Geotechnical Evaluation Report

Proposed Pedestrian Bridge
Great Sauk State Trail/Walking Iron Trail
Sauk City, Wisconsin

Prepared for

Sauk County, Wisconsin

Brandon K. Wright, PE
Senior Engineer
License Number: 40141
February 19, 2021

Project B2008520

Braun Intertec Corporation

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February 19, 2021 Project B2008520

Ms. Lisa Wilson
Sauk County Land Resources and Environmental Department
West Square Building, Room 248
505 Broadway
Baraboo, WI 53913

Re: Geotechnical Evaluation
Proposed Pedestrian Bridge
Great Sauk State Trail/Walking Iron Trail
Sauk City, Wisconsin

Dear Ms. Wilson:

We are pleased to present this Geotechnical Evaluation Report for the proposed Great Sauk State Trail/Walking Iron Trail pedestrian bridge to be constructed over the Wisconsin River in Sauk City, Wisconsin.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Brandon Wright at 608.781.7277 or by email at bwright@braunintertec.com.

Sincerely,

BRAUN INTERTEC CORPORATION

Brandon K. Wright, PE
Senior Engineer

Scott M. Mackiewicz, PhD, PE, D.GE
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A. Introduction

A.1. Project Description

This Geotechnical Evaluation Report addresses the proposed design and construction of a pedestrian bridge over the Wisconsin River in Sauk City, Wisconsin. The pedestrian bridge will be located at the former Wisconsin Southern Rail bridge crossing. The proposed bridge will be a three-span Warren steel truss with abutments on the west and east embankments, and two center piers in the Wisconsin River. The bridge will have a total length of about 502 feet, with each span having lengths of 164 to 168 feet. Based on the RFP, we understand that the abutments will be supported on driven HP14x73 piles and the piers will be supported on 9-foot diameter drilled shafts with 8 1/2-foot diameter rock socket extending into the sandstone. Furthermore, we understand that driven, 14-inch diameter closed-ended pipe (CEP) piles are also being considered to support the abutments.

While currently planned to be a pedestrian bridge, the proposed bridge could have potential future use as a railroad bridge. For this reason, the abutments and center piers are being designed and constructed in accordance with AREMA loading requirements. The abutment pilings will be driven to a minimum ultimate axial resistance of 250 tons per pile. The center pier service design loads (at the scour depth) include an axial load of 2,850 kips, a shear force of 145 kips, and an overturning moment of 9,750 kip-feet.

Figure 1. Proposed Pedestrian Bridge Plan

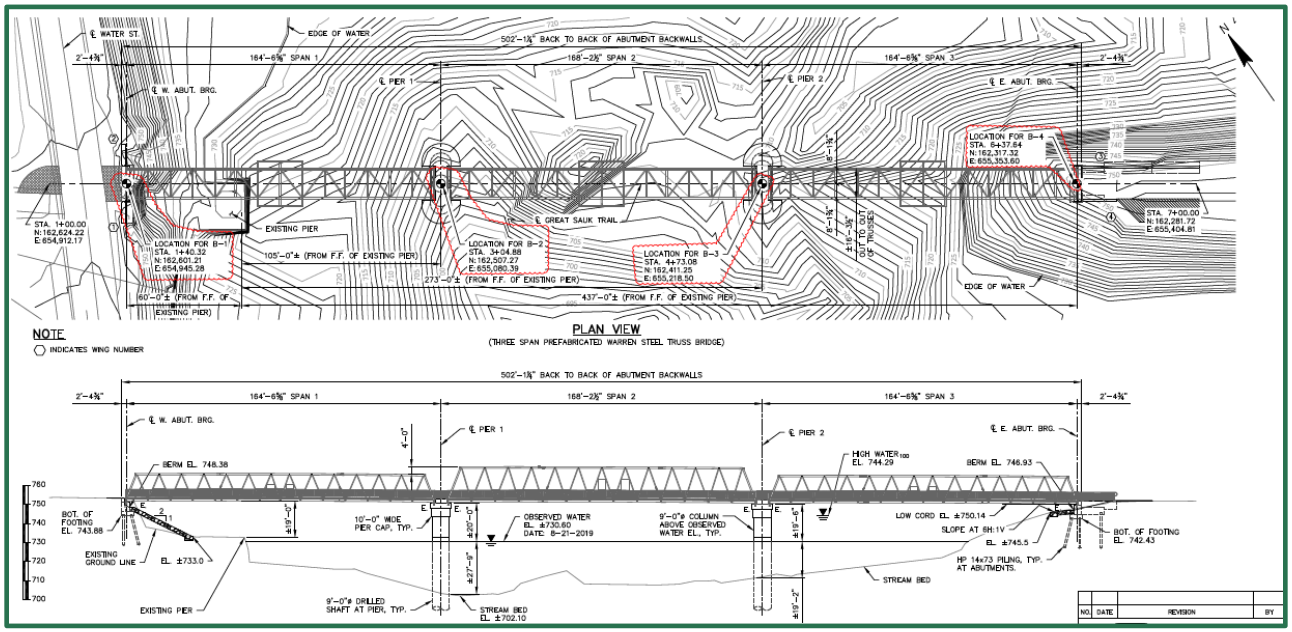


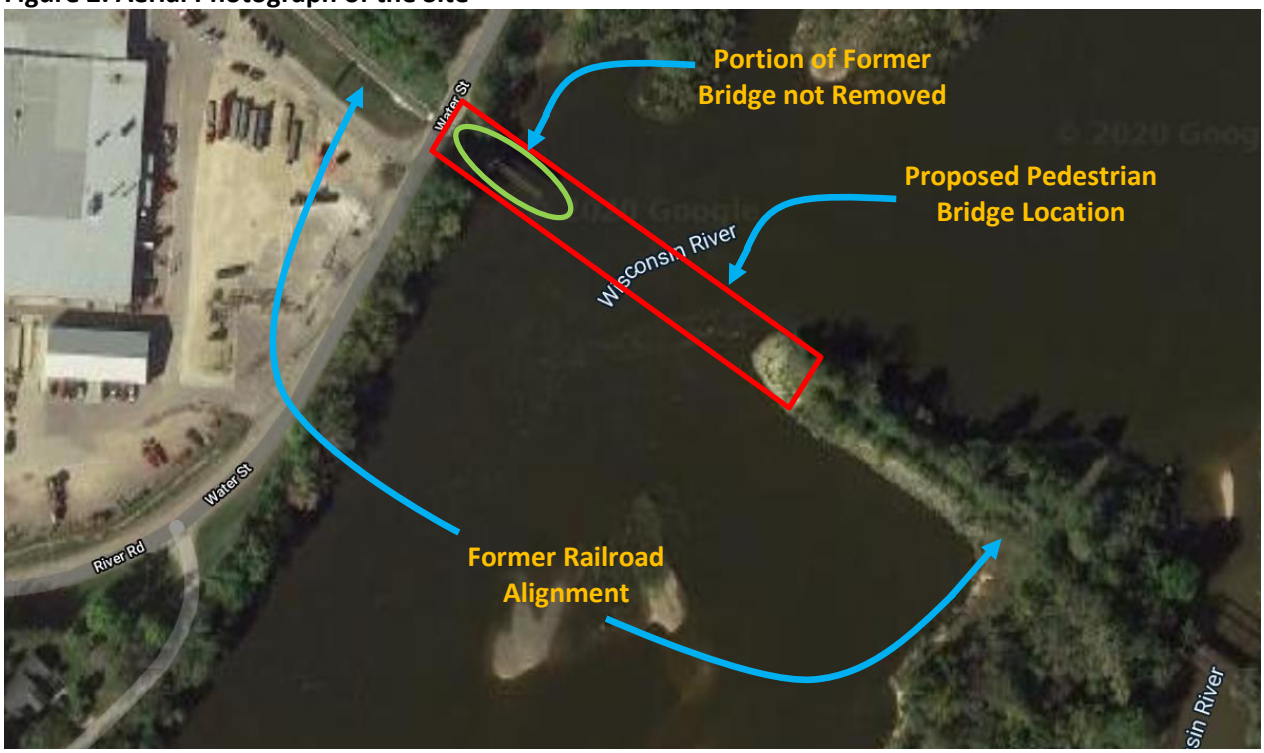
Figure prepared by Westbrook Associated Engineers, Inc., dated July 24, 2020.

A.2. Site Conditions and History

Historically, a railroad bridge under the operation of Wisconsin Southern Rail spanned across the Wisconsin River. The railroad bridge was deemed structurally deficient and the railroad track was abandoned. Although the majority of the bridge was removed, a portion of the western abutment, along with approximately 130 feet of the bridge superstructure, remains in place extending over the Wisconsin River.

The location of the proposed pedestrian bridge, the former railroad alignment, and the location of the former bridge that was not removed are shown in Figure 2.

Figure 2. Aerial Photograph of the Site



Photograph from Google Earth.

A.3. Background Information and Reference Documents

We reviewed the following sources and publicly available sources of information:

- Request for Proposal, issued by Sauk County, Wisconsin, dated August 5, 2020.
- University of Wisconsin Extension, Preliminary Bedrock Geologic of Dane County, Wisconsin, Plate 1 and Plate 2, dated 2013.
- Communications with Sauk County regarding site access, previous or known geotechnical and geology of the area, condition and requirements of the existing railroad, and requirements for required permits for this phase of the project.
- Overhead images of the site using Google Earth, used to aid in evaluating site access and historic construction.

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

A.4. Scope of Services

We performed our scope of services for the project in general accordance with our Proposal QTB125178 to Sauk County, Wisconsin, dated August 28, 2020, and authorized on September 25, 2020. The following list describes the geotechnical tasks completed.

- Reviewing the background information and reference documents previously cited.
- Clearing the exploration location of underground utilities. Westbrook Associated Engineers selected, and we staked the new exploration locations. We acquired the surface elevations and locations with GPS technology and by reference topographic maps included in the RFP.
- Performing four standard penetration test (SPT) borings with rock coring.

- Performing laboratory testing on select samples to aid in soil and rock classification and engineering analysis.

- Preparing this report containing a boring location sketch, logs of soil borings, a summary of the soils and rock encountered, results of laboratory tests, and recommendations for the design of driven pile foundations and drilled shaft foundations.

Our scope of services did not include environmental services but did include screening of collected standard penetration test (SPT) samples with a photoionization detector (PID). Results of the PID screening is presented on the boring logs for each SPT sample. The materials encountered in the borings, however, did not generate organic vapor concentrations above background levels.

B. Results

B.1. Boring Results

Table 1 provides a summary of the soil boring results, in the general order we encountered the strata. For simplicity in this report, we define fill to mean existing, uncontrolled, or undocumented fill. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheets in Appendix A include definitions of abbreviations used in Table 1.

Table 1. Subsurface Profile Summary*

Strata	Soil Type - USCS Classification	Range of Penetration Resistances	Commentary and Details
Fill	SP, SP-SM, SM, GP	4 to 66 BPF	▪ Fill was encountered in Borings B-1 and B-4, at the abutment locations. The fill extended to depths of 18 feet in Boring B-1 and to a depth of 38 feet in Boring B-4. ▪ Fill was composed of poorly graded sand (SP), poorly graded sand with silt (SP-SM), silty sand (SM), and poorly graded gravel (GP). ▪ Moisture condition generally moist to wet.
Alluvial deposits	SP, SM, ML	5 to 99 BPF	▪ At the river bottom in Borings B-2 and B-3, and below the fill in Borings B-1 and B-4, the borings encountered alluvial soils. ▪ Alluvial soils extended to depths of 107 to 109 feet in the Wisconsin River, corresponding to elevations 631 to 633, and to depths of 123 to 139 feet at the abutment locations, which correspond to an elevation of 631 at the west abutment and elevation 612 at the east abutment. ▪ Alluvial soils were composed mainly of poorly graded sand (SP), but also contained sandy silt (ML), poorly graded gravel, (GP), and fat clay (CH). ▪ General penetration resistance testing indicates the sand and silt soils are loose to very dense, but are medium dense overall, the gravel soils are dense to very dense, and the clay soil is hard. ▪ Moisture condition generally moist to wet.
	GP	33 BPF to 100 blows for 2 inches of penetration	
	CH	37 BPF	
Bedrock	Sandstone and limestone	100 blows for 2 inches of penetration	▪ Top of bedrock varied from elevation 612 to 633 in all the borings. After auger refusal was met, Borings B-2 and B-3, were cored to approximate elevations of 599 to 600 1/2 feet. ▪ Bedrock was composed of sandstone from the Wonewoc Formation, underlain by sandstone from the Eau Claire Formation. ▪ RQD in the Wonewoc Formation varied from 0 to 20, with 40 to 100 percent recovery. ▪ RQD in the Eau Claire Formation varied from 15 to 78, with 90 to 100 percent recovery. ▪ Highly to moderately weathered sandstone extended to approximate elevations of 624 to 626 feet. Generally below 624 feet, the sandstone was slightly weathered to unweathered. ▪ Highly weathered sandstone was generally white to greenish tan and very soft to soft. ▪ Slightly weathered to unweathered sandstone in the Wonewoc Formation was generally brown and greenish gray and moderately hard to hard. ▪ Slightly weathered to unweathered sandstone in the Eau Claire Formation was generally gray and hard.

*Abbreviations defined in the attached Descriptive Terminology sheets.

B.2. Groundwater

Table 2 summarizes the depths where we observed groundwater. The attached Log of Boring sheets in the Appendix also include the groundwater information. As indicated, groundwater was consistently in the range of elevations 731 to 738 feet. Given the close proximity of the Wisconsin River, and the free draining characteristics associated with sandy soils, we believe this represents the groundwater elevation for this site. Seasonal and annual fluctuations of groundwater should also be anticipated with the river elevation. We recommend assuming the seasonal high groundwater will be near the 100-year flood elevation, which is reported to be at elevation 744.29.

Table 2. Groundwater Summary

Location	Surface Elevation	Measured or Estimated Depth to Groundwater (ft)	Corresponding Groundwater Elevation (ft)
B-1	754	23	731
B-2	740 1/2*	2 1/2	738**
B-3	740 1/2*	2 1/2	738**
B-4	751	20	731

*Surface elevation refers to top of barge platform while drilling.
**Elevation represents the river elevation during drilling.

B.3. Organic Vapor Results

Our PID screening of the samples of geologic materials encountered in the borings did not generate organic vapor concentrations above background levels. Measured results are presented on each of the boring log sheets.

B.4. Laboratory Test Results

B.4.a. Soil Classification Tests

Table 3 below present the results of our laboratory tests.

Table 3. Laboratory Classification Test Results

Boring	Sample Depth (ft)	Classification	Moisture Content (w, %)	Percent Passing a #200 Sieve
B-1	2 1/2	Fill: Poorly graded sand with silt (SP-SM)	8	10
B-1	5	Fill: Poorly graded gravel (GP)	2	---
B-1	7 1/2	Fill: Silty sand with gravel (SM)	5	---
B-1	10	Fill: Poorly graded sand with gravel (SP)	8	3
B-2	53	Silty sand (SM)	25	18

B.4.b. Compression Strength Testing on Cored Bedrock

Table 4 below has a summary of our compressive strength testing results on cored bedrock samples collected from Borings B-2 and B-3.

Table 4. Summary of Compressive Strength Tests on Cored Bedrock

Boring	Depth (ft)	Elevation (ft)	Bedrock Type	Formation	Compressive Strength (psi)
B-2	120	620 1/2	Sandstone	Wonewoc	540
B-2	133	607 1/2	Sandstone	Eau Claire	6,270
B-3	118 1/2	622	Sandstone	Wonewoc	3,000
B-3	124 1/2	616	Sandstone	Eau Claire	2,290
B-3	136	604 1/2	Sandstone	Eau Claire	3,850

C. Recommendations

C.1. Design and Construction Discussion

We based the recommendations submitted in this report, in part, upon data obtained from our exploration. The nature and extent of subsurface variations that may exist at the proposed project site will not become evident until construction. If variations appear evident, then the recommendations presented in this report should be re-evaluated. In the event that any changes in the nature, design, location, or depth of the proposed structure occur, the conclusions and recommendations contained in this report are not valid unless we review the changes and confirm or modify our recommendations in writing.

C.2. Driven Piles

We anticipate that HP14x73 or 14-inch diameter closed-ended pipe (CEP) piles filled with concrete, Grade 50 piles will be used for the foundations of the west and east abutments. The HP14x73 and 14-inch CEP piles have a required ultimate axial resistance of up to 250 tons (500 kips) and an allowable axial design resistance of 200 kips which results in a design factor of safety of 2.5. The final pile design should account for any potential grade changes or loss of support due to scour. We have provided recommendations for driven HP14x73 and 14-inch concrete filled CEP piles below.

C.2.a. Axial Resistance

We have assumed the grade at the abutments will be increased by less than 2 feet. Based on the soil we encountered and minimal grade changes, we do not recommend including drag loads for pile design. If the grades increase by more than 2 feet and site conditions differ from what we encountered in our borings, we should be contacted to evaluate the drag loads.

Braun Intertec performed a preliminary drivability analysis using the GRLWEAP program, the subsurface profile at each abutment, and a Delmag D30-32 diesel pile driving hammer with a rated energy of 75 kip-feet. Results of our preliminary evaluation indicated that the piles can be driven to the required ultimate resistance and pile tip elevations with a relatively low risk of over-stressing the pile. We anticipate blow counts at the end of driving are less than 20 blows per inch for the modeled system. If requested, we can perform a more detailed hammer qualification analysis prior to construction.

Based on this evaluation, we anticipate the driven HP14x73 piles will terminate in sandstone at the West Abutment and in dense to very dense gravel at the East Abutment. We anticipate 14-inch diameter, closed-ended pipe (CEP) piles will terminate in dense to very dense sand at both abutments. A summary of anticipated pile tip elevations is provided in Table 5.

Table 5. Anticipated Pile Tip Elevations

Substructure	Pile Type	Top of Pile Elevation (feet)	Ultimate Geotechnical Resistance (kips)	Allowable Geotechnical Resistance (kips)**	Anticipated Tip Elevation (feet)	Anticipated Length of Pile (feet)
West Abutment	HP14x73	743.9	500	200	624 ± 5	120 ± 5
	14-inch CEP*		500	200	659 ± 5	85 ± 5
East Abutment	HP14x73	742.4	500	200	622 ± 5	120 ± 5
	14-inch CEP*		500	200	647 ± 5	95 ± 5

*Closed-end pipe piles filled with concrete.
**Factor of safety of 2.5.

We anticipate long-term structural settlement for steel H-piles or steel CEP piles filled with concrete, designed and constructed as outlined in this report, should be less than 1/2-inch at the pile top.

C.2.b. Driven Pile Construction Considerations

Our anticipated geotechnical construction considerations for driven piles are presented below:

- Installation*:* Piles should be installed in accordance with the Plan. Pile driving resistance should be closely monitored and pile resistance should be assessed using dynamic pile testing. For H-piles, we recommend dynamic pile testing be utilized because the piles will be driven into water-bearing sands. We anticipate the potential for overdriving into the water-bearing sands to be higher using energy methods to monitor pile resistance rather than dynamic pile testing. For CEP piles, we recommend dynamic pile testing be utilized to monitor the potential for overstressing the pile and damaging the pile toe. Additionally, this may also help evaluate the potential to reduce pile lengths by measuring the geotechnical resistance at higher elevations.

- Drivability: The ability to drive the pile to the required penetration depth should be checked using a Wave Equation Analysis. A wave equation analysis (WEAP) for the actual pile type and hammer size used to install the piling should be performed and submitted three weeks prior to installing piles. It is important that the final set during driving not exceed 20 blows per inch in order to avoid damaging the hammer and piling.

- Protective Pile Tips: For H-piles, protective points to reduce the potential for damage during driving are required due to the presence of high blow count sands and gravel. For CEP piles, we recommend a thickened driving shoe to reduce the potential for damage during driving.

- Pile Properties: We recommend filling CEP piles with concrete having a minimum 28-day compressive strength of 3,000 psi.

- Pile Spacing: Piles should be installed with a minimum center-to-center spacing of three diameters. No reduction in individual pile capacity for group action is needed for this spacing. Group effects should be included in the evaluation of lateral resistance.

- Existing Bridge Substructure: We recommend the location of the piles be planned to avoid remaining substructure components from the former railroad bridge.

C.3. Drilled Shafts

Drilled shafts can be used as the foundation system for the span piers (Piers 1 and 2). Straight-sided, drilled shafts will develop capacity from side resistance and end bearing within the rock socket. We anticipate that drilled shaft construction will be difficult through the gravel and will require the use of a permanent casing extending through the alluvial sand and gravel materials and into the top of the bedrock.

Excavation of the very dense gravel may require the use of special techniques. Drilled shaft casing could be installed using oscillator-rotator type methods. Excavation of the moderately hard, weathered sandstone formations will require the use of a rock bit and core barrel. The contractor should review the boring logs to assess the potential problems with completing the excavations and requirements of casing for the materials encountered at this site. Recommendations for design and construction of the drilled shafts are presented in the following sections.

C.3.a. Axial Resistance

Drilled shaft foundations should be straight-sided, steel reinforced concrete, and designed based on the recommendations presented in Table 6 and the subsurface information at the appropriate boring location. The allowable capacity is based on a safety factor of 2.5 for side resistance and 3.0 for end bearing. Uplift capacity of shafts can be computed using the axial compressive capacity from side resistance multiplied by a reduction factor of 0.7.

Table 6. Drilled Shaft Geotechnical Resistance Summary

Elevation (feet)	Material	Compressive Side Resistance (ksf)[1]			End Bearing Resistance (ksf)	
		Ultimate	Allowable (FOS=2.5)	Uplift Resistance	Ultimate	Allowable (FOS=3.0)
> 631	Overburden soil	NA	NA[2]	NA	NA	NA
631 to 617	Wonewoc Formation, Sandstone, q_u=600 psi	4	1.6	1.1	NA	NA
617 to 600	Eau Claire Formation, Sandstone, q_u=2000 psi	8.8	3.5	2.5	240	80

NA=not applicable
[1]Uplift resistance can be determined by taking 70% of the compressive side resistance.
[2]At the time of this report we were not provided scour elevation. We anticipate the scour depth will be fully within the overburden soil.

Based on the design plans provided we anticipate the drilled shafts will be 9-foot in diameter in the overburden soils with an 8 1/2-foot diameter rock socket into the underlying sandstone. The center pier service design loads (at the scour depth) include an axial load of 2,850 kips, a shear force of 145 kips, and an overturning moment of 9,750 kip-feet.

We recommend the drilled shafts (also known as drilled piers or caissons) be designed for a combination of side resistance and end bearing in the sound, slightly weathered to unweathered bedrock of the Eau Claire Formation. Side resistance in the cased portion of the shaft and within the overburden have been neglected.

We recommend the drilled shafts be embedded within the slightly weathered to unweathered sandstone a minimum of 2 rock socket diameters, i.e., 17 feet. The final depth of penetration will be determined by a representative of the geotechnical engineer in the field and may vary from the depths noted by the rock cores. We have estimated the approximate tip elevation of the drilled shafts in Table 7 using the provided loads above in Table 6.

Table 7. Estimated Depth to Bedrock and Drilled Shaft Tip Elevation Pier 1 and Pier 2

Structure	Required Allowable Axial Resistance (kips)	Stream Bed Elevation (feet)	Top of Rock Elevation (feet)	Approximate Depth to Tip Elevation Below Bottom of Stream Channel (feet)	Approximate Drilled Shaft Tip Elevation (feet)
Pier 1 (B-2)	2,850	708	631	91	614
Pier 2 (B-3)	2,850	716	634	99	617

We anticipate total and differential settlement of the drilled shafts will be negligible under the proposed loads. Significant lateral capacity can be developed by drilled shafts. We recommend the centers of the shafts be spaced at three diameters apart, unless otherwise reviewed. Note that group effects for lateral loading apply for shaft spacing less than five diameters, center-to-center, unless otherwise reviewed.

C.3.b. Drilled Shaft Construction Considerations

- Scour: We were not provided the elevation of scour at the time of this report. We recommend neglecting any side resistance within the scour zone for the axial and lateral resistance of the drilled shafts.

- Shaft Spacing: We understand that preliminarily the 9-foot diameter drilled shafts with 8 1/2-foot diameter rock sockets will be spaced at 21-feet center-to-center for a spacing of 2 1/2 rock socket diameters. No reduction in individual shaft axial capacity for group action is needed for this rock socket spacing. If the center-to-center spacing changes to less than 2 1/2 rock socket diameters, we should be contacted to reevaluate reduced capacities. Construction of adjacent drilled shaft rock sockets within 3 shaft diameters (i.e. 27 feet for 9-foot diameter drilled shafts) should not happen on the same day.

- Permanent Casing: For all drilled shafts, the use of smooth-walled casing extending to bedrock will be required. We anticipate oscillating/rotating casing may be required through the gravel layer extending to the top of rock. The casing should be the same, nominal diameter as the drilled shaft.

- Wet Excavation Method: If drilled shafts are installed using casing and wet methods (i.e., using water or slurry to maintain excavation stability), the contractor should prevent the slurry from “setting up” prior to pouring the concrete. Additionally, the contractor should control the sand content of the slurry to less than 4 percent by volume at any point in the excavation and maintain the slurry level a minimum of 6 feet above the highest expected piezometric head surface.

- Integrity Testing: We recommend that a minimum of inspection tubes be installed within each of the drilled shafts to facilitate cross-hole sonic logging at completion of the shaft.

- Concrete Placement: The bottom of the shaft excavation should be cleaned of water and loose material before placing reinforcing steel and concrete. Concrete placement should be continuous from the bottom to the top elevation of the shaft. Wet excavated shafts will require concrete placement using tremie methods. The tremie pipe should be clean and have

a suitable inside diameter for use with the specific concrete mix, but not less than 10 inches. The discharge end of the tremie should allow free, radial flow of the concrete and be immersed at least 10 feet in concrete and maintain a positive pressure differential at all times during placement to prevent water or slurry intrusion.

- Construction Observations: Drilled shaft installation should be monitored by Braun Intertec to assess 1) the proper identification of bearing material, 2) that adequate penetration of the shaft excavation into the bearing layer is provided, and 3) that the base and sides of the shaft excavation are clean of loose cuttings, where observable. Note that these items and the following discussion are intended to benefit the Owner and maintain the intent of the design during construction. This discussion is not intended to prescribe a specific means and methods for construction.

C.4. Lateral Geotechnical Parameters

Lateral capacity and behavior of the shafts and piles may be evaluated using the "p-y method" and LPILE (Ensoft, Inc.) Version 2019, or similar, software. The soil and rock input parameters for the LPILE program, in Tables 8 and 9, was based on the design subsurface profiles and were estimated or calculated using generally accepted, engineering correlations. The following outlines our assumptions and general recommendations for evaluation of lateral loads.

- No lateral soil resistance should be given within the depth of scour or the depth to frost zone (5 feet below existing grade), whichever is greater. At the time of this report the scour depth was unknown.

- If the drilled shafts are spaced closer than six times the pile diameter center-to-center spacing in the direction of loading, lateral resistances should be scaled by an appropriate multiplier, see Table 10. Values for drilled shafts spaced at different spacings than what are in Table 10 can be linearly interpolated from the provided multiplier values.

- Use the observed groundwater and river water level for the groundwater location in lateral analyses. We have used the 100-year flood elevation of 744.29 feet as the groundwater elevation.

- The values indicated below are ultimate values and do not include any factors of safety.

- For the lateral analysis of driven piles at the abutments, we do not recommend providing lateral resistance in the sandstone layers because we expect the pile will meet refusal within the dense to very dense sand layers or less than 5 feet into the sandstone.

- A p-multiplier of 0.4 should be used within the slope height for driven piles planned within 6 diameters of abutments having a 2H:1V fore slopes in addition to p-multiplier required for spacing.

Table 8. LPILE Parameters

Elevation (feet)	Material	p-y Model	Effective Unit Weight (pcf)[1]	Undrained Shear Strength, s_u (psf)	Friction Angle, ϕ (degrees)	Strain Factor, ε_{50}	Horizontal Modulus of Subgrade Reaction, k_h (pci)
West Abutment							
> 744	Fill soil – SP, GP, SM	Sand	120	---	30	---	20
744 to 736	Fill soil – SP, GP, SM	Sand	58	---	32	---	50
736 to 725	SP, N~13	Sand	58	---	32	---	50
725 to 705	SP, N~40	Sand	63	---	38	---	120
705 to 685	SP, N~30	Sand	63	---	36	---	100
685 to 631	SP, N~35	Sand	63	---	36	---	100
Pier #1 and #2							
> 698	SP, N~10	Sand	58	---	31	---	50
698 to 683	SP-SM, N~20	Sand	58	---	33	---	80
683 to 640	SP, N~30	Sand	63	---	36	---	100
640 to 630	SP, N~50	Sand	63	---	40	---	280
East Abutment							
> 731	Fill soil – SP, SM	Sand	58	---	30	---	20
731 to 713	GP, N~20	Sand	63	---	34	---	70
713 to 703	ML, N~28	Sand	53	---	28	---	15
703 to 667	SP, N~20	Sand	58	---	34	---	70
667 to 627	SP, N~40	Sand	63	---	38	---	120
627 to 617	GP, N~50+	Sand	63	---	40	---	280
617 to 612	CH, N~37	Stiff clay w/o water	63	6,000	---	0.004	---

[1]For effective unit weight values, we subtracted 62.4 pcf from the total unit weight for soil layers below EL 744 feet.

Table 9. LPILE Geotechnical Parameters for Rock – Piers #1 and #2

Approximate Elevation (feet)	Material	p-y Model	Effective Unit Weight (pcf)	Unconfined Compressive Strength, qu (psi)	Initial Modulus of Rock Mass (psi)	RQD (%)	Strain Factor, k_{rm}
630 to 617	Wonewoc Formation, sandstone	Weak rock	135/73	600	100,000	20	0.0005
617 to 605	Eau Claire Formation, sandstone, qu=2000 psi	Rock	140/78	2,000	---	---	---

Table 10. P-Multiplier for Multiple Row Pile Groups (modified from Table 10.7.2.4-1, AASHTO 2019)

Pile Center to Center Spacing	P-Multiplier, Pm		
	Row 1	Row 2	Row 3 and Greater
2.3B	0.73	0.24	0.16
3B	0.8	0.4	0.3
5B	1.0	0.85	0.7

The lateral capacity of the foundation is determined based on the stiffness of the foundation element and the stiffness of the soil and rock surrounding the element. When considering lateral capacity of shafts, it should also be understood the process the contractor will use to install the shafts. It is anticipated the contractors will use a series of casing resulting in a “telescoping” of the shaft at the surface, which can considerably increase lateral capacity.

C.5. Earthwork

C.5.a. Excavated Slopes

Based on the borings, we anticipate on-site soils in excavations will consist of granular fill and sandy alluvial soils. These soils are typically considered Type C Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type C soils should have a gradient no steeper than 1.5H:1V. Slopes constructed in this manner may still exhibit surface sloughing. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, "Excavations and Trenches." This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

C.5.b. Excavation Dewatering

We recommend removing groundwater from the excavations. Project planning should include temporary sumps and pumps for excavations above elevation 740. However, any excavation that extends below elevation 740 should anticipate the need for dewatering. In the sand soils present at this site, well points or deep wells will likely be required for dewatering. A licensed dewatering contractor should review our report and provide recommendations for dewatering.

C.5.c. Engineered Fill Materials and Compaction

Table 11 below contains our recommendations for engineered fill materials.

Table 11. Engineered Fill Materials*

Fill Classification	Locations To Be Used	Fill Source and Soil Descriptions	Gradation
Structural fill	▪ Below abutment wall foundations ▪ Excavation backfill	Imported sand and gravel consisting of GP, GW, SP, SW, SP-SM	100% passing 3-inch sieve <10% passing #200 sieve <2% Organic Content (OC)
Abutment backfill	▪ Abutment wall backfill – Types 1 or 2** ▪ Drainage layer placed within 2 feet of abutment walls – Type 1**	Imported sand and gravel consisting of GP, GW, SP, SW, SP-SM	100% passing 1-inch sieve <10% passing #200 sieve <2% Organic Content (OC)
Submerged backfill	Placement of structural fill below the water table	Imported crushed gravel	3/4-inch or larger <5% passing #200 sieve
Non-structural fill	Below landscaped surfaces, where subsidence is not a concern	On-site soils and imported soils	100% passing 6-inch sieve < 10% OC

* More select soils comprised of coarse sands with < 5% passing #200 sieve may be needed to accommodate work occurring in periods of wet or freezing weather.

**Abutment backfill types 1 and 2 from Table 8-5-1 from 2019 American Railway Engineering and Maintenance of Way Association Manual of Railway Engineering (AREMA MRE, 2019) Chapter 8.

We recommend spreading engineered fill in loose lifts of approximately 8 to 12 inches thick. We recommend compacting engineered fill in accordance with the criteria presented below in Table 12. The project documents should specify relative compaction of engineered fill, based on the structure located above the engineered fill, and vertical proximity to that structure.

Table 12. Compaction Recommendations Summary

Reference	Relative Compaction, percent (ASTM D698 – Standard Proctor)	Moisture Content Variance from Optimum, percentage points
Structural fill	98	-6 to +3
Abutment backfill	95	-2 to +2
Submerged backfill	N/A	N/A
Non-structural fill	90	±6

*Increase compaction requirement to meet compaction required for structure supported by this engineered fill.

The project documents should not allow the contractor to use frozen material as engineered fill or to place engineered fill on frozen material. Frost should not penetrate under foundations during construction.

We recommend performing density tests in engineered fill to evaluate if the contractors are effectively compacting the soil and meeting project requirements.

C.6. Configuring and Resisting Lateral Load on Abutment Walls

We recommend designing the retaining wall using the parameters in Table 13. Designs should also consider the slope of any engineered fill and dead or live loads placed behind the abutment walls within a horizontal distance that is equal to the height of the walls. The design of abutment walls below the water table should include hydrostatic forces action on the walls to the elevation of the 100-year flood, which is reported to be at elevation 744.29. The values in Table 14 below does not include hydrostatic pressure.

The abutment walls should incorporate a minimum of 2 feet (horizontal) of free draining, engineered fill (Type 1 backfill material), as defined in Table 8-5-1 in AREMA MRE 2019, and Table 11 above. We recommend a drainage system be installed to prevent hydrostatic loading on the abutment wall above the water table.

Table 13. Recommended Below-Grade Wall Design Parameters

Retained Soil	Wet Unit Weight (pcf)	Friction Angle (degrees)	Lateral Earth Pressure Coefficients		
			Active, Ka	At-Rest, Ko	Passive, Kp
Abutment backfill – Type 1	105	32	0.31	0.47	3.25
Abutment backfill – Type 2	110	30	0.33	0.50	3.00

* Based on Rankine model for soils in a region behind the wall extending at least 2 horizontal feet beyond the bottom outer edges of the wall footings and then rising up and away from the wall at an angle no steeper than 60 degrees from horizontal.

**Refer to Table 11 for requirements of abutment backfill.

Sliding resistance between the bottom of the footing and the soil can also resist lateral pressures. We recommend assuming a sliding coefficient equal to 0.35 between the concrete and soil.

The values presented in this section are un-factored.

C.7. Seismic Consideration

C.7.a. Site Classification

We based the seismic site class evaluation for this bridge on our interpretation of the soil and bedrock profile as indicated in our boring and defined per Table 9-1-6, American Railway Engineering and Maintenance of Way Association Manual of Railway Engineering (AREMA MRE, 2019). Based on our evaluation, we recommend a Site Class D, per Section 1.4.4.1.1 of the AREMA MRE (2019).

Additionally, we evaluated the seismic site classification based on the Wisconsin Commercial Building Code. Based on the soils and data we collected, this site meets the criteria for Site Class D, as defined in Table 1613.5.2 of Section 1613.5.2 of the 2019 International Building Code (IBC) adopted by the Wisconsin Commercial Building Code.

C.7.b. Commentary on Soil Liquefaction

For liquefaction to occur during earthquake shaking, three conditions are generally necessary: (1) saturated ground, (2) liquefaction-susceptible soils (i.e. low-plasticity fine-grained and/or granular soils), and (3) relatively low soil density. Based on the results of our investigation, the liquefaction potential of the site soils is medium.

D. Procedures

D.1. Penetration Test Borings

We drilled the penetration test borings with a track-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 1/2- or 5-foot intervals in general accordance with ASTM D1586. The boring logs show the actual sample intervals and corresponding depths

D.2. Rock Cores

We performed rock cores with an NQ-3 core barrel. First, we lowered the bit and casing to the bottom of the previously advanced borehole. Then we lowered the core barrel into the casing with a wire line and locked into place. We advanced the bit and barrel by rotating the assembly while applying crowd pressure. We used bentonite-drilling mud to cool the bit and wash cuttings to the surface. Our drillers noted bit pressure, rate of advance, fluid pressure and fluid return as coring progressed. They also noted intervals with a rapid rate of advance, a sudden loss of fluid pressure or return and intervals with a loss of bit pressure.

After completing each 5-foot core run, the drillers unlocked the core barrel from the bit and brought the barrel to the surface. They then extruded the split inner tube from the barrel and opened the tube to reveal the core sample. After field classification and logging, the drillers packed the core into a cardboard storage box, arranged into 2-foot-long sections.

D.3. Exploration Logs

D.3.a. Log of Boring and Coring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials and present the results of penetration resistance and other in-situ tests performed. The logs also present the results of organic vapor screening, laboratory tests performed on penetration test samples, and groundwater measurements.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

Follow the standard penetration test logs, we have logs of our rock coring. The logs identify and describe rock lithology, weathering, hardness, bedding and fracture characteristics, and other features. The logs also report the bit pressure, rate of advance, and water pressure and return (if applicable) recorded during the coring process. The percent recovery and rock quality designation (RQD) for each 5-foot core run is also shown.

We inferred strata boundaries from changes in lithology along the length of the core sample. Due to natural and mechanical fractures, destruction of the rock fabric during coring, and limited recovery, it is difficult to place the core sample in the geologic profile; the strata boundary depths in the rock are also approximate, and likely vary from the core locations.

D.3.b. Organic Vapor Measurements

We screened the material samples retrieved during drilling for the presence of organic vapors with a photoionization detector (PID) using both: (1) direct readings from each sample, and (2) the headspace method. The PID is equipped with a 10.6 eV lamp and calibrated to an isobutylene standard, prior to the start of fieldwork.

The materials encountered in the borings did not generate organic vapor concentrations above background levels.

D.3.c. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance and other in-situ testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.4. Material Classification and Testing

D.4.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

D.4.b. Laboratory Testing

The exploration logs in the Appendix note most of the results of the laboratory tests performed on geologic material samples. The remaining laboratory test results follow the exploration logs. We performed the tests in general accordance with ASTM or AASHTO procedures.

D.5. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our evaluation, analyses, and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation, and thickness away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications, and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

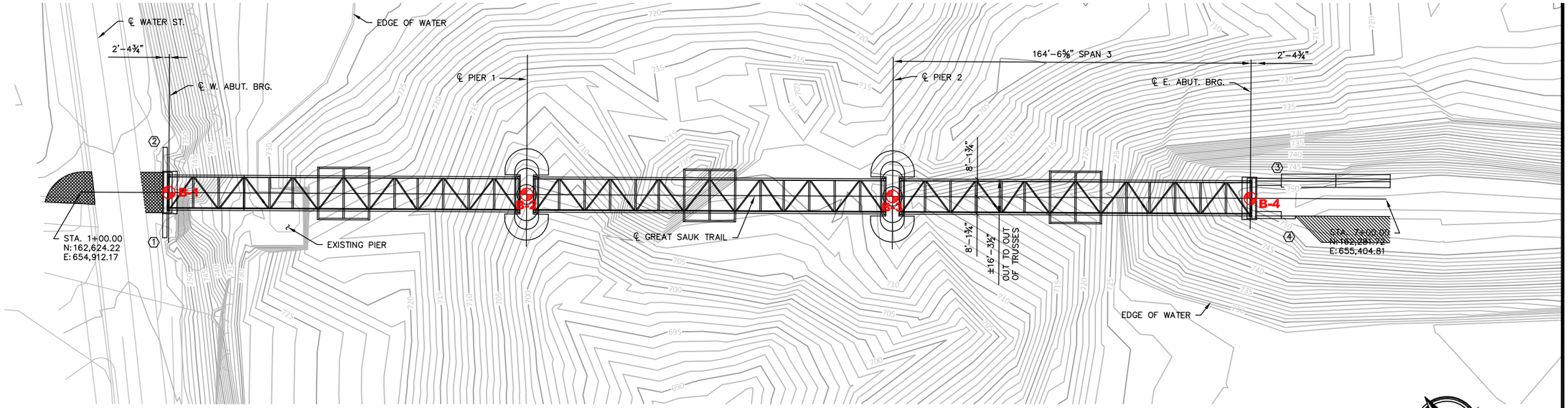
E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses, and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

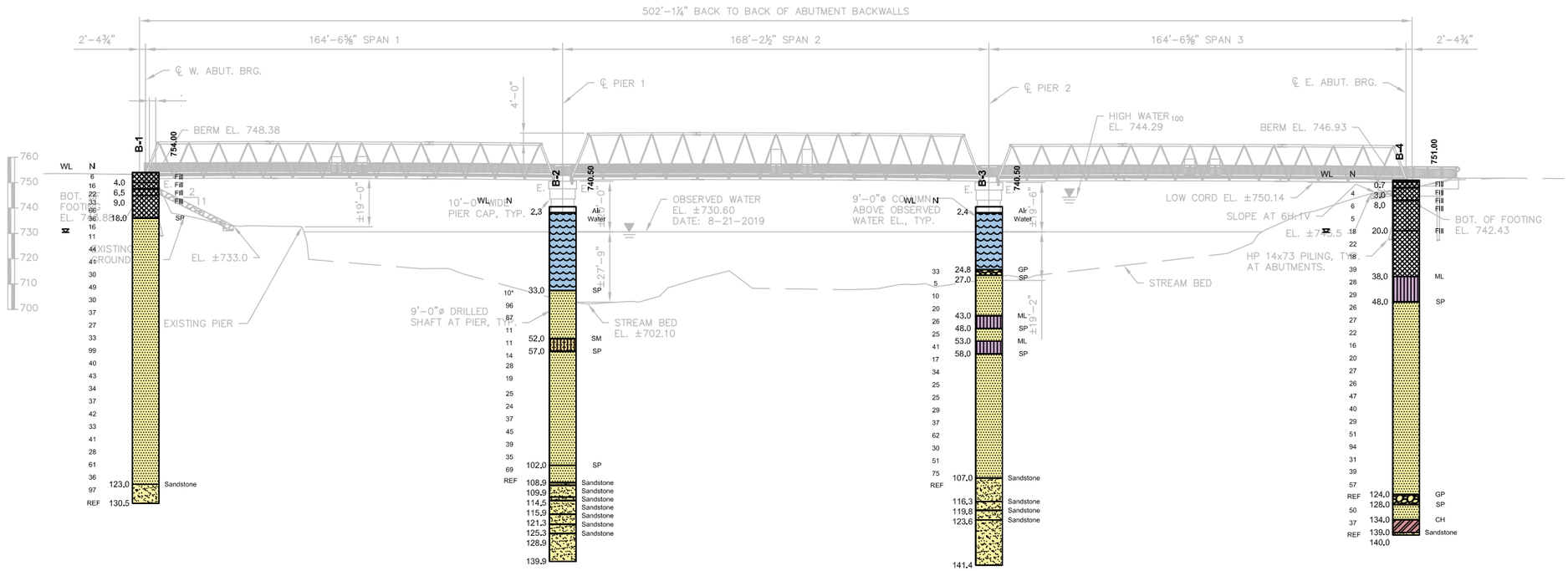
Appendix A



DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

25' 0 50'

SCALE: 1" = 50'



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11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Drawing Information

Project No: B2008520

Drawing No: B2008520

Drawn By:	BJB
Date Drawn:	10/26/20
Checked By:	BW
Last Modified:	1/26/21

Project Information

Geotechnical Evaluation

Proposed Pedestrian Bridge - Great Sauk State Trail / Walking Iron Trail

Wisconsin River

Sauk City, Wisconsin

Soil Boring Location Sketch

Figure A-1

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-1**

LOCATION: See attached sketch

NORTHING: 162601 EASTING: 654945

DRILLER: G. Scallon LOGGED BY: C. Kehl START DATE: 11/18/20 END DATE: 11/18/20

SURFACE ELEVATION: 754.0 ft RIG: 8504 METHOD: Mud Rotary SURFACING: Gravel WEATHER: Sunny, 45°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
750.0		FILL: POORLY GRADED SAND with SILT (SP-SM), dark brown, moist		3-3-3 (6) 12"		8	P200=10% PID=0.3 ppm
4.0 747.5		FILL: POORLY GRADED GRAVEL (GP), tan	5	6-10-6 (16) 6"		2	PID=0.5 ppm
6.5 745.0		FILL: SILTY SAND with GRAVEL (SM), red to brown, moist		8-9-13 (22) 16"		5	PID=0.4 ppm
9.0 736.0		FILL: POORLY GRADED SAND with GRAVEL (SP), brown, moist	10	9-17-16 (33) 16"		8	P200=3% PID=0.2 ppm
				22-31-35 (66) 18"			PID=0.3 ppm
			15	26-20-16 (36) 16"			PID=0.3 ppm
18.0	▽	POORLY GRADED SAND (SP), fine-grained, light brown, moist to wet, medium dense to dense (ALLUVIUM)	20	6-8-8 (16) 14"			PID=0.3 ppm
			25	6-4-7 (11) 12"			PID=0.2 ppm
			30	10-17-27 (44) 18"			PID=0.2 ppm

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-1**

LOCATION: See attached sketch

NORTHING: 162601 EASTING: 654945

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 11/18/20 | END DATE: 11/18/20

SURFACE ELEVATION: 754.0 ft | RIG: 8504 | METHOD: Mud Rotary | SURFACING: Gravel | WEATHER: Sunny, 45°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine-grained, light brown, moist to wet, medium dense to dense (ALLUVIUM)					
35				14-20-21 (41) 18"			PID=0.4 ppm
40				11-14-16 (30) 18"			PID=0.3 ppm
45				14-24-25 (49) 17"			PID=0.3 ppm
50				10-14-16 (30) 14"			PID=0.4 ppm
55				8-13-24 (37) 18"			PID=0.2 ppm
60				13-13-14 (27) 18"			PID=0.4 ppm

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-1**

LOCATION: See attached sketch

NORTHING: 162601 EASTING: 654945

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 11/18/20 | END DATE: 11/18/20

SURFACE ELEVATION: 754.0 ft | RIG: 8504 | METHOD: Mud Rotary | SURFACING: Gravel | WEATHER: Sunny, 45°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine-grained, light brown, moist to wet, medium dense to dense (ALLUVIUM)	65	14-16-17 (33) 18"			PID=0.3 ppm
			70	33-47-52 (99) 18"			PID=0.4 ppm
			75	13-20-20 (40) 17"			PID=0.8 ppm
			80	22-17-26 (43) 18"			PID=0.6 ppm
			85	10-14-20 (34) 18"			PID=0.7 ppm
			90	16-19-18 (37) 16"			PID=0.8 ppm
			95	7-16-26 (42) 18"			PID=1.4 ppm

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-1**

LOCATION: See attached sketch

NORTHING: 162601 EASTING: 654945

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 11/18/20 | END DATE: 11/18/20

SURFACE ELEVATION: 754.0 ft | RIG: 8504 | METHOD: Mud Rotary | SURFACING: Gravel | WEATHER: Sunny, 45°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine-grained, light brown, moist to wet, medium dense to dense (ALLUVIUM)					
100				12-14-19 (33) 18"			PID=1.1 ppm
105				17-19-22 (41) 18"			PID=1.2 ppm
110				10-13-15 (28) 18"			PID=1.0 ppm
115				17-30-31 (61) 18"			PID=1.1 ppm
120				13-17-19 (36) 18"			PID=0.7 ppm
631.0							
123.0		WONEWOC FORMATION, SANDSTONE, tan to white, highly weathered, soft, very fine-grained, thin bedded, highly fractured					
125				20-49-48 (97) 18"			PID=0.9 ppm

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-1**

LOCATION: See attached sketch

NORTHING: 162601 EASTING: 654945

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 11/18/20 | END DATE: 11/18/20

SURFACE ELEVATION: 754.0 ft | RIG: 8504 | METHOD: Mud Rotary | SURFACING: Gravel | WEATHER: Sunny, 45°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
623.5		WONEWOC FORMATION, SANDSTONE, tan to white, highly weathered, soft, very fine-grained, thin bedded, highly fractured					
130.5		END OF BORING Boring immediately grouted	M	100/2" (REF) 2"			PID=0.9 ppm Water observed at 23.0 feet while drilling.

130
135
140
145
150
155

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-2**

LOCATION: See attached sketch

NORTHING: 162507	EASTING: 655080		
DRILLER: G. Scallon	LOGGED BY: C. Kehl	START DATE: 12/08/20	END DATE: 12/08/20
SURFACE ELEVATION: 740.5 ft	RIG: 8503	METHOD: Mud Rotary	SURFACING:	WEATHER: Cloudy, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		Air					
738.2							
2.3		WATER					
5							
10							
15							
20							
25							
30							

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-2**

LOCATION: See attached sketch

NORTHING: 162507 EASTING: 655080

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 12/08/20 | END DATE: 12/08/20

SURFACE ELEVATION: 740.5 ft | RIG: 8503 | METHOD: Mud Rotary | SURFACING: | WEATHER: Cloudy, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
707.5		WATER					
33.0		POORLY GRADED SAND (SP), fine-grained, light brown, wet, loose to very dense (ALLUVIUM)	35	3-4-6-8 (10*) 0"			*Not screened *No recovery
				34-34-62-83 (96) 24"			PID=2.8 ppm
			40				
		With Limestone at 43 to 45 feet		34-40-47 (87) 18"			PID=1.4 ppm
			45				
				5-5-6 (11) 18"			PID=0.7 ppm
			50				
688.5							
52.0		SILTY SAND (SM), light brown, wet, medium dense (ALLUVIUM)		5-6-5 (11) 18"		25	P200=18% PID=0.9 ppm
			55				
683.5							
57.0		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium dense to dense (ALLUVIUM)		5-7-7 (14) 18"			PID=0.9 ppm
			60				
		Trace Gravel at 63 feet		11-13-15 (28) 18"			PID=0.7 ppm

Continued on next page

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-2**
LOCATION: See attached sketch
NORTHING: 162507 EASTING: 655080
DRILLER: G. Scallon LOGGED BY: C. Kehl START DATE: 12/08/20 END DATE: 12/08/20
SURFACE ELEVATION: 740.5 ft RIG: 8503 METHOD: Mud Rotary SURFACING: WEATHER: Cloudy, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
65		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium dense to dense (ALLUVIUM)					
				6-9-10 (19) 18"			PID=0.0 ppm
70							
				11-13-12 (25) 15"			PID=0.0 ppm
75							
				12-11-13 (24)			PID=0.0 ppm
80							
				9-15-22 (37)			PID=0.0 ppm
85							
				13-19-26 (45)			PID=0.0 ppm
90							
		Trace Gravel at 93 feet		24-19-20 (39) 14"			PID=0.2 ppm
95							

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-2**
LOCATION: See attached sketch
NORTHING: 162507 EASTING: 655080
DRILLER: G. Scallon LOGGED BY: C. Kehl START DATE: 12/08/20 END DATE: 12/08/20
SURFACE ELEVATION: 740.5 ft RIG: 8503 METHOD: Mud Rotary SURFACING: WEATHER: Cloudy, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium dense to dense (ALLUVIUM)	100	7-11-24 (35) 16"			PID=0.8 ppm
638.5 102.0		POORLY GRADED SAND (SP), fine to coarse-grained, with Gravel, and Limestone, brown, wet, very dense (ALLUVIUM)	105	9-33-36 (69)			PID=4.1 ppm Not screened
631.6 108.9		WONEWOC FORMATION, SANDSTONE, white, highly weathered, moderately hard to soft, fine-grained, thin bedded, highly fractured		100/2" (REF) 2"			Rate of advance rounded to nearest whole minute

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks
630.6 109.9		WONEWOC FORMATION, SANDSTONE, white to greenish tan, highly weathered, very soft, very fine-grained, thin bedded, intensely fractured, with SHALEY layers	110	0	100	0 0 1 2 2	3260	50 120	90	Run 1
626.0 114.5 624.6		WONEWOC FORMATION, SANDSTONE, tan, slightly weathered, hard, very fine-grained, thin bedded, intensely fractured	115	20	80	1 0 0 0 0	2790	100	98	Run 2
115.9 619.2		WONEWOC FORMATION, SANDSTONE, brown to light brown, slightly weathered, moderately hard, very fine-grained, thin bedded, highly fractured	120	78	97	0 0 0 0 0	3720	70	95	Run 3
121.3 615.2		EAU CLAIRE FORMATION, SANDSTONE, gray, unweathered, hard, fine-grained, thin bedded, moderately fractured	125	17	95	1 0 0	2790	150	95	Run 4
125.3		EAU CLAIRE FORMATION, SANDSTONE, gray, slightly weathered, hard, very fine-grained, thin bedded, intensely fractured, with SHALEY layers spaced 2 to 8 inches								

Continued on next page

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LOG OF CORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-2**

LOCATION: See attached sketch

NORTHING: 162507 EASTING: 655080

DRILLER: G. Scallon LOGGED BY: C. Kehl START DATE: 12/08/20 END DATE: 12/08/20

SURFACE ELEVATION: 740.5 ft RIG: 8503 METHOD: Mud Rotary SURFACING: WEATHER: Cloudy, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks
611.6						0				
128.9		EAU CLAIRE FORMATION, SANDSTONE, gray, slightly weathered, hard, very fine-grained, thin bedded, intensely fractured, with SHALEY layers spaced 2 to 8 inches				2				
130										Run 5
		EAU CLAIRE FORMATION, SANDSTONE, gray, slightly weathered, hard, very fine-grained, thin bedded, intensely fractured		34	100	2 3 1 1 1	2560	180	95	
135										Run 6
				59	100	2 0 1 1 1	2560	150	90	
600.6										
139.9		END OF CORING Boring immediately grouted								
140										
145										
150										
155										

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-3**

LOCATION: See attached sketch

NORTHING: 162411 EASTING: 655218

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 12/10/20 | END DATE: 12/10/20

SURFACE ELEVATION: 740.5 ft | RIG: 8503 | METHOD: Mud Rotary | SURFACING: | WEATHER: Sunny, 40°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
738.1		Air					
2.4		WATER					
			5				
			10				
			15				
			20				
715.7							
24.8		POORLY GRADED GRAVEL (GP), with Limestone, brown, wet, dense (ALLUVIUM)	25	9-11-22 (33) 18"			PID=5.3 ppm
713.5							
27.0		POORLY GRADED SAND (SP), fine-grained, light brown, wet, loose to medium dense (ALLUVIUM)					
			30	1-2-3 (5) 11"			PID=6.6 ppm
		Continued on next page					

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-3**
LOCATION: See attached sketch
NORTHING: 162411 EASTING: 655218
DRILLER: G. Scallon LOGGED BY: C. Kehl START DATE: 12/10/20 END DATE: 12/10/20
SURFACE ELEVATION: 740.5 ft RIG: 8503 METHOD: Mud Rotary SURFACING: WEATHER: Sunny, 40°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine-grained, light brown, wet, loose to medium dense (ALLUVIUM)	35	4-5-5 (10) 12"			PID=7.8 ppm
			40	6-8-12 (20) 14"			PID=11.5 ppm
697.5 43.0		SANDY SILT (ML), light brown, wet, medium dense (ALLUVIUM)	45	7-11-15 (26) 15"			PID=9.8 ppm
692.5 48.0		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium dense (ALLUVIUM)	50	6-10-15 (25) 18"			PID=4.8 ppm
687.5 53.0		SANDY SILT (ML), light brown, wet, dense (ALLUVIUM)	55	21-22-19 (41) 16"			PID=5.7 ppm
682.5 58.0		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium dense to very dense (ALLUVIUM)	60	6-9-8 (17) 10"			PID=5.8 ppm

Continued on next page

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-3**

LOCATION: See attached sketch

NORTHING: 162411 EASTING: 655218

DRILLER: G. Scallon LOGGED BY: C. Kehl START DATE: 12/10/20 END DATE: 12/10/20

SURFACE ELEVATION: 740.5 ft RIG: 8503 METHOD: Mud Rotary SURFACING: WEATHER: Sunny, 40°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium dense to very dense (ALLUVIUM)	65	18-15-19 (34) 15"			PID=4.6 ppm
			70	8-11-14 (25) 16"			PID=4.7 ppm
			75	8-11-14 (25) 15"			PID=3.7 ppm
			80	9-14-15 (29) 18"			PID=3.6 ppm
			85	12-15-22 (37) 14"			PID=6.1 ppm
			90	18-27-35 (62) 15"			PID=4.4 ppm
			95	12-12-18 (30) 18"			PID=2.8 ppm

Continued on next page

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-3**

LOCATION: See attached sketch

NORTHING: 162411 EASTING: 655218

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 12/10/20 | END DATE: 12/10/20

SURFACE ELEVATION: 740.5 ft | RIG: 8503 | METHOD: Mud Rotary | SURFACING: | WEATHER: Sunny, 40°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium dense to very dense (ALLUVIUM)	100	9-20-31 (51) 13"			PID=3.8 ppm
			105	27-33-42 (75) 14"			PID=0.9 ppm
633.5		*With Silty Sand, Weathered Limestone and Weathered Sandstone, dark brown, brown and white at 106 feet*					
107.0		WONEWOC FORMATION, SANDSTONE, greenish tan, moderately weathered, soft, very fine-grained, thin bedded, intensely fractured, with SHALEY layers	110	100/2" (REF) 2"			*Rate of advance rounded to nearest whole minute PID=4.0 ppm

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks
629.2						0				Run 1
111.3		WONEWOC FORMATION, SANDSTONE, greenish tan, moderately weathered, soft, very fine-grained, thin bedded, intensely fractured, with SHALEY layers		7	40	0	2320	80	95	
			115			0				
624.2						2		150		
116.3		WONEWOC FORMATION, SANDSTONE, brown and greenish gray, unweathered, hard, very fine-grained, thin bedded, highly fractured, with SHALEY layers		55	100	3	2790	100	100	Run 2
620.7						1				
119.8		WONEWOC FORMATION, SANDSTONE, brown, slightly weathered, moderately hard, very fine-grained, thin bedded, highly fractured	120			0				
616.9						1				Run 3
123.6		EAU CLAIRE FORMATION, SANDSTONE, gray, unweathered, hard, very fine-grained, thin bedded, highly fractured		15	100	0	2790	50	95	
			125			0				
						4	1860			
						0				
						0				Run 4
		1-inch thick SHALE layer at 127 1/2 feet				1				

Continued on next page

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LOG OF CORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-3**

LOCATION: See attached sketch

NORTHING: 162411 EASTING: 655218

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 12/10/20 | END DATE: 12/10/20

SURFACE ELEVATION: 740.5 ft | RIG: 8503 | METHOD: Mud Rotary | SURFACING: | WEATHER: Sunny, 40°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks
		EAU CLAIRE FORMATION, SANDSTONE, gray, unweathered, hard, very fine-grained, thin bedded, highly fractured			90	2 1 1	2790	120	100	Run 5
130		*2- to 8-inch thick SHALEY layers starting at 132 feet*		32	100	3 4 6 5 1	2320	180	90	
135				32	100	3 4 1 1 4	2790	180	90	
140										
599.1										
141.4		END OF CORING								
145										
150										
155										

BRAUN INTERTEC
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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-4**

LOCATION: See attached sketch

NORTHING: 162317 EASTING: 655354

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 12/11/20 | END DATE: 12/11/20

SURFACE ELEVATION: 751.0 ft | RIG: 8503 | METHOD: 6 1/4" HSA | SURFACING: Railroad ballast | WEATHER: Snow, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
750.3		FILL: BALLAST, 8 inches					
0.7		FILL: SILTY SAND (SM), fine to medium-grained, black, moist					
748.0							
3.0		FILL: POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist	5	2-2-2 (4) 18"			PID=0.2 ppm
743.0							
8.0		FILL: POORLY GRADED SAND (SP), fine-grained, light brown, moist to wet	10	2-3-3 (6) 12"			PID=0.1 ppm
			15	3-2-3 (5) 18"			PID=0.0 ppm Switched to mud rotary drilling at 16 feet
731.0	▽		20	5-8-10 (18) 13"			PID=0.9 ppm
20.0		FILL: POORLY GRADED GRAVEL (GP), with layers of Silty Sand and Limestone, light brown, wet	25	5-10-12 (22) 16"			PID=0.4 ppm
			30	14-9-9 (18) 15"			PID=0.0 ppm

Continued on next page

BRAUN INTERTEC
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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-4**

LOCATION: See attached sketch

NORTHING: 162317 EASTING: 655354

DRILLER: G. Scallon LOGGED BY: C. Kehl START DATE: 12/11/20 END DATE: 12/11/20

SURFACE ELEVATION: 751.0 ft RIG: 8503 METHOD: 6 1/4" HSA SURFACING: Railroad ballast WEATHER: Snow, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		FILL: POORLY GRADED GRAVEL (GP), with layers of Silty Sand and Limestone, light brown, wet	35	20-21-18 (39) 6"			PID=0.5 ppm
713.0							
38.0		SANDY SILT (ML), light brown, wet, medium dense (ALLUVIUM)	40	10-13-15 (28) 14"			PID=0.0 ppm
			45	9-11-18 (29) 15"			PID=0.0 ppm
703.0							
48.0		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium to very dense (ALLUVIUM)	50	11-13-13 (26) 15"			PID=0.4 ppm
			55	8-13-14 (27) 11"			PID=0.0 ppm
			60	9-9-13 (22) 15"			PID=0.0 ppm

Continued on next page

BRAUN INTERTEC
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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-4**

LOCATION: See attached sketch

NORTHING: 162317 EASTING: 655354

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 12/11/20 | END DATE: 12/11/20

SURFACE ELEVATION: 751.0 ft | RIG: 8503 | METHOD: 6 1/4" HSA | SURFACING: Railroad ballast | WEATHER: Snow, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium to very dense (ALLUVIUM)	65	7-7-9 (16) 4"			PID=1.1 ppm
			70	7-8-12 (20) 16"			PID=0.4 ppm
			75	12-13-14 (27) 12"			PID=1.0 ppm
			80	11-12-14 (26) 18"			PID=0.0 ppm
			85	13-24-23 (47) 17"			PID=0.0 ppm
			90	19-22-18 (40) 12"			PID=0.4 ppm
			95	14-15-14 (29) 9"			PID=1.1 ppm

Continued on next page

BRAUN INTERTEC
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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-4**

LOCATION: See attached sketch

NORTHING: 162317 EASTING: 655354

DRILLER: G. Scallon | LOGGED BY: C. Kehl | START DATE: 12/11/20 | END DATE: 12/11/20

SURFACE ELEVATION: 751.0 ft | RIG: 8503 | METHOD: 6 1/4" HSA | SURFACING: Railroad ballast | WEATHER: Snow, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine-grained, light brown, wet, medium to very dense (ALLUVIUM)					
		Fine to coarse-grained layer at 100 feet	100	17-19-32 (51) 15"			PID=1.8 ppm
			105	21-34-60 (94) 12"			PID=1.7 ppm
			110	10-10-21 (31) 18"			PID=3.0 ppm
		Fine to coarse-grained below 112 feet	115	14-17-22 (39) 18"			PID=2.8 ppm
			120	15-24-33 (57) 18"			PID=0.0 ppm
627.0							
124.0		POORLY GRADED GRAVEL (GP), with Limestone, and Sandstone, very dense (ALLUVIUM)	125	63-100/2" (REF) 2"			PID=0.0 ppm
623.0							
128.0							

Continued on next page

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2008520
Geotechnical Evaluation
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, Wisconsin

BORING: **B-4**

LOCATION: See attached sketch

NORTHING: 162317	EASTING: 655354		
DRILLER: G. Scallon	LOGGED BY: C. Kehl	START DATE: 12/11/20	END DATE: 12/11/20
SURFACE ELEVATION: 751.0 ft	RIG: 8503	METHOD: 6 1/4" HSA	SURFACING: Railroad ballast	WEATHER: Snow, 30°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
617.0		POORLY GRADED SAND (SP), fine-grained, greenish brown, wet, dense (ALLUVIUM)	130	19-21-29 (50) 12"			PID=0.0 ppm
134.0		FAT CLAY (CH), contains lenses of Sandy Silt, gray, wet, hard (ALLUVIUM)	135	20-18-19 (37) 18"			PID=0.1 ppm
612.0							
139.0		WONEWOC FORMATION, SANDSTONE, tan, wet, highly weathered, fine-grained	140	100/2" (REF) 1"			Water observed at 20.0 feet while drilling.
611.0							
140.0		END OF BORING					
		Boring immediately grouted					
			145				
			150				
			155				

q_u (psi)

Axial Point Load Test Result

BRAUN INTERTEC

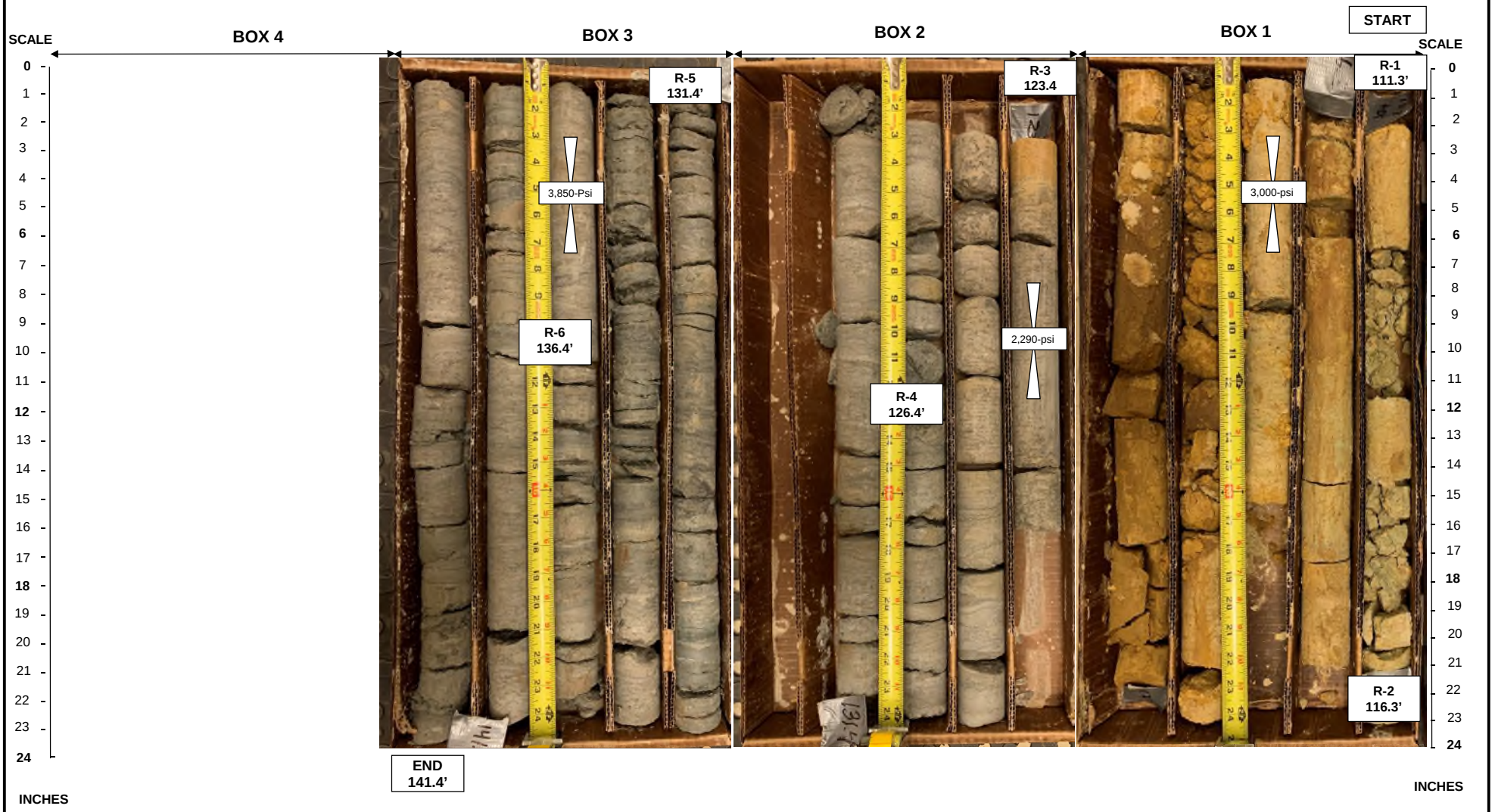
PROJECT NO.	B2008520
DRAWN BY:	BKW
CHECKED BY:	MLR

ROCK CORE PHOTOGRAPHS
BORING B-2 (108.9'- 139.9')

Great Sauk State Trail
Sauk City, Wisconsin

Figure

A-2



q_u (psi) Axial Point Load Test Result

BRAUN INTERTEC

PROJECT NO.	B2008520
DRAWN BY:	BKW
CHECKED BY:	MLR

ROCK CORE PHOTOGRAPHS
BORING B-3 (111.3'- 141.4')

Great Sauk State Trail
Sauk City, Wisconsin

Figure
A-3

Appendix B

BRAUN INTERTEC
The Science You Build On.

Braun Intertec Corporation
2309 Palace Street
La Crosse, WI 54603

Phone: 608.781.7277
Fax: 608.781.7279
Web: braunintertec.com

Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C)
ASTM D 7012

Date: December 28, 2020

Project Number: B2008520

Client: Lisa Wilson
Sauk County Wisconsin
505 Broadway
Baraboo, WI 53913

Project Description: Great Sauk State Trail

Sample Data

Date Sampled:	12/8/2020
Samples Obtained By:	Braun Drilling, LLC
Date Received:	12/21/2020
Sample Preparation:	Trim / Polish

Laboratory Data

						ASTM D4543 Limits
Sample Number:	B-2 (120)	B-2 (133)	B-3 (118.5)	B-3 (124.5)	B-3 (136)	
Date Tested:	12/28/2020	12/28/2020	12/28/2020	12/28/2020	12/28/2020	
Rock Type:						
Moisture Condition During Testing:	As Received	As Received	As Received	As Received	As Received	
Diameter (in.):	1.85	1.85	1.84	1.79	1.84	
Length (in.):	3.51	3.41	3.75	3.81	3.82	
Length-to-Diameter Ratio (L/D):	1.9	1.8	2.0	2.1	2.1	$2.0 \leq L/D \leq 2.5$
Side Tolerance, Maximum (in.)	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020 in.
End Tolerance, Maximum (in.)	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in.
Perpendicularity Deviation (°)	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.250°
Parallelism Deviation (°)	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.25°
Maximum Load (lbs):	1,449	16,875	7,968	5,768	10,253	
Area (in^2):	2.69	2.69	2.66	2.52	2.66	
Compressive Strength (psi):	540	6,270	3,000	2,290	3,850	
Compressive Strength (MPa):	4	43	20	16	26	

Remarks:

Reviewed By:

Brandon Wright
Senior Engineer

BRAUN INTERTEC
The Science You Build On.

2309 Palace Street
La Crosse, WI 54603
Phone: 608-781-7277

Geotechnical Testing

Various ASTM

12/31/2020

Client:

Sauk County Wisconsin
505 Broadway
Baraboo, WI 53913

Project:

B2008520
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, WI 53583

Sample Information

Metafield ID: 355817

Completed Date: 12/31/2020 **Prepared By:** Streier, Jim

Laboratory Results Summary

Boring	Sample	Depth (ft)	MC (%)	Wash Loss (%)	LL	PL	PI	Organic Content %	Dry Density (pcf)	Resistivity (ohm-cm)	Q_u (tsf)	Specific Gravity
B-2	5	53.0	25.2	18								

General

Results: The test is for informational purposes.

BRAUN INTERTEC
The Science You Build On.

Sieve Analysis Of Soil

ASTM D6913

12/31/2020

2309 Palace Street
La Crosse, WI 54603
Phone: 608-781-7277

Client:

Sauk County Wisconsin
505 Broadway
Baraboo, WI 53913

Project:

B2008520
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, WI 53583

Sample Information

Sample Number:	355818	**Depth (ft):**	88
Boring Number:	B-2	**Sampled By:**	Drill Crew
Sample Date:	12/21/2020		
Received Date:	12/31/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	12/31/2020	**Tested By:**	Streier, Jim

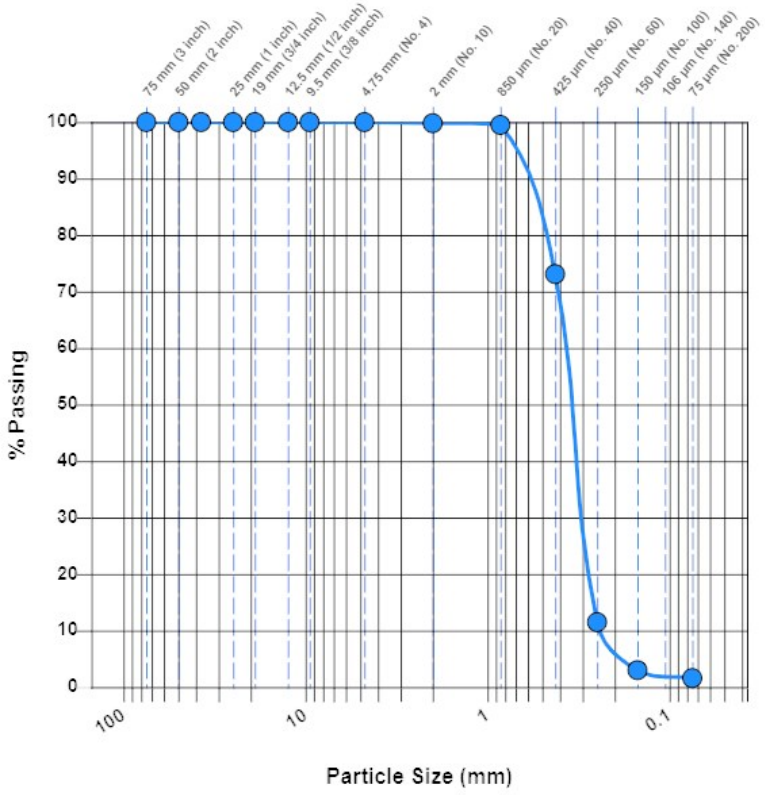
Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	99.8	
850 µm (No. 20)	99.5	
425 µm (No. 40)	73.1	
250 µm (No. 60)	11.5	
150 µm (No. 100)	3.0	
75 µm (No. 200)	1.6	

Sand (%)	Silt & Clay (%)
98.4	1.6

D10	D30	D60
0.232	0.303	0.388

C_U	C_C
1.67	1.02



Classification: SP Poorly graded sand

General

Results: The test is for informational purposes.

BRAUN INTERTEC
The Science You Build On.

Sieve Analysis Of Soil

ASTM D6913

12/31/2020

2309 Palace Street
La Crosse, WI 54603
Phone: 608-781-7277

Client:

Sauk County Wisconsin
505 Broadway
Baraboo, WI 53913

Project:

B2008520
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, WI 53583

Sample Information

Sample Number:	355819	**Depth (ft):**	30
Boring Number:	B-3	**Sampled By:**	Drill Crew
Sample Date:	12/21/2020		
Received Date:	12/31/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	12/31/2020	**Tested By:**	Streier, Jim

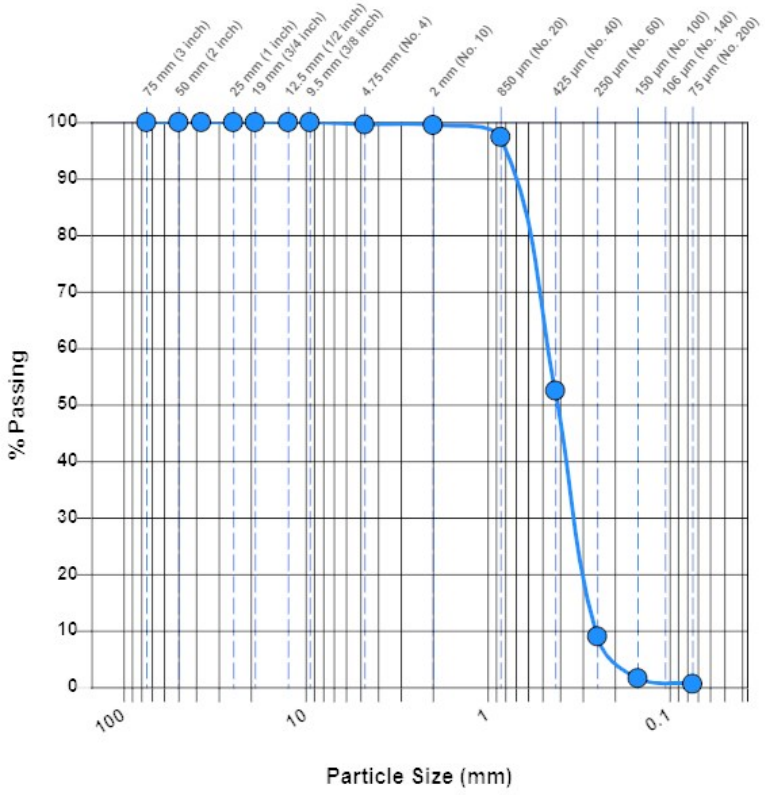
Laboratory Data

Sieve Size	Passing (%)	Specification
9.5 mm (3/8 inch)	100.0	
4.75 mm (No. 4)	99.6	
2 mm (No. 10)	99.5	
850 µm (No. 20)	97.4	
425 µm (No. 40)	52.5	
250 µm (No. 60)	9.0	
150 µm (No. 100)	1.6	
75 µm (No. 200)	0.6	

Gravel (%)	Sand (%)	Silt & Clay (%)
0.4	99.0	0.6

D10	D30	D60
0.254	0.334	0.496

C_U	C_C
1.95	0.89



Classification: SP Poorly graded sand

General

Results: The test is for informational purposes.

BRAUN INTERTEC
The Science You Build On.

Sieve Analysis Of Soil

ASTM D6913

12/31/2020

2309 Palace Street
La Crosse, WI 54603
Phone: 608-781-7277

Client:

Sauk County Wisconsin
505 Broadway
Baraboo, WI 53913

Project:

B2008520
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, WI 53583

Sample Information

Sample Number:	355818	**Depth (ft):**	88
Boring Number:	B-2	**Sampled By:**	Drill Crew
Sample Date:	12/21/2020		
Received Date:	12/31/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	12/31/2020	**Tested By:**	Streier, Jim

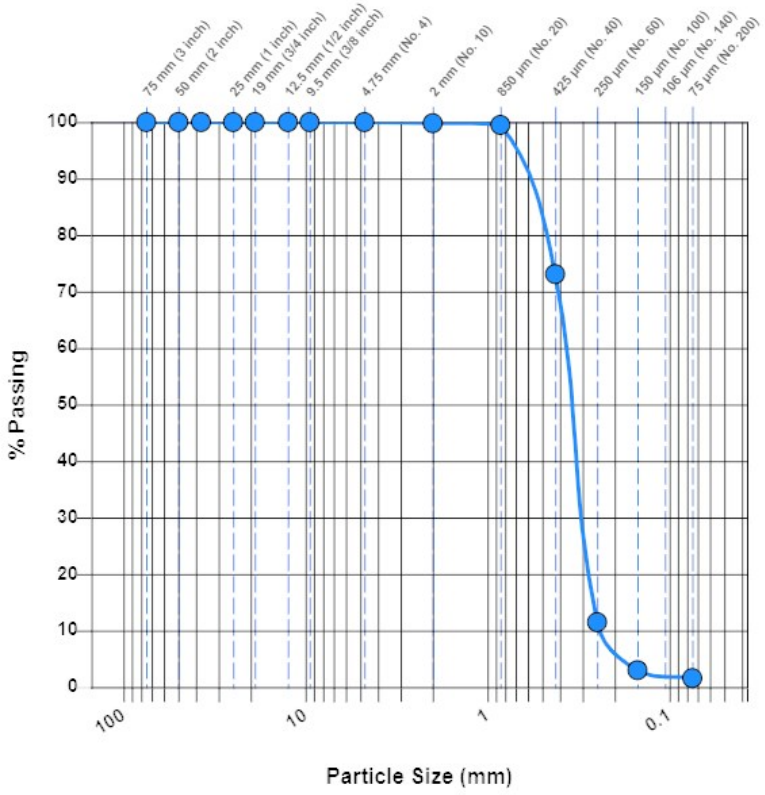
Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	99.8	
850 µm (No. 20)	99.5	
425 µm (No. 40)	73.1	
250 µm (No. 60)	11.5	
150 µm (No. 100)	3.0	
75 µm (No. 200)	1.6	

Sand (%)	Silt & Clay (%)
98.4	1.6

D10	D30	D60
0.232	0.303	0.388

C_U	C_C
1.67	1.02



Classification: SP Poorly graded sand

General

Results: The test is for informational purposes.

BRAUN INTERTEC
The Science You Build On.

Sieve Analysis Of Soil

ASTM D6913

12/31/2020

2309 Palace Street
La Crosse, WI 54603
Phone: 608-781-7277

Client:

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505 Broadway
Baraboo, WI 53913

Project:

B2008520
Great Sauk State Trail/Walking Iron Trail
Pedestrian Bridge
Sauk City, WI 53583

Sample Information

Sample Number:	355819	**Depth (ft):**	30
Boring Number:	B-3	**Sampled By:**	Drill Crew
Sample Date:	12/21/2020		
Received Date:	12/31/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	12/31/2020	**Tested By:**	Streier, Jim

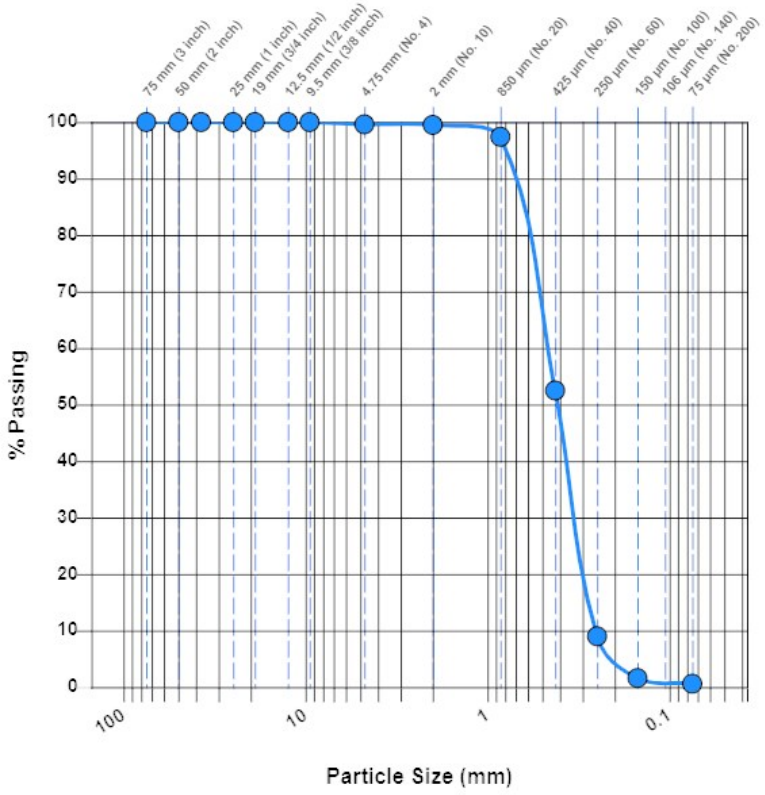
Laboratory Data

Sieve Size	Passing (%)	Specification
9.5 mm (3/8 inch)	100.0	
4.75 mm (No. 4)	99.6	
2 mm (No. 10)	99.5	
850 µm (No. 20)	97.4	
425 µm (No. 40)	52.5	
250 µm (No. 60)	9.0	
150 µm (No. 100)	1.6	
75 µm (No. 200)	0.6	

Gravel (%)	Sand (%)	Silt & Clay (%)
0.4	99.0	0.6

D10	D30	D60
0.254	0.334	0.496

C_U	C_C
1.95	0.89



Classification: SP Poorly graded sand

General

Results: The test is for informational purposes.