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20900 Swenson Drive
Suite 150
Waukesha, WI 53186
T: 262.754.2560
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May 1, 2019
File No. 20.0156044.10

Mr. David P. Misky, CHMM
Redevelopment Authority of the City of Milwaukee
809 North Broadway, 2nd Floor
Milwaukee, Wisconsin 53201-3617

Re: Preliminary Geotechnical Investigation Results Report
Vacant Lot - Fifth Ward
200 East Greenfield Avenue
Milwaukee, Wisconsin

Dear Mr. Misky:

In accordance with our February 19, 2019 Proposal for Geotechnical and Fill Material Evaluation Services, GZA File No. 20.P000665.19, and as a follow-up to our discussion of results on March 22, 2109, GZA GeoEnvironmental, Inc. (GZA) is pleased to present this Preliminary Geotechnical Investigation Results Report to the Redevelopment Authority of the City of Milwaukee (RACM/"Client") regarding the subsurface conditions that exist at the vacant lot located east of the northeast corner of South 1st Street and East Greenfield Avenue at 200 East Greenfield Avenue in the City of Milwaukee, Wisconsin ("Site"). A Site Location Map is provided as Figure 1. This Preliminary Geotechnical Investigation Results Report presents GZA's understanding of the project and results of our preliminary subsurface exploration, laboratory testing, and limited design parameters. Please note that this report is subject to the Limitations provided in Attachment 1.

BACKGROUND

It is understood that RACM owns the Site, which was previously privately held. The Client has requested that GZA provide a preliminary geotechnical evaluation of the Site and environmental assessment of the upper fill soils recently placed at the Site. The environmental assessment has been provided by GZA under a separate cover. Although development plans have not yet been identified for the Site, it is assumed that the Site will be used for future commercial or residential development. GZA was tasked with undertaking a limited geotechnical drilling program and providing preliminary geotechnical parameters and recommendations for future development. This report is not intended for final design. Future development at the Site should include an updated and more thorough geotechnical investigation at the Site.

SITE DESCRIPTION

The vacant and largely grass-covered, approximately 2-acre Site is located approximately 350 feet east of the northeast corner of South 1st Street and East Greenfield Avenue. The Site is located in the southeast quarter of the southeast quarter of Section 32 Township 7 North, Range 22 East of the 4th Principle Meridian. The Site is approximately 425 feet north to south and 180 feet east to west. The Site is bounded on the north by a grocery store, on the south by East Greenfield Avenue, on the east by railroad tracks, and on the west by an asphalt parking lot and commercial/residential development. The Site slopes west and south with elevations ranging

from about 592 to 586 feet (NGVD 29) (per Milwaukee County GIS website). The Site has remained largely vacant since at least 1937, with some railroad tracks and parking/staging developments at various times.

SUBSURFACE EXPLORATION PROGRAM

GZA subcontracted with Badger State Drilling (BSD) of Stoughton, Wisconsin to advance 12 soil test borings in a general grid pattern as shown on the Boring Location Plan, provided as Figure 2. BSD used a truck-mounted CME-75 drill rig and a 2.25-inch inside-diameter, hollow-stem auger to drill the borings to depths of 5 to 30 feet below ground surface (bgs). Under the supervision of a GZA field engineer, standard penetration tests (SPTs) were taken continuously in the upper 5 feet and at a 2.5- to 5-foot intervals to the bottom of the borings. The GZA field engineer classified and logged the soil samples recovered from the SPTs and conducted additional field tests. In addition to the soil classification, the field engineer recorded the SPT N-value, groundwater conditions, and pocket penetrometer readings. The borings were abandoned using ⅜-inch bentonite chips and soil cuttings to the surface and covered with a thin layer of soil cuttings. Soil samples were placed in water-tight, glass jars and transported to our office for additional testing and examination. Some borings were left open for an extended period to take longer-term groundwater depth readings. Boring logs are provided in Attachment 2.

SUBSURFACE SOIL CONDITIONS

Surface conditions at the boring locations consisted of approximately 4 to 16 inches of clayey cap soils underlain with several feet of formerly-placed fill soils. Fill soils consisted of at least two layers of fill (identified as Fill 1 and Fill 2 on the boring logs) and extended to about 8.5 feet, below ground surface (bgs). The upper fill (Fill 1) consisted predominately of clayey sand and sandy lean clay (Unified Soil Classification System [USCS] Soil Classifications: SC and CL, respectably), however, variations in Fill 1 were noted with areas of silty clay and poorly-graded sand present (USCS Classifications: CL-ML and SP, respectively). The deeper fill soils (Fill 2) consisted largely of clayey sand, sandy lean clay and various amounts of gravel, silt and foundry sand. SPT blowcount N-values in the fill soils varied from 7 to 50+ blows per foot, indicating that fill materials were not placed in a uniform, compacted manner. A summary of the fill materials estimated thicknesses (rounded to the nearest ½ foot) is provided in the table below.

Boring No.	Est. Total Fill Thickness (feet)	Est. Fill 1 Thickness (feet)	Est. Fill 2 Thickness (feet)
B-1	> 5	4	> 1
B-2	12.5	3	9.5
B-3	> 5	3	> 2
B-4	> 5	3	> 2
B-5	> 5	2	> 3
B-6	12.5	2	10.5
B-7	12.5	3	9.5
B-8	> 5	3	> 2
B-9	12.5	2	10.5
B-10	> 6	3	> 3
B-11	> 6	2	> 4
B-12	12	4	8

Native soils were encountered in borings extending below depths of about 6 feet bgs (borings B-2, B-6, B-7, B-9, and B-12). Native soils consisted of varying sandy soils and fine-grained soils, common for lacustrine deposits in the area. Thicknesses and depths of these layers were not consistent between individual borings. Organic-rich peat soils were encountered at depths of 18.5 to 20 feet bgs and may extend to depths of up to 25 feet bgs or greater. Non-organic native

soils generally exhibited SPT N-values ranging from about 4 to 27 blows per foot indicating loose to medium-dense relative density for coarse-grained soils and pocket penetrometer readings varying from about 0.25 to 4.0+ tons per square foot (tsf), indicating medium-stiff to hard consistency of the fine-grained soils. Based on historical borings in the area, bedrock is anticipated to be greater than 100 feet bgs. Groundwater was encountered in several soil borings and ranged from about 12.1 to 13.75 feet bgs.

LABORATORY TESTING

Select soils samples from the geotechnical investigation were subject to laboratory testing, including natural moisture content, grain-size distribution (sieve analysis), plasticity characteristics (Atterberg testing), and loss on ignition testing. A summary of the laboratory test results is provided in Attachment 3. Moisture content varied from about 3.5% to 247.5% by weight, with organic-rich soils exhibiting higher moisture contents. Fines content (those materials passing the U.S. No. 200 Sieve) of selected soils samples varied from 3% to 19% for the coarse-grained samples. Plastic Indices (PIs) on select fine-grained soils ranged from 12 to 13, indicating low plasticity. A single loss on ignition test on a peat soil sample indicated a relative organic content of 62.1% by weight.

PRELIMINARY DESIGN PARAMETERS

Based on other developments in the area, it is assumed that the Site will be developed as a commercial and/or residential development. As plans and structural loads are developed, we recommend that additional geotechnical information be obtained. The design parameters and recommendations provided herein are preliminary in nature and should not be used for final design.

In general, the existing fill soils placed on the Site are of variable composition and relative density. The soil appears to have been placed without engineering control and may not provide uniform bearing capacity for future development. Additionally, deeper, organic-rich peat deposits may degrade and/or compress over time resulting in settlements in excess of tolerable limits. Because building loads and configurations are not known at this time, we have provided two preliminary options for support of proposed structures. Smaller, lightly-loaded structures may be founded on shallow spread footings while larger, moderately-loaded structures will likely require piles, drilled piers, or other deep foundation systems for support.

<u>Smaller Structures</u>

For preliminary design, smaller structures, limited to one story, may be founded on shallow-spread footings placed on overexcavated and recompacted native and/or suitable fill soils. The existing fill soils are of variable consistency/density and could experience differential settlements greater than 1 inch over a 20-foot span under light to moderate loads. It is recommended that the existing fill soils be excavated to expose native soils at a minimum of 4 feet below the bottom of footing elevations. The overexcavation should extend laterally a minimum of 24 inches beyond the edge of the footing in all directions. The excavation should thereafter be backfilled with compacted excavated soils, compacted import fill materials, or lean-mix concrete. Backfill soil or fill should be moisture conditioned and placed in uniform, horizontal lifts no greater than 12 inches thick and compacted to a minimum of 95% of the theoretical maximum density, as determined by a standard Proctor test (ASTM D698, *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort*). In lieu of compacted backfill, lean mix concrete with a minimum 28-day compressive strength of 1,500 pounds per square inch (psi) may be used.

Provided the bearing area is constructed in this way, a preliminary maximum allowable bearing capacity of 2,500 pounds per square foot (psf) may be utilized at this time for smaller structures. Footing widths should not exceed 8 feet in width if this option is exercised.

Larger Structures

For preliminary design, larger structures requiring larger bearing capacities should be founded on deep foundation elements (such as piles, drilled piers, etc.) extending below the organic-rich peat layer(s) present at the Site. Additional borings extending to depths of at least 50 feet bgs with at least one boring extending to a minimum of 75 feet bgs should be undertaken for design of the deep foundation system. Based on other projects in the area, 10¾-inch (nominal) diameter pipe piles driven to depths of about 85 feet have regularly developed allowable capacities in the range of 75 to 100 tons.

Ground floor slabs-on-grade should be placed on a suitable layer of aggregate base course. Slab subgrades should be surficially compacted and tested prior to placement of the aggregate base course. Floor slabs founded on a base course over clayey fill soils should be field evaluated but are anticipated to have a vertical modulus of subgrade reaction (k_v) of approximately 150 pounds per cubic inch (pci). For slabs founded on tested existing fill materials, a k_v value of 100 pci should be used.

Floor slabs should be isolated from walls and columns to allow for independent movement. Joints should be constructed at regular intervals, as recommended by the American Concrete Institute (ACI). The structural engineer should specify actual details of the floor slab, including thickness, reinforcing, and joint details.

The need for and placement of a vapor barrier should be determined by the environmental engineer, architect, or structural engineer, based on the proposed floor covering treatment, building function, concrete properties, placement techniques, and construction schedule. For further guidance concerning the use of vapor retarders, the designer should refer to ACI 302, *Construction of Concrete Floors,* and ACI 360, *Guide to Design of Slabs-on-Ground*.

Floor slabs should generally be underlain by a minimum 8-inch-thick, coarse aggregate base course. The coarse aggregate base course should consist of a well-graded material meeting the requirements for Wisconsin Department of Transportation (WisDOT) Standard Specifications for Highway and Structure Construction. An experienced geotechnical engineer or representative thereof should test and approve the subgrade prior to placement of the base course material.

For slabs, retaining walls and structures founded on shallow spread footings, lateral loads may be resisted by friction at the soil/foundation interface. We recommend that a value of 0.40 be used for design purposes for the coefficient of friction between the slab and underlying soils. An equivalent fluid pressure of 45 pounds per cubic foot (pcf) may be used at this time for drained, active soil conditions and 70 pcf for drained, at-rest conditions.

Based on the subsurface encountered in the borings, the seismic Site Class is considered to be "E," based on Table 1613.5.2 of the 2012 International Building Code (IBC). This classification is based on Standard Penetration Test "N" values, the unknown extent of organic-rich soils at the Site, estimated shear strengths and our experience at other project sites in the area. Additional geotechnical analysis at the Site, may result in an increased classification. The following seismic design parameters presented below are calculated using the United States Geological Survey (USGS) *Seismic Hazard Curves and Uniform Hazard Response Spectra* calculator using Site Class "E" parameters.

Parameter	Value (unit)
S_s = Short Period Mapped Spectral Acceleration	0. 087(g)
S_1=1-second Period Mapped Spectral Acceleration	0.047 (g)
Fa = Short Period Site Coefficient	2.5 (unitless)
Fv = 1-sec. Period Site Coefficient	3.5 (unitless)
$SM_s = S_s \times Fa$	0.217 (g)
$SM_1 = S_1 \times Fv$	0.163 (g)
$SD_s = 0.667 \times SM_s$	0.145 (g)
$SD_1 = 0.667 \times SM_1$	0.109 (g)

PRELIMINARY PAVEMENT RECOMMENDATIONS

We assume that paved areas are planned for the development. Based on the soil conditions in the borings and our understanding of the proposed grades, we assume that the subgrade in these areas will generally consist of existing clayey fill and/or imported fill material. Based on our experience within these materials, a CBR value of about 3 was used by GZA to determine the recommended pavement thickness. Similarly, a modulus of subgrade reaction value equal to 150 pci could be used for design of rigid concrete pavement sections founded on the native fine-grained soils while 100 pci should be used when founded on the upper fill soils (if present). Prior to placement of base course, subgrade soils should be evaluated by a representative of the geotechnical engineer.

Typical pavement thickness recommendations are provided in the following table for asphalt and concrete pavements. The recommended pavement sections are based on an assumed moderate volume of passenger vehicle traffic and low volume of traffic from delivery or garbage trucks and should be considered minimum design thicknesses. Thickness recommendations for Passenger Vehicle Parking sections are based on light passenger vehicle traffic (gross weight less than 4 tons) and only occasional truck traffic, such as fire trucks and snow removal trucks (2001 Wisconsin Asphalt Paving Association [WAPA] Traffic Class II). The Driveways sections are based on occasional garbage truck, buses and delivery truck traffic (WAPA Traffic Class III).

MINIMUM PAVEMENT SECTIONS

	Passenger Vehicle Parking	Driveways
Portland Cement Concrete (PCC)	5 inches	6 inches
Granular Base Course	6 inches	6 inches
Flexible Pavement Section:		
Asphalt Cement Concrete (ACC)	4 inches	5 inches
Granular Base Course	8 inches	10 inches

1. All materials should meet the current WisDOT Standard Specifications for Highway and Structure Construction.
2. In areas of anticipated heavy traffic, delivery trucks or concentrated loads (e.g. dumpster pads), a minimum concrete thickness of 7 inches is recommended, but should be evaluated further when loading conditions are known.
3. A minimum 6-inch granular base should be used below PCC pavements.
4. A minimum 1.5-inch surface course should be used on ACC pavements.

Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Final design sections should consider details such as traffic loadings, traffic volumes, the desired design life and any applicable local or County requirements. If you wish, we would be pleased to perform a detailed pavement section design using American Association of State Highway and Transportation Officials (AASHTO) or ACI procedures when this information is available. A planned maintenance program that includes surface sealing, joint cleaning and sealing, and timely repair of cracks and deteriorated areas will increase the pavement's service life. As an option, thicker sections could be constructed to decrease future maintenance. We recommend that the pavement subgrade be sloped to discharge water to the perimeter edges of the pavement or to a catch basin/drain pipe system.

CONSTRUCTION PHASE CONSIDERSATIONS

Dewatering at the Site will likely be limited to sumps and pumps to control surface water and precipitation events. If excavations extend below a depth of about 12 feet, larger dewatering systems will likely be needed for control of groundwater.

During construction, it is likely that the upper fine-grained soils will become unstable during changing moisture contents and while subjected to repeated wheel and track loads. Timber mud mats and/or aggregate tracking paths should be considered during development.

RECOMMENDATIONS FOR FUTURE WORK

As plans and structural loads are developed, a more thorough geotechnical investigation should be undertaken. The scope of the additional work should be determined by the design team based on structural and geotechnical conditions of the individual developments. GZA would be pleased to provide these services.

We appreciate the opportunity to submit this letter report and attachments. Please feel free to contact the undersigned with any questions.

Very truly yours,

GZA GeoEnvironmental, Inc.

Ian J. Mosbrucker, E.I.T.
Geotechnical Engineer

Jesse D. Graham, P.E.
Project Manager

Patrick J. Harrison, P.E.
Senior Consultant

James F. Drought, P.H.
Vice President Principal

J:\156000to156999\156044\10 Geotech\Report\FINAL 20.0156044.10 Prelim Geotech Investigation Results_200 E Greenfield 5-1-19.docx

Attachments: Figures
Limitations
Soil Boring Logs
Summary of Laboratory Data

FIGURES

Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

0 1,000 2,000 4,000

SCALE IN FEET

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NO.	ISSUE / DESCRIPTION	BY	DATE

VACANT LOT - FIFTH WARD
200 EAST GREENFIELD AVENUE
MILWAUKEE, WISCONSIN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
REDEVELOPMENT AUTHORITY OF THE CITY OF MILWAUKEE

SITE LOCATION

PROJ MGR: HAW	REVIEWED BY: JFD	CHECKED BY: HAW	FIG
DESIGNED BY: HAW	DRAWN BY: KLK	SCALE: 1 in = 2,000 ft	1
DATE: 04/01/2019	PROJECT NO: 20.0156044.00	REVISION NO:	SHEET NO:

© 2019 - GZA GeoEnvironmental, Inc. \\GZAWAUKESHA\Jobs\156000to156999\156044\Fill Evaluation Report\Figures\20.0156044 Site Location.mxd, April 01, 2019 - 8:59:17 AM, madeline.salo

© 2019 - GZA GeoEnvironmental, Inc. J:\156000to156999\156044\Figures\20.0156044.00 Soil Boring Location Map.mxd, April 16, 2019 - 11:41:38 AM, janee.pederson

NOTES

1) THE 2018 AERIAL IMAGERY BASE MAP WAS OBTAINED FROM THE MILWAUKEE COUNTY LAND INFORMATION OFFICE.

2) THE USE OF AERIAL PHOTOGRAPHY CAN OFTEN MAKE BUILDINGS AND OTHER SITE FEATURES APPEAR TO BE OVERLAPPING AND DISTORTED WHEN OVERLAID WITH ACTUAL SITE FEATURES.

3) THE LOCATION OF THE BORINGS WERE APPROXIMATELY DETERMINED GPS. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

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0 25 50 100
SCALE IN FEET

VACANT LOT - FIFTH WARD
200 EAST GREENFIELD AVENUE
MILWAUKEE, WISCONSIN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
REDEVELOPMENT AUTHORITY
OF THE CITY OF MILWAUKEE

SOIL BORING LOCATION PLAN

PROJ MGR:	JDG	REVIEWED BY:	JFD	CHECKED BY:	PJH	FIG	2
DESIGNED BY:	JDG	DRAWN BY:	KLK	SCALE:	1 in = 50 ft		
DATE: 04/16/2019		PROJECT NO: 20.0156044.10		REVISION NO:		SHEET NO:	OF

ATTACHMENT 1

Limitations

LIMITATIONS

USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the contract documents, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions .

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

SUBSURFACE CONDITIONS

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

7. Water level readings have been made in test holes (as described in this Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

8. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

9. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

COMPLIANCE WITH CODES AND REGULATIONS

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

11. Our interpretation of field screening and laboratory data is presented in the Report. Unless otherwise noted, we relied upon the laboratory's QA/QC program to validate these data.

12. Variations in the types and concentrations of contaminants observed at a given location or time may occur due to release mechanisms, disposal practices, changes in flow paths, and/or the influence of various physical, chemical, biological or radiological processes. Subsequently observed concentrations may be other than indicated in the Report.

ADDITIONAL SERVICES

13. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

ATTACHMENT 2

Soil Boring Logs

GZA GeoEnvironmental, Inc.
20900 Swenson Drive #150
Waukesha, WI 53186
(262) 754-2560

BORING NUMBER B- 1

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/6/19 **COMPLETED** 3/6/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/6/19	N/A	N/A		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: FROZEN SAMPLE Upper 4": FILL CAP SOILS) Hard, lean CLAY (CL), low plasticity; little Sand, fine-grained; brown, moist Middle 6": FILL 1) Dense, silty SAND (SM), fine to medium-grained; organic rich; black, moist Lower 2": FILL 1) Wood debris with some sand		SS S-1 (0-2)	12	6-16-18 (34)		0					
2.5		S-2: Upper 7": FILL 1) Medium dense, silty SAND (SM), fine to medium-grained; organic rich; some wood debris; black, moist Lower 3": FILL 1) Stiff, silty CLAY (CL-ML), low plasticity; olive-green, moist		SS S-2 (2-4)	10	10-8-8 (16)		0					
5.0		S-3: FILL 2) Medium dense, silty SAND (SM), fine to medium-grained; olive-gray; moist		SS S-3 (4-5)	12	6-5- (11)		0					

End of Boring at 5 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

GEOTECH BH COLUMNS W/ REMARKS - GINT STD US LAB.GDT - 4/1/19 11:10 - J:\GEOTECH PROJECTS\GINT PROJECT DATABASES\20.0156044.10 GREENFIELD SITE (MARCH 2019).GPJ

GZA GeoEnvironmental, Inc.
20900 Swenson Drive #150
Waukesha, WI 53186
(262) 754-2560

BORING NUMBER B- 2

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/6/19 **COMPLETED** 3/7/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/7/19	AD	13.75'	N/A	20 min

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: FROZEN SAMPLE Upper 4": CLAY CAP) Hard, lean CLAY (CL), low plasticity; brown, moist Lower 14": FILL 1) Hard, silty CLAY (CL-ML), low plasticity; some Gravel, fine; brown, moist		SS S-1 (0-2)	18	14-34-25 (55)		0.9					
2.5		S-2: Upper 6": FILL 1) Dense, silty SAND (SM), fine to medium-grained; some Gravel, fine; brown, moist Lower 6": FILL 2) Dense, silty FOUNDRY SAND (SM), fine to medium-grained; some charred material; black, moist		SS S-2 (2-4)	12	16-25-24 (49)		2.9					
5.0		S-3: FILL 2) Dense, silty FOUNDRY SAND (SM), fine to medium-grained; black, moist		SS S-3 (4-5)	8	14-22- (22+)		0					
7.5		S-4: FILL 2) Soft, lean CLAY with SAND (CL), low plasticity; reddish-brown, wet	1	SS S-4 (8.5-10)	15	4-2-3 (5)	0.5		18.0	30	17	13	
10.0		S-5: FILL 2) Loose, silty SAND (SM), fine to medium-grained; organic rich; dark gray to black, wet		SS S-5 (11-12.5)	4	2-3-3 (6)							

REMARKS

1. 1. Sand content increases with depth. Possible fill.

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BORING NUMBER B- 2

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
12.5		S-6: Upper 14": Loose, poorly-graded SAND (SP), fine to medium-grained; trace Gravel, fine; trace Silt: gray, wet Lower 4": Loose, silty SAND (SM), fine to medium-grained; trace Gravel, fine; gray, wet		SS S-6 (13.5-15)	18	2-3-5 (8)			18.9				3
15.0													
17.5		S-7: PEAT, brown to black, moist to wet		SS S-7 (18.5-20)	9	3-4-5 (9)							
20.0		End of Boring at 20 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.											

REMARKS

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BORING NUMBER B- 3

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/6/19 **COMPLETED** 3/6/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/6/19	N/A	N/A		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: FROZEN SAMPLE Upper 12": FILL CAP SOILS) Hard, lean CLAY (CL), low plasticity; trace roots; little charred wood debris; brown, moist Lower 3": FILL 1) Hard, silty CLAY (CL-ML), low plasticity; some Gravel, fine-grained; brown, moist	1	SS S-1 (0-2)	15	9-6-6 (12)		See remark number 1.					
2.5		S-2: Upper 10": FILL 1) Medium dense, silty SAND (SM), medium-grained; little wood debris; black, moist Lower 4": FILL 2) Hard, lean CLAY (CL), low plasticity; some Cream City Brick fragments, brown; moist	2	SS S-2 (2-4)	14	10-10-15 (25)		See remark number 2.					
5.0		S-3: Upper 8": FILL 2) Hard, silty CLAY (CL-ML), low plasticity; trace roots; brown, moist Lower 4": Pulverized rock; white		SS S-3 (4-5)	12	21-25-(25+)		0					

End of Boring at 5 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

1. 1. PID measurement was taken on soil from 0-3 feet bgs. Field test data from 0-3 feet bgs was 0 ppm.
2. 2. PID measurement was taken on soil from 3-4 feet bgs. Field test data from 3-4 feet bgs was 0 ppm.

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BORING NUMBER B- 4

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/6/19 **COMPLETED** 3/6/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/6/19	N/A	N/A		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: FROZEN SAMPLE Upper 9": CLAY CAP) Hard, lean CLAY (CL), low plasticity; organic-rich; trace roots; brown, moist Lower 3": FILL 1) Hard, lean CLAY (CL), low plasticity; organic-rich; brown, moist	1	SS S-1 (0-2)	12	5-6-3 (9)		See remark number 1.					
2.5		S-2: Upper 8": FILL 1) Very dense, silty SAND (SM), medium-grained; brown to black, moist Middle 6": FILL 2) Very dense, poorly-graded SAND and GRAVEL (SP), fine to medium-grained; moist Lower 2": FILL 2) Very dense, silty SAND (SM), medium-grained; black, moist	2	SS S-2 (2-4)	16	9-40-28 (68)		See remark number 2.					
5.0		S-3: FILL 2) Dense, silty SAND (SM), medium-grained; black, moist		SS S-3 (4-5)	9	15-25-(25+)		0.4					

End of Boring at 5 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

1. 1. PID measurement was taken on soil from 0-3 feet bgs. Field test data from 0-3 feet bgs was 0.3 ppm.
2. 2. PID measurement was taken on soil from 3-4 feet bgs. Field test data from 3-4 feet bgs was 2.7 ppm.

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BORING NUMBER B- 5

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/6/19 **COMPLETED** 3/6/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/6/19	N/A	N/A		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: FROZEN SAMPLE CLAY CAP/FILL 1) Hard, lean CLAY (CL), low plasticity; trace Gravel, fine-grained; trace Sand, fine to medium; little organics; trace roots; brown, moist		SS S-1 (0-2)	16	11-12-8 (20)		0					
2.5		S-2: FILL 2) Dense, poorly-graded SAND (SP), fine to medium-grained; trace Gravel, fine; brown, moist	1	SS S-2 (2-4)	4	6-12-19 (31)		0.1					
5.0		S-3: FILL 2) Hard, lean CLAY (CL), low plasticity; trace Gravel, fine-grained; trace Sand, fine; brown, moist		SS S-3 (4-5)	12	7-37- (37+)		1.1					

End of Boring at 5 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

1. Rock in shoe.

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BORING NUMBER B- 6

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/6/19 **COMPLETED** 3/6/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/6/19	N/A	N/A		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: SLIGHTLY FROZEN Upper 8": CLAY CAP) Hard, lean CLAY (CL), low plasticity; trace Gravel, fine-grained; trace Sand, medium; brown, moist Lower 6": FILL 1) Very stiff, lean CLAY (CL), low plasticity; little Gravel, fine-grained; trace foundry Sand, fine; brown to black, moist		SS S-1 (0-2)	14	6-8-8 (16)		0					
2.5		S-2: FILL 2) Dense, clayey GRAVEL (GC), fine to coarse-grained; some Sand, fine to medium; brown, wet		SS S-2 (2-4)	7	6-4-39 (43)		0.2					
5.0		S-3: FILL 2) Very dense, silty GRAVEL (GM), fine to coarse-grained; gray to brown, dry		SS S-3 (4-6)	2	50/4-- (50+)		0.1					
7.5		S-4: FILL 2) Medium dense, silty SAND (SM), fine to medium-grained; little brick shards; little Gravel, fine; black, moist		SS S-4 (8.5-10)	5	10-13-14 (27)							
10.0		S-5: FILL 2) Medium dense, silty SAND (SM), fine to medium-grained; gray upper 6", black lower 8", wet		SS S-5 (11-12.5)	14	11-9-13 (22)							

REMARKS

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BORING NUMBER B- 6

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
12.5		S-6: Medium dense, poorly graded SAND with SILT (SP-SM), fine to medium grained; trace Gravel, fine; trace shells; brown, wet		SS S-6 (13.5-15)	16	9-10-10 (20)			18.4	NP	NP	NP	5
15.0													
17.5		S-7: Upper 4": Medium dense, poorly-graded SAND with SILT (SP-SM), fine to medium-grained; trace shells; brown, wet Lower 9": Loose, PEAT (PT); trace Sand; dark brown, moist Organic Content by LOI: 62.1%		SS S-7 (18.5-20)	13	2-2-6 (8)			247.5				
20.0													
22.5		S-8: Soft, sandy organic SILT (OL), non-plastic; trace shells, fine; dark brown, wet		SS S-8 (23.5-25)	18	1-2-2 (4)	0.5		94.5	NP	NP	NP	
25.0													

REMARKS

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BORING NUMBER B- 6

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
27.5													
30.0		S-9: Stiff, sandy SILT (ML), low plasticity; trace shells; gray, moist		SS S-9 (28.5-30)	18	2-2-3 (5)	1.0						

End of Boring at 30 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

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BORING NUMBER B- 7

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/6/19 **COMPLETED** 3/6/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/6/19	AD	13'	N/A	Overnight

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: Upper 10": CLAY CAP) Frozen; stiff, sandy lean CLAY (CL), low plasticity; brown, dry Lower 9": FILL 1) Medium dense, clayey SAND (SC), fine to coarse-grained; little Gravel, fine; brown to black, moist		SS S-1 (0-2)	19			0.4					
2.5		S-2: FILL 1) Medium dense, clayey SAND (SC), fine to coarse-grained; little Gravel, fine; black (foundry sand)		SS S-2 (2-4)	13			0.3					
5.0		S-3: Upper 6": FILL 2) Medium dense, poorly-graded SAND with SILT (SP-SM), fine to medium-grained; black, wet Lower 7": FILL 2) Medium dense, clayey GRAVEL (GC), fine to coarse-grained; little Sand, fine; dark brown to black, moist		SS S-3 (4-6)	13			0					
7.5		S-4: Upper 6": FILL 2) Stiff, lean CLAY (CL), low to medium plasticity; little Sand, fine-grained; red, moist Lower 8": FILL 2) Medium dense, poorly-graded SAND (SP), fine to medium-grained; brown, dry		SS S-4 (8.5-11)	14		1.5						
10.0		S-5: FILL 2) Medium dense, pooorly-graded SAND with SILT and GRAVEL (SP-SM), fine to medium-grained (foundry sand); little cinders, black, moist		SS S-5 (11-12.5)	16				19.8	NP	NP	NP	10

REMARKS

1. Rock in shoe.

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BORING NUMBER B- 7

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
12.5													
		S-6: Loose, clayey SAND (SC), fine to coarse-grained; little Gravel, fine; gray to brown, moist		SS S-6 (13.5-15)	17		1.5		15.9				
15.0													
17.5													
		S-7: Upper 4": Loose, poorly graded SAND (SP), fine to medium-grained; trace Silt; wet Lower 2" PEAT, trace Sand, fine-grained; brown to black		SS S-7 (18.5-20)	6				95.3				
20.0													

End of Boring at 20 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

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BORING NUMBER B- 8

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/7/19 **COMPLETED** 3/7/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/6/19	N/A	N/A		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: Upper 8": CLAY CAP) Frozen; hard, lean CLAY (CL), low plasticity; trace Gravel, fine-grained; organic-rich; brown, moist Lower 10": FILL 1) Dense, poorly-graded SAND (SP), fine to coarse-grained; trace foundry Sand, fine; white to brown, moist		SS S-1 (0-2)	18	12-21-19 (40)		0.3					
2.5		S-2: Medium dense, poorly-graded SAND (SP), fine to medium-grained; some Gravel, fine; brown, moist		SS S-2 (2-4)	10	20-8-8 (16)		0					
5.0		S-3: FILL 2) Medium dense, silty SAND (SM), fine to medium-grained; black, moist		SS S-3 (4-5)	12	4-4-22 (26)		0					

End of Boring at 5 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

1. Fill 1 ends at 3 feet bgs. Fill 2 starts at 3 feet bgs.
2. Gravel at bottom.

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BORING NUMBER B- 9

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/7/19 **COMPLETED** 3/7/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/7/19	AD	12.1'	N/A	20 min

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: Upper 13": CLAY CAP) Stiff, lean CLAY (CL), low plasticity; trace Sand, fine-grained; trace roots; brown, moist Lower 7": FILL 1) Dense, clayey SAND (SC), fine to coarse-grained; little Gravel, fine; brown, dry		SS S-1 (0-2)	20	15-19-14 (33)		0.6					
2.5		S-2: FILL 2) Medium dense, clayey SAND (SC), fine to coarse-grained; little Gravel, fine; trace cinders; dark brown, moist		SS S-2 (2-4)	10	7-7-7 (14)		0.6					
5.0		S-3: No recovery.		SS S-3 (4-6)	0	6-8-11 (19)		See remark number 2.					
7.5		S-4: FILL 2) Loose, poorly-graded SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, fine; brown, moist		SS S-4 (8.5-11)	12	4-4-8 (12)			5.6	NP	NP	NP	5
10.0		S-5: FILL 2) Medium dense, poorly-graded sand (SP), fine to medium-grained, trace Silt; trace Gravel, fine; thin layers of foundry sand, fine; brown, moist Bottom 3" wet		SS S-5 (11-13.5)	15	8-10-8 (18)							

REMARKS

1. Rock in shoe.
2. PID reading was not obtained due to no soil recovery.

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BORING NUMBER B- 9

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
12.5													
		S-6: Medium stiff, lean CLAY with SAND (CL), low plasticity; lenses of sand present; gray, wet		SS S-6 (13.5-15)	16	5-4-6 (10)	0.75		17.9				
15.0													
		S-7: Wood.		SS S-7 (16.5-17)	5								

End of Boring at 17.5 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

3. Wood appears to be a buried log.

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GZA GeoEnvironmental, Inc.
20900 Swenson Drive #150
Waukesha, WI 53186
(262) 754-2560

BORING NUMBER B-10

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/7/19 **COMPLETED** 3/7/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/7/19	N/A	N/A		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: Upper 7": CLAY CAP) Hard, lean CLAY (CL), low plasticity; trace roots; brown, moist Lower 5": FILL 1) Medium dense, clayey SAND (SC), fine to medium-grained; some Gravel, fine; charred material present; brown, moist	1	SS S-1 (0-2)	12	7-9-9 (18)		See remark number 1.					
2.5		S-2: Upper 12": FILL 1) Hard, lean CLAY (CL), low plasticity; trace Sand, fine to medium-grained; trace Gravel, fine; brown, moist Lower 6": FILL 2) Medium dense, silty SAND (SM), fine to medium-grained; some Gravel, fine; trace foundry Sand, fine; brown, moist	2	SS S-2 (2-4)	18	4-3-18 (21)		See remark number 2.					
5.0		S-3: Upper 10": FILL 2) Hard, lean CLAY (CL), low plasticity; with Sand, fine to medium-grained; trace Gravel, fine; trace roots; brown, moist Middle 7": FILL 2) Dense, poorly-graded SAND (SP), fine to medium-grained; some Gravel, fine; little foundry Sand, fine; wood debris; brown, moist Lower 1": FILL 2) Dense, poorly-graded SAND (SP), fine to medium-grained; brown, moist		SS S-3 (4-6)	18	17-31-18 (49)		1.7					

End of Boring at 6 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

1. 1. PID measurement was taken on soil from 0-3 feet bgs. Field test data from 0-3 feet bgs was 0.6 ppm.
2. 2. PID measurement was taken on soil from 3-4 feet bgs. Field test data from 3-4 feet bgs was 1.8 ppm.

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GZA GeoEnvironmental, Inc.
20900 Swenson Drive #150
Waukesha, WI 53186
(262) 754-2560

BORING NUMBER B-11

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/7/19 **COMPLETED** 3/7/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/7/19	N/A	N/A		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: Upper 16": CLAY CAP) Hard, lean CLAY (CL), low plasticity; some roots; brown, moist Lower 2": FILL 1) Hard, lean CLAY (CL); trace Sand; light brown, moist (no roots)		SS S-1 (0-2)	18	8-5-5 (10)		0					
2.5		S-2: Upper 4.5": FILL 2) Dense, clayey SAND (SC), fine to medium-grained, little Gravel, fine; trace foundry Sand, fine; brown, moist Lower 1.5": FILL 2) Wood debris, odorous		SS S-2 (2-4)	6	11-27-9 (36)		0.2					
5.0		S-3: Upper 13": FILL 2) Medium dense, clayey SAND (SC), fine to medium-grained; trace roots; trace Grave, fine; trace foundry Sand, fine; wood debris present; brown, moist Middle 1": FILL 2) Pulverized rock Lower 2": FILL 2) Medium dense, poorly-graded SAND (SP), fine to medium-grained; brown, moist		SS S-3 (4-6)	16	8-5-13 (18)		33.8					

End of Boring at 6 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

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GZA GeoEnvironmental, Inc.
20900 Swenson Drive #150
Waukesha, WI 53186
(262) 754-2560

BORING NUMBER B-12

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave
DATE STARTED 3/7/19 **COMPLETED** 3/7/19
GROUND ELEVATION **HOLE SIZE** 6.25 inches
DRILLING CONTRACTOR Badger State Drilling
DRILLING METHOD 2-1/4 HSA
LOGGED BY JDG/MJS **CHECKED BY** JDG
DRILL RIG

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
3/7/19	Ad	12.6	N/A	20 min

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		S-1: Upper 10": CLAY CAP) Very stiff, lean CLAY with SAND (CL), low plasticity; trace Gravel, fine-grained; trace organics; brown, moist Lower 4": FILL 1) Medium dense, clayey SAND with GRAVEL (SC), fine to medium-grained; brown, moist		SS S-1 (0-2)	14	6-6-11 (17)	3.0	0.1					
2.5		S-2: FILL 1) Loose, clayey SAND (SC), fine to medium-grained; little Gravel, fine; brown, moist		SS S-2 (2-4)	19	3-4-3 (7)		0.1	12.6				19
5.0		S-3: Upper 9": FILL 2) Medium stiff, sand lean CLAY (CL), low plasticity; little Gravel, fine-grained; brown to black, moist Lower 10": FILL 2) Medium dense, well graded SAND with SILT (SW-SM), fine to coarse-grained; little Gravel, fine; brown, moist		SS S-3 (4-6)	19	3-7-12 (19)	0.5-3.5	0					
7.5		S-4: FILL 2)Medium dense, well graded SAND with SILT (SW-SM), fine to coarse-grained; little Gravel, fine; organic rich; brown, moist	1	SS S-4 (8.5-11)	10	6-8-5 (13)			3.5				
10.0		S-5: FILL 2) Upper 6": Medium dense, silty SAND (SM), fine to coarse-grained; little Gravel, fine; little cinders; trace organics; dark brown, wet FILL 2) Middle 4": Medium dense, well graded SAND (SW), fine to		SS S-5 (11-12.5)	15	8-11-9 (20)							

REMARKS

1. 1. Silt in tip of spoon.

(Continued Next Page)

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GZA GeoEnvironmental, Inc.
20900 Swenson Drive #150
Waukesha, WI 53186
(262) 754-2560

BORING NUMBER B-12

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
12.5		coarse-grained; little Gravel, fine; brown, wet Lower 5": Medium dense, poorly graded SAND with SILT (SP-SM), fine to medium-grained; little organics; gray, wet											
		S-6: Soft, sandy SILT (ML), low plasticity; little organics; gray, wet		SS S-6 (13.5-15)	18	3-2-2 (4)	0.25		17.9				
15.0													
17.5													
		S-7: Stiff, lean CLAY (CL), low plasticity; little Sand, fine-grained; gray, wet		SS S-7 (18.5-20)	18	2-3-4 (7)	1.5		18.7	29	17	12	
20.0													
22.5													
		S-8: Upper 2": Rotting wood. Lower 13": Medium stiff, lean CLAY with SAND (CL), low plasticity; trace Gravel, fine-grained; gray, wet		SS S-8 (23.5-25)	15	3-5-5 (10)	0.75		16.6				79
25.0													

REMARKS

(Continued Next Page)

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20900 Swenson Drive #150
Waukesha, WI 53186
(262) 754-2560

BORING NUMBER B-12

CLIENT City of Milwaukee
PROJECT NAME Freshwater Plaza - Greenfield and 1st
PROJECT NUMBER 20.0156044.10
PROJECT LOCATION 200 East Greenfield Ave

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	PID READING (PPM)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
27.5													
30.0		S-9: Loose, silty SAND (SM), fine to medium-grained; little shells; gray, moist		SS S-9 (28.5-30)	18	3-3-5 (8)							

End of Boring at 30 feet, bgs. Boring backfilled with 3/8 bentonite chips and native soils.

REMARKS

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ATTACHMENT 3

Summary of Laboratory Data

GZA GeoEnvironmental, Inc.
20900 Swenson Drive #150
Waukesha, WI 53186
(262) 754-2560

TABULATION OF LABORATORY DATA

CLIENT City of Milwaukee

PROJECT NAME Freshwater Plaza- Greenfield and 1st

PROJECT NUMBER 20.0156044.10

PROJECT LOCATION 200 East Greenfield Ave

Boring Number	Sample Number	Depth (ft)	Natural Moisture %	Dry Unit Weight (pcf)	Sieve Data: Percent Passing By Weight					Atterberg Limits			USCS Classification	Unconfined Compress. Strength (psf)
					3/4"	No. 4	No. 10	*No. 40	No. 200	LL	PL	PI		
B- 2	S-4	8.5	18.0							30	17	13		
B- 2	S-6	13.5	18.9			100	99	50	3				SP	
B- 6	S-6	13.5	18.4		100	95	91	56	5	NP	NP	NP	SP-SM	
B- 6	S-7	18.5	247.5											
B- 6	S-8	23.5	94.5							NP	NP	NP		
B- 7	S-5	11.0	19.8		83	72	62	42	10	NP	NP	NP	SP-SM	
B- 7	S-6	13.5	15.9											
B- 7	S-7	18.5	95.3											
B- 9	S-4	8.5	5.6			96	95	68	5	NP	NP	NP	SP-SM	
B- 9	S-6	13.5	17.9											
B-12	S-2	2.0	12.6		94	75	65	45	19					
B-12	S-4	8.5	3.5											
B-12	S-6	13.5	17.9											
B-12	S-7	18.5	18.7							29	17	12		
B-12	S-8	23.5	16.6						79					
Maximum Values:			247.5		100	100	99	68	79	30	17			
Minimum Values:			3.5		83	72	62	42	3	0	0			
Average Value:			41.4		92	88	82	52	20	9.8	5.7			
Number of Tests Performed:			15	0	3	5	5	5	6	6	6	6		0

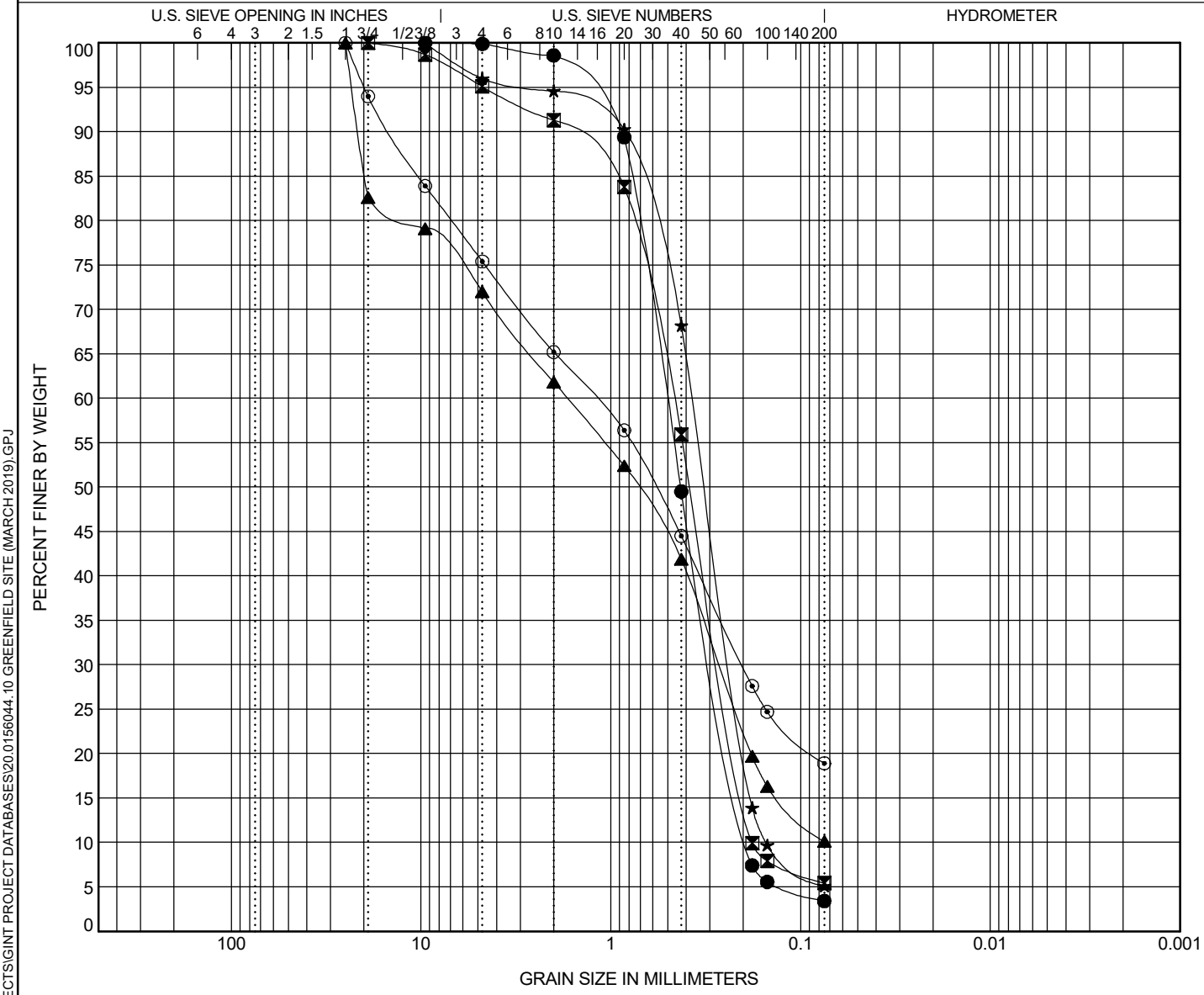
GZA LAB SUMMARY - GINT STD US LAB.GDT - 3/29/19 13:58 - J:\GEOTECH PROJECTS\GINT PROJECT DATABASES\20.0156044.10 GREENFIELD SITE (MARCH 2019).GPJ

GZA GeoEnvironmental, Inc.
20900 Swenson Drive #150
Waukesha, WI 53186
(262) 754-2560

GRAIN SIZE DISTRIBUTION

CLIENT City of Milwaukee **PROJECT NAME** Freshwater Plaza- Greenfield and 1st

PROJECT NUMBER 20.0156044.10 **PROJECT LOCATION** 200 East Greenfield Ave



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B- 2	13.5	POORLY GRADED SAND(SP)				0.84	2.69
⊠	B- 6	13.5	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	0.81	2.61
▲	B- 7	11.0	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	NP	NP	NP	0.57	22.89
★	B- 9	8.5	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	0.95	2.46
⊙	B-12	2.0						

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B- 2	13.5	9.5	0.51	0.285	0.19	0.1	96.5	3.4	
⊠	B- 6	13.5	19	0.471	0.262	0.18	4.9	89.7	5.4	
▲	B- 7	11.0	25	1.698	0.268		28.0	61.9	10.1	
★	B- 9	8.5	9.5	0.373	0.232	0.152	4.0	90.9	5.1	
⊙	B-12	2.0	25	1.206	0.203		24.6	56.5	18.9	

GRAIN SIZE - GINT STD US LAB.GDT - 3/27/19 10:06 - J:\GEOTECH PROJECTS\GINT PROJECT DATABASES\20.0156044.10 GREENFIELD SITE (MARCH 2019).GPJ

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of
Moisture Content, Organic Content, and Density of Soil

Project Name:	GZA Misc. Testing	Date:	March 29, 2019
Project Number:	19086-40 (20.0156044.00)	Report To:	GZA
Project Location:			
ASTM Designation:	**D2216, D2974 (Method C), D7263**		

Boring Number	B-6							
Sample Number	7							
Cup Number	PC-101							
Weight of Cup (g)	69.32							
Weight of Wet Soil and Cup (g)	122.17							
Weight of Dry Soil and Cup (g)	84.53							
Weight of Soil and Cup After Burn (g)	75.09							
Weight of Sample for Density (lbs)								
Diameter (in)								
Length(in)								
Moisture Content (%)	247.5							
Organic Content (%)	62.1							
Wet Density (pcf)								
Dry Density (pcf)								

Boring Number								
Sample Number								
Cup Number								
Weight of Cup (g)								
Weight of Wet Soil and Cup (g)								
Weight of Dry Soil and Cup (g)								
Weight of Soil and Cup After Burn (g)								
Weight of Sample for Density (lbs)								
Diameter (in)								
Length(in)								
Moisture Content (%)								
Organic Content (%)								
Wet Density (pcf)								
Dry Density (pcf)								

Performed by BJB Reviewed by JB