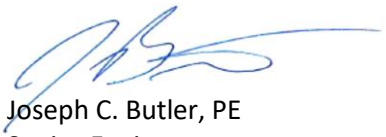
Subsurface Investigation Report

Enbridge Line 5 Reroute
MP 4 HDD Crossing – White River
Location 1-E, West of Bease Road, North of White River
Location 3-WR-1, West of Bease Road, North of White River
Location 4-WR-1, East of WI-112, South of White River
Location 5-E-2, East of WI-112, South of White River
Town of Gingles, Ashland County, Wisconsin

Prepared for

Enbridge Energy

Professional Certification:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Wisconsin.



Joseph C. Butler, PE
Senior Engineer
License Number: E-43286-6
October 1, 2020

Project B2001991

Braun Intertec Corporation

BRAUN INTERTEC
The Science You Build On.

Braun Intertec Corporation
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October 1, 2020 Project B2001991

Mr. Adam Erickson
Enbridge Energy, Limited Partnership
Manulife Place, 10180-101 Street
Edmonton, AB T5J 3S4

Re: Subsurface Investigation
Enbridge Line 5 Reroute
MP 4 HDD Crossing – White River
Location 1-E, West of Bease Road, North of White River
Location 3-WR-1, West of Bease Road, North of White River
Location 4-WR-1, East of WI-112, South of White River
Location 5-E-2, East of WI-112, South of White River
Town of Gingles, Ashland County, Wisconsin

Dear Mr. Erickson:

We are pleased to present this Subsurface Investigation Report for the Line 5 Reroute Project at the MP 4 HDD Crossing under White River in Town of Gingles, Ashland County, 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 Kyle Warmuth (kwarmuth@brauninterte.com) or David Morrison (dmorrison@braunintertec.com) at 218.624.4967.

Sincerely,

BRAUN INTERTEC CORPORATION

Kyle P. Warmuth
Staff Consultant

David E. Morrison
Project Consultant

Joseph C. Butler, PE
Business Unit Manager / Senior Engineer

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Appendix

A. Introduction

A.1. Project Description

Enbridge Energy plans to relocated Line 5 around the Bad River Indian Reservation, as part of that project, a geotechnical investigation and evaluation is being completed. We are providing subsurface investigation services as part of this effort.

This report provides a factual data obtained at Borehole Locations 1-E, 3-WR-1, 4-WR-1, and 5-E-2 for the HDD crossing under White River which is located at MP 4 in the proposed pipeline alignment in Town of Gingles, Iron County, Wisconsin.

A.2. Purpose

The purpose of our subsurface investigation is to characterize subsurface geologic conditions at the selected exploration location.

A.3. Background Information and Reference Documents

We reviewed the following information:

- Wisconsin Geologic Map, “Soils of Wisconsin”, prepared by F. D. Hole, M.T Beatty, C.J. Milfred, G.B. Lee, and A.J Klingelhoets, dated 1968.
- “Bedrock Geologic Map of Wisconsin”, prepared by M.G. Mudrey, Jr., B.A. Brown, and J.K. Greenberg, dated 1982.
- “Rock Mechanics Properties of Typical Foundation Rock Types”, prepared by J.R. Brandon, dated July 1974.
- Aerial photos from Google Earth Pro©.

A.4. Scope of Services

We performed our scope of services for the project in accordance with our Quote to Mr. Jonathan Underland of Enbridge Energy, under the terms of the Work Order (132013839) provided by Enbridge Energy. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.
- Lake Superior Consulting selected and staked the boring location and we cleared the exploration location of underground utilities. The Soil Boring Location Sketch included in the Appendix shows the approximate location of the boring.
- Performing four (4) standard penetration test (SPT) borings with coring denoted as 1-E, 3-WR-1, 4-WR-1, and 5-E-2 to nominal depths ranging from 162 to 230 feet below grade.
- Performing laboratory testing on select samples as selected by Lake Superior Consulting.
- Preparing this report containing a boring location sketch, an exploration log, laboratory tests, a summary of the geologic materials encountered.

Our scope of services did not include environmental services or testing and our geotechnical personnel performing this evaluation are not trained to provide environmental services or testing. We can provide environmental services or testing at your request.

B. Results

B.1. Geologic Overview

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Geologic Materials

B.2.a. Soil Encountered

The general geologic profile of the soils encountered between the four (4) borings consisted (proceeding down from the ground surface) of 2 foot to 6 1/2 feet of fill in borings 1-E, 4-WR-1, and 5-E-2, the fill is underlain by alternating layers of lacustrine (lake deposited) and glacial deposits. The soils contained in the layers consisted of silty sands, poorly graded sand with silt, fat clay, lean clay with sand, silty clay with sand, silty clayey sand, sandy silty clay, and clayey sand to the termination depth of each boring or refusal on bedrock, the encountered soils contained variable amounts of gravel. Table 1 in section B.3 contains more information on each material encountered.

B.2.b. Bedrock Encountered

Below the glacial deposits, borings 3-WR-1, 4-WR-1, and 5-E-1 encountered bedrock extending from an approximate elevation ranging between of 644 1/2 to 573 1/2 feet to the termination depth of the boring.

The bedrock generally consisted of Reddish brown with gray sandstone and mudstone and reddish brown with gray conglomerate associated the Freda Sandstone Group.

The sandstone and mudstone was generally classified as “moderately fractured” to “highly fractured”. The rock was deemed as “soft” to “moderately hard” in terms of the rock hardness scale and ranged from “slightly weathered” to “highly weathered”

The conglomerate was generally classified as “moderately fractured” to “highly fractured”. The rock was deemed as “moderately hard” in terms of the rock hardness scale and was deemed “slightly weathered”.

B.3. Estimated Soil Properties

Estimated soil properties for each significant strata change are presented below in Table 1.

Table 1: Estimated Soil Properties

Soil Strata and Elevations (ft)	Soil Type	Blow Count per foot Range (BPF)	Dry Unit Weight Range (pcf)	Undrained Unit Weight Range (pcf)	Drained Friction Angle Range (degrees)	Undrained Friction Angle (degrees)	Undrained Cohesion Range (ksf)	Drained Cohesion Range (ksf)	Modulus of Elasticity Range* (tsf)
Upper Soils (789 to 718 1/2)	Lean Clay (CL)	10 - 17	99 - 111	122 - 130	27 - 30	5 - 10	1.5 – 4.5	0.9 – 3.0	40 - 98
	Fat Clay (CH)	2 - 16	81 - 101	105 - 117	17 - 25	0	0.25 – 3.6	0.15 – 2.1	8 - 92
Middle Soils (725 to 600)	Lean Clay (CL)	7 - 58	96 - 106	122 - 135	27 - 35	5 - 10	1.5 - 10	0.9 -6.1+	28 - 334
	Fat Clay (CH)	2 - 22	75 - 96	105 - 117	17 - 25	0	0.25 – 3.6	0.15 - 2.1	8 - 127
	Poorly Graded Sand with Silt (SP-SM)	50 blows per 3 inches of penetration	111 - 115	122 - 127	38 - 40	36	0	0	490 - 504
	Silty Clay (CL-ML)	61 - 50 blows per 0 inches of penetration	114 - 119	125 - 130	30	0	7.5+	4.2+	280 - 403
	Silty Clayey Sand (SC-SM)	29 - 50 blows per 1 inch of penetration	105 - 120	122 - 130	33 - 37	25	2.0 – 2.5	2.5 – 4.1+	116 - 302
	Clayey Sand (SC)	50 blows per 5 inches of penetration- 50 blows per 2 inches of penetration	111 - 115	125 - 130	35 - 37	25	2.5	4.1+	280 - 302
	Silty Sand (SM)	45 - 50 blows per 2	79 - 114	125 - 130	35 - 37	25	2.5	4.1+	259 - 490

Soil Strata and Elevations (ft)	Soil Type	Blow Count per foot Range (BPF)	Dry Unit Weight Range (pcf)	Undrained Unit Weight Range (pcf)	Drained Friction Angle Range (degrees)	Undrained Friction Angle (degrees)	Undrained Cohesion Range (ksf)	Drained Cohesion Range (ksf)	Modulus of Elasticity Range* (tsf)
Lower Soils (629 to 563)		inches of penetration							
	Poorly Graded Sand with Silt (SP-SM)	50 blows per 3 inches of penetration-50 blows per 6 inches of penetration	109 - 136	120 - 150	38 - 40	36	0	0	490 - 504
Bedrock (644 1/2 to 534 1/2)	Congl.**	N/A	161-167	161-167	35 - 38	31 - 36	0	0	122,400 – 165, 600
	Sandstone/ Mudstone	N/A	154	154	35 - 38	31 - 36	0	0	64,800 – 72,000

*Sustained Young's Modulus values
**Conglomerate

B.4. Groundwater

We did not observe groundwater while advancing the borings. Groundwater may take days or longer to reach equilibrium in the boreholes and we immediately backfilled the boreholes, in accordance with our scope of work.

Project planning should anticipate seasonal and annual fluctuations of groundwater. Mud-rotary drilling techniques were used to advance the borings, hindering the ability to observe groundwater.

B.5. Laboratory Test Results

The boring logs show the results of the sieve analysis, moisture testing, Atterberg Limits, density, hydrometer with sieve analysis, unconfined compressive strength, and compressive strength of cores that were requested. The Appendix contains the results of these tests.

C. Procedures

C.1. Penetration Test Borings

We drilled the penetration test borings with a float tire-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 to ASTM D1586. We collected thin-walled tube samples in general accordance with ASTM D1587 at selected depths. The boring logs show the actual sample intervals and corresponding depths. We also collected bulk samples of auger cuttings at selected locations for laboratory testing.

C.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.

C.3. Exploration Logs

C.3.a. Log of Boring 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 laboratory tests performed on penetration test samples, and groundwater measurements. The Appendix also includes a Fence Diagram intended to provide a summarized cross-sectional view of the soil profile across the site.

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.

C.3.b. Logs of Coring

Log of Coring sheets follow the logs of the penetration test borings through which we performed 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.

C.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.

C.4. Material Classification and Testing

C.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.

C.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.

C.5. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes, as noted on the boring logs.

D. Qualifications

D.1. Variations in Subsurface Conditions

D.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.

D.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.

D.2. Continuity of Professional Responsibility

D.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.

D.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.

D.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.

D.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

BRAUN INTERTEC
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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **1-E**

LOCATION: See attached sketch

LATITUDE: 46.50594 LONGITUDE: -90.89399

DRILLER: M. Takada | LOGGED BY: A. Hillerud | START DATE: 05/19/20 | END DATE: 05/22/20

SURFACE ELEVATION: 792.9 ft | RIG: 7507 | METHOD: 4 1/4" HSA | SURFACING: | WEATHER: sunny

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
~~792.6~~ 0.3		SILTY CLAY (CL-ML), with roots, dark brown, moist (TOPSOIL)					
		FILL: FAT CLAY with SAND (CH), trace Gravel, trace roots, reddish brown, moist		2-3-5 (8) 12"			
788.9 4.0		LEAN CLAY with SAND (CL), trace Gravel, reddish brown, moist to wet, very stiff to stiff (LACUSTRINE)	5	5-7-9 (16) 14"			
				4-7-10 (17) 16"		17	Test results are in the attached lab report
			10	5-7-9 (16) 16"			
				5-6-6 (12) 18"			
			15	4-5-6 (11) 18"	2		
							Drilling method switched to mud rotary at 18 feet
			20	3-4-6 (10) 16"	1.5	21	Test results are in the attached lab report
			25	3-4-7 (11) 16"	1.25		
			30	4-6-8 (14) 22"	1.5		

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Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **1-E**

LOCATION: See attached sketch

LATITUDE:	46.50594	LONGITUDE:	-90.89399
DRILLER:	M. Takada	LOGGED BY:	A. Hillerud
START DATE:	05/19/20	END DATE:	05/22/20
SURFACE ELEVATION:	792.9 ft	RIG:	7507
METHOD:	4 1/4" HSA	SURFACING:	
WEATHER:	sunny		

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
759.9		LEAN CLAY with SAND (CL), trace Gravel, reddish brown, moist to wet, very stiff to stiff (LACUSTRINE)					
33.0		LEAN CLAY (CL), reddish brown, wet, stiff (LACUSTRINE)					
			35	TW	2.5	23	Thinwall - Test results are in the attached lab report
			40	3-4-6 (10) 22"	1.25		
			45	TW	1.5		Thinwall
			50	3-4-6 (10) 22"	1		
			55	TW	1.5	22	Thinwall - Test results are in the attached lab report
			60	4-5-6 (11) 22"	1.25		

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Various Locations
Ashland and Iron Counties, Wisconsin

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SURFACE ELEVATION:	792.9 ft	RIG:	7507
METHOD:	4 1/4" HSA	SURFACING:	
WEATHER:	sunny		

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
		LEAN CLAY (CL), reddish brown, wet, stiff (LACUSTRINE)	65	TW	0.75		Thinwall
724.9							
68.0		LEAN CLAY with SAND (CL), trace Gravel, reddish brown, wet, medium (LACUSTRINE)	70	3-3-5 (8) 22"	0.75		
			75	TW	1.5	18	Thinwall - Test results are in the attached lab report
			80	3-4-6 (10) 22"	0.75		
			85	TW	2		Thinwall
			90	3-5-7 (12) 22"	0.75		
			95	4-6-6 (12) 6"	1.25		

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Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **1-E**

LOCATION: See attached sketch

LATITUDE: 46.50594 LONGITUDE: -90.89399

DRILLER: M. Takada | LOGGED BY: A. Hillerud | START DATE: 05/19/20 | END DATE: 05/22/20

SURFACE ELEVATION: 792.9 ft | RIG: 7507 | METHOD: 4 1/4" HSA | SURFACING: | WEATHER: sunny

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
		LEAN CLAY with SAND (CL), trace Gravel, reddish brown, wet, medium (LACUSTRINE)					
			100	14-15-17 (32) 22"		27	Test results are in the attached lab report
			105	3-4-7 (11) 22"	1.5		
			110	0"			
			115	14-16-17 (33) 4"	0.25		
			120	3-6-7 (13) 22"	1.5		
669.9 123.0		SANDY LEAN CLAY (CL), with Gravel, reddish brown, wet, stiff to hard (LACUSTRINE)	125	6-7-10 (17) 12"	0.5	17	Test results are in the attached lab report

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Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **1-E**

LOCATION: See attached sketch

LATITUDE: 46.50594 LONGITUDE: -90.89399

DRILLER: M. Takada | LOGGED BY: A. Hillerud | START DATE: 05/19/20 | END DATE: 05/22/20

SURFACE ELEVATION: 792.9 ft | RIG: 7507 | METHOD: 4 1/4" HSA | SURFACING: | WEATHER: sunny

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
		SANDY LEAN CLAY (CL), with Gravel, reddish brown, wet, stiff to hard (LACUSTRINE)					
			130	6-7-11 (18) 0"			No recovery
			135	4-9-10 (19) 0"			No recovery
			140	6-9-11 (20) 0"			No recovery
			145	19-25-30 (55) 4"		22	Test results are in the attached lab report
			150	14-24-34 (58)			
639.9 153.0		SANDY SILTY CLAY (CL-ML), fine to medium-grained, with Gravel, reddish brown, moist to wet, hard (GLACIAL TILL)	155	41-50/5" (REF) 11"			
				41-45-32			

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BORING: **1-E**

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START DATE:	05/19/20	END DATE:	05/22/20
SURFACE ELEVATION:	792.9 ft	RIG:	7507
METHOD:	4 1/4" HSA	SURFACING:	
WEATHER:	sunny		

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
		SANDY SILTY CLAY (CL-ML), fine to medium-grained, with Gravel, reddish brown, moist to wet, hard (GLACIAL TILL)		(77) 14"			
165				24-27-50/4" (REF) 15"		10	Test results are in the attached lab report
170				16-31-37 (68) 14"			
175				24-39-50/5" (REF) 15"			
180				50/3" (REF) 3"			
185				41-50/3" (REF) 8"			
190				50/0" (REF) 3"		9	Test results are in the attached lab report

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Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **1-E**

LOCATION: See attached sketch

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DRILLER:	M. Takada	LOGGED BY:	A. Hillerud
START DATE:	05/19/20	END DATE:	05/22/20
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METHOD:	4 1/4" HSA	SURFACING:	
WEATHER:	sunny		

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
599.9		SANDY SILTY CLAY (CL-ML), fine to medium-grained, with Gravel, reddish brown, moist to wet, hard (GLACIAL TILL)					
193.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, with Gravel, reddish brown, moist to wet, very dense (GLACIAL OUTWASH)					
		195		68/6" (REF) 4"		10	Test results are in the attached lab report
		200		50/6" (REF) 6"			
		205		50/5" (REF)			
		210		50/4" (REF) 0"			No recovery
579.9							
213.0		SILTY SAND with GRAVEL (SM), fine to medium-grained, brown, moist to wet, very dense (GLACIAL TILL)					
		215		50/4" (REF) 4"		58	Test results are in the attached lab report
		220		50/4" (REF) 0"			No recovery

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BORING: **1-E**

LOCATION: See attached sketch

LATITUDE: 46.50594 LONGITUDE: -90.89399

DRILLER: M. Takada LOGGED BY: A. Hillerud START DATE: 05/19/20 END DATE: 05/22/20

SURFACE ELEVATION: 792.9 ft RIG: 7507 METHOD: 4 1/4" HSA SURFACING: WEATHER: sunny

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
		SILTY SAND with GRAVEL (SM), fine to medium-grained, brown, moist to wet, very dense (GLACIAL TILL)		100/3" (REF) 0"			No recovery
563.1							
229.8		END OF BORING		200/3" (REF) 3"			Water not observed while drilling.
		Boring then backfilled with cement/bentonite grout					

225
230
235
240
245
250
255

BRAUN INTERTEC
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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **3-WR-1**
LOCATION: See attached sketch
LATITUDE: 46.50325 LONGITUDE: -90.89249
DRILLER: C. Gorman LOGGED BY: P. Moe START DATE: 06/22/20 END DATE: 06/25/20
SURFACE ELEVATION: 696.7 ft RIG: 8502 METHOD: 3 1/4" HSA SURFACING: WEATHER: sunny

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
696.5 0.2		LEAN CLAY (CL), trace organic, brown, moist (TOPSOIL)					
		LEAN CLAY with SAND (CL), fine to medium-grained, trace Gravel, brown, moist, medium (LACUSTRINE)		4-3-4 (7) 10"			
690.7			5	4-3-5 (8) 10"			
6.0		FAT CLAY (CH), reddish brown, moist, stiff (LACUSTRINE)		3-4-5 (9) 11"		26	Test results are in the attached lab report
			10	4-5-6 (11) 16"			
				4-5-9 (14) 18"			
678.7			15	4-5-4 (9) 12"			
18.0		SANDY LEAN CLAY (CL), reddish brown, moist, stiff (LACUSTRINE)					
			20	TW		25	Thinwall - Test results are in the attached lab report
			25	5-4-7 (11) 18"			
669.2							
27.5		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, moist, dense (GLACIAL OUTWASH)					
			30	11-12-28 (40) 10"		10	Test results are in the attached lab report
664.2							
32.5		FAT CLAY (CH), reddish brown, moist, medium to stiff (LACUSTRINE)					

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **3-WR-1**
LOCATION: See attached sketch
LATITUDE: 46.50325 LONGITUDE: -90.89249
DRILLER: C. Gorman LOGGED BY: P. Moe START DATE: 06/22/20 END DATE: 06/25/20
SURFACE ELEVATION: 696.7 ft RIG: 8502 METHOD: 3 1/4" HSA SURFACING: WEATHER: sunny

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
		FAT CLAY (CH), reddish brown, moist, medium to stiff (LACUSTRINE)	35	4-3-4 (7) 16"			
			40	1-3-4 (7) 16"		33	Test results are in the attached lab report
			45	3-3-6 (9) 17"			
649.2							
47.5		FAT CLAY (CH), trace Gravel, reddish brown, moist, very stiff (LACUSTRINE)	50	4-11-11 (22) 6"			
644.2							
52.5		LEAN CLAY with SAND (CL), reddish brown, moist, stiff (LACUSTRINE)	55	3-4-5 (9) 12"			
			60	4-5-6 (11) 17"		25	Test results are in the attached lab report
			65	TW			Thinwall
629.2		SILTY SAND with GRAVEL (SM), fine to medium-grained, brown, moist, very dense (GLACIAL TILL)					
67.5		Continued on next page					

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **3-WR-1**
LOCATION: See attached sketch
LATITUDE: 46.50325 LONGITUDE: -90.89249
DRILLER: C. Gorman LOGGED BY: P. Moe START DATE: 06/22/20 END DATE: 06/25/20
SURFACE ELEVATION: 696.7 ft RIG: 8502 METHOD: 3 1/4" HSA SURFACING: WEATHER: sunny

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
		SILTY SAND with GRAVEL (SM), fine to medium-grained, brown, moist, very dense (GLACIAL TILL)	70	17-21-25 (46)			No recovery
			75	17-20-25 (45)			No recovery
			80	50/3" (REF) 3"			No recovery
			85	50/3" (REF) 3"		14	Test results are in the attached lab report
			90	50/3" (REF) 3"			
603.7 93.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, with Gravel, brown, moist, very dense (GLACIAL OUTWASH)	95	50/3" (REF) 3"		10	Test results are in the attached lab report
599.2 97.5		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist, very dense (GLACIAL TILL)	100	50/3" (REF) 3"			

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **3-WR-1**
LOCATION: See attached sketch
LATITUDE: 46.50325 LONGITUDE: -90.89249
DRILLER: C. Gorman LOGGED BY: P. Moe START DATE: 06/22/20 END DATE: 06/25/20
SURFACE ELEVATION: 696.7 ft RIG: 8502 METHOD: 3 1/4" HSA SURFACING: WEATHER: sunny

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
		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown, moist, very dense (GLACIAL TILL)					
			105	50/5" (REF) 5"			
			110	50/4" (REF) 4"		11	Test results are in the attached lab report
584.2							
112.5		SILTY SAND (SM), fine to medium-grained, brown, moist, very dense (GLACIAL TILL)					
			115	50/2" (REF) 2"			
			120	50/2" (REF) 2"			
573.7							Auger met refusal at 123 feet. Drilling method switched to rock coring at 125 feet.
123.0			125				
569.7		KEWEENAWAN SUPER GROUP: FREDA SANDSTONE FORMATION, SANDSTONE, reddish brown, highly weathered, soft, fine-grained, massive, highly fractured					
127.0		KEWEENAWAN SUPER GROUP: FREDA SANDSTONE FORMATION, SANDSTONE, reddish brown with gray, moderately weathered, moderately hard, fine-grained, massive, moderately fractured		80 / 90	2	3260	100 / 90 Run 1 MOH's 3
			130				
		Test results are in the attached lab report					Run 2 MOH's 4
			135				

Continued on next page

RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks

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LOG OF CORING

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Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **3-WR-1**
LOCATION: See attached sketch
LATITUDE: 46.50325 LONGITUDE: -90.89249
DRILLER: C. Gorman LOGGED BY: P. Moe START DATE: 06/22/20 END DATE: 06/25/20
SURFACE ELEVATION: 696.7 ft RIG: 8502 METHOD: 3 1/4" HSA SURFACING: WEATHER: sunny

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
		KEWEENAWAN SUPER GROUP: FREDA SANDSTONE FORMATION, SANDSTONE, reddish brown with gray, moderately weathered, moderately hard, fine-grained, massive, moderately fractured		90	80	4	3260	180	90	
		Test results are in the attached lab report	140							
				90	90	4	3260	160	90	Run 3 MOH's 4
		Test results are in the attached lab report	145							
				90	85	7	3260	200	90	Run 4 MOH's 4
			150							
				90	100	4	3260	200	90	Run 5 MOH's 4
		Test results are in the attached lab report	155							
534.7			160							
162.0		END OF CORING								Water not observed while drilling.
		Boring then backfilled with cement/bentonite grout	165							

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **4-WR-1**
LOCATION: See attached sketch
LATITUDE: 46.49903 LONGITUDE: -90.89597
DRILLER: EPC LOGGED BY: P. Moe START DATE: 07/13/20 END DATE: 07/17/20
SURFACE ELEVATION: 704.9 ft RIG: Subcontractor METHOD: 4 1/4" HSA SURFACING: WEATHER:

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
702.9		FILL: LEAN CLAY (CL), trace organic, brown, moist		3-4-4-6 (8) 10"			
2.0		FAT CLAY (CH), reddish brown, moist, soft to very stiff (LACUSTRINE)		3-7-9-12 (16) 12"			
			5	4-6-9-11 (15) 18"			
				4-5-4-4 (9) 14"			
			10	TW 21"		29	Thinwall - Test results are in the attached lab report
				2-4-5-6 (9) 20"			
			15	2-3-4-5 (7) 20"			
				2-2-4-5 (6) 18"			
			20				
				TW 18"		21	Thinwall - Test results are in the attached lab report
			25				
				1-2-2-2 (4) 20"			
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **4-WR-1**
LOCATION: See attached sketch
LATITUDE: 46.49903 LONGITUDE: -90.89597
DRILLER: EPC LOGGED BY: P. Moe START DATE: 07/13/20 END DATE: 07/17/20
SURFACE ELEVATION: 704.9 ft RIG: Subcontractor METHOD: 4 1/4" HSA SURFACING: WEATHER:

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
		FAT CLAY (CH), reddish brown, moist, soft to very stiff (LACUSTRINE)		TW 22"			Thinwall
			35				
				1-1-3-3 (4) 24"			
			40				
				TW 24"			Thinwall
			45				
				0-2-4-4 (6) WOH/6" 24"			
			50				
652.9							
52.0		SANDY LEAN CLAY (CL), trace Gravel, brown, moist, stiff (LACUSTRINE)		TW 20"		15	Thinwall - Test results are in the attached lab report
			55				
				4-5-6-7 (11) 24"			
			60				
643.9							
61.0		SILTY CLAY with SAND (CL-ML), fine to medium-grained, Gravel, brown, moist, hard (GLACIAL TILL)		10-21-40-50/ 4" (61) 8"		10	Test results are in the attached lab report

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

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Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **4-WR-1**

LOCATION: See attached sketch

LATITUDE: 46.49903 LONGITUDE: -90.89597

DRILLER: EPC LOGGED BY: P. Moe START DATE: 07/13/20 END DATE: 07/17/20

SURFACE ELEVATION: 704.9 ft RIG: Subcontractor METHOD: 4 1/4" HSA SURFACING: WEATHER:

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
639.9		SILTY CLAY with SAND (CL-ML), fine to medium-grained, Gravel, brown, moist, hard (GLACIAL TILL)	65				
65.0		CLAYEY SAND (SC), fine to medium-grained, brown, moist, very dense (GLACIAL TILL)		50/5" (REF) 5"			
			70	50/2" (REF) 2"		13	Test results are in the attached lab report
629.9			75				
75.0		SILTY, CLAYEY SAND with GRAVEL (SC-SM), rock fragments, brown, moist, very dense (GLACIAL TILL)		50/1" (REF) 1"			Auger met refusal at 80 feet. Drilling method switched to rock coring at 80 feet.
624.9			80	50/2" (REF) 2"			
80.0		FREDA SANDSTONE, SANDSTONE, reddish brown with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, highly fractured		67 100			Run 1 MOHs 2
		Test results are in the attached lab report					
			85	90 100			Run 2 MOHs 2
			90	93 100			Run 3 MOHs 2
		Test results are in the attached lab report					
			95	92 100			Run 4 MOHs 2

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RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks

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LOG OF CORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **4-WR-1**
LOCATION: See attached sketch
LATITUDE: 46.49903 LONGITUDE: -90.89597
DRILLER: EPC LOGGED BY: P. Moe START DATE: 07/13/20 END DATE: 07/17/20
SURFACE ELEVATION: 704.9 ft RIG: Subcontractor METHOD: 4 1/4" HSA SURFACING: WEATHER:

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
		FREDA SANDSTONE, SANDSTONE, reddish brown with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, highly fractured								
			100	87	100					Run 5 MOHs 2
601.9										
103.0		FREDA SANDSTONE, SANDSTONE/ MUDSTONE, reddish brown with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, moderately fractured *Test results are in the attached lab report*	105	100	100					Run 6 MOHs 2
596.9										
108.0		FREDA SANDSTONE, SANDSTONE/ MUDSTONE, reddish brown with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, highly fractured	110	92	100					Run 7 MOHs 2
		Test results are in the attached lab report	115	100	100					Run 8 MOHs 2
586.9										
118.0		FREDA SANDSTONE, SANDSTONE/ MUDSTONE, reddish brown with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, moderately fractured	120	100	100					Run 9 MOHs 2
581.9										
123.0		FREDA SANDSTONE, SANDSTONE/ MUDSTONE, reddish gray with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, highly fractured	125	97	100					Run 10 MOHs 2
		Test results are in the attached lab report								

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Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **4-WR-1**
LOCATION: See attached sketch
LATITUDE: 46.49903 LONGITUDE: -90.89597
DRILLER: EPC LOGGED BY: P. Moe START DATE: 07/13/20 END DATE: 07/17/20
SURFACE ELEVATION: 704.9 ft RIG: Subcontractor METHOD: 4 1/4" HSA SURFACING: WEATHER:

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
		FREDA SANDSTONE, SANDSTONE/ MUDSTONE, reddish gray with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, highly fractured								Run 11 MOHs 2
		130		93	100					
										Run 12 MOHs 2
		135		94	100					
566.9										
138.0		FREDA SANDSTONE, MUDSTONE, reddish gray with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, highly fractured *Test results are in the attached lab report*								Run 13 MOHs 2
		140		95	100					
										Run 14 MOHs 2
		145		100	100					
										Run 15 MOHs 2
554.9										
150.0		FREDA SANDSTONE, SANDSTONE/ MUDSTONE, reddish gray with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, highly fractured *Test results are in the attached lab report*								
		150		97	100					
										Run 16 MOHs 2
		155		93	100					
										Run 17 MOHs 2
544.9										
160.0		Continued on next page								

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **4-WR-1**

LOCATION: See attached sketch

LATITUDE: 46.49903 LONGITUDE: -90.89597

DRILLER: EPC LOGGED BY: P. Moe START DATE: 07/13/20 END DATE: 07/17/20

SURFACE ELEVATION: 704.9 ft RIG: Subcontractor METHOD: 4 1/4" HSA SURFACING: WEATHER:

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
		FREDA SANDSTONE, SANDSTONE, reddish gray with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, highly fractured *Test results are in the attached lab report*		90	100					
										Run 18 MOHs 2
			165	93	100					
535.9										Run 19 MOHs 2
169.0		FREDA SANDSTONE, SANDSTONE/ MUDSTONE, reddish gray with whitish gray, slightly weathered, soft, fine-grained to medium-grained, massive, highly fractured *Test results are in the attached lab report*		88	100					
534.9			170							
170.0		END OF CORING Boring then backfilled with cement/bentonite grout								Water not observed while drilling.
			175							
			180							
			185							
			190							

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **5-E-2**

LOCATION: See attached sketch

LATITUDE: 46.49673 LONGITUDE: -90.89565

DRILLER: M. Swenson | LOGGED BY: P. Moe | START DATE: 07/13/20 | END DATE: 07/28/20

SURFACE ELEVATION: 791.4 ft | RIG: 7505 | METHOD: 4 1/4" HSA | SURFACING: | WEATHER:

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: SILTY CLAY with SAND (CL-ML), fine to medium-grained, trace organic, roots, trace Gravel, brown, dry to moist		3-13-15 (28) 10"			
			5	5-10-16 (26) 12"			
784.9 6.5		FAT CLAY (CH), reddish brown, moist, soft to very stiff (LACUSTRINE)		3-6-10 (16) 14"		16	Test results are in the attached lab report
			10	TW			Thinwall
				3-5-6 (11) 18"			
			15	3-7-7 (14) 18"			
			20	TW		27	Thinwall - Test results are in the attached lab report
			25	3-4-6 (10) 14"			
			30	TW			Thinwall

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **5-E-2**
LOCATION: See attached sketch
LATITUDE: 46.49673 LONGITUDE: -90.89565
DRILLER: M. Swenson LOGGED BY: P. Moe START DATE: 07/13/20 END DATE: 07/28/20
SURFACE ELEVATION: 791.4 ft RIG: 7505 METHOD: 4 1/4" HSA SURFACING: WEATHER:

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
		FAT CLAY (CH), reddish brown, moist, soft to very stiff (LACUSTRINE)	35	2-4-5 (9) 12"			
			40	TW		29	Thinwall - Test results are in the attached lab report
			45	1-2-3 (5) 18"			
744.4 47.0		FAT CLAY with GRAVEL (CH), reddish brown, moist, soft to medium (LACUSTRINE)	50	TW		30	Thinwall - Test results are in the attached lab report
			55	0-1-2 (3) WOH/6" 18"			
			60	TW			Thinwall, No recovery
			65	TW			Thinwall

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **5-E-2**

LOCATION: See attached sketch

LATITUDE: 46.49673 LONGITUDE: -90.89565

DRILLER: M. Swenson | LOGGED BY: P. Moe | START DATE: 07/13/20 | END DATE: 07/28/20

SURFACE ELEVATION: 791.4 ft | RIG: 7505 | METHOD: 4 1/4" HSA | SURFACING: | WEATHER:

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
		FAT CLAY with GRAVEL (CH), reddish brown, moist, soft to medium (LACUSTRINE)	70	0-1-1 (2) WOH/6" 0"			No recovery
718.4 73.0		FAT CLAY with SAND (CH), trace Gravel, reddish brown, moist, medium to stiff (LACUSTRINE)	75	2-2-3 (5) 6"		25	Test results are in the attached lab report
			80	4-5-5 (10) 5"			
			85	TW		34	Thinwall - Test results are in the attached lab report
			90	0-3-5 (8) WOH/6" 0"			No recovery
			95	TW			Thinwall, No recovery
			100	1-3-4 (7) 0"			No recovery

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **5-E-2**
LOCATION: See attached sketch
LATITUDE: 46.49673 LONGITUDE: -90.89565
DRILLER: M. Swenson LOGGED BY: P. Moe START DATE: 07/13/20 END DATE: 07/28/20
SURFACE ELEVATION: 791.4 ft RIG: 7505 METHOD: 4 1/4" HSA SURFACING: WEATHER:

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
688.4		FAT CLAY with SAND (CH), trace Gravel, reddish brown, moist, medium to stiff (LACUSTRINE)					
103.0		FAT CLAY (CH), reddish brown, moist, soft (LACUSTRINE)	105	TW		40	Thinwall - Test results are in the attached lab report
			110	0-1-2 (3) WOH/6" 18"			
			115	TW			Thinwall
			120	0-0-2 (2) WOH/12" 18"			
			125	TW			Thinwall - No recovery
663.9							
127.5		SILTY, CLAYEY SAND with GRAVEL (SC-SM), rock fragments, brown, moist, very stiff to hard (GLACIAL TILL)	130	12-14-15 (29) 0"			No recovery
			135	50/1" (REF) 1"			

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **5-E-2**
LOCATION: See attached sketch
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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
		SILTY, CLAYEY SAND with GRAVEL (SC-SM), rock fragments, brown, moist, very stiff to hard (GLACIAL TILL)		50/1" (REF) 1"			Drilling method switched to rock coring at 147 feet
644.4 147.0		FREDA SANDSTONE, MUDSTONE, reddish brown, slightly weathered, moderately hard, fine-grained, massive, highly fractured *Test results are in the attached lab report*		37 75	2 3 4	4650	90 70 Run 1 MOHs 2
639.4 152.0		FREDA SANDSTONE, CONGLOMERATE, reddish brown, slightly weathered, moderately hard, fine-grained to coarse-grained, massive, highly fractured *Test results are in the attached lab report*		81 87	3 2 3 3 3	4650	90 70 Run 2 MOHs 2
				85 100	3 3 3 2 3 4	4650	90 80 Run 3 MOHs 2
		Test results are in the attached lab report		94 100	3 3 3 3 3 2 3 3 2	4650	90 80 Run 4 MOHs 2
		Continued on next page		RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi) Water Pressure (psi) Water Return % Remarks

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LOG OF CORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **5-E-2**
LOCATION: See attached sketch
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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
		FREDA SANDSTONE, CONGLOMERATE, reddish brown, slightly weathered, moderately hard, fine-grained to coarse-grained, massive, highly fractured		92	93	3 3 3 3 3	4650	90	70	Run 5 MOHs 2
		Test results are in the attached lab report	175	87	100	2 3 3	4650	90	70	Run 6 MOHs 2
				99	89	3 3 3 3 3 3 3 3	4650	90	70	Run 7 MOHs 2
		Test results are in the attached lab report	180 185							
605.4 186.0		FREDA SANDSTONE, CONGLOMERATE, reddish brown with gray, slightly weathered, moderately hard, fine-grained to coarse-grained, massive, highly fractured		92	100	3 3 3 3 3 3 3 3 3 3 3 3	4650	90	75	Run 8 MOHs 2
		Test results are in the attached lab report	190 195	90	100	2 3 3 3 3 3 3 3 3	4650	90	65	Run 9 MOHs 2
			200							

Continued on next page

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LOG OF CORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2001991
Geotechnical Evaluation
Enbridge Line 5 Re-Route
Various Locations
Ashland and Iron Counties, Wisconsin

BORING: **5-E-2**

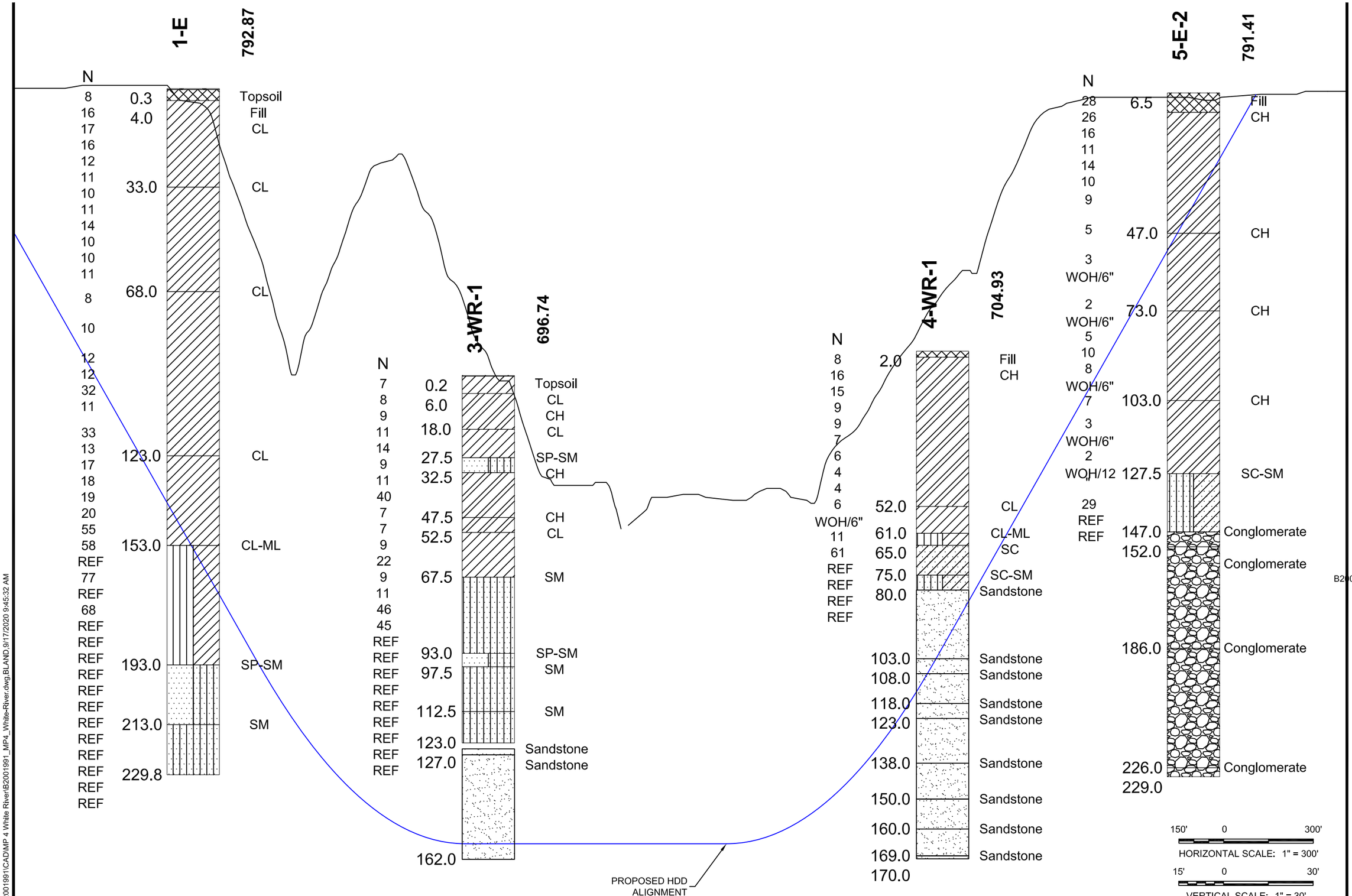
LOCATION: See attached sketch

LATITUDE: 46.49673 LONGITUDE: -90.89565

DRILLER: M. Swenson | LOGGED BY: P. Moe | START DATE: 07/13/20 | END DATE: 07/28/20

SURFACE ELEVATION: 791.4 ft | RIG: 7505 | METHOD: 4 1/4" HSA | SURFACING: | WEATHER:

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
		FREDA SANDSTONE, CONGLOMERATE, reddish brown with gray, slightly weathered, moderately hard, fine-grained to coarse-grained, massive, highly fractured				3				
						3				Run 10 MOHs 2
						3				
						3				
						2				
						3				
		Test results are in the attached lab report		78	99	3	4650	90	60	
						3				
						3				
						3				
						3				
						3				
						3				Run 11 MOHs 2
						2				
						2				
		Test results are in the attached lab report				3				
				95	99	2	4650	90	65	
						2				
						3				
						2				
						3				
						3				
565.4						3				Run 12 MOHs 2
226.0		FREDA SANDSTONE, CONGLOMERATE, reddish brown with gray, slightly weathered, moderately hard, fine-grained to coarse-grained, massive, moderately fractured		100	100	3	4650	90	50	
						3				
562.4		*Test results are in the attached lab report*				3				
229.0		END OF CORING								Water not observed while drilling.
		Boring then backfilled with cement/bentonite grout								



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

Drawing Information

Project No: B2001991

Drawing No: B2001991_MP4_WHITE-RIVER

Drawn By:	BJB
Date Drawn:	7/22/20
Checked By:	DM
Last Modified:	9/17/20

Project Information

Enbridge Line 5 Re-route

MP 4 - White River

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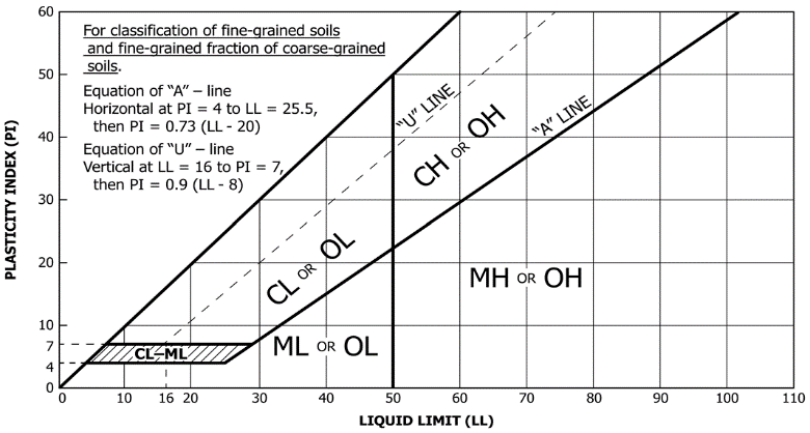
Descriptive Terminology of Soil

Based on Standards ASTM D2487/2488
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines[C])	$C_u \geq 4$ and $1 \leq C_c \leq 3$[D]	GW	Well-graded gravel[E]
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$)[D]	GP	Poorly graded gravel[E]
		Gravels with Fines (More than 12% fines[C])	Fines classify as ML or MH	GM	Silty gravel[E F G]
			Fines Classify as CL or CH	GC	Clayey gravel[E F G]
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines[H])	$C_u \geq 6$ and $1 \leq C_c \leq 3$[D]	SW	Well-graded sand[I]
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$)[D]	SP	Poorly graded sand[J]
		Sands with Fines (More than 12% fines[H])	Fines classify as ML or MH	SM	Silty sand[F G I]
			Fines classify as CL or CH	SC	Clayey sand[F G I]
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K L M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OL	Organic clay[K L M N] / Organic silt[K L M O]
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay[K L M]
			PI plots below "A" line	MH	Elastic silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OH	Organic clay[K L M P] / Organic silt[K L M Q]
Highly Organic Soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

A. Based on the material passing the 3-inch (75-mm) sieve.
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C. Gravels with 5 to 12% fines require dual symbols:
   GW-GM well-graded gravel with silt
   GW-GC well-graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
E. If soil contains ≥ 15% sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. Sands with 5 to 12% fines require dual symbols:
   SW-SM well-graded sand with silt
   SW-SC well-graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
I. If soil contains ≥ 15% gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
L. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
M. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
N. PI ≥ 4 and plots on or above "A" line.
O. PI < 4 or plots below "A" line.
P. PI plots on or above "A" line.
Q. PI plots below "A" line.



Particle Size Identification

Boulders..... over 12"
Cobbles..... 3" to 12"
Gravel
  Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
  Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
  Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
  Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
  Fine..... No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt..... No. 200 (0.075 mm) to .005 mm
Clay..... < .005 mm

Relative Proportions[L, M]

trace..... 0 to 5%
little..... 6 to 14%
with..... ≥ 15%

Inclusion Thicknesses

lens..... 0 to 1/8"
seam..... 1/8" to 1"
layer..... over 1"

Apparent Relative Density of Cohesionless Soils

Very loose ..... 0 to 4 BPF
Loose ..... 5 to 10 BPF
Medium dense..... 11 to 30 BPF
Dense..... 31 to 50 BPF
Very dense..... over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft	0 to 1 BPF	< 0.25 tsf
Soft	2 to 4 BPF	0.25 to 0.5 tsf
Medium	5 to 8 BPF	0.5 to 1 tsf
Stiff	9 to 15 BPF	1 to 2 tsf
Very Stiff	16 to 30 BPF	2 to 4 tsf
Hard	over 30 BPF	> 4 tsf

Moisture Content:

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.

Drilling Notes:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (▽), at the end of drilling (▼), or at some time after drilling (▼).

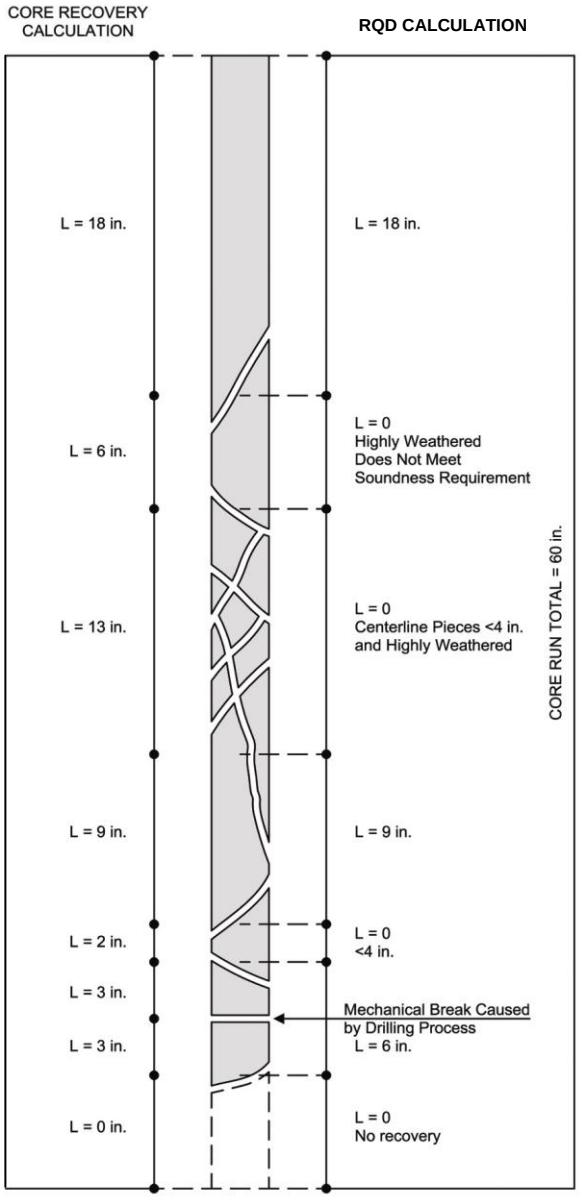
Laboratory Tests

DD	Dry density, pcf	**OC**	Organic content, %	**LL**	Liquid limit
WD	Wet density, pcf	**q_p**	Pocket penetrometer strength, tsf	**PL**	Plastic limit
P200	% Passing #200 sieve	**MC**	Moisture content, %	**PI**	Plasticity index
		q_U	Unconfined compression test, tsf		

3/2019

Descriptive Terminology of Rock

Based on U.S. Army Corps of Engineers EM 1110-1-2908



Example Calculations

Core Recovery, CR = $\frac{\text{Total length of rock recovered}}{\text{Total core run length}}$

Example:CR = $\frac{(18 + 6 + 13 + 9 + 2 + 3 + 3)}{(60)}$

CR = 90%

RQD = $\frac{\text{Sum of sound pieces 4 inches or larger}}{\text{Total core run length}}$

RQD Percent	Rock Quality
< 25	very poor
25 < 50	poor
50 < 75	fair
75 < 90	good
90 < 100	excellent

Example: RQD = $\frac{(18 + 9 + 6)}{(60)}$

RQD = 55%

Weathering

Unweathered: No evidence of chemical or mechanical alteration.

Slightly weathered: Slight discoloration on surface, slight alteration along discontinuities, less than 10% of rock volume altered.

Moderately Weathered: Discoloration evident, surface pitted and altered with alteration penetrating well below rock surfaces, weathering halos evident, 10% to 50% of the rock altered.

Highly Weathered: Entire mass discolored, alteration pervading nearly all of the rock, with some pockets of slightly weathered rock noticeable, some mineral leached away.

Decomposed: Rock reduced to a soil consistency with relict rock texture, generally molded and crumbled by hand.

Hardness

Very soft:	Can be deformed by hand
Soft:	Can be scratched with a fingernail
Moderately hard:	Can be scratched easily with a knife
Hard:	Can be scratched with difficulty with a knife
Very hard:	Cannot be scratched with a knife

Texture

Sedimentary Rocks:	*Grain Size*
Coarse grained	2 – 5 mm
Medium grained	0.4 – 2 mm
Fine grained	0.1 – 0.4 mm
Very fine grained	< 0.1 mm

Igneous and Metamorphic Rocks:	
Coarse grained	5 mm
Medium grained	1 – 5 mm
Fine grained	0.1 – 1 mm
Aphanitic	< 0.1 mm

Thickness of Bedding

Massive:	3 ft. thick or greater
Thick bedded:	1 to 3 ft. thick
Medium bedded:	4 in. to 1 ft. thick
Thin bedded:	4 in. thick or less

Degree of Fracturing (Jointing)

Unfractured:	Fracture spacing 6 ft. of more
Slightly fractured:	Fracture spacing 2 to 6 ft.
Moderately fractured:	Fracture spacing 8 in. to 2 ft.
Highly fractured:	Fracture spacing 2 in. to 8 in.
Intensely fractured:	Fracture spacing 2 in. or less

11001 Hampshire Avenue S
Minneapolis, MN 55438
Phone: 952-995-2000

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Metafield ID: 318955
Sampled By: Drill Crew
Sample Date: 06/02/2020
Received Date: 06/30/2020
Lab: 11001 Hampshire Ave S, Bloomington, MN
Completed Date: 06/30/2020
Tested 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
1-E	130	7.5	16.5		43	16	27					
1-E	134	20.0	20.5		40	15	25					
1-E	TW	35.0	23		44	16	28		104.5			
1-E	TW	55.0	22.3		39	16	23		105.6			
1-E	TW	75.0	17.7		30	14	16		115.7			
1-E	150	100.0	27.1		30	13	17					
1-E	155	125.0	16.7		23	13	10					
1-E	159	145.0	21.8		44	14	30					
1-E	163	165.0	10.1		19	12	7					

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Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Boring	Sample	Depth (ft)	MC (%)	Wash Loss (%)	LL	PL	PI	Organic Content %	Dry Density (pcf)	Resistivity (ohm-cm)	Q_u (tsf)	Specific Gravity
1-E	168	190.0	9.1		20	10	10					

General

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Phone: 952-995-2000

Geotechnical Testing

Various ASTM

7/17/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Metafield ID: 322791
Sampled By: Drill Crew
Sample Date: 07/02/2020
Received Date: 07/17/2020
Lab: 11001 Hampshire Ave S, Bloomington, MN
Completed Date: 07/17/2020
Tested 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
3WR-1		7.5	25.6		65	18	47					
3WR-1		40.0	32.7		67	19	48					
3WR-1		60.0	24.6		42	14	28					

General

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11001 Hampshire Avenue S
Minneapolis, MN 55438
Phone: 952-995-2000

Geotechnical Testing

Various ASTM

7/22/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Metafield ID: 323924
Sampled By: Drill Crew
Sample Date: 07/02/2020
Received Date: 07/22/2020
Lab: 11001 Hampshire Ave S, Bloomington, MN
Completed Date: 07/22/2020
Tested 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
3WR-1		19.0	24.8		31	13	18		101.4			

General

11001 Hampshire Avenue S
Minneapolis, MN 55438
Phone: 952-995-2000

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Metafield ID: 331864
Sampled By: Drill Crew
Sample Date: 08/06/2020
Received Date: 08/25/2020
Lab: 11001 Hampshire Ave S, Bloomington, MN
Completed Date: 08/25/2020
Tested By: Tschida, Simone T.

Laboratory Results Summary

Boring	Sample	Depth (ft)	MC (%)	Wash Loss (%)	LL	PL	PI	Wet Density (pcf)	Dry Density (pcf)	Resistivity (ohm-cm)	Q_u (tsf)	Specific Gravity
5-E-2	4	7.5	16.3		46	16	30					
5-E-2		20.0	26.6		52	16	36	124.9	98.7			
5-E-2		40.0	28.9		48	17	31	123.0	95.4			
5-E-2		50.0	30		49	16	33	121.3	93.3			
5-E-2	19	75.0	24.5		45	15	30					
5-E-2		85.0	33.8		57	18	39	119.1	89.0			
5-E-2		105.0	40.4		77	21	56	114.3	81.4			
4-WR-1		9.5	29		56	18	38	123.1	95.4			
4-WR-1		22.0	21.2		38	15	23	130.4	107.6			
4-WR-1		52.0	14.6		23	13	10	139.4	121.6			
4-WR-1	17	72.0	9.8		20	12	8					

General

BRAUN INTERTEC
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11001 Hampshire Avenue S
Minneapolis, MN 55438
Phone: 952-995-2000

Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

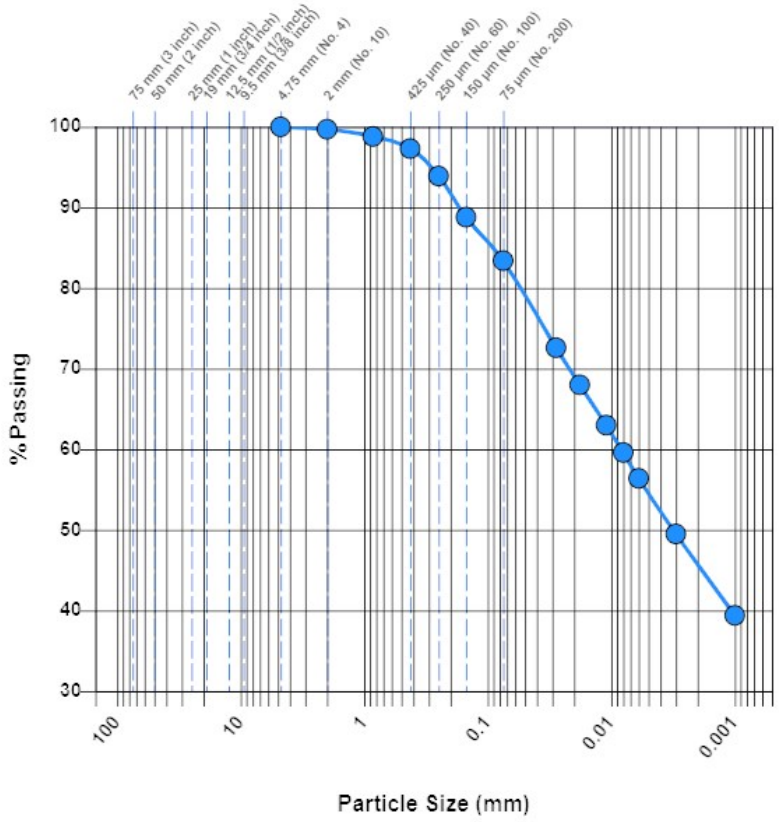
Sample Information

Sample Number:	318976	**Depth (ft):**	7.5
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	99.7	-
850 µm (No. 20)	98.8	-
425 µm (No. 40)	97.3	-
250 µm (No. 60)	93.9	-
150 µm (No. 100)	88.8	-
75 µm (No. 200)	83.4	-
28.3 (µm)	72.6	-
18.2 (µm)	68.0	-
10.8 (µm)	63.0	-
7.7 (µm)	59.6	-
5.5 (µm)	56.4	-
2.8 (µm)	49.5	-
1.2 (µm)	39.4	-



Soil Classification: CL Lean clay with sand

Gravel (%):	0.0	**Sand (%):**	16.6	**Silt (%):**	29.3	**Clay (%):**	54.1
D_{60} (µm):	8.4						

General

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11001 Hampshire Avenue S
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Phone: 952-995-2000

Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

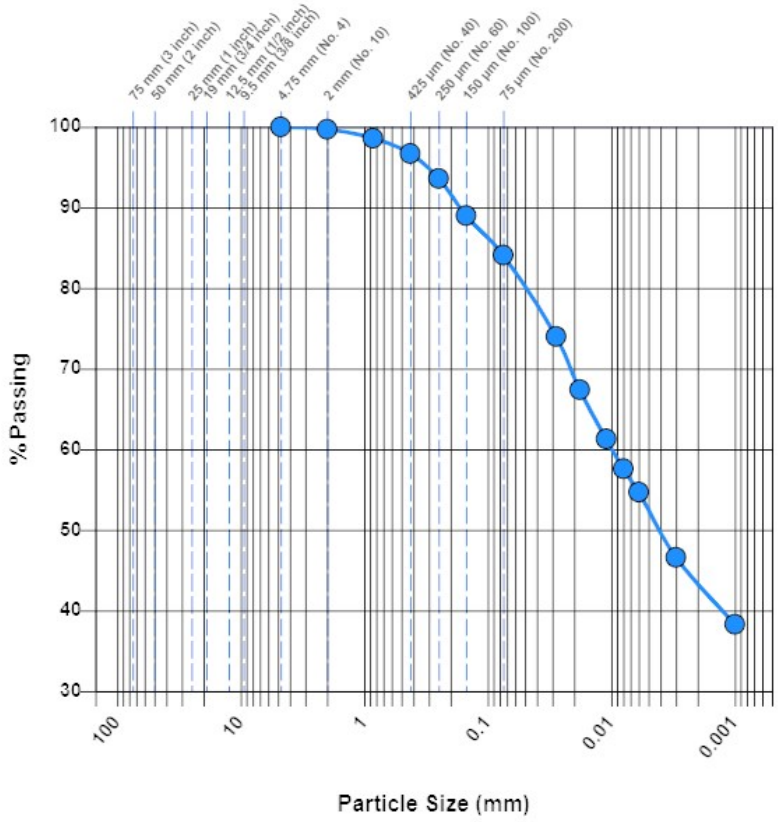
Sample Information

Sample Number:	318977	**Depth (ft):**	20
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	99.7	-
850 µm (No. 20)	98.6	-
425 µm (No. 40)	96.7	-
250 µm (No. 60)	93.6	-
150 µm (No. 100)	89.0	-
75 µm (No. 200)	84.1	-
28.4 (µm)	74.0	-
18.4 (µm)	67.4	-
10.9 (µm)	61.3	-
7.5 (µm)	57.6	-
5.6 (µm)	54.7	-
2.8 (µm)	46.6	-
1.2 (µm)	38.3	-



Soil Classification: CL Lean clay with sand

Gravel (%):	0.0	**Sand (%):**	15.9	**Silt (%):**	32.1	**Clay (%):**	52.0
D_{60} (µm):	9.9						

General

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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

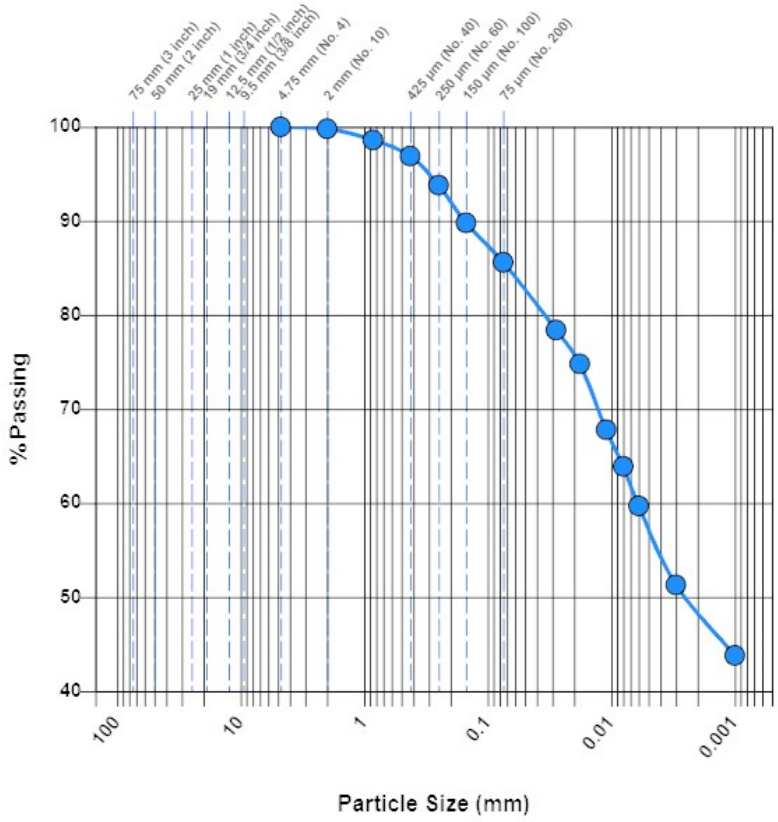
Sample Information

Sample Number:	318978	**Depth (ft):**	35
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	99.8	-
850 µm (No. 20)	98.6	-
425 µm (No. 40)	96.9	-
250 µm (No. 60)	93.8	-
150 µm (No. 100)	89.8	-
75 µm (No. 200)	85.6	-
27.8 (µm)	78.4	-
17.9 (µm)	74.8	-
10.6 (µm)	67.8	-
7.6 (µm)	63.9	-
5.5 (µm)	59.7	-
2.8 (µm)	51.3	-
1.2 (µm)	43.8	-



Soil Classification: CL Lean clay

Gravel (%):	0.0	**Sand (%):**	14.4	**Silt (%):**	28.7	**Clay (%):**	56.9
D_{60} (µm):	6.1						

General

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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

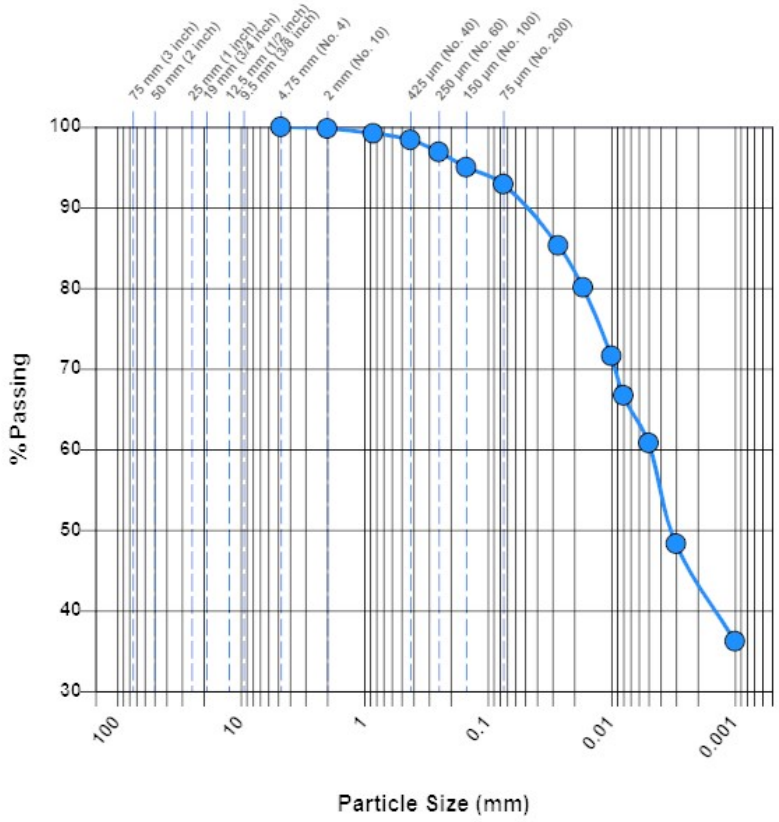
Sample Information

Sample Number:	318979	**Depth (ft):**	55
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	99.8	-
850 µm (No. 20)	99.2	-
425 µm (No. 40)	98.4	-
250 µm (No. 60)	96.9	-
150 µm (No. 100)	95.0	-
75 µm (No. 200)	92.9	-
26.8 (µm)	85.3	-
17.4 (µm)	80.1	-
10.4 (µm)	71.6	-
7.5 (µm)	66.7	-
5.4 (µm)	60.8	-
2.8 (µm)	48.3	-
1.2 (µm)	36.2	-



Soil Classification: CL Lean clay

Gravel (%):	0.0	**Sand (%):**	7.1	**Silt (%):**	32.1	**Clay (%):**	60.8
D_{60} (µm):	4.9						

General

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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

Client:

Enbridge Energy, Limited Partnership
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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

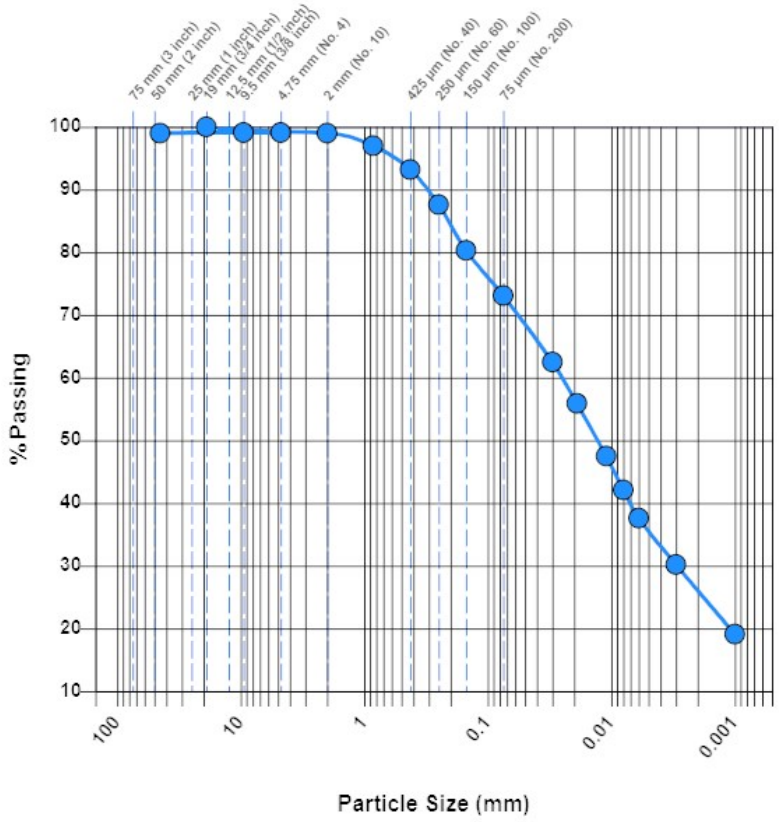
Sample Information

Sample Number:	318980	**Depth (ft):**	75
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
19 mm (3/4 inch)	100.0	-
4.75 mm (No. 4)	99.1	-
9.5 mm (3/8 inch)	99.1	-
4.75 mm (No. 4)	99.0	-
2 mm (No. 10)	99.0	-
850 µm (No. 20)	97.0	-
425 µm (No. 40)	93.2	-
250 µm (No. 60)	87.6	-
150 µm (No. 100)	80.3	-
75 µm (No. 200)	73.1	-
29.5 (µm)	62.5	-
19.2 (µm)	55.9	-
11.4 (µm)	47.5	-
8.2 (µm)	42.1	-
5.9 (µm)	37.6	-
3.0 (µm)	30.2	-
1.3 (µm)	19.1	-



Soil Classification: CL Lean clay with sand

Gravel (%):	0.9	**Sand (%):**	26.0	**Silt (%):**	38.0	**Clay (%):**	35.1
D_{60} (µm):	25.8	**D_{30} (µm):**	3.0				

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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

Client:

Enbridge Energy, Limited Partnership
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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

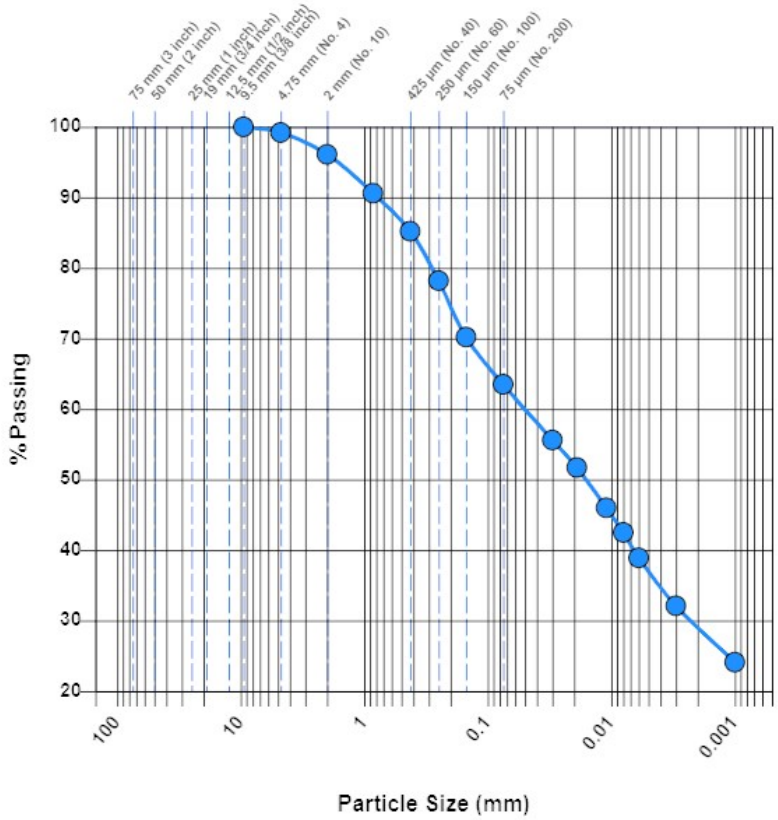
Sample Information

Sample Number:	318981	**Depth (ft):**	100
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
9.5 mm (3/8 inch)	100.0	-
4.75 mm (No. 4)	99.2	-
2 mm (No. 10)	96.1	-
850 µm (No. 20)	90.6	-
425 µm (No. 40)	85.2	-
250 µm (No. 60)	78.2	-
150 µm (No. 100)	70.2	-
75 µm (No. 200)	63.5	-
30.0 (µm)	55.6	-
19.3 (µm)	51.7	-
11.4 (µm)	46.0	-
7.8 (µm)	42.5	-
5.8 (µm)	38.9	-
2.9 (µm)	32.1	-
1.3 (µm)	24.1	-



Soil Classification: CL Sandy lean clay

Gravel (%):	0.8	**Sand (%):**	35.7	**Silt (%):**	26.9	**Clay (%):**	36.6
D_{60} (µm):	55.1	**D_{30} (µm):**	2.5				

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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

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Houston, TX 77056

Project:

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Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

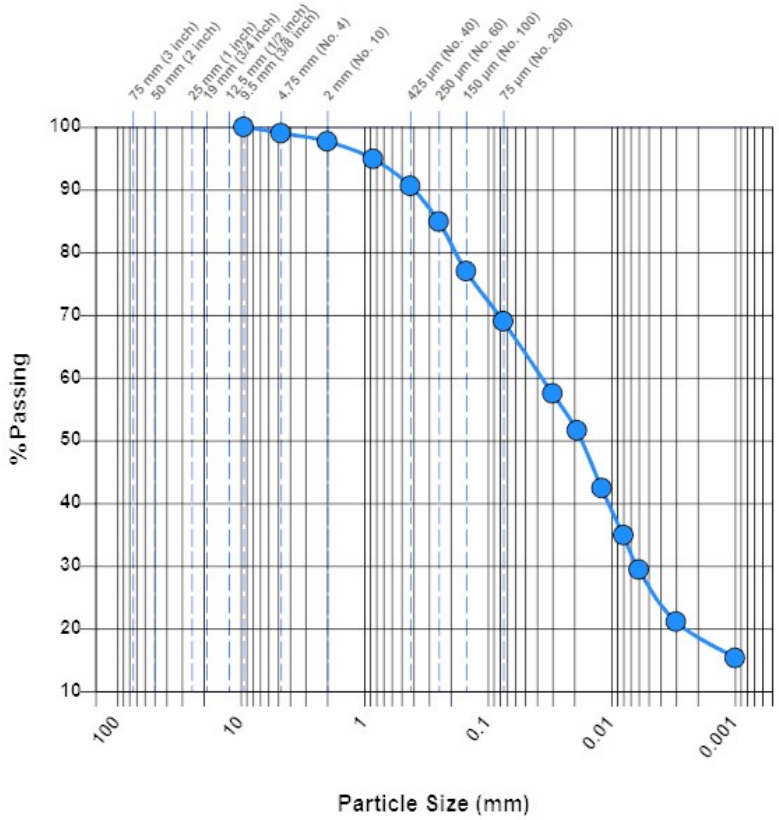
Sample Information

Sample Number:	318982	**Depth (ft):**	125
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
9.5 mm (3/8 inch)	100.0	-
4.75 mm (No. 4)	99.0	-
2 mm (No. 10)	97.7	-
850 µm (No. 20)	94.9	-
425 µm (No. 40)	90.6	-
250 µm (No. 60)	84.9	-
150 µm (No. 100)	77.0	-
75 µm (No. 200)	69.0	-
30.0 (µm)	57.5	-
19.4 (µm)	51.6	-
11.6 (µm)	42.4	-
8.4 (µm)	34.9	-
6.1 (µm)	29.4	-
3.0 (µm)	21.1	-
1.3 (µm)	15.3	-



Soil Classification: CL Sandy lean clay

Gravel (%):	1.0	**Sand (%):**	30.0	**Silt (%):**	42.4	**Clay (%):**	26.6
D_{60} (µm):	39.8	**D_{30} (µm):**	6.2				

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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

Client:

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

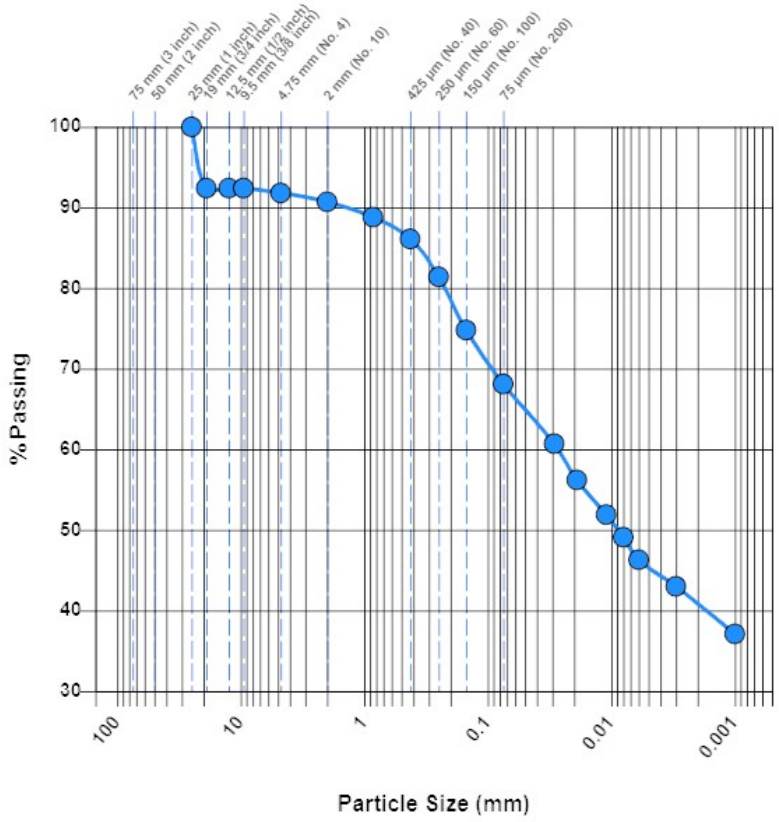
Sample Information

Sample Number:	318983	**Depth (ft):**	145
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
25 mm (1 inch)	100.0	-
19 mm (3/4 inch)	92.4	-
12.5 mm (1/2 inch)	92.4	-
9.5 mm (3/8 inch)	92.4	-
4.75 mm (No. 4)	91.8	-
2 mm (No. 10)	90.7	-
850 µm (No. 20)	88.8	-
425 µm (No. 40)	86.1	-
250 µm (No. 60)	81.4	-
150 µm (No. 100)	74.8	-
75 µm (No. 200)	68.1	-
29.2 (µm)	60.7	-
18.8 (µm)	56.2	-
11.1 (µm)	51.9	-
7.9 (µm)	49.1	-
5.7 (µm)	46.3	-
2.7 (µm)	43.0	-
1.2 (µm)	37.1	-



Soil Classification: CL Sandy lean clay

Gravel (%):	8.2	**Sand (%):**	23.7	**Silt (%):**	22.9	**Clay (%):**	45.2
D_{60} (µm):	27.4						

General

Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

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Project:

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Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

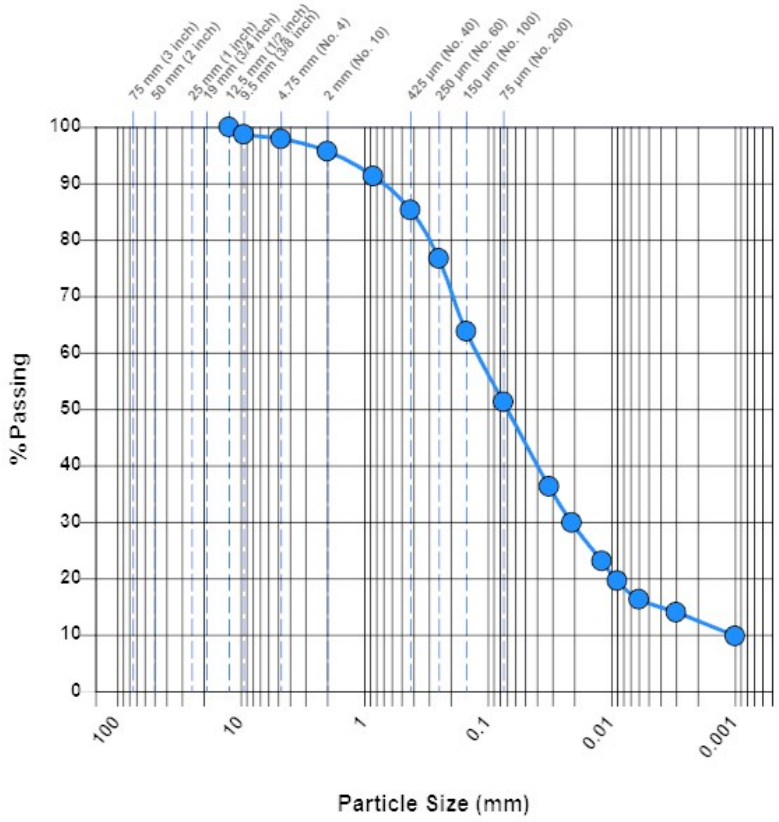
Sample Information

Sample Number:	318984	**Depth (ft):**	165
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
12.5 mm (1/2 inch)	100.0	-
9.5 mm (3/8 inch)	98.7	-
4.75 mm (No. 4)	97.9	-
2 mm (No. 10)	95.7	-
850 µm (No. 20)	91.3	-
425 µm (No. 40)	85.3	-
250 µm (No. 60)	76.7	-
150 µm (No. 100)	63.8	-
75 µm (No. 200)	51.3	-
32.1 (µm)	36.3	-
20.8 (µm)	29.9	-
12.3 (µm)	23.1	-
8.8 (µm)	19.6	-
6.3 (µm)	16.3	23 -
3.0 (µm)	14.0	-
1.3 (µm)	9.8	-



Soil Classification: CL-ML Sandy silty clay

Gravel (%):	2.1	**Sand (%):**	46.6	**Silt (%):**	35.8	**Clay (%):**	15.5		
D_{60} (µm):	127.2	**D_{30} (µm):**	21.2	**D_{10} (µm):**	1.1	**C_u:**	115.64	**C_c:**	3.21

General

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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

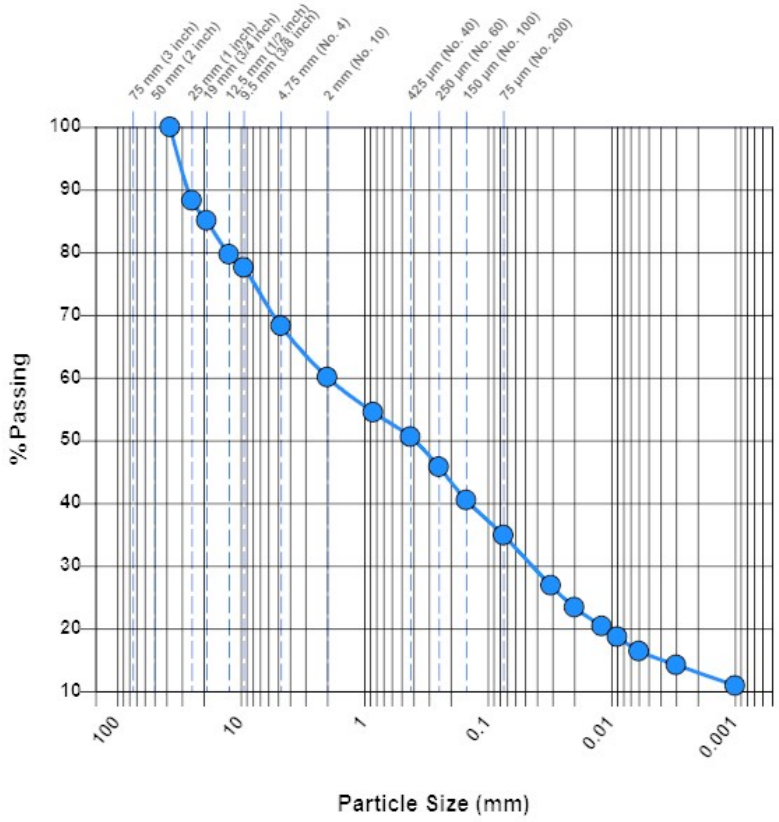
Sample Information

Sample Number:	318985	**Depth (ft):**	190
Boring Number:	1-E	**Sampled By:**	Drill Crew
Sample Date:	06/02/2020		
Received Date:	06/30/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
37.5 mm (1.5 inch)	100.0	-
25 mm (1 inch)	88.3	-
19 mm (3/4 inch)	85.1	-
12.5 mm (1/2 inch)	79.7	-
9.5 mm (3/8 inch)	77.6	-
4.75 mm (No. 4)	68.3	-
2 mm (No. 10)	60.1	-
850 µm (No. 20)	54.5	-
425 µm (No. 40)	50.6	-
250 µm (No. 60)	45.8	-
150 µm (No. 100)	40.5	-
75 µm (No. 200)	34.9	-
31.2 (µm)	26.9	-
20.2 (µm)	23.4	-
11.9 (µm)	20.4	-
8.5 (µm)	18.7	-
6.1 (µm)	16.4	-
2.9 (µm)	14.2	-
1.3 (µm)	10.9	-



Soil Classification: SC Clayey sand with gravel

Gravel (%):	31.7	**Sand (%):**	33.4	**Silt (%):**	19.2	**Clay (%):**	15.7
D_{60} (µm):	1979.5	**D_{30} (µm):**	48.1				

General

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Hydrometer And Sieve Analysis

ASTM D422

7/17/2020

Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

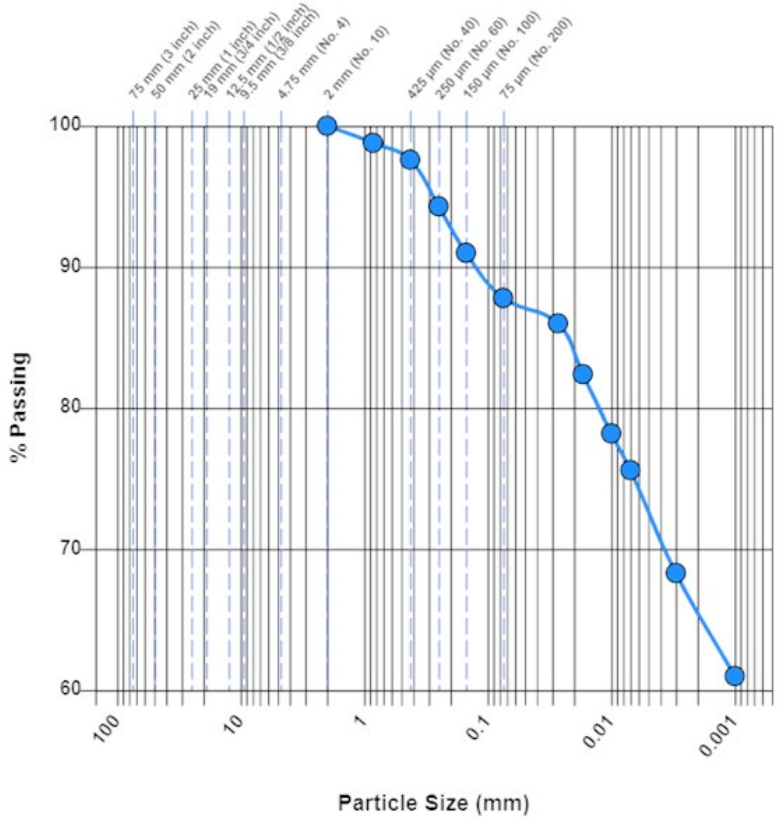
Sample Information

Sample Number:	322795	**Depth (ft):**	7.5
Boring Number:	3WR-1	**Sampled By:**	Drill Crew
Sample Date:	07/02/2020		
Received Date:	07/17/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/17/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
2 mm (No. 10)	100.0	-
850 µm (No. 20)	98.8	-
425 µm (No. 40)	97.6	-
250 µm (No. 60)	94.3	-
150 µm (No. 100)	91.0	-
75 µm (No. 200)	87.8	-
26.9 (µm)	86.0	-
17.3 (µm)	82.4	-
10.2 (µm)	78.2	-
7.3 (µm)	75.6	-
2.6 (µm)	68.3	-
1.2 (µm)	61.0	-



Soil Classification: CH Fat clay

Gravel (%): 0 **Sand (%):** 12.2 **Silt (%):** 15.8 **Clay (%):** 72.0

General

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Hydrometer And Sieve Analysis

ASTM D422

7/22/2020

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Client:

Enbridge Energy, Limited Partnership
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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

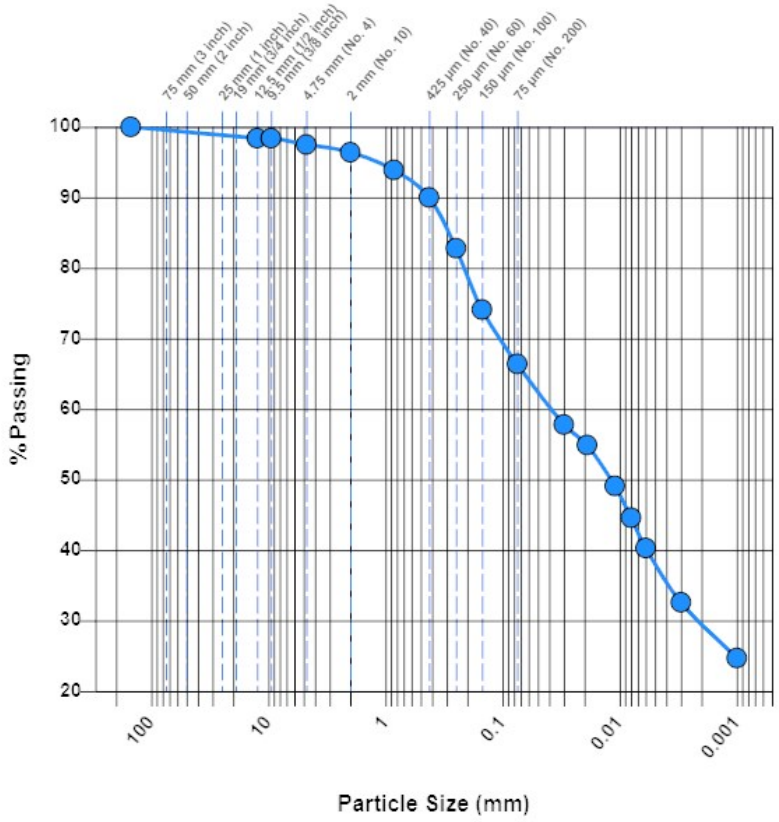
Sample Information

Sample Number:	323924	**Depth (ft):**	19-21
Boring Number:	3WR-1	**Sampled By:**	Drill Crew
Sample Date:	07/02/2020		
Received Date:	07/22/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/22/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
19 mm (3/4 inch)	100.0	-
12.5 mm (1/2 inch)	98.4	-
9.5 mm (3/8 inch)	98.4	-
4.75 mm (No. 4)	97.5	-
2 mm (No. 10)	96.4	-
850 µm (No. 20)	93.9	-
425 µm (No. 40)	90.0	-
250 µm (No. 60)	82.8	-
150 µm (No. 100)	74.1	-
75 µm (No. 200)	66.4	-
29.8 (µm)	57.8	-
19.0 (µm)	54.9	-
11.3 (µm)	49.1	-
8.1 (µm)	44.6	-
5.8 (µm)	40.3	-
2.9 (µm)	32.6	-
1.3 (µm)	24.7	-



Soil Classification: CL Sandy lean clay

Gravel (%):	2.5	**Sand (%):**	31.1	**Silt (%):**	28.7	**Clay (%):**	37.7
D_{60} (µm):	41.5	**D_{30} (µm):**	2.3				

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Hydrometer And Sieve Analysis

ASTM D422

7/17/2020

Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

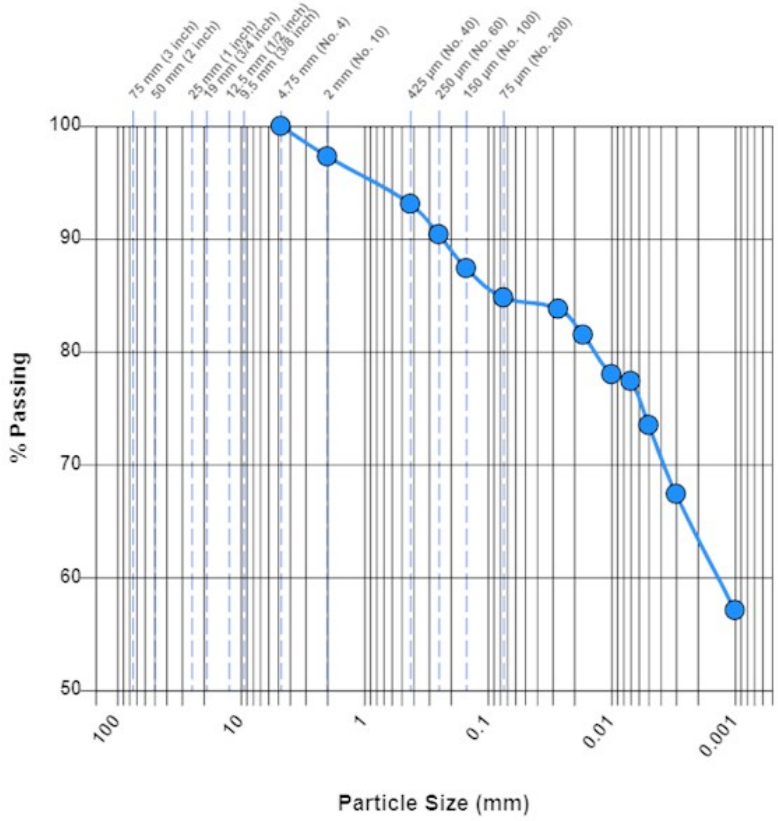
Sample Information

Sample Number:	322796	**Depth (ft):**	40
Boring Number:	3WR-1	**Sampled By:**	Drill Crew
Sample Date:	07/02/2020		
Received Date:	07/17/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/17/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	97.3	-
425 µm (No. 40)	93.1	-
250 µm (No. 60)	90.4	-
150 µm (No. 100)	87.4	-
75 µm (No. 200)	84.8	-
27.0 (µm)	83.8	-
17.3 (µm)	81.5	-
10.1 (µm)	78.0	-
7.2 (µm)	77.4	-
5.2 (µm)	73.5	-
2.6 (µm)	67.4	-
1.2 (µm)	57.1	-



Soil Classification: CH Fat clay

Gravel (%):	0.0	**Sand (%):**	15.2	**Silt (%):**	11.3	**Clay (%):**	73.5
D_{60} (µm):	1.6						

General

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11001 Hampshire Avenue S
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Hydrometer And Sieve Analysis

ASTM D422

7/17/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

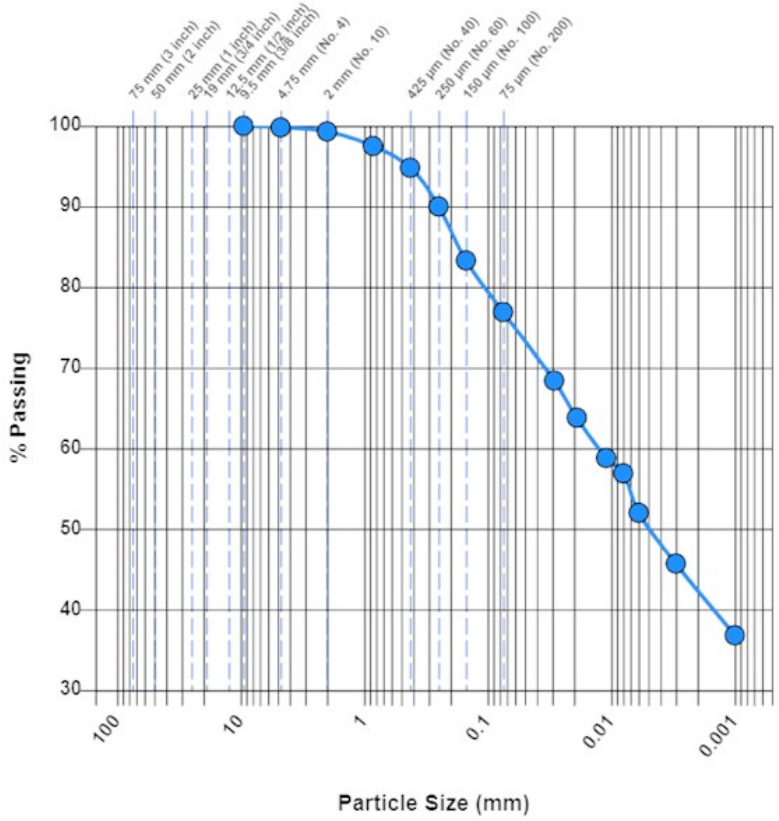
Sample Information

Sample Number:	322797	**Depth (ft):**	60
Boring Number:	3WR-1	**Sampled By:**	Drill Crew
Sample Date:	07/02/2020		
Received Date:	07/17/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/17/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
9.5 mm (3/8 inch)	100.0	-
4.75 mm (No. 4)	99.8	-
2 mm (No. 10)	99.3	-
850 µm (No. 20)	97.5	-
425 µm (No. 40)	94.8	-
250 µm (No. 60)	90.0	-
150 µm (No. 100)	83.3	-
75 µm (No. 200)	76.9	-
29.0 (µm)	68.4	-
18.7 (µm)	63.8	-
11.0 (µm)	58.8	-
7.8 (µm)	56.9	-
5.6 (µm)	52.0	-
2.8 (µm)	45.7	-
1.3 (µm)	36.8	-



Soil Classification: CL Lean clay with sand

Gravel (%):	0.2	**Sand (%):**	22.9	**Silt (%):**	27.0	**Clay (%):**	49.9
D_{60} (µm):	12.9						

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

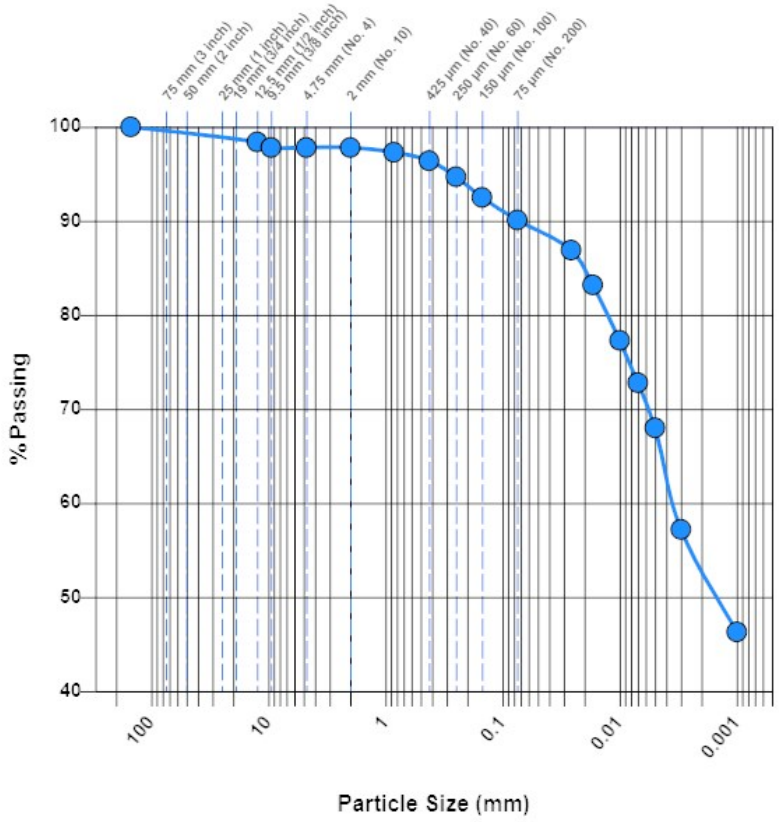
Sample Information

Sample Number:	331882	**Depth (ft):**	9.5
Boring Number:	4-WR-1	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
19 mm (3/4 inch)	100.0	-
12.5 mm (1/2 inch)	98.4	-
9.5 mm (3/8 inch)	97.8	-
4.75 mm (No. 4)	97.8	-
2 mm (No. 10)	97.8	-
850 µm (No. 20)	97.3	-
425 µm (No. 40)	96.4	-
250 µm (No. 60)	94.7	-
150 µm (No. 100)	92.5	-
75 µm (No. 200)	90.1	-
26.4 (µm)	86.9	-
17.0 (µm)	83.2	-
10.1 (µm)	77.3	-
7.3 (µm)	72.8	-
5.2 (µm)	68.0	-
2.7 (µm)	57.2	-
1.2 (µm)	46.3	-



Soil Classification: CH Fat clay

Gravel (%):	2.2	**Sand (%):**	7.7	**Silt (%):**	22.1	**Clay (%):**	68.0
D_{60} (µm):	3.5						

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

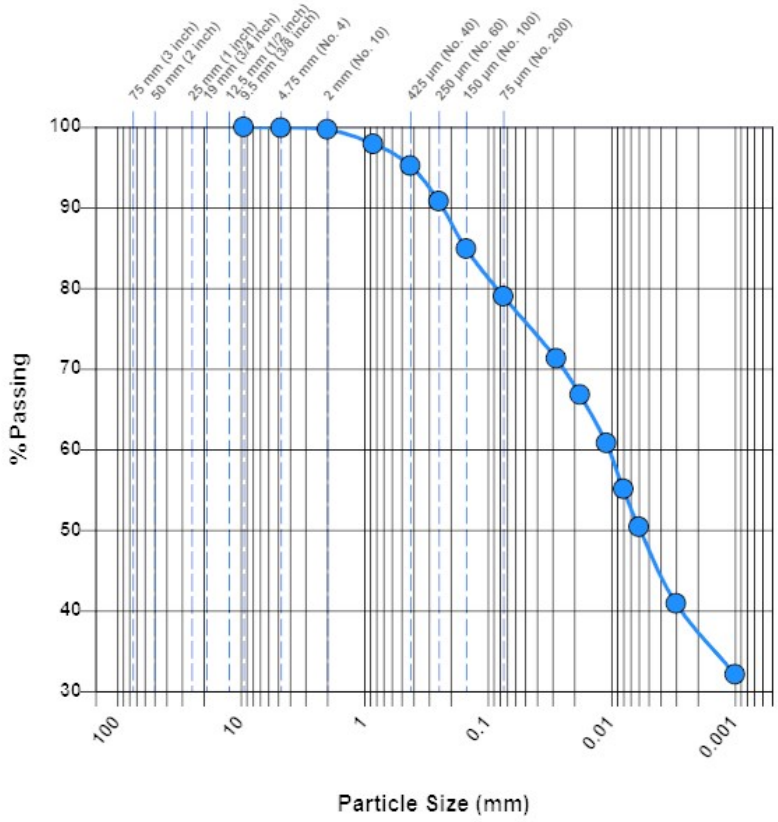
Sample Information

Sample Number:	331887	**Depth (ft):**	22
Boring Number:	4-WR-1	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
9.5 mm (3/8 inch)	100.0	-
4.75 mm (No. 4)	99.9	-
2 mm (No. 10)	99.7	-
850 µm (No. 20)	97.9	-
425 µm (No. 40)	95.2	-
250 µm (No. 60)	90.8	-
150 µm (No. 100)	84.9	-
75 µm (No. 200)	79.0	-
28.3 (µm)	71.3	-
18.3 (µm)	66.8	-
10.8 (µm)	60.8	-
7.8 (µm)	55.1	-
5.6 (µm)	50.4	-
2.8 (µm)	40.9	-
1.2 (µm)	32.1	-



Soil Classification: CH Fat clay with sand

Gravel (%):	0.1	**Sand (%):**	20.9	**Silt (%):**	31.8	**Clay (%):**	47.2
D_{60} (µm):	10.6						

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

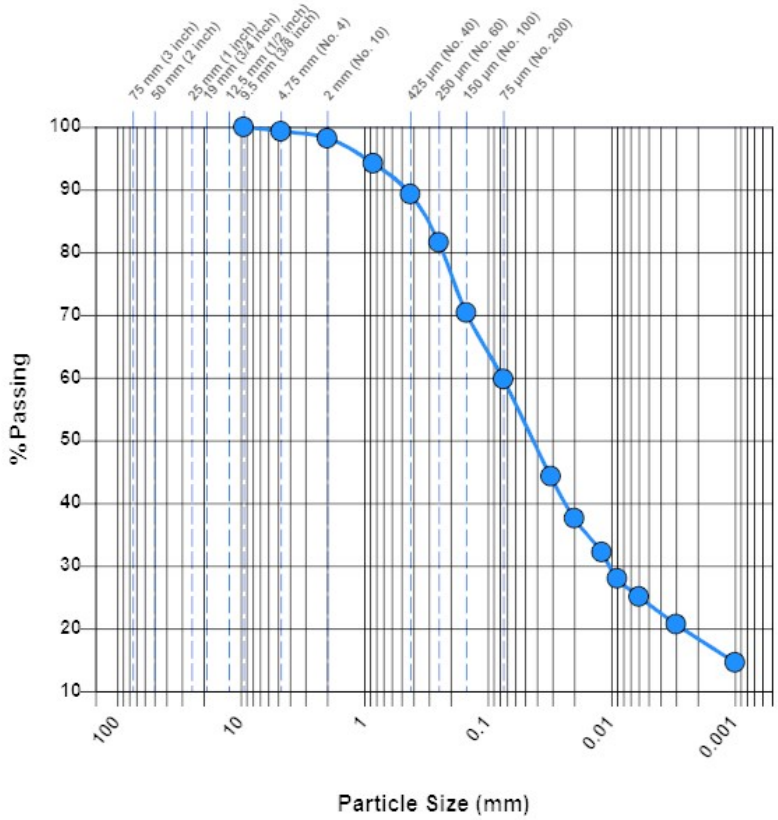
Sample Information

Sample Number:	331889	**Depth (ft):**	52
Boring Number:	4-WR-1	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
9.5 mm (3/8 inch)	100.0	-
4.75 mm (No. 4)	99.3	-
2 mm (No. 10)	98.2	-
850 µm (No. 20)	94.2	-
425 µm (No. 40)	89.3	-
250 µm (No. 60)	81.6	-
150 µm (No. 100)	70.4	-
75 µm (No. 200)	59.8	-
30.8 (µm)	44.3	-
20.0 (µm)	37.6	-
11.8 (µm)	32.2	-
8.5 (µm)	28.0	-
6.0 (µm)	25.1	-
3.0 (µm)	20.7	-
1.3 (µm)	14.6	-



Soil Classification: CL Sandy lean clay

Gravel (%):	0.7	**Sand (%):**	39.5	**Silt (%):**	36.2	**Clay (%):**	23.6
D_{60} (µm):	76.4	**D_{30} (µm):**	10.4				

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

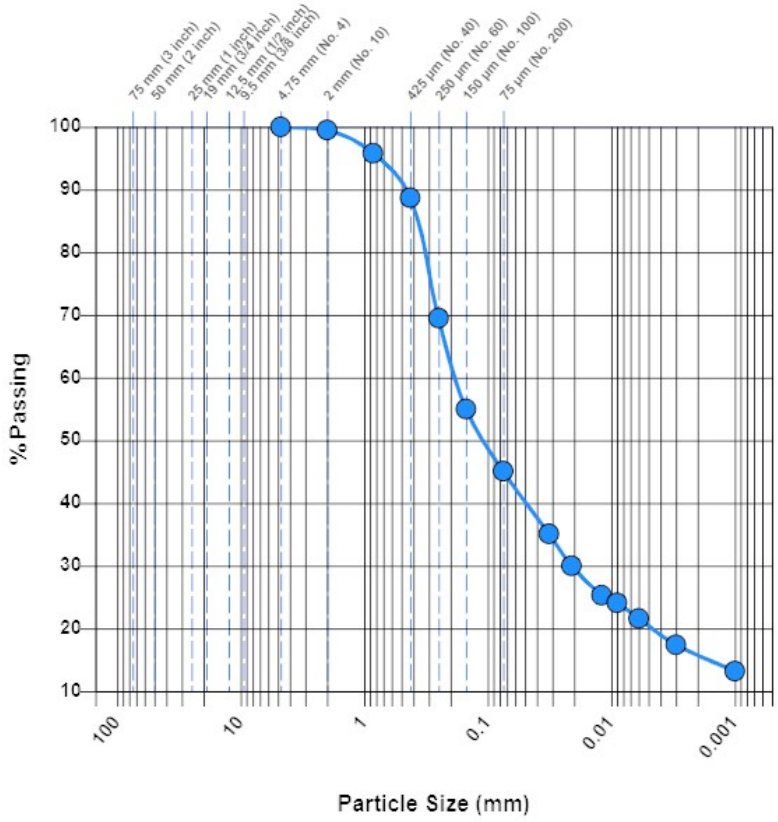
Sample Information

Sample Number:	331891	**Depth (ft):**	62
Boring Number:	4-WR-1	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	99.5	-
850 µm (No. 20)	95.8	-
425 µm (No. 40)	88.7	-
250 µm (No. 60)	69.5	-
150 µm (No. 100)	55.0	-
75 µm (No. 200)	45.1	-
31.8 (µm)	35.1	-
20.5 (µm)	30.0	-
12.1 (µm)	25.3	-
8.6 (µm)	24.1	-
6.1 (µm)	21.6	-
3.0 (µm)	17.4	-
1.3 (µm)	13.2	-



Soil Classification: SC Clayey sand

Gravel (%):	0.0	**Sand (%):**	54.9	**Silt (%):**	24.9	**Clay (%):**	20.2
D_{60} (µm):	184.5	**D_{30} (µm):**	21.0				

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

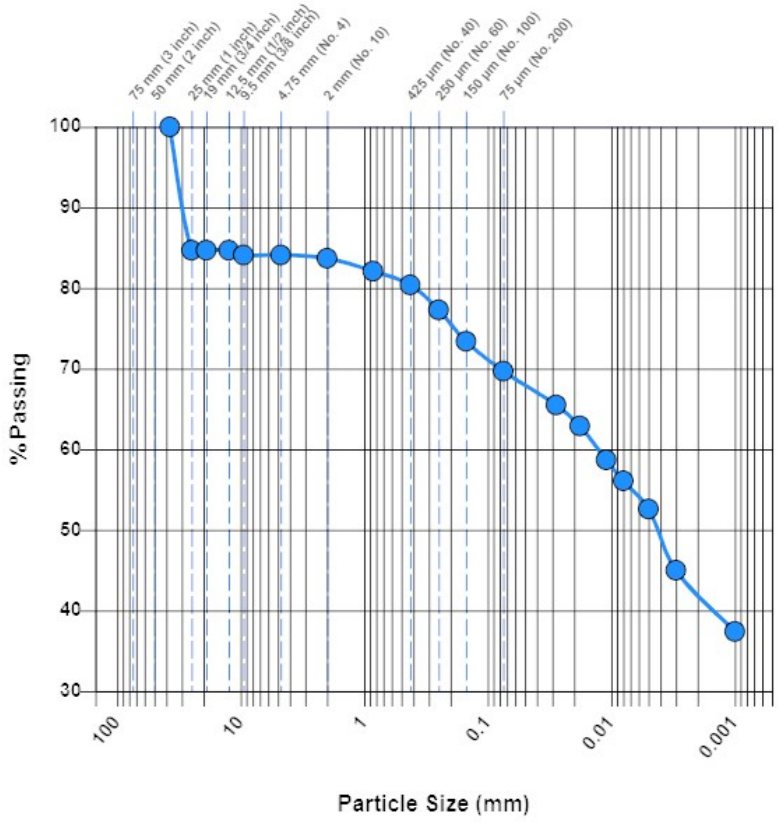
Sample Information

Sample Number:	331872	**Depth (ft):**	50
Boring Number:	5-E-2	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
37.5 mm (1.5 inch)	100.0	-
25 mm (1 inch)	84.7	-
19 mm (3/4 inch)	84.7	-
12.5 mm (1/2 inch)	84.7	-
9.5 mm (3/8 inch)	84.1	-
4.75 mm (No. 4)	84.1	-
2 mm (No. 10)	83.7	-
850 µm (No. 20)	82.1	-
425 µm (No. 40)	80.4	-
250 µm (No. 60)	77.3	-
150 µm (No. 100)	73.4	-
75 µm (No. 200)	69.7	-
27.8 (µm)	65.5	-
17.8 (µm)	62.9	-
10.5 (µm)	58.7	-
7.5 (µm)	56.1	-
5.4 (µm)	52.6	-
2.7 (µm)	45.0	-
1.2 (µm)	37.4	-



Soil Classification: CH Gravelly fat clay

Gravel (%): 15.9 **Sand (%):** 14.4 **Silt (%):** 17.1 **Clay (%):** 52.6

D_{60} (µm): 13.2

General

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

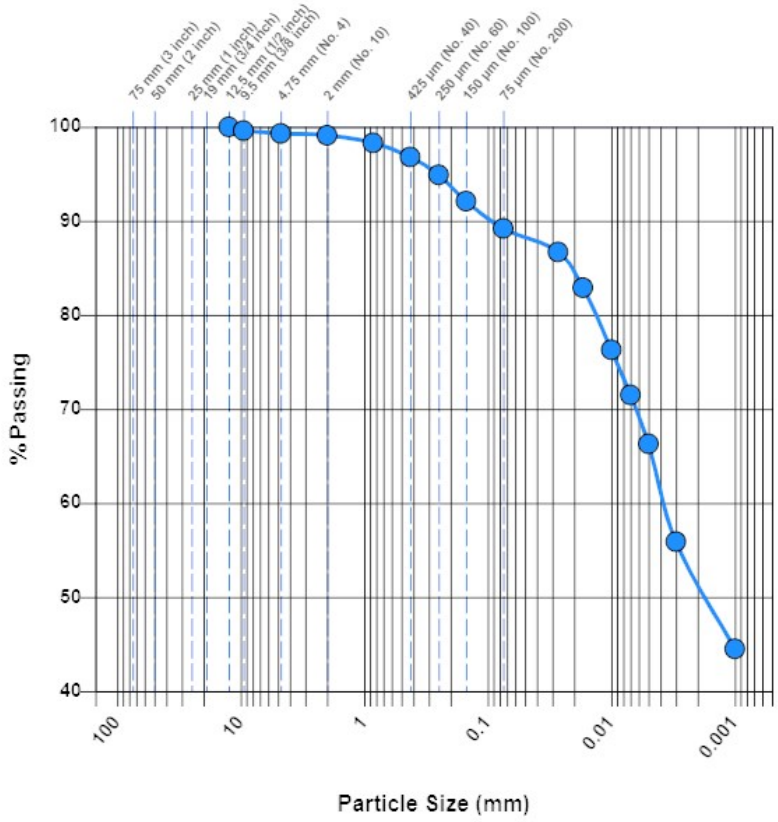
Sample Information

Sample Number:	331873	**Depth (ft):**	40
Boring Number:	5-E-2	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
12.5 mm (1/2 inch)	100.0	-
9.5 mm (3/8 inch)	99.6	-
4.75 mm (No. 4)	99.3	-
2 mm (No. 10)	99.1	-
850 µm (No. 20)	98.3	-
425 µm (No. 40)	96.8	-
250 µm (No. 60)	94.9	-
150 µm (No. 100)	92.1	-
75 µm (No. 200)	89.2	-
26.9 (µm)	86.7	-
17.3 (µm)	82.9	-
10.3 (µm)	76.3	-
7.4 (µm)	71.5	-
5.4 (µm)	66.3	-
2.7 (µm)	55.9	-
1.2 (µm)	44.5	-



Soil Classification: CH Fat clay

Gravel (%):	0.7	**Sand (%):**	10.1	**Silt (%):**	22.9	**Clay (%):**	66.3
D_{60} (µm):	3.8						

General

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

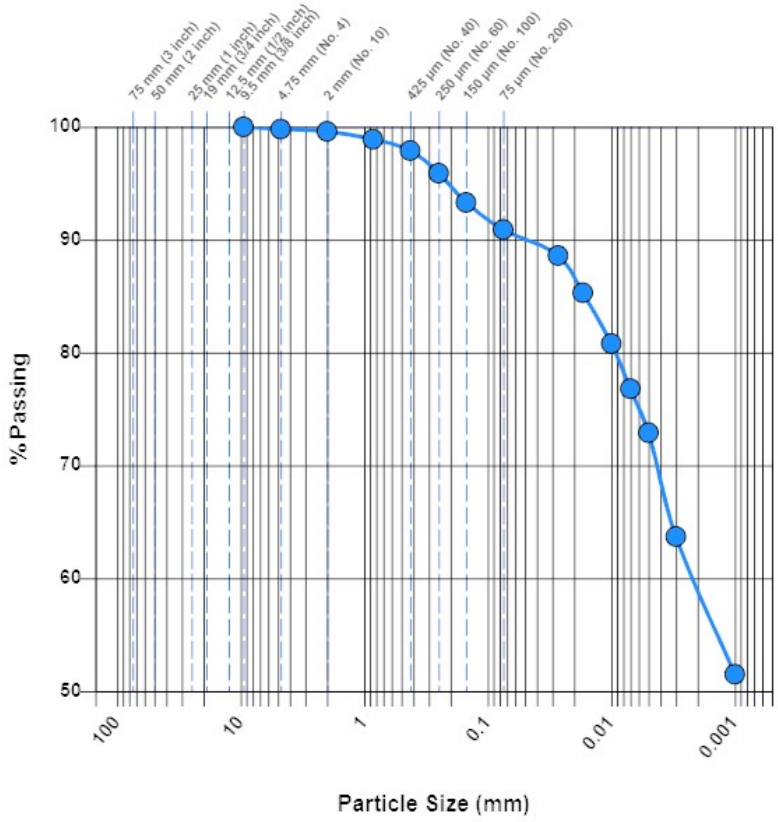
Sample Information

Sample Number:	331875	**Depth (ft):**	85
Boring Number:	5-E-2	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
9.5 mm (3/8 inch)	100.0	-
4.75 mm (No. 4)	99.8	-
2 mm (No. 10)	99.6	-
850 µm (No. 20)	98.9	-
425 µm (No. 40)	97.9	-
250 µm (No. 60)	95.9	-
150 µm (No. 100)	93.3	-
75 µm (No. 200)	90.9	-
27.0 (µm)	88.6	-
17.3 (µm)	85.3	-
10.2 (µm)	80.8	-
7.3 (µm)	76.8	-
5.3 (µm)	72.9	-
2.7 (µm)	63.7	-
1.2 (µm)	51.5	-



Soil Classification: CH Fat clay

Gravel (%):	0.2	**Sand (%):**	8.9	**Silt (%):**	18.0	**Clay (%):**	72.9
D_{60} (µm):	2.4						

General

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

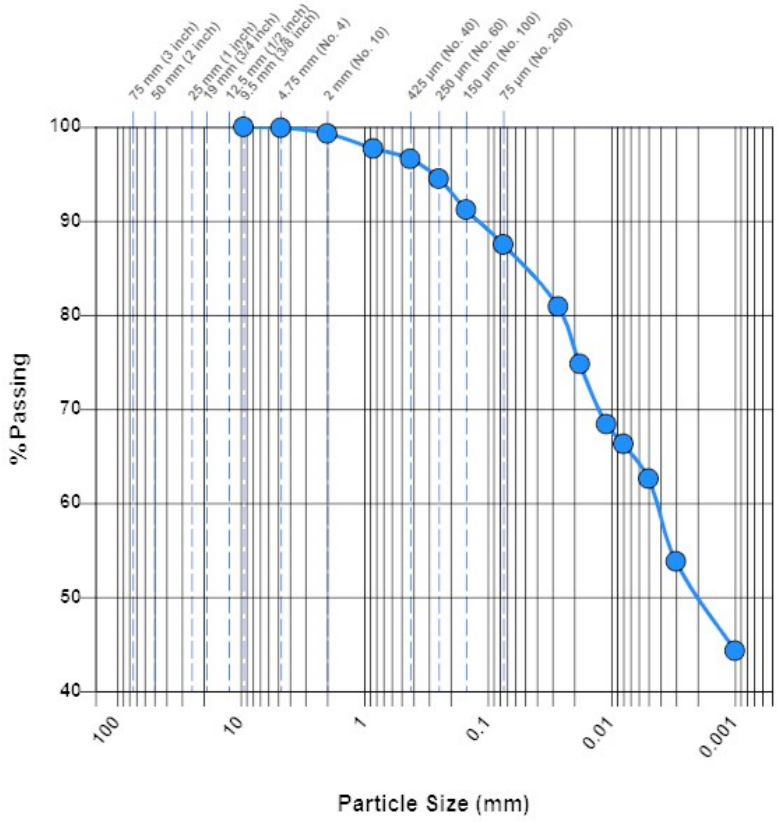
Sample Information

Sample Number:	331877	**Depth (ft):**	20
Boring Number:	5-E-2	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
9.5 mm (3/8 inch)	100.0	-
4.75 mm (No. 4)	99.9	-
2 mm (No. 10)	99.3	-
850 µm (No. 20)	97.7	-
425 µm (No. 40)	96.6	-
250 µm (No. 60)	94.5	-
150 µm (No. 100)	91.2	-
75 µm (No. 200)	87.5	-
27.3 (µm)	80.9	-
17.7 (µm)	74.8	-
10.5 (µm)	68.4	-
7.5 (µm)	66.3	-
5.4 (µm)	62.6	-
2.7 (µm)	53.8	-
1.2 (µm)	44.3	-



Soil Classification: CH Fat clay

Gravel (%):	0.1	**Sand (%):**	12.4	**Silt (%):**	24.9	**Clay (%):**	62.6
D_{60} (µm):	4.4						

General

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

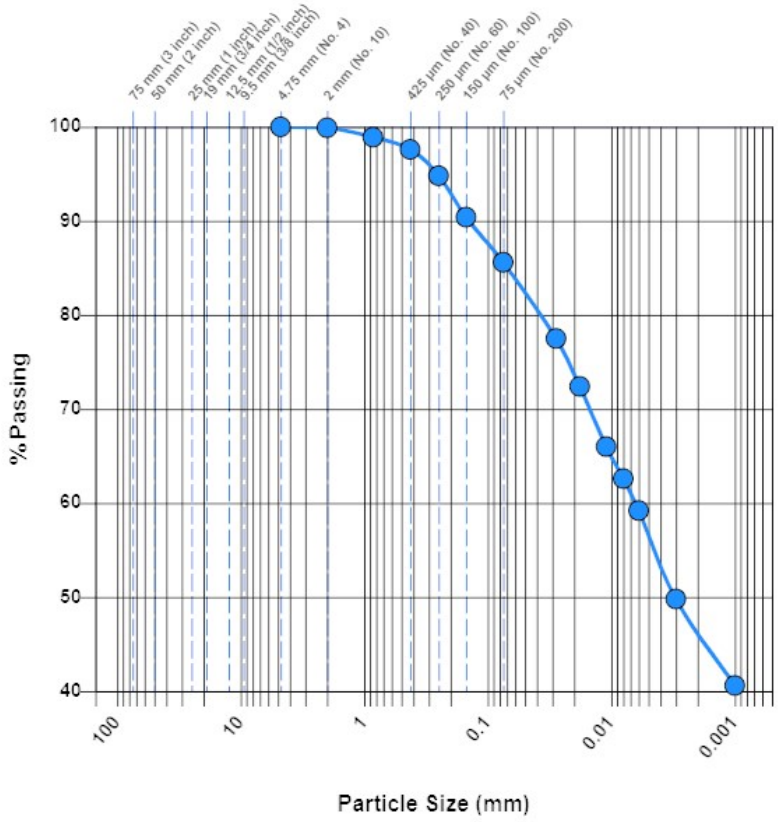
Sample Information

Sample Number:	331879	**Depth (ft):**	7.5
Boring Number:	5-E-2	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	99.9	-
850 µm (No. 20)	98.9	-
425 µm (No. 40)	97.6	-
250 µm (No. 60)	94.8	-
150 µm (No. 100)	90.4	-
75 µm (No. 200)	85.6	-
28.2 (µm)	77.5	-
18.2 (µm)	72.4	-
10.8 (µm)	66.0	-
7.7 (µm)	62.6	-
5.5 (µm)	59.2	-
2.8 (µm)	49.8	-
1.2 (µm)	40.6	-



Soil Classification: CH Fat clay

Gravel (%):	0.0	**Sand (%):**	14.4	**Silt (%):**	29.5	**Clay (%):**	56.1
D_{60} (µm):	6.5						

General

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

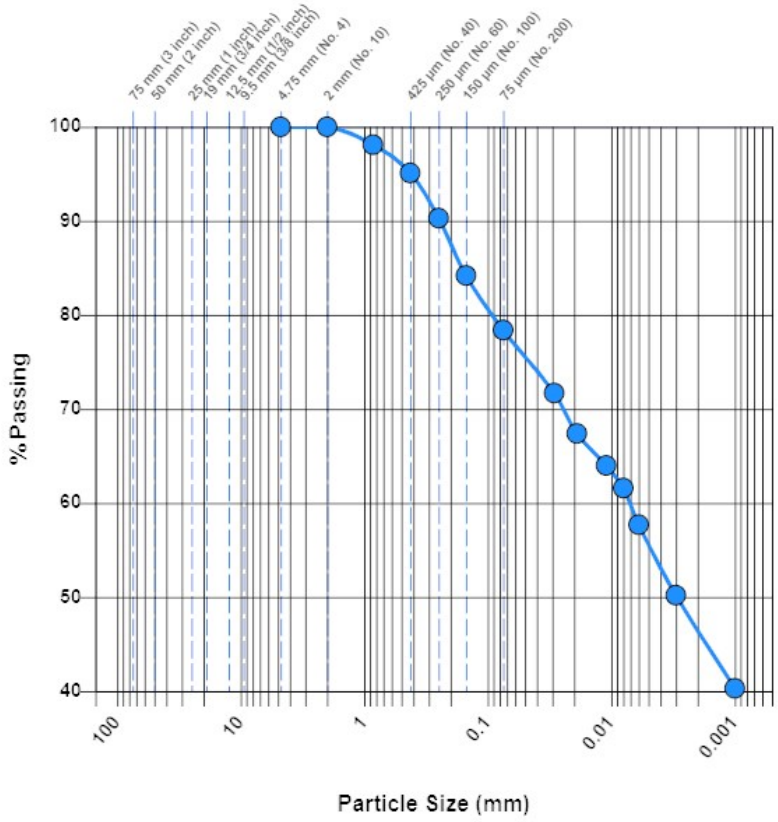
Sample Information

Sample Number:	331880	**Depth (ft):**	75
Boring Number:	5-E-2	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	100.0	-
850 µm (No. 20)	98.1	-
425 µm (No. 40)	95.1	-
250 µm (No. 60)	90.3	-
150 µm (No. 100)	84.2	-
75 µm (No. 200)	78.4	-
28.9 (µm)	71.7	-
18.6 (µm)	67.4	-
10.9 (µm)	64.0	-
7.7 (µm)	61.6	-
5.6 (µm)	57.7	-
2.8 (µm)	50.2	-
1.2 (µm)	40.3	-



Soil Classification: CH Fat clay with sand

Gravel (%):	0.0	**Sand (%):**	21.6	**Silt (%):**	23.2	**Clay (%):**	55.2
D_{60} (µm):	7.2						

General

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Hydrometer And Sieve Analysis

ASTM D422

8/26/2020

Client:

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

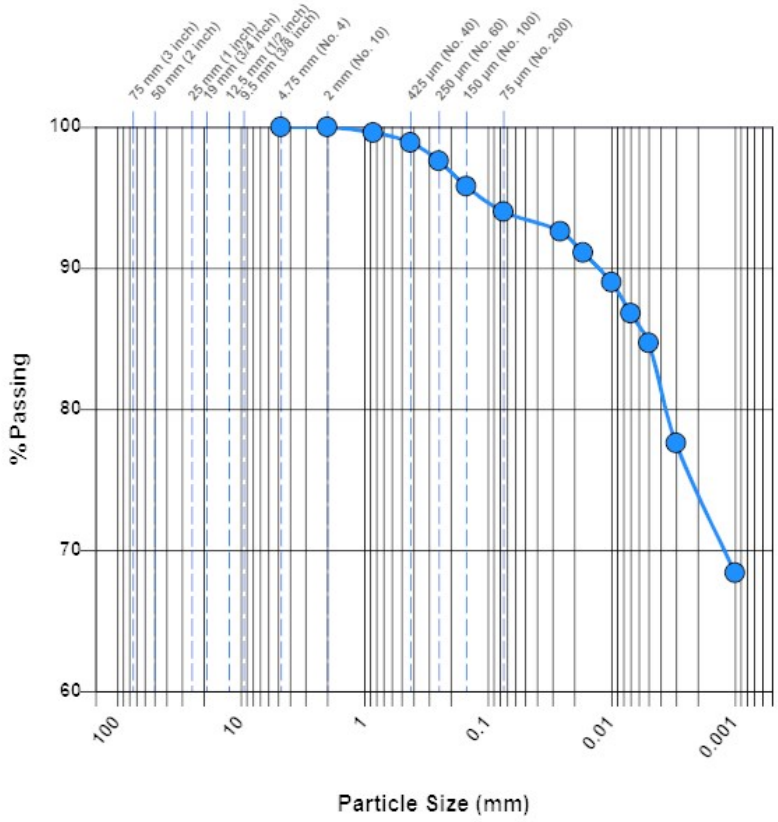
Sample Information

Sample Number:	331881	**Depth (ft):**	105
Boring Number:	5-E-2	**Sampled By:**	Drill Crew
Sample Date:	08/06/2020		
Received Date:	08/25/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	08/26/2020	**Tested By:**	Tschida, Simone T.

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.6	-
425 µm (No. 40)	98.9	-
250 µm (No. 60)	97.6	-
150 µm (No. 100)	95.8	-
75 µm (No. 200)	94.0	-
26.4 (µm)	92.6	-
16.8 (µm)	91.1	-
9.8 (µm)	89.0	-
7.0 (µm)	86.8	-
5.0 (µm)	84.7	-
2.5 (µm)	77.6	-
1.1 (µm)	68.4	-



Soil Classification: CH Fat clay

Gravel (%):	0.0	**Sand (%):**	6.0	**Silt (%):**	9.3	**Clay (%):**	84.7

General

BRAUN INTERTEC
The Science You Build On.

Sieve Analysis Of Soil

ASTM D6913

6/8/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

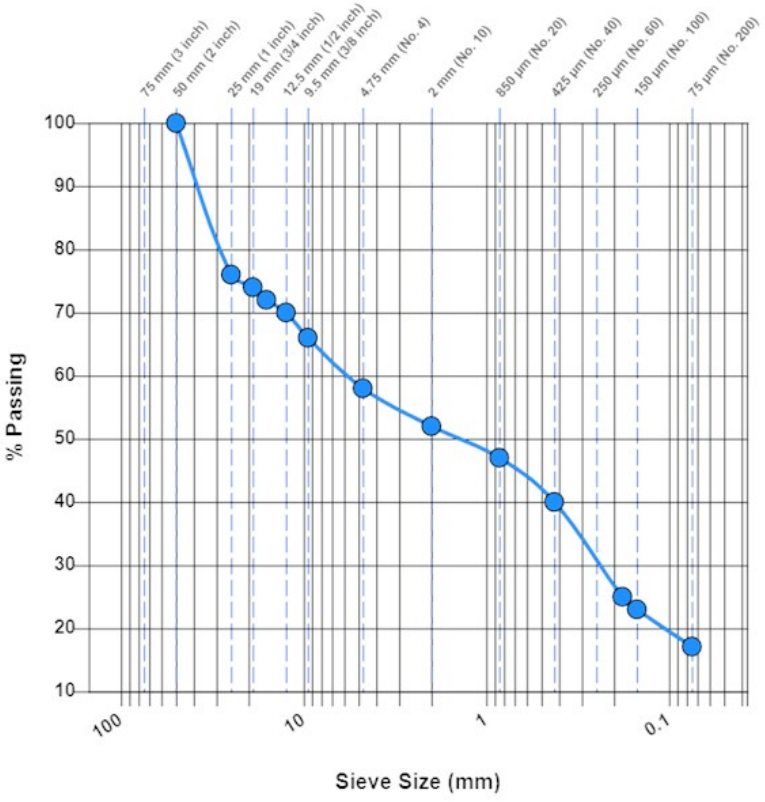
B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number:	312748	**Alternate ID:**	1-E 195'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	195
Boring Number:	1-E	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 1-E 195'		
Sample Date:	06/03/2020		
Received Date:	06/03/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/05/2020		

Laboratory Data

Sieve Size	% Passing	Specification
50 mm (2 inch)	100	
25 mm (1 inch)	76	
19 mm (3/4 inch)	74	
16 mm (5/8 inch)	72	
12.5 mm (1/2 inch)	70	
9.5 mm (3/8 inch)	66	
4.75 mm (No. 4)	58	
2 mm (No. 10)	52	
850 µm (No. 20)	47	
425 µm (No. 40)	40	
180 µm (No. 80)	25	
150 µm (No. 100)	23	
75 µm (No. 200)	17.1	



Test Method: Method A (Composite Sieving)
Dispersion Apparatus: Shaking
Specimen Obtained: Oven Dry
Classification: SP-SM Poorly graded sand with silt and gravel

General

Results: The test is for informational purposes.
Remarks: Total weight of dry sample 373.83 grams

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Sieve Analysis Of Soil

ASTM D6913

6/7/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

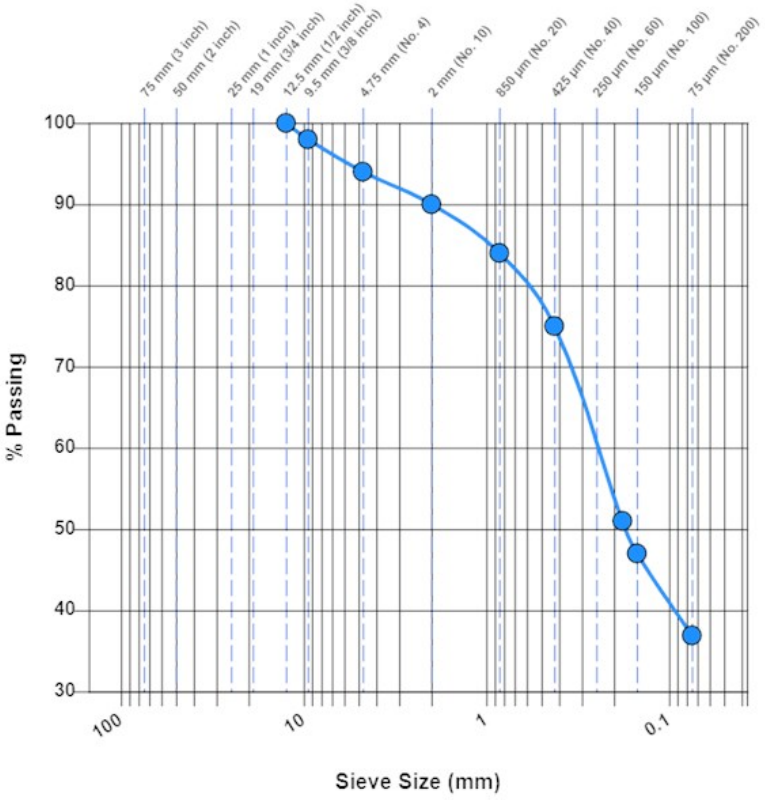
B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number:	312749	**Alternate ID:**	1-E Sample 173 215'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	215
Boring Number:	1-E	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 1-E Sample 173 215'		
Sample Date:	06/03/2020		
Received Date:	06/03/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/05/2020		

Laboratory Data

Sieve Size	% Passing	Specification
12.5 mm (1/2 inch)	100	
9.5 mm (3/8 inch)	98	
4.75 mm (No. 4)	94	
2 mm (No. 10)	90	
850 µm (No. 20)	84	
425 µm (No. 40)	75	
180 µm (No. 80)	51	
150 µm (No. 100)	47	
75 µm (No. 200)	36.9	



Test Method: Method A (Composite Sieving)
Dispersion Apparatus: Shaking
Specimen Obtained: Oven Dry

Classification: SM Silty sand

General

Results: The test is for informational purposes.
Remarks: Total dry weight of sample 245.44 grams

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Sieve Analysis Of Soil

ASTM D6913

7/10/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

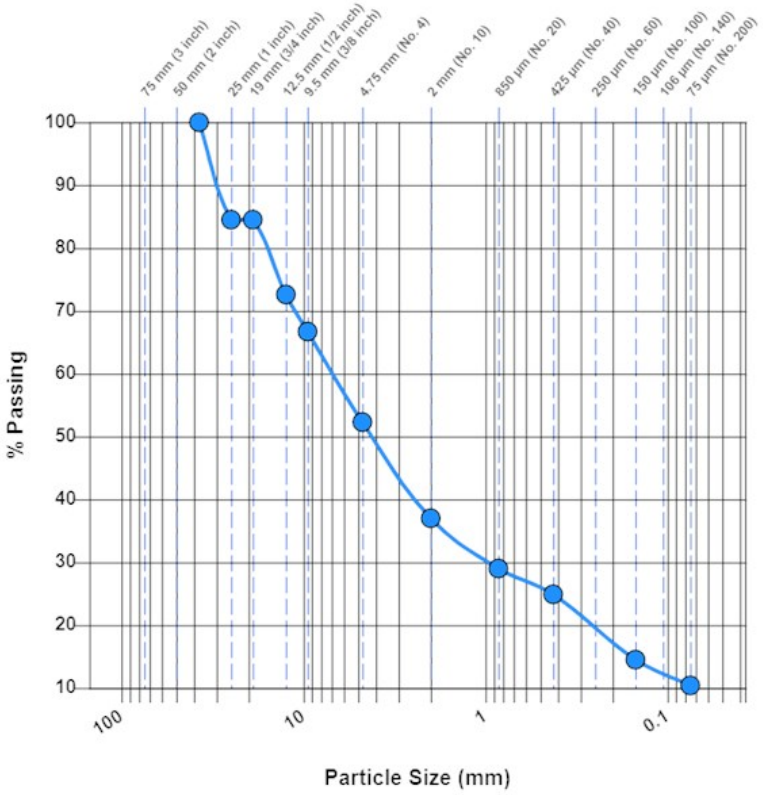
Sample Number:	320061	**Alternate ID:**	3WR-1 10 30'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	30
Boring Number:	3WR-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 3WR-1 Sample 10 30'		
Sample Date:	06/16/2020		
Received Date:	07/06/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	07/09/2020	**Tested By:**	Nelson, Brennan

Laboratory Data

Sieve Size	Passing (%)	Specification
37.5 mm (1.5 inch)	100.0	
25 mm (1 inch)	84.5	
12.5 mm (1/2 inch)	72.6	
9.5 mm (3/8 inch)	66.7	
4.75 mm (No. 4)	52.3	
2 mm (No. 10)	37.0	
850 µm (No. 20)	29.0	
425 µm (No. 40)	24.9	
150 µm (No. 100)	14.5	
75 µm (No. 200)	10.4	

Gravel (%)	Sand (%)	Silt & Clay (%)
47.7	41.9	10.4

D30	D60
0.994	7.290



Classification: SP-SM Poorly graded sand with silt and gravel

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample is 292.4 grams.

BRAUN INTERTEC
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Sieve Analysis Of Soil

ASTM D6913

7/10/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

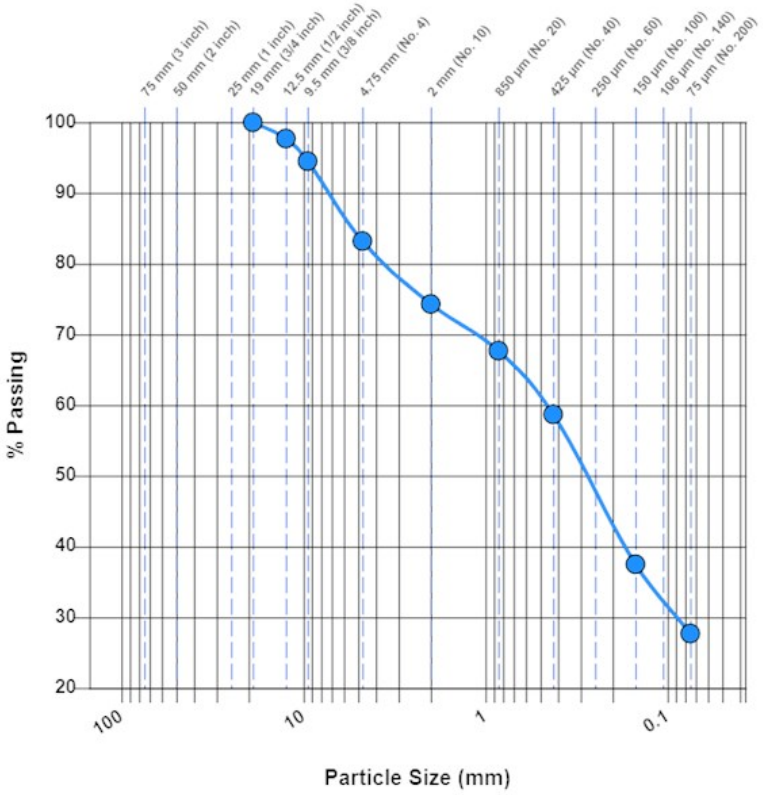
Sample Number:	320062	**Alternate ID:**	3WR-1 21 & 22 85-90'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	85-90
Boring Number:	3WR-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 3WR-1 Sample 21 & 22 85-90'		
Sample Date:	06/22/2020		
Received Date:	07/06/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	07/08/2020	**Tested By:**	Nelson, Brennan

Laboratory Data

Sieve Size	Passing (%)	Specification
19 mm (3/4 inch)	100.0	
12.5 mm (1/2 inch)	97.7	
9.5 mm (3/8 inch)	94.5	
4.75 mm (No. 4)	83.2	
2 mm (No. 10)	74.3	
850 µm (No. 20)	67.7	
425 µm (No. 40)	58.7	
150 µm (No. 100)	37.5	
75 µm (No. 200)	27.7	

Gravel (%)	Sand (%)	Silt & Clay (%)
16.8	55.5	27.7

D30	D60
0.082	0.486



Classification: SM Silty sand with gravel

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample is 428.6

BRAUN INTERTEC
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Sieve Analysis Of Soil

ASTM D6913

7/10/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

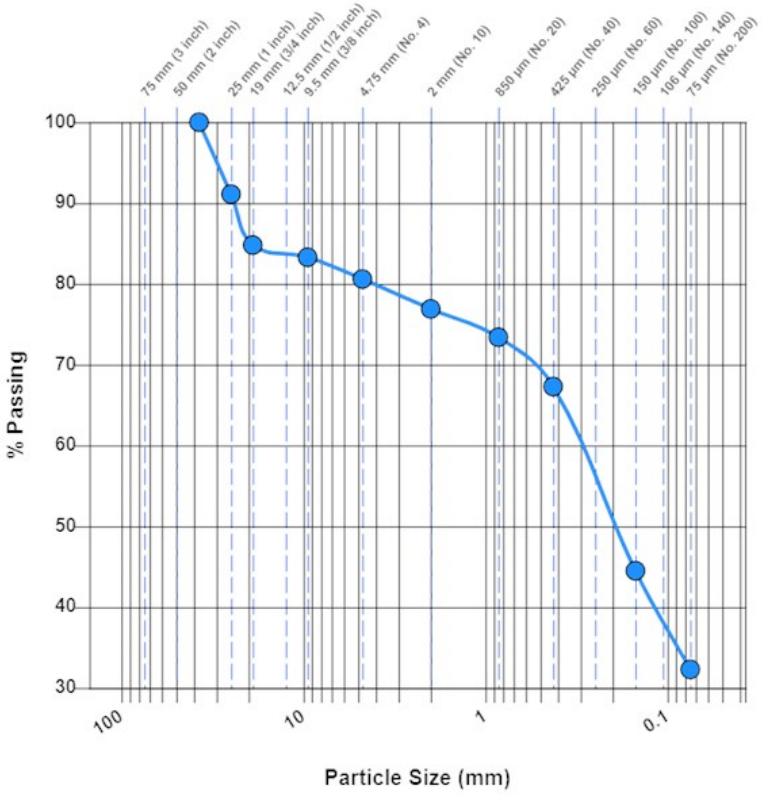
Sample Number:	320063	**Alternate ID:**	3WR-1 21 & 22 95-100
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	95-100
Boring Number:	3WR-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 3WR-1 Sample 23 & 24 95-100'		
Sample Date:	06/22/2020		
Received Date:	07/06/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	07/09/2020	**Tested By:**	Nelson, Brennan

Laboratory Data

Sieve Size	Passing (%)	Specification
37.5 mm (1.5 inch)	100.0	
25 mm (1 inch)	91.1	
19 mm (3/4 inch)	84.8	
9.5 mm (3/8 inch)	83.3	
4.75 mm (No. 4)	80.6	
2 mm (No. 10)	76.9	
850 µm (No. 20)	73.4	
425 µm (No. 40)	67.3	
150 µm (No. 100)	44.5	
75 µm (No. 200)	32.3	

Gravel (%)	Sand (%)	Silt & Clay (%)
19.4	48.3	32.3

D60
0.218



Classification: SP-SM Poorly graded sand with silt and gravel

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample is 457.8 grams.

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4511 West First Street
Suite 4
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Phone: 218-624-4967

Sieve Analysis Of Soil

ASTM D6913

7/10/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

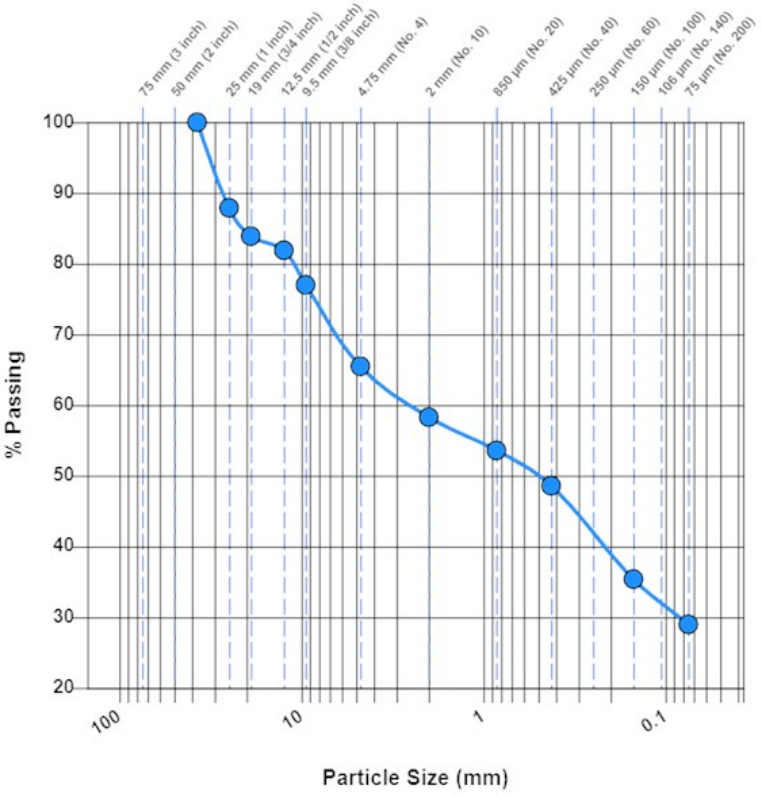
Sample Number:	320064	**Alternate ID:**	3WR-1 26&27 110-115
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	110-115
Boring Number:	3WR-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 3WR-1 Sample 26 & 27 110-115'		
Sample Date:	06/22/2020		
Received Date:	07/06/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	07/10/2020	**Tested By:**	Nelson, Brennan

Laboratory Data

Sieve Size	Passing (%)	Specification
37.5 mm (1.5 inch)	100.0	
25 mm (1 inch)	87.9	
19 mm (3/4 inch)	83.9	
12.5 mm (1/2 inch)	81.9	
9.5 mm (3/8 inch)	77.0	
4.75 mm (No. 4)	65.5	
2 mm (No. 10)	58.3	
850 µm (No. 20)	53.6	
425 µm (No. 40)	48.6	
150 µm (No. 100)	35.4	
75 µm (No. 200)	29.0	

Gravel (%)	Sand (%)	Silt & Clay (%)
34.5	36.5	29.0

D30	D60
0.080	2.649



Classification: SM Silty sand with gravel

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample is 325.0.

BRAUN INTERTEC
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Sieve Analysis Of Soil

ASTM D6913

8/11/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

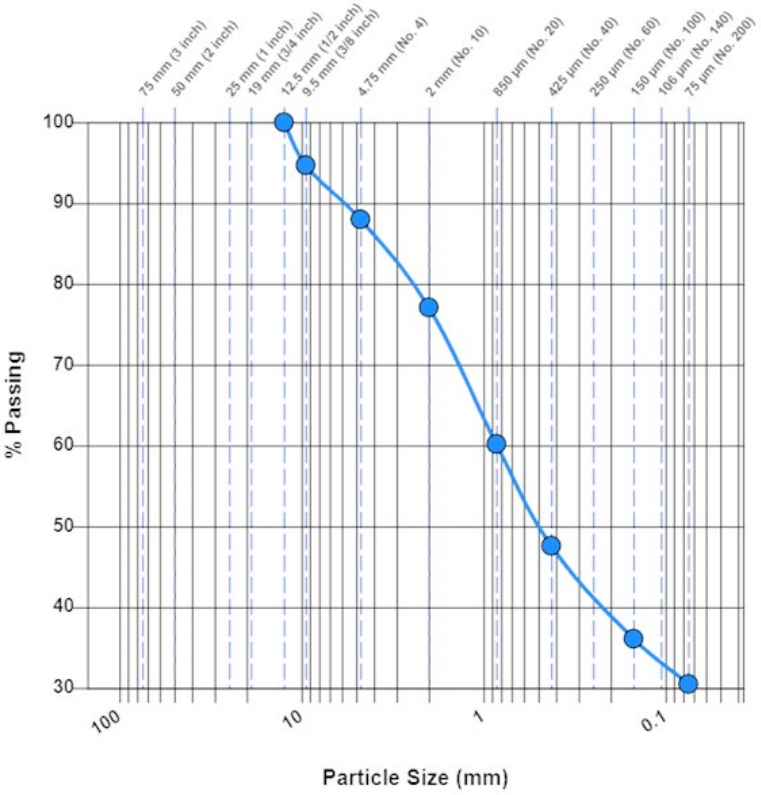
Sample Number:	327699	**Alternate ID:**	4WR-1 19 72'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	72
Boring Number:	4WR-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 4WR-1 Sample 19 72'		
Sample Date:	07/15/2020		
Received Date:	08/06/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	08/11/2020	**Tested By:**	Nelson, Brennan

Laboratory Data

Sieve Size	Passing (%)	Specification
12.5 mm (1/2 inch)	100.0	
9.5 mm (3/8 inch)	94.7	
4.75 mm (No. 4)	88.0	
2 mm (No. 10)	77.1	
850 µm (No. 20)	60.2	
425 µm (No. 40)	47.6	
150 µm (No. 100)	36.1	
75 µm (No. 200)	30.5	

Gravel (%)	Sand (%)	Silt & Clay (%)
12.0	57.5	30.5

D60
0.843



Classification: SM Silty sand
Specimen Obtained: Oven Dry
Test Method: Method A (Composite Sieving)
Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.
Remarks: Total dry weight of sample is 90.1 grams.

BRAUN INTERTEC
The Science You Build On.

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

6/8/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 312748
Alternate ID: 1-E 195'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 1-E 195'
Sample Date: 06/03/2020
Received Date: 06/03/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/05/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
1-E		195.0	9.7

General

Results: The test is for informational purposes.

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Moisture Content Of Soil

ASTM D2216

6/7/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 312749
Alternate ID: 1-E Sample 173 215'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 1-E Sample 173 215'
Sample Date: 06/03/2020
Received Date: 06/03/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/05/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
1-E	173	215.0	57.8

General

Results: The test is for informational purposes.

BRAUN INTERTEC
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4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

7/10/2020

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 320061
Alternate ID: 3WR-1 10 30'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 3WR-1 Sample 10 30'
Sample Date: 06/16/2020
Received Date: 07/06/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 07/09/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
3WR-1	10	30.0	10.3

General

Results: The test is for informational purposes.

BRAUN INTERTEC
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Moisture Content Of Soil

ASTM D2216

7/10/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 320062
Alternate ID: 3WR-1 21 & 22 85-90'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 3WR-1 Sample 21 & 22 85-90'
Sample Date: 06/22/2020
Received Date: 07/06/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 07/08/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
3WR-1	21 + 22	87.0	14.0

General

Results: The test is for informational purposes.

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Moisture Content Of Soil

ASTM D2216

7/10/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 320063
Alternate ID: 3WR-1 21 & 22 95-100
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 3WR-1 Sample 23 & 24 95-100'
Sample Date: 06/22/2020
Received Date: 07/06/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 07/09/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
3WR-1	23 + 24	97.0	9.7

General

Results: The test is for informational purposes.

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Moisture Content Of Soil

ASTM D2216

7/10/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 320064
Alternate ID: 3WR-1 26&27 110-115
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 3WR-1 Sample 26 & 27 110-115'
Sample Date: 06/22/2020
Received Date: 07/06/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 07/10/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
3WR-1	26 & 27	112.0	10.6

General

Results: The test is for informational purposes.

BRAUN INTERTEC
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Moisture Content Of Soil

ASTM D2216

8/11/2020

4511 West First Street
Suite 4
Duluth, MN 55807
Phone: 218-624-4967

Client:

Enbridge Energy, Limited Partnership
Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number: 327699
Alternate ID: 4WR-1 19 72'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 4WR-1 Sample 19 72'
Sample Date: 07/15/2020
Received Date: 08/06/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 08/11/2020
Tested By: Nelson, Brennan

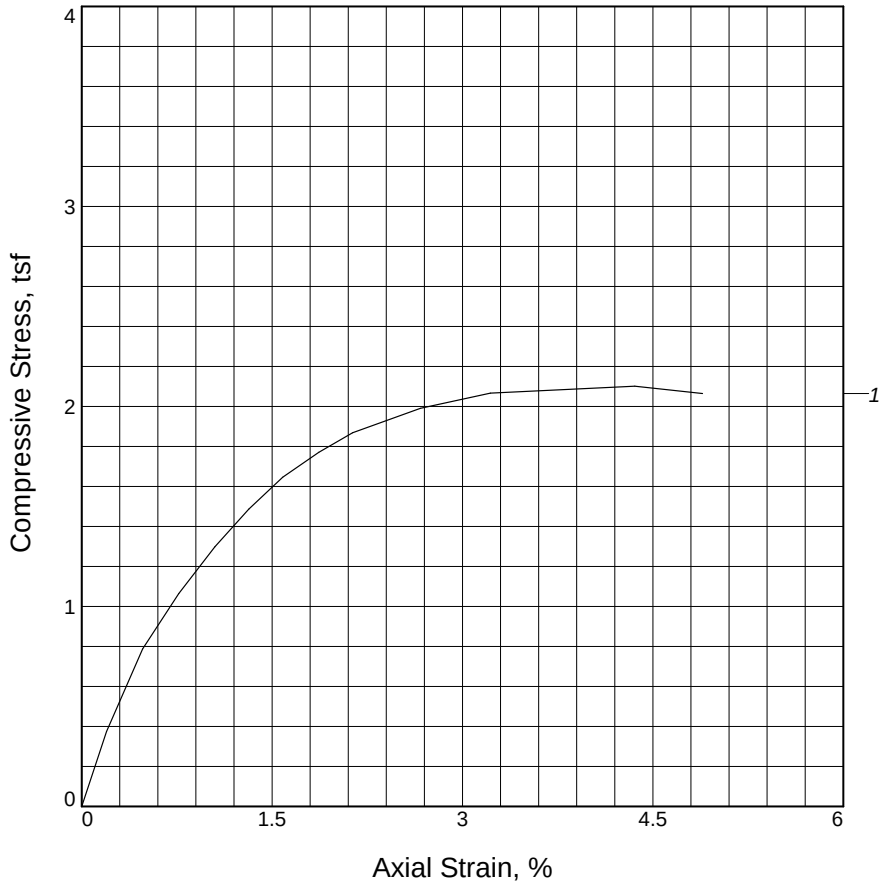
Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
4WR-1	19	72.0	12.5

General

Results: The test is for informational purposes.

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	2.1013			
Undrained shear strength, tsf	1.0506			
Failure strain, %	4.4			
Strain rate, %/min.	1.00			
Water content, %	23.0			
Wet density, pcf	128.5			
Dry density, pcf	104.5			
Saturation, %	98.3			
Void ratio	0.6423			
Specimen diameter, in.	2.857			
Specimen height, in.	5.622			
Height/diameter ratio	1.97			

Description: LEAN CLAY, red (CL)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

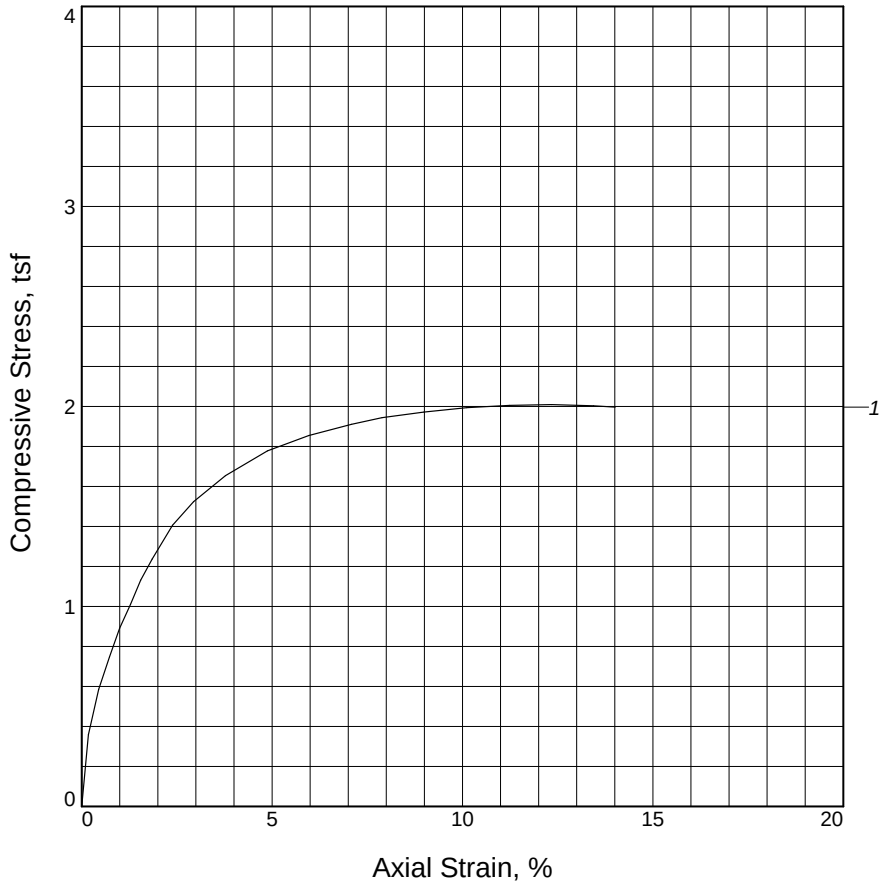
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 1-E **Depth:** 35'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	2.0092			
Undrained shear strength, tsf	1.0046			
Failure strain, %	12.3			
Strain rate, %/min.	1.00			
Water content, %	22.3			
Wet density, pcf	129.1			
Dry density, pcf	105.6			
Saturation, %	99.6			
Void ratio	0.6086			
Specimen diameter, in.	2.860			
Specimen height, in.	5.617			
Height/diameter ratio	1.96			

Description: LEAN CLAY, red (CL)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.72	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

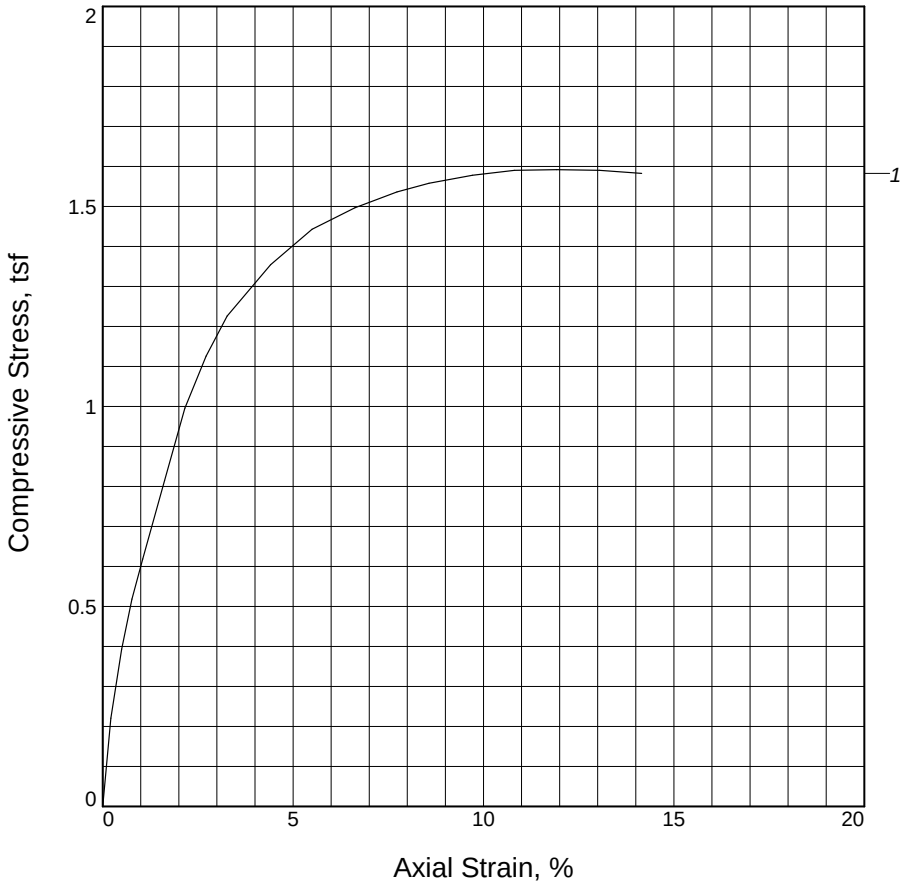
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 1-E **Depth:** 55'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.5920			
Undrained shear strength, tsf	0.7960			
Failure strain, %	11.9			
Strain rate, %/min.	1.00			
Water content, %	17.7			
Wet density, pcf	136.2			
Dry density, pcf	115.7			
Saturation, %	99.9			
Void ratio	0.4893			
Specimen diameter, in.	2.837			
Specimen height, in.	5.602			
Height/diameter ratio	1.97			

Description: LEAN CLAY, red (CL)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.76	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

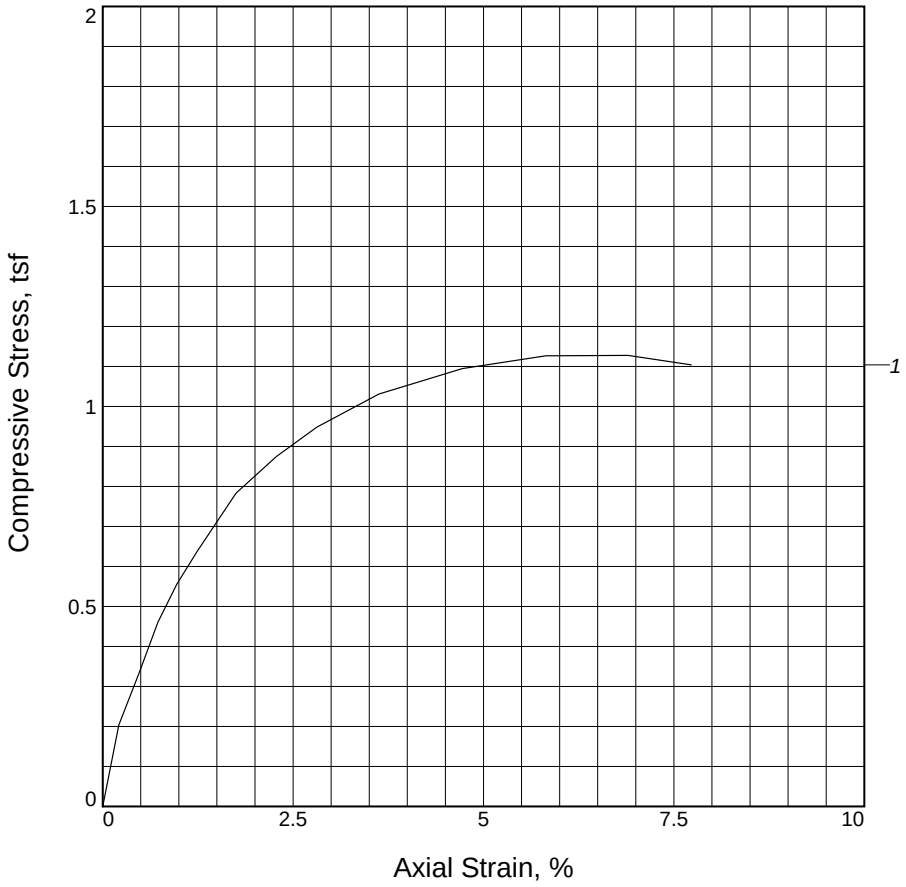
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 1-E **Depth:** 75'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.1275			
Undrained shear strength, tsf	0.5637			
Failure strain, %	6.9			
Strain rate, %/min.	1.00			
Water content, %	24.8			
Wet density, pcf	126.6			
Dry density, pcf	101.5			
Saturation, %	98.4			
Void ratio	0.6921			
Specimen diameter, in.	2.863			
Specimen height, in.	5.654			
Height/diameter ratio	1.97			

Description: SANDY LEAN CLAY, red (CL)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Thinwall

Project No.: B2001991

Date Sampled: 7/2/2020

Remarks:
ASTM D 2166

Figure _____

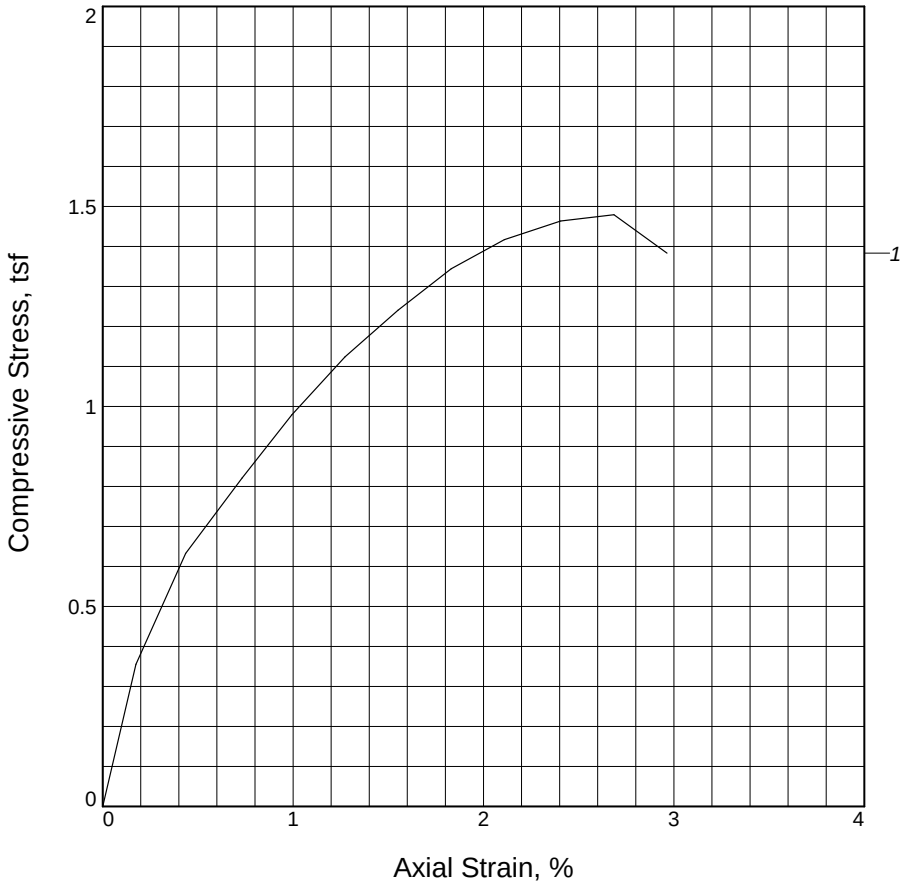
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 3WR-1 **Depth:** 19-21'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.4793			
Undrained shear strength, tsf	0.7397			
Failure strain, %	2.7			
Strain rate, %/min.	1.00			
Water content, %	29.0			
Wet density, pcf	123.1			
Dry density, pcf	95.4			
Saturation, %	99.8			
Void ratio	0.7992			
Specimen diameter, in.	2.858			
Specimen height, in.	5.736			
Height/diameter ratio	2.01			

Description: FAT CLAY, reddish brown (CH)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

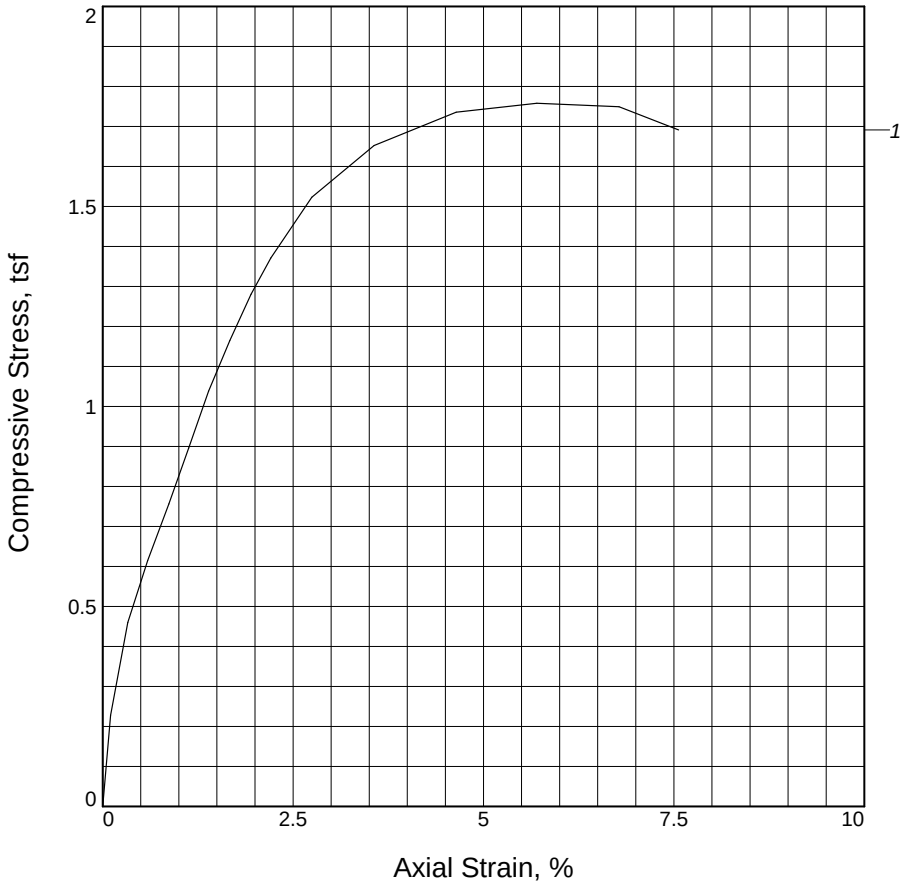
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 4-WR-1 **Depth:** 9.5'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.7580			
Undrained shear strength, tsf	0.8790			
Failure strain, %	5.7			
Strain rate, %/min.	1.00			
Water content, %	21.2			
Wet density, pcf	130.5			
Dry density, pcf	107.7			
Saturation, %	98.0			
Void ratio	0.5947			
Specimen diameter, in.	2.860			
Specimen height, in.	5.753			
Height/diameter ratio	2.01			

Description: FAT CLAY with SAND, reddish brown (CH)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

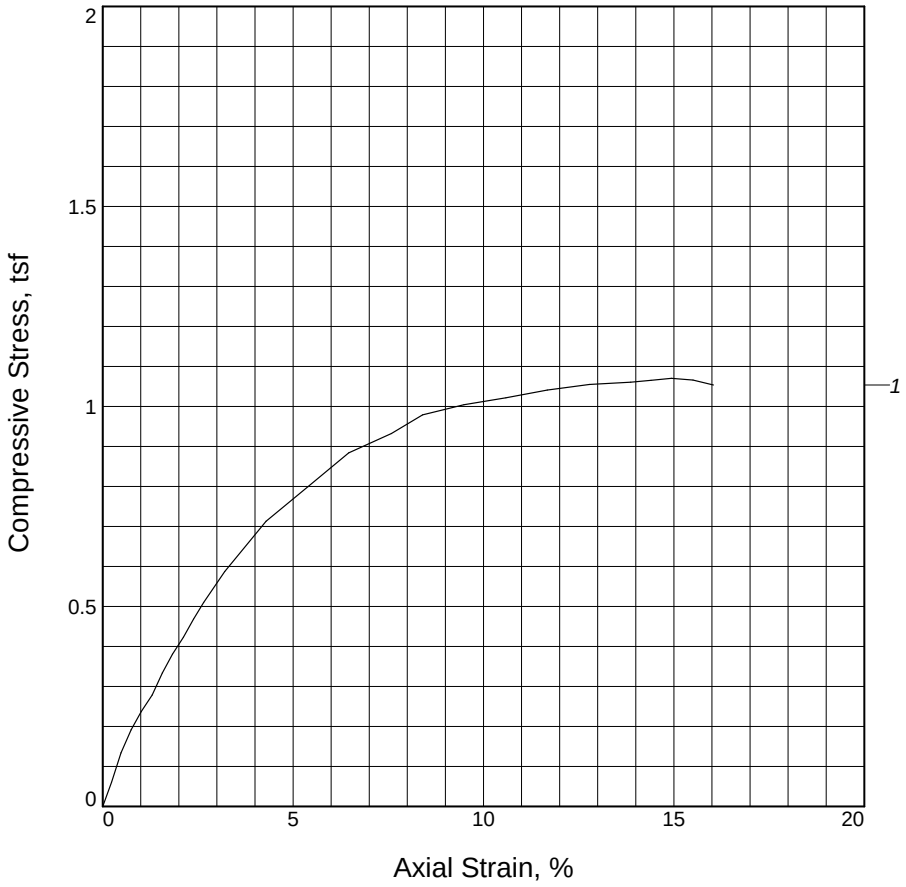
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 4-WR-1 **Depth:** 22'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.0704			
Undrained shear strength, tsf	0.5352			
Failure strain, %	14.9			
Strain rate, %/min.	1.00			
Water content, %	14.6			
Wet density, pcf	139.5			
Dry density, pcf	121.7			
Saturation, %	97.6			
Void ratio	0.4105			
Specimen diameter, in.	2.845			
Specimen height, in.	5.618			
Height/diameter ratio	1.97			

Description: SANDY LEAN CLAY, reddish brown (CH)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

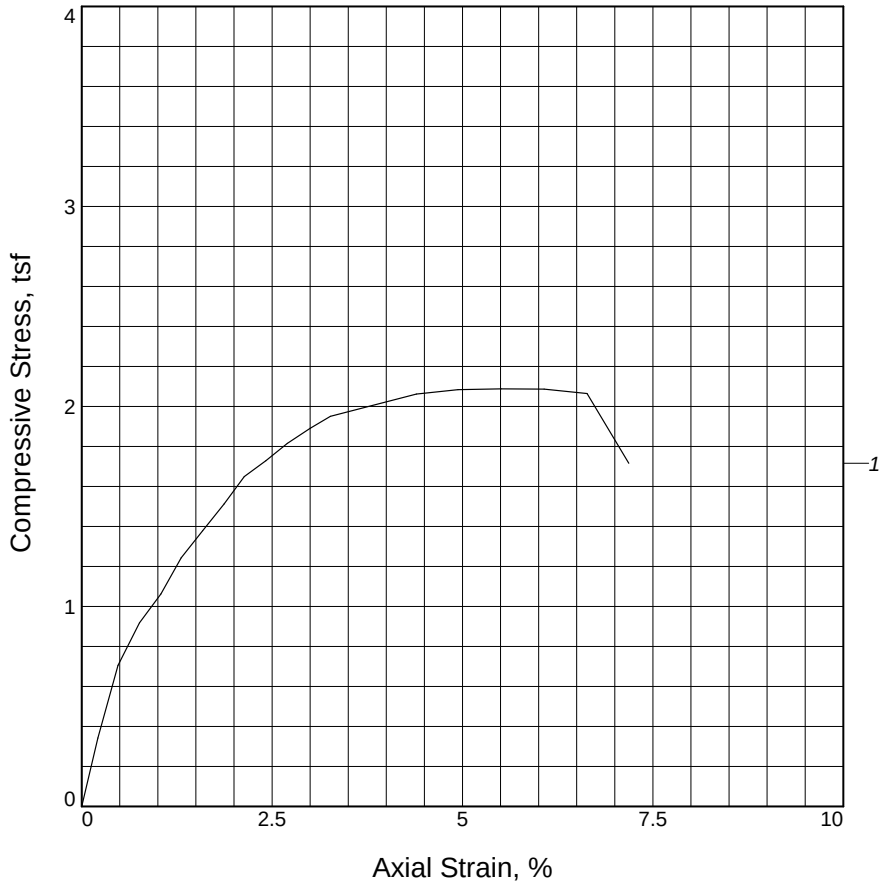
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 4-WR-1 **Depth:** 52'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	2.0880			
Undrained shear strength, tsf	1.0440			
Failure strain, %	5.5			
Strain rate, %/min.	1.00			
Water content, %	26.6			
Wet density, pcf	124.9			
Dry density, pcf	98.6			
Saturation, %	98.9			
Void ratio	0.7409			
Specimen diameter, in.	2.858			
Specimen height, in.	5.666			
Height/diameter ratio	1.98			

Description: FAT CLAY, reddish brown (CH)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

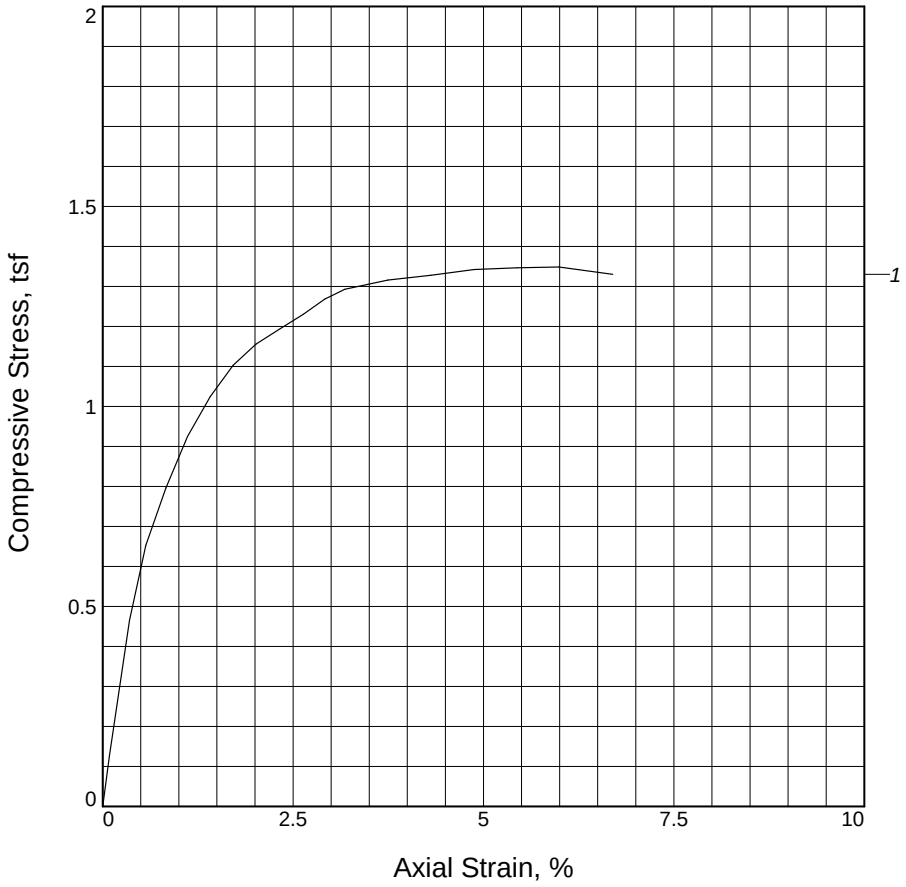
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 5-E-2 **Depth:** 20'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.3486			
Undrained shear strength, tsf	0.6743			
Failure strain, %	6.0			
Strain rate, %/min.	1.00			
Water content, %	28.9			
Wet density, pcf	122.9			
Dry density, pcf	95.4			
Saturation, %	99.3			
Void ratio	0.7995			
Specimen diameter, in.	2.853			
Specimen height, in.	5.659			
Height/diameter ratio	1.98			

Description: FAT CLAY, reddish brown (CH)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

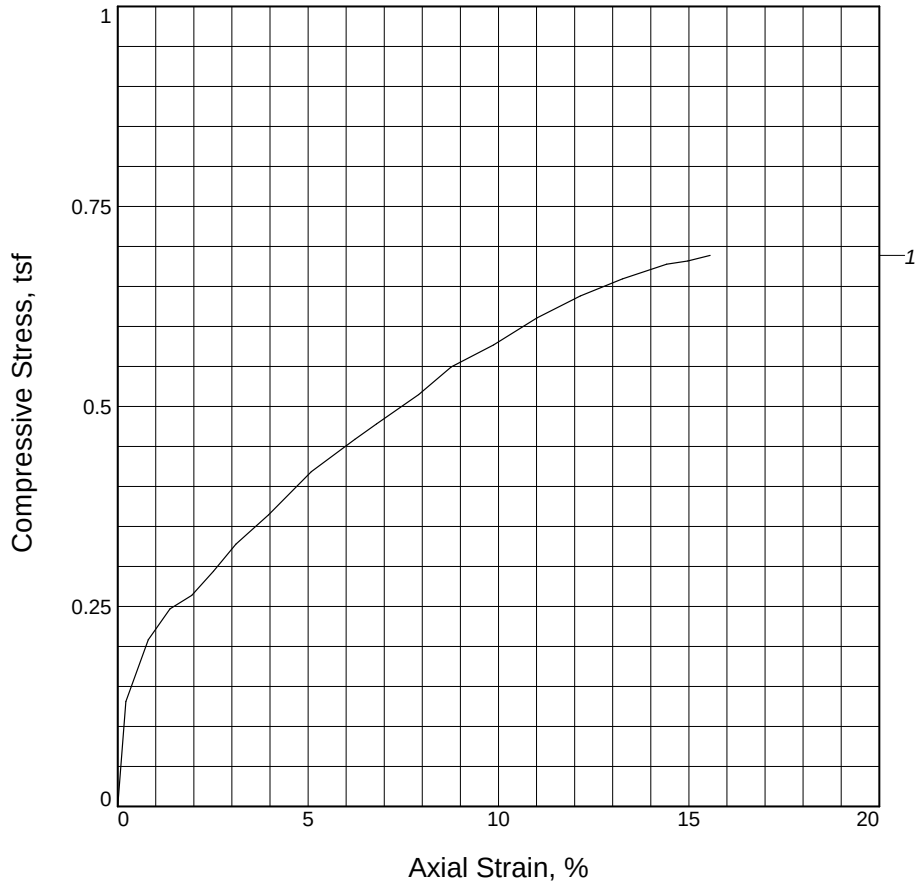
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 5-E-2 **Depth:** 40'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	0.6888			
Undrained shear strength, tsf	0.3444			
Failure strain, %	15.6			
Strain rate, %/min.	1.00			
Water content, %	30.0			
Wet density, pcf	121.3			
Dry density, pcf	93.2			
Saturation, %	98.2			
Void ratio	0.8411			
Specimen diameter, in.	2.814			
Specimen height, in.	5.604			
Height/diameter ratio	1.99			

Description: GRAVELLY FAT CLAY, reddish brown (CH)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

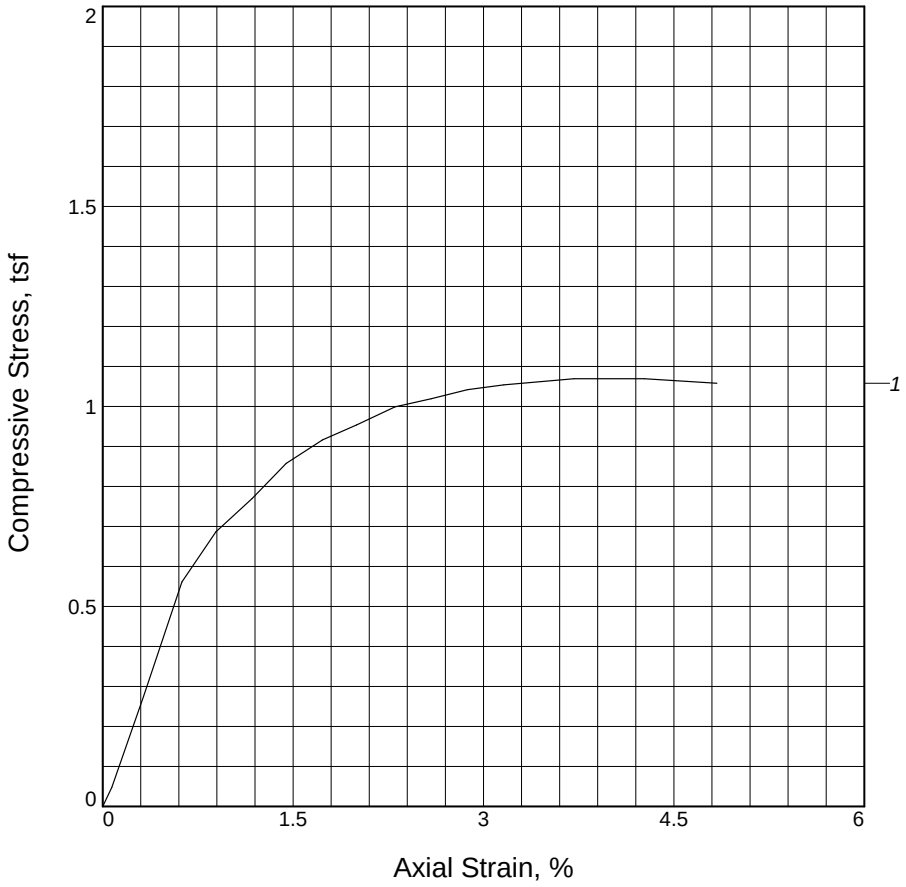
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 5-E-2 **Depth:** 50'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.0694			
Undrained shear strength, tsf	0.5347			
Failure strain, %	4.3			
Strain rate, %/min.	1.00			
Water content, %	33.8			
Wet density, pcf	119.1			
Dry density, pcf	89.1			
Saturation, %	99.7			
Void ratio	0.9347			
Specimen diameter, in.	2.855			
Specimen height, in.	5.601			
Height/diameter ratio	1.96			

Description: FAT CLAY, reddish brown (CH)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.76	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

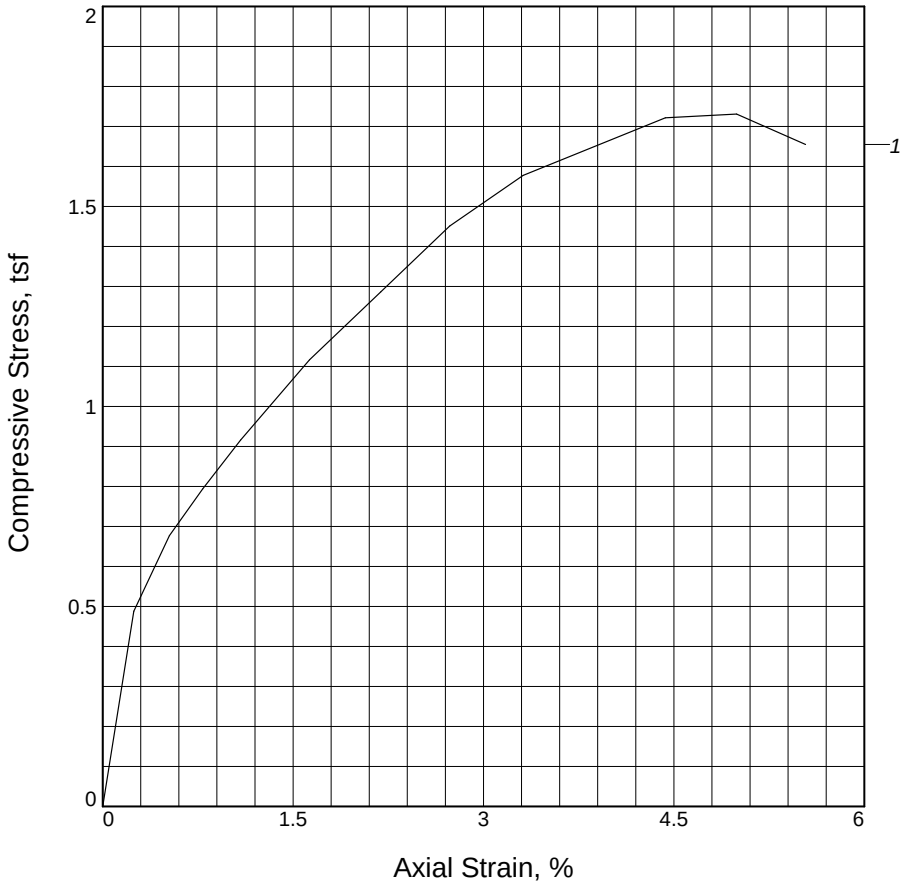
Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 5-E-2 **Depth:** 85'

BRAUN INTERTEC

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.7310			
Undrained shear strength, tsf	0.8655			
Failure strain, %	5.0			
Strain rate, %/min.	1.00			
Water content, %	40.4			
Wet density, pcf	114.3			
Dry density, pcf	81.5			
Saturation, %	99.9			
Void ratio	1.1154			
Specimen diameter, in.	2.854			
Specimen height, in.	5.707			
Height/diameter ratio	2.00			

Description: FAT CLAY, reddish brown (CH)

LL =	**PL =**	**PI =**	**Assumed GS=** 2.76	**Type:** Thinwall

Project No.: B2001991

Date Sampled:

Remarks:
ASTM D 2166

Figure _____

Client:

Project: Enbridge Line 5 Re-route
Enbridge Line 5

Source of Sample: 5-E-2 **Depth:** 105'

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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: September 16, 2020

Project Number: B2001991

Client: Accounts Payable
Enbridge Energy, Limited Partnership
5400 Westheimer Ct
Houston, TX 77056

Project Description:
Enbridge Line 5 Re-route

Sample Data

Date Sampled:	Not Given
Samples Obtained By:	Braun
Date Received:	7/7/2020
Sample Preparation:	Trim and Polished

Laboratory Data

					ASTM D4543 Limits
Sample Number:	129-130	139-140	149-150	160-161	
Date Tested:	7/15/2020	7/15/2020	7/15/2020	7/15/2020	
Rock Type:	Sandstone	Sandstone	Sandstone	Sandstone	
Moisture Condition During Testing:	Dry	Dry	Dry	Dry	
Diameter (in.):	1.69	1.69	1.75	1.69	
Length (in.):	4.12	3.98	2.60	3.70	
Length-to-Diameter Ratio (L/D):	2.4	2.4	1.5	2.2	$2.0 \leq L/D \leq 2.5$
Side Tolerance, Maximum (in.)	≤ 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.
Perpendicularity Deviation (^{o})	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	$\leq 0.250^o$
Parallelism Deviation (^{o})	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	$\leq 0.25^o$
Maximum Load (lbs):	15,928	15,645	13,465	15,144	
Area (in^2):	2.24	2.24	2.41	2.24	
Compressive Strength (psi):	7,110	6,980	5,590	6,760	
Compressive Strength (MPa):	48	47	38	46	

Remarks:
3WR-1

Reviewed By:
David Morrison

Project Manager

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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: September 9, 2020

Project Number: B2001991

Client: Accounts Payable
Enbridge Energy, Limited Partnership
5400 Westheimer Ct
Houston, TX 77056

Project Description:
Enbridge Line 5 Re-route

Sample Data

Date Sampled: Not Given
Samples Obtained By: Braun
Date Received: 8/10/2020
Sample Preparation: Trim and Polished

Laboratory Data

					ASTM D4543 Limits
Sample Number:	82-83	93-94	104-105	115-116	
Date Tested:	7/16/2020	7/16/2020	7/16/2020	7/16/2020	
Rock Type:	Sandstone	Sandstone	Sandstone/ Mudstone	Sandstone/ Mudstone	
Moisture Condition During Testing:	Dry	Dry	Dry	Dry	
Diameter (in.):	1.92	1.93	1.94	1.94	
Length (in.):	4.22	4.26	4.42	4.04	
Length-to-Diameter Ratio (L/D):	2.2	2.2	2.3	2.1	$2.0 \leq L/D \leq 2.5$
Side Tolerance, Maximum (in.) End	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020 in.
Tolerance, Maximum (in.)	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in.
Perpendicularity Deviation (^{o})	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	$\leq 0.250^o$
Parallelism Deviation (^{o}) Maximum	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	$\leq 0.25^o$
Load (lbs):	15,880	18,518	17,745	22,324	
Area (in^2):	2.90	2.93	2.96	2.96	
Compressive Strength (psi):	5,480	6,320	5,990	7,540	
Compressive Strength (MPa):	37	43	41	51	

Remarks:
Location: 4-WR-1

Reviewed By:
David Morrison

Project Manager

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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: September 9, 2020

Project Number: B2001991

Client: Accounts Payable
Enbridge Energy, Limited Partnership
5400 Westheimer Ct
Houston, TX 77056

Project Description:
Enbridge Line 5 Re-route

Sample Data

Date Sampled: Not Given
Samples Obtained By: Braun
Date Received: 8/10/2020
Sample Preparation: Trim and Polished

Laboratory Data

						ASTM D4543 Limits
Sample Number:	127-128	140-141	150-151	161-162	169-170	
Date Tested:	7/16/2020	7/16/2020	7/16/2020	7/16/2020	7/17/2020	
Rock Type:	Sandstone/ Mudstone	Mudstone	Sandstone/ Mudstone	Sandstone	Sandstone/ Mudstone	
Moisture Condition During Testing:	Dry	Dry	Dry	Dry	Dry	
Diameter (in.):	1.94	1.94	1.93	1.94	1.97	
Length (in.):	3.97	4.13	4.08	4.33	3.98	
Length-to-Diameter Ratio (L/D):	2.0	2.1	2.1	2.2	2.0	$2.0 \leq L/D \leq 2.5$
Side Tolerance, Maximum (in.) End	< 0.020	< 0.020	< 0.020	< 0.020	< 0.021	≤ 0.020 in.
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 (°) Maximum	< 0.001 in	< 0.001 in	< 0.001 in	< 0.001 in	< 0.001 in	≤ 0.25°
Load (lbs):	24,917	13,523	20,259	23,896	19,414	
Area (in^2):	2.96	2.96	2.93	2.96	3.05	
Compressive Strength (psi):	8,420	4,570	6,910	8,070	6,370	
Compressive Strength (MPa):	57	31	47	55	43	

Remarks:
Location: 4-WR-1

Reviewed By:
David Morriso

Project Manager

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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: September 9, 2020

Project Number: B2001991

Client: Accounts Payable
Enbridge Energy, Limited Partnership
5400 Westheimer Ct
Houston, TX 77056

Project Description:
Enbridge Line 5 Re-route

Sample Data

Date Sampled:	Not Given
Samples Obtained By:	Braun
Date Received:	8/10/2020
Sample Preparation:	Trim and Polished

Laboratory Data

					ASTM D4543 Limits
Sample Number:	150-151	155-156	168-169	175-176	
Date Tested:	7/16/2020	7/16/2020	7/16/2020	7/16/2020	
Rock Type:	Conglomerate	Conglomerate	Breccia	Breccia	
Moisture Condition During Testing:	Dry	Dry	Dry	Dry	
Diameter (in.):	1.69	1.69	1.70	1.70	
Length (in.):	4.00	4.52	4.34	4.34	
Length-to-Diameter Ratio (L/D):	2.4	2.7	2.6	2.6	$2.0 \leq L/D \leq 2.5$
Side Tolerance, Maximum (in.)	≤ 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.
Perpendicularity Deviation (^{o})	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	$\leq 0.250^o$
Parallelism Deviation (^{o})	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	$\leq 0.25^o$
Maximum Load (lbs):	8,785	5,096	7,314	7,314	
Area (in^2):	2.24	2.24	2.27	2.27	
Compressive Strength (psi):	3,920	2,280	3,220	3,220	
Compressive Strength (MPa):	27	15	22	22	

Remarks:
Location: 5-E-2

Reviewed By:
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Project Manager

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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: September 9, 2020

Project Number: B2001991

Client: Accounts Payable
Enbridge Energy, Limited Partnership
5400 Westheimer Ct
Houston, TX 77056

Project Description:
Enbridge Line 5 Re-route

Sample Data

Date Sampled: Not Given
Samples Obtained By: Braun
Date Received: 8/10/2020
Sample Preparation: Trim and Polished

Laboratory Data

						ASTM D4543 Limits
Sample Number:	184-185	196-197	208-209	218-219	228-229	
Date Tested:	7/16/2020	7/16/2020	7/16/2020	7/16/2020	7/17/2020	
Rock Type:	Conglomerate	Conglomerate	Conglomerate	Conglomerate	Conglomerate	
Moisture Condition During Testing:	Dry	Dry	Dry	Dry	Dry	
Diameter (in.):	1.69	1.69	1.69	1.69	1.69	
Length (in.):	4.48	4.41	4.41	4.48	4.11	
Length-to-Diameter Ratio (L/D):	2.7	2.6	2.6	2.7	2.4	$2.0 \leq L/D \leq 2.5$
Side Tolerance, Maximum (in.)	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.021	≤ 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 (^{o})	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	$\leq 0.250^o$
Parallelism Deviation (^{o})	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	$\leq 0.25^o$
Maximum Load (lbs):	5,256	10,037	5,933	12,703	7,601	
Area (in^2):	2.24	2.24	2.24	2.24	2.24	
Compressive Strength (psi):	2,350	4,480	2,650	5,670	3,390	
Compressive Strength (MPa):	16	30	18	38	23	

Remarks:
Location: 5-E-2

Reviewed By:
David Morrison

Project Manager