Subsurface Investigation Report

Enbridge Line 5 Reroute
MP 11 HDD Crossing – Marengo River
Location 15-C-1, West of Riemer Road, North of Marengo River Road
Location 17-C, West of Riemer Road, South of Marengo River Road
Location 19-C, West of Riemer Road, South of Marengo River Road
White River Town, 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
Business Unit Manager / Senior Engineer
License Number: E-43286-6
July 13, 2020

Project B2001991

Braun Intertec Corporation

BRAUN INTERTEC
The Science You Build On.

Braun Intertec Corporation
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July 13, 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 11 HDD Crossing – Marengo River
Location 15-C-1, West of Riemer Road, North of Marengo River Road
Location 17-C, West of Riemer Road, South of Marengo River Road
Location 19-C, West of Riemer Road, South of Marengo River Road
White River Town, Ashland County, Wisconsin

Dear Mr. Erickson:

We are pleased to present this Subsurface Investigation Report for the Line 5 Reroute Project at the MP 11 HDD Crossing under Marengo River in White River Town, 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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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 surfaces as part of this effort.

This report provides a factual data obtained at Borehole Locations 15-C-1, 17-C, and 19-C for the HDD crossing under Marengo River which is located at MP 11 in the proposed pipeline alignment in White River Town, Ashland 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.

- 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 three (3) standard penetration test (SPT) borings, denoted as 15-C-1, 17-C, and 19-C to nominal depths ranging from 101 to 126 1/2 feet below grade across the site.

- 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. Soils Encountered

The general geologic profile of the soils encountered between the three (3) borings generally consisted (proceeding down from the ground surface) of 1 foot of silty sand topsoil or silty sand fill material, underlain by lacustrine (lake deposited) and glacial deposited fat clays, lean clays, silty clay, silts, poorly graded sands, poorly graded sands with silt, and silty sands to the termination depth of each boring, the encountered soils contained variable amounts of gravel. Table 1 in section B.3 contains more information on each material encountered.

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 (776 1/2 to 756)	Lean Clay (CL)	6 - 8	95 - 120	120 - 125	26 - 28	0 - 5	0.75 – 2.5	0.5 – 1.5	24 - 46
	Poorly Graded Sand (SP)	10 - 13	92 - 95	112 - 115	32 - 33	32	0	0	70 - 94
	Silt (ML)	7	95 - 105	105 - 110	26 - 27	27	0	0	28 - 30
	Poorly Graded Sand with Silt (SP-SM)	6	100 - 105	105 - 110	30 - 31	30	0	0	42 – 43
	Silty Clay (CL-ML)	4 - 6	100 - 105	105 - 110	17 - 20	0	0.25 – 1.0	0.15 - 0.55	16 - 26
Middle Soils (756 to 679 1/2)	Fat Clay (CH)	0 - 4	77 - 82 1/2	100 - 110	15 - 20	0	0.10 – 1.0	0.10 – 0.55	0 - 23
	Poorly Graded Sand with Silt (SP-SM)	27	107 - 109	120 - 122	36 - 38	35	0	0	189 - 194

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)
	Lean Clay (CL)	20	95 - 120	125 - 130	29 - 30	10	2.5 – 4.5	1.6 – 3.0	80 - 115
	Poorly Graded Sand (SP)	NA	100 - 115	117 - 118	33 - 34	33	0	0	126 - 130
	Fat Clay (CH)	0 - 1	77 - 82 1/2	100 - 105	15 - 17	0	0.1 – 0.3	0.1 – 0.3	0 - 6
Lower Soils (679 1/2 to 651)	Poorly Graded Sand with Silt (SP-SM)	20 - 60	99 - 107	118 - 127	35 - 40	34 - 36	0	0	140 - 432
	Silty Sand (SM)	16 - 57	97 - 110	118 - 130	31 - 37	20 - 25	2.0 – 2.5	2.0 - 4.1+	92 - 399

*Sustained Young's Modulus values

B.4. Groundwater

We did not observe groundwater while advancing borings 15-C-1 and 19-C. 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.

We encountered groundwater at a depth of 15 feet in boring 17-C while advancing the boring.

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 hydrometer with sieve analysis, moisture testing, soil density testing, Atterberg limits, and unconfined compressive strength of soil that was 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. Exploration Logs

C.2.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.2.b. 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.3. Material Classification and Testing

C.3.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.3.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.4. 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: **15-C-1**

LOCATION: See attached sketch

LATITUDE:	46.42973	LONGITUDE:	-90.84856
DRILLER: M. Swenson	LOGGED BY: A. Hillerud	START DATE: 05/16/20	END DATE: 05/21/20
SURFACE ELEVATION: 762.3 ft	RIG: 7505	METHOD: 4 1/4" HSA	SURFACING:	WEATHER: 50°, 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
758.3		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose (GLACIAL OUTWASH)		1-3-3 (6) 12"			
4.0		SILTY CLAY (CL-ML), with Sand, reddish brown, moist, very loose (LACUSTRINE)	5	1-2-2 (4) 14"	1.5		
755.8							
6.5		FAT CLAY (CH), reddish brown, moist, soft to very soft (LACUSTRINE)		1-1-2 (3) 15"	1.25	33	Test results are in the attached lab report
			10	1-1-1 (2) 15"	0.5		
				0-1-1 (2) WOH/6" 15"	0.5		
			15	0-1-1 (2) WOH/6" 15"	0.25	39	Test results are in the attached lab report
			20	0-0-1 (1) WOH/12" 16"	<0.25		
							Drilling method switched to mud rotary at 22 feet
			25	TW 27"		44	Thinwall Test results are in the attached lab report
			30	0-0-0 WOH/18" 17"	<0.25		

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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: **15-C-1**

LOCATION: See attached sketch

LATITUDE: 46.42973 LONGITUDE: -90.84856

DRILLER: M. Swenson | LOGGED BY: A. Hillerud | START DATE: 05/16/20 | END DATE: 05/21/20

SURFACE ELEVATION: 762.3 ft | RIG: 7505 | METHOD: 4 1/4" HSA | SURFACING: | WEATHER: 50°, 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, soft to very soft (LACUSTRINE)					
35				TW 28"			Thinwall
40				0-0-0 WOH/18" 16"	<0.25		
45				TW 28"		44	Thinwall Test results are in the attached lab report
50				0-0-0 WOH/18" 16"	<0.25		
55				TW			Thinwall
60				0-0-0 WOH/18" 16"	<0.25		

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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: **15-C-1**

LOCATION: See attached sketch

LATITUDE: 46.42973 LONGITUDE: -90.84856

DRILLER: M. Swenson | LOGGED BY: A. Hillerud | START DATE: 05/16/20 | END DATE: 05/21/20

SURFACE ELEVATION: 762.3 ft | RIG: 7505 | METHOD: 4 1/4" HSA | SURFACING: | WEATHER: 50°, 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, soft to very soft (LACUSTRINE)	65	0-0-0 WOH/18"	0.25	34	Test results are in the attached lab report
			70	TW 28"		40	Thinwall Test results are in the attached lab report
			75	0-0-1 (1) WOH/12" 16"	0.25		
681.3			80	0-0-1 (1) WOH/12" 16"	0.5		
81.0		SILTY SAND (SM), fine-grained, reddish brown, wet, dense to very dense (GLACIAL TILL)	85	TW 0"			Thinwall - no recovery
			90	20-20-27 (47) 13"			
			95	12-27-30 (57) 14"		22	Test results are in the attached lab report

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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: **15-C-1**

LOCATION: See attached sketch

LATITUDE: 46.42973 LONGITUDE: -90.84856

DRILLER: M. Swenson LOGGED BY: A. Hillerud START DATE: 05/16/20 END DATE: 05/21/20

SURFACE ELEVATION: 762.3 ft RIG: 7505 METHOD: 4 1/4" HSA SURFACING: WEATHER: 50°, 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
664.3		SILTY SAND (SM), fine-grained, reddish brown, wet, dense to very dense (GLACIAL TILL)					
98.0		SILTY SAND (SM), fine to medium-grained, trace Gravel, reddish brown, wet, dense (GLACIAL TILL)	100	11-21-21 (42) 16"			
661.3							Water not observed while drilling.
101.0		END OF BORING Boring then backfilled with cement/bentonite grout					
			105				
			110				
			115				
			120				
			125				

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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: **17-C**

LOCATION: See attached sketch

LATITUDE:	46.42812	LONGITUDE:	-90.84860		
DRILLER:	M. Takada	LOGGED BY:	P. Moe	START DATE:	05/11/20
END DATE:	05/11/20				
SURFACE ELEVATION:	771.2 ft	RIG:	Subcontractor	METHOD:	4 1/4" HSA
SURFACING:		WEATHER:	cloudy		

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
770.2		SILTY SAND (SM), fine to medium-grained, with organic, roots, brownish black, dry (TOPSOIL)					
1.0		POORLY GRADED SAND (SP), fine to medium-grained, brown, dry to moist, medium dense (GLACIAL OUTWASH)		4-6-7 (13) 14"			
			5	4-5-5 (10) 22"		21	Test results are in the attached lab report
765.2							
6.0		SILT (ML), fine-grained, brown, moist, medium (LACUSTRINE)		3-4-3 (7) 12"			
762.7							
8.5		SILTY CLAY (CL-ML), brown, moist, medium (LACUSTRINE)	10	2-3-3 (6) 22"			
760.2							
11.0		FAT CLAY (CH), reddish brown, moist to wet, very soft to soft (LACUSTRINE)		2-2-2 (4) 24"			
	▽		15	TW		41	Thinwall Test results are in the attached lab report Drilling method switched to mud rotary at 15 feet
			20	WOH/24" 24"			
			25	WOH/24" 24"			
			30	WOH/24" 24"			

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

BORING: **17-C**

LOCATION: See attached sketch

LATITUDE: 46.42812	LONGITUDE: -90.84860		
DRILLER: M. Takada	LOGGED BY: P. Moe	START DATE: 05/11/20	END DATE: 05/11/20
SURFACE ELEVATION: 771.2 ft	RIG: Subcontractor	METHOD: 4 1/4" HSA	SURFACING:	WEATHER: cloudy

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 to wet, very soft to soft (LACUSTRINE)					
736.2							
35.0		FAT CLAY (CH), reddish brown, moist, very soft to soft (LACUSTRINE)	35	WOH/24" 24"		40	Test results are in the attached lab report
			40	WOH/24" 24"			
			45	WOH/24" 24"			
			50	WOH/24" 24"			
			55	WOH/24" 24"			
			60	WOH/24" 24"			
707.2							
64.0		Continued on next page					

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

BORING: **17-C**
LOCATION: See attached sketch
LATITUDE: 46.42812 LONGITUDE: -90.84860
DRILLER: M. Takada LOGGED BY: P. Moe START DATE: 05/11/20 END DATE: 05/11/20
SURFACE ELEVATION: 771.2 ft RIG: Subcontractor METHOD: 4 1/4" HSA SURFACING: WEATHER: cloudy

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, very soft (LACUSTRINE)	65	WOH/24" 24"			
			70	0-0-1 (1) WOH/12" 24"		36	Test results are in the attached lab report
			75	WOH/24" 24"			
			80	0-0-1 (1) WOH/12" 20"			
			85	WOH/24" 24"			
684.2 87.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, moist, medium dense to very dense (GLACIAL OUTWASH)	90	10-9-11 (20) 8"		17	Test results are in the attached lab report
			95	12-24-26 (50) 6"			

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

BORING: **17-C**

LOCATION: See attached sketch

LATITUDE: 46.42812 LONGITUDE: -90.84860

DRILLER: M. Takada | LOGGED BY: P. Moe | START DATE: 05/11/20 | END DATE: 05/11/20

SURFACE ELEVATION: 771.2 ft | RIG: Subcontractor | METHOD: 4 1/4" HSA | SURFACING: | WEATHER: cloudy

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, moist, medium dense to very dense (GLACIAL OUTWASH)					
100				19-24-26 (50) 10"			
105				11-19-26 (45) 7"		20	Test results are in the attached lab report
110				15-26-30 (56) 14"			
115				20-21-21 (42) 14"			
				24-26-27 (53) 14"			
653.2							
118.0		END OF BORING					Water observed at 15.0 feet while drilling.
120		Boring then backfilled with cement/bentonite grout					
125							

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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: **19-C**

LOCATION: See attached sketch

LATITUDE: 46.42615 LONGITUDE: -90.84706

DRILLER: EPC LOGGED BY: P. Moe START DATE: 05/08/20 END DATE: 05/13/20

SURFACE ELEVATION: 777.6 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
776.6		FILL: SILTY SAND (SM), fine to medium-grained, brown, moist		3-2-4-4 (6) 12"			
1.0		LEAN CLAY with SAND (CL), fine to medium-grained, brown, moist, medium (LACUSTRINE)		2-3-4-7 (7) 12"			
			5	2-4-4-7 (8) 18"	3		
770.6							
7.0		LEAN CLAY (CL), brown, moist, medium (LACUSTRINE)		2-3-5-5 (8) 24"	0.25		
			10	2-3-3-3 (6) 24"	1.25		
765.6							
12.0		FAT CLAY (CH), reddish brown, moist, very soft to soft (LACUSTRINE)		TW 24"		43	Thinwall Test results are in the attached lab report
			15	1-2-2-3 (4) 24"	1.3		
			20	1-1-1-2 (2) 24"	0.5		
			25	1-0-1-0 (1) WOH/12" 24"	0.4		
			30	0-0-1-1 (1) WOH/12" 24"	0.25		

Continued on next page

BRAUN INTERTEC
The Science You Build On

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: **19-C**
LOCATION: See attached sketch
LATITUDE: 46.42615 LONGITUDE: -90.84706
DRILLER: EPC LOGGED BY: P. Moe START DATE: 05/08/20 END DATE: 05/13/20
SURFACE ELEVATION: 777.6 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, very soft to soft (LACUSTRINE)					
35				0-0-1-1 (1) WOH/12" 24"	0.25	42	Test results are in the attached lab report
40				0-0-1-1 (1) WOH/12" 24"	<0.25		
45				0-0-0-0 WOH/24" 24"	0.25		
50				0-0-0-1 WOH/18" 24"	0.25		
55				0-0-0-0 WOH/24" 24"	0.25		
60				0-0-0-1 WOH/18" 24"	0.25	44	Test results are in the attached lab report

Continued on next page

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: **19-C**
LOCATION: See attached sketch
LATITUDE: 46.42615 LONGITUDE: -90.84706
DRILLER: EPC LOGGED BY: P. Moe START DATE: 05/08/20 END DATE: 05/13/20
SURFACE ELEVATION: 777.6 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, very soft to soft (LACUSTRINE)	65	0-0-0-1 WOH/18" 24"	0.5		
707.6			70	10-16-11-12 (27) 16"		12	Test results are in the attached lab report
70.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, brown, moist, medium dense (GLACIAL OUTWASH)					
704.6							
73.0		LEAN CLAY with SAND (CL), fine to medium-grained, brown, moist, very stiff (GLACIAL TILL) *Boulder at 73.5 feet*	75	30-12-8 (20) 4"	0.25		
700.6							
77.0		POORLY GRADED SAND with GRAVEL (SP), fine to coarse-grained, brown, moist (GLACIAL TILL)	80				Lost 75 gallons of mud due to gravel zone. Cased off hole to 85 feet to prevent loss of mud. Unable to take thin tubes past 15 feet due to setting casing.
694.6							
83.0		FAT CLAY (CH), reddish brown, moist, very soft (LACUSTRINE)	85	0-0-1 (1) WOH/12" 18"			
			90	0-0-0-0 WOH/24" 24"	<0.25	63	Test results are in the attached lab report
			95	0-0-0-1 WOH/18" 24"	0.25		

Continued on next page

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: **19-C**

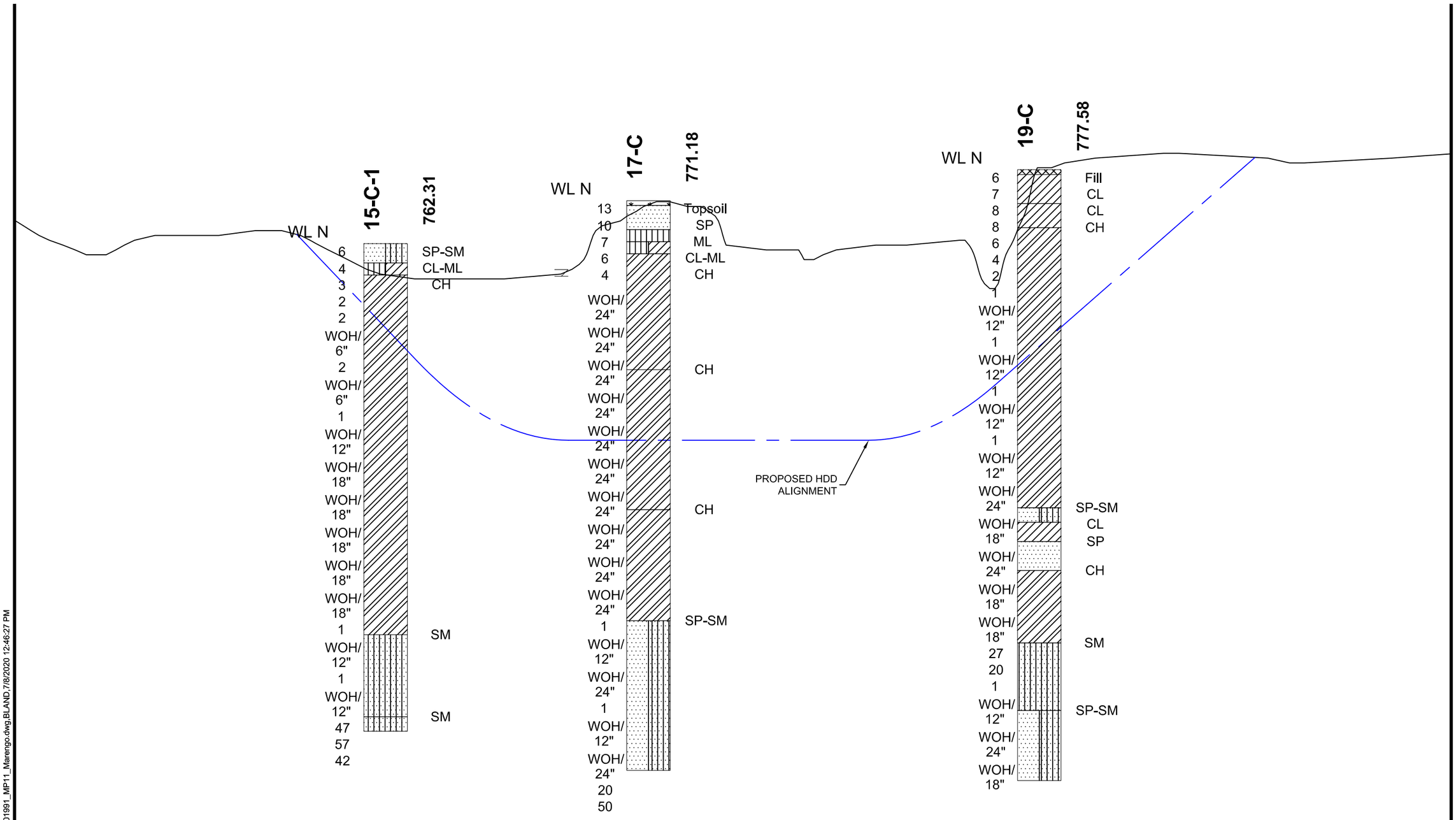
LOCATION: See attached sketch

LATITUDE: 46.42615 LONGITUDE: -90.84706

DRILLER: EPC LOGGED BY: P. Moe START DATE: 05/08/20 END DATE: 05/13/20

SURFACE ELEVATION: 777.6 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
679.6		FAT CLAY (CH), reddish brown, moist, very soft (LACUSTRINE)					
98.0		SILTY SAND (SM), fine to medium-grained, brown, moist, medium dense to dense (GLACIAL TILL)	100	8-8-8 (16) 6"			
			105	8-11-10 (21) 18"			
			110	9-21-14 (35) 0"			No recovery
665.6							
112.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, brown, moist, medium dense to very dense (GLACIAL OUTWASH)	115	11-11-12 (23) 18"			
		Cobbles at 117 feet					
			120	12-17-23 (40) 18"		21	Test results are in the attached lab report
			125	23-24-36 (60) 18"			
651.1							
126.5		END OF BORING					Water not observed while drilling.
		Boring then backfilled with cement/bentonite grout					



100' 0 200'

HORIZONTAL SCALE: 1" = 200'

10' 0 20'

VERTICAL SCALE: 1" = 20'

VERTICAL EXAGGERATION: 10x

F:\2020\B2001991\CAD\MP 11 Marengo River\B2001991_MP11_Marengo.dwg,BLAND,7/8/2020 12:46:27 PM

BRAUN INTERTEC
The Science You Build On.
11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Drawing Information

Project No: B2001991

Drawing No: B2001991_MP11_MARENGO

Drawn By:	BJB
Date Drawn:	7/8/20
Checked By:	DM
Last Modified:	7/8/20

Project Information

Enbridge Line 5 Re-route

MP 11 - Marengo River

BRAUN INTERTEC
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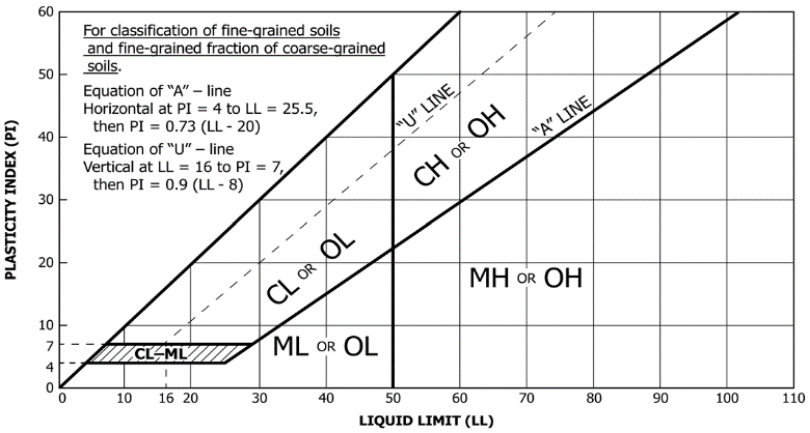
Descriptive Terminology of Soil

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

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-C-1	104	10.0	14.5		36	15	21					
1-C-1	109	30.0	12.0		36	15	21					
1-C-1	112	45.0	18.4		34	16	18					
2WB	117	7.5	14.6		30	14	16					
2WB	121	20.0	23.1		48	18	30					
2WB	TW	30.0	30.7		59	19	40		92.7			
2WB	125	40.0	27.5		53	21	32					
10WB	8	20.0	15.1				NP					
15-C-1	4	7.0	32.8		50	21	29					
15-C-1	7	14.5	39.2		61	20	41					
15-C-1	TW	25.0	44.3		56	18	38		77.0			
15-C-1	TW	45.0	43.9		58	18	40		77.9			
15-C-1	17	65.0	33.6		51	19	32					
15-C-1	TW	70.0	39.6		55	17	38		82.4			
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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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

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

BRAUN INTERTEC
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Geotechnical Testing

Various ASTM

7/6/2020

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: 320137
Sampled By: Drill Crew
Sample Date: 06/26/2020
Received Date: 07/06/2020
Lab: 11001 Hampshire Ave S, Bloomington, MN
Completed Date: 07/06/2020
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
17-C		15.0	41.2		68	21	47					
17-C		35.0	39.8		60	21	39					
17-C		70.0	36.2		56	19	37					
19-C		12.5	43.2		74	21	53					
19-C		35.0	41.9		68	20	48					
19-C		60.0	43.9		68	20	48					
19-C		90.0	63.0		87	23	64					

General

BRAUN INTERTEC
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Moisture Content Of Soil

ASTM D2216

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: 312866
Alternate ID: 15-C-1 23 95'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 15-C-1 Sample 23 95'
Sample Date: 06/03/2020
Received Date: 06/05/2020
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 (%)
15-C-1	23	95.0	21.6

General

Results: The test is for informational purposes.

BRAUN INTERTEC
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Moisture Content Of Soil

ASTM D2216

6/26/2020

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: 318168
Alternate ID: 17-C Sample 74 4.5'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 17-C 74 4.5'
Sample Date: 06/25/2020
Received Date: 06/25/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/25/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
17-C	74	5.0	21.4

General

Results: The test is for informational purposes.

BRAUN INTERTEC
The Science You Build On.

Moisture Content Of Soil

ASTM D2216

6/26/2020

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: 318175
Alternate ID: 17-C Sample 93 90'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 17-C 93 90'
Sample Date: 06/25/2020
Received Date: 06/25/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/25/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
17-C	93	90.0	16.9

General

Results: The test is for informational purposes.

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

Moisture Content Of Soil

ASTM D2216

6/26/2020

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: 318177
Alternate ID: 17-C Sample 96 105'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 17-C 96 105'
Sample Date: 06/25/2020
Received Date: 06/25/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/25/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
17-C	96	105.0	20.2

General

Results: The test is for informational purposes.

BRAUN INTERTEC
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Moisture Content Of Soil

ASTM D2216

6/26/2020

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: 318207
Alternate ID: 19-C Sample 19 70'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 19-C 19 70'
Sample Date: 05/11/2020
Received Date: 06/25/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/25/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
19-C	19	70.0	11.5

General

Results: The test is for informational purposes.

BRAUN INTERTEC
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Moisture Content Of Soil

ASTM D2216

6/25/2020

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: 318210
Alternate ID: 19-C Sample 28 120'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 19-C 28 120'
Sample Date: 05/11/2020
Received Date: 06/25/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/25/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
19-C	28	120.0	20.7

General

Results: The test is for informational purposes.

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

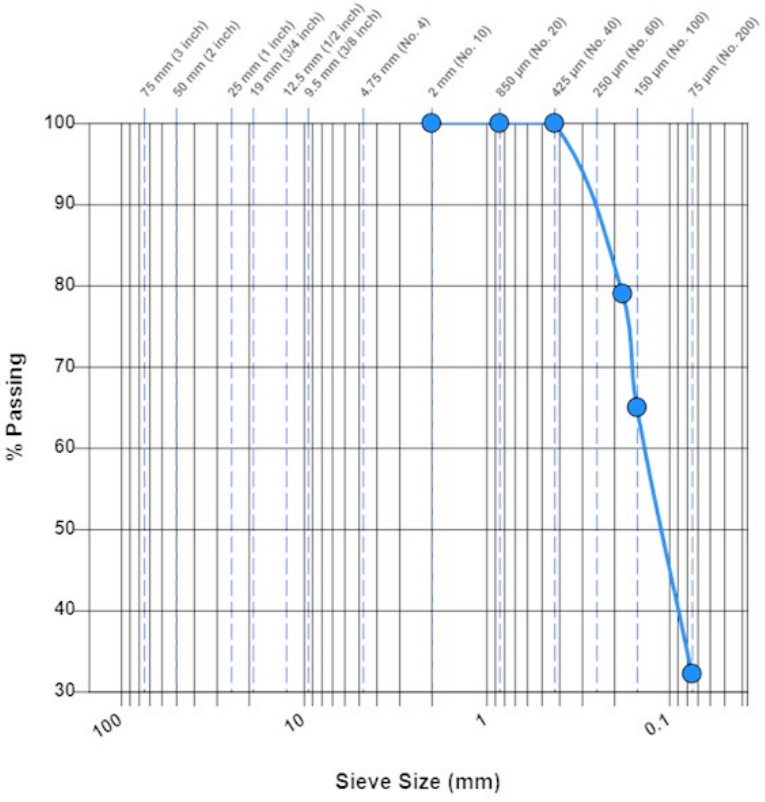
Sample Information

Sample Number:	312866	**Alternate ID:**	15-C-1 23 95'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	95
Boring Number:	15-C-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 15-C-1 Sample 23 95'		
Sample Date:	06/03/2020		
Received Date:	06/05/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/05/2020		

Laboratory Data

Sieve Size	% Passing	Specification
2 mm (No. 10)	100	
850 µm (No. 20)	100	
425 µm (No. 40)	100	
180 µm (No. 80)	79	
150 µm (No. 100)	65	
75 µm (No. 200)	32.2	

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 205.88 grams

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

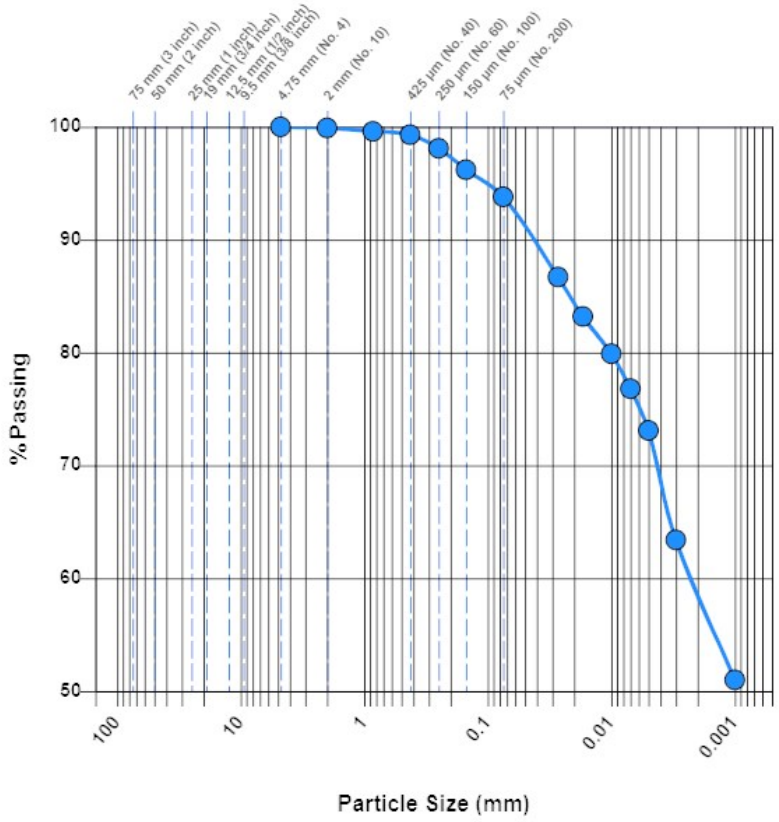
Sample Information

Sample Number:	318973	**Depth (ft):**	45
Boring Number:	15-C-1	**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)	99.9	-
850 µm (No. 20)	99.6	-
425 µm (No. 40)	99.3	-
250 µm (No. 60)	98.1	-
150 µm (No. 100)	96.2	-
75 µm (No. 200)	93.8	-
26.7 (µm)	86.7	-
17.2 (µm)	83.2	-
10.1 (µm)	79.9	-
7.2 (µm)	76.8	-
5.2 (µm)	73.1	-
2.6 (µm)	63.4	-
1.2 (µm)	51.0	-



Soil Classification: CH Fat clay

Gravel (%):	0.0	**Sand (%):**	6.2	**Silt (%):**	20.7	**Clay (%):**	73.1
D_{60} (µm):	2.5						

General

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Sieve Analysis Of Soil

ASTM D6913

6/26/2020

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:	318168	**Alternate ID:**	17-C Sample 74 4.5'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	4.5
Boring Number:	17-C	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 17-C 74 4.5'		
Sample Date:	06/25/2020		
Received Date:	06/25/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/25/2020	**Tested By:**	Nelson, Brennan

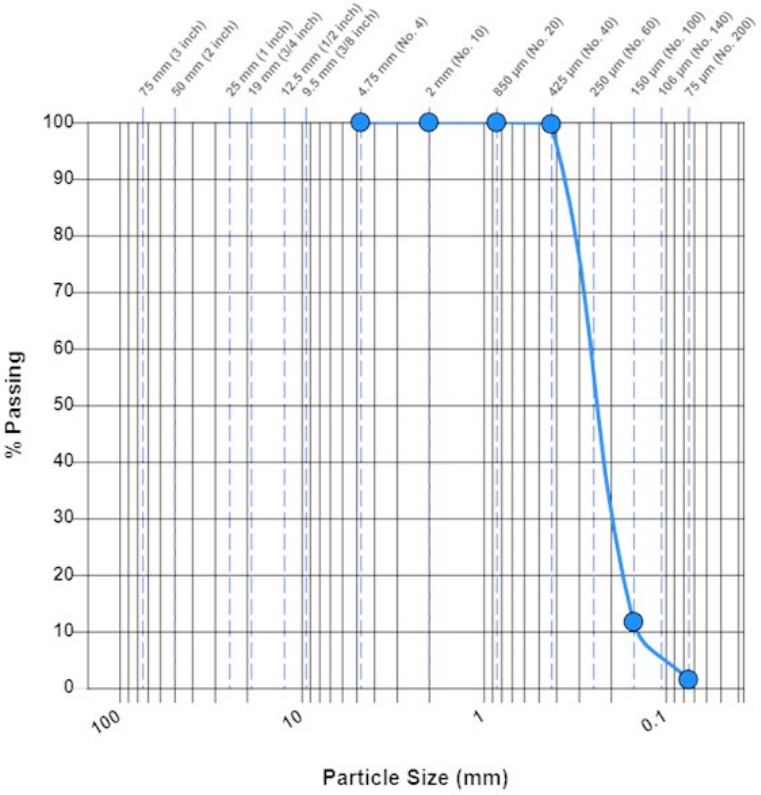
Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
850 µm (No. 20)	100.0	
425 µm (No. 40)	99.7	
150 µm (No. 100)	11.7	
75 µm (No. 200)	1.5	

Sand (%)	Silt & Clay (%)
98.5	1.5

D10	D30	D60
0.101	0.171	0.205

C_U	C_C
2.03	1.41



Classification: SP Poorly graded 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 the sample 214.0 grams

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Sieve Analysis Of Soil

ASTM D6913

6/26/2020

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Houston, TX 77056

Project:

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

Sample Information

Sample Number:	318175	**Alternate ID:**	17-C Sample 93 90'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	90
Boring Number:	17-C	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 17-C 93 90'		
Sample Date:	06/25/2020		
Received Date:	06/25/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/25/2020	**Tested By:**	Nelson, Brennan

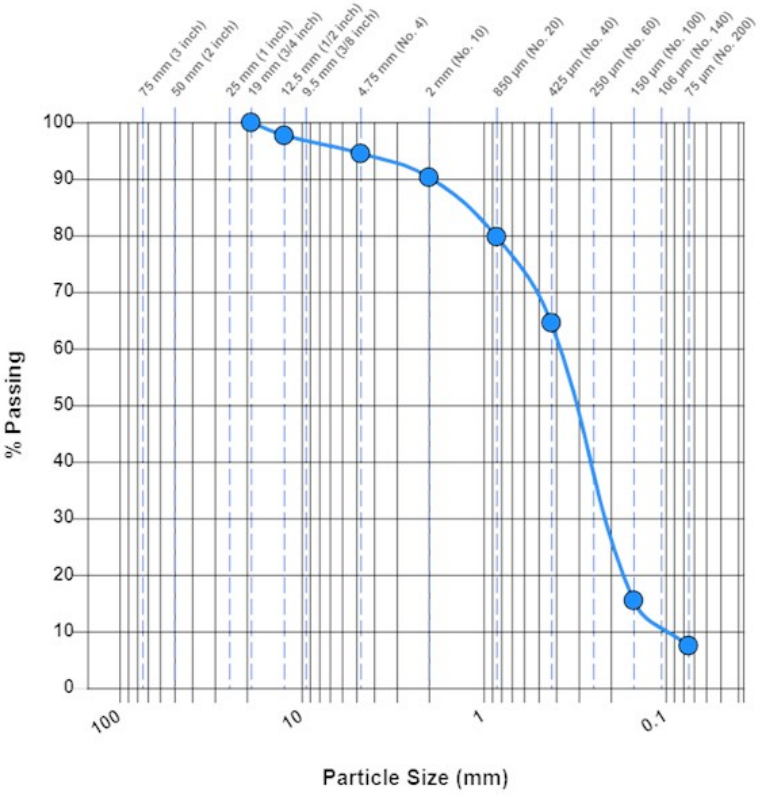
Laboratory Data

Sieve Size	Passing (%)	Specification
19 mm (3/4 inch)	100.0	
12.5 mm (1/2 inch)	97.7	
4.75 mm (No. 4)	94.5	
2 mm (No. 10)	90.3	
850 µm (No. 20)	79.8	
425 µm (No. 40)	64.6	
150 µm (No. 100)	15.5	
75 µm (No. 200)	7.5	

Gravel (%)	Sand (%)	Silt & Clay (%)
5.5	87.0	7.5

D10	D30	D60
0.085	0.180	0.241

C_U	C_C
2.84	1.58



Classification: SP-SM Poorly graded sand with silt

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 239.3 grams

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Sieve Analysis Of Soil

ASTM D6913

6/26/2020

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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

Sample Information

Sample Number:	318177	**Alternate ID:**	17-C Sample 96 105'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	105
Boring Number:	17-C	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 17-C 96 105'		
Sample Date:	06/25/2020		
Received Date:	06/25/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/25/2020	**Tested By:**	Patterson, Gregg

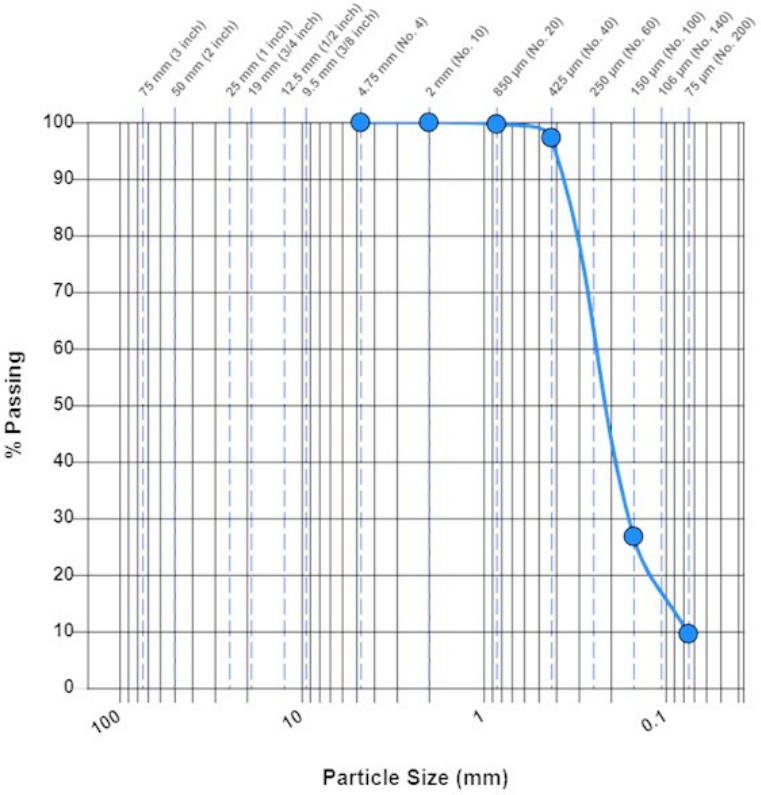
Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
850 µm (No. 20)	99.7	
425 µm (No. 40)	97.3	
150 µm (No. 100)	26.8	
75 µm (No. 200)	9.6	

Sand (%)	Silt & Clay (%)
90.4	9.6

D10	D30	D60
0.076	0.155	0.197

C_U	C_C
2.59	1.60



Classification: SP-SM Poorly graded sand with silt

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 the sample 187.8 grams

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Sieve Analysis Of Soil

ASTM D6913

6/26/2020

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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

Sample Information

Sample Number:	318207	**Alternate ID:**	19-C Sample 19 70'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	70
Boring Number:	19-C	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 19-C 19 70'		
Sample Date:	05/11/2020		
Received Date:	06/25/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/25/2020	**Tested By:**	Patterson, Gregg

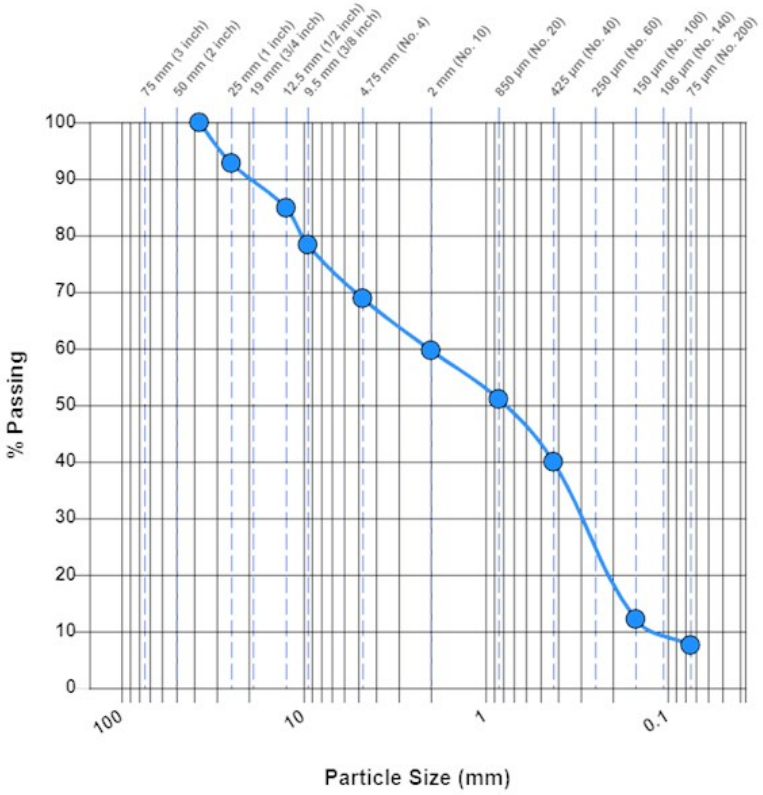
Laboratory Data

Sieve Size	Passing (%)	Specification
37.5 mm (1.5 inch)	100.0	
25 mm (1 inch)	92.8	
12.5 mm (1/2 inch)	84.9	
9.5 mm (3/8 inch)	78.4	
4.75 mm (No. 4)	68.9	
2 mm (No. 10)	59.7	
850 µm (No. 20)	51.1	
425 µm (No. 40)	40.0	
150 µm (No. 100)	12.2	
75 µm (No. 200)	7.6	

Gravel (%)	Sand (%)	Silt & Clay (%)
31.1	61.3	7.6

D10	D30	D60
0.114	0.214	2.090

C_U	C_C
18.33	0.19



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 571.6 grams

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Sieve Analysis Of Soil

ASTM D6913

6/25/2020

4511 West First Street
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Duluth, MN 55807
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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

Sample Information

Sample Number:	318210	**Alternate ID:**	19-C Sample 28 120'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	70
Boring Number:	19-C	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 19-C 28 120'		
Sample Date:	05/11/2020		
Received Date:	06/25/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/25/2020	**Tested By:**	Patterson, Gregg

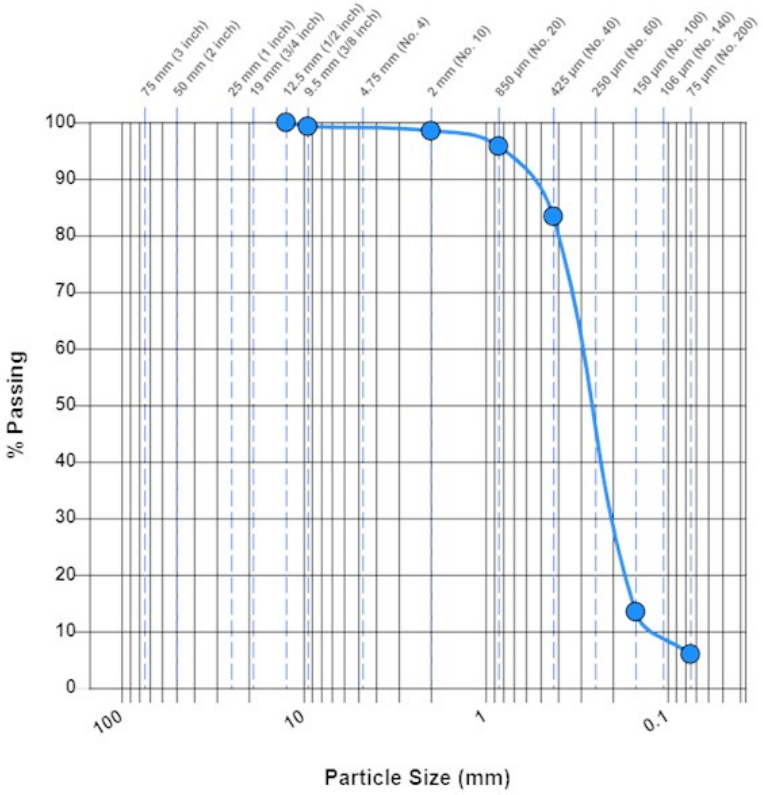
Laboratory Data

Sieve Size	Passing (%)	Specification
12.5 mm (1/2 inch)	100.0	
9.5 mm (3/8 inch)	99.3	
2 mm (No. 10)	98.5	
850 µm (No. 20)	95.8	
425 µm (No. 40)	83.4	
150 µm (No. 100)	13.5	
75 µm (No. 200)	6.0	

Gravel (%)	Sand (%)	Silt & Clay (%)
0.6	93.3	6.1

D10	D30	D60
0.091	0.173	0.216

C_U	C_C
2.37	1.52



Classification: SP-SM Poorly graded sand with silt

Specimen Obtained: Oven Dry

Test Method: Method A (Composite Sieving)

Dispersion Apparatus: Shaking

General

Results: The test is for informational purposes.

Remarks: Total weight of the dry sample 196.5 grams

BRAUN INTERTEC
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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

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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

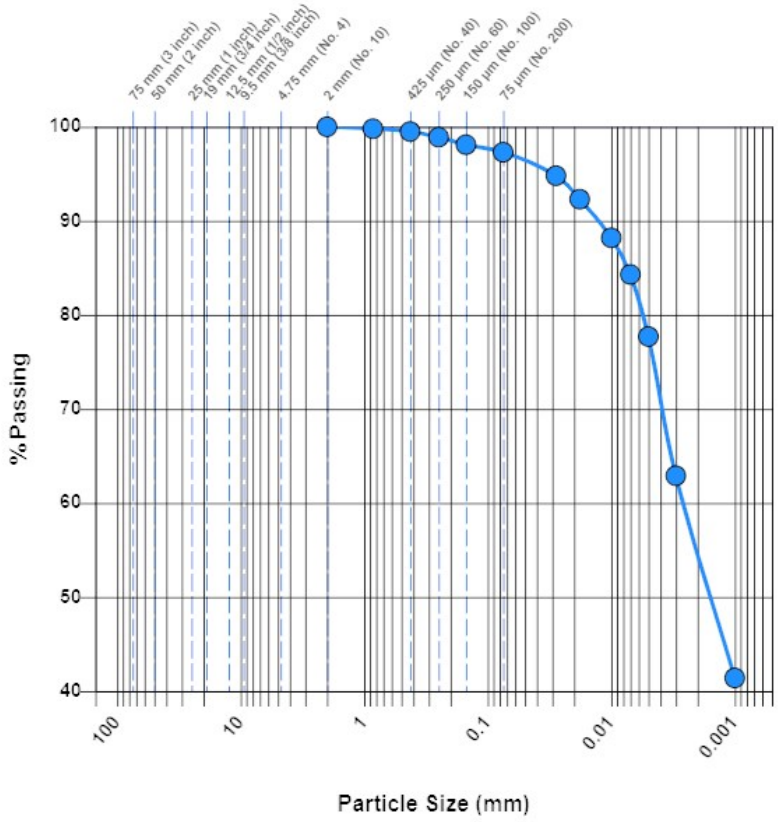
Sample Information

Sample Number:	318970	**Depth (ft):**	7
Boring Number:	15-C-1	**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
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.8	-
425 µm (No. 40)	99.5	-
250 µm (No. 60)	98.9	-
150 µm (No. 100)	98.1	-
75 µm (No. 200)	97.3	-
27.7 (µm)	94.8	-
17.7 (µm)	92.3	-
10.4 (µm)	88.2	-
7.4 (µm)	84.3	-
5.4 (µm)	77.7	-
2.7 (µm)	62.9	-
1.3 (µm)	41.4	-



Soil Classification: CH Fat clay

Gravel (%):	0	**Sand (%):**	2.7	**Silt (%):**	19.6	**Clay (%):**	77.7
D_{60} (µm):	2.7						

General

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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

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Houston, TX 77056

Project:

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

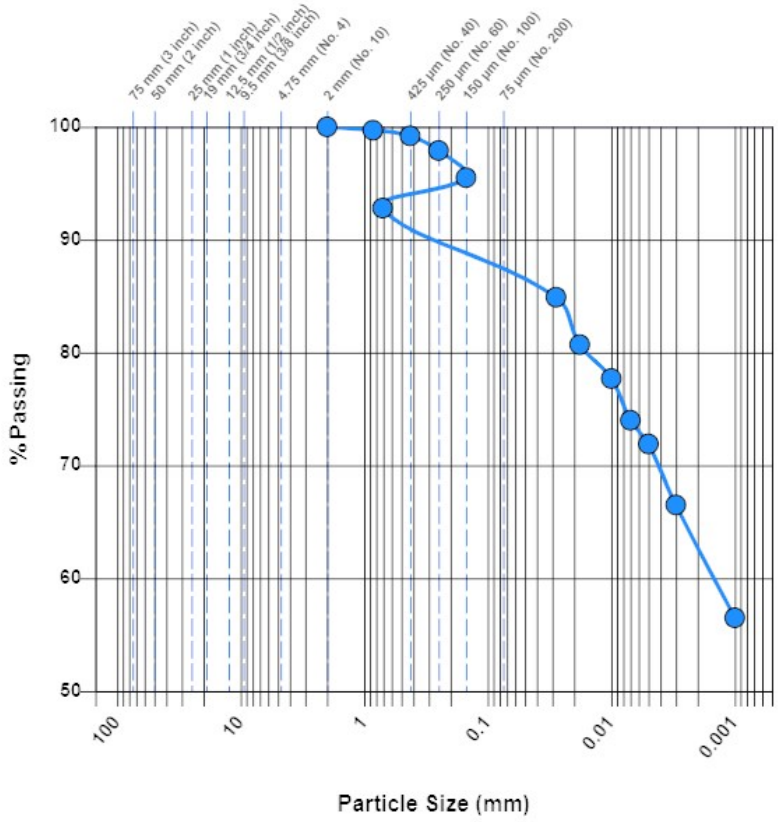
Sample Information

Sample Number:	318971	**Depth (ft):**	14.5
Boring Number:	15-C-1	**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
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.7	-
425 µm (No. 40)	99.2	-
250 µm (No. 60)	97.9	-
150 µm (No. 100)	95.5	-
75 µm (No. 200)	92.8	-
27.6 (µm)	84.9	-
17.8 (µm)	80.7	-
10.4 (µm)	77.7	-
7.4 (µm)	74.0	-
5.3 (µm)	71.9	-
2.6 (µm)	66.5	-
1.2 (µm)	56.5	-



Soil Classification: CH Fat clay

Gravel (%):	0	**Sand (%):**	0.0	**Silt (%):**	-71.9	**Clay (%):**	71.9
D_{60} (µm):	1.7						

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

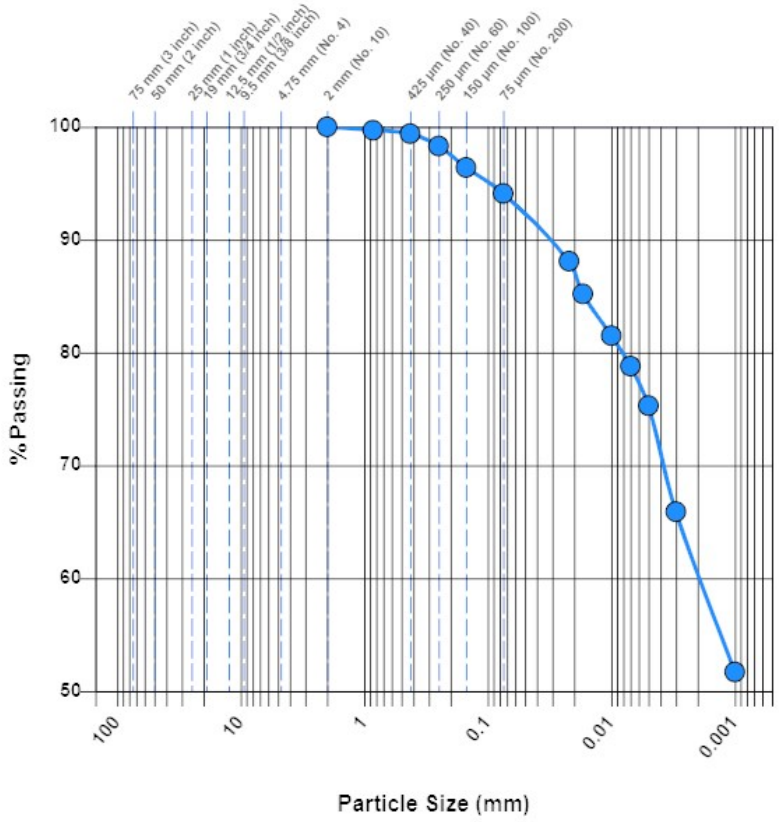
Sample Information

Sample Number:	318972	**Depth (ft):**	25
Boring Number:	15-C-1	**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
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.7	-
425 µm (No. 40)	99.4	-
250 µm (No. 60)	98.3	-
150 µm (No. 100)	96.4	-
75 µm (No. 200)	94.1	-
21.7 (µm)	88.1	-
17.0 (µm)	85.2	-
10.0 (µm)	81.5	-
7.2 (µm)	78.8	-
5.1 (µm)	75.3	-
2.6 (µm)	65.9	-
1.2 (µm)	51.7	-



Soil Classification: CH Fat clay

Gravel (%):	0	**Sand (%):**	5.9	**Silt (%):**	18.8	**Clay (%):**	75.3
D_{60} (µm):	2.2						

General

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Hydrometer And Sieve Analysis

ASTM D422

7/1/2020

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Houston, TX 77056

Project:

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

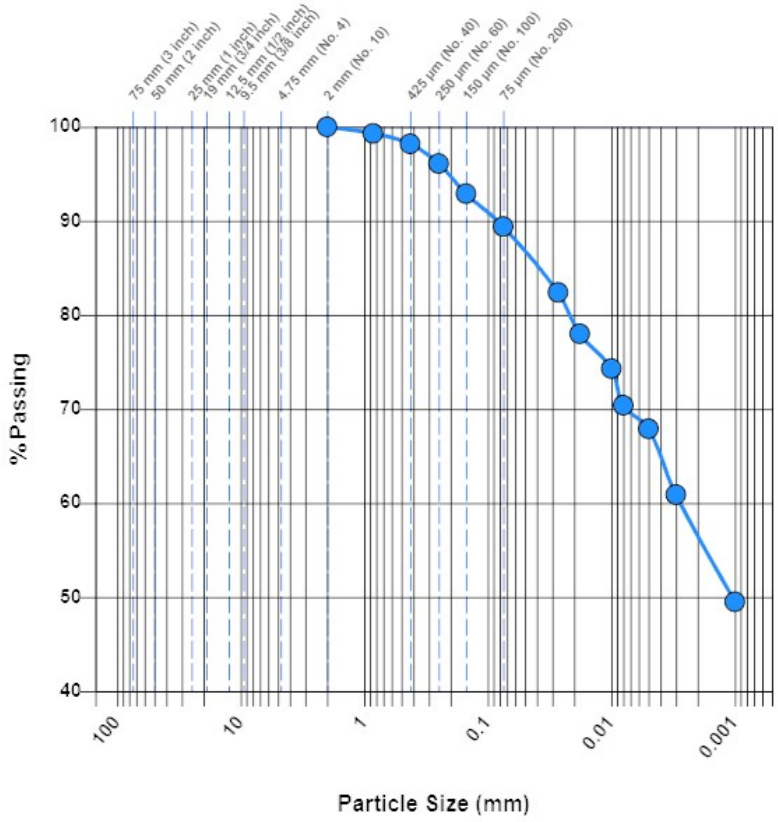
Sample Information

Sample Number:	318974	**Depth (ft):**	65
Boring Number:	15-C-1	**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
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.3	-
425 µm (No. 40)	98.2	-
250 µm (No. 60)	96.1	-
150 µm (No. 100)	92.9	-
75 µm (No. 200)	89.4	-
27.4 (µm)	82.4	-
17.7 (µm)	78.0	-
10.4 (µm)	74.3	-
7.5 (µm)	70.4	-
5.3 (µm)	67.9	-
2.7 (µm)	60.9	-
1.2 (µm)	49.5	-



Soil Classification: CH Fat clay

Gravel (%):	0	**Sand (%):**	10.6	**Silt (%):**	21.5	**Clay (%):**	67.9
D_{60} (µm):	2.8						

General

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Hydrometer And Sieve Analysis

ASTM D422

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Houston, TX 77056

Project:

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

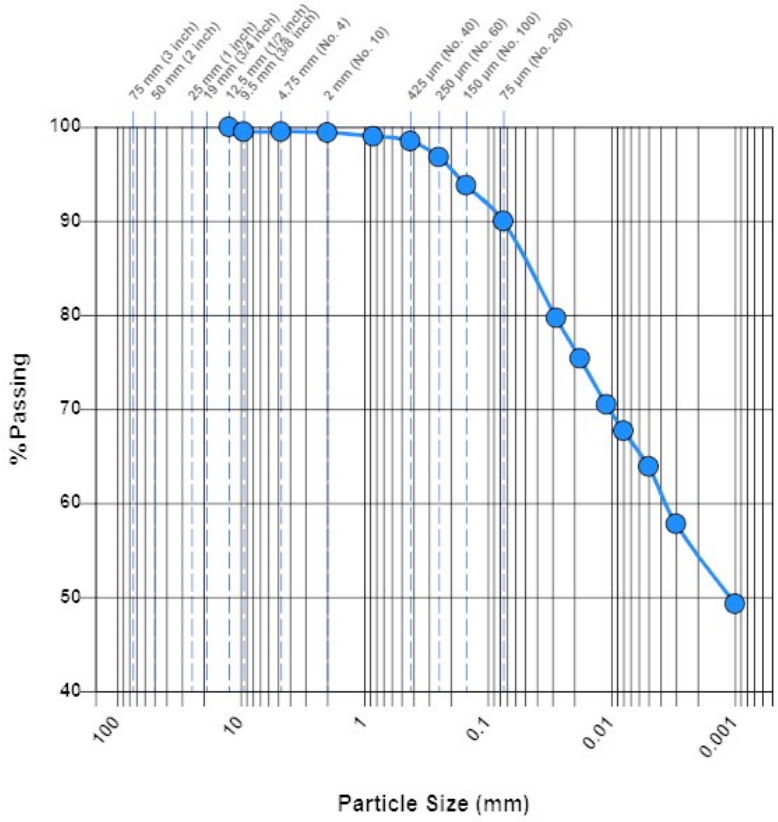
Sample Information

Sample Number:	318975	**Depth (ft):**	70
Boring Number:	15-C-1	**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)	99.5	-
4.75 mm (No. 4)	99.5	-
2 mm (No. 10)	99.4	-
850 µm (No. 20)	99.0	-
425 µm (No. 40)	98.5	-
250 µm (No. 60)	96.8	-
150 µm (No. 100)	93.8	-
75 µm (No. 200)	90.0	-
27.7 (µm)	79.7	-
17.9 (µm)	75.4	-
10.5 (µm)	70.5	-
7.5 (µm)	67.7	-
5.4 (µm)	63.9	-
2.7 (µm)	57.8	-
1.2 (µm)	49.3	-



Soil Classification: CH Fat clay

Gravel (%):	0.5	**Sand (%):**	9.5	**Silt (%):**	26.1	**Clay (%):**	63.9
D_{60} (µm):	3.7						

General

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Hydrometer And Sieve Analysis

ASTM D422

7/6/2020

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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

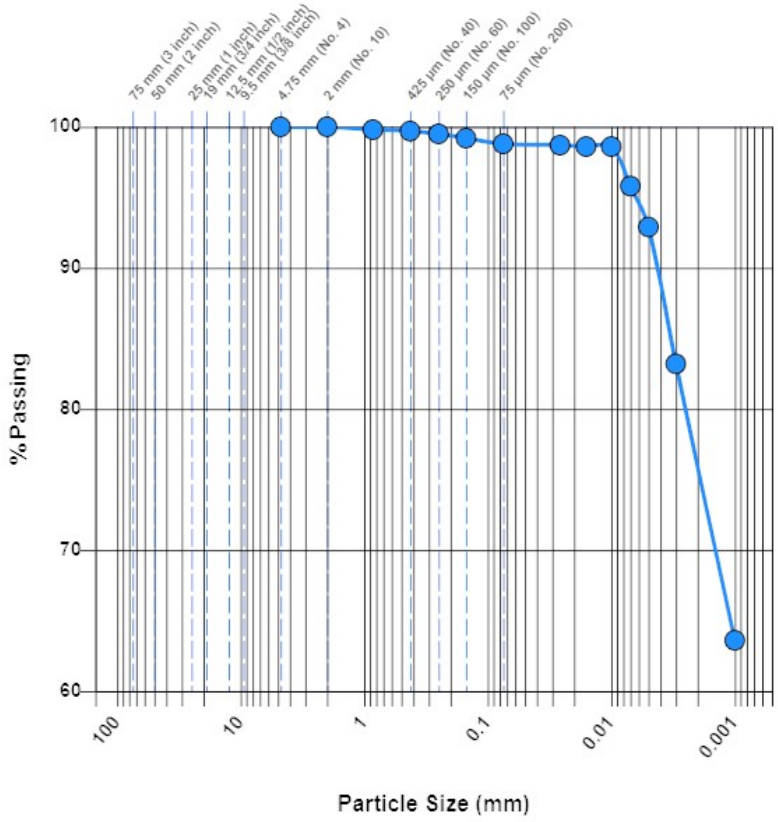
Sample Information

Sample Number:	320138	**Depth (ft):**	15
Boring Number:	17-C	**Sampled By:**	Drill Crew
Sample Date:	06/26/2020		
Received Date:	07/06/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/06/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.8	-
425 µm (No. 40)	99.7	-
250 µm (No. 60)	99.5	-
150 µm (No. 100)	99.2	-
75 µm (No. 200)	98.8	-
26.0 (µm)	98.7	-
16.4 (µm)	98.6	-
9.5 (µm)	98.6	-
6.8 (µm)	95.8	-
4.9 (µm)	92.9	-
2.5 (µm)	83.2	-
1.1 (µm)	63.6	-



Soil Classification: CH Fat clay

Gravel (%): 0.0 **Sand (%):** 1.2 **Silt (%):** 5.9 **Clay (%):** 92.9

General

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Hydrometer And Sieve Analysis

ASTM D422

7/6/2020

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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

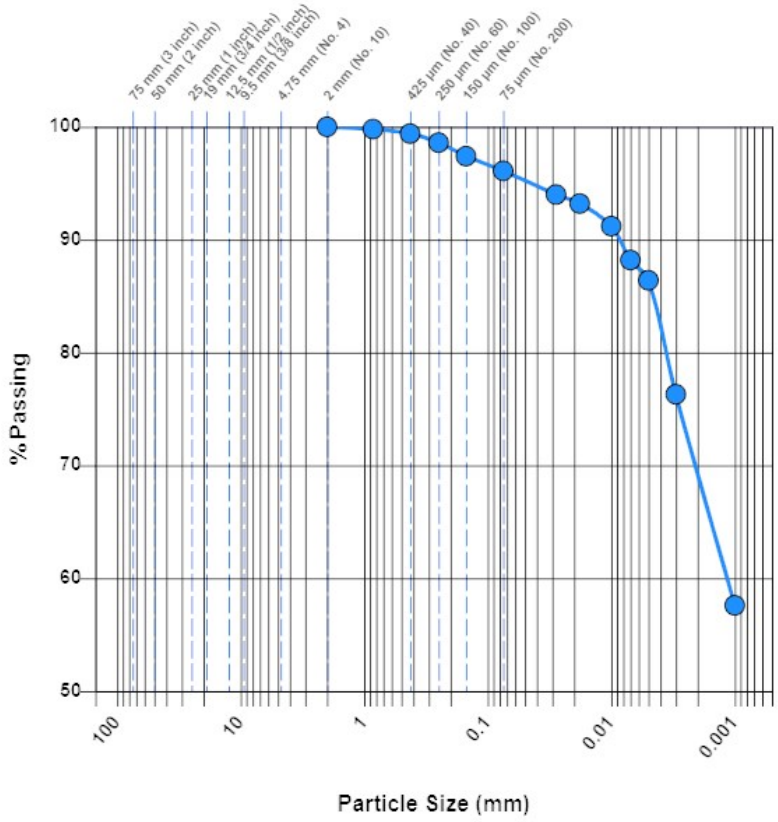
Sample Information

Sample Number:	320139	**Depth (ft):**	35
Boring Number:	17-C	**Sampled By:**	Drill Crew
Sample Date:	06/26/2020		
Received Date:	07/06/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/06/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.8	-
425 µm (No. 40)	99.4	-
250 µm (No. 60)	98.6	-
150 µm (No. 100)	97.4	-
75 µm (No. 200)	96.1	-
27.9 (µm)	94.0	-
17.7 (µm)	93.2	-
10.3 (µm)	91.2	-
7.3 (µm)	88.2	-
5.2 (µm)	86.4	-
2.6 (µm)	76.3	-
1.2 (µm)	57.6	-



Soil Classification: CH Fat clay

Gravel (%):	0	**Sand (%):**	3.9	**Silt (%):**	9.7	**Clay (%):**	86.4
D_{60} (µm):	1.3						

General

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

Hydrometer And Sieve Analysis

ASTM D422

7/6/2020

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

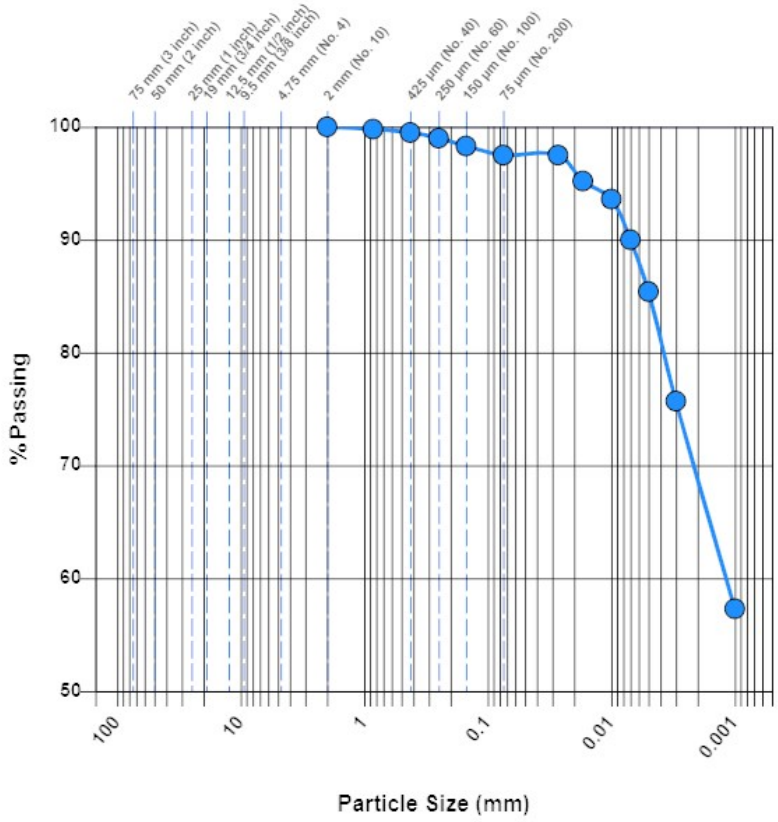
Sample Information

Sample Number:	320140	**Depth (ft):**	70
Boring Number:	17-C	**Sampled By:**	Drill Crew
Sample Date:	06/26/2020		
Received Date:	07/06/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/06/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.8	-
425 µm (No. 40)	99.5	-
250 µm (No. 60)	99.0	-
150 µm (No. 100)	98.3	-
75 µm (No. 200)	97.5	-
26.6 (µm)	97.5	-
17.0 (µm)	95.2	-
9.9 (µm)	93.6	-
7.1 (µm)	90.0	-
5.1 (µm)	85.4	-
2.6 (µm)	75.7	-
1.2 (µm)	57.3	-



Soil Classification: CH Fat clay

Gravel (%):	0	**Sand (%):**	2.5	**Silt (%):**	12.1	**Clay (%):**	85.4
D_{60} (µm):	1.3						

General

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Phone: 952-995-2000

Hydrometer And Sieve Analysis

ASTM D422

7/6/2020

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

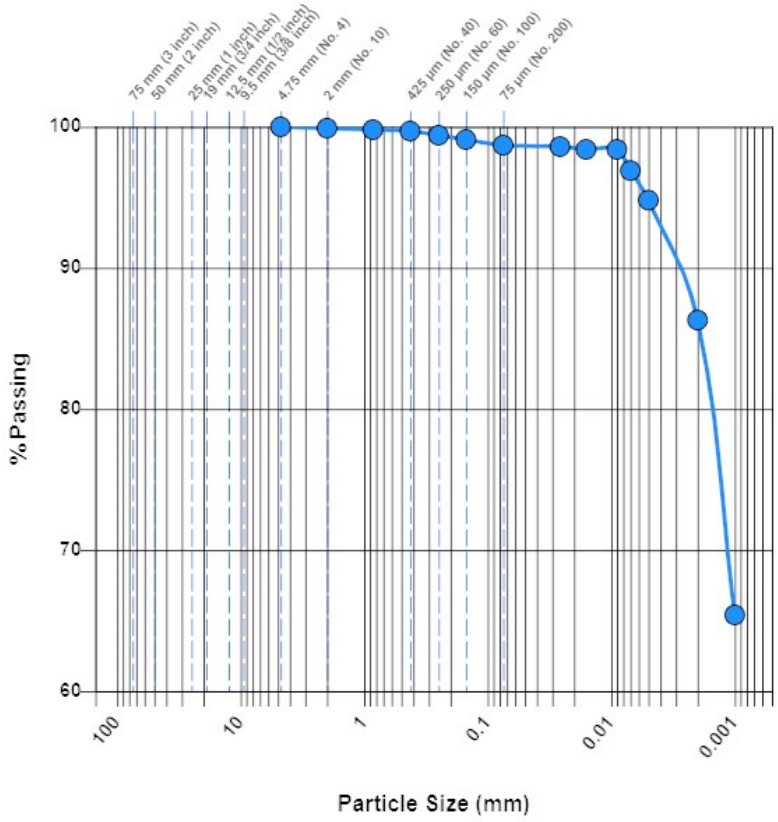
Sample Information

Sample Number:	320141	**Depth (ft):**	12.5
Boring Number:	19-C	**Sampled By:**	Drill Crew
Sample Date:	06/26/2020		
Received Date:	07/06/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/06/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
4.75 mm (No. 4)	100.0	-
2 mm (No. 10)	99.9	-
850 µm (No. 20)	99.8	-
425 µm (No. 40)	99.7	-
250 µm (No. 60)	99.4	-
150 µm (No. 100)	99.1	-
75 µm (No. 200)	98.7	-
25.5 (µm)	98.6	-
16.1 (µm)	98.4	-
9.3 (µm)	98.4	-
6.6 (µm)	96.9	-
4.7 (µm)	94.8	-
2.4 (µm)	86.3	-
1.1 (µm)	65.4	-



Soil Classification: CH Fat clay

Gravel (%): 0.0 **Sand (%):** 1.3 **Silt (%):** 3.9 **Clay (%):** 94.8

General

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Hydrometer And Sieve Analysis

ASTM D422

7/6/2020

11001 Hampshire Avenue S
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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

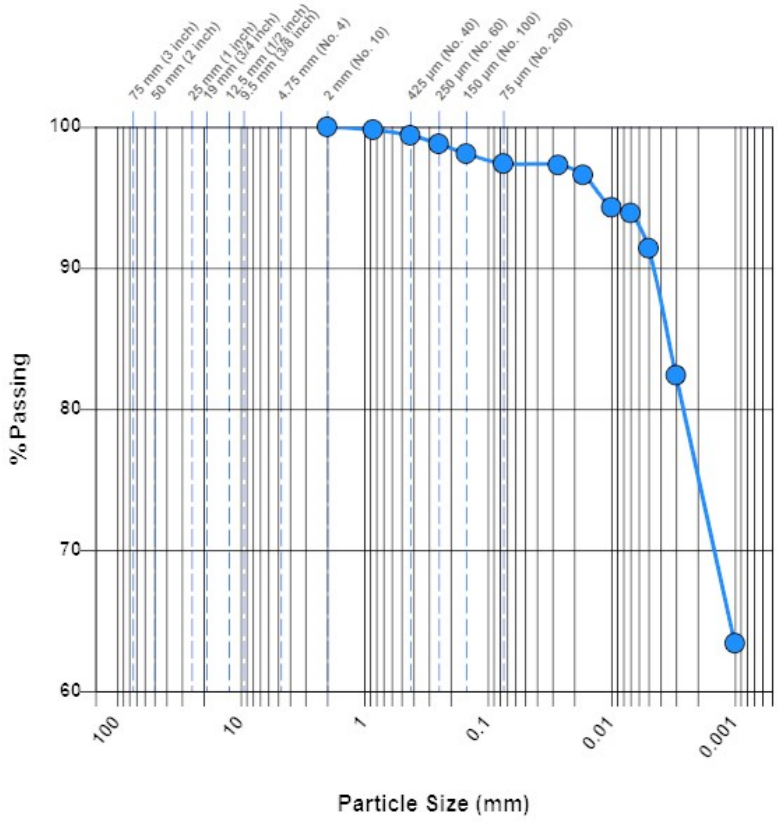
Sample Information

Sample Number:	320142	**Depth (ft):**	35
Boring Number:	19-C	**Sampled By:**	Drill Crew
Sample Date:	06/26/2020		
Received Date:	07/06/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/06/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.8	-
425 µm (No. 40)	99.4	-
250 µm (No. 60)	98.8	-
150 µm (No. 100)	98.1	-
75 µm (No. 200)	97.4	-
26.6 (µm)	97.3	-
16.8 (µm)	96.6	-
9.8 (µm)	94.3	-
6.9 (µm)	93.9	-
5.0 (µm)	91.4	-
2.5 (µm)	82.4	-
1.1 (µm)	63.4	-



Soil Classification: CH Fat clay

Gravel (%):	0	**Sand (%):**	2.6	**Silt (%):**	6.0	**Clay (%):**	91.4

General

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Hydrometer And Sieve Analysis

ASTM D422

7/6/2020

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

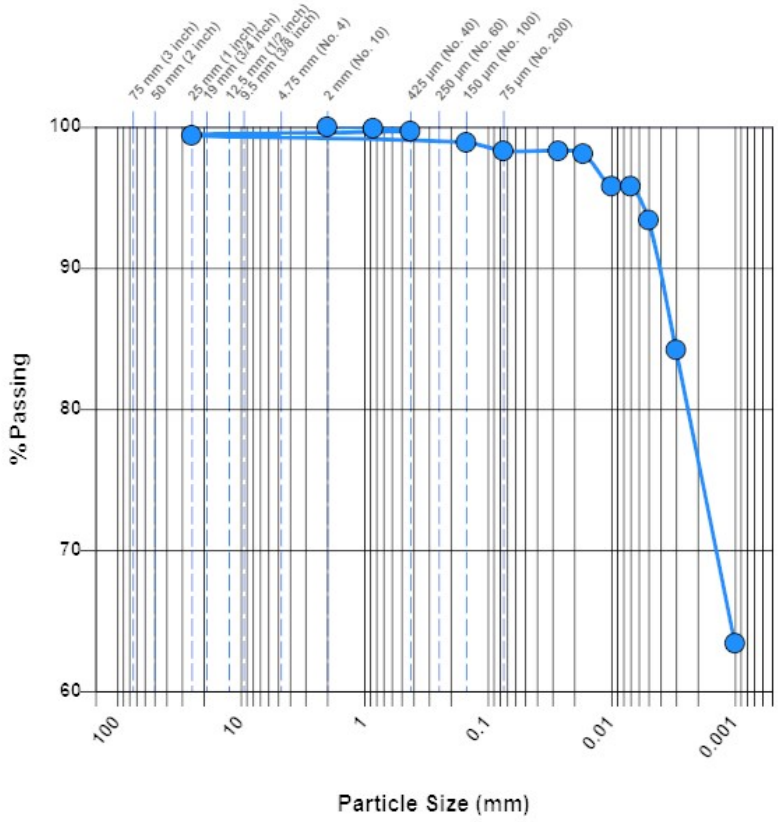
Sample Information

Sample Number:	320143	**Depth (ft):**	60
Boring Number:	19-C	**Sampled By:**	Drill Crew
Sample Date:	06/26/2020		
Received Date:	07/06/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/06/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.9	-
425 µm (No. 40)	99.7	-
250 µm (No. 60)	99.4	-
150 µm (No. 100)	98.9	-
75 µm (No. 200)	98.3	-
26.7 (µm)	98.3	-
16.9 (µm)	98.1	-
9.8 (µm)	95.8	-
7.0 (µm)	95.8	-
5.0 (µm)	93.4	-
2.5 (µm)	84.2	-
1.1 (µm)	63.4	-



Soil Classification: CH Fat clay

Gravel (%): 0 **Sand (%):** 1.7 **Silt (%):** 4.9 **Clay (%):** 93.4

General

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Hydrometer And Sieve Analysis

ASTM D422

7/6/2020

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

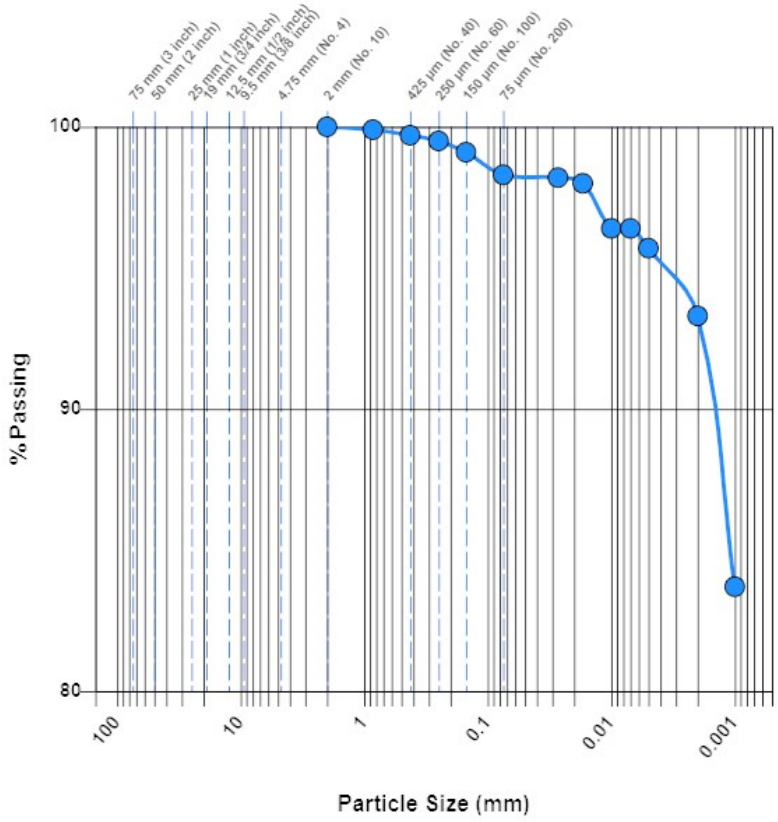
Sample Information

Sample Number:	320144	**Depth (ft):**	90
Boring Number:	19-C	**Sampled By:**	Drill Crew
Sample Date:	06/26/2020		
Received Date:	07/06/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/06/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
2 mm (No. 10)	100.0	-
850 µm (No. 20)	99.9	-
425 µm (No. 40)	99.7	-
250 µm (No. 60)	99.5	-
150 µm (No. 100)	99.1	-
75 µm (No. 200)	98.3	-
26.8 (µm)	98.2	-
17.0 (µm)	98.0	-
9.8 (µm)	96.4	-
7.0 (µm)	96.4	-
4.9 (µm)	95.7	-
2.4 (µm)	93.3	-
1.1 (µm)	83.7	-

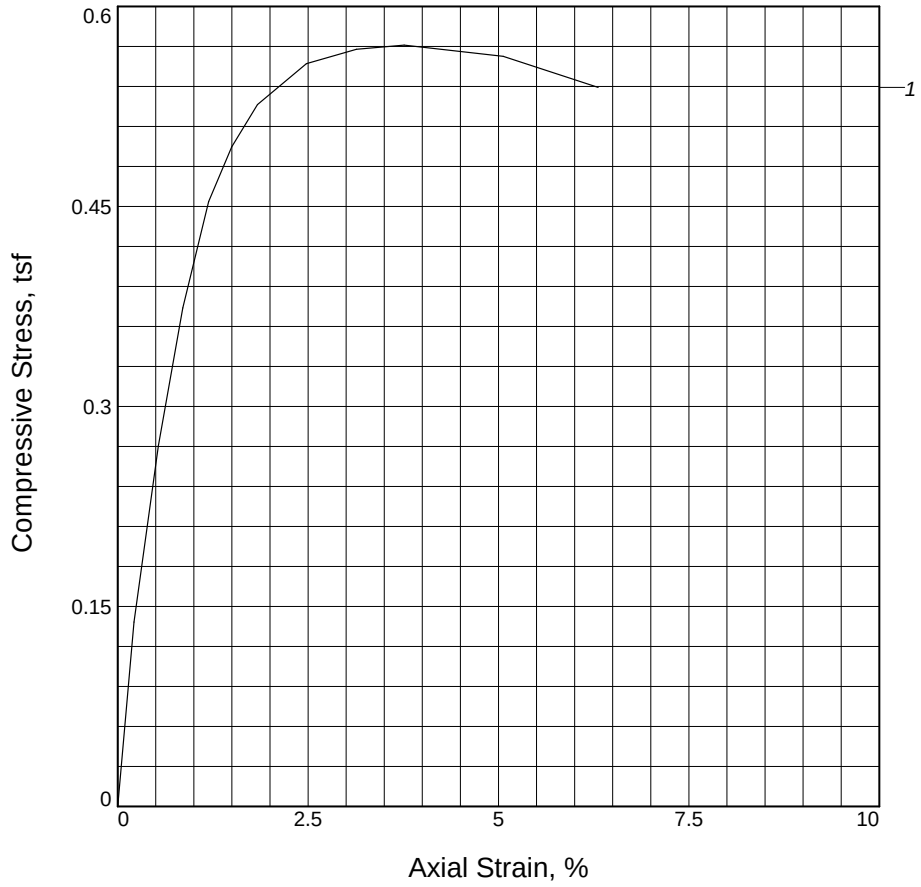


Soil Classification: CH Fat clay

Gravel (%): 0 **Sand (%):** 1.7 **Silt (%):** 2.6 **Clay (%):** 95.7

General

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	0.5709			
Undrained shear strength, tsf	0.2855			
Failure strain, %	3.8			
Strain rate, %/min.	1.00			
Water content, %	44.3			
Wet density, pcf	111.1			
Dry density, pcf	77.0			
Saturation, %	99.8			
Void ratio	1.2057			
Specimen diameter, in.	2.854			
Specimen height, in.	5.611			
Height/diameter ratio	1.97			

Description: FAT CLAY, red (CH)

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: 15-C-1 **Depth:** 25'

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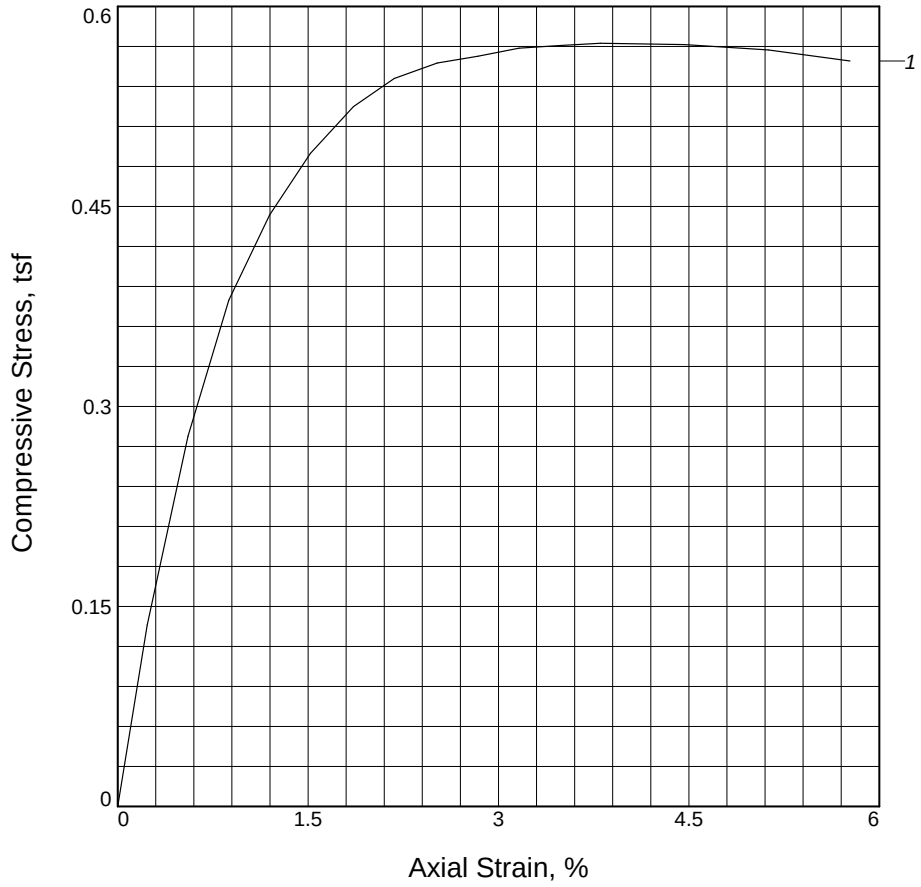
UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	0.5724			
Undrained shear strength, tsf	0.2862			
Failure strain, %	3.8			
Strain rate, %/min.	1.00			
Water content, %	43.9			
Wet density, pcf	112.1			
Dry density, pcf	77.9			
Saturation, %	100.0			
Void ratio	1.2129			
Specimen diameter, in.	2.835			
Specimen height, in.	5.599			
Height/diameter ratio	1.97			

Description: FAT CLAY, red (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: 15-C-1 **Depth:** 45'

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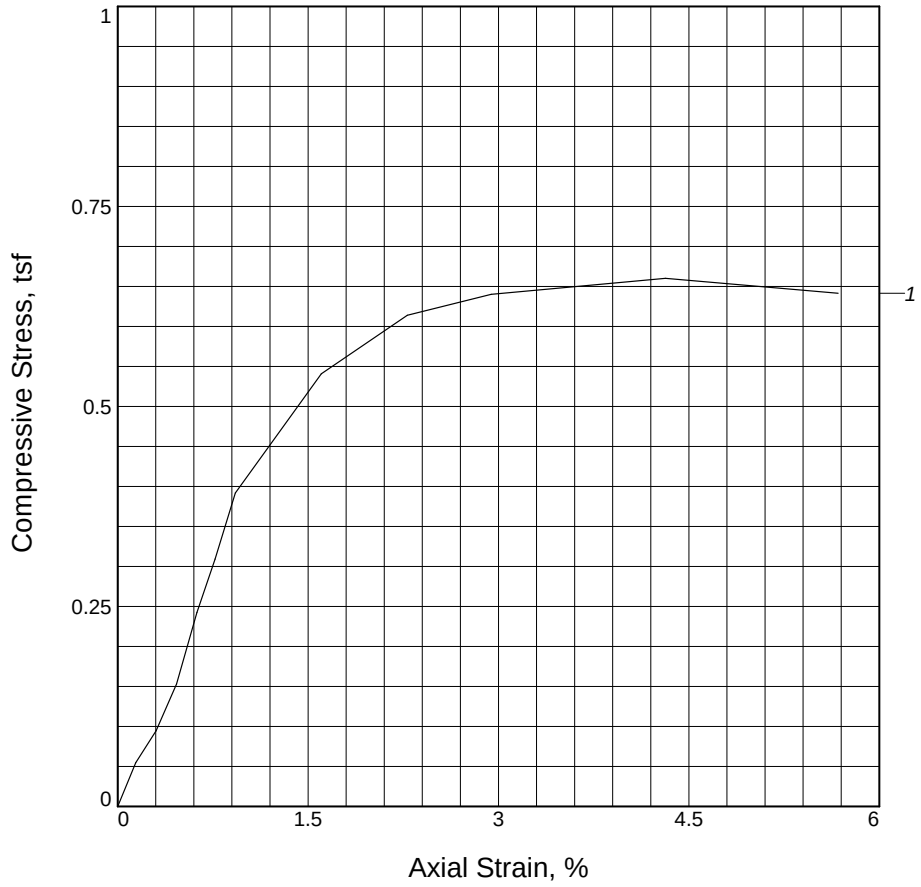
UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	0.6601			
Undrained shear strength, tsf	0.3300			
Failure strain, %	4.3			
Strain rate, %/min.	1.00			
Water content, %	39.6			
Wet density, pcf	114.9			
Dry density, pcf	82.3			
Saturation, %	100.0			
Void ratio	1.0935			
Specimen diameter, in.	2.836			
Specimen height, in.	5.608			
Height/diameter ratio	1.98			

Description: FAT CLAY, red (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: 15-C-1 **Depth:** 70'

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