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March 17, 2017

Mr. Daniel J. Moeglin, P. E.
City Engineer
City of Canton Engineering Dept.
2436 30th Street NE
Canton, OH 44705

Re: Geotechnical Subsurface Exploration Report
Proposed Market Square Project
NWC of Market Ave N & 3rd St NW
Canton, OH 44702
PSI Project No.: 01451259

Dear Mr. Moeglin:

In compliance with your instructions, we have conducted a geotechnical subsurface exploration and foundation evaluation for the above-referenced project. The results of this exploration, together with our recommendations, are to be found in the accompanying report, three (3) copies of which are being transmitted, herewith.

After the plans and specifications are complete, PSI should review the final design and specifications in order to verify that the earthwork and recommendations are properly interpreted and implemented. **It is considered imperative that the geotechnical engineer and/or its representative be present during earthwork operations and foundation installations to observe the field conditions with respect to the design assumptions and specifications. PSI will not be held responsible for interpretations and field quality control observations made by others.**

Should you have any questions regarding the contents of this submittal, please do not hesitate to contact us at 330-478-0081.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Kyle Schneider, E.I.T.
Branch Manager

A. Veeramani, P.E.
Vice-President

Subsurface Exploration Report

For The

Proposed Market Square Project
NWC of Market Ave N & 3rd St NW
Canton, OH 44702

Prepared for

City of Canton Engineering Dept.
2436 30th Street NE
Canton, OH 44705

Prepared by

Professional Service Industries, Inc.
4579 Navarre Road, S.W.
Canton, Ohio 44706

Report Date: March 17, 2017

PSI Project No. 01451259

TABLE OF CONTENTS

PROJECT INFORMATION

Project Authorization

This report presents the results of a geotechnical subsurface exploration and evaluation conducted for the City of Canton Engineering Dept., in connection with the proposed Market Square project at the northwest corner of Market Ave N & 3rd St NW in the City of Canton, Stark County, Ohio. Authorization to perform this exploration and analysis was in the form of an approved City of Canton Purchase Order No. 2017-00001801.

Project Description

Project information was provided by Ms. Kristine Griffith, of the City of Canton Engineering Dept. Included, received the following documents to aid in preparing our proposal:

- Email with anticipated structural load information - dated 1/24/2017
- Standard Conditions for Geotechnical Investigation and Engineering Services
- Schematic Design Set – dated 12/15/2016
- Site Plan L5.00 – dated 7/11/2016

Based on the provided drawings and our site meeting on January 24, 2017, we understand that the proposed project consists of the construction of a five-legged tower rising approximately 150 feet above the existing surface grades at the NWC of the intersection of Market Avenue N and 3rd Street NW, in the City of Canton, Ohio. Specifically, the proposed structure will consist of five, steel, truss columns connected to a circular ring near the top. The bottom of the legs will be equally spaced around a 150-foot diameter area at ground level, and the top of the legs will be equally spaced around a 40-foot diameter area. PSI understands that the proposed structure may also incorporate a water feature.

Preliminary structural loading information was provided to PSI in an email. PSI understands that each individual leg will be supported on a 15- to 20-foot square concrete footing supported on deep foundations capable of resisting significant uplift. Each footing will have an approximate overturning moment of 10,000 K-ft. The vertical uplift and downward load on each side of the footing due to the moment in loading will be a maximum of 600 kips. The net uplift and downward load on a footing will be 150 kips (excluding the weight of the footing). The lateral load to be resisted will be approximately 150 kips.

From the provided topographical map, the existing grades in the area slope from the center of the site downward towards the edges of the site. The grades within the proposed structural footprint vary by approximately 2 feet (Elev. 1054.0± to 1056.0± ft. MSL). The anticipated bottom elevation for the proposed water features will be located approximately 15 feet below existing grades. Therefore, it is anticipated that the proposed project will require maximum cut operations of about 15 foot for the proposed construction.

The geotechnical recommendations presented in this report are based on the available project information, the proposed location and orientation of the building on the site and the subsurface materials described in this report. If any of the information we have been given or have assumed is incorrect, please contact us so that we may amend the recommendations presented accordingly. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site and to prepare recommendations for foundations, floor slab construction, pavement, site preparation and other construction considerations. Our scope for this service included a project site reconnaissance, drilling and sampling six (6) soil test borings, completing a laboratory testing program and submitting an engineering analysis and evaluation of the surface materials. An additional seventh boring was originally scheduled for the north roadway area, however, due to onsite utility concerns, this boring was cancelled.

The scope of services for the geotechnical exploration did not include an environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the client.

PSI's scope also did not include any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same. The Client should be aware that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. The Client should also be aware that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or reoccurrence of mold amplification.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The project site for the proposed Market Square Project is located at the NWC of the intersection of Market Avenue N and 3rd Street NW, in the City of Canton, Ohio. The proposed construction site consisted of grass, with an asphalt parking area located on the west side and concrete sidewalks and asphalt roadways surrounding the side on the north, east and south sides of the site.

Based on the provided topographical information and our observations, the site generally slopes downward from the center of the site towards the edges of the site with an elevation difference of approximately 2.0 feet, elevation of 1056.0± feet MSL near the center of the site to an elevation of about 1054.0± feet MSL near the edges of the site. We recommend that any existing utility lines be checked and marked prior to construction activities.

Subsurface Conditions

The subsurface conditions at the site were explored with a total of six (6) soil test borings for the proposed building and pavement areas. The test borings were drilled to depths ranging between 5.0 to 35.0 feet below the existing surface grades. The approximate boring locations are shown on the Boring Location Plan presented in the *Appendix* of this report. The number of test borings was selected and field located by representatives of PSI.

The borings were advanced utilizing 3¼ inch inside diameter, hollow-stem auger drilling methods. Soil samples were routinely obtained during the drilling process. Selected soil samples were later tested in the laboratory to obtain soil material properties for the foundation, floor slabs and pavement recommendations. Drilling, sampling, and laboratory testing was accomplished in general accordance with ASTM procedures.

The types of subsurface materials encountered in the test borings have been visually classified. The results of the visual classifications, Standard Penetration tests, moisture contents and water level observations are presented on the boring logs in the *Appendix* of this report. Representative samples of the soils were placed in sample jars, and are now stored in the laboratory for further analysis, if requested. Unless notified to the contrary, all samples will be disposed of after 60 days following the date of this report.

The surface materials encountered varied at the soil boring locations. The table below is a summary of the surface materials encountered.

Boring No.	Surface Material Description	Boring No.	Surface Material Description
B-1	3" Topsoil	B-4	2" Topsoil
B-2	4" Asphalt/ 6" Gravel Base	B-5	3" Topsoil
B-3	4" Asphalt/ 6" Gravel Base	B-6	3.5" Asphalt/ 5" Brick

**The thickness and composition of the surface materials should be expected to be variable throughout site.

Below the surface materials, miscellaneous fill soils were encountered at test boring locations B-1, B-2, B-3, B-4 and B-5, extending to depths of approximately 8.5 to 14.0 feet below the existing surface grades. The fill soils consisted of silty sand and fine to coarse sand with various amounts of clay, silt, gravel, and brick fragments. The fill soil exhibited moisture contents of 6 to 10 percent. The engineering characteristics of the miscellaneous fill materials, such as strength, composition and compressibility are considered to be extremely variable.

The surface and fill materials were underlain by natural soils encountered at all the test boring locations. The natural soils consisted of sandy silt, silty sand, and fine to coarse sands containing varying amounts of clay, coal, and gravel. The natural soils extended to the terminal depths of the borings and exhibited moisture contents of 3 to 13 percent and had a stiff consistency for cohesive soils and a medium dense to very dense relative density for the granular soils, based on the Standard Penetration Test results.

The subsurface description is of a generalized nature provided to highlight the major strata encountered. The boring logs included in the Appendix should be reviewed for specific information at the individual boring locations. The stratifications shown on the boring logs represent the conditions only at the actual test positions. Variations may occur and should be expected between the boring locations. The stratifications represent the approximate boundary between the subsurface materials, and the transition may be gradual or not clearly defined.

Water Level Measurements

Groundwater was not encountered at any of the test boring locations during field drilling operations. Note that groundwater levels fluctuate seasonally as a function of precipitation. During a time of year or weather different from the time of drilling, there may be a considerable change in the water table. Furthermore, the water levels in the boreholes often are not representative of the actual groundwater level, because the boreholes remain open for a relatively short time. Therefore, we recommend that the contractor determine the actual groundwater levels at the time of construction to evaluate groundwater impact on the construction procedures.

FOUNDATION EVALUATION AND RECOMMENDATIONS

Site Preparation and Earthwork Construction

Prior to placing concrete floors or engineered fill on this site, general site area clearing should be carried out. All existing topsoil, concrete, asphalt, excessively wet soils, highly organic soils, and soft/loose or obviously compressible materials, should be completely removed from the proposed construction areas. The decision in connection with the precise extent of required cut and fill should be determined in the field by a representative of PSI following observation of the exposed subgrades and proof rolling operations.

Following the site clearing, stripping and undercutting, and prior to placing engineered fill, the exposed subgrades should be critically proofrolled with a loaded 20-ton tandem-axle dump truck until the grade offers a relatively unyielding surface. Areas of excessive yielding, as observed by a PSI representative, should be excavated and backfilled with compacted engineered fill and/or the unstable soils can be stabilized by choking the exposed bearing surface with crushed limestone or similar coarse aggregate. After the existing subgrade materials are excavated to design grade, proper control of subgrade compaction and the placement and compaction of new fill materials should be observed and tested by a representative of PSI.

It is recommended that the site preparation, proofrolling and earthwork activities should be performed during a period of dry weather, which can significantly reduce the required extent of soil stabilization, drainage and surface repairs.

During site preparation, burn pits, trash pits or other isolated disposal areas may be encountered. All too frequently such buried materials occur in isolated areas outside boring locations. Any such materials encountered during site work or construction should be completely excavated and removed from the site.

Engineered Fill

Engineered fill materials should consist of non-expansive materials. Materials selected for use as engineered fill should generally contain less than 3 percent by weight of organic matter, waste construction debris, or other deleterious materials. Fill materials should generally have a Standard Proctor maximum dry density greater than 110 pounds per cubic foot (pcf), an Atterberg Liquid Limit less than 40, a Plasticity Index of less than 20, and a maximum particle size of 2 inches or less. The existing on site medium dense to dense granular material encountered underlying the surface materials is considered acceptable material for use as engineered fill.

Representative samples of the proposed fill materials should be collected at least one week prior to the start of the filling operations. The samples should be tested to determine the maximum dry density, optimum moisture content, particle size distribution and plasticity characteristics. These tests are needed to determine if the material is acceptable as structural fill and for quality control during the compaction process. The type of engineered fill material should be verified and approved by the project's geotechnical engineer prior to placement.

The fill should be placed in layers of not more than 8 inches in thickness, with each layer being compacted to a minimum density of 98 percent of the maximum dry density and within ± 2% of the optimum moisture content, as determined by the Standard Proctor Method ASTM D-698. Moisture control (increasing or decreasing the natural moisture content) of the engineered fill materials may be necessary for compaction.

Foundation Recommendations

The test boring, laboratory test results, the proposed construction and analysis indicates that the proposed tower can be supported on either a shallow bearing concrete rigid block/mat foundation bearing on the natural soils, or deep seated foundation, such as drilled piers.

Shallow Foundation

Based on the field drilling operations and proposed construction, a rigid concrete block/mat foundation can be utilized to support the proposed tower bearing on the natural soils and/or compacted engineered fill soil formation. The proposed shallow foundation supporting the tower can be designed utilizing a maximum allowable soil bearing pressure of 3,000 psf. Foundations supporting individual columns should have a minimum width/length of 36 inches. All perimeter foundations must be placed at a minimum depth

of 36 inches below the exterior finished grades in order to protect against frost action.

The horizontal loads on a shallow foundation will be resisted by the base friction and the passive resistance. For a shallow foundation bearing at least 5 feet below finished grade, the following design parameters may be utilized:

Ultimate base friction coefficient:	0.40
Ultimate adhesion (Ca):	1000 psf
Passive resistance, Soil backfill (FS = 2):	180 psf/ft
Soil backfill unit weight:	120 pcf
Ground Water level:	---

Note: Compacted soil backfill should be placed over the foundation as soon as practical following footing construction to reduce the potential for surface water infiltration.

The uplift resistance of a shallow foundation formed in an open excavation will be limited to the weight of the foundation and the soil above it. For design purposes, the ultimate uplift resistance should be based on effective unit weights of 120 and 150 pcf for soil backfill and concrete, respectively. Minimum factors of safety of 2 for axial loads and 1.5 for lateral loads should be applied.

In view of the subsurface conditions, it is anticipated that total foundation settlements will be less than 1 inch for the above recommended bearing pressure. However, actual settlements will be dependent upon the depth of the foundations, structural loads and other related factors.

Footing bearing surfaces are to be critically inspected and tested to verify consistency and compatibility with subsurface exploration data, and to assure that the recommended bearing capacity is being achieved. It is recommended that a representative of PSI be present at the site throughout foundation excavation and construction.

Extreme care should be taken to prevent weakening of the foundation bearing materials because of prolonged atmospheric exposure, construction activity disturbance or an increase in moisture content. In the event that an overnight delay in concrete placement is anticipated, the foundation excavations should be cut approximately 6 inches and subsequently excavated to final grade immediately before placement of concrete.

Pier Foundation

Alternatively, we recommend that pier foundations bearing within the area's natural soil formation can be used to support the proposed tower. We recommend that the design parameters shown in the following table be used to design the tower foundations:

Depth Range Ft.	Ultimate Shear Strength	Ultimate Friction (psf)	Ultimate End Bearing (psf)	Lateral Modulus (k,pci)	Strain Factor (E_{50})
0-4	Neglect	--	--	--	--
4-10	$\emptyset = 28^{o}$	1200	6,000	60	NA
Below 10	$\emptyset = 32^{o}$	2000	10,000	125	NA

A factor of safety of 2.0 should be applied to the design loads to define required pier diameter and depth. The overburden soils would not be expected to be free standing in an open excavation for the depths of the piers. Therefore, for the caisson excavations, temporary protective steel casing and possibly slurry will be required. Temporary casing should be at least as large in outside diameter as the nominal shaft size and of sufficient wall thickness to resist crushing by hydrostatic and earth pressures.

Pier excavations are to be concreted immediately following inspection and approval and are to be protected to the fullest extent possible from groundwater ingress and inundation. In the event that it is impossible to dewater any given excavation, concreting operations are to be carried out employing carefully controlled full depth tremie devices and procedures. It is recommended that concrete in a caisson be poured the same day that the caisson is drilled and have a slump of 7-9 inches. Reinforcement for the individual caisson units should be designed for the maximum bending moment and shear force expected at any section of the caisson member during the worst loading conditions. Every precaution is to be taken during the course of casing removal procedures to preclude the possibility of groundwater or soil "blow in" below the bottom of the casing.

During the course of the concreting operations care is to be exercised to protect and to prevent misalignment of the included reinforcing steel.

Seismic Site Class

The project site is located within a municipality that employs the International Building Code. As part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site. As part of the procedure to evaluate seismic forces, the code requires the evaluation of the Seismic Site Class, which categorizes the site based upon the characteristics of the subsurface profile within the upper 100 feet of the ground surface.

To define the Site Class for this project, we have interpreted the results of soil test borings drilled with the project site and estimated appropriate soil properties below the base of the borings to a depth of 100 feet, as permitted by Section 1613.5.5 of the code. The estimated soil properties were based upon data available in published geologic reports as well as our experience with subsurface conditions in the general site area.

Based on table 1613.5.5 of the OBC Building Code, the test boring results and review of the geology in vicinity to the project area, a **Site Classification of 'D'** can be utilized for the seismic design.

Groundwater Control

Groundwater was not encountered at any of the test boring locations during field drilling operations. However, groundwater seepage will likely be encountered during foundation excavation and construction. Accordingly, a gravity drainage system, sump pump or other conventional dewatering procedure, as deemed necessary by the field conditions, should be implemented throughout construction such that the groundwater is controlled and maintained at an elevation of at least 2 feet below the excavation bottom at all times. Every effort should be made to keep the excavations dry if water is encountered.

Drainage

Water should not be allowed to collect near the foundation areas of the building either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the proposed structure. Overall site area drainage is to be arranged in a

manner such that the possibility of water impounding below foundation areas and over the structural fill is prevented.

Excavations

In Federal Register, Volume 54, No. 209 (October, 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P." This document was issued to better insure the safety of workers entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or foundation excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced. If they are not followed closely, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person" as defined in "CFR Part 1926," should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. PSI is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred. If the excavations are left open and exposed to the elements for a significant length of time, desiccation of the clays may create minute shrinkage cracks which could allow large pieces of clay to collapse or slide into the excavation. Materials removed from the excavation should not be stockpiled immediately adjacent to the excavation, inasmuch as this load may cause a sudden collapse of the embankment.

Weather Considerations

The soils encountered at this site are known to be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. Care should be exercised during the grading operations at the site. Due to the fine-grained nature of the surficial soils, the traffic of

heavy equipment, including heavy compaction equipment, may very well create pumping and a general deterioration of those soils in the presence of water. Therefore, the grading should, if at all possible, be performed during a dry season. A layer of crushed stone may be required to allow the movement of construction traffic over the site during the rainy season. The contractor should maintain positive site drainage and if wet/pumping conditions occur, the contractor will be responsible to over excavate the wet soils and replace them with a properly compacted engineered fill. During wet seasons, limestone stabilization may be required to place engineer fill.

GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. Site exploration identifies actual subsurface conditions only at those points where samples are taken. A geotechnical report is based on conditions that existed at the time of the subsurface exploration. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding sections constitute PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

REPORT LIMITATIONS

The recommendations submitted in this report are based on the available subsurface information obtained by PSI and design details furnished by Ms. Kristine Griffith, of the City of Canton Engineering Dept. If there are any revisions to the plans for the proposed building structure or pavement areas, or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be retained to determine if changes in the recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the geotechnical recommendations for the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein, have been presented after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics and engineering geology. No other warranties are implied or expressed.

After the plans and specifications are complete, it is recommended that PSI be provided the opportunity to review the final design and specifications, in order to verify that the earthwork and recommendations are properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of the City of Canton Engineering Dept., in connection with the proposed Market Square project to be located at the northwest corner of Market Ave N & 3rd St NW in the City of Canton, Stark County, Ohio.

APPENDIX

Site Vicinity Map

Boring Location Plan

Boring Logs

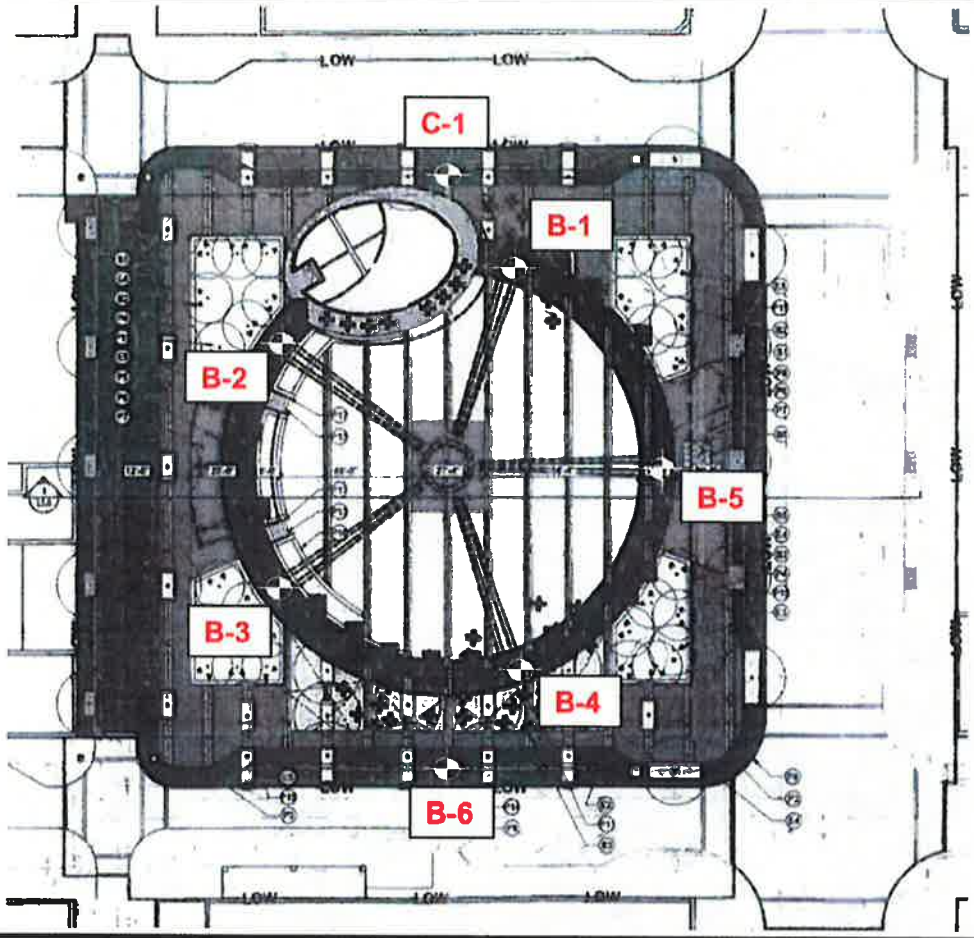
Reports of Soil Analysis

Core Photos

General Notes

USCS Soil Classification Chart

PSI Information To Build On Engineering • Consulting • Testing	**Proposed Market Square Project** **NWC of Market Ave N & 3rd St NW** **Canton, OH**	**Date: 2/23/2017** **Drawn By: KS** **Scale: NA**	**Site Vicinity Map** **PSI Project No: 01451259**



psi Information To Build On Engineering • Consulting • Testing	**Proposed Market Square Project** **NWC of Market Ave N & 3rd St NW** **Canton, OH**	**Date: 2/23/2017** **Drawn By: KS** **Scale: NA**	**Boring Location Plan** **PSI Project No: 01451259**

Professional Service Industries, Inc.
4579 Navarre Road, SW
Canton, OH 44706
Telephone: (330) 478-0081
Fax: (330) 478-3267

LOG OF BORING B-1

PSI Job No.: 01451259
Project: Market Square Structure (City of Canton)
Location: Market Avenue N & 3rd Street NW
Canton, Ohio

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location:

WATER LEVELS	
While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N In blows/ft / STRENGTH, tsf	Additional Remarks
	0					3" Topsoil	TOPSOIL				
				1	17	Medium Dense to Very Dense, Moist, Brown, Fine to Coarse SAND, Some Gravel, Little Silt, Little Brick Fragments, Trace Clay		9-11-15 N=26	8		
	5			2	9		FILL	22-26-48 N=74	6		
				3	18			16-15-16 N=31	6		Non-Plastic Fines=26.2%
				4	17			8-11-12 N=23	10		
	10					Medium Dense to Very Dense, Brown, Fine to Coarse SAND, With Gravel					
	15			5	19			7-12-14 N=26	6		
				6	17			12-19-15 N=34	3		
	20						SP				
	25			7	6			20-50-4 N=54	4		
				8	3	**Boulder Encountered at 28.5 feet		50/3	3		
	30										
	35			9	12			36-38-37 N=75	4		

Completion Depth: 35.0 ft
Date Boring Started: 2/28/17
Date Boring Completed: 2/28/17
Logged By: KS
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude:
Longitude:
Drill Rig: D-50
Remarks: Borings Backfilled with Auger Cuttings

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
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Canton, OH 44706
Telephone: (330) 478-0081
Fax: (330) 478-3267

LOG OF BORING B-2

PSI Job No.: 01451259
Project: Market Square Structure (City of Canton)
Location: Market Avenue N & 3rd Street NW
Canton, Ohio

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location:

WATER LEVELS	
While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0					4" Asphalt	ASPHALT			
						6" Gravel Base	GRAVEL BASE			
				1	12	Medium Dense to Very Dense, Brown, Moist, Fine to Coarse SAND, With Gravel, Trace Silt, Trace Brick Fragments		7-8-6 N=14	7	
	5			2	16		FILL	9-30-22 N=52	6	
				3	14			13-15-17 N=32	7	
				4	16	Stiff, Moist, Brown, Sandy SILT, With Gravel, Little Clay	ML	6-8-4 N=12	8	
	10			5	15	Medium Dense to Very Dense, Moist, Brown, Fine to Coarse SAND, With Gravel		7-6-9 N=15	7	
	15			6	14			10-13-14 N=27	7	
	20			7	17		SP	10-16-24 N=40	5	
	25			8	16			19-16-30 N=46	3	
	30			9	3	**Boulder Encountered at 33.5 feet		50/5	5	

STANDARD PENETRATION TEST DATA
N in blows/ft
Moisture
PL
LL
0 25 50
STRENGTH, tsf
Qu
Qp
0 2.0 4.0

Completion Depth:	33.9 ft
Date Boring Started:	3/2/17
Date Boring Completed:	3/2/17
Logged By:	KS
Drilling Contractor:	PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude:
Longitude:
Drill Rig: D-50
Remarks: Borings Backfilled with Auger Cuttings

The stratification lines represent approximate boundaries. The transition may be gradual.

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Canton, OH 44706
Telephone: (330) 478-0081
Fax: (330) 478-3267

LOG OF BORING B-3

PSI Job No.: 01451259
Project: Market Square Structure (City of Canton)
Location: Market Avenue N & 3rd Street NW
Canton, Ohio

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location:

WATER LEVELS	
While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0					4" Asphalt 6" Gravel Base	ASPHALT GRAVEL BASE			
				1	14	Medium Dense, Moist, Brown, Fine to Coarse SAND, Some Clay, Little Silt, Little Gravel, Trace Brick Fragments		16-12-10 N=22	6	
	5			2	18			7-8-10 N=18	10	Non-Plastic Fines=37.6%
				3	13		FILL	9-9-8 N=18	8	
				4	14			7-7-6 N=13	9	
	10									
				5	14	Very Dense to Dense, Moist, Brown, Fine to Coarse SAND, With Gravel, Trace Coal Fragments		12-18-35 N=53	4	
	15									
				6	5	**Boulder Encountered at 18.5 feet		50/5	5	
	20									
				7	17		SP	12-16-19 N=35	6	
	25									
				8	18			12-20-18 N=38	6	
	30									
				9	15			16-14-18 N=32	5	
	35									

STANDARD PENETRATION TEST DATA
N in blows/ft
Moisture, PL, LL (0, 25, 50)
STRENGTH, tsf
Qu, Qp (0, 2.0, 4.0)

Completion Depth:	35.0 ft
Date Boring Started:	3/2/17
Date Boring Completed:	3/2/17
Logged By:	KS
Drilling Contractor:	PSI, Inc.

Sample Types:
- Auger Cutting
- Split-Spoon
- Rock Core
- Shelby Tube
- Hand Auger
- Calif. Sampler
- Texas Cone

Latitude:
Longitude:
Drill Rig: D-50
Remarks: Borings Backfilled with Auger Cuttings

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
4579 Navarre Road, SW
Canton, OH 44706
Telephone: (330) 478-0081
Fax: (330) 478-3267

LOG OF BORING B-4

PSI Job No.: 01451259
Project: Market Square Structure (City of Canton)
Location: Market Avenue N & 3rd Street NW
Canton, Ohio

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location:

WATER LEVELS	
While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					12" Topsoil	TOPSOIL				
				1	18	Dense to Very Dense, Moist, Brown, Fine to Coarse SAND, Some Gravel, Little Silt, Little Clay, Trace Brick Fragments	FILL	5-17-29 N=46	7		Non-Plastic Fines=29.0%
				2	18			24-25-27 N=52	6		>>
	5			3	17	Dense, Moist, Brown, Silty SAND, With Gravel, Trace Brick Fragments		10-14-19 N=33	8		
				4	17		FILL	33-23-25 N=48	7		
	10										
				5	13	Medium Dense to Dense, Moist, Brown, Fine to Coarse SAND, With Gravel		10-9-14 N=23	4		
	15										
				6	19			18-17-20 N=37	4		
	20										
				7	15		SP	10-9-8 N=17	4		
	25										
				8	16			32-14-18 N=32	5		
	30										
				9	17			13-17-20 N=37	3		
	35										

Completion Depth: 35.0 ft
Date Boring Started: 2/28/17
Date Boring Completed: 2/28/17
Logged By: KS
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude:
Longitude:
Drill Rig: D-50
Remarks: Borings Backfilled with Auger Cuttings

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF BORING B-5

PSI Job No.: 01451259
Project: Market Square Structure (City of Canton)
Location: Market Avenue N & 3rd Street NW
Canton, Ohio

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location:

WATER LEVELS	
While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ● LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					3" Topsoil	TOPSOIL				
				1	17	Medium Dense to Dense, Moist, Brown, Fine to Coarse SAND, With Gravel, Trace Brick Fragments		9-12-17 N=29	8	×	
	5			2	18			14-14-21 N=35	7	×	
				3	17		FILL	25-25-21 N=46	6	×	
				4	18			12-18-16 N=34	8	×	
	10										
				5	18	Medium Dense to Very Dense, Moist, Brown, Fine to Coarse SAND, With Gravel		17-20-16 N=36	4	×	
	15										
				6	17			12-9-15 N=24	3	×	
	20										
				7	18		SP	49-36-37 N=73	7	×	>>
	25										
				8	17			34-24-37 N=61	5	×	>>
	30										
				9	18			34-25-23 N=48	4	×	
	35										

Completion Depth: 35.0 ft
Date Boring Started: 2/28/17
Date Boring Completed: 2/28/17
Logged By: KS
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude:
Longitude:
Drill Rig: D-50
Remarks: Borings Backfilled with Auger Cuttings

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF BORING B-6

PSI Job No.: 01451259
Project: Market Square Structure (City of Canton)
Location: Market Avenue N & 3rd Street NW
Canton, Ohio

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location:

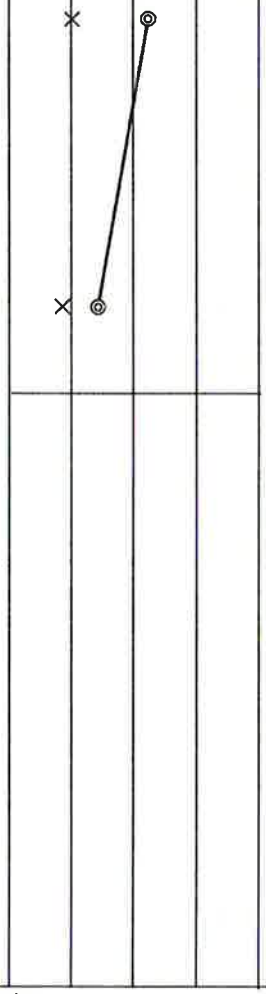
WATER LEVELS	
While Drilling	None
Upon Completion	None
Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0					3.5" Asphalt	ASPHALT			
						5" Brick	BRICK			
						Medium Dense, Moist, Brown, Fine to Coarse SAND, Some Gravel				
				1	18		SP	9-18-10 N=28	13	
						Medium Dense, Moist, Brown, Silty SAND, Some Gravel				
	5			2	18		SM	5-7-11 N=18	11	

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ■ PL ✚ LL
0 25 50

STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

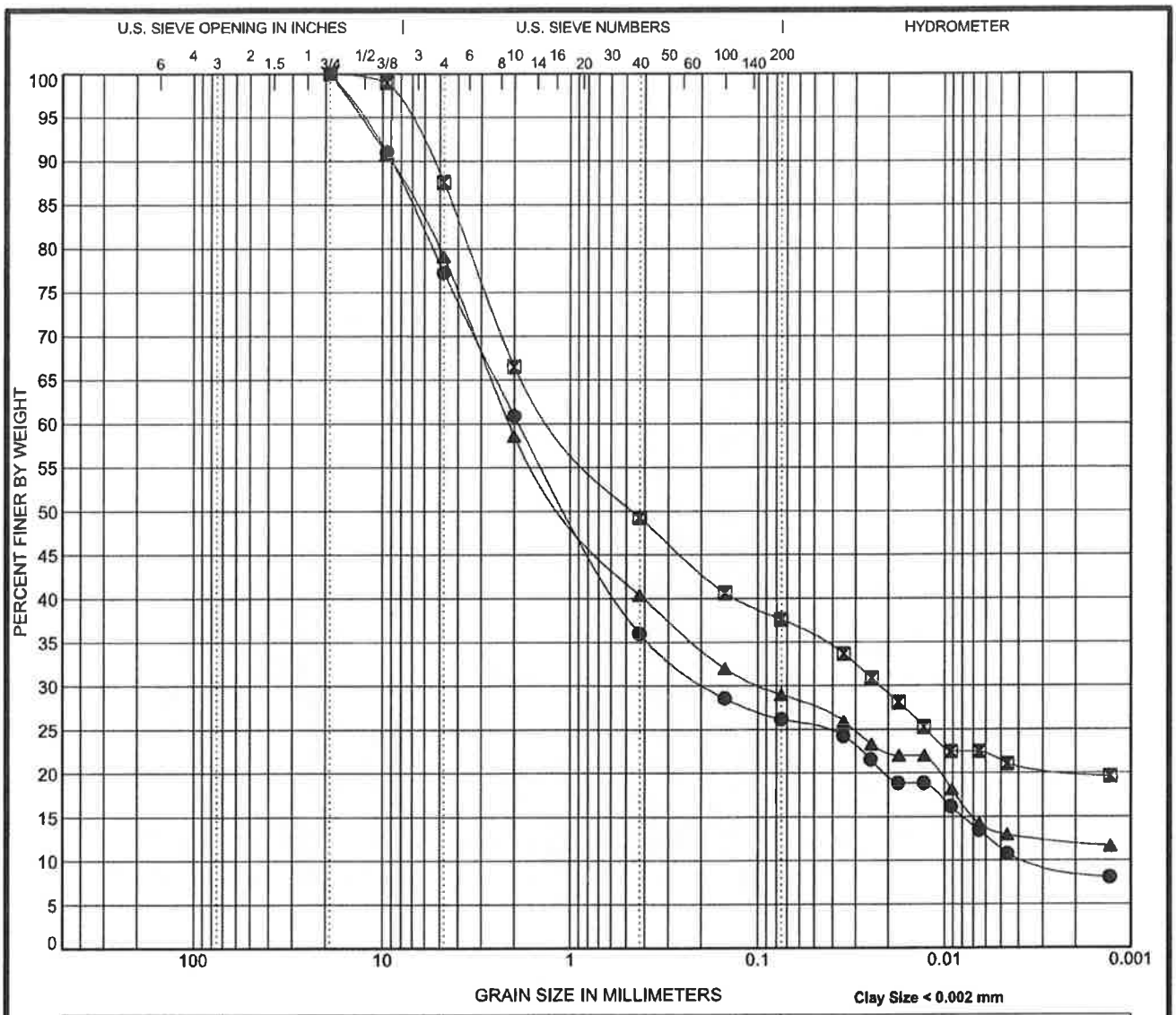


Completion Depth:	5.0 ft
Date Boring Started:	3/2/17
Date Boring Completed:	3/2/17
Logged By:	KS
Drilling Contractor:	PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude:
Longitude:
Drill Rig: D-50
Remarks: Borings Backfilled with Auger Cuttings

The stratification lines represent approximate boundaries. The transition may be gradual.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● B-1	6.8	Fine to Coarse SAND, Some Gravel, Little Silt, Trace Clay	NP	NP	NP	5.58	590.95
⊠ B-3	4.3	Fine to Coarse SAND, Some Clay, Little Silt, Little Gravel	NP	NP	NP		
▲ B-4	1.8	Fine to Coarse SAND, Some Gravel, Little Silt, Little Clay	NP	NP	NP		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	6.8	19	1.891	0.184	0.003	22.8	51.1	17.2	9.0
⊠ B-3	4.3	19	1.116	0.022		12.5	50.0	17.5	20.1
▲ B-4	1.8	19	2.125	0.095		20.9	50.1	16.9	12.1

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GRAIN SIZE DISTRIBUTION

Project: Market Square Structure (City of Canton)
PSI Job No.: 01451259
Location: Market Avenue N & 3rd Street NW
Canton, Ohio

Core: B-6
Measured Depth: 3.5" Asphalt, 5.0" Brick

PSI Information To Build On Engineering • Consulting • Testing	Proposed Market Square Project NWC of Market Ave N & 3rd St NW Canton, OH	Date: 3/15/2017 Drawn By: KS Scale: NA	Asphalt Core PSI Project No: 01451259

Core: C-1
Measured Depth: 3.5" Asphalt, 5.0" Brick

PSI Information To Build On Engineering • Consulting • Testing	Proposed Market Square Project NWC of Market Ave N & 3rd St NW Canton, OH	Date: 3/15/2017 Drawn By: KS Scale: NA	Asphalt Core PSI Project No: 01451259

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.002 mm to 0.075 mm
Clay:	<0.002mm to <0.005 mm depending on agency

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_u - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_u - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

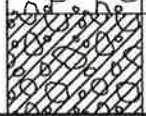
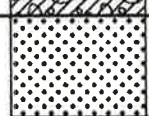
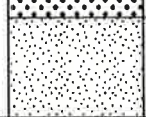
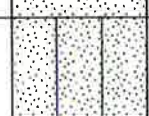
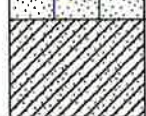
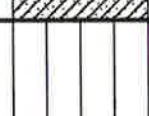
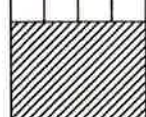
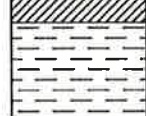
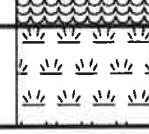
Slightly Weathered: Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.

Weathered: Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.

Highly Weathered: Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO 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 (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS)

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

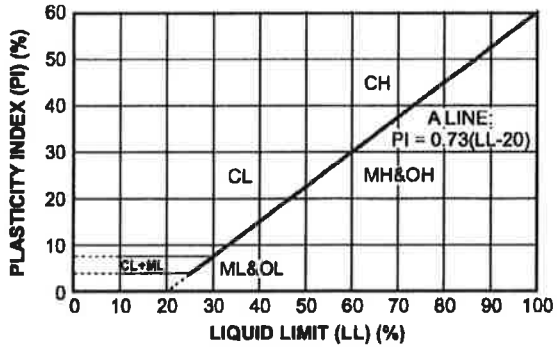
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with 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



Information To Build On
Engineering • Consulting • Testing
Federal ID 37-0962090
Professional Service Industries, Inc.
www.psiusa.com

CANTON BRANCH
CANTON, OH 44706
(330) 478-0081

CITY OF CANTON ENGINEERING
2436 30TH STREET NE
CANTON OH 44705
USA

CITY OF CANTON ENGINEERING
2436 30TH STREET NE
CANTON OH 44705

Customer #	Purchase Order	Project Number	Date	Invoice #	Page
1036156	00001801	01451259	03/31/17	00493643	0001

Project: MARKET SQUARE PROJECT

Date	Work Order Nbr	Description	Quantity	Unit Cost	Amount
02/24/17	01451259-1	MOB/DEMOB RIG (TRIP)	1.00	500.00	500.00
02/24/17	01451259-1	SOIL DRILL/SAMP 0-50' (FT)	179.00	17.00	3,043.00
02/24/17	01451259-1	ASPH CORE & DEPTH VERIF	2.00	75.00	150.00
02/24/17	01451259-1	BORING LAYOUT/ELEV	2.00	75.00	150.00
02/24/17	01451259-1	SO, CLASSIFICATION/MOISTURE	1.00	150.00	150.00
02/24/17	01451259-1	SO, ATTERBERG LIMITS (EA)	3.00	125.00	375.00
02/24/17	01451259-1	ENGINEER, PROJECT (HR)	12.00	85.00	1,020.00
02/24/17	01451259-1	ENGINEER, PROF/REG (HR)	2.00	135.00	270.00
02/24/17	01451259-1	ADMIN/CLERICAL (HR)	4.00	25.00	100.00

APPROVED
2017-00001801
CITY CIVIL ENGINEER
CANTON, OHIO
Date 4/10/17

Invoice Total:	$5,758.00
Balance Due:	$5,758.00

TERMS: NET 30 DAYS. A SERVICE CHARGE OF 1.5% PER MONTH, WHICH IS AN ANNUAL PERCENTAGE RATE OF 18% WILL BE ADDED TO ALL PAST DUE ACCOUNTS.

To assure proper credit to your account, please return with your check made payable to PSI

Please mail remittance to

Customer #	Invoice #	Project Number	Amount Enclosed
1036156	00493643	01451259	

Professional Service Industries, Inc.
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Chicago, IL 60674-8418