



Construction • Geotechnical  
Consulting Engineering/Testing

January 4, 2022  
C21051-28

Mr. Kyle Frank  
City of Madison Engineering Dept.  
City-County Building, Room 115  
210 Martin Luther King, Jr. Blvd.  
Madison, WI 53703-3345

Re: Geotechnical Services  
Fordem Towers Sanitary  
Madison, Wisconsin

Dear Mr. Frank:

CGC, Inc. has completed our geotechnical services for the above-referenced project. At your request, two soil borings were drilled along an easement within a parking lot to the west of the southern tower at 1622 Fordem Avenue. An initial boring (B1) was performed on Dec 3, 2021 at a location selected by the City and marked in the field by CGC. A second boring (B2) was performed at a location determined by City of Madison Hydrogeologist Brynn Bemis (approximately 6 ft W of B1), on Dec 14, 2021. Elevations at the boring locations were estimated using topographic information obtained from Dane County DCi Map, which should be considered approximate. Additionally, City of Madison Hydrogeologist Brynn Bemis was on-site during drilling at B2 collecting samples to be analyzed for potential contamination. Results from said analyses are separate from this report. The following paragraphs discuss our observations and provide opinions relative to pavement/utility construction.

### **SUBSURFACE PROGRAM & OBSERVATIONS**

The borings were drilled to depths selected by City personnel utilizing the services of Badger State Drilling (under subcontract to CGC) using a truck-mounted, rotary CME 55 drill rig equipped with hollow-stem augers. Standard Penetration Test (SPT) drilling techniques (ASTM D1586) were used for the full exploration depth at the boring locations. This method consists of driving a 2-inch outside diameter split-barrel sampler using a 140-pound weight falling freely through a distance of 30 inches. The sampler is first seated 6 inches into the material to be sampled and then driven 12 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the log of borings and is known as the Standard Penetration Resistance (commonly referred to as the N-value).

During the field exploration program, the driller visually classified the soils and prepared a field log. Water level observations were made within the borings during and shortly after drilling, which are shown on the bottom of each boring log. Note groundwater was encountered approximately 6 ft below existing grades at the boring locations. Groundwater levels are anticipated to fluctuate based on seasonal variations in precipitation, infiltration, nearby Yahara River stages, as well as other

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factors. Upon completion of drilling, the borings were backfilled to satisfy WDNR requirements, patched with asphalt and the remaining soil samples were delivered to our laboratory for classification. The soils were visually classified by CGC and reviewed by a geotechnical engineer using the Unified Soil Classification System (USCS). The final logs prepared by the engineer and a description of the USCS are presented in Appendix A.

The attached boring logs indicate that 4 in. of asphalt pavement was present atop 8 to 10 in. of base course over approximately 7 to 8 ft of fill containing “municipal waste” materials including, but not limited to, brick fragments, glass, wood pieces and cinders. The fill was underlain by 2 to 3 of highly organic peat soils resting atop 4 ft of cohesive soils at B1; or 2 ft of sand over 3.5 ft of cohesive soils extending to the maximum depth explored at B2. Please refer to the final logs included in Appendix A for additional information specific to a boring location.

## UTILITY CONSTRUCTION

In our opinion, both the variable fill materials in loose to very loose conditions and highly organic peat soils are *unsatisfactory* for proposed utility support. We therefore recommend that excavations for utility replacements extend through the peat and into the underlying granular and/or cohesive soils. Care should be exercised to prevent disturbance to the pipe subgrade soils during excavation, and consideration be given to the placement of a geotextile separation layer beneath compacted bedding materials. Furthermore, dewatering to allow for construction “in the dry” will likely be necessary during utility installations. Pumping from filtered sump pits is typically acceptable for drawdowns of about two feet or less whereas well points are generally needed for drawdowns greater than two feet. Dewatering means and methods are the responsibility of the contractor. Additional details can be provided upon request.

We anticipate that imported sands will be required for use as backfill which is a typical requirement for City projects. On-site sands could be considered for reuse as trench backfill but they should be separated from clay soils and selectively stockpiled. Moisture conditioning would likely be necessary to achieve desired compaction levels. We recommend that at least a level of 95% compaction be achieved within backfill material placed within the final 3 feet below finished subgrades or within road right-of-ways (including undercut backfill - if any), with 90% compaction required at depths greater than 3 feet. The specified levels of compaction are based on modified Proctor methods (ASTM D1557). Also, the backfill material should be placed and compacted in accordance with our Recommended Compacted Fill Specifications presented in Appendix B.

## PAVEMENT CONSTRUCTION

We envision that restoration of the paved easement would be accomplished by trench-patching involving the matching of existing conditions per standard City of Madison specifications. Note that a thin layer or “crust” of relatively stable subgrade materials directly underlying the pavement section at the boring locations could potentially destabilize (even beneath existing pavement not removed for utility installations) after exposure to significant construction traffic. The potential

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exists that pavement restorations could be necessary beyond areas immediately affected by installations. Care should therefore be exercised to prevent damage to the existing pavements where repeated construction traffic is necessary. If isolated areas of instability are observed, the strategic (ie: early) placement of steel plates could prevent larger sections of pavement from requiring repair. In the event that pavement restorations beyond trench patching become necessary, affected areas should be undercut and stabilized with coarse crushed aggregate prior to paving.

\*\*\*\*\*

We appreciate the opportunity to be of service on this project and look forward to working with you as it proceeds. Other information regarding this report and its limitations is included in Appendix C.

We trust this report addresses your present needs. If you have any questions, please contact us.

Sincerely,

**CGC, Inc.**



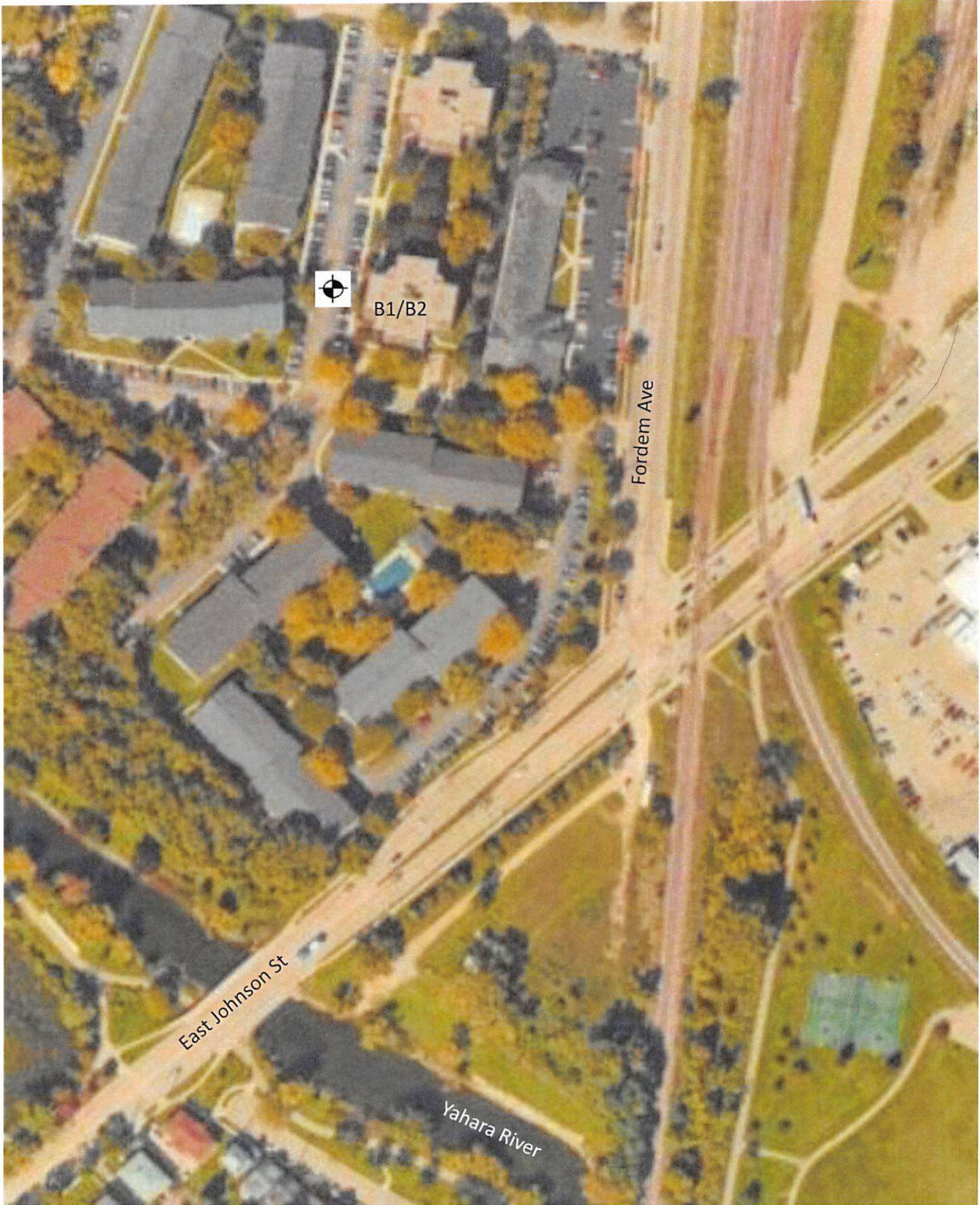
Michael N. Schultz, P.E.  
Principal/Consulting Professional

Encl: Appendix A - Soil Boring Location Map  
          Logs of Test Borings (2)  
          Log of Test Borings-General Notes  
          Unified Soil Classification System  
Appendix B - Recommended Compacted Fill Specifications  
Appendix C - Document Qualifications

Cc: Ms. Johanna Johnson, City of Madison, Eng. Division  
      Ms. Christy Bachmann, City of Madison, Eng. Division

**APPENDIX A**

**SOIL BORING LOCATION MAP  
LOGS OF TEST BORINGS (2)  
LOG OF TEST BORING-GENERAL NOTES  
UNIFIED SOIL CLASSIFICATION SYSTEM**



**Legend**

☉ Denotes boring location

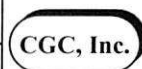
**Notes**

1. Soil borings performed by Badger State Drilling in December 2021
2. Boring locations are approximate

Scale: Reduced

Job No.  
C21051-28

Date:  
12/2021



**SOIL BORING LOCATION MAP**  
**1622 Fordem Ave Easement**  
**Madison, Wisconsin**



# LOG OF TEST BORING

Project Fordem Towers Sanitary  
 Location Madison, WI

Boring No. 1  
 Surface Elevation (ft) 853±  
 Job No. C21051-28  
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
				0	4 in. Asphalt Pavement/10 in. Base Course					
1	14	M	21	21	FILL: Medium Dense to Very Loose Gray-Brown Sand with Silt and Gravel, Scattered Brick Fragments, Wood Pieces and Cinders					
2	3	M	2	2						
3		W	2	2						
4	8	W	3	3	Very Loose, Dark Brown to Black Sedimentary to Fibrous PEAT (PT)					
				10	Stratified Medium Stiff, Light Brown to Gray Lean CLAY and Medium Dense Sandy SILT (CL/ML)					
5	18	W	15	15		(0.75)				
				15	End Boring at 15 ft  Borehole backfilled with bentonite chips and asphalt patch					
				20						

### WATER LEVEL OBSERVATIONS

While Drilling  $\nabla$  6.0' Upon Completion of Drilling \_\_\_\_\_  
 Time After Drilling \_\_\_\_\_  
 Depth to Water \_\_\_\_\_  
 Depth to Cave in \_\_\_\_\_

### GENERAL NOTES

Start 12/3/21 End 12/3/21  
 Driller BSD Chief MC Rig CME-55  
 Logger DD Editor ESF  
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



# LOG OF TEST BORING

Project Fordem Towers Sanitary  
 Location Madison, WI

Boring No. 2  
 Surface Elevation (ft) 853±  
 Job No. C21051-28  
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
					4 in. Asphalt Pavement/8 in. Base Course					
1	14	M	8		FILL: Loose to Very Loose Gray-Brown Sand with Silt and Gravel, Scattered Brick Fragments, Glass, Wood Pieces and Cinders					
2	8	M	4							
3	4	W	53/7"		Larger Wood Piece Near 6.5'					
					Very Loose, Dark Brown to Black Sedimentary to Fibrous PEAT (PT)					
4	18	W	12		Medium Dense to Loose, Gray Silty Fine SAND (SM)					
5	18	W	9		Stratified Medium Stiff Light Brown to Gray Lean CLAY and Medium Dense SILT (CL/ML)	(1.0)				
6	14	W	9			(0.75)				
				15	End Boring at 15 ft					
					Borehole backfilled with bentonite chips and asphalt patch					
				20						

## WATER LEVEL OBSERVATIONS

While Drilling  $\nabla$  6.0'      Upon Completion of Drilling \_\_\_\_\_  
 Time After Drilling \_\_\_\_\_  
 Depth to Water \_\_\_\_\_  
 Depth to Cave in \_\_\_\_\_

## GENERAL NOTES

Start 12/14/21 End 12/14/21  
 Driller BSD Chief MC Rig CME-55  
 Logger DD Editor ESF  
 Drill Method 2.25" HSA; Autohammer

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

**LOG OF TEST BORING**  
*General Notes*

**DESCRIPTIVE SOIL CLASSIFICATION**

Grain Size Terminology

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders .....	Larger than 12" .....	Larger than 12"
Cobbles .....	3" to 12" .....	3" to 12"
Gravel: Coarse.....	¾" to 3" .....	¾" to 3"
Fine .....	4.76 mm to ¾" .....	#4 to ¾"
Sand: Coarse.....	2.00 mm to 4.76 mm.....	#10 to #4
Medium .....	0.42 to mm to 2.00 mm .....	#40 to #10
Fine .....	0.074 mm to 0.42 mm.....	#200 to #40
Silt.....	0.005 mm to 0.074 mm.....	Smaller than #200
Clay.....	Smaller than 0.005 mm.....	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

General Terminology

- Physical Characteristics  
Color, moisture, grain shape, fineness, etc.
- Major Constituents  
Clay, silt, sand, gravel
- Structure  
Laminated, varved, fibrous, stratified, cemented, fissured, etc.
- Geologic Origin  
Glacial, alluvial, eolian, residual, etc.

Relative Density

Term	"N" Value
Very Loose.....	0 - 4
Loose.....	4 - 10
Medium Dense.....	10 - 30
Dense.....	30 - 50
Very Dense.....	Over 50

Relative Proportions Of Cohesionless Soils

Proportional Term	Defining Range by Percentage of Weight
Trace.....	0% - 5%
Little.....	5% - 12%
Some.....	12% - 35%
And .....	35% - 50%

Consistency

Term	q <sub>u</sub> -tons/sq. ft
Very Soft.....	0.0 to 0.25
Soft.....	0.25 to 0.50
Medium.....	0.50 to 1.0
Stiff.....	1.0 to 2.0
Very Stiff.....	2.0 to 4.0
Hard.....	Over 4.0

Organic Content by Combustion Method

Soil Description	Loss on Ignition
Non Organic.....	Less than 4%
Organic Silt/Clay.....	4 - 12%
Sedimentary Peat.....	12% - 50%
Fibrous and Woody Peat...	More than 50%

Plasticity

Term	Plastic Index
None to Slight.....	0 - 4
Slight.....	5 - 7
Medium.....	8 - 22
High to Very High ..	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

**SYMBOLS**

Drilling and Sampling

- CS – Continuous Sampling
- RC – Rock Coring: Size AW, BW, NW, 2"W
- RQD – Rock Quality Designation
- RB – Rock Bit/Roller Bit
- FT – Fish Tail
- DC – Drove Casing
- C – Casing: Size 2 ½", NW, 4", HW
- CW – Clear Water
- DM – Drilling Mud
- HSA – Hollow Stem Auger
- FA – Flight Auger
- HA – Hand Auger
- COA – Clean-Out Auger
- SS - 2" Dia. Split-Barrel Sample
- 2ST – 2" Dia. Thin-Walled Tube Sample
- 3ST – 3" Dia. Thin-Walled Tube Sample
- PT – 3" Dia. Piston Tube Sample
- AS – Auger Sample
- WS – Wash Sample
- PTS – Peat Sample
- PS – Pitcher Sample
- NR – No Recovery
- S – Sounding
- PMT – Borehole Pressuremeter Test
- VS – Vane Shear Test
- WPT – Water Pressure Test

Laboratory Tests

- q<sub>a</sub> – Penetrometer Reading, tons/sq ft
- q<sub>u</sub> – Unconfined Strength, tons/sq ft
- W – Moisture Content, %
- LL – Liquid Limit, %
- PL – Plastic Limit, %
- SL – Shrinkage Limit, %
- LI – Loss on Ignition
- D – Dry Unit Weight, lbs/cu ft
- pH – Measure of Soil Alkalinity or Acidity
- FS – Free Swell, %

Water Level Measurement

- ▽ - Water Level at Time Shown
- NW – No Water Encountered
- WD – While Drilling
- BCR – Before Casing Removal
- ACR – After Casing Removal
- CW – Cave and Wet
- CM – Caved and Moist
















Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

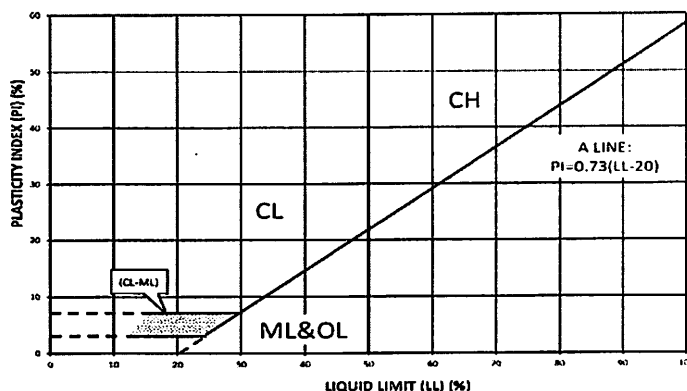


# CGC, Inc.

Madison - Milwaukee

# Unified Soil Classification System

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART			
<b>COARSE-GRAINED SOILS</b>			
(more than 50% of material is larger than No. 200 sieve size)			
<b>GRAVELS</b> More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)		
		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)		
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
<b>SANDS</b> 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)		
		SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)		
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
<b>FINE-GRAINED SOILS</b>			
(50% or more of material is smaller than No. 200 sieve size.)			
<b>SILTS AND CLAYS</b> Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
<b>SILTS AND CLAYS</b> Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
<b>HIGHLY ORGANIC SOILS</b>		PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA			
GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3		
GP	Not meeting all gradation requirements for GW		
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols	
GC	Atterberg limits above "A" line or P.I. greater than 7		
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3		
SP	Not meeting all gradation requirements for GW		
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols	
SC	Atterberg limits above "A" line with P.I. greater than 7		
<p>Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:</p> <p>Less than 5 percent ..... GW, GP, SW, SP                      More than 12 percent ..... GM, GC, SM, SC                      5 to 12 percent ..... Borderline cases requiring dual symbols</p>			
<b>PLASTICITY CHART</b>			
			

**APPENDIX B**

**RECOMMENDED COMPACTED FILL SPECIFICATIONS**

## **APPENDIX B**

### **CGC, INC.**

## **RECOMMENDED COMPACTED FILL SPECIFICATIONS**

### **General Fill Materials**

Proposed fill shall contain no vegetation, roots, topsoil, peat, ash, wood or any other non-soil material which by decomposition might cause settlement. Also, fill shall never be placed while frozen or on frozen surfaces. Rock, stone or broken concrete greater than 6 in. in the largest dimension shall not be placed within 10 ft of the building area. Fill used greater than 10 ft beyond the building limits shall not contain rock, boulders or concrete pieces greater than a 2 sq ft area and shall not be placed within the final 2 ft of finish subgrade or in designated utility construction areas. Fill containing rock, boulders or concrete pieces should include sufficient finer material to fill voids among the larger fragments.

### **Special Fill Materials**

In certain cases, special fill materials may be required for specific purposes, such as stabilizing subgrades, backfilling undercut excavations or filling behind retaining walls. For reference, WisDOT gradation specifications for various types of granular fill are attached in Table 1.

### **Placement Method**

The approved fill shall be placed, spread and leveled in layers generally not exceeding 10 in. in thickness before compaction. The fill shall be placed at moisture content capable of achieving the desired compaction level. For clay soils or granular soils containing an appreciable amount of cohesive fines, moisture conditioning will likely be required.

It is the Contractor's responsibility to provide all necessary compaction equipment and other grading equipment that may be required to attain the specified compaction. Hand-guided vibratory or tamping compactors will be required whenever fill is placed adjacent to walls, footings, columns or in confined areas.

### **Compaction Specifications**

Maximum dry density and optimum moisture content of the fill soil shall be determined in accordance with modified Proctor methods (ASTM D1557). The recommended field compaction as a percentage of the maximum dry density is shown in Table 2. Note that these compaction guidelines would generally not apply to coarse gravel/stone fill. Instead, a method specification would apply (e.g., compact in thin lifts with a vibratory compactor until no further consolidation is evident).

### **Testing Procedures**

Representative samples of proposed fill shall be submitted to CGC, Inc. for optimum moisture-maximum density determination (ASTM D1557) prior to the start of fill placement. The sample size should be approximately 50 lb.

CGC, Inc. shall be retained to perform field density tests to determine the level of compaction being achieved in the fill. The tests shall generally be conducted on each lift at the beginning of fill placement and at a frequency mutually agreed upon by the project team for the remainder of the project.

**Table 1**  
**Gradation of Special Fill Materials**

Material	WisDOT Section 311	WisDOT Section 312	WisDOT Section 305			WisDOT Section 209		WisDOT Section 210
	Breaker Run	Select Crushed Material	3-in. Dense Graded Base	1 1/4-in. Dense Graded Base	3/4-in. Dense Graded Base	Grade 1 Granular Backfill	Grade 2 Granular Backfill	Structure Backfill
Sieve Size	Percent Passing by Weight							
6 in.	100							
5 in.		90-100						
3 in.			90-100					100
1 1/2 in.		20-50	60-85					
1 1/4 in.				95-100				
1 in.					100			
3/4 in.			40-65	70-93	95-100			
3/8 in.				42-80	50-90			
No. 4			15-40	25-63	35-70	100 (2)	100 (2)	25-100
No. 10		0-10	10-30	16-48	15-55			
No. 40			5-20	8-28	10-35	75 (2)		
No. 100						15 (2)	30 (2)	
No. 200			2-12	2-12	5-15	8 (2)	15 (2)	15 (2)

**Notes:**

1. Reference: Wisconsin Department of Transportation *Standard Specifications for Highway and Structure Construction*.
2. Percentage applies to the material passing the No. 4 sieve, not the entire sample.
3. Per WisDOT specifications, both breaker run and select crushed material can include concrete that is 'substantially free of steel, building materials and other deleterious material'.

**Table 2**  
**Compaction Guidelines**

Area	Percent Compaction (1)	
	Clay/Silt	Sand/Gravel
<b>Within 10 ft of building lines</b>		
Footing bearing soils	93 - 95	95
Under floors, steps and walks		
- Lightly loaded floor slab	90	90
- Heavily loaded floor slab and thicker fill zones	92	95
<b>Beyond 10 ft of building lines</b>		
Under walks and pavements		
- Less than 2 ft below subgrade	92	95
- Greater than 2 ft below subgrade	90	90
Landscaping	85	90

**Notes:**

1. Based on Modified Proctor Dry Density (ASTM D 1557)

**APPENDIX C**  
**DOCUMENT QUALIFICATIONS**

## APPENDIX C DOCUMENT QUALIFICATIONS

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### I. GENERAL RECOMMENDATIONS/LIMITATIONS

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CGC, Inc. should be provided the opportunity for a general review of the final design and specifications to confirm that earthwork and foundation requirements have been properly interpreted in the design and specifications. CGC should be retained to provide soil engineering services during excavation and subgrade preparation. This will allow us to observe that construction proceeds in compliance with the design concepts, specifications and recommendations, and also will allow design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction. CGC does not assume responsibility for compliance with the recommendations in this report unless we are retained to provide construction testing and observation services.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and no other warranties are expressed or implied. The opinions and recommendations submitted in this report are based on interpretation of the subsurface information revealed by the test borings indicated on the location plan. The report does not reflect potential variations in subsurface conditions between or beyond these borings. Therefore, variations in soil conditions can be expected between the boring locations and fluctuations of groundwater levels may occur with time. The nature and extent of the variations may not become evident until construction.

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### II. IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

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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 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 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. *CGC cannot accept responsibility or liability for problems that occur because our reports do not consider developments of which we were not informed.*

#### SUBSURFACE CONDITIONS CAN CHANGE

A geotechnical engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *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 OPINION

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 judgement 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 over-rely on the confirmation-dependent recommendations included in your report. *Those confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgement and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *CGC cannot assume responsibility or liability for the report's confirmation-dependent recommendations if we do not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

#### **A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION**

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront 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. Constructors can also misinterpret a geotechnical engineering report. Confront that risk by having CGC participate in prebid and preconstruction conferences, and by providing geotechnical 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 CONSTRUCTORS A COMPLETE REPORT AND GUIDANCE**

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors 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 constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors 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 constructors 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 engineer's 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.

#### **ENVIRONMENTAL CONCERNS ARE NOT COVERED**

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any environmental 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 environmental 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, many 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 GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE**

Membership in the Geotechnical Business Council (GBC) of Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with CGC, a member of GBC, for more information.

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