



Department of Public Works  
**Engineering Division**  
Robert F. Phillips, P.E., City Engineer

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**Principal Engineer 2**

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**Principal Engineer 1**

Christina M. Bachmann, P.E.  
Mark D. Moder, P.E.  
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**Facilities & Sustainability**

Jeanne E. Hoffman, Manager  
Bryan Cooper, Principal Architect

**Mapping Section Manager**

Eric T. Pederson, P.S.

**Financial Manager**

Steven B. Danner-Rivers

**NOTICE OF ADDENDUM  
ADDENDUM 1  
CONTRACT NO. 8177  
WALTER STREET RESTROOM BUILDING REPLACEMENT**

Revise and amend the contract document(s) for the above project as stated in this addendum, otherwise, the original document shall remain in effect.

**CHANGES TO SECTION D: SPECIAL PROVISIONS**

1. **Add** Soil Boring Report from CGC, Inc. dated April 21, 2017
2. At **SECTION 104 SCOPE OF WORK**  
Add the following:

Olbrich Park is a former shallow fill site that is capped with 6 to 12 inches of granular soil. The City has received permission from the Wisconsin Department of Natural Resources (WDNR) to proceed with this project. If the Contractor encounters waste during excavation, the Contractor shall notify the Engineer, segregate waste and disposed of as solid waste at the WM Madison Prairie Landfill in Sun Prairie at no additional cost to the City. **Tipping fees will be paid for by the City of Madison.**

3. **ADD**  
**SECTION 205 EXCAVATION, LOADING AND HAULING OF SOLID WASTE MATERIALS**

This special provision describes excavating, loading, and hauling of any trash, solid waste, or contaminated soil encountered during the project to the Waste Management Madison Prairie Landfill. The City shall be responsible for all waste profiling and provide signed manifests to the Contractor to take with each load to the landfill. **Tipping fees shall be paid for by the City of Madison.**

Waste Management Madison Prairie Landfill  
3490 Nelson Road  
Sun Prairie, WI 53590  
(t) 608.837.9031

Work shall be performed in accordance to standard spec 205 and with pertinent parts of Chapters NR 700-754 of the Wisconsin Administrative Code, as supplemented herein. Per NR 718.07, a solid waste collection and transportation service-operating license is required under NR 502.06 for each vehicle used to transport contaminated soil.

## **A.2. Notice to the Contractor – Contaminated Soil Locations**

It is anticipated that fragments of glass, brick, and cinders may be encountered from depths ranging from 1 to 4 feet below ground surface. It is likely that such historical waste will only be encountered during the excavation of trenches for site utilities. Refer to the April 21, 2017 CGC boring log reports for more detail (attached). Based on the age of waste and boring logs, there are no special health or safety measures that must be implemented when excavating such material.

If contaminated soils—based on unusual odor, presence of cinders, staining, presence of trash, etc.—are encountered, immediately notify the Project Engineer. For more information regarding environmental contamination within the project limits, contact:

Brynn Bemis  
City of Madison Engineering  
210 Martin Luther King, Jr. Blvd., Rm 115  
Madison, WI 53703  
608.267.1986  
[bbemis@cityofmadison.com](mailto:bbemis@cityofmadison.com)

## **A.3. Coordination**

Do not transport materials offsite to a landfill for disposal without prior approval from the Project Engineer. Coordinate work under this contract with the City of Madison Environmental Consultant:

Brynn Bemis  
City of Madison Engineering  
210 Martin Luther King, Jr. Blvd., Rm 115  
Madison, WI 53703  
608.267.1986  
[bbemis@cityofmadison.com](mailto:bbemis@cityofmadison.com)

The role of the Environmental Consultant will be limited to:

1. Providing hauling manifests for Madison Prairie Landfill.
2. Assisting with determining the location and limits of petroleum-contaminated soil to be excavated based on soil analytical results, visual observations, and/or field screening instruments.
3. Coordinating response measures for unknown contamination encountered.
4. Documenting that activities associated with management of contaminated soil are in conformance with the contaminated soil management methods for this project as specified herein.

Provide at least a 14-calendar day notice of the preconstruction conference date to the environmental consultant. At the preconstruction conference, provide a schedule for all excavation activities in the areas of contamination to the environmental consultant. Also notify both the Environmental Consultant and Project Engineer at least three (3) calendar days prior to commencement of excavation activities in each of the contaminated areas.

## **A.4. Health and Safety Requirements**

*Supplement standard spec 107.1 with the following:*

During excavation activities, expect to encounter soil contaminated with cinders and/or petroleum contamination. Site workers taking part in activities that will result in the reasonable probability of exposure to safety and health hazards associated with hazardous materials shall have completed health and safety training that meets the Occupational Safety and Health Administration (OSHA) requirements for Hazardous Waste Operations and Emergency Response (HAZWOPER), as provided in 29 CFR 1910.120.

Prepare a site-specific Health and Safety Plan, and develop, delineate and enforce the health and safety exclusion zones for each contaminated site location as required by 29 CFR 1910.120. Submit the site-specific health and safety plan and written documentation of up-to-date OSHA training to the engineer prior to the start of work.

## **B. Construction**

*Subsection 205.3 of the standard specification is supplemented with the following:*

The Environmental Consultant will periodically evaluate soil excavated from the contaminated area to determine if the soil will require offsite disposal. The environmental consultant will evaluate excavated soil based on field screening results, visual observations, and soil analytical results from previous environmental investigations. Assist the environmental consultant in collecting soil samples for evaluation using excavation equipment.

While excavating, only excavate contaminated soils as required by the construction plan set. Do not over-excavate contaminated soils, unless directed by the Environmental Consultant or Engineer. Non-petroleum-contaminated soil, such as soils containing brick fragments or cinders, that is geotechnically suitable shall be reused as backfill.

Directly load and haul soils designated in the construction plan set or by the Environmental Consultant for offsite landfill. Excavated contaminated soils may be temporarily stockpiled on site. Per WDNR requirements, petroleum-contaminated soils must be placed on base material impervious to the contaminant and to water, such as concrete, asphalt, or plastic sheeting. Cover petroleum piles with plastic sheeting to prevent infiltration of precipitation and to inhibit volatilization of soil contaminants. Soil containing cinders and/or other solid waste material does not need to be covered during stockpiling.

Use loading and hauling practices that are appropriate to prevent any spills or releases of contaminated soils or residues. If spills or releases occur, immediately notify the Environmental Consultant and Engineer. Immediately recover all contaminated soil, residue, and any new contamination that was caused by the spill or release. Prior to transport, sufficiently dewater soils designated for off-site disposal so as not to contain free liquids.

Dispose of petroleum-contaminated soil at the approved facility's bioremediation facility.

### **4. At NON-STANDARD BID ITEMS**

Add the following:

#### **BID ITEM 90002 EXCAVATION, LOADING, AND HAULING OF SOLID WASTE**

**DESCRIPTION:** removal of trash, solid waste or contaminated soil encountered during excavation as described in Section 205.

**METHOD OF MEASUREMENT:** Excavation, loading and hauling of waste-contaminated soil will be measured in tons of contaminated soil accepted by the approved landfill as documented by weight tickets generated by the landfill.

**BASIS OF PAYMENT:** Payment is full compensation for contaminated soil excavation, segregation, loading, and hauling of solid waste-contaminated soil; assistance with soil sampling; dewatering soil prior to transport; temporary stockpiling; replacement fill material; weighing of

July 27, 2018

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trucks; obtaining weight tickets from scale attendant; providing original copies of weight tickets to the engineer and the Environmental Consultant; arranging to have certificate of soil treatment submitted to the Engineer and the Environmental Consultant; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

5. Proposal Page – line item 90002 has been added to the revised Proposal Page dated 7/27/18

#### **CHANGES TO SPECIFICATIONS (DIVISIONS 2 – 33)**

6. **Section 07 53 23 ETHYLENE PROPYLENE DIENE MONOMER (EPDM) ROOFING**  
At 2.1 A 1) **ADD** d. Mule-Hide as an acceptable manufacturer
7. **Section 10 28 00 TOILET, BATH, AND LAUNDRY ACCESSORIES**  
At 2.2 F Warm Air Dryer **ADD** Saniflow Optima M99A-UL as an acceptable product

#### **CHANGES TO DRAWINGS**

8. **Sheets L100, L200, L201 and L300**  
Revise note regarding existing basketball court to read: “Basketball court to be removed by Owner prior to start of construction”
9. **Sheet C100**  
Revise note 3 (diamond) to read “Disconnect existing electric service at existing toilet building, coordinate with Park’s Maintenance staff. Disconnect and remove underground feeders as shown, coordinate with Park’s Maintenance staff. Coordinate electric service relocation with MG&E.

#### **END OF ADDENDUM**

Please acknowledge this addendum on page E1 of the contract documents and/or in Section E: Bidder’s Acknowledgement on Bid Express.

Electronic version of these documents can be found on the Bid Express web site at:

<http://www.bidexpress.com>

If you are unable to download plan revisions associated with the addendum, please contact the Engineering office at 608-266-4751 to receive the material by another route.

Sincerely,



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Robert F. Phillips, P.E., City Engineer

Cc: Greg Fries



Construction • Geotechnical  
Consulting Engineering/Testing

April 21, 2017  
C17051-10

Ms. Kathleen Kane  
City of Madison Parks Division  
City-County Building, Room 104  
210 Martin Luther King Jr. Boulevard  
Madison, WI 537013

Re: Geotechnical Exploration Report  
Proposed Restroom Building  
Olbrich Park  
Madison, Wisconsin

Dear Ms. Kane:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the geotechnical exploration program for the project referenced above. The purpose of this exploration program was to evaluate the subsurface conditions within the proposed construction area and to provide geotechnical recommendations regarding site preparation, foundation, floor slab and pavement design/construction. An electronic copy of this report is provided for your use, and a paper copy can be sent to you upon request.

### PROJECT DESCRIPTION/SITE CONDITIONS

We understand that this project will include the construction of an enclosed restroom facility in the general location of the soil borings (refer to map presented in Appendix B). It will replace a toilet shelter. Some adjacent asphalt pavement may also be replaced. Little (if any) grade change is anticipated for building construction, with building loads expected to be light (i.e., 100 kip column loads or less.)

The existing site is basically a flat landscaped area covered by grass. Ground surface elevations at the boring locations were not determined for this study.

### SUBSURFACE CONDITIONS

Subsurface conditions on site were explored by drilling three Standard Penetration Test (SPT) soil borings to planned depths of 15 ft below existing site grades. The boring locations were selected by the City of Madison and staked in the field by CGC personnel. The soil borings were conducted by Soil Essentials (under subcontract to CGC) on April 14, 2107 using a track-mounted Geoprobe 7822DT ATV drill rig equipped with hollow-stem augers and an automatic SPT hammer. The boring locations are shown in plan on the Soil Boring Location Exhibit attached in Appendix B.



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April 21, 2017  
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The subsurface profiles at the boring locations were fairly similar and a generalized profile can be described by the following strata, in descending order:

- 4 in. of *topsoil fill* or *2.5 in. asphalt pavement/5 in. base course* at B-3, over
- About 2.5 to 4 ft of *fill* consisting of mainly sand/clay/silt intermixed with brick/concrete/slag/cinders in some areas; then
- 1 to 3.5 ft of soft to stiff *lean clay*; followed by
- Loose to medium dense *sand strata* with varying silt and gravel contents, to the termination depths.

Groundwater was encountered in each boring at 7.3 to 8.5 ft below existing grade during or shortly after drilling. Groundwater levels are expected to fluctuate with seasonal variations in precipitation, infiltration, nearby lake levels, evapotranspiration and other factors. A more detailed description of the site soil and groundwater conditions is presented on the Soil Boring Logs attached in Appendix B.

## DISCUSSION AND RECOMMENDATIONS

### 1. Site Preparation

As a general rule, the topsoil should be stripped to at least 10 ft beyond the proposed construction areas. This is dependent on proposed grades and cutting/filling depths (if any). The topsoil is expected to be up to 4 in. thick, but deeper layers of topsoil fill should be expected from previous grading activities. Topsoil can be stockpiled on-site and re-used as fill in landscaped areas. Asphalt pavement removal can also occur at this time if required.

After topsoil fill removal, the exposed subgrades are expected to consist of sand/clay fill (or base course near B-3). The exposed soils, where filling is required (or where the subgrade is at finished grade), should be recompact with a smooth-drum compactor and then proof-rolled with a loaded tri-axle dump truck to check for soft/yielding areas. If soft/yielding areas are detected, they should be undercut/removed. Note that cinder and slag material may require disposal at a licensed facility. Grade should be re-established using granular backfill compacted to at least 95% compaction based on modified Proctor methods (ASTM D1557). As an alternative, 3-in. dense graded base (DGB) or select crushed material that is compacted in thin lifts (less than about 12 in.) until deflection ceases can be used to restore grade.

After the existing soils have been checked and undercut/replaced, as needed, fill placement (if necessary) to establish planned grades can begin. We recommend using granular soils as fill within building areas as sand/gravel are generally easier to place and compact in a wider range of weather conditions. We generally do not recommend using silt/clay soils as fill within building or the upper part of pavement areas, as moisture conditioning is typically required to achieve required compaction levels, which can result in construction delays. In our opinion, silt/clay soils are best used as fill in

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landscaped areas or potentially in the bottom of deeper fills in pavement areas provided the cohesive soils are adequately dried to facilitate compaction. The new fill within the building footprint should be compacted to a minimum of 95% compaction based on modified Proctor methods (ASTM D 1557). Periodic field density tests should be taken by CGC staff within the fill/backfill to document the adequacy of compactive effort.

We recommend that fill soils be undercut below foundations. There is a small risk of floor slab settlement/cracking occurring if the existing undocumented fill is left in-place below floor slabs after passing proof-rolling to confirm firmness, and the risk is the owner's responsibility. If the owner does not want to accept the risk of floor slab settlement/cracking potentially occurring, the fill should also be undercut below slab areas. Where existing fill is removed (and disposed of at a licensed facility when necessary), the area(s) can be backfilled with engineered granular soils as described in the previous paragraph.

## 2. Foundation Recommendations

In our opinion, the proposed structure can be supported on reinforced concrete spread footing foundations bearing on newly-placed granular fill, native clays or natural sand soils. *As discussed previously, an important component of the foundation design assumptions includes undocumented fill removal below the foundations in order to limit post-construction settlement to typically tolerable levels.* The following parameters should be used for foundation design:

- Maximum net allowable soil bearing pressure: 2500 psf
- Minimum foundation widths:
  - Continuous wall footings: 18 in.
  - Column pad footings: 30 in.

Perimeter footings should be founded at least 4 ft below exterior site grades for frost protection. Footings within interior heated areas do not need to be lowered for frost protection.

For an allowable bearing pressure of 2,500 psf, we have assumed that foundations will bear on "new" granular fill, native stiff clays or natural granular soils and undercutting below footing grade will be required if undocumented fill, loose sands or clays are encountered at or slightly below footing grade. Where undercutting is required, the base of the undercut excavation should be widened beyond the footing edges at least 0.5 ft in each direction for each foot of undercut depth for stress distribution purposes. Footing grade should be restored using granular backfill compacted to at least 95% (ASTM D1557).

We recommend using a smooth-edged backhoe bucket for footing excavations. Further, footing subgrade soils should be rigorously recompact with a large sampling jack compactor or hoe-pak (backhoe mounted compactor) to densify soils loosened/disturbed during excavation. Provided the

foundation design/construction recommendations discussed above are followed, we estimate that total and differential settlements should not exceed 1.0 and 0.5 in., respectively.

### 3. Floor Slabs

The floor slab for the proposed structure can be supported on the existing fill after passing the proof-roll test. As mentioned above, there is a small risk of floor slab settlement/cracking occurring if slabs are supported on the existing undocumented fill, and the risk is the owner's responsibility. If the owner does not want to accept this risk, the undocumented fill should be undercut below the floor slab areas. Prior to slab construction, the subgrades should be recompacted to densify soils that may become disturbed or loosened during construction activities. The design subgrade modulus is based on a recompacted subgrade such that non-yielding conditions are developed.

To serve as a capillary break, the final 4 to 6-in. of soil placed below the slabs should consist of well-graded sand or gravel with no more than 5 percent by weight passing a No. 200 U.S. standard sieve. Importing sand/gravel for this purpose will be required. Note that some structural engineers require approximately 6-in. thick layer of dense graded base (i.e., base course) directly below the floor slab (in lieu of the drainage layer) to increase the subgrade modulus. If 6 in. or more of dense graded base is included immediately below the floor slab, the subgrade modulus can be increased to 150 pci. To further minimize the potential for moisture migration, a plastic vapor barrier should also be utilized. Fill and drainage course material placed below the slabs should be placed, as described in the Site Preparation section of this report. The slabs should be structurally separate from the foundation and have construction joints and reinforcement for crack control.

### 4. Site Class for Seismic Design

In our opinion, the average soil/rock properties in the upper 100 ft of the site (based on SPT blow counts (N values) exceeding 15 blows/ft on average) can be characterized as a stiff soil profile. This characterization would place the site in Site Class D for seismic design according to the International Building Code (see Table 1613.5.2).

### 5. Pavement Design

We anticipate that the subgrade soils within replacement parking and drive areas will likely consist of existing fill and possible newly-placed fill. Pavement subgrades should be proof-rolled/recompacted, as described in the Site Preparation section of this report, and stabilized as needed with coarse stone or replaced with compacted granular fill. *Since the pavement subgrade is expected to primarily be existing fill involving cohesive soils, we anticipate that some undercutting and stabilization may be required during subgrade preparation. We therefore recommend that the budget include a contingency for these operations.* We assume that the parking area pavement will experience fairly light traffic loads consisting primarily of cars and light trucks (Traffic Class I). The entrance drives may experience larger truck volumes (Traffic Class II). The clay soils will control



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the pavement thickness design. Accordingly, the pavement sections tabulated below were selected assuming a CBR of approximately 2 to 3 for a firm or stabilized clay subgrade and a design life of 20 years.

**Table 1 - Recommended Pavement Sections**

Material	Thicknesses (in.)		WDOT Specification <sup>1</sup>
	Parking Lots (Traffic Class I)	Main Driveways and Truck Traffic Areas (Traffic Class II)	
Bituminous Upper Layer <sup>2,3</sup>	1.5	1.75	Section 460, Table 460-1, 9.5 mm, 12.5 mm
Bituminous Lower Layer <sup>2,3</sup>	1.75	2.25	Section 460, Table 460-1, 12.5 mm, 19 mm
Dense Graded Base Course <sup>2,4</sup>	8.0	10.0	Sections 301 and 305, 3 in. and 1¼ in.
<b>Total Thickness</b>	11.25	14.0	

Notes:

1. Wisconsin DOT *Standard Specifications for Highway and Structure Construction*, latest edition, including supplemental specifications, and Wisconsin Asphalt Pavement Association *2016 Asphalt Pavement Design Guide*.
2. Compaction requirements:
  - Bituminous concrete: Refer to Section 460-3.
  - Base course: Refer to Section 301.3.4.2, Standard Compaction
3. Mixture Type LT (or E-0.3) bituminous; note that a heavy duty (H) mix may be required in truck traffic areas where high, slow moving wheel loads exist; refer to Section 460, Table 460-2 of the *Standard Specifications*.
4. The upper 4 in. should consist of 1¼-in. DGB; the bottom part of the layer can consist of 3-in. DGB.

Note that if traffic volumes differ from those assumed, CGC should be allowed to review the recommended pavement sections and adjust them accordingly. The pavement design assumes a stable/non-yielding subgrade and a regular program of preventative maintenance. Alternative



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pavement designs may prove applicable and should be reviewed by CGC. If there is a delay between subgrade preparation and placing the base course, the subgrade should be recompacted.

### **CONSTRUCTION CONSIDERATIONS**

Due to variations in weather, construction methods and other factors, specific construction problems are difficult to predict. Soil related difficulties which could be encountered on the site are discussed below:

- Due to the potentially sensitive nature of the on-site soils, we recommend that final site grading activities be completed during dry weather, if possible. Construction traffic should be avoided on prepared subgrades to minimize potential disturbance.
- Contingencies in the project budget for subgrade stabilization with coarse stone in parking and floor slab areas should be increased if the project schedule requires that work proceed during adverse weather conditions.
- Earthwork construction during the early spring or late fall could be complicated as a result of wet weather and freezing temperatures. During cold weather, exposed subgrades should be protected from freezing before and after footing construction. Fill should never be placed while frozen or on frozen ground.
- Excavations extending greater than 4 ft in depth below the existing ground surface should be sloped or braced in accordance with current OSHA standards.
- Based on observations made during the field exploration, groundwater infiltration into excavations is generally not expected to be a problem. Water accumulating at the base of excavations as a result of precipitation or seepage should be controlled and quickly removed using pumps operating from filtered sump pits.

### **RECOMMENDED CONSTRUCTION MONITORING**

The quality of the foundation, floor slab and pavement subgrades will be largely determined by the level of care exercised during site development. To check that earthwork and foundation construction proceeds in accordance with our recommendations, the following operations should be monitored by CGC:

- Topsoil stripping/subgrade proof-rolling within the construction areas;
- Fill/backfill placement and compaction;
- Foundation excavation/subgrade preparation; and
- Concrete placement.



Ms. Kathleen Kane  
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\* \* \* \* \*

It has been a pleasure to serve you on this project. If you have any questions or need additional consultation, please contact us.

Sincerely,

**CGC, Inc.**

Michael N. Schultz, P.E  
President

- Encl: Appendix A - Field Exploration
- Appendix B - Soil Boring Location Exhibit
  - Logs of Test Borings (3)
  - Log of Test Boring-General Notes
  - Unified Soil Classification System
- Appendix C - Document Qualifications
- Appendix D - Recommended Compacted Fill Specifications

**APPENDIX A**

**FIELD EXPLORATION**

## APPENDIX A

### FIELD EXPLORATION

Three Standard Penetration Test (SPT) soil borings were drilled to planned depths of 15 ft below existing site grades at locations selected by the City. The boring locations were staked in the field by CGC personnel. The soil borings were conducted by Soil Essentials (under subcontract to CGC) on April 14, 2017 using a track-mounted Geoprobe 7822DT ATV drill rig equipped with hollow-stem augers and an automatic SPT hammer. The boring locations are shown in plan on the Soil Boring Location Exhibit attached in Appendix B.

In each boring, soil samples were obtained at 2.5 foot intervals to a depth of 10 ft and at 5 ft intervals thereafter. The soil samples were obtained in general accordance with specifications for standard penetration testing, ASTM D 1586. The specific procedures used for drilling and sampling are described below.

1. Boring Procedures between Samples

The boring is extended downward, between samples, by a hollow-stem auger.

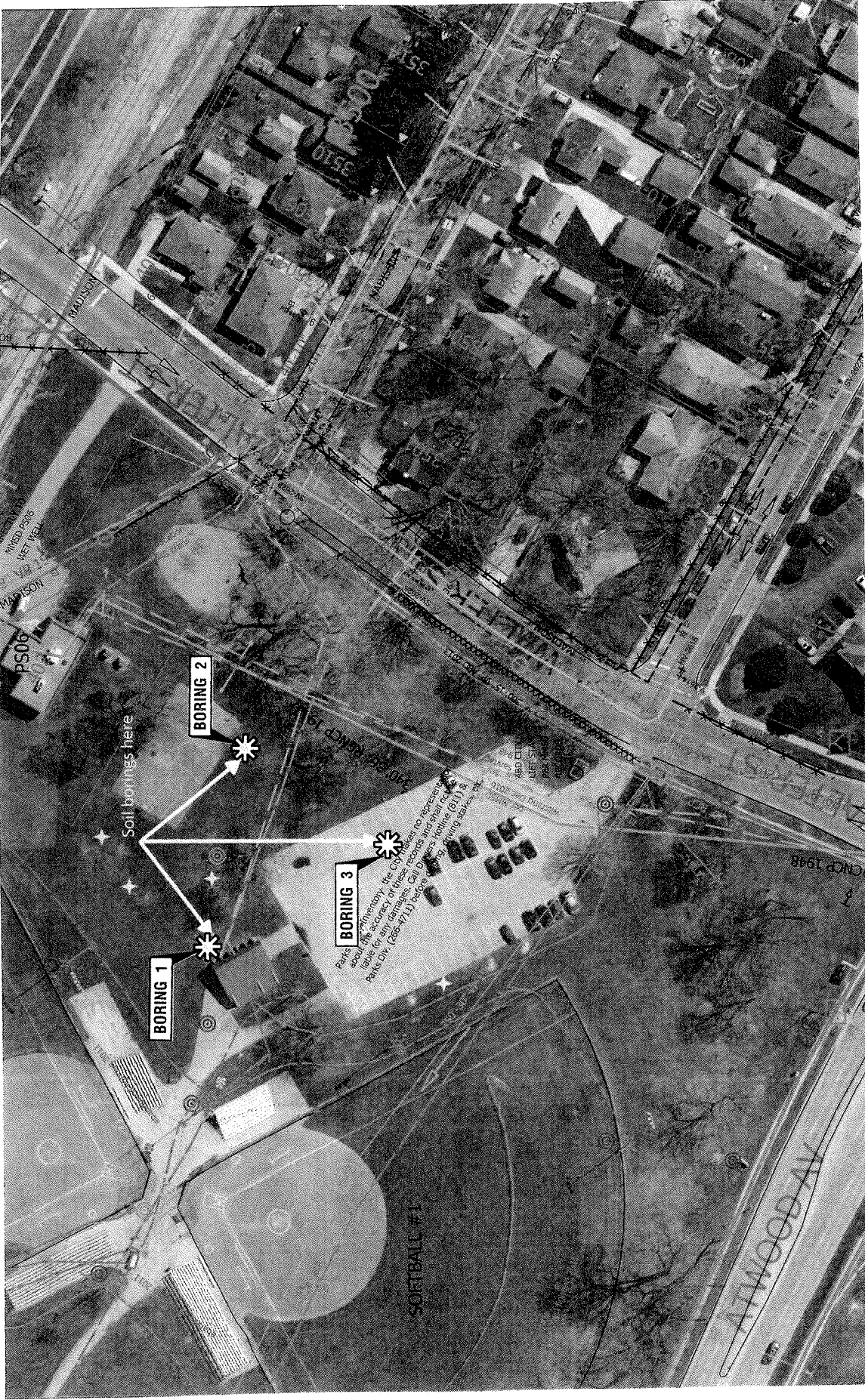
2. Standard Penetration Test and Split-Barrel Sampling of Soils  
(ASTM Designation: D 1586)

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.


During the field exploration, the driller visually classified the soil and prepared a field log. *Field screening of the soil samples for possible environmental contaminants was not conducted by the drillers as these services were not part of CGC's work scope.* Water level observations were made in each boring during and after drilling and are shown at the bottom of each boring log. Upon completion of drilling, the borings were backfilled with bentonite (where required) to satisfy WDNR regulations and the soil samples were delivered to our laboratory for visual classification and laboratory testing. The soils were visually classified by a geotechnical engineer using the Unified Soil Classification System. The final logs prepared by the engineer and a description of the Unified Soil Classification System are presented in Appendix B.

**APPENDIX B**

**SOIL BORING LOCATION EXHIBIT  
LOGS OF TEST BORINGS (3)  
LOG OF TEST BORING – GENERAL NOTES  
UNIFIED SOIL CLASSIFICATION SYSTEM**



**Legend**

 Denotes Boring Location and Number

**Notes**

1. Borings were drilled on April 14, 2017 by Soil Essentials (under subcontract by CGC).
2. Base map provided by the City of Madison
3. Boring locations are approximate.



Scale: Reduced

**Date:**  
4/2017

**Job No.**  
C17051-10

**SOIL BORING LOCATION MAP**  
Proposed Restroom Building  
Olbrich Park  
Madison, Wisconsin

**CGC, Inc.**



# LOG OF TEST PIT

Project Olbrich Park Restroom Facility  
Atwood Avenue  
 Location City of Madison, Dane County, Wisconsin

Pit No. 1  
 Surface Elevation \_\_\_\_\_  
 Job No. C17051-10  
 Sheet 1 of 1

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	DEPTH (ft)	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL
					0	4 in. ± TOPSOIL FILL (OL)				
1		15	M	11	1	FILL: Brown Silty Clay (Based on Driller's Description)				
					2	FILL: Medium Dense, Dark Brown to Black Silty Sand, Little to Some Gravel, Numerous Cinder/Slag Fragments				
2		17	M	7	3	Stiff, Brown Lean CLAY, Some Silt, Little Sand, Trace Gravel (CL)	(1.5-1.75)			
					4	Loose, Brown Silty SAND, Trace to Little Clay, Trace Gravel (SM/SM-SC)				
3		15	M/W	6	5	Loose, Brown Fine to Medium SAND, Trace to Little Silt, Trace Gravel, Scattered Silty Sand Seams (SP/SP-SM)				
					6					
4		16	W	7	7					
					8					
					9					
					10					
					11					
					12					
					13					
					14					
5		18	W	6	15					
					16					
					17					
					18					
					19					
					20					

End of Boring at 15 ft  
 Borehole Backfilled with Bentonite Chips

WATER LEVEL OBSERVATIONS					GENERAL NOTES				
While Excavating	∇	Upon Completion of Drilling	_____		Start	4/14/17	End	4/14/17	
Time After Excavating	_____		_____	30 Min.	Driller	SE	Chief	_____	Geoprobe
Depth to Water	_____		_____	8.5'	Logger	_____	Editor	TFG	7822DT
Depth to Cave in	_____		_____	_____	Equip. Used:	2-1/4" HSA; Autohammer			
The stratification lines represent the approximate boundary between soil types and the transition may be gradual.									





# LOG OF TEST PIT

Project Olbrich Park Restroom Facility  
Atwood Avenue  
 Location City of Madison, Dane County, Wisconsin

Pit No. 2  
 Surface Elevation \_\_\_\_\_  
 Job No. C17051-10  
 Sheet 1 of 1

2921 PERRY STREET, MADISON, WIS. 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE E	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL
1		15	M	2/18"	4 in. ± TOPSOIL FILL (OL) FILL: Brown Clayey Silt (Based on Driller's Description)					
2		16	M	5	FILL: Very Loose, Brown/Grayish Brown Clayey Sand and Silty Clay, Little to Some Gravel, Scattered Cinder/Slag/Glass Fragments Stiff, Gray Lean CLAY, Some Silt, Trace Sand (CL)	(1.5-1.75)				
3		16	M/W	7	Loose, Brown Fine to Medium SAND, Little to Some Silt, Trace Gravel (SP-SM/SM)					
4		14	W	9	Silt Content Slightly Decreasing with Depth					
5		14	W	7	End of Boring at 15 ft  Borehole Backfilled with Bentonite Chips					

WATER LEVEL OBSERVATIONS	GENERAL NOTES
While Excavating $\nabla$ _____ Time After Excavating _____ Depth to Water _____ Depth to Cave in _____	Upon Completion of Drilling _____ <u>30 Min.</u> <u>7.3'</u> $\nabla$
Start <u>4/14/17</u> End <u>4/14/17</u> Driller <u>SE</u> Chief _____ Logger _____ Editor <u>TFG</u> Equip. Used: <u>2-1/4" HSA; Autohammer</u>	
The stratification lines represent the approximate boundary between soil types and the transition may be gradual.	

Geoprobe  
7822DT



### LOG OF TEST BORING

Project Olbrich Park Restroom Facility  
Atwood Avenue  
 Location City of Madison, Dane County, Wisconsin

Boring No. 3  
 Surface Elevation (ft) \_\_\_\_\_  
 Job No. C17051-10  
 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
					2.5 in. ± ASPHALT PAVEMENT over 5 in. ± BASE COURSE					
1	8	M	2		FILL: Very Loose, Grayish Brown to Black, Fine to Coarse Sand, Some Gravel, Trace to Little Silt, Numerous Brown Clayey Sand Seams and Cinder/Slag Fragments					
2	15	M	2/18"		FILL: Brick/Slag/Concrete Debris (Based on Driller's Description)					
				5	Soft, Grayish Brown Lean CLAY, Some Silt, Trace Sand (CL)	(0.25-0.5)				
3	12	M/W	9		Loose, Brown Fine to Medium SAND, Little to Some Silt, Trace Gravel (SP-SM/SM), Laminated with Dark Brown Fine to Coarse SAND, Some Silt and Gravel, Trace Clay (SM)					
4	17	M/W	10		Loose to Medium Dense, Brown/Reddish Brown Fine to Medium SAND, Some Silt, Trace Gravel, Scattered Silt Seams (SM)					
				10						
					Loose to Medium Dense, Brown Fine to Medium SAND, Little to Some Silt, Trace Gravel (SP-SM/SM)					
5	16	W	10							
				15	End of Boring at 15 ft					
					Borehole Backfilled with Bentonite Chips/Asphalt Patched					
				20						

#### WATER LEVEL OBSERVATIONS

While Drilling ∇ 8.3' Upon Completion of Drilling 8.3'  
 Time After Drilling \_\_\_\_\_  
 Depth to Water \_\_\_\_\_  
 Depth to Cave in \_\_\_\_\_

#### GENERAL NOTES

Start 4/14/17 End 4/14/17  
 Driller SE Chief \_\_\_\_\_ Rig Geoprobe  
 Logger \_\_\_\_\_ Editor TFG 7822DT  
 Drill Method 2-1/4" 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>a</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

### COARSE-GRAINED SOILS

(more than 50% of material is larger than No. 200 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

#### 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

### FINE-GRAINED SOILS

(50% or more of material is smaller than No. 200 sieve size.)



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



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



PT

Peat and other highly organic soils

**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

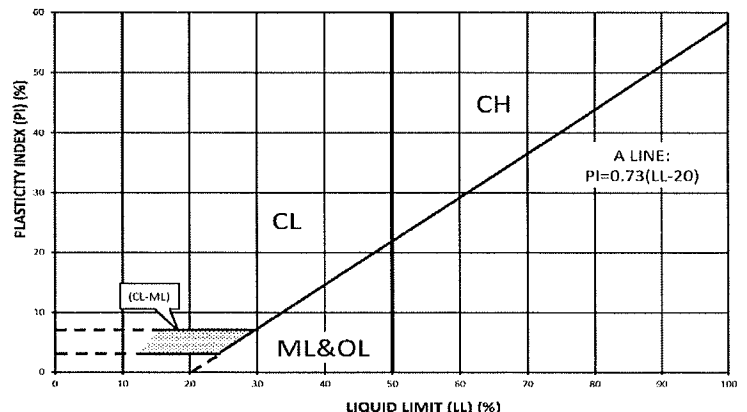
SM Atterberg limits below "A" line or P.I. less than 4  
 Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

SC Atterberg limits above "A" line with P.I. greater than 7

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:

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

### PLASTICITY CHART



**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.

---

## 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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Geotechnical Business Council  
of the Geoprofessional Business Association  
8811 Colesville Road, Suite G 106  
Silver Spring, MD 20910

**APPENDIX D**

**RECOMMENDED COMPACTED FILL SPECIFICATIONS**



## APPENDIX D

### 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:**

- Reference: Wisconsin Department of Transportation *Standard Specifications for Highway and Structure Construction*.
- Percentage applies to the material passing the No. 4 sieve, not the entire sample.
- 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:**

- Based on Modified Proctor Dry Density (ASTM D 1557)