Professional Service Industries, Inc.
821 Corporate Court, Waukesha, WI 53189
Phone: (262) 521-2125
Fax: (262) 521-2471

July 27, 2023

Strand & Associates, Inc.
126 North Jefferson Street, Suite 350
Milwaukee, WI 53202

Attn: Ms. Emily Rowntree, P.E
Municipal Discipline Coordinator

Re: Subsurface Exploration and Evaluation
Brighton Dale Park Force Main Replacement
Kansasville, WI
PSI Project No. 00523222-R1

Dear Ms. Rowntree:

The subsurface exploration and evaluation for the referenced project has been completed. An electronic copy of the report is being provided via email. Paper copies can be issued upon request. After you have had the opportunity of reading the report, please call at any time with any questions or comments you may have. Professional Service Industries, Inc. (PSI), an Intertek Company, appreciates the opportunity to be of service on this project, and looks forward to continuing as your geotechnical consultant during the design and construction phases, as well as your upcoming projects.

Sincerely,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Emily Broback
Project Manager

James M. Becco, P.E.
Regional Vice President

WISCONSIN
JAMES M.
BECCO
27254-6
EAGLE,
WI
PROFESSIONAL ENGINEER

The above Professional Engineering Seal and signature is an electronic reproduction of the original seal and signature. Original hard copies can be provided upon request. This electronic reproduction shall not be construed as an original or certified document.

GEOTECHNICAL ENGINEERING SERVICES REPORT

For the:

Brighton Dale Park Force Main Replacement
Kansasville, WI

Prepared for:

Strand & Associates, Inc.
126 North Jefferson Street, Suite 350
Milwaukee, WI 53202

Prepared by:

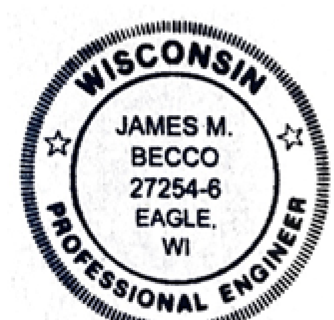
Professional Service Industries, Inc.
821 Corporate Court, Waukesha, WI 53189
Phone: (262) 521-2125
Fax: (262) 521-2471

July 27, 2023

PSI Project No. 00523222-R1

Emily Broback
Project Manager

James M. Becco, P.E.
Regional Vice President
Geotechnical Services



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INTRODUCTION

General

This report presents the results of the subsurface exploration for the proposed Brighton Dale Park force main replacement project in Kansasville, Wisconsin. The work was performed for Strand & Associates, Inc., at the request of Ms. Emily Rowntree.

Purpose

The purpose of this study was to evaluate the subsurface conditions at specific boring locations and to establish parameters for use by the engineers in preparing the utility installation designs for the proposed project.

Scope

The scope of services included the subsurface exploration, an evaluation of soil characteristics by field and laboratory testing, and an evaluation of the data obtained. Subgrade preparation recommendations and construction considerations are also provided. The scope of the field work, including the number and depth of the borings was determined by PSI.

Authorization

The description of services and authorization to perform this subsurface exploration and evaluation were in the form of signed PSI Proposal No. 401672, dated June 14, 2023. The general conditions for the performance of the work were referenced in the proposal. This report has been prepared on behalf of, and exclusively for the use of Strand & Associates, Inc. The information contained in this report may not be relied upon by any other parties without the express written consent of PSI, and acceptance by such parties of PSI's General Conditions.

SITE AND PROJECT DESCRIPTION

Site Features

The proposed project area is located within Brighton Dale Park which is located at the southwest corner of 7th Street and 248th Street, in Kansasville, Wisconsin. The project begins approximately 930 feet west of 248th Street and 1630 feet south of 7th Street and extends along the east side a paved parkway approximately 1160 feet north towards 7th Street. The project site is surrounded by wooded areas on the north and east and golf courses to the west and south. Aerial photos viewed on Google Earth indicate that the subject site has remained relatively similar in appearance to that described herein since at least April of 2000. The subject site is depicted on the enclosed Boring Location Plan (Figure 1). The topography of the site slopes down to the north with an elevation difference between the borings of about 24 feet (EL. 832 to EL. 808).

Project Description

Based on the information provided, the proposed project consists of the installation of a new force main to replace the existing force main. The new utility alignment is generally adjacent to the existing parkway and will cross wetland areas as well as 2 streams. Installation of the new force main is planned to be by horizontal directional drilling (HDD). The installation depth is planned to range from 6 to 15 feet (EL. 801 to EL. 827) below existing grade. Planned pipe type, diameter, and other details were not provided. The existing force main will be abandoned in place.

When additional information becomes available, and/or if any of the information changes or differs from that provided herein, PSI must be notified in order to determine if any report revisions are necessary.

EXPLORATION AND LABORATORY PROCEDURES

Scope Summary

The field and laboratory data utilized in the evaluation of the subsurface materials was obtained by drilling exploratory test borings, securing soil samples by the split-spoon sampling method, and subjecting the samples to standard laboratory testing.

Field Exploration

Four (4) soil test borings were performed for this project. The borings were drilled to a planned depth of about 25 feet below existing grade. The number, depth, and location of the borings were determined by PSI. The borings were staked in the field by PSI utilizing a handheld consumer grade GPS. They are estimated to be accurate to within several feet. The surface elevations shown on the logs were estimated by interpolation of a 1 foot contour map of the property, provided by the client. The elevations are estimated to be accurate to within about 1 foot.

The soil test borings were performed with a truck-mounted rotary drilling rig utilizing continuous flight augers to advance the boreholes. Representative soil samples were obtained by the Standard Penetration Test (SPT) method in general accordance with ASTM D-1586 procedures at 2-foot continuous intervals to the end of the borings. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty (30) inches, required to advance the split-spoon sampler one (1) foot into the soil. The sampler is lowered to the bottom of the drill hole and the number of blows recorded for each of the three (3) successive increments of six (6) inches penetration. The “N” value is obtained by adding the second and third incremental numbers. The SPT provides a means of estimating the relative density of granular soils and comparative consistency of cohesive soils, thereby providing a method of evaluating the relative strength and compressibility characteristics of the subsoils.

The SPT soil samples were transferred into clean glass jars immediately after retrieval and returned to the laboratory upon completion of the field operations. Samples will be discarded unless other instructions are received. All soil samples were visually classified in general accordance with the Unified Soil Classification System. A description of the subsurface conditions encountered at each boring location is shown on the enclosed Soil Boring Logs. After completion of the borings, the auger holes were backfilled to the ground surface with soil cuttings and bentonite chips.

A copy of the Soil Boring Logs and Boring Location Plan (Figure 1) are enclosed in the Appendix. The soil stratification shown on the logs represents the approximate soil conditions in the actual boring locations at the time of the exploration. The terms and symbols used on the logs are described in the General Notes found in the Appendix.

Laboratory Physical Testing

Soil samples obtained from the exploration were visually classified in the laboratory, and subjected to testing, which included moisture content determinations. Selected cohesive soil samples were tested in unconfined compression with a controlled strain loading rate and/or with a calibrated hand penetrometer to aid in evaluating the soil strength characteristics. The values of strength tests performed on soil samples obtained by the Standard Penetration Test Method (SPT) are considered approximate, recognizing that the SPT method provides a representative but somewhat disturbed soil sample.

The laboratory testing was performed in general accordance with the respective ASTM methods, as applicable, and the results are shown on the boring logs in the Appendix.

DESCRIPTION OF SUBSURFACE CONDITIONS

General

A description of the subsurface conditions encountered at the test boring locations is shown on the Soil Boring Logs. The lines of demarcation shown on the logs represent an approximate boundary between the various soil classifications; however, some variation is expected. It must be recognized that the soil descriptions are considered representative estimates for the specific test hole location, but those variations may occur between and beyond the sampling intervals and boring locations. Soil depths, pavement and layer thicknesses, and demarcation lines can be utilized for preconstruction planning, but should not be expected to yield exact and final quantities. A summary of the major soil profile components is described in the following paragraphs.

Subsurface Conditions

The surface materials encountered at the borings consisted of about 7 to 11 inches of topsoil comprised of black sand and sandy clay. Underlying the topsoil, the soils consisted of predominantly natural lean clay with silt seams and pockets, with occasional silt layers, to the termination depth of about 25 feet (EL. 807 to EL. 783) below existing grade. The natural cohesive soils were in a stiff to hard condition with unconfined compressive strengths ranging from 1.0 to 7.0 tons per square foot (tsf). The natural granular soils were in a medium dense condition with an N-value of 19 blows per foot (bpf).

The foregoing discussion of soil conditions on this site represents a generalized soil profile as determined at the test boring locations. A more detailed description and supporting data for each test location can be found on the individual Soil Boring Logs.

Groundwater Observations

Groundwater observations were made during the drilling operations and in the open boreholes upon completion of drilling and removal of the augers. No groundwater was observed within the borings during auger advancement or above the caved depth of the boreholes upon completion of drilling and removal of the augers.

The groundwater observations reported herein are considered approximate. It must be recognized that groundwater levels fluctuate with time due to variations in seasonal precipitation, lateral drainage conditions, and soil permeability characteristics. Longer term monitoring would be required and is recommended to further evaluate groundwater levels on this site.

PID Screening Results

At the request of the client, soil samples collected at the borings were screened for volatile organic vapor emissions in the field with a Photoionization Detector (PID). The PID is an electronic instrument that measures the relative concentration of volatile organic vapor emissions in the headspace of a container. The response of the instrument is dependent upon volatility, temperature, and the ionization potential of the compounds measured. It serves as one tool in selecting samples for analytical testing, and estimating zones of more highly affected soil. It gives a relative indication of the presence of volatile vapor emissions, but cannot quantify concentrations of individual compounds. It must be recognized that the meter is typically used on sites where petroleum contamination is suspected, or known to be present within subsurface soils. It is not typically utilized for confirming if a release has or has not occurred. Additionally, the PID is not considered to be an appropriate means of confirming the absence or presence of contaminants during a geotechnical exploration. PSI did not recommend the performance of PID screening, has made no evaluation, and offers no comment or recommendations on the results. Aluminum foil was placed over the split-spoon sample jars on-site before transporting the samples to the laboratory. The probe was subsequently inserted into the sample, through the aluminum foil, to take a reading in the laboratory.

CONSIDERATIONS AND RECOMMENDATIONS

General Development Considerations

In general, the natural soils encountered in the borings can generally be used for support of the force main. A discussion of construction guidelines and recommendations is included in the following sections.

Utility Installation Considerations

The soils encountered within the borings can generally be used for support of the planned force main. However, conditions may vary along the route, between and beyond the borings. Where conventional excavating is performed, such as for manholes, some undercutting of soft, unstable or otherwise unsuitable soils may be necessary. All pipelines and associated manholes or other structures must bear upon a suitable and stable subgrade of sufficient strength, or upon properly placed structural fill.

Pipe Material

In order to reduce the amount of pipe deflection, it must be recognized that proper selection and compaction of the pipe bedding and cover materials is essential (in areas where pipe will not be directionally drilled). This should be done in accordance with the Standard Specification for Sewer and Water Construction. Bedding material exhibiting a well-defined moisture density relationship should be compacted to 95 percent of ASTM D-698 (Standard proctor). Pipelines and associated manholes along the project route bearing upon suitable soils or upon properly placed and compacted structural fill can be designed to exert a net allowable bearing pressure of 1,500 to 3,000 pounds per square foot, dependent upon depth and location. The use of undercutting, in conjunction with a coarse stone working mat, may be necessary to achieve a suitable bearing subgrade, in at least some areas.

Installation Considerations

It is estimated the force main will be installed at depths ranging from about 6 to 15 feet (EL. 801 to EL. 827) below existing grade. The material encountered in the borings at these approximate elevations consisted predominantly of very stiff natural clay that can generally be used for support of the proposed force main. Interpolation of conditions between the borings can assist in design; however, soils may vary substantially between the borings, especially beneath waterways such as wetlands and streams, where organic soil deposits and/or soft bottom sediments generally not considered suitable for pipeline support are more commonly present. The force main must bear upon a suitable and stable subgrade of sufficient strength.

It is recommended that piping be installed a minimum of 15 feet below the bottom of streams, marshes, wetlands, rivers, and other similar features; and in general accordance with the manual of practice titled ASCE Pipeline Design for Installation by HDD, especially where less favorable drilling conditions occur, in which case a minimum of 25 feet of standard separation is recommended. However, the installation depth must also be sufficient to prevent the potential for drilling fluid loss to the surface. Additionally, the piping must be installed in accordance with design specifications, such as with regard to depth, proper slope, or other requirements.

It is expected that mud drilling will be utilized (and be required) for force main construction (especially beneath the streams) in order to prevent collapsing, thereby facilitating proper pipe installation.

Any entry and exit pits must be suitably braced, and an adequate dewatering effort (if necessary) be provided. Sheeting and bracing plans must be properly designed by qualified personnel and must be submitted to the design engineer and contractor prior to the excavation of the pits. The plans must include any surcharge loads, such as excavation or drilling spoils stockpiled in close proximity to the pits.

Pipe embedment depths must be sufficient enough to prevent drilling fluid loss under pressure to the surface of the site. This is especially of concern when installing below soft, loose, or organic soil deposits.

Pit Backfilling

It is recommended that well graded granular soils be utilized as backfill in any entry and exit pits to reduce the potential for consolidation and settlement of the backfill. All fill soils must be properly placed and compacted under engineered controlled conditions to provide suitable support for overlaying structures and roadways.

Silt, clay, organic, and wet granular materials are not recommended for use as backfill in structural areas due to the substantial difficulty of obtaining proper compaction in confined areas. Based on the foregoing, significant importing of suitable granular backfill materials may be necessary for the project. The suitability of soils for use as backfill must be evaluated prior to their use.

It is recommended that mechanical compaction be used to achieve uniform consolidation of the backfill material. As a general guideline, backfill within structural areas should be placed in 6-inch loose lifts and compacted to a minimum of 95 percent of the maximum dry density as determined by Standard Proctor (ASTM D698). Proper moisture control is essential to reduce the amount of compactive effort necessary to achieve the specified density.

Backfill of utility pits must not be performed with water, remnant drilling mud, or other sediments present. Granular backfill material should have a gradation that will filter protect the backfill material from the adjacent soils. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material.

All excavations must be properly shored and braced as required by applicable federal and state

OSHA codes, and as necessary to protect life and property. Utility construction should be performed in accordance with “The Standard Specifications for Sewer and Water Line Construction” for the State of Wisconsin.

Water should not be allowed to collect in the entry and exit pits during or after construction. A thick granular mat may be placed in the bottom of the entry/exit pits to help prevent disturbance of the excavated surface materials. Areas should be sloped to facilitate removal of collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around and into the excavations. The grades should be sloped away from the trench and surface drainage should be collected and discharged such that water is not permitted to saturate subgrades. Excavated soils, new fill, equipment, or other materials must not be stockpiled in close proximity to pit edges, so as to avoid excessive surcharge pressures.

<u>Groundwater Control</u>

Groundwater observations were made during the drilling operations and in the open boreholes upon completion of drilling and removal of the augers. No groundwater was observed within the borings during auger advancement or above the caved depth of the boreholes upon completion of drilling and removal of the augers.

Because no groundwater was encountered in the upper levels of the boreholes during the exploration, no major difficulties during installation of the force main are anticipated. A gravity drainage system and filtered sump pumps or other conventional dewatering procedures, should be adequate to control perched water if encountered.

Since portions of the anticipated subgrade soils are subject to softening when exposed to free moisture, every effort should be made to keep excavations dry. Site grading should be performed to direct runoff away from the construction area, so that the potential for the softening of the subgrade soils is reduced.

While little or no groundwater was encountered at the time the borings were drilled, seasonal variations in precipitation and site drainage conditions can cause groundwater to be present in the upper soils.

<u>Excavations and Site Drainage</u>

Sloping, shoring or bracing of excavation sidewalls will be necessary. Excavating may be difficult due to the instability of vertical slopes, and will therefore require a flattening of trench sides, or some other means of protection, to facilitate construction and to protect life and property. Major sloughing and caving should be expected within unprotected excavations, especially in the presence of water. The degree of excavation instability problems is dependent upon the depth and length of time that excavations remain open, excavation bank slopes, water levels and the effectiveness of any dewatering systems. All excavation work must be performed in accordance with OSHA and local building code requirements.

Where excavations encroach upon or extend below the groundwater or perched zones and into sand, silt, or soft clay, a substantially unstable subgrade may develop when the confining effect of the overburden is removed. Significant sloughing or caving of sidewalls may also occur. Extensive overexcavation of softened or loosened soils, in conjunction with the use of a crushed stone working mat, may be necessary to establish a stable bearing subgrade. Additionally, significantly widened excavations may result, or be required to maintain or achieve sidewall stability.

All excavations must be performed with caution and utilize methods which will prevent undermining or destabilization of buildings, utilities, pavements, or other structures. The use of a properly designed shoring and bracing, sheet piling, or underpinning system must be utilized as necessary to adequately protect utilities, pavements, and other structures. This must be performed by an experienced specialty contractor. Additionally, extreme care must be used during the installation of any bracing system, especially those using driven or vibratory methods, in order to avoid damaging existing buildings, utilities, and other structures. Consideration should be given to the performance of video and/or photographic documentation of the condition of nearby buildings, utilities, and other structures prior to installation.

Since the subgrade soils are generally sensitive to moisture, every effort should be made to provide adequate drainage across the site during construction, and to prevent ponding of runoff on the subgrade. These soils are also subject to erosion caused by runoff, and erosion control measures should be implemented where needed or required by local ordinances.

It is mandated that excavations, whether they be for utility trenches, basement excavations or footing excavations, be constructed in accordance with current Occupational Safety and Health Administration (OSHA) guidelines to protect workers and others during construction. PSI recommends that these regulations be strictly enforced.

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 29 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.

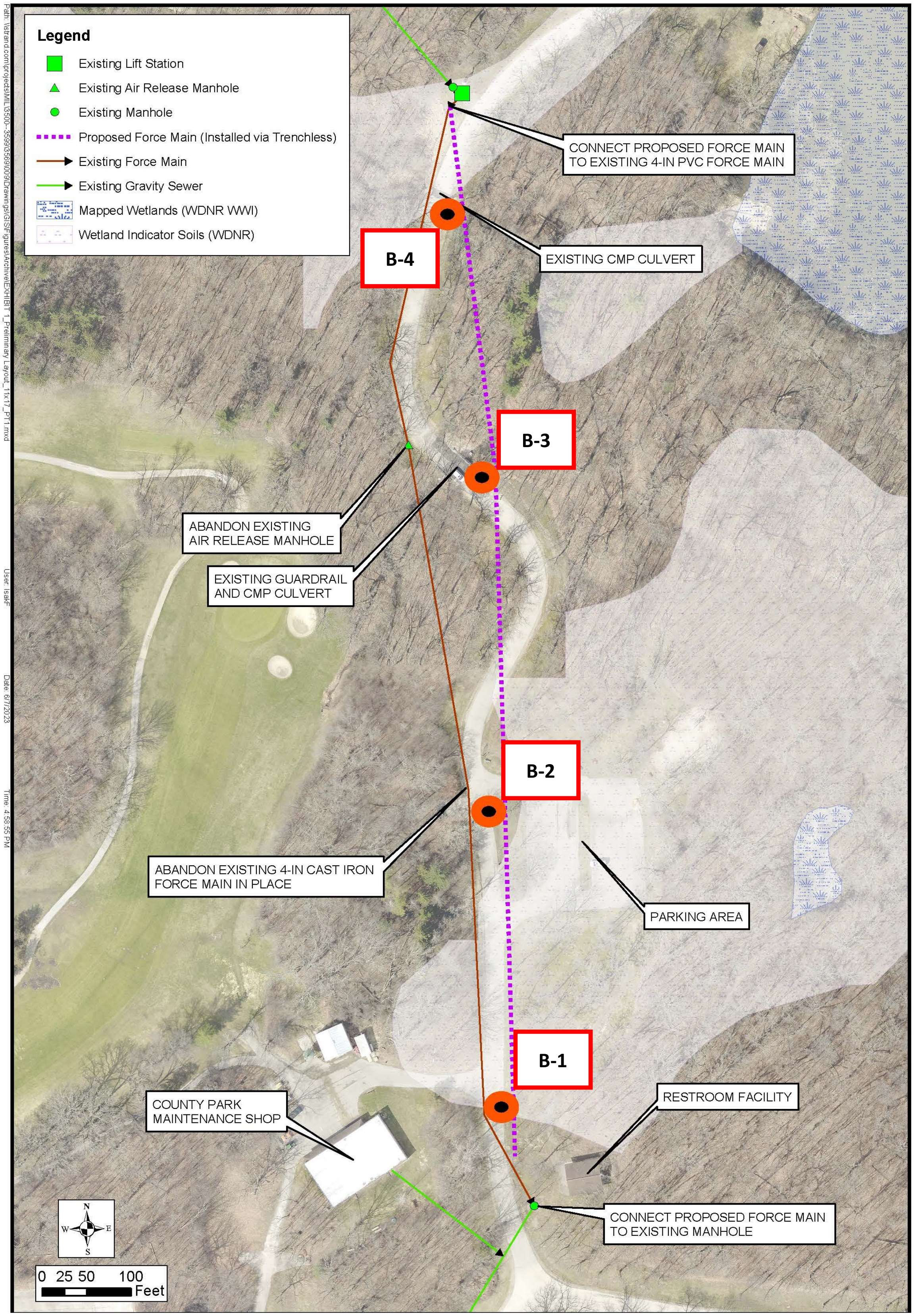
PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

GENERAL COMMENTS

This geotechnical exploration and subgrade evaluation has been prepared to aid in the evaluation of the soil conditions on this site. The recommendations presented herein are based on the available soil information and the preliminary project information provided. Any changes in the planned project activities should be brought to the attention of the soil engineer to determine if modifications in the recommendations are required. The final design plans and specifications should also be reviewed by the soil engineer to determine that the recommendations presented herein have been interpreted and implemented as intended.

This geotechnical study has been conducted in a manner consistent with that level of care ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. The findings, recommendations and opinions contained herein have been promulgated in accordance with generally accepted practice in the fields of foundation engineering, soils mechanics, and engineering geology. No other representations, expressed or implied, and no warranty or guarantee is included or intended in this report.

It is recommended that the earthwork and foundation operations be monitored by the soil engineer, to test and evaluate the subgrade stability, bearing capacities, and the selection, placement and compaction of controlled fills. The Wisconsin DOT Standard Specifications for Highway and Structure Construction can also serve as a guide in implementing the subgrade preparation and other earthwork operations.



intertek psi	Brighton Dale Park Force Main 248th Ave Kansasville, WI	SCALE: 1 inch = 60 feet (approx.) DATE: 6/27/2023
	BORING LOCATION PLAN	PSI PROJECT NO. 00523222

BORING B-1

DATE STARTED: 6/27/23
DATE COMPLETED: 6/27/23
COMPLETION DEPTH 25.0 ft
BENCHMARK: N/A
ELEVATION: 832 ft
LATITUDE:
LONGITUDE:
STATION: N/A **OFFSET:** N/A
REMARKS:

DRILL COMPANY: PSI, Inc.
DRILLER: PR **LOGGED BY:** AW
DRILL RIG: Truck-Mounted - Rig #431
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: 2-in SS
HAMMER TYPE: Automatic
EFFICIENCY N/A
REVIEWED BY:

Water
- While Drilling: Not Obsvd
- Upon Completion: Not Obsvd
- Delay: N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			Topsoil, Black Sandy Clay, Trace Gravel, Moist (10"± Thick)	TPSL		19	
830		1	14	Brown to Gray Lean Clay, With Silt Seams and Pockets, Trace Gravel, Moist	CL	7-6-8 N=14	25	>> Q_r = 5.0 tsf PID=0.4 ppm
		2	14			7-9-11 N=20	13	>> PID=0.4 ppm
	5							
825		3	18			10-12-15 N=27	14	Q_r = 1.5 tsf PID=0.4 ppm
		4	18			8-10-14 N=24	20	>> Q_r = 2.9 tsf PID=0.4 ppm
	10							
820								
		5	18			8-9-12 N=21	17	Q_r = 4.3 tsf PID=0.4 ppm
	15							
815								
		6	12			7-7-8 N=15	18	PID=0.4 ppm
	20							
810								
		7	16			6-6-7 N=13	19	Q_r = 2.5 tsf PID=0.4 ppm
	25			End of Boring at 25' Cave-In at 5.5'				

STANDARD PENETRATION TEST DATA: N in blows/ft ◎; × Moisture; PL; LL; scale 0 – 25 – 50
STRENGTH, tsf: ▲ Qu; ✳ Qp; scale 0 – 2.0 – 4.0

intertek psi
Professional Service Industries, Inc.
821 Corporate Court, Suite 100
Waukesha, WI 53189
Telephone: (262) 521-2125

PROJECT NO.: 00523222
PROJECT: Brighton Dale Park Force Main
LOCATION: 25253-26053 CTH BB
Kansasville, WI

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

BORING B-2

DATE STARTED:	6/27/23	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	6/27/23	**DRILLER:** PR	**LOGGED BY:** AW
COMPLETION DEPTH	25.0 ft	**DRILL RIG:**	Truck-Mounted - Rig #431
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	822 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	
REMARKS:			

Water

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
822	0			Topsoil, Black Sandy Clay, Moist (11"± Thick)	TPSL		15	
		1	14	Brown to Gray Lean Clay, With Silt Seams and Pockets, Trace Gravel, Moist	CL	3-4-5 N=9	16	Q_r = 3.1 tsf PID=0.4 ppm
		2	16			7-7-9 N=16	14	Q_r = 5.8 tsf PID=0.4 ppm
	5							
815		3	18			10-14-19 N=33	18	Q_r = 5.6 tsf PID=0.4 ppm
		4	18			8-11-15 N=26	16	Q_r = 7.0 tsf PID=0.4 ppm
	10							
810								
		5	18			6-8-9 N=17	18	Q_r = 4.3 tsf PID=0.4 ppm
	15							
805								
		6	18			4-5-7 N=12	19	Q_r = 2.1 tsf PID=0.4 ppm
	20							
800								
		7	18			4-6-9 N=15	18	Q_r = 2.7 tsf PID=0.4 ppm
	25			End of Boring at 25'				
				Cave-In at 7.5'				

STANDARD PENETRATION TEST DATA: N in blows/ft ◎; × Moisture; PL; LL (0 – 25 – 50). STRENGTH, tsf: ▲ Qu; ✳ Qp (0 – 2.0 – 4.0).

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821 Corporate Court, Suite 100
Waukesha, WI 53189
Telephone: (262) 521-2125

PROJECT NO.: 00523222
PROJECT: Brighton Dale Park Force Main
LOCATION: 25253-26053 CTH BB, Kansasville, WI

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

BORING B-3

DATE STARTED:	6/27/23	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	6/27/23	**DRILLER:** PR	**LOGGED BY:** AW
COMPLETION DEPTH	25.0 ft	**DRILL RIG:**	Truck-Mounted - Rig #431
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	813 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	
REMARKS:			

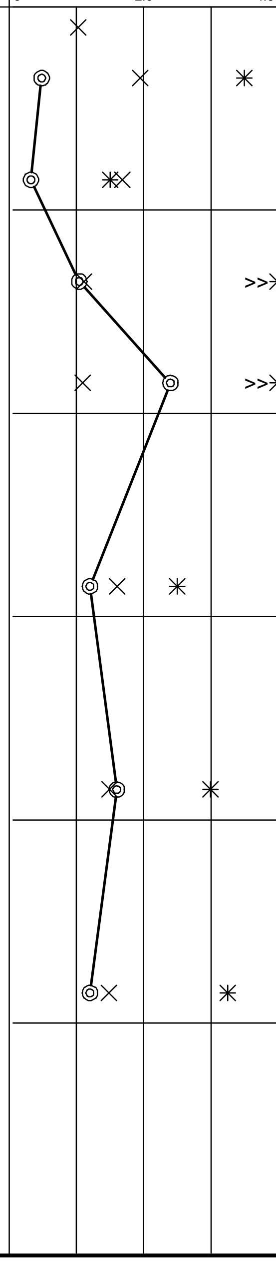
Water

While Drilling		Not Obsvd
Upon Completion		Not Obsvd
Delay		N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
813	0				Topsoil, Black Sand, Moist (7"± Thick)	TPSL		13	
					Brown to Gray Lean Clay, With Silt Seams and Pockets, Trace Gravel, Moist	CL			
		SS	1	14			3-3-3 N=6	24	Q_r = 2.2 tsf PID=0.4 ppm
810		SS	2	16			2-2-2 N=4	21	Q_r = 0.8 tsf PID=0.4 ppm
	5	SS	3	10			2-3-10 N=13	14	Q_r = 4.3 tsf PID=0.4 ppm
805		SS	4	18			11-13-17 N=30	14	Q_r = 6.0 tsf PID=0.4 ppm
	10								
800		SS	5	18			6-7-8 N=15	20	Q_r = 1.3 tsf PID=0.4 ppm
	15								
795		SS	6	18			7-9-11 N=20	19	Q_r = 3.1 tsf PID=0.4 ppm
	20								
790		SS	7	18			5-6-9 N=15	18	Q_r = 2.8 tsf PID=0.4 ppm
	25				End of Boring at 25'				
					Cave-In at 6'				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0



intertek psi

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Telephone: (262) 521-2125

PROJECT NO.: 00523222
PROJECT: Brighton Dale Park Force Main
LOCATION: 25253-26053 CTH BB
Kansasville, WI

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

BORING B-4

DATE STARTED:	6/27/23	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	6/27/23	**DRILLER:** PR	**LOGGED BY:** AW
COMPLETION DEPTH	25.0 ft	**DRILL RIG:**	Truck-Mounted - Rig #431
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	808 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	
REMARKS:			

Water

While Drilling	Not Obsvd
Upon Completion	Not Obsvd
Delay	N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
808	0			Topsoil, Black Sandy Clay, Trace Gravel, Moist (11"± Thick)	TPSL		18	
		1	12	Brown to Gray Lean Clay, With Silt Seams and Pockets, Trace Gravel, Moist	CL	3-4-5 N=9	21	Q_r = 1.7 tsf PID=0.4 ppm
805		2	14			4-5-7 N=12	18	>> Q_r = 5.0 tsf PID=0.4 ppm
	5	3	18	Gray Silt, Trace Sand and Gravel, Moist	ML	7-8-11 N=19	5	PID=1.2 ppm
800		4	18	Gray Lean Clay, Trace Gravel, Moist	CL	7-11-17 N=28	18	PID=0.4 ppm
795	10	5	4			9-9-10 N=19		PID=0.4 ppm
790	15	6	0			4-6-7 N=13		
785	20	7	1			5-4-9 N=13		PID=0.4 ppm
	25			End of Boring at 25' Cave-In at 7'				

STANDARD PENETRATION TEST DATA: N in blows/ft ◎; × Moisture; PL; LL (0, 25, 50). STRENGTH, tsf: ▲ Qu; ✳ Qp (0, 2.0, 4.0)

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Telephone: (262) 521-2125

PROJECT NO.: 00523222
PROJECT: Brighton Dale Park Force Main
LOCATION: 25253-26053 CTH BB
Kansasville, WI

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

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.
RC: Rock Core
TC: Texas Cone
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:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

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

Description	Criteria
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 GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	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
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	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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