GEOTECHNICAL ENGINEERING REPORT

Proposed Pump Station & Force Main Improvements
2nd Street and Broadway Avenue
Wellsville, Columbiana County, Ohio

PSI Project No.: 0139641

August 8, 2011

PSI Information To Build On
Engineering • Consulting • Testing

August 8, 2011

Mr. Jim Saracco
Wellsville Village Administrator
1200 Main Street
Wellsville, Ohio 43968

Re: Report of Geotechnical Subsurface Exploration
Proposed Pump Station and Force Main Improvements
2nd Street and Broadway Avenue
Wellsville, Columbiana County, Ohio
PSI File Number: 0139641

Dear Mr. Saracco:

In compliance with your instructions, we have conducted a geotechnical subsurface exploration and analysis 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, foundation and floor slab installation 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.**

Please advise us of the appropriate time to discuss the field quality control and engineering services, and we will be pleased to meet with you at your convenience.

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

STATE OF OHIO
CHARLES R. DAUB
E-64434
REGISTERED PROFESSIONAL ENGINEER

Randy Daub, P.E.
Project Manager

A. Veeramani, P.E.
District Manager

1cc: Mr. Jim Saracco – Wellsville Village Administrator
2cc: Mr. Nate Wonsick, P.E. – GGJ, Inc.

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PROJECT INFORMATION

Project Authorization

This report presents the results of a geotechnical subsurface exploration and evaluation conducted for GGJ, Inc., in connection with the proposed pump station and force main improvements located on 2nd street, in the Village of Wellsville, Columbiana County, Ohio. PSI's services for this project were performed in accordance with PSI Proposal No. 0142-47084, dated June 14, 2011. The proposal included proposed scope of services, estimated cost, unit rates and PSI's General Conditions. Authorization to perform this exploration and analysis was in the form of signed acceptance of the aforementioned proposal and acknowledged by Mr. Jim Saracco, Wellsville Village Administrator, on June 30, 2011.

Project Description

Project information has been provided by Mr. Nate Wonsick, P.E. of GGJ, Inc. PSI received a complete set of project drawings (Project #09-044).

Based on the available information, it is understood that the proposed development will include the construction of a below-grade wet well/pump station measuring about 42 feet deep and 10 feet in (internal) diameter. Also, a single story force main building measuring about 288 square feet (24 feet by 12 feet) in plan area. The force main building will include a slab-on-grade generator room measuring about 192 square feet (12 feet by 16 feet) in plan area, and a 9-foot deep below-grade valve vault area about 96 square feet (8 feet by 12 feet) in plan area. The valve vault area will be connected with the proposed sanitary sewer pump. The proposed finished floor elevation for the generator room will be 681.0' MSL.

No structural load information was provided at the time of this report. However, it is assumed that wall and floor loads will be no more than about 3 kips per lineal foot and 100 pounds per square foot, respectively, for this submittal.

If any of the noted information is incorrect or has changed, please inform PSI immediately so that we may amend the recommendations presented in this report, if appropriate.

Purpose and Scope of Services

The purposes of this exploration were to evaluate the soil, rock and groundwater conditions at the site, and to provide geotechnical recommendations for foundation, floor slab construction, site preparation and other construction considerations. The scope of

the exploration and analysis included a project site reconnaissance, drilling two (2) test borings within the proposed development areas, completing a laboratory testing program and submitting an engineering analysis and evaluation of the subsurface materials.

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.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The site for the proposed development area upon which this subsurface exploration is completed, is located on 2nd street, in the Village of Wellsville, Columbiana County, Ohio. Specifically, the proposed development areas will be located on 2nd street, east of Broadway Avenue.

The site is within the existing roadway. There is an existing pump station and storage building located immediately east of the proposed site areas, as well as some existing mobile homes/trailers located immediately south. The existing site areas are relatively level with a maximum elevation difference of less than one foot within the proposed development area. Surface drainage was good at the time of the field drilling operations. 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 two (2) test borings, including one each for the wet well and pump station. The test borings were drilled to depths ranging from approximately 20 to 50 feet below the existing surface grades at the approximate locations shown on the Boring Location Plan presented in the *Appendix* of this report. The number and location of the test borings were selected by representatives of GGJ, Inc. prior to the field drilling operations. The test borings were located in the field by PSI utilizing normal taping procedures. However, the borings were moved approximately 10 feet north of the proposed locations due to concerns over existing utilities.

Field and laboratory testing were completed in general accordance with ASTM standards. 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*. Representative samples of the soil and rock 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 of the site at test boring locations B-1 and B-2 was covered with a layer of sand and gravel. The thickness of the surface materials should be expected to be variable throughout the site areas.

Below the sand/gravel, , fill materials consisting of sand with gravel and containing variable fractions of slag and concrete fragments were encountered to a depth of about 9 feet below the existing surface grades. Underlying the fill materials, natural soils were encountered to the terminal depths of about 20 to 50 feet below the existing surface grades at the test boring locations B-1 and B-2. The natural soils consisted of sandy lean clay with traces of rock fragments and well-graded sand with silt and gravel. The natural soils exhibited moisture contents ranging from about 11 to 29 percent. The natural soils exhibited a firm to very stiff consistency for cohesive soils and medium dense relative density for granular soils, based on the Standard Penetration tests.

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.

Groundwater Conditions

During the field drilling operations, groundwater was encountered at test boring locations B-1 and B-2 at a depth of about 18.5 feet below the existing surface grades. At the completion of field drilling activities, water was recorded at depths of about 17.2 feet and 12.2 feet, respectively, below the existing surface grades at test borings B-1 and B-2. However, it should be recognized that the groundwater levels fluctuate seasonally as a function of rainfall. Therefore, at a time of year different from the time of drilling, there may be a considerable change in the water table or the occurrence of water where not previously encountered. PSI recommends that the contractor determine the actual groundwater levels at the time of construction to determine groundwater impact.

SITEWORK 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 excessively wet 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 proofrolling 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, 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 to perform the site preparation, proofrolling and earthwork activities during a period of warm and dry weather. If site work is performed during a dry period, the need for soil stabilization, drainage and surface repairs can be significantly reduced. 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. Pyritic and/or potentially expansive materials, such as mine tailings, slag, shale fragments and soil mixed with more than 5 percent of shale fragments, should not be used as engineered fill material. Materials selected for use as engineered fill should 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 15, and a maximum particle size of 3 inches or less.

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 fill should be placed in layers of not more than 8 inches in thickness, with each layer being compacted to a minimum density of 100 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.

If the on-site natural soils are used for fill, close moisture content control will be required to achieve the recommended degree of compaction. We anticipate discing and aerating the soils during a warm, dry period may be necessary to lower the moisture content. If engineered fill placement must proceed during a wet or cool time of the year, it may likely be infeasible to re-use the on-site soils as engineered fill, and imported fill materials would be required. If wet or cool season earthwork is necessary, we recommend the use of imported fill materials such as ODOT No. 304 crushed aggregate.

FOUNDATION AND FLOOR SLAB RECOMMENDATIONS

Proposed Building Structure

Considering the subsurface conditions and the proposed construction, the proposed building structure can be founded on conventional shallow bearing isolated and/or continuous spread footing members.

Foundations supporting the proposed building structures, bearing on the existing natural/compacted engineered fill soils can be designed utilizing a maximum allowable soil bearing pressure of 2,000 psf. Foundations supporting individual columns should have a minimum width/length of 24 inches, and continuous wall foundations should have a minimum width of 18 inches. All perimeter foundations must be placed at a minimum depth of 42 inches below the exterior finished grades in order to protect against frost action. Interior foundations in the heated areas should bear at a depth of at least 18 inches below the floor slab elevation.

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.

Based on the provided structural loads, it is anticipated that total and differential foundation settlements will be less than 1.0-inch and 0.50-inch, respectively. However, actual settlements will be dependent upon the depth of the foundations, column spacing, structural loads and other related factors. The structural and architectural design should include provisions for liberally spaced, vertical control joints to minimize the affects of potential settlement.

Floor Slab Design and Construction

Preparation of floor slab subgrades should be in accordance with recommendations outlined in the *Site Preparation* and *Engineered Fill* sections of the report. If the materials at the finished subgrade elevations exhibit excessive moisture contents and unstable subgrade conditions, then undercutting and replacement of the objectionable soils should be performed to achieve firm subgrade support. Alternatively, the unstable soils can be stabilized by choking the exposed bearing surface with crushed limestone or similar coarse aggregate.

A capillary gravel layer (such as AASHTO #57 or equivalent) should be provided between the floor slab and the approved subgrade materials. The gravel layer should have a minimum thickness of 6 inches and should be properly compacted. Also, a vapor barrier is recommended below the floor slab as per ACI specifications. We recommend that a subgrade modulus (k) of 100 pci be used in floor slab design calculations.

Careful field control is to be exercised in finish grading operations in order to assure that subgrade tolerances are maintained. It is particularly important that no low sectors or depressions be allowed to exist within these areas, water may accumulate and lead to serious loss of supporting capacity.

The floor slab should be suitably reinforced, as per structural considerations, to make it as rigid as practical. Proper joints should be provided at the junctions of the slab and foundation system so that a small amount of independent movement can occur without causing damage. Large floor areas should be provided with joints at frequent intervals to compensate for concrete volume changes during curing and temperature changes.

Wet Well/Pump Station

Based on the provided information, the top-of-slab for the wet well will be located at a depth of about 40 feet (641' MSL) below the existing surface grades. The results of the test boring B-1 indicate that the proposed wet well will bear within the natural soils consisting of sandy lean clay with traces of rock fragments. An allowable bearing pressure of 3,000 psf should be used for the slab foundation design. Foundation bearing surface evaluations should be performed by a representative of PSI during excavation

prior to placement of reinforcing steel.

A gravel layer (such as AASHTO #57 or equivalent) should be provided between the slab foundations and the approved bearing surfaces. The gravel layer should have a minimum thickness of 12 inches and be properly compacted.

For the various subsurface formations encountered, the following soil parameters may be adopted for determining lateral earth pressures:

Type of Soil	Unit Weight (pcf)	Effective Strength	Undrained Strength
Granular Soils (Med Dense)	105	$\phi' = 28°$, C' = 0 psf	$\phi = 28°$, C = 0 psf
Cohesive Soils (Firm/V. Stiff)	110	$\phi' = 22°$, C' = 100 psf	$\phi = 0°$, C = 1,000 psf

The design groundwater depth should be determined based on the actual groundwater conditions encountered in the field during construction.

Construction specifications are to specifically preclude the possibility of long-term inundation of excavations and mechanical disturbance of the proposed bearing surfaces. In addition, it is recommended that concreting operations occur immediately after foundation excavation and that wherever practical, concrete be poured "neat" i.e., employing soil as forms.

Precautions must be taken in the design of the proposed structures to assure that the systems are flexible enough to absorb some settlement without impairment of its proper function. It is anticipated that maximum total foundation settlement will be less than 1.0 inch based on the total allowable loads.

Below Grade Wall Members

Exterior walls for the proposed pump station will be supporting soils to various heights; therefore, these wall members should be designed as earth retaining structures. It is unlikely that significant lateral deflections will occur, permitting active earth pressure to develop from the structure walls. Therefore, the walls should be designed for at rest earth pressure conditions. If granular material is used for backfill, an equivalent fluid at rest pressure value of 60 pounds per cubic foot can be used for drained backfill condition. It is further recommended that due allowance be given for any surcharge loads. Surcharge loads should be taken as an equivalent uniform load having a rectangular distribution with depth and a lateral earth pressure coefficient of 0.50. If granular material is not utilized as backfill, then an equivalent fluid at rest pressure value of 68 pounds per cubic foot and lateral earth pressure coefficient of 0.56 can be used for drained conditions. If no drainage is provided, the effects of saturated soil conditions need to be included in the

design. This would increase the equivalent fluid values to 92 pounds per cubic foot if granular backfill is utilized and 95 pounds per cubic foot if granular backfill is not utilized under saturated soil conditions.

Once the below grade walls are built, over-compaction of the materials against its backface is to be avoided under all circumstances so as to prevent undue lateral earth pressures.

Uplift Considerations

The results at the test borings B-1 and B-2 indicate that the groundwater table was initially encountered at a depth of about 18.5 below the existing surface grades. It must be recognized that, over a period of time, the backfill against the below grade structure will be saturated. Under this circumstance it is possible that the bottom slab will be subjected to hydrostatic uplift, which should be considered in the design. Uplift may be resisted by assuring that the dead load of the proposed structure counter balances the buoyant forces with an appropriate factor of safety. Sufficient waterproofing and water stops should be used to prevent in-flow seepage into the pump station.

CONSTRUCTION CONSIDERATIONS

Groundwater Control and Drainage

The groundwater was encountered at both test boring locations at a depth of about 18.5 below the existing surface grades during the field drilling operations. Therefore, groundwater will 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.

Water should not be allowed to collect near the foundation or floor slab 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 building and beneath the floor slab. Overall site area drainage is to be arranged in a manner such that the possibility of water impounding below slab-on-grade 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.

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 Mr. Nate Wonsick, P.E., Project Manager of GGJ, Inc. If there are any revisions to the plans for the proposed building structure, 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 Village of Wellsville for the specific application to the proposed Pump Station and Force Main Improvements on 2nd Street, in the Village of Wellsville, Columbiana County, Ohio.

APPENDIX I

Site Plan

Boring Location Map

General Notes

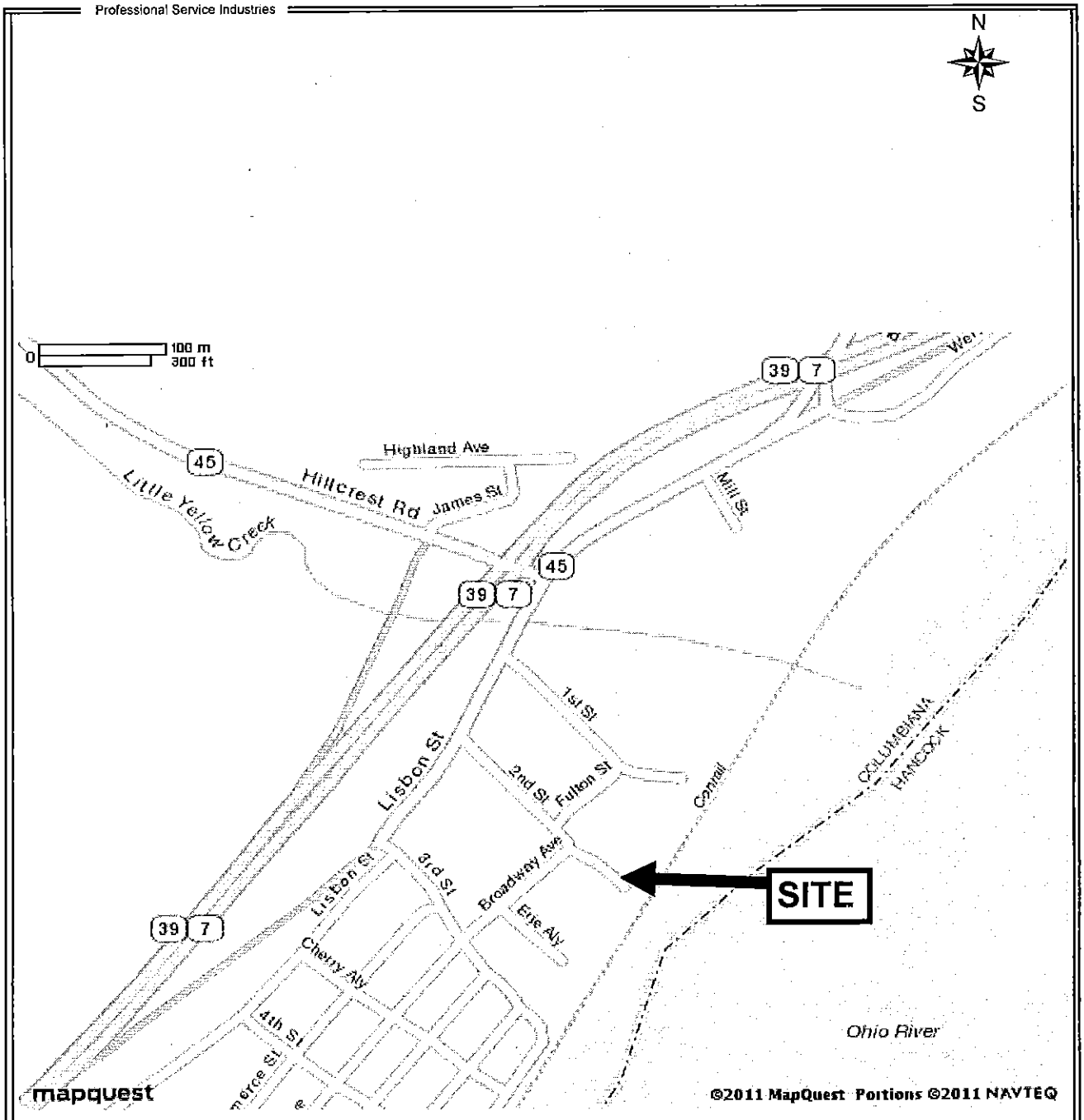
Boring Logs (B-1 and B-2)

Grain Size Analysis (2)

Atterberg Limits' Determination (1)

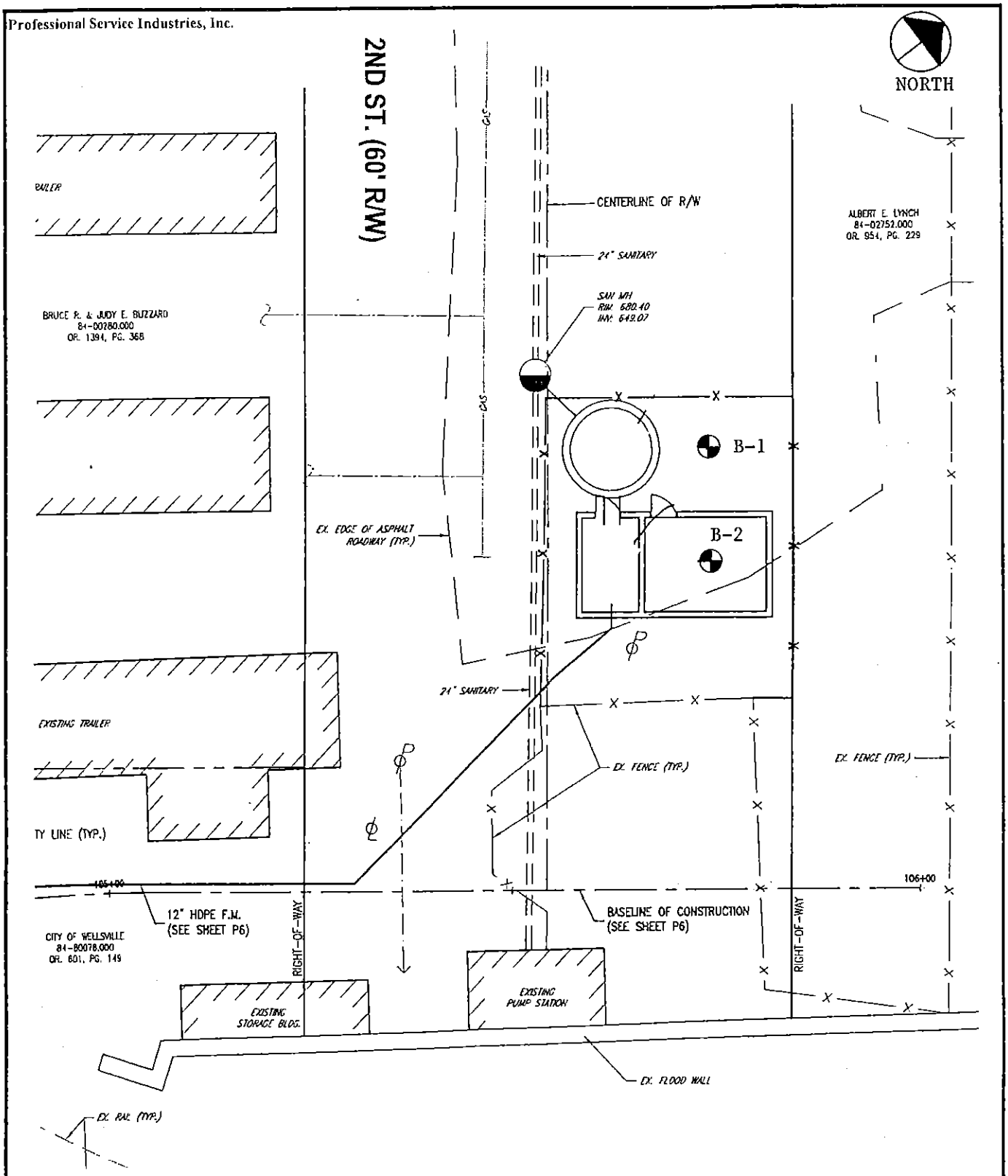
USCS Soil Classification Chart

Professional Service Industries



Project Name: Proposed Pump Station and Force Main Improvements 2nd Street Wellsville, Ohio	NOT TO SCALE Base map obtained from MapQuest.com	
	Project No.: 0139641	Date: August 4, 2011

Professional Service Industries, Inc.



PROJECT NAME	BORING LOCATION PLAN	
Proposed Pump Station and Force Main Improvements 2nd Street Wellsville, Ohio	PROJECT NO. 0139641	DATE August 4, 2011

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

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

Q_u: Unconfined compressive strength, tons per square foot (TSF)

Q_p: Penetrometer value, unconfined compressive strength (TSF)

M_c: Water content, %

LL: Liquid Limit, %

PI: Plasticity Index, %

δ_d: Natural dry density, pounds per cubic foot (PCF)

▼: Apparent groundwater level at time noted after completion

DRILLING AND SAMPLING SYMBOLS

SS: Split-spoon - 1 3/8" I.D., 2" O.D., except where noted.

ST: Shelby Tube - 3" O.D., except where noted.

AU: Auger Sample

DB: Diamond Bit

CB: Carbide Bit.

WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

TERM (NON-COHESIVE SOILS)	STANDARD PENETRATION RESISTENCE
Very Loose	0 - 2
Loose	2 - 4
Slightly Compact	4 - 8
Medium Dense	8 - 16
Dense	16 - 26
Very Dense	Over 26

TERM (COHESIVE)	Qu - (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00 +

PARTICLE SIZE

Boulders:	8 in. +	Coarse Sand:	5 mm - 0.6 mm	Silt:	0.074 mm - 0.005 mm
Cobbles:	8 in. - 3 in.	Medium Sand:	0.6 mm - 0.2 mm	Clay:	< 0.005 mm
Gravel:	3 in - 5 mm	Fine Sand:	0.2 mm - 0.074 mm		

Professional Service Industries, Inc.
1061 Trumbell Avenue, Suite G
Girard, OH 44420
Telephone: (330) 759-0288
Fax: (330) 759-0923

LOG OF BORING B-1

PSI Job No.: 0139641
Project: Pump Station & Force Main
Location: 2nd Street
Wellsville, Ohio

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

WATER LEVELS

While Drilling	18.5 feet
Upon Completion	17.2 feet
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			1	5	Medium Dense, moist, brown, Sand with Gravel, some slag, some concrete fragments (FILL)		6-9-9 N=18	9		
				2	2		FILL	4-5-5 N=10	11		
	5			3	3			5-8-3 N=11	8		
				4	16	Firm to Very Stiff, moist to wet, brown, Sandy Lean Clay, trace rock fragments (CL)		2-2-3 N=5	24		
	10			5	18			2-2-3 N=5	23		
	15			6	18			2-2-2 N=4	29		
	20			7	6			3-3-3 N=6	29		
	25			8	18		CL	3-3-3 N=6	25		
	30										

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Completion Depth: 50.0 ft
Date Boring Started: 7/20/11
Date Boring Completed: 7/20/11
Logged By: Randy Daub, PE
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:

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

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LOG OF BORING B-1

PSI Job No.: 0139641
Project: Pump Station & Force Main
Location: 2nd Street
Wellsville, Ohio

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

WATER LEVELS

White Drilling	18.5 feet
Upon Completion	17.2 feet
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
	30					Firm to Very Stiff, moist to wet, brown, Sandy Lean Clay, trace rock fragments (CL)					
				9	18			5-9-12 N=21	25		
	35										
				10	18			13-12-8 N=20	22		
	40										
				11	18			6-7-8 N=15	12		
	45					Medium Dense, moist, brown, Well-Graded Sand with Silt and Gravel (SW-SM)	SW-SM				
				12	18			4-8-13 N=21	11		Non-Plastic
	50					End of Boring @ 50'					
						Water Encountered @ 18.5'					
						Water at Completion @ 17.2'					

Completion Depth: 50.0 ft
Date Boring Started: 7/20/11
Date Boring Completed: 7/20/11
Logged By: Randy Daub, PE
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:

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

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LOG OF BORING B-2

Sheet 1 of 1

PSI Job No.: 0139641
Project: Pump Station & Force Main
Location: 2nd Street
Wellsville, Ohio

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

WATER LEVELS

While Drilling	18.5 feet
Upon Completion	12.2 feet
Delay	N/A

Station: N/A
Offset: N/A

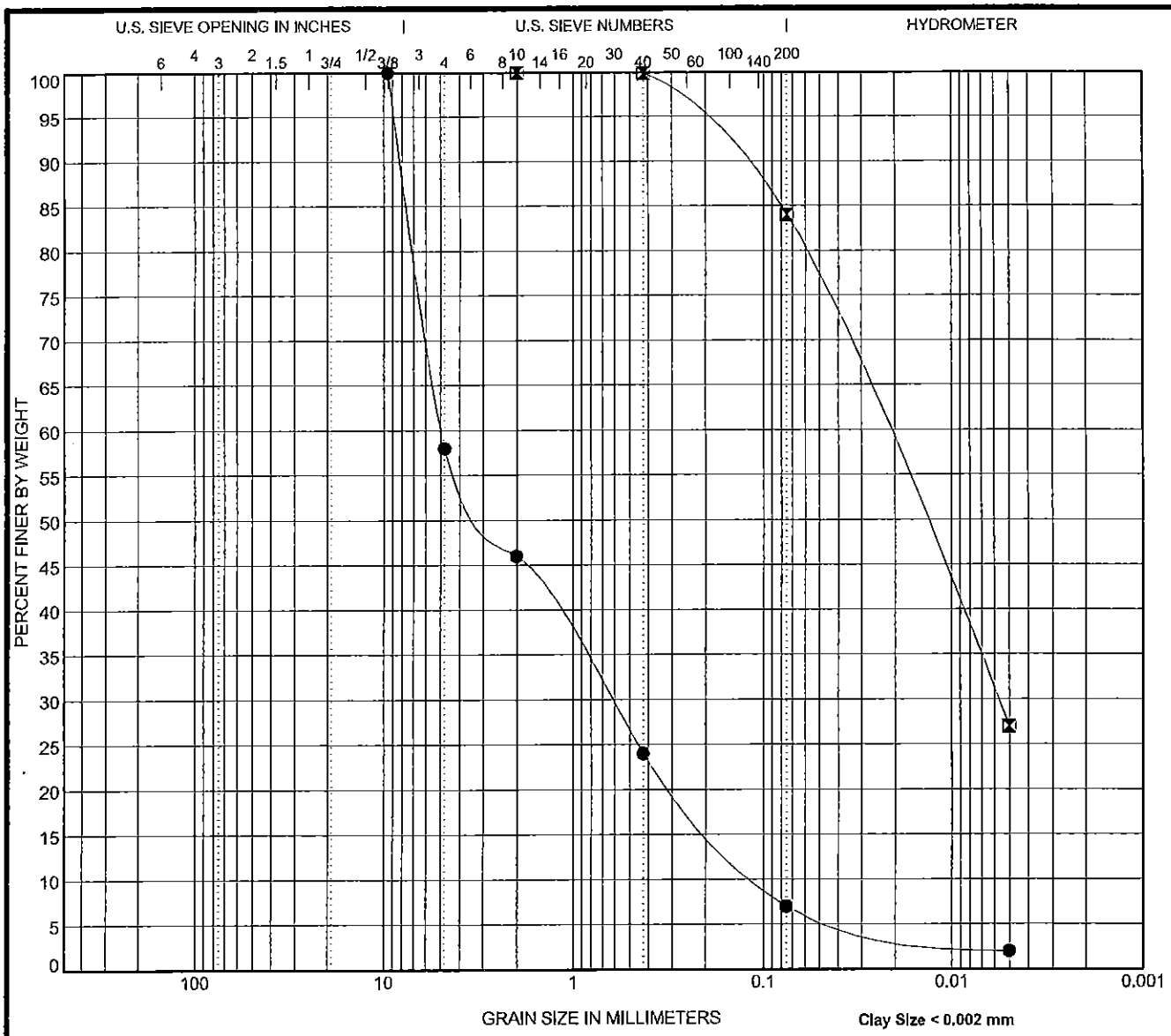
Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Loose to Medium Dense, moist, brown, Sand with Gravel, some slag (FILL)					
				1	6			5-12-7 N=19	12		
				2	3		FILL	2-1-2 N=3	10		
	5			3	8			5-13-7 N=20	29		
				4	18	Firm to Stiff, moist to wet, brown, Sandy Lean Clay, trace rock fragments (CL)		3-3-4 N=7	24		
	10										
				5	18		CL	4-4-6 N=10	12		LL = 32 PL = 21
	15										
				6	18			2-2-4 N=6	24		
	20					End of Boring @ 20'					
						Water Encountered @ 18.5' Water at Completion @ 12.2'					

Completion Depth:	20.0 ft
Date Boring Started:	7/20/11
Date Boring Completed:	7/20/11
Logged By:	Randy Daub, PE
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:

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



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

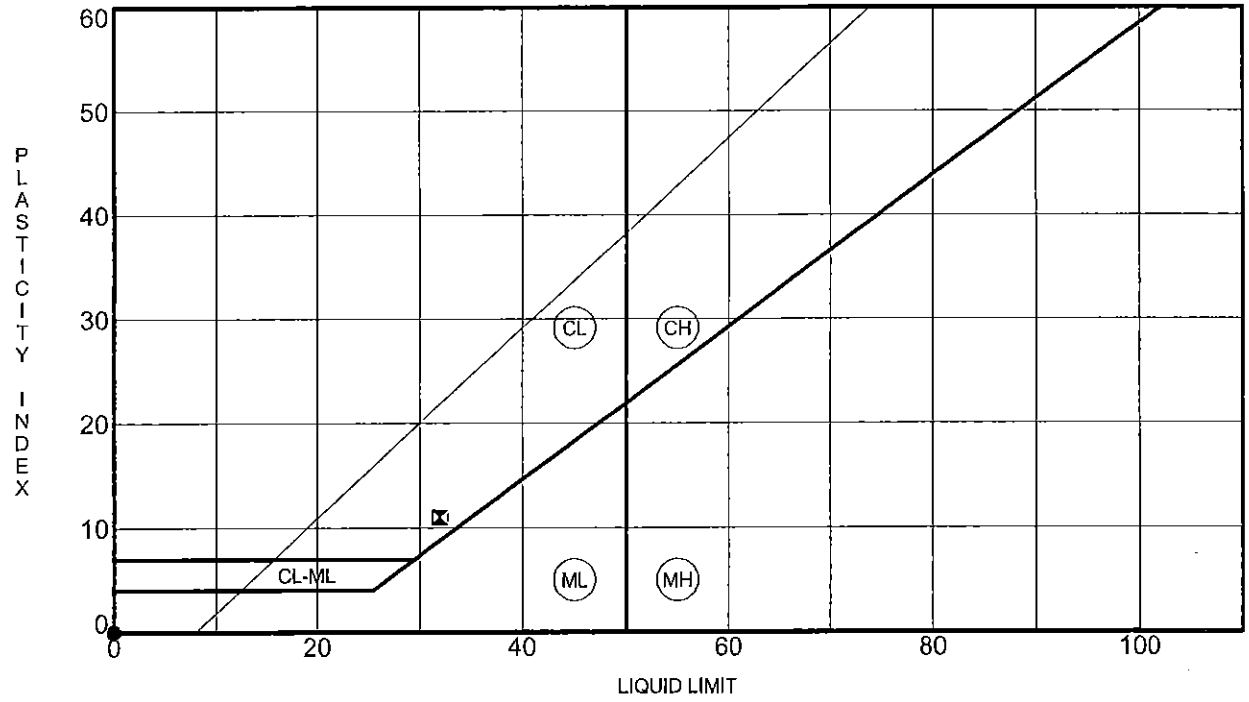
	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-1	48.5	Well-Graded Sand with Silt and Gravel (SW-SM)	NP	NP	NP	0.84	48.20
⊠	B-2	13.5	Sandy Lean Clay (CL)	32	21	11		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	48.5	9.5	4.909	0.648	0.102	42.0	51.0	7.0	
⊠	B-2	13.5	2	0.024	0.006		0.0	16.0	84.0	

Professional Service Industries, Inc.
1061 Trumbell Avenue, Suite G
Girard, OH 44420
Telephone: (330) 759-0288
Fax: (330) 759-0923

GRAIN SIZE DISTRIBUTION

Project: Pump Station & Force Main
PSI Job No.: 0139641
Location: 2nd Street
Wellsville, Ohio



	Boring	Depth (ft)	LL	PL	PI	Fines	Classification (*Visual)
●	B-1	48.5	NP	NP	NP	7.0	Well-Graded Sand with Silt and Gravel (SW-SM)
⊠	B-2	13.5	32	21	11	84.0	Sandy Lean Clay (CL)

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ATTERBERG LIMIT RESULTS

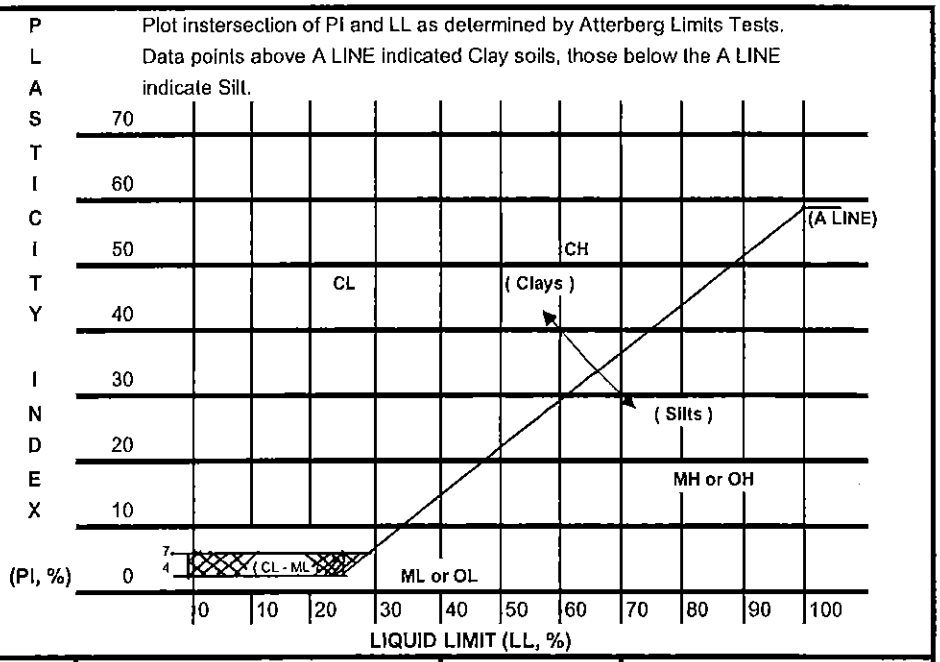
PSI Job No.: 0139641
Project: Pump Station & Force Main
Location: 2nd Street
Wellsville, Ohio

United Soil Classification System
ASTM Designation D - 2487

Information To Build On
Engineering • Consulting • Testing

Based upon percentage of material passing No. 200 sieve classify as:

Less than 5%	GW, GP, SW, SP
More than 12%	GM, GC, SM, SC
5% to 12%	Borderline, use dual symbols



Coarse Grained Soils (More than half of is larger than No. 200 sieve)	Gravels (More than 50% retained on No.4 sieve)	GW	Well graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}} > 4$	$1 < C_c = \frac{[D_{30}]^2}{D_{10} * D_{60}} < 3$
		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Does not meet all requirements for GW	
		GM	Silty gravels, gravel-sand-silt mixtures	below A Line, PI < 4	in shaded area 4 < PI < 7 Dual Symbols
		GC	Clayey gravels, gravel-sand-clay mixtures	above A Line, PI > 7	
	Sands (More than 50% passing a No. 4 sieve)	SW	Well graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}} > 6$	$1 < C_c = \frac{[D_{30}]^2}{D_{10} * D_{60}} < 3$
		SP	Poorly graded sands, gravelly sands, little or no fines	Does not meet all requirements for SW	
		SM	Silty sands, sand-silt mixtures	below A Line, PI < 4	in shaded area 4 < PI < 7 Dual Symbols
		SC	Clayey sands, sand-clay mixtures	above A Line, PI > 7	
Fine Grained Soils (More than half of material is smaller than No. 200 sieve)	Silts & Clays (LL less than 50)	ML	Inorganic silts, 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 & Clays (LL greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, plastic silts		
		CH	Inorganic clays of high plasticity fat clays		
		OH	Organic clays of medium to high plasticity		
	Highly Organic Soil	Pt	Peat and other highly organic soils		