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May 25, 2023

Mr. Russ Kiviniemi
Cedar Corporation
604 Wilson Avenue
Menomonie, Wisconsin 54751

SUBJECT: Preliminary Subsurface Exploration and Evaluation
Proposed Yellowstone Industrial Park Expansion
Marshfield, Wisconsin
PSI Project No. 00952008

Dear Mr. Kiviniemi,

The preliminary subsurface exploration and site feasibility 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) 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.

Kalie M. Ress
Staff Geologist

Jeffrey A. Manninen
Branch Manager

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

PRELIMINARY SUBSURFACE EXPLORATION AND SITE FEASIBILITY EVALUATION

Proposed Yellowstone Industrial Park Expansion

Marshfield, Wisconsin

Prepared For:

Cedar Corporation

604 Wilson Avenue

Menomonie, Wisconsin 54751

May 25, 2023

PSI Project No. 00952008

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INTRODUCTION

General

This report presents the results of the subsurface exploration and site feasibility evaluation for the proposed Yellowstone Industrial Park expansion project, located in the City of Marshfield, Wisconsin. The work was performed for Cedar Corporation, at the request of Mr. Russ Kiviniemi.

Purpose

The purpose of this preliminary study was to evaluate the subsurface conditions at the site, and to provide subsurface information for general site feasibility and preliminary design planning for the proposed project. A comprehensive foundation evaluation and recommendations for specific structures, stormwater management designs, and for utilities and pavements, were beyond the scope of this preliminary site evaluation.

Scope

The scope of services included a site reconnaissance, the subsurface exploration, a determination of soil characteristics by field and laboratory testing, and an evaluation of the data obtained. The scope of the field exploration program, including the number, depth and locations of the borings, was determined by the client.

Authorization

The description of services and authorization to perform this subsurface exploration were in the form of a signed copy of PSI Proposal No. 394492, dated March 6, 2023. The general conditions for the performance of the work were referenced in the proposal. This preliminary report has been prepared on behalf of and exclusively for the use of Cedar Corporation. 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 subject site is comprised of two (2) vacant parcels totaling approximately 171 acres, located to the northeast (124 acres) and southeast (47 acres) of the intersection of Yellowstone Drive and Mallard Avenue, in the City of Marshfield, Wisconsin. At the time of the exploration, the subject site consisted of farm fields, generally covered with corn stubble. Trees are present along portions of the northern and eastern property lines of the northern parcel. The subject site is surrounded by the existing Yellowstone Industrial Park to the south and west, and farm fields with some wooded areas to the north and east. The topography of the site may be considered rolling with some relatively flat areas, with an elevation difference of about 19 feet between the borings.

Aerial photography from various years between 1998 and 2022 was reviewed on Google Earth. Throughout the series of photos, it appears that the subject site has remained relatively similar in appearance to existing. However, several of the photos are grainy and difficult to discern detail.

Project Description

From the information provided by the client, it is understood that the proposed project will consist of developing the site with industrial structures. For the purpose of this report, it is presumed that the buildings will be one (1) to two (2) story, without any below grade levels. The number, type and locations of planned structures, as well as design grades, were not available at the time of report preparation. The existing elevations across the site at the borings range from about EL. 1227.2 to EL. 1246.5. It is estimated that cuts and fills of several feet (possibly 5 to 10 feet) or more may be necessary. When additional information becomes available, including planned surface grades, utility depths, structure types and locations, and other details, PSI must be informed.

This preliminary exploration has been commissioned to evaluate the subsurface conditions across areas of the subject site and to provide subsurface information for general site feasibility and preliminary design planning for the proposed development. The number and spacing of the borings requested is not considered sufficient to serve as a conventional foundation evaluation for future buildings, or for more detailed planning with regard to pavements, utility depths and final surface grades. Additional borings are necessary and recommended across the site to assist in developing surface grades and establishing utility depths (especially considering the presence of weathered sandstone and weathered granite). Additional borings are also recommended and necessary within each of the proposed building footprints to further evaluate more specific soil conditions and provide subsequent recommendations at each building location.

EXPLORATION AND LABORATORY PROCEDURES

Scope Summary

The field 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 laboratory testing.

Field Exploration

Ten (10) soil borings to a depth of about 26.5 feet were planned for this project. Cedar Corporation staked the borings and provided ground surface elevations. The approximate locations of the borings performed are shown on the Boring Location Diagram (Figure 1), which is provided in the Appendix of this report.

The soil test borings were performed with an ATV-mounted drilling rig utilizing continuous flight hollow stem augers to advance the holes. Representative samples were obtained by the

Standard Penetration Test (SPT) method in general accordance with ASTM D-1586 procedures. Samples were secured at 2.5-foot intervals to a depth of 10 feet, and then at 5-foot 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 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. The soil samples were visually classified in general accordance with the Unified Soil Classification System (ASTM D-2488-75). After completion of the boring, the auger hole was backfilled to ground surface with bentonite chips.

A copy of the Soil Boring Logs and Boring Location Diagram (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 determination.

Selected cohesive soil samples were tested in unconfined compression 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 that variations may occur between and beyond the sampling intervals and boring locations. Soil depths, topsoil 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.

Soil Conditions

The surface of the site at each of the borings was covered with about 5 to 9 inches of clay topsoil. The topsoil at each of borings was generally underlain by clay soils, with varying amounts of silt, sand, gravel and sandstone fragments, to depths of about 7.5 to 25 feet (EL. 1206.2 to El. 1227.1) below ground surface at B-3, B-4, B-6, B-7, B-9 and B10; and to at least the termination depth at the remaining borings (26.5 feet). The clay soils were characterized by interbedded sand layers at most of the borings. It should be noted that some of the sand and clay soils at B-7 and B-8 were classified as possible weathered sandstone and possible weathered granite. The clay soils may be considered soft to very stiff with unconfined compressive strengths of 0.5 to 3.25 tons per square foot. The sand soils may be considered loose to dense with standard penetration resistance of 9 to 41 blows per foot.

The underlying materials at B-3, B-4, B-6, B-7, B-9 and B-10 consisted of weathered sandstone and weathered granite, to at least the termination depth of the borings. The weathered sandstone may be considered medium dense to extremely dense with standard penetration resistance of 11 blows per foot to 50 blows per 3 inches of sampler penetration. The weathered granite may be considered medium dense to extremely dense with standard penetration resistances of 17 blows per foot to 50 blows per 3 inches of sampler penetration.

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. Groundwater was encountered during auger advancement at depths ranging from about 5 to 20 feet (EL. 1212.3 to EL. 1230.5) below ground surface at each of the borings. Upon completion and removal of the augers, groundwater was measured in each of the borings at depths of about 3 to 19 feet (EL. 1212.3 to EL. 1236.9) below ground surface.

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 to further evaluate groundwater levels on this site.

EVALUATION AND RECOMMENDATIONS

General

The initial stages of the site development will typically consist of grading in preparation for building lot preparation, pavement construction and utility installation. The soils encountered in

the borings are generally considered suitable for the support of typical commercial and light industrial one (1) to two (2) story structures supported by conventional spread footings; and for the support of typical associated pavements and utilities.

Depending upon the locations of structures and site grades selected, substantial difficulty with groundwater, excavation instability and softening of subgrade soils may be experienced. An adequate dewatering effort, possibly in conjunction with the overexcavation of unstable zones, and the use of a crushed stone working mat, may be required. Substantial difficulty digging and longer excavation times may also be experienced on this site due to the presence of weathered sandstone and weathered granite. Refusal or near refusal conditions may also be experienced.

The preliminary evaluation of the initial development stages has been based on the engineering characteristics of the subsurface conditions encountered at the boring locations. Additional borings within the footprints of the proposed structures, and in utility and pavement areas, are recommended and considered essential to further evaluate the subsurface conditions and groundwater levels in order to provide subsequent recommendations. It must be recognized that the conditions encountered by the additional exploration may warrant an alteration of the preliminary foundation and soil bearing design recommendations presented in this report.

Site Preparation and Grading

The presence of organic topsoil, vegetation, trees and roots in the subgrade can adversely affect the serviceability of structural fills, foundations, floor slabs, pavements, and other structures placed upon them. Approximately 5 to 9 inches of topsoil were present on the surface of the site at the boring locations. However, some variation should be expected, especially within former agricultural fields, where tilling and other related operations can result in thicker pockets of topsoil, or topsoil having become intermixed within underlying soils. All topsoil, vegetation, trees, roots and other organic matter must be stripped from the areas of footings, floor slabs, pavements, sidewalks, and other structures.

The subject site is an agricultural field. If any remnant drain tiles are encountered during construction, it is generally recommended that they be tied into new drainage structures or otherwise be properly drained to a suitable area (in accordance with any applicable regulatory requirements or restrictions), since they may still actively drain areas of the subject site or adjacent properties.

After stripping the topsoil and cutting high areas of the site to the planned finished grade, and prior to the placement of new fill which may be placed to raise grades, the subgrade must be thoroughly proofrolled to detect unstable, yielding soils. This should consist of overlapping passes in a perpendicular grid pattern, with a fully-loaded tandem-axle dump truck, or other equipment of similar size and weight suitable for the surface conditions. Proofrolling should be performed in consultation with the geotechnical engineer at the time of construction. Some difficulty with subgrade preparation may be experienced, especially in wet or cold weather, or during thawing conditions. Additionally, instability can become more severe in silty and clayey materials, which are considered to be moderately to highly moisture sensitive. It is generally

recommended that earthwork be carried out during relatively warm, dry weather. Any soft, wet, or otherwise unstable zones which cannot be improved by scarification and aeration, must be removed and replaced with compacted structural fill, such as clean crushed stone, possibly in conjunction with the use of a geotextile fabric. Lime, lime kiln dust, fly ash, or Portland cement modification are additional remedial measures which can be considered for clayey and some silty soils. However, this must only be performed at the direction and under the supervision of the geotechnical engineer. A proper mix design must be performed prior to the performance of any modification. Substantial construction delays and difficulty with subgrade stabilization may be experienced during periods of wet and/or cool weather. Consideration should be given to installing construction roads to reduce disturbance to the sensitive subgrade soils.

Every effort must be made to keep excavations dry. If construction proceeds during wet weather, some additional over-excavation may be necessary. If weather permits, the soil could be dried and recompacted. A crushed stone working mat, possibly in conjunction with a geotextile fabric may also be feasible to help stabilize subgrades. Site grading runoff should be directed to catch basins, so that the potential for the softening of the foundation and pavement subgrade soils is reduced.

Where the removal of unsuitable bearing material is performed beneath proposed footings, the excavation must extend laterally beyond the perimeter of the foundation for a distance at least equal to the thickness of the fill below the footing bottom. This general guideline also applies to instances where a raised structural fill pad is constructed to achieve a bearing elevation greater than existing grades. The influence zone of footing stresses can be represented as an imaginary 45° line extending downward and outward from the footing bottom. All fill placed within this zone after cutting to firm soil must be properly engineered, from the bottom of the cut, up to the floor slab subgrade elevation.

Where site grades are raised in excess of 2 feet, the first lift of new fill must be placed so as to extend a minimum lateral distance of 5 feet beyond the planned top building pad dimension (for fills less than 5 feet in thickness), or for a distance equal to at least 1 foot laterally beyond the top pad dimension for every foot of fill thickness (for fills greater than 5 feet in depth). Subsequent lifts can then be placed on an approximate 1H:1V slope back up to the planned top perimeter dimension of the pad. Proper moisture control is essential to reduce the amount of compactive effort necessary to achieve the desired densities. In addition, proper placement and compaction of new fill to raise grades is essential for proper foundation support.

When a firm and stable subgrade is established, low areas may be raised to planned grades with properly compacted structural fill. Any new fill should be a clean granular soil, such as those materials meeting the gradations outlined in Section 209 or 305 of the State of Wisconsin Standard Specification for Highway and Structure Construction. If fine-grained soils, such as those with high silt or clay content are used, they should generally be placed over large open areas, where conditions are more favorable for the proper placement and compaction of such materials. It must be recognized that high silt or clay content materials are difficult to compact when placed at moisture contents beyond a few percent of the optimum moisture content. In addition, the near surface soils in some areas of the site are considered moisture sensitive; therefore, some difficulty with subgrade preparation should be expected,

especially if they become wet during construction. Fill must be placed in layers of not more than nine (9) inches in thickness, at moisture contents at or near optimum, and be compacted to a minimum density of 95 percent of the maximum dry density as determined by ASTM designation D-698 (Standard Proctor). The on-site sand soils with low amounts of fines may be suitable for use as structural fill, subject to moisture conditioning. However, some sorting may be required. If the clay soils are used as structural fill, they should generally be placed over large open areas, where conditions are more favorable for the proper placement and compaction of such materials. In addition, these soils may require extensive moisture conditioning. Silt, clay, and wet granular soils are not suitable for reuse as compacted fill in trenches, or adjacent to foundation stem walls or retaining walls.

It is recommended that well-graded granular soils be utilized as backfill in new utility trenches and along side below grade walls to reduce the potential for consolidation and settlement of the fill. All fill soils must be placed and compacted under engineering controlled conditions, to provide suitable support for overlaying structures and roadways. Additional guidance can be provided at the time of construction in the selection process for grade-raising fill and trench backfill.

The selection of fill materials for various applications should be done in consultation with the soils engineer. Similarly, the evaluation of the subgrade and placement and compaction of fill for structural applications should be monitored and tested by a qualified representative of the soils engineer.

Pavement Considerations

The location of proposed pavements and specific traffic type, frequency and loading conditions for the proposed development were not provided. The following paragraphs include a general discussion of various items related to pavement subgrade preparation.

In general, flexible pavements derive their strength from the characteristics of the subgrade soils (or new fills), the base course and the asphaltic concrete binder and surface mixtures. The soils encountered beneath the topsoil at the boring locations generally consisted of clay, with variable amounts of sand, silt and gravel. These soils have been assigned estimated visual AASHTO classifications A-6. These soils are generally rated as poor for pavement subgrade support based on their moderate to high shrink/swell potential, moderate to high frost susceptibility and relatively poor drainage characteristics. With proper subgrade preparation, these soils are estimated to have the following pavement subgrade design coefficients.

PAVEMENT SUBGRADE DESIGN COEFFICIENTS

AASHTO Soil Classification	**A-6**
Design Frost Index	**F-4**
Design Group Index	**15**
Soil Support Value	**3.8**
Estimated Subgrade Modulus (k)	**125**

These values are representative of the existing clay soils present at the boring locations. Some variations may be encountered and should be expected. In order to use the above values, all new fill used to raise low areas or replace unsuitable material must have pavement support characteristics that are equal to or better than the existing clay soils. The final design should be performed by a qualified engineer based on the intended pavement use, anticipated loading and subgrade conditions, and desired service life.

Utility Construction

In general, the on-site soils can be used for support of utility lines. However, some undercutting of soft, loose or otherwise unsuitable soils may be necessary on at least an isolated basis. Some difficulty with the stability of utility trenches may be experienced due to the presence of granular soils, especially in the presence of water. The use of shoring, bracing, or trench boxes will be required. Additionally, excavations encroaching upon or extending below the groundwater can become substantially unstable when the confining effect of the overburden is removed. Utility construction should be performed in accordance with "The Standard Specifications for Sewer and Water Line Construction" for the State of Wisconsin.

It is recommended that well graded granular soils, such as those specified in Tables 37 and 39 of "The Standard Specifications for Sewer and Water Line Construction for the State of Wisconsin", be utilized as backfill in utility trenches to reduce the potential for consolidation and settlement of the backfill. All fill soils must be properly placed and compacted under engineering controlled conditions to provide suitable support for overlaying structures and roadways. Silty and clayey soils, organic materials and wet granular soils are not recommended for use as backfill within utility trenches due to the substantial difficulty of obtaining proper compaction in confined areas.

As with all excavation work, all open cut trenches must be properly shored and braced as required by applicable federal and state OSHA codes, and as necessary to protect life and property.

Groundwater Considerations

Groundwater was encountered during auger advancement at depths ranging from about 5 to 20 feet (EL. 1212.3 to EL. 1230.5) below ground surface at each of the borings. Upon completion and removal of the augers, groundwater was measured in each of the borings at depths of about 3 to 19 feet (EL. 1212.3 to EL. 1236.9) below ground surface. Therefore, substantial difficulty with groundwater may be experienced. A filtered sump pump, or other conventional dewatering procedures, may be adequate to control isolated perched zones or excavations not extending more than a few inches below the groundwater. However, the use of a series of sumps and high capacity sump pumps, may be required for deeper excavations.

Since the foundation materials are subject to softening when exposed to free moisture, every effort should be made to keep excavations dry. Discharge water from roof drains should be directed away from the building, and the site grading direct runoff to catch basins, so that the potential for the softening of the foundation and pavement subgrade soils is reduced.

Seasonal variations in precipitation, site drainage conditions, soil permeability, and other factors can cause groundwater to be present in the upper soils at other times, including during construction.

Excavations and Site Drainage

Sloping, shoring or bracing of the excavation sidewalls will be necessary. Excavations 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. Sloughing and caving may occur within unprotected excavations. 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.

Weathered sandstone, possible weathered sandstone, possible weathered granite and weathered granite were encountered in several of the borings at depths ranging from about 5 feet to 25 feet (EL. 1206.2 to EL. 1227.1) below ground surface. Therefore, difficulty digging and longer excavation times may be experienced. It is recommended that test pits be performed as part of design planning to further evaluate the depth/elevation, and the type and excavatability of the materials; and to assist in establishing floor slab, ground surface and utility bearing elevations. Specialized removal techniques, such as ripping and/or blasting, may be required on this site dependent upon final surface elevations and resulting utility bearing or other bearing elevations. If blasting is performed, it is recommended that a specialty contractor be utilized to perform the blasting operations. Blasting can cause noise and vibration disturbance to neighboring structures, and must be performed using extreme caution. 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 any blasting. Following the blasting, the exposed subgrade must be observed by the geotechnical engineer to ensure that disturbance of the overburden is not excessive and that the blasted rock is sufficiently stable for piping, foundation or other support. It is possible that the blasting will result in several feet or more of “overblast”, where larger sized rock requiring removal will be present in the bottom of excavations. The larger rock must be removed and replaced with suitable granular fill, or must be crushed to suitable size for re-use. Proper placement and compaction will be necessary.

All excavations must be performed with caution and utilize methods which will prevent undermining or destabilization of slopes, buildings, utilities, pavements, sidewalks 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 buildings, 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. In addition, monitoring of such structures must be performed from the time of commencement and extending through completion of the installation activities.

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. Some difficulty digging may be experienced with increasing depth in some areas due to the presence of dense granular soils.

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; otherwise, workers could be in danger and the owner(s) and the contractor(s) 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 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.

Preliminary Foundation Design Recommendations

The following is a general overview of the subsurface conditions for the site, as it relates to foundation design, and can be used in preliminary site planning. It is recommended that a more in-depth investigation be conducted prior to construction to determine specific recommendations for each proposed structure.

Based on the data obtained at the borings for this preliminary study, the natural soils encountered below the topsoil at the borings are generally considered suitable for support of typical one (1) to two (2) story commercial and light industrial structures. Conventional spread footings may be used for support of structures when founded on suitable natural soils or structural compacted fill used to raise grades. Dependent upon location and bearing elevation; a net allowable soil bearing pressure in the range of 2,000 to 4,000 psf may be used for footings bearing on suitable natural soils or properly placed and compacted structural fill (or lean concrete mix). Some undercutting of soft, loose or otherwise unsuitable soils may be necessary on at least an isolated basis.

All perimeter foundations must be placed at a depth of at least four (4) feet (or deeper if required by local code or in accordance with customary practice) below the finished exterior grade for frost protection. All footings must be protected from the effects of frost if construction is carried out during winter months. Interior footings not subject to frost action may be placed at a shallower depth of at least eighteen (18) inches below the floor slab, provided they bear on suitable natural soils or engineered fills.

It is recommended that the footings supporting individual columns have a minimum dimension of 24 inches, and continuous footings have a minimum width of 18 inches, even if the maximum recommended allowable bearing pressure is not fully utilized. In order to minimize the effects of any slight differential movement that may occur due to variations in the character of the supporting soils and any variations in seasonal moisture contents, it is recommended that all foundations be suitably reinforced to make them as rigid as needed.

In general, the performance of foundation systems on this site will be dependent on the various factors discussed herein. The soil bearing pressures suggested herein should be used for preliminary planning only, in the evaluation of general site feasibility. As indicated previously, additional borings are recommended when the final structure locations and site grading have been determined.

Seismic Design Considerations

The soils encountered in the borings are considered to meet the criteria for Site Class C or D (depending on location) in accordance with 1613.2.5.2 of the International Building Code-2018 (which directs to the simplified design procedure outlined in ASCE 7 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures).

GENERAL COMMENTS

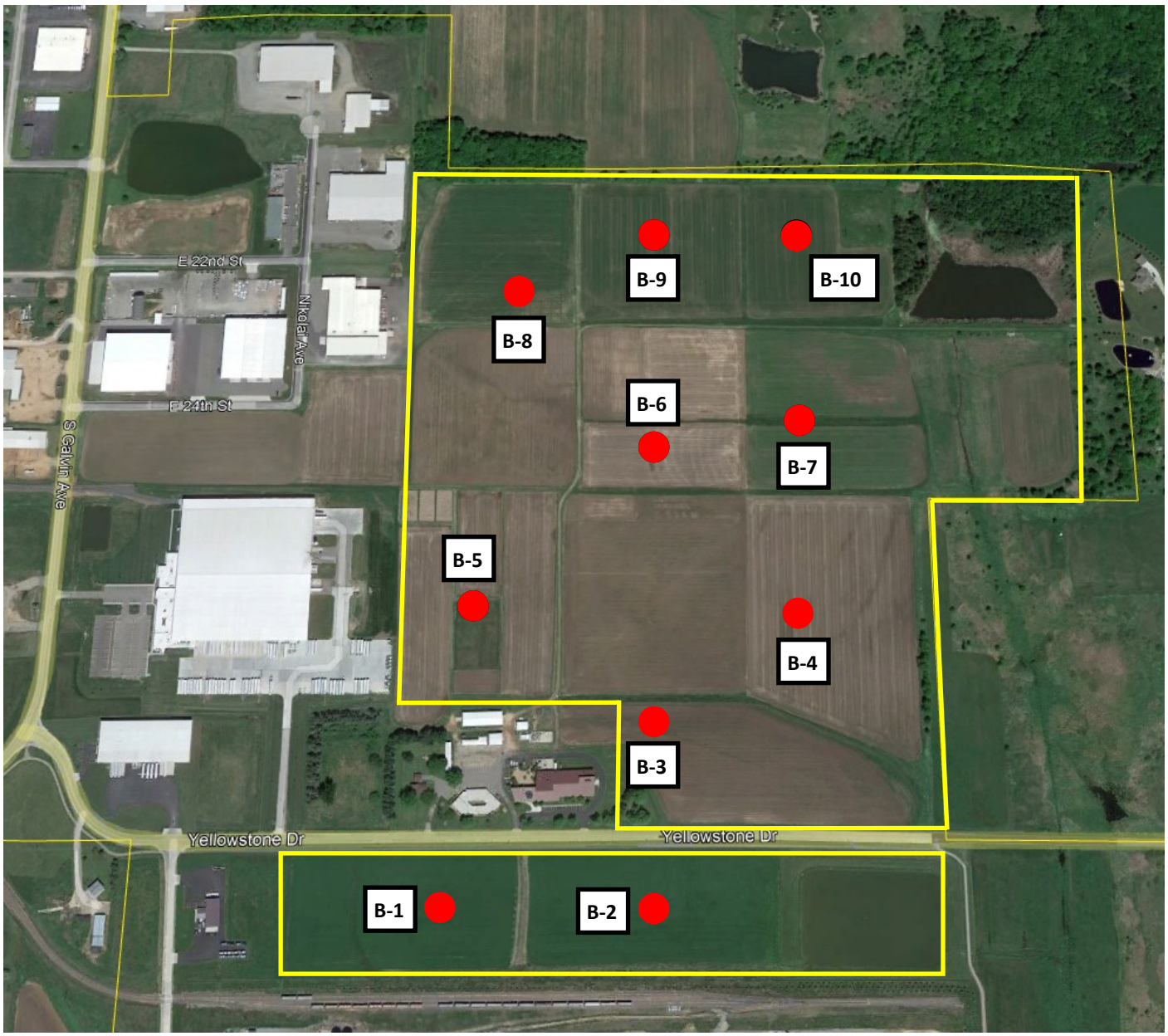
This geotechnical exploration and foundation evaluation has been prepared to aid in the evaluation of the foundation conditions on this site. The recommendations presented herein are based on the available soil information and the design information provided. Any changes in the design information or building locations should be brought to the attention of the soils engineer to determine if modifications in the recommendations are required. The final design plans and specifications should also be reviewed by the soils 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 soils engineer, to test and evaluate the bearing capacities, and the selection, placement and compaction of controlled fills.

APPENDIX

Appendix (in order of appearance)
Figure 1 – Boring Location Diagram
Soil Boring Logs
General Notes



intertek psi	Proposed Yellowstone Industrial Park Expansion Marshfield, Wisconsin	DATE: May 25, 2023
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	FIGURE 1 - Boring Location Diagram	PAGE 1 OF 1

SOIL BORING LOG: B - 1

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 24, 2023

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1233.2	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1 1232.2	0 - 9" Dark brown CLAY, with silt, trace sand and root hairs, moist (TOPSOIL)	1-SS	-			28	
2 1231.2	Gray and orange mottled silty CLAY, trace silt seams, moist						
3 1230.2	Reddish brown clayey SAND, with gravel, moist	2-SS	17			10	
4 1229.2							
5 1228.2							
6 1227.2	Reddish brown and gray sandy CLAY, trace silt, moist to very moist	3-SS	12	1.5		15	
7 1226.2							
8 1225.2		4-SS	9	1.5		18	
9 1224.2							
10 1223.2							
11 1222.2		5-SS	13			19	
12 1221.2							
13 1220.2							
14 1219.2							
15 1218.2							▼
16 1217.2	Yellowish brown silty SAND, trace gravel, wet	6-SS	32			15	
17 1216.2							
18 1215.2							
19 1214.2							v
20 1213.2							
21 1212.2	Pale brown and tan CLAY, with silt and sand, damp to wet	7-SS	24	2.0		18	⊥
22 1211.2							
23 1210.2							
24 1209.2							
25 1208.2							
26 1207.2		8-SS	38	2.5		21	
27 1206.2	**END OF BORING @ 26.5± FEET**						
28 1205.2							
29 1204.2							
30 1203.2							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: 15± feet below ground surface (EL 1218.2±) ▼

Water Level $_{\text{upon completion}}$: 19± feet below ground surface (EL 1214.2±) v

Caved at $_{\text{upon completion}}$: 21± feet below ground surface (EL 1212.2±) ⊥

Frost Depth N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 2

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 24, 2023

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1232.3	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1 1231.3	0 - 7" Dark brown silty CLAY, with silt seams, trace sand and root hairs, moist (TOPSOIL)	1-SS	4			19	
2 1230.3	Gray and orange mottled sandy CLAY, with silt, trace gravel, moist						
3 1229.3	Gray and orange mottled CLAY, with sand and silt, trace gravel, moist	2-SS	13	2.75		18	
4 1228.3							
5 1227.3							
6 1226.3	Reddish brown and dark brown sandy CLAY, trace sand seams and gravel, damp to moist	3-SS	12			16	
7 1225.3							
8 1224.3		4-SS	13			15	
9 1223.3							
10 1222.3							
11 1221.3	Light brown sandy CLAY, trace gravel, moist	5-SS	15			18	
12 1220.3							
13 1219.3							
14 1218.3							
15 1217.3							▽
16 1216.3	Reddish brown sandy CLAY, trace silt seams and gravel, moist	6-SS	10	1.75		16	
17 1215.3							
18 1214.3							
19 1213.3							
20 1212.3							▼
21 1211.3	Orangish brown silty CLAY, trace sand and gravel, wet	7-SS	8	1.75		28	
22 1210.3							
23 1209.3							⊥
24 1208.3							
25 1207.3							
26 1206.3	Orangish brown and brown CLAY, with silt, trace sand and gravel, wet	8-SS	16	1.75		17	
27 1205.3	**END OF BORING @ 26.5± FEET**						
28 1204.3							
29 1203.3							
30 1202.3							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: 20± feet below ground surface (EL 1212.3±) ▼

Water Level $_{\text{upon completion}}$: 15± feet below ground surface (EL 1217.3±) ▽

Caved at $_{\text{upon completion}}$: 23± feet below ground surface (EL 1209.3±) ⊥

Frost Depth N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 3

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 24, 2023

DEPTH/EL. (feet)		VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1233.7	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	1232.7	0 - 8" Dark brown silty CLAY, trace sand and root hairs, very moist (TOPSOIL)	1-SS	5			19	
2	1231.7	Orangish brown and gray mottled silty CLAY, with sand seams, moist						
3	1230.7	Gray and orange mottled CLAY, with sand and silt, trace gravel, moist	2-SS	11			20	
4	1229.7							
5	**1228.7**							
6	1227.7	Brown and reddish brown fine SAND, trace silt, moist to wet	3-SS	16			18	▽ ▼
7	1226.7							
8	1225.7	Light brown and gray sandy CLAY, trace silt, wet	4-SS	13			28	
9	1224.7							
10	**1223.7**							
11	1222.7	Brown sandy CLAY, wet	5-SS	3	0.25		30	
12	1221.7							
13	1220.7							
14	1219.7							
15	**1218.7**							
16	1217.7	Pale brown and tan CLAY, with silt and sand, trace gravel, wet	6-SS	15	2.0		19	
17	1216.7							
18	1215.7							
19	1214.7							⊥
20	**1213.7**							
21	1212.7	Dark red, CLAY, wet	7-SS	22	2.0		23	
22	1211.7							
23	1210.7							
24	1209.7							
25	**1208.7**							
26	1207.7	Reddish brown and red Weathered GRANITE	8-SS	50/3"			--	
27	1206.7	**END OF BORING @ 26.5± FEET**						
28	1205.7							
29	1204.7							
30	**1203.7**							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: 6.5± feet below ground surface (EL 1227.2±) ▼

Water Level $_{\text{upon completion}}$: 6± feet below ground surface (EL 1227.7±) ▽

Caved at $_{\text{upon completion}}$: 19± feet below ground surface (EL 1214.7±) ⊥

Frost Depth N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 4

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 24, 2023

DEPTH/EL. (feet)		VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1228.3	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	1227.3	0 - 8" Dark brown silty CLAY, trace sand and root hairs, with silt seams, very moist (TOPSOIL)	1-SS	5			24	
2	1226.3	Gray and orange mottled silty CLAY, trace silt seams, moist						
3	1225.3	Reddish brown clayey SAND, trace gravel, moist	2-SS	15			12	
4	1224.3							
5	**1223.3**							▼
6	1222.3	Brown and reddish brown fine SAND, with silt, wet	3-SS	14			15	
7	1221.3							
8	1220.3	Light brown and light reddish brown silty CLAY, with sand, trace gravel, moist to wet	4-SS	5			25	
9	1219.3							
10	**1218.3**							
11	1217.3		5-SS	6			30	
12	1216.3							
13	1215.3							
14	1214.3							
15	**1213.3**							
16	1212.3	Brown and reddish brown CLAY, trace silt, sand and gravel, wet	6-SS	4			22	v
17	1211.3							
18	1210.3							
19	1209.3							
20	**1208.3**							
21	1207.3	Reddish brown and red Weathered GRANITE	7-SS	17			--	
22	1206.3							⊥
23	1205.3							
24	1204.3							
25	**1203.3**							
26	1202.3		8-SS	39			--	
27	1201.3	**END OF BORING @ 26.5± FEET**						
28	1200.3							
29	1199.3							
30	**1198.3**							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: 5± feet below ground surface (EL 1223.3±) ▼

Water Level $_{\text{upon completion}}$: 16± feet below ground surface (EL 1212.3±) v

Caved at $_{\text{upon completion}}$: 22± feet below ground surface (EL 1206.3±) ⊥

Frost Depth N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 5

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 24, 2023

DEPTH/EL. (feet)		VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1245.5	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	1244.5	0 - 8" Dark brown silty CLAY, trace sand and root hairs, very moist (TOPSOIL)	1-SS	4			27	
2	1243.5	Gray and orange mottled silty CLAY, trace silt seams, moist						
3	1242.5	Reddish brown sandy CLAY, damp	2-SS	12	2.5		17	
4	1241.5							
5	**1240.5**							
6	1239.5	Reddish brown CLAY, trace sand and silt, moist	3-SS	11	1.75		23	
7	1238.5							
8	1237.5	Reddish brown sandy CLAY, damp	4-SS	6			22	
9	1236.5							
10	**1235.5**							
11	1234.5	Reddish brown CLAY, trace sand and silt, moist	5-SS	7			21	
12	1233.5							v
13	1232.5							
14	1231.5							
15	**1230.5**							▼
16	1229.5	Dark reddish brown and dark brown SAND, with silt, wet	6-SS	21			15	
17	1228.5							
18	1227.5							
19	1226.5							⊥
20	**1225.5**							
21	1224.5	Pale brown and tan CLAY, with silt and sand, damp to wet	7-SS	20			19	
22	1223.5							
23	1222.5							
24	1221.5							
25	**1220.5**							
26	1219.5	Dark red and light gray sandy CLAY, with gravel, and silt seams, trace sandstone fragements, damp	8-SS	39			13	
27	1218.5							
28	1217.5	**END OF BORING @ 26.5± FEET**						
29	1216.5							
30	**1215.5**							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: 15± feet below ground surface (EL 1230.5±) ▼

Water Level $_{\text{upon completion}}$: 12± feet below ground surface (EL 1233.5±) v

Caved at $_{\text{upon completion}}$: 19± feet below ground surface (EL 1226.5±) ⊥

Frost Depth N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 6

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 24, 2023

DEPTH/EL. (feet)		VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1234.6	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	1233.6	0 - 7" Dark brown silty CLAY, trace sand and root hairs, very moist (TOPSOIL)	1-SS	--			23	
2	1232.6	Gray, dark brown and orange mottled silty CLAY, trace silt seams, moist						
3	1231.6	Reddish brown and brown sandy CLAY, with sand seams, very moist	2-SS	7			13	▽
4	1230.6							
5	**1229.6**							
6	1228.6	Yellowish gray sandy CLAY, with sandstone fragments, very moist	3-SS	10			19	
7	1227.6							▼
8	1226.6		4-SS	11			--	
9	1225.6							
10	**1224.6**							
11	1223.6		5-SS	34			--	
12	1222.6							
13	1221.6							
14	1220.6							
15	**1219.6**							
16	1218.6		6-SS	50/3"			--	
17	1217.6	White, light tan and orangish yellow Weathered SANDSTONE, trace clay seams						
18	1216.6							
19	1215.6							⊥
20	**1214.6**							
21	1213.6		7-SS	50/5.5"			--	
22	1212.6							
23	1211.6							
24	1210.6							
25	**1209.6**							
26	1208.6		8-SS	50/4"			--	
27	1207.6	**END OF BORING @ 26.5± FEET**						
28	1206.6							
29	1205.6							
30	**1204.6**							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: 7.5± feet below ground surface (EL 1227.1±) ▼

Water Level $_{\text{upon completion}}$: 3± feet below ground surface (EL 1231.6±) ▽

Caved at $_{\text{upon completion}}$: 19± feet below ground surface (EL 1215.6±) ⊥

Frost Depth N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 7

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 24, 2023

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1227.2	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1 1226.2	0 - 5" Dark brown CLAY, with silt, trace sand and root hairs, moist (TOPSOIL)	1-SS	--			25	
2 1225.2	Gray and orange mottled CLAY, with silt, damp						
3 1224.2	Reddish brown clayey SAND, with gravel, moist	2-SS	16			10	
4 1223.2							▽
5 1222.2							
6 1221.2	Grayish brown and tan SAND, trace silt and sandstone fragments, moist to wet (Possible Weathered SANDSTONE)	3-SS	11			12	
7 1220.2							▼
8 1219.2		4-SS	17			16	
9 1218.2							
10 1217.2							
11 1216.2	Dark red and greenish gray CLAY, damp	5-SS	7	1.25		24	
12 1215.2							
13 1214.2							
14 1213.2							
15 1212.2							
16 1211.2	Greenish gray CLAY, trace rock fragments, damp (Possible Weathered GRANITE)	6-SS	14			27	
17 1210.2							
18 1209.2							
19 1208.2							
20 1207.2							
21 1206.2		7-SS	28			--	
22 1205.2	Orangish brown and dark red Weathered GRANITE						⊥
23 1204.2							
24 1203.2							
25 1202.2							
26 1201.2		8-SS	50/4"			--	
27 1200.2	**END OF BORING @ 26.5± FEET**						
28 1199.2							
29 1198.2							
30 1197.2							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: 7.5± feet below ground surface (EL 1219.7±) ▼

Water Level $_{\text{upon completion}}$: 4± feet below ground surface (EL 1223.2±) ▽

Caved at $_{\text{upon completion}}$: 22± feet below ground surface (EL 1205.2±) ⊥

Frost Depth N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 8

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 25, 2023

DEPTH/EL. (feet)		VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1246.5	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	1245.5	0 - 5" Dark brown CLAY, with silt, trace sand and root hairs, very moist (TOPSOIL)	1-SS	--			25	
2	1244.5	Gray and orange mottled CLAY, with silt, damp						
3	1243.5		2-SS	13			19	
4	1242.5							
5	**1241.5**	Reddish brown and gray sandy CLAY, trace silt and gravel, moist to very moist						
6	1240.5		3-SS	12	1.75		19	
7	1239.5							
8	1238.5		4-SS	7	2.25		26	
9	1237.5							
10	**1236.5**							
11	1235.5		5-SS	4	1.5		29	
12	1234.5	Brown and brownish orange CLAY, trace silt and sand, moist to very moist						
13	1233.5							
14	1232.5							
15	**1231.5**							
16	1230.5		6-SS	15			19	
17	1229.5							▼v
18	1228.5							
19	1227.5							
20	**1226.5**	Light brown CLAY, with sand, trace silt, moist to wet						
21	1225.5		7-SS	52	3.5		14	
22	1224.5							⊥
23	1223.5							
24	1222.5							
25	**1221.5**							
26	1220.5	Light gray and yellowish SAND, with sandstone fragments, trace silt seams, wet (Possible Weathered SANDSTONE)	8-SS	41			12	
27	1219.5							
28	1218.5	**END OF BORING @ 26.5± FEET**						
29	1217.5							
30	**1216.5**							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: 17± feet below ground surface (EL 1229.5±) ▼

Water Level $_{\text{upon completion}}$: 17± feet below ground surface (EL 1229.5±) v

Caved at $_{\text{upon completion}}$: 22± feet below ground surface (EL 1224.5±) ⊥

Frost Depth N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 9

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 25, 2023

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1239.9	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1 1238.9	0 - 7" Dark brown CLAY, with silt, trace sand and root hairs, moist (TOPSOIL)	1-SS	--			27	
2 1237.9	Gray and orange mottled silty CLAY, trace silt seams, moist						
3 1236.9		2-SS	9	2.0		20	▽
4 1235.9							
5 1234.9	Reddish brown and gray CLAY, with sand, very moist						
6 1233.9		3-SS	12			14	
7 1232.9							
8 1231.9		4-SS	10			23	
9 1230.9							
10 1229.9							
11 1228.9		5-SS	12			25	
12 1227.9	Brown sandy CLAY, with sandstone fragments, very moist						
13 1226.9							
14 1225.9							
15 1224.9							
16 1223.9		6-SS	41			--	
17 1222.9							▼
18 1221.9	Pinkish red and orangish brown Weathered SANDSTONE, trace clay seams						
19 1220.9							
20 1219.9							
21 1218.9		7-SS	66/9"			--	⊥
22 1217.9							
23 1216.9							
24 1215.9	White and light pink Weathered SANDSTONE, with greenish gray clay seams						
25 1214.9							
26 1213.9		8-SS	50/4"			--	
27 1212.9	**END OF BORING @ 26.5± FEET**						
28 1211.9							
29 1210.9							
30 1209.9							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: 17± feet below ground surface (EL 1222.9±) ▼

Water Level $_{\text{upon completion}}$: 3± feet below ground surface (EL 1236.9±) ▽

Caved at $_{\text{upon completion}}$: 21± feet below ground surface (EL 1218.9±) ⊥

Frost Depth N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 10

Project: Proposed Yellowstone Industrial Park Expansion **Project No.:** 00952008

Location: Marshfield, Wisconsin **Drill Date:** April 25, 2023

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 1236.4	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1 1235.4	0 - 5" Brown CLAY, with silt, trace sand and roothairs, moist (TOPSOIL)	1-SS	--			23	
2 1234.4	Light gray and orange mottled silty CLAY, with silt seams, damp						
3 1233.4		2-SS	12			22	
4 1232.4							
5 1231.4	Brown and gray sandy CLAY, with silt, trace sand seams, moist						
6 1230.4		3-SS	11			20	
7 1229.4							
8 1228.4		4-SS	9			13	
9 1227.4	Reddish orangish brown clayey SAND, trace gravel, moist						
10 1226.4							
11 1225.4		5-SS	9			13	
12 1224.4							
13 1223.4	Brownish red sandy CLAY, trace gravel, very moist						
14 1222.4							
15 1221.4							▼v
16 1220.4		6-SS	50/5"			--	
17 1219.4							
18 1218.4	Grayish brown and gray Weathered SANDSTONE						
19 1217.4							
20 1216.4							
21 1215.4		7-SS	58			--	
22 1214.4							⊥
23 1213.4	White, orange and red Weathered SANDSTONE, trace clay seams						
24 1212.4							
25 1211.4							
26 1210.4	Red, white and brown Weathered GRANITE	8-SS	67			--	
27 1209.4	**END OF BORING @ 26.5± FEET**						
28 1208.4							
29 1207.4							
30 1206.4							

FIELD OBSERVATIONS:

Water Level $_{during\ drilling}$: 15± feet below ground surface (EL 1221.4±) ▼

Water Level $_{upon\ completion}$: 15± feet below ground surface (EL 1221.4±) v

Caved at $_{upon\ completion}$: 22± feet below ground surface (EL 1214.4±) ⊥

Frost Depth N/A

Water Level $_{delayed}$: N/A

Caved at $_{delayed}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also 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.