and Observations

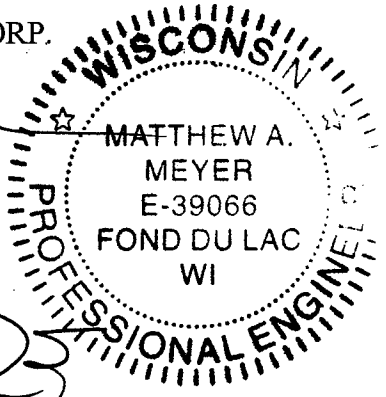
Because the borings encountered existing fill soils, we ***strongly*** recommend the owner retain RVT to observe the completed excavations before placement of embankment/liner fill. This will provide the necessary documentation of the complete removal of all unsuitable soil. RVT should also document the soils encountered in the excavations have similar characteristics as those noted in the soil borings. Density tests should be taken during fill placement to document the achievement of our recommended compaction.

8.0 STANDARD OF CARE

The recommendations contained in this report represent our opinions arrived at in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended in this report.

This report was prepared by,

RIVER VALLEY TESTING CORP.



Matthew A. Meyer, P.E.
Staff Geotechnical Engineer

This report reviewed by,

Alex E. Barker, P.E.
President/Geotechnical Engineer

MAM/AEB/mam

APPENDIX

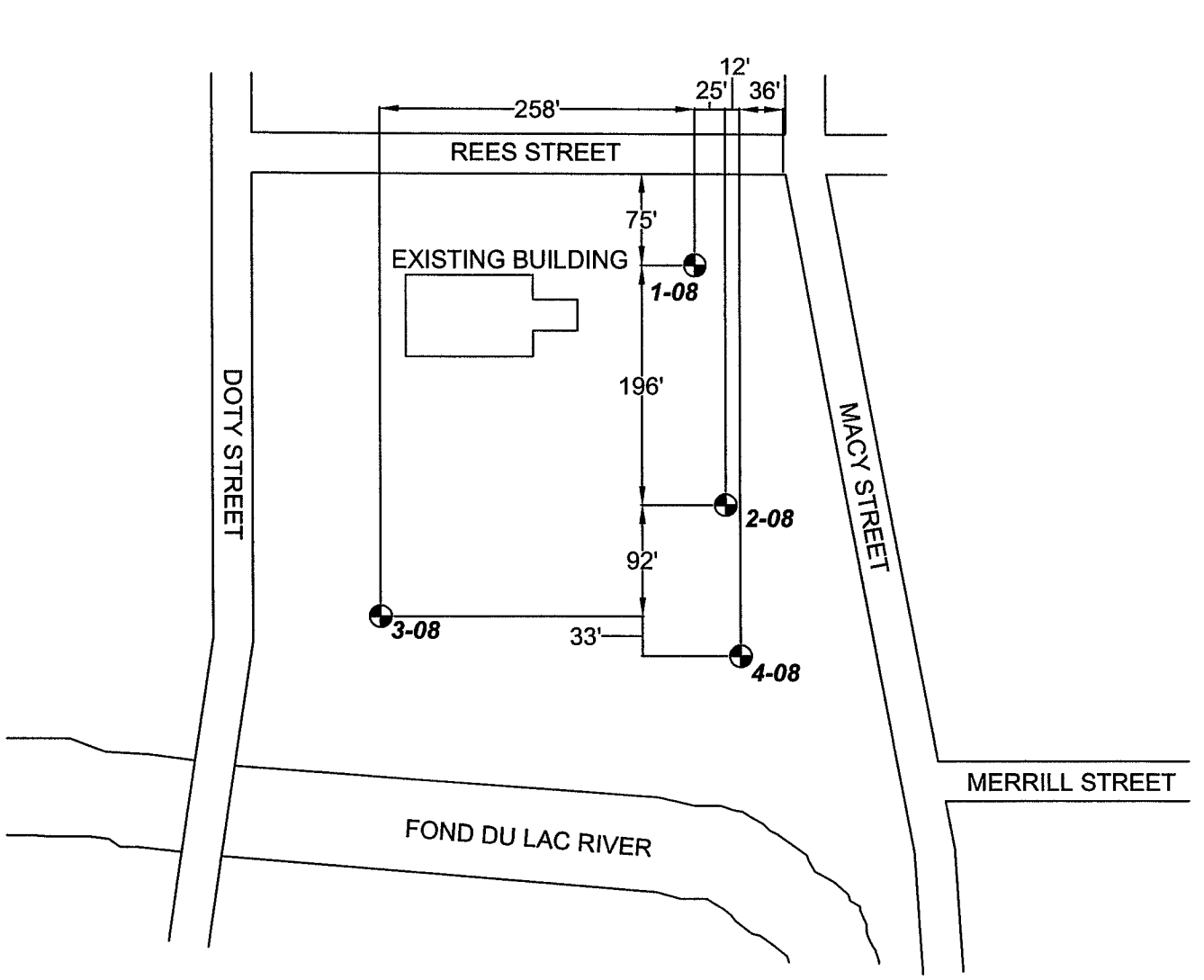
Boring Location Sketch

Soil Boring Logs

Unified Soil Classification System

Report of Laboratory Analysis of Soil

Important Information About Your
Geotechnical Engineering Report



LEGEND

SOIL BORING LOCATION

BORING LOCATION SKETCH		
PROJECT: PROPOSED RUEPING-MACY POND FOND DU LAC, WISCONSIN		
FILE NO: N08-113	DATE: 02/26/08	BY: M. MEYER

RVT

Appleton
Green Bay
Madison
Wisconsin

Geotechnical, Environmental, and Construction Consulting

TEST BORING LOG

Project:	PROPOSED RUEPING-MACY POND		
Location:	FOND DU LAC, WISCONSIN		
RVT File No:	N08-113		**Page:** 1 of 1
Surface Elev:	756.7'	**Scale:** 1" = 4'	**Boring No:** 1-08

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/12/08 Completed: 2/12/08 Driller: GABR Method: 3 1/4" HSA 0' to 13 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
2"	7	2		ORGANIC CLAY, dark greyish brown, wet, medium (OL)	No WLD No WLA							
	4	5	6	[TOPSOIL]		1	SS				Pq (tsf) = 0.25	
2	2	3		FILL, mostly Lean Clay, with Sand, reddish brown and greyish brown, moist, medium (CL)								
3	15	8	18	[FILL]		2	SS				Pq (tsf) = 3.0	
4	3	3		FILL, mostly Lean Clay and Organic Clay, dark greyish brown, brown, and grey, moist, rather stiff (CL, OL)								
	3	4	6	[FILL]		3	SS	40				Org =11%
6	1	4		FILL, mostly Silty Sand, with Gravel, greyish brown and yellowish brown, moist, medium dense (SM)								
	7		11	[FILL]		4	SS	21			Pq (tsf) = 4.5+	
				FILL, mostly Organic Clay, with a little Lean Clay, very dark greyish brown, black, and brown, moist, medium (CL)								
				[FILL]		5	3T	22		48/22		P200 =90%
		3		LEAN CLAY, with Sand, reddish brown, moist, rather stiff (CL)								K*
	6	9	15	[GLACIAL TILL]		6	SS				Pq (tsf) = 4.0	
		2										
	5	8	13			7	SS	23			Pq (tsf) = 4.25	P200 =89%
15				End of Boring at 15'								

Note: K* = Hydraulic Conductivity sample.

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Appleton
Green Bay
Madison
Wisconsin

Geotechnical, Environmental, and Construction Consulting

TEST BORING LOG

Project:	PROPOSED RUEPING-MACY POND		
Location:	FOND DU LAC, WISCONSIN		
RVT File No:	N08-113		**Page:** 1 of 1
Surface Elev:	756.6'	**Scale:** 1" = 4'	**Boring No:** 2-08

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

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RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/12/08 Completed: 2/12/08 Driller: GABR Method: 3 1/4" HSA 0' to 13 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
2"	8	3		ORGANIC CLAY, dark greyish brown, wet, medium (OL)	No WLD No WLA							
	4	5	7	[TOPSOIL]		1	SS				Pq (tsf) = 1.5	
	2	3		FILL, mostly Lean Clay, with Sand and Gravel, reddish brown, brown, and light grey, moist, medium (CL)								
	6	8	9			2	SS				Pq (tsf) = 1.0	
4				[FILL]							Pq (tsf) = 4.25	
	3	4		FILL, mostly Lean Clay and Organic Clay, dark greyish brown and reddish brown, moist, medium (CL, OL)								
	5	5	9			3	SS				Pq (tsf) = 3.75	
6				[FILL]							Pq (tsf) = 2.75	
	5	6										
	8		14	LEAN CLAY, with Sand, reddish brown, moist, rather stiff (CL)		4	SS	21			Pq (tsf) = 4.5+	P200 =90%
				[GLACIAL TILL]		5	3T	21		48/20		P200 =87%
10				FAT CLAY, reddish brown, moist, rather stiff (CH)								
		3										
				[GLACIAL TILL]								
	5	6	11			6	SS	22		50/19	Pq (tsf) = 4.0	
		2										
	6	7	13			7	SS				Pq (tsf) = 3.75	
15				End of Boring at 15'								

RVT

Appleton
Green Bay
Madison
Wisconsin

Geotechnical, Environmental, and Construction Consulting

TEST BORING LOG

Project:	PROPOSED RUEPING-MACY POND		
Location:	FOND DU LAC, WISCONSIN		
RVT File No:	N08-113		**Page:** 1 of 1
Surface Elev:	761.2'	**Scale:** 1" = 4'	**Boring No:** 3-08

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
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MA* = Mechanical Analysis
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Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/12/08 Completed: 2/12/08 Driller: GABR Method: 3 1/4" HSA 0' to 12' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
	2	1		FILL, mostly Lean Clay and Organic Clay, reddish brown and dark greyish brown, wet, soft (CL, OL)	No WLD No WLA							
	2	2	3			1	SS					
2				[FILL]								
	3	4		FILL, mostly Lean Clay, reddish brown, wet, rather stiff to very stiff (CL)								
	6	7	10			2	SS				Pq (tsf) = 3.75	
	2	5		[FILL]								
	6	6	11			3	SS	23			Pq (tsf) = 2.25	P200 =89%
	3	12									Pq (tsf) = 3.0	
7½	24		36			4	SS				Pq (tsf) = 1.75	
		34		FILL, mostly Silty Sand, with Gravel, greyish brown and grey, moist, extremely dense (SM)								
	50/9"		50/9"	[FILL]		5	SS					
12				Auger Refusal at 12' End of Boring at 12'								
				Note: Boring offset 10' east and blind drilled to auger refusal at 12'.								

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Appleton
Green Bay
Madison
Wisconsin

Geotechnical, Environmental, and Construction Consulting

TEST BORING LOG

Project:	PROPOSED RUEPING-MACY POND		
Location:	FOND DU LAC, WISCONSIN		
RVT File No:	N08-113		**Page:** 1 of 1
Surface Elev:	763.6'	**Scale:** 1" = 4'	**Boring No:** 4-08

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/11/08 Completed: 2/11/08 Driller: GABR Method: 3 1/4" HSA 0' to 21.5' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Type	W (%)	DD (pcf)	LL / PL	Qu (psf)	Other
	2	2		FILL, mostly Organic Clay and Lean Clay, dark greyish brown, wet, medium (OL, CL)	No WLA							
	4	4	6	[FILL]		1	SS					
	3	3										
3.5	3	4	6	LEAN CLAY, with Sand, reddish brown, moist, medium to rather stiff to soft (CL)		2	SS				Pq (tsf) = 1.25	
	2	4						26		49/19	Pq (tsf) = 2.75	
	4	5	8	[POSSIBLE FILL]		3	SS				Pq (tsf) = 2.5	
	4	4										
	5	6	9			4	SS				Pq (tsf) = 4.5+	
						5	3T					
	2	11										
	8		19			6	SS				Pq (tsf) = 1.25	
		3										
	8	3	11			7	SS				Pq (tsf) = 1.25	
						8	3T					
		0										
	0	1	1		WLD	9	SS					
21.5				Auger Refusal at 21.5' End of Boring at 21.5'								

UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM: D2487-90

	Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]			Soil Classification	
				Group Symbol	Group Name[B]
Coarse-Grained Soils: More than 50% retained on #200 sieve	Gravels: More than 50% of coarse fraction retained on #4 sieve	Clean Gravels with less than 5% fines[C]	Cu >= 4 and 1 <= Cc <= 3[E]	GW	Well-graded gravel[F]
			Cu < 4 and/or 1 > Cc > 3[E]	GP	Poorly graded gravel[F]
		Gravels with more than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands: 50% or more of coarse fraction passes #4 sieve	Clean Sands with less than 5% fines[D]	Cu >= 6 and 1 <= Cc <= 3[E]	SW	Well-graded sand
			Cu < 6 and/or 1 > Cc > 3[E]	SP	Poorly graded sand[I]
		Sands with more than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,J]
			Fines classify as CL or CH	SC	Clayey sand[G,H,J]
Fine-Grained Soils: 50% or more passes the #200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		Organic[R]	Liquid limit (oven dried) / Liquid limit (not dried) < 0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	Inorganic	PI > 7 and plots on or above "A" line	CH	Fat clay[K,L,M]
			PI < 4 or plots below "A" line	MH	Elastic Silt[K,L,M]
		Organic[R]	Liquid limit (oven dried) / Liquid limit (not dried) < 0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,O]
Highly organic soils[S]	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3" (75mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM, well-graded gravel with silt
GW-GC, well-graded gravel with clay
GP-GM, poorly graded gravel with silt
GP-GC, poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM, well-graded sand with silt
SW-SC, well-graded sand with clay
SP-SM, poorly graded sand with silt
SP-SC, poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains >= 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains >= 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty sand.

[K] If soil contains 15 to 29% plus #200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains >= 30% plus #200, predominantly sand, add "sandy" to group name.

[M] If soil contains >= 30% plus #200, predominantly gravel, add "gravelly" to group name.

[N] PI >= 4 and plots on or above "A" line.

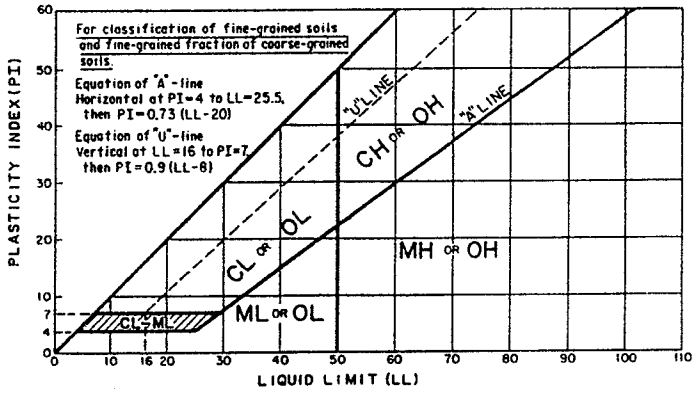
[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

[R] Organic Content > 5% and < = 30%.

[S] Organic Content > 30%.



ADDITIONAL DESCRIPTIVE TERMINOLOGY

Soil Type	Size Range
Boulder	> 12"
Cobble	12" - 3"
Gravel	3" - #4*
Sand:	
Coarse	#4 - #10
Medium	#10 - #40
Fine	#40 - #200
Silt & Clay	< #200, based on plasticity

*U.S. Standard Sieve Sizes

Relative Gravel Contents	
Descriptive Term	Gravel Content
Sand:	
A Little Gravel	5 - 14%
With Gravel	15 - 49%
Silt & Clay:	
A Little Gravel	5 - 14%
With Gravel	15 - 29%
Gravelly	30 - 49%

Consistency (Clay)	"N" Blows/Ft	Relative Density (Sand)
Soft	0 - 4	Very Loose
Medium	5 - 9	Loose
Rather Stiff	10 - 19	Medium Dense
Stiff	20 - 29	Dense
Very Stiff	30 - 49	Very Dense
Hard	50+	Extremely Dense

Other Descriptive Terms	
Lamination	Stratum up to 1/16" thick
Seam	Stratum 1/16" to 1/2" thick
Layer	Stratum from 1/2" to 6" thick
Lens	Discontinuous stratum or pocket from 1/2" to 6" thick
Varved	Alternating laminations or seams of clay, silt and/or fine grained sand; or alternating colors
Mottled	Mixture of clay, silt and/or fine sand exhibiting no layering; or mixture of colors exhibiting no layering
Moist	Below saturation
Wet	Saturated relatively impervious soils
Waterbearing	Saturated Pervious soils

RVT
Engineering Resources, Testing Solutions

REPORT OF LABORATORY ANALYSIS OF SOIL

1060 Breezewood Lane, Suite 102
Neenah, WI 54956
ph 920-886-1406
fax 920-886-1409
www.rvtcorp.com

Project: **PROPOSED DETENTION POND**
RUEPING-MACY PROJECT
FOND DU LAC, WISCONSIN

Copies:

Client: Ms. Caroline Burger
Earthtech, Inc.
1210 Fourier Drive
Madison, WI 53717

Date: March 20, 2008

RVT File No: N08-113

GENERAL:

Scope of Work: Determine the percent material passing the #200 sieve size, the Atterberg Limits and the Hydraulic Conductivity of the select boring sample.

Date of Test: 2/26/08 – 3/13/08 Technician: B Coleman

Sampled By: RVT Personnel Date Sampled: 2/12/08

RESULTS:

Test Method:

ASTM D2487	Classification of Soils for Engineering Purposes
ASTM D1140	Percent Material Finer than the No 200 Sieve
ASTM D4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D5084	Hydraulic Conductivity Test

Boring Number	1-08				WDNR Requirements
Sample Number	5				
Sample Depth	9' – 11'				
USCS Classification	CL				CL or CH
% Passing No 200 Sieve	90				50 – 100
Liquid Limit (LL)	48				20 Min / 25 Avg
Plastic Limit (PL)	22				—
Plasticity Index (PI)	26				10 Min / 12 Avg
Moisture Content (%)	22				—
Dry Density (pcf)	107				—
Hydraulic Conductivity (cm/sec)	8.9×10^{-9}				1.0×10^{-7} Maximum

REMARKS:

The above sample meets WDNR requirements for detention pond liner material. A portion of the sample will be held for 30 days after the date of this report and then will be discarded unless notified otherwise.

Respectfully Submitted,
River Valley Testing Corp.

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you —* should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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