Subsurface Investigation Report

Enbridge Line 5 Reroute
MP 39 HDD Crossing – Vaughn Creek
Location 46WB, West of Curry Road, North of Steimtz Road
Location 47WB-1, West of Curry Road, North of Steimtz Road
Location 82-C-1, North of Steimtz Road, West of Curry Road
Location 83-1-C, Southeast of Heffner's Road, South of Aggies Road
Gurney Town, Iron 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.

Mark W. Gothard, PE
Senior Engineer
License Number: E-38488-6
August 10, 2020

Project B2001991

Braun Intertec Corporation

BRAUN INTERTEC
The Science You Build On.

Braun Intertec Corporation
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August 10, 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 39 HDD Crossing – Vaughn Creek
Location 46WB, West of Curry Road, North of Steimtz Road
Location 47WB-1, West of Curry Road, North of Steimtz Road
Location 82-C-1, North of Steimtz Road, West of Curry Road
Location 83-1-C, Southeast of Heffner's Road, South of Aggies Road
Gurney Town, Iron County, Wisconsin

Dear Mr. Erickson:

We are pleased to present this Subsurface Investigation Report for the Line 5 Reroute Project at the MP 39 HDD Crossing under Vaughn Creek in Gurney Town, Iron 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

Mark W. Gothard, PE
Senior Engineer

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Description **Page**

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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 services as part of this effort.

This report provides a factual data obtained at Borehole Locations 46WB, 47WB-1, 82-C-1, and 83-1-C for the HDD crossing under Vaughn Creek which is located at MP 39 in the proposed pipeline alignment in Gurney Town, 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 locations of the borings.
- Performing four (4) standard penetration test (SPT) borings with coring denoted as 46WB, 47WB-1, 82-C-1, and 83-1-C to nominal depths ranging from 128 to 221 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, exploration logs, 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 and Bedrock Encountered

The general geologic profile of the soils encountered between the four (4) borings consisted (proceeding down from the ground surface) of 1 to 6 1/2 feet of silty sand topsoil and fill, underlain by layers of lacustrine (lake deposits) and glacial deposits. The soils contained in the layers consisted of silty sands, poorly graded sands with silt, poorly graded sand, fat clay, silty clayey sand, silty clay with sand, and silts to the termination of the borings or refusal on bedrock in each boring, 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

Below the glacial deposits, the borings encountered bedrock extending from an approximate elevation ranging between 962 to 898 feet to the termination depth of the borings. The bedrock generally consisted of reddish brown and gray conglomerate associated with Copper Harbor Complex, dark gray argillite associated with Nonesuch Formation, and reddish brown with gray sandstone associated with the Keweenawan Super Group: Nonesuch Formation.

The conglomerate was generally classified as “unfractured” to “intensely fractured”. The rock was deemed as “moderately hard” to “hard” in terms of the rock hardness scale and ranged from “unweathered” to “decomposed”.

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

B.2.c. Artesian Groundwater Conditions

While drilling Boring 46WB, artesian groundwater conditions were encountered at a depth of approximately 128 feet. Due to the high pressure of the water formation at this depth, the drilling operations were not able to meet the target depth of 188 feet and the boring was terminated at a depth of 128 feet below the ground surface.

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 (1052 1/2 to 978 1/2)	Silty Sand (SM)	2 - 48	89 - 117	110 - 130	27 - 37	5 - 25	0.5 – 2.5	0.1 – 4.1+	12 - 336
	Silt (ML)	4 - 54	85 - 108	105 - 127	26 - 36	27 - 35	0	0	16 - 233
	Fat Clay (CH)	0 - 3	66 - 70	100 - 105	15 - 17	0	0.1 – 0.5	0.1 – 0.3	0 - 12
	Poorly Graded Sand (SP)	7 - 10	83 - 108	105 - 115	30 - 33	30 - 32	0	0	49 - 72
	Silty, Clayey Sand (SC-SM)	9 - 18	105 - 115	117 - 120	30 - 31	15 - 20	1.0 – 1.25	0.9 -1.9	36 - 72
	Poorly Graded Sand with Silt (SP-SM)	5 - 13	100 - 110	105 - 115	30 - 33	30 - 32	0	0	35 - 94
Middle Soils (1000 1/2 to 922 1/2)	Silty Sand (SM)	14 - 80	102 - 114	118 - 130	31 - 37	20 - 25	1.25 – 2.5	1.4 – 4.1+	81 - 560
	Silt (ML)	4 - 50 blows per 4 inches of penetration	84 - 98	105 - 127	26 - 36	27 - 35	0	0	16 - 346
	Poorly Graded Sand with Silt (SP-SM)	31 - 49	96 - 102	120 - 127	36 - 40	35 - 36	0	0	217 - 353

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 (953 1/2 to 860 1/2)	Silty Sand (SM)	82 - 50 blows per 6 inches of penetration	105 - 117	122 - 130	35 - 37	25	2.0– 2.5	2.5 – 4.1+	472 - 630
	Silt (ML)	33 - 100 blows per 1 inches of penetration	98 - 113	122 - 127	32 - 36	33 - 35	0	0	132 - 346
	Silty Clay (CL-ML)	35 - 72	100 - 120	120 - 130	27 - 30	0	3.8 – 7.5+	2.2 – 4.2+	140 - 415
Bedrock (962 to 838)	Conglom-erate	N/A	154 - 167	154 - 167	42 - 45	35 - 36	0	0	122,400 – 165,600
	Argillite	N/A	160 - 173	160 - 173	42 - 45	35 - 36	0	0	698,400 – 720,000

*Sustained Young's Modulus values

B.4. Groundwater

We encountered groundwater at depths ranging between 9 1/2 to 45 feet below the ground surface in Borings 82-C-1, 46WB, and 83-1-C while advancing the borings.

We did not observe groundwater while advancing Boring 47WB-1. 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, hydrometer with sieve analysis, Atterberg limits, 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

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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: **46WB**

LOCATION: See attached sketch

LATITUDE: 46.48845 LONGITUDE: -90.48807

DRILLER: EPC LOGGED BY: S. Sullivan START DATE: 04/03/20 END DATE: 04/08/20

SURFACE ELEVATION: 1026.5 ft RIG: Subcontractor METHOD: 3 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
1024.5		SILTY SAND (SM), fine to medium-grained, with roots, brown, moist (TOPSOIL FILL)		3-3-4-5 (7) 1"			
2.0 1022.0		FILL: SILTY SAND (SM), fine to medium-grained Sand, brown, moist, loose		4-5-5-4 (10) 24"			
4.5 1017.5		SANDY SILT (ML), fine to medium-grained, brown, moist, loose (LACUSTRINE)	5	3-3-3-3 (6) 12"		18	Test results are in the attached lab report
				3-4-3-3 (7) 18"			
9.0 1012.0	▽	SILTY SAND (SM), fine to medium-grained, brown, moist to wet, very loose (GLACIAL TILL)	10	3-1-1-4 (2) 12"		23	Test results are in the attached lab report
				2-1-1-0 (2) WOH/6" 12"			
14.5 1008.5		FAT CLAY (CH), brown, moist, very soft (LACUSTRINE)	15	0-0-0-0 WOH/24" 24"		51	Test results are in the attached lab report Drilling method switched to mud rotary at 15 feet
18.0 1003.5		SILTY SAND (SM), fine to medium-grained Sand, brown, moist, loose (GLACIAL TILL)	20	0-3-4-0 (7) 0"			
23.0 998.5		SILT (ML), fine to medium-grained, brown, moist, very loose (GLACIAL TILL)	25	2-2-2-2 (4) 24"		23	Test results are in the attached lab report
28.0		SILTY SAND (SM), fine to medium-grained Sand, brown, moist, loose to medium dense (GLACIAL TILL)	30	4-6-8-8 (14) 18"		23	Test results are in the attached lab report

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

BORING: **46WB**
LOCATION: See attached sketch
LATITUDE: 46.48845 LONGITUDE: -90.48807
DRILLER: EPC LOGGED BY: S. Sullivan START DATE: 04/03/20 END DATE: 04/08/20
SURFACE ELEVATION: 1026.5 ft RIG: Subcontractor METHOD: 3 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
		SILTY SAND (SM), fine to medium-grained Sand, brown, moist, loose to medium dense (GLACIAL TILL)	35	5-6-7-7 (13) 18"			
987.5							
39.0		SANDY SILT (ML), fine to medium-grained, with Gravel, brown, moist, very stiff to hard (GLACIAL TILL)	40	2-3-5-5 (8) 12"		21	Test results are in the attached lab report
			45	5-8-9-12 (17) 6"			
			50	20-23-43 (66) 12"			
973.5							
53.0		SILTY SAND (SM), fine to medium-grained Sand, brown, moist, dense to medium dense (GLACIAL TILL)	55	23-29-38 (67) 18"		14	Test results are in the attached lab report
			60	25-37-43 (80) 18"			
963.5							
63.0		SANDY SILT (ML), brown, moist, very dense (GLACIAL TILL)	65	46-50/5" (REF) 11"		15	Test results are in the attached lab report

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LOG OF BORING

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

BORING: **46WB**

LOCATION: See attached sketch

LATITUDE: 46.48845 LONGITUDE: -90.48807

DRILLER: EPC LOGGED BY: S. Sullivan START DATE: 04/03/20 END DATE: 04/08/20

SURFACE ELEVATION: 1026.5 ft RIG: Subcontractor METHOD: 3 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
		SANDY SILT (ML), brown, moist, very dense (GLACIAL TILL)	70	42-50/4" (REF) 10"			
953.5							
73.0		SILTY SAND (SM), fine to medium-grained, brown, moist, dense to medium dense (GLACIAL TILL)	75	31-45-43 (88) 18"		16	Test results are in the attached lab report
			80	30-43-39 (82) 16"			
943.5							
83.0		SANDY SILT (ML), brown, moist (GLACIAL TILL)	85	14-21-24 (45) 18"		12	Test results are in the attached lab report Bedrock at 90 feet. Roller bit refusal at 91 feet. Drilling method switched to rock coring at 91 feet.
936.5			90	45-50/1" (REF)			
90.0							
		NONESUCH FORMATION, ARGILLITE, dark gray, slightly weathered, moderately hard, fine-grained to medium-grained, massive, highly fractured		58 88			Run 1 MOH's = 2.5
933.5							
93.0		NONESUCH FORMATION, ARGILLITE, dark gray, slightly weathered, moderately hard, fine-grained to medium-grained, massive, moderately fractured *Test results are in the attached lab report*	95	100 100		4650	MOH's = 2.5
			100	93 100			MOH's = 2.5

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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: **46WB**

LOCATION: See attached sketch

LATITUDE: 46.48845 LONGITUDE: -90.48807

DRILLER: EPC LOGGED BY: S. Sullivan START DATE: 04/03/20 END DATE: 04/08/20

SURFACE ELEVATION: 1026.5 ft RIG: Subcontractor METHOD: 3 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
		NONESUCH FORMATION, ARGILLITE, dark gray, slightly weathered, moderately hard, fine-grained to medium-grained, massive, moderately fractured								
		105		100	100		4650			Run 2 MOH's = 2.5
		110		97	100					MOH's = 2.5
		Test results are in the attached lab report								
		115		90	95					Run 3 MOH's = 2.5
		120		100	100		4650			MOH's = 2.5
		Test results are in the attached lab report								
		125		95	100					MOH's = 2.5
		Bore 46WB had an initial target depth of 188 feet but the bore was terminated at 128 feet due to over pressured formation water.								
898.5										
128.0		END OF CORING								Water observed at 9.5 feet while drilling.
		Boring then backfilled with cement/bentonite grout								
		130								
		135								

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LOG OF BORING

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

BORING: **47WB-1**

LOCATION: See attached sketch

LATITUDE: 46.49110 LONGITUDE: -90.48706

DRILLER: M. Takada | LOGGED BY: A. Hillerud | START DATE: 06/12/20 | END DATE: 06/23/20

SURFACE ELEVATION: 1036.2 ft | RIG: | 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
1035.2		SILTY SAND (SM), fine to medium-grained, with organic, roots, reddish brown, moist (TOPSOIL)					
1.0		FILL: SANDY SILT (ML), fine to medium-grained, brown, moist		2-1-3 (4) 16"			
			5	7-9-10 (19) 16"			
1030.2							
6.0		POORLY GRADED SAND (SP), fine to medium-grained, brown, moist, loose to medium dense (ALLUVIUM)		5-7-5 (12) 16"			
			10	3-4-5 (9) 16"		27	Test results are in the attached lab report
1024.7							
11.5		SILTY, CLAYEY SAND (SC-SM), fine to medium-grained, brown, moist, stiff (LACUSTRINE)		3-3-6 (9) 14"			
1022.7							
13.5		FAT CLAY with SAND (CH), fine to medium-grained, reddish brown, moist, soft (LACUSTRINE)	15	2-2-1 (3) 14"			
1018.7							
17.5		SILTY, CLAYEY SAND (SC-SM), fine to medium-grained, brown, moist, very stiff (LACUSTRINE)	20	6-8-10 (18) 12"			
1013.7							
22.5		SILTY SAND (SM), fine to medium-grained, brown, moist, stiff to very stiff (GLACIAL TILL)	25	8-15-20 (35) 12"			
			30	9-9-11 (20) 12"			

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

BORING: **47WB-1**
LOCATION: See attached sketch
LATITUDE: 46.49110 LONGITUDE: -90.48706
DRILLER: M. Takada LOGGED BY: A. Hillerud START DATE: 06/12/20 END DATE: 06/23/20
SURFACE ELEVATION: 1036.2 ft RIG: 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
		SILTY SAND (SM), fine to medium-grained, brown, moist, stiff to very stiff (GLACIAL TILL)	35	7-7-13 (20) 12"			
			40	9-9-13 (22) 16"		16	Test results are in the attached lab report
			45	13-14-15 (29) 12"			
			50	10-12-15 (27) 14"			
983.7 52.5		SANDY SILT (ML), fine to medium-grained, brown, moist, medium dense (GLACIAL TILL)	55	8-6-15 (21) 16"			
978.7 57.5		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, moist to wet, dense (GLACIAL OUTWASH)	60	12-14-17 (31) 12"			

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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: **47WB-1**
LOCATION: See attached sketch
LATITUDE: 46.49110 LONGITUDE: -90.48706
DRILLER: M. Takada LOGGED BY: A. Hillerud START DATE: 06/12/20 END DATE: 06/23/20
SURFACE ELEVATION: 1036.2 ft RIG: 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
		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, moist to wet, dense (GLACIAL OUTWASH)	65	11-13-18 (31) 13"			
			70	17-23-26 (49) 11"		25	Test results are in the attached lab report
			75	14-14-20 (34) 14"			
958.7							
77.5		SANDY SILT (ML), fine to medium-grained, brown, moist, dense (GLACIAL TILL)	80	26-23-24 (47) 18"			
			85	16-15-24 (39) 0"			No recovery
			90	15-18-18 (36) 14"			
943.7							
92.5		SILTY CLAY (CL-ML), trace Gravel, brown, moist, hard (GLACIAL TILL)	95	17-20-23 (43) 16"			

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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: **47WB-1**
LOCATION: See attached sketch
LATITUDE: 46.49110 LONGITUDE: -90.48706
DRILLER: M. Takada LOGGED BY: A. Hillerud START DATE: 06/12/20 END DATE: 06/23/20
SURFACE ELEVATION: 1036.2 ft RIG: 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
938.7		SILTY CLAY (CL-ML), trace Gravel, brown, moist, hard (GLACIAL TILL)					
97.5		SANDY SILT (ML), fine to medium-grained, trace Gravel, brown, moist, dense to very dense (GLACIAL TILL)					
			100	17-23-32 (55) 14"			
			105	50-50/5" (REF) 12"		22	Test results are in the attached lab report
			110	17-29-38 (67) 0"			No recovery
			115	14-15-18 (33) 18"			
			120	11-24-24 (48) 12"			
			125	20-24-27 (51) 0"			No recovery
908.2							
128.0							

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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: **47WB-1**
LOCATION: See attached sketch
LATITUDE: 46.49110 LONGITUDE: -90.48706
DRILLER: M. Takada LOGGED BY: A. Hillerud START DATE: 06/12/20 END DATE: 06/23/20
SURFACE ELEVATION: 1036.2 ft RIG: 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
903.2		SILTY SAND with GRAVEL (SM), fine to medium-grained, brown, moist, very dense (GLACIAL TILL)	130	50/6" (REF) 16"		11	Test results are in the attached lab report
133.0		SANDY SILT (ML), fine to medium-grained, trace Gravel, brown, moist, dense to very dense (GLACIAL TILL)	135	50/6" (REF) 8"			
900.2							
136.0		SANDY SILT (ML), with weathered rock, brown, moist, very dense (GLACIAL TILL)					Drilling method switched to rock coring at 141.5 feet
898.2				50/1" (REF) 1"			
138.0			140				
		COPPER HARBOR, CONGLOMERATE, reddish brown with gray, highly weathered, moderately hard, fine-grained to coarse-grained, massive, highly fractured		0 100	3	3720	Run 1 MOH's 4 Bit Pressure 3,720-4,650 psi
		Test results are in the attached lab report	145	10 100	3	7440	Run 2 MOH's 4
889.2							
147.0		COPPER HARBOR, CONGLOMERATE, reddish brown with gray, decomposed, moderately hard, fine-grained to coarse-grained, massive, intensely fractured	150	0 90	3	4650	Run 3 MOH's 4 Bit Pressure 4,650-7,905 psi
				0 90	4	6980	Run 4 MOH's 4
881.2			155				
155.0		COPPER HARBOR, CONGLOMERATE, reddish brown with gray, highly weathered, moderately hard, fine-grained to coarse-grained, massive, highly fractured		30 100	3	5580	Run 5 MOH's 4
878.2							
158.0		KEWEENAWAN SUPER GROUP: NONESUCH FORMATION, SANDSTONE, reddish brown with gray, moderately weathered, moderately					
		Continued on next page		RQD % Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi) Water Return % Remarks

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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: **47WB-1**
LOCATION: See attached sketch
LATITUDE: 46.49110 LONGITUDE: -90.48706
DRILLER: M. Takada LOGGED BY: A. Hillerud START DATE: 06/12/20 END DATE: 06/23/20
SURFACE ELEVATION: 1036.2 ft RIG: 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
871.2		KEWEENAWAN SUPER GROUP: NONESUCH FORMATION, SANDSTONE, reddish brown with gray, moderately weathered, moderately hard, fine-grained to medium-grained, massive, highly fractured *Test results are in the attached lab report*		70	90	1	6510			Run 6 MOH's 4
165.0		KEWEENAWAN SUPER GROUP: NONESUCH FORMATION, SANDSTONE, reddish brown with gray, moderately weathered, moderately hard, fine-grained to coarse-grained, massive, highly fractured	165	70	90	2	7900			Run 7 MOH's 4
861.4		*Test results are in the attached lab report*	170	95	95	2	8840	20	90	Run 8 MOH's 4
174.8		KEWEENAWAN SUPER GROUP: NONESUCH FORMATION, SANDSTONE, reddish brown with gray, slightly weathered, moderately hard, fine-grained to coarse-grained, massive, moderately fractured	175	80	95	2	7900	20	80	Run 9 MOH's 4
		Test results are in the attached lab report	180	95	100	2	6980	20	80	Run 10 MOH's 4
			185	95	100	2	6980	20	80	Run 11 MOH's 4
			190							Run 12 MOH's 4

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

BORING: **47WB-1**

LOCATION: See attached sketch

LATITUDE: 46.49110 LONGITUDE: -90.48706

DRILLER: M. Takada LOGGED BY: A. Hillerud START DATE: 06/12/20 END DATE: 06/23/20

SURFACE ELEVATION: 1036.2 ft RIG: 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
		KEWEENAWAN SUPER GROUP: NONESUCH FORMATION, SANDSTONE, reddish brown with gray, slightly weathered, moderately hard, fine-grained to coarse-grained, massive, moderately fractured		90	100	3	6980	20	80	
195		*Test results are in the attached lab report*		100	90	3	6800	20	80	Run 13 MOH's 4
838.2										
198.0		END OF CORING Boring then backfilled with cement/bentonite grout								Water not observed while drilling.
200										
205										
210										
215										
220										

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

BORING: **82-C-1**

LOCATION: See attached sketch

LATITUDE:	46.48696	LONGITUDE:	-90.48808
DRILLER: EPC	LOGGED BY: D. Morrison	START DATE: 03/19/19	END DATE: 04/02/20
SURFACE ELEVATION: 1058.9 ft	RIG: Subcontractor	METHOD: 3 1/4" HSA	SURFACING:	WEATHER: 35°, rain

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
1056.9		FILL: SILTY SAND (SM), fine to medium-grained Sand, trace Gravel, brown, moist		2-4-4-4 (8) 14"			
2.0		FILL: SILTY SAND (SM), fine-grained Sand, brown, moist		3-4-4-10 (8) 12"			
1054.4							
4.5		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, brown, moist	5	4-10-8-9 (18) 14"			
1052.4							
6.5		SILTY SAND (SM), fine-grained, brown, moist to wet, very loose to medium dense (GLACIAL TILL)		4-5-6-7 (11) 14"			
			10	3-5-4-5 (9) 6"			
	▽			3-3-3-4 (6) 14"		18	Test results are in the attached lab report
			15	3-5-5-6 (10) 16"			
		layer of Silt at 16 feet					
			20	3-1-1-1 (2) 12"			
1035.9							
23.0		SILTY SAND (SM), fine to medium-grained, brown, moist, very loose to loose (GLACIAL TILL)	25	2-2-3-5 (5) 14"		16	Drilling method switched to mud rotary at 24 1/2 feet Test results are in the attached lab report
1030.4							
28.5		SILTY SAND (SM), fine to medium-grained, with Gravel, brown, wet (GLACIAL TILL)	30	5-6-5-3 (11) 10"		17	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: **82-C-1**
LOCATION: See attached sketch
LATITUDE: 46.48696 LONGITUDE: -90.48808
DRILLER: EPC LOGGED BY: D. Morrison START DATE: 03/19/19 END DATE: 04/02/20
SURFACE ELEVATION: 1058.9 ft RIG: Subcontractor METHOD: 3 1/4" HSA SURFACING: WEATHER: 35°, rain

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
1025.4		SILTY SAND (SM), fine to medium-grained, with Gravel, brown, wet (GLACIAL TILL)					
33.5		SILTY SAND (SM), fine-grained Sand, brown, wet, medium dense to dense (GLACIAL TILL)	35	6-5-13-21 (18) 12"		16	Test results are in the attached lab report
			40	16-21-21-24 (42) 18"			
			45	19-23-25-27 (48) 18"			
1010.4							
48.5		SILT (ML), brown, moist, medium dense to very dense (GLACIAL TILL)	50	19-27-27-31 (54) 20"			
			55	39-25-26-24 (51) 18"			
1000.4							
58.5		SILTY SAND (SM), trace Gravel, brown, moist, medium dense to very dense (GLACIAL TILL)	60	20-28-31-22 (59) 18"		12	Test results are in the attached lab report

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

BORING: **82-C-1**
LOCATION: See attached sketch
LATITUDE: 46.48696 LONGITUDE: -90.48808
DRILLER: EPC LOGGED BY: D. Morrison START DATE: 03/19/19 END DATE: 04/02/20
SURFACE ELEVATION: 1058.9 ft RIG: Subcontractor METHOD: 3 1/4" HSA SURFACING: WEATHER: 35°, rain

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), trace Gravel, brown, moist, medium dense to very dense (GLACIAL TILL)	65	17-19-21-22 (40) 18"			
			70	37-32-38-33 (70) 20"			
			75	19-23-23-21 (46) 20"			
			80	14-16-18-18 (34) 18"			
974.9 84.0		SILT (ML), fine-grained Sand, brown, moist, medium dense to very dense (GLACIAL TILL)	85	13-16-19-20 (35) 18"		12	Test results are in the attached lab report
			90	11-12-12-15 (24) 18"			
			95	10-15-50/5" (REF) 16"			

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

BORING: **82-C-1**
LOCATION: See attached sketch
LATITUDE: 46.48696 LONGITUDE: -90.48808
DRILLER: EPC LOGGED BY: D. Morrison START DATE: 03/19/19 END DATE: 04/02/20
SURFACE ELEVATION: 1058.9 ft RIG: Subcontractor METHOD: 3 1/4" HSA SURFACING: WEATHER: 35°, rain

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
961.9		SILT (ML), fine-grained Sand, brown, moist, medium dense to very dense (GLACIAL TILL)					
97.0		COPPER HARBOR, CONGLOMERATE, red with gray, slightly weathered, hard, medium grained to coarse grained, massive, highly fractured	100	50/1" (REF) 0"			No recovery Drilling method switched to rock coring at 102.4 feet
956.5		*Test results are in the attached lab report*					
102.4		COPPER HARBOR, CONGLOMERATE, red with gray, slightly weathered, hard, medium grained to coarse grained, massive, highly fractured	105	68 100		4650	MOH's = 4-6 Run 1 MOH's = 4-6
947.1			110				
111.8		COPPER HARBOR, CONGLOMERATE, red with gray, slightly weathered, hard, medium grained to coarse grained, massive, slightly fractured	115	90 100		4650	Run 2 MOH's = 5-7 MOH's = 5-7
937.4		*Test results are in the attached lab report*	120				
121.5		COPPER HARBOR, CONGLOMERATE, grayish white with red, unweathered, hard, medium grained to coarse grained, massive, slightly fractured	125	98 100		4650	Run 3 MOH's = 4-5 MOH's = 4-5

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

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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: **82-C-1**
LOCATION: See attached sketch
LATITUDE: 46.48696 LONGITUDE: -90.48808
DRILLER: EPC LOGGED BY: D. Morrison START DATE: 03/19/19 END DATE: 04/02/20
SURFACE ELEVATION: 1058.9 ft RIG: Subcontractor METHOD: 3 1/4" HSA SURFACING: WEATHER: 35°, rain

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
930.4		COPPER HARBOR, CONGLOMERATE, grayish white with red, unweathered, hard, medium grained to coarse grained, massive, slightly fractured								
128.5			130							Run 4
		COPPER HARBOR, CONGLOMERATE, grayish white with red, unweathered, hard, medium grained to coarse grained, massive, slightly fractured		98	100		4650			MOH's = 4-5
925.4										
133.5		COPPER HARBOR, CONGLOMERATE, grayish white with red, unweathered, hard, medium grained to coarse grained, massive, slightly fractured	135							Run 5
				97	100		4650			MOH's = 4-5
		Test results are in the attached lab report	140							
915.4										MOH's = 4-5
143.5		COPPER HARBOR, CONGLOMERATE, red with grayish white, unweathered, hard, medium grained to coarse grained, massive, moderately fractured	145							Run 6
				98	100		4650			MOH's = 3.5
			150							
905.6										MOH's = 3.5
153.3		COPPER HARBOR, CONGLOMERATE, red with grayish white, unweathered, hard, medium grained to coarse grained, massive, slightly fractured	155							Run 7
				99	99		4650			MOH's = 3.5

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

BORING: **82-C-1**
LOCATION: See attached sketch
LATITUDE: 46.48696 LONGITUDE: -90.48808
DRILLER: EPC LOGGED BY: D. Morrison START DATE: 03/19/19 END DATE: 04/02/20
SURFACE ELEVATION: 1058.9 ft RIG: Subcontractor METHOD: 3 1/4" HSA SURFACING: WEATHER: 35°, rain

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
895.6		COPPER HARBOR, CONGLOMERATE, red with grayish white, unweathered, hard, medium grained to coarse grained, massive, slightly fractured *Test results are in the attached lab report*								MOH's = 3.5
163.3		COPPER HARBOR, CONGLOMERATE, red with grayish white, unweathered, hard, fine grained to coarse grained, massive, slightly fractured	165 170	98	100		4650			Run 8 MOH's = 3.5
885.6										MOH's = 3.5
173.3		COPPER HARBOR, CONGLOMERATE, gray with reddish white, unweathered, hard, fine grained to coarse grained, massive, unfractured *Test results are in the attached lab report*	175 180	100	100		4650			Run 9 MOH's = 3.5
875.6										MOH's = 3.5
183.3		COPPER HARBOR, CONGLOMERATE, gray with reddish white, unweathered, hard, fine grained to coarse grained, massive, unfractured	185 190	100	99		4650			Run 10 MOH's = 3.5

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

BORING: **82-C-1**

LOCATION: See attached sketch

LATITUDE: 46.48696 LONGITUDE: -90.48808

DRILLER: EPC LOGGED BY: D. Morrison START DATE: 03/19/19 END DATE: 04/02/20

SURFACE ELEVATION: 1058.9 ft RIG: Subcontractor METHOD: 3 1/4" HSA SURFACING: WEATHER: 35°, rain

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
865.6		COPPER HARBOR, CONGLOMERATE, gray with reddish white, unweathered, hard, fine grained to coarse grained, massive, unfractured								MOH's = 3.5
193.3		COPPER HARBOR, CONGLOMERATE, red with gray, unweathered, hard, fine grained to coarse grained, massive, moderately fractured								Run 11
		195								
				92	94		4650			MOH's = 4-6
		Test results are in the attached lab report								
		200								
855.6										MOH's = 4-6
203.3		COPPER HARBOR, CONGLOMERATE, red with grayish white, unweathered, hard, fine grained to coarse grained, massive, moderately fractured								Run 12
		205								
				93	100		4650			MOH's = 5-7.5
		210								
		Test results are in the attached lab report								
845.6										MOH's = 3.5-5
213.3		COPPER HARBOR, CONGLOMERATE, gray with reddish white, unweathered, hard, fine grained to coarse grained, massive, moderately fractured								Run 13
		215								
				89	94		4650			MOH's = 3.5-5
		220								
837.9										
221.0		END OF CORING								Water observed at 14.5 feet while drilling.
		Boring then backfilled with cement/bentonite grout								

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

BORING: **83-1-C**
LOCATION: See attached sketch
LATITUDE: 46.49366 LONGITUDE: -90.48748
DRILLER: M. Swenson LOGGED BY: A. Hillerud START DATE: 05/29/20 END DATE: 06/05/20
SURFACE ELEVATION: 1025.4 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
1024.4		SILTY SAND (SM), fine to medium-grained, with roots, dark brown, moist (TOPSOIL)					
1.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose (GLACIAL OUTWASH)		2-2-3 (5) 15"			
			5	3-3-5 (8) 15"			
1018.9							
6.5		SILTY SAND (SM), fine-grained, trace Gravel, brown, moist, medium dense (GLACIAL TILL)		3-5-6 (11) 14"		11	Test results are in the attached lab report
1016.4							
9.0		POORLY GRADED SAND (SP), fine-grained, trace Gravel, brown, moist, loose (GLACIAL OUTWASH)	10	2-5-5 (10) 15"			
				3-3-4 (7) 13"			
			15	3-4-4 (8) 14"		6	Test results are in the attached lab report
							Drilling method switched to mud rotary at 18 feet
1005.4			20	7-3-4 (7) 0"			No recovery
20.0		SILTY SAND (SM), fine to medium-grained, reddish brown, moist, loose (GLACIAL TILL)					
			25	1-2-1 (3) 15"			
			30	TW 20"		23	Thinwall 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: **83-1-C**
LOCATION: See attached sketch
LATITUDE: 46.49366 LONGITUDE: -90.48748
DRILLER: M. Swenson LOGGED BY: A. Hillerud START DATE: 05/29/20 END DATE: 06/05/20
SURFACE ELEVATION: 1025.4 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
992.4		SILTY SAND (SM), fine to medium-grained, reddish brown, moist, loose (GLACIAL TILL)					
33.0		SILTY SAND (SM), fine-grained, brown, moist, medium dense (GLACIAL TILL)	35	4-5-6 (11) 14"		24	Test results are in the attached lab report
988.9							
36.5		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, medium dense (GLACIAL OUTWASH)	40	4-6-7 (13) 15"			
983.9							
41.5	▽	SANDY SILT with GRAVEL (ML), brown, wet, soft to hard (GLACIAL TILL)	45	3-3-1 (4) 16"			
		Cobbles at 50 feet	50	6-7-15 (22) 14"		19	Test results are in the attached lab report
			55	16-20-20 (40) 16"			
			60	7-7-7 (14) 15"			

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: **83-1-C**
LOCATION: See attached sketch
LATITUDE: 46.49366 LONGITUDE: -90.48748
DRILLER: M. Swenson LOGGED BY: A. Hillerud START DATE: 05/29/20 END DATE: 06/05/20
SURFACE ELEVATION: 1025.4 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
		SANDY SILT with GRAVEL (ML), brown, wet, soft to hard (GLACIAL TILL)	65	8-8-8 (16) 16"			
			70	10-13-13 (26) 16"			
952.4							
73.0		SILT (ML), with Sand, brown, wet, medium dense to very dense (LACUSTRINE)	75	10-13-18 (31) 16"		26	Test results are in the attached lab report
			80	10-11-12 (23) 16"			
			85	12-12-16 (28) 16"			
			90	12-16-17 (33) 16"			
			95	12-14-21 (35) 16"			

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: **83-1-C**
LOCATION: See attached sketch
LATITUDE: 46.49366 LONGITUDE: -90.48748
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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
		SILT (ML), with Sand, brown, wet, medium dense to very dense (LACUSTRINE)	100	15-28-32 (60) 16"		25	Test results are in the attached lab report
922.4							
103.0		SILTY CLAY with SAND (CL-ML), trace Gravel, reddish brown, wet, hard (GLACIAL TILL)	105	14-16-19 (35) 16"			
			110	26-20-27 (47) 16"			
			115	20-28-44 (72) 15"			
907.4							
118.0		SILT (ML), with Sand, brown, wet, very dense (LACUSTRINE)	120	22-27-34 (61) 16"			
			125	32-33-40 (73) 16"		25	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: **83-1-C**
LOCATION: See attached sketch
LATITUDE: 46.49366 LONGITUDE: -90.48748
DRILLER: M. Swenson LOGGED BY: A. Hillerud START DATE: 05/29/20 END DATE: 06/05/20
SURFACE ELEVATION: 1025.4 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
		SILT (ML), with Sand, brown, wet, very dense (LACUSTRINE)					
			130	20-28-32 (60) 16"			
			135	14-20-25 (45) 16"			
			140	19-20-18 (38) 16"			
			145	25-34-46 (80) 16"			
			150	46-49-50/3" (REF) 16"		19	Test results are in the attached lab report
872.4 153.0		SILT (ML), with Sand, with Gravel, brown, wet, very dense (GLACIAL TILL)	155	70-84/5" (REF) 11"			

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: **83-1-C**

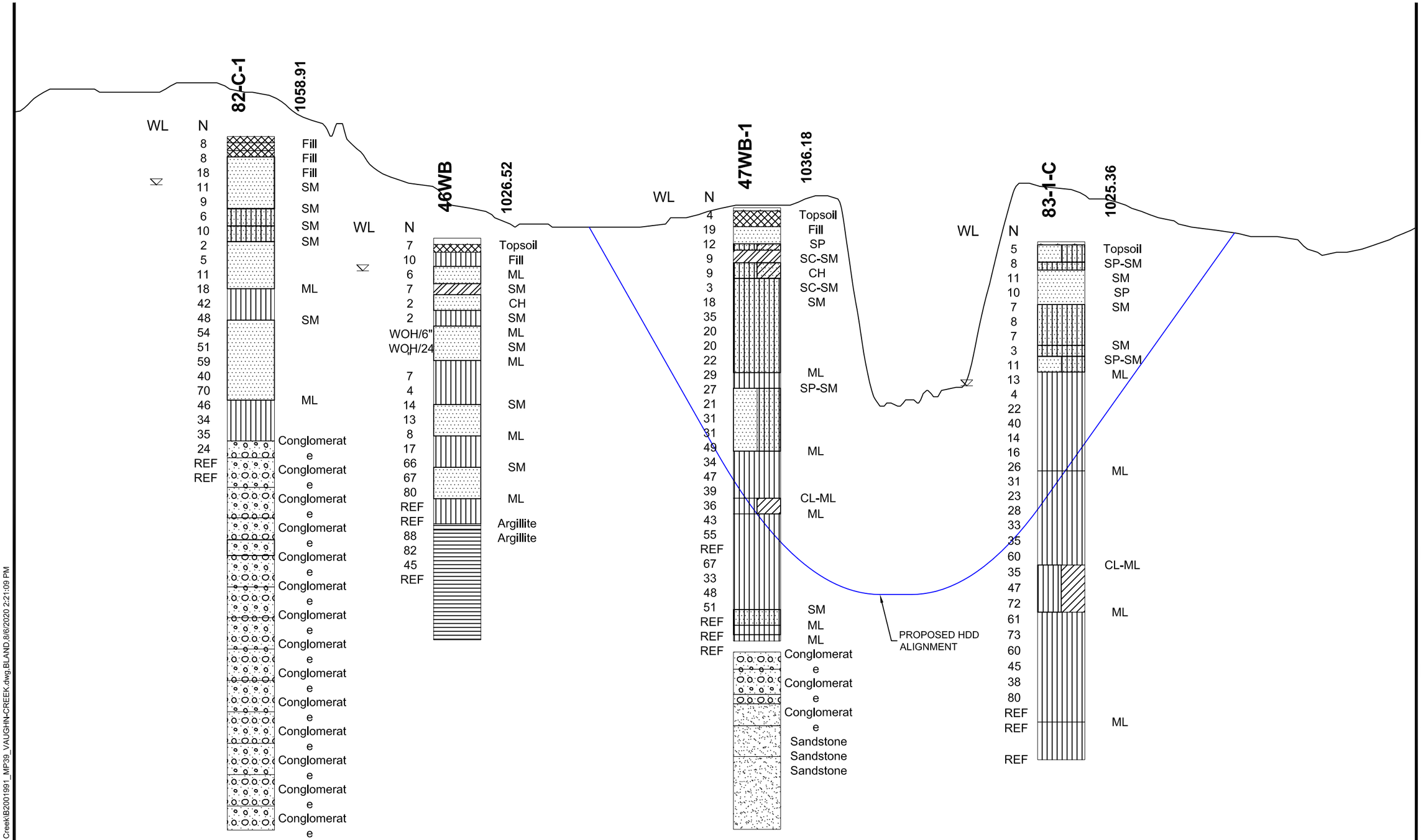
LOCATION: See attached sketch

LATITUDE: 46.49366 LONGITUDE: -90.48748

DRILLER: M. Swenson | LOGGED BY: A. Hillerud | START DATE: 05/29/20 | END DATE: 06/05/20

SURFACE ELEVATION: 1025.4 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
		SILT (ML), with Sand, with Gravel, brown, wet, very dense (GLACIAL TILL)					
860.4							
165.0		END OF BORING	165	100/1" (REF)			Water observed at 45.0 feet while drilling.
		Boring then backfilled with cement/bentonite grout					
			170				Auger met refusal at 165 feet
			175				
			180				
			185				
			190				



150' 0 300'

HORIZONTAL SCALE: 1" = 300'

15' 0 30'

VERTICAL SCALE: 1" = 30'

VERTICAL EXAGGERATION: 10x

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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_MP39_VAUGHN-CREEK

Drawn By:	BJB
Date Drawn:	7/22/20
Checked By:	DM
Last Modified:	8/6/20

Project Information

Enbridge Line 5 Re-route

MP 39 - Vaughn Creek Crossing

BRAUN INTERTEC
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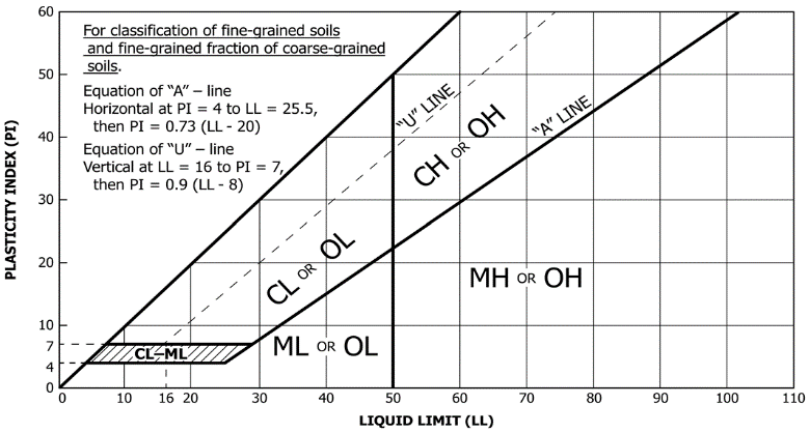
Descriptive Terminology of Soil

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 (▼).

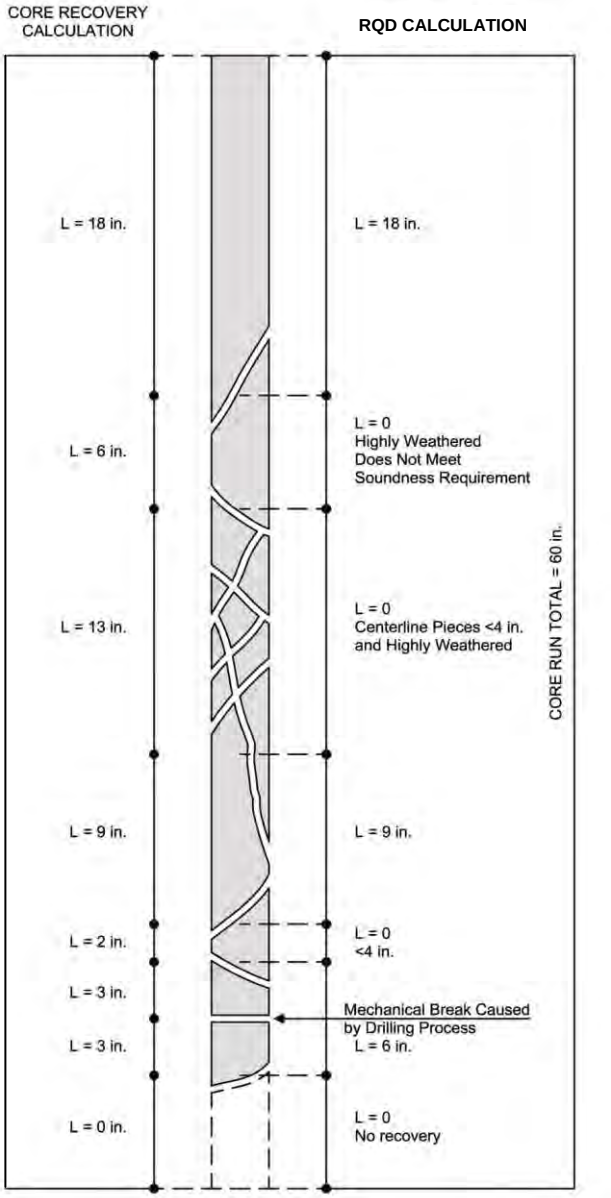
Laboratory Tests

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

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

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

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: 320579
Sampled By: Drill Crew
Sample Date: 06/16/2020
Received Date: 07/08/2020
Lab: 11001 Hampshire Ave S, Bloomington, MN
Completed Date: 07/08/2020
Tested By: Streier, Jim

Laboratory Results Summary

Boring	Sample	Depth (ft)	MC (%)	Wash Loss (%)	LL	PL	PI	Organic Content %	Wet Density (pcf)	Dry Density (pcf)	Resistivity (ohm-cm)	Q_u (tsf)
15WB		7.0	22.8		49	17	32		128.8	104.9		
15WB		15.0	27.1		52	18	34		124.9	98.3		
15WB		30.0	33.5		59	19	40		119.1	89.2		
15WB		40.0	31.3		46	16	30		119.8	91.2		
83-C-1		30.0	22.5				NP		97.3	79.4		
3WB	5	9.5	17.8		50	16	34					

General

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

Geotechnical Testing

Various ASTM

5/1/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Metafield ID: 305490

Completed Date: 05/01/2020 **Prepared By:** Streier, Jim

Laboratory Results Summary

Boring	Sample	Depth (ft)	MC (%)	Wash Loss (%)	LL	PL	PI	Organic Content %	Dry Density (pcf)	Resistivity (ohm-cm)	Q_u (tsf)	Specific Gravity
46-WB	14	14.5	51.1		55	18	37					

General

Sieve Analysis Of Soil

ASTM D6913

4/7/2020

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
<Blank>, <Blank>

Sample Information

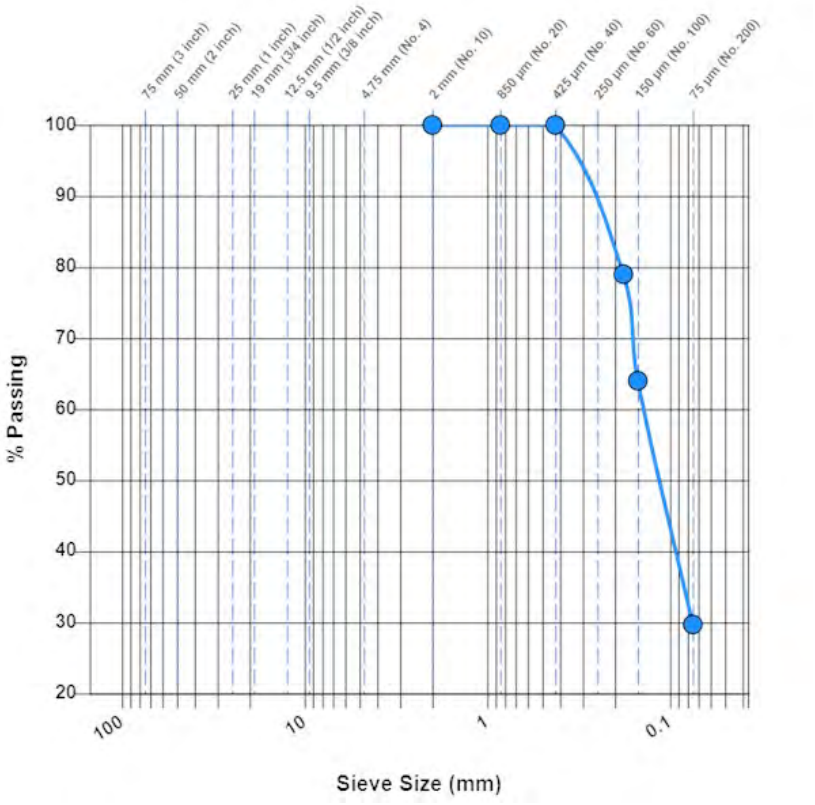
Sample Number:	300697	**Alternate ID:**	82-C-1 12'-16.5'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	12'-16.5'
Boring Number:	82-C-1	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020		

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)	64	
75 µm (No. 200)	29.7	

Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry



Classification: SM Silty sand

General

Results: The test is for informational purposes.

Sieve Analysis Of Soil

ASTM D6913

4/7/2020

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
<Blank>, <Blank>

Sample Information

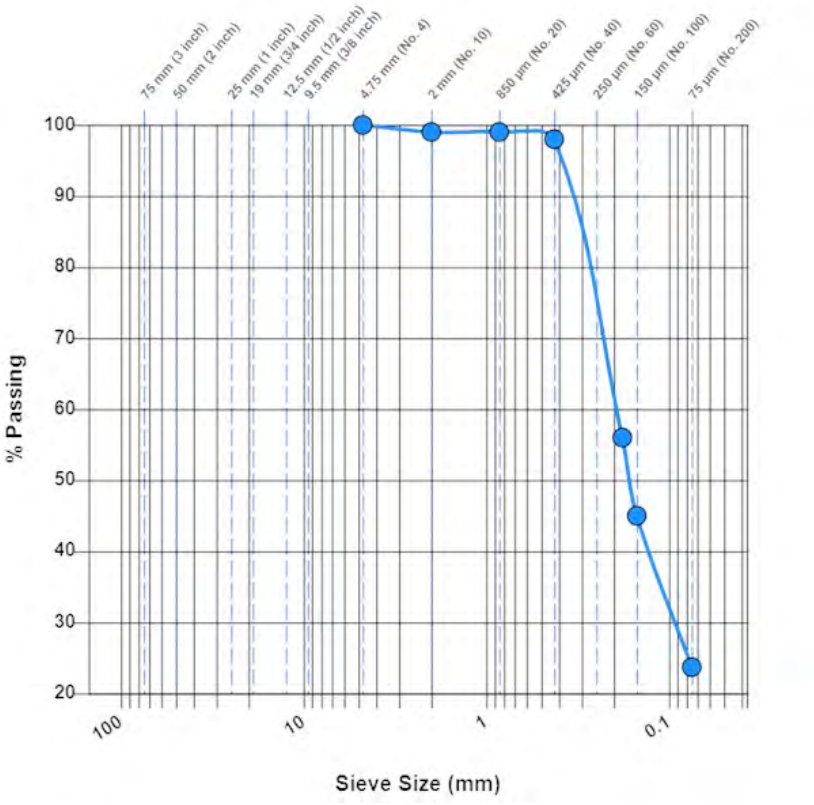
Sample Number:	300698	**Alternate ID:**	82-C-1 24.5'-26.5'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	24.5'-26.5'
Boring Number:	82-C-1	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020		

Laboratory Data

Sieve Size	% Passing	Specification
4.75 mm (No. 4)	100	
2 mm (No. 10)	99	
850 µm (No. 20)	99	
425 µm (No. 40)	98	
180 µm (No. 80)	56	
150 µm (No. 100)	45	
75 µm (No. 200)	23.7	

Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry



Classification: SM Silty sand

General

Results: The test is for informational purposes.

Sieve Analysis Of Soil

ASTM D6913

4/7/2020

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:

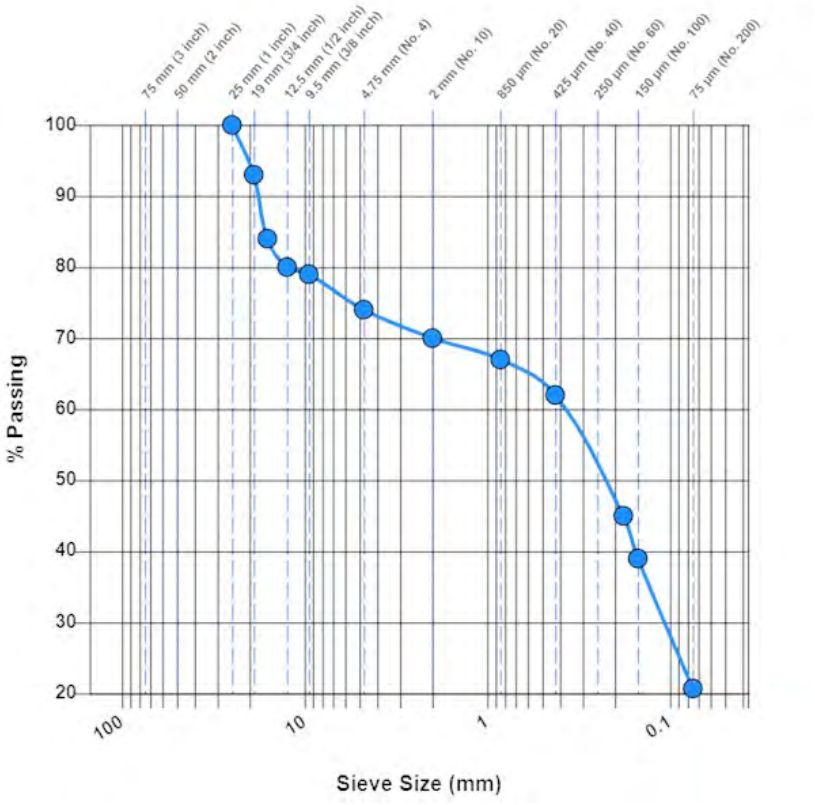
B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	300700	**Alternate ID:**	82-C-1 30'-32'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	30'-32'
Boring Number:	82-C-1	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020		

Laboratory Data

Sieve Size	% Passing	Specification
25 mm (1 inch)	100	
19 mm (3/4 inch)	93	
16 mm (5/8 inch)	84	
12.5 mm (1/2 inch)	80	
9.5 mm (3/8 inch)	79	
4.75 mm (No. 4)	74	
2 mm (No. 10)	70	
850 µm (No. 20)	67	
425 µm (No. 40)	62	
180 µm (No. 80)	45	
150 µm (No. 100)	39	
75 µm (No. 200)	20.7	



Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry

Classification: SM Silty sand with gravel

General

Results: The test is for informational purposes.

Sieve Analysis Of Soil

ASTM D6913

4/7/2020

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:

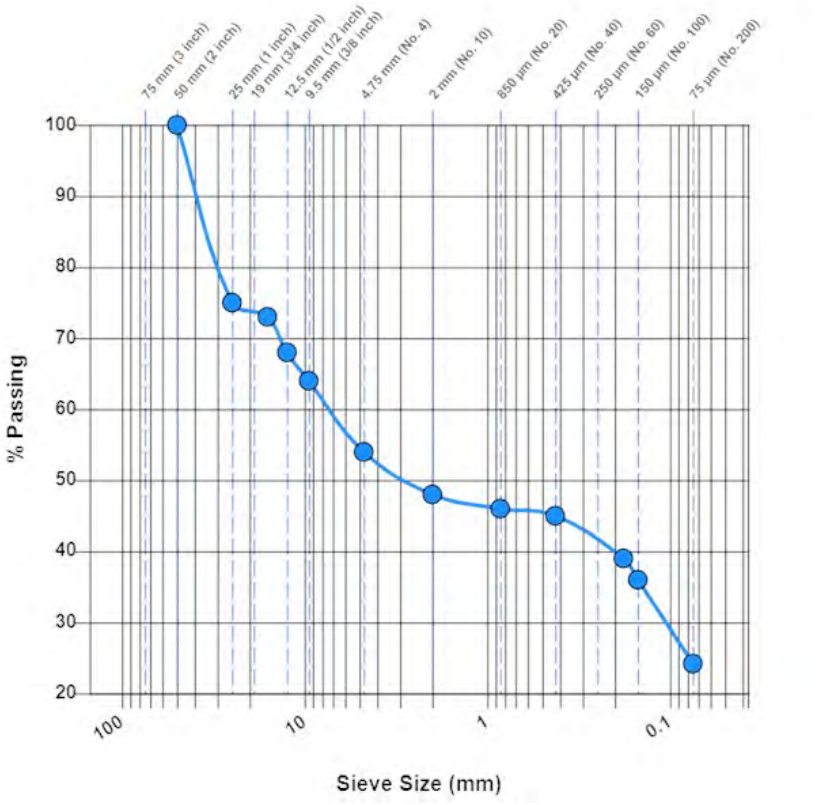
B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	300701	**Alternate ID:**	82-C-1 35'-37'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	35'-37'
Boring Number:	82-C-1	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020		

Laboratory Data

Sieve Size	% Passing	Specification
50 mm (2 inch)	100	
25 mm (1 inch)	75	
16 mm (5/8 inch)	73	
12.5 mm (1/2 inch)	68	
9.5 mm (3/8 inch)	64	
4.75 mm (No. 4)	54	
2 mm (No. 10)	48	
850 µm (No. 20)	46	
425 µm (No. 40)	45	
180 µm (No. 80)	39	
150 µm (No. 100)	36	
75 µm (No. 200)	24.2	



Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry

Classification: SM Silty sand with gravel

General

Results: The test is for informational purposes.

Sieve Analysis Of Soil

ASTM D6913

4/8/2020

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:

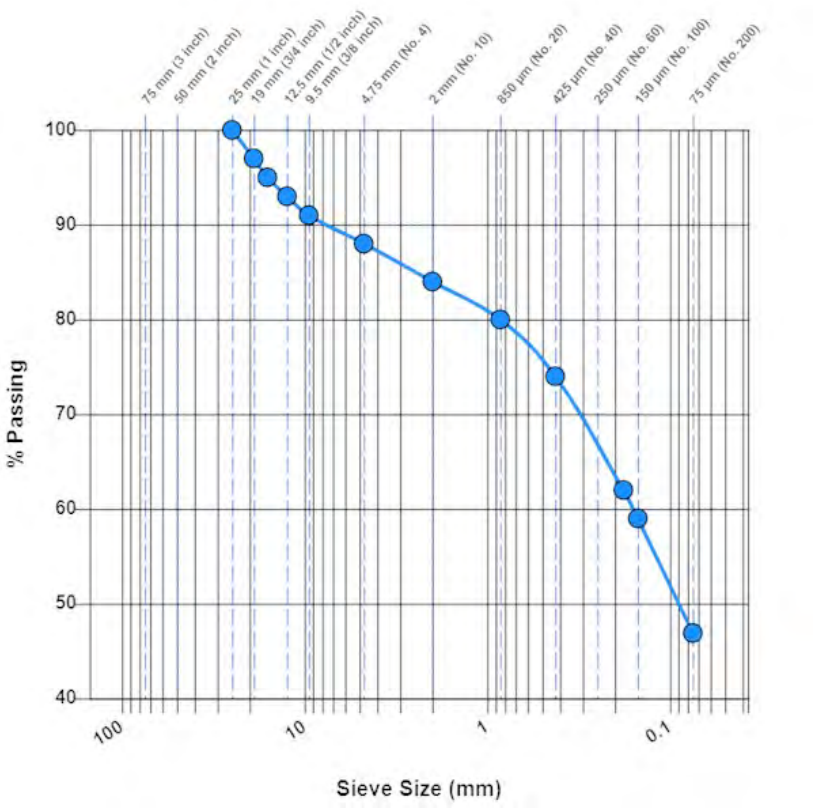
B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	300702	**Alternate ID:**	82-C-1 60'-67'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	60'-67'
Boring Number:	82-C-1	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020		

Laboratory Data

Sieve Size	% Passing	Specification
25 mm (1 inch)	100	
19 mm (3/4 inch)	97	
16 mm (5/8 inch)	95	
12.5 mm (1/2 inch)	93	
9.5 mm (3/8 inch)	91	
4.75 mm (No. 4)	88	
2 mm (No. 10)	84	
850 µm (No. 20)	80	
425 µm (No. 40)	74	
180 µm (No. 80)	62	
150 µm (No. 100)	59	
75 µm (No. 200)	46.9	



Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry

Classification: SM Silty sand

General

Results: The test is for informational purposes.

Sieve Analysis Of Soil

ASTM D6913

4/8/2020

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Phone: 218-624-4967

Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
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<Blank>, <Blank>

Sample Information

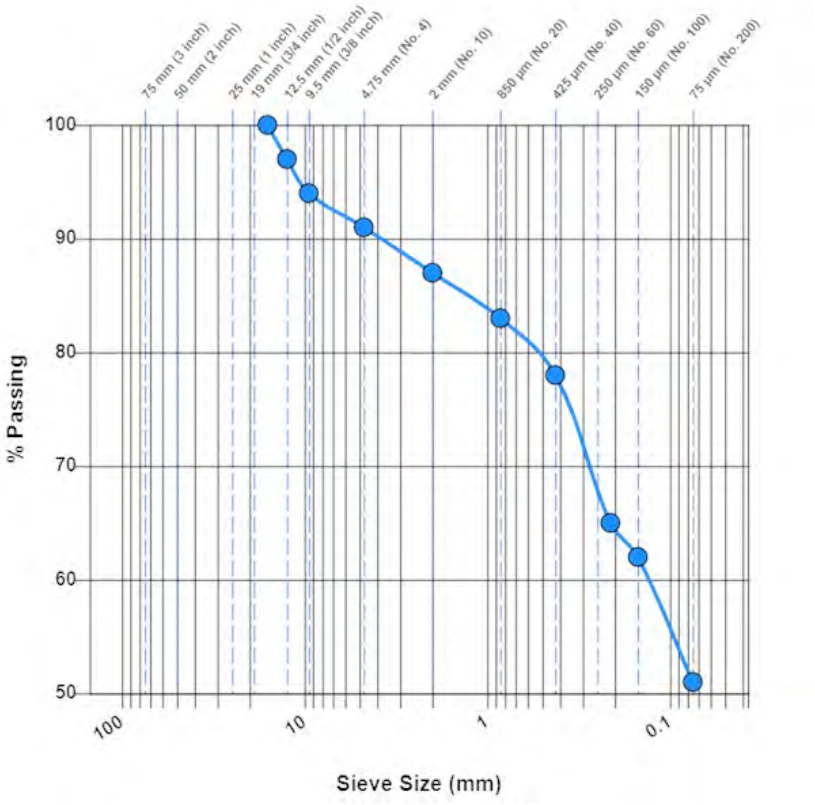
Sample Number:	300704	**Alternate ID:**	82-C-1 85'-92'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	85'-92'
Boring Number:	82-C-1	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020		

Laboratory Data

Sieve Size	% Passing	Specification
16 mm (5/8 inch)	100	
12.5 mm (1/2 inch)	97	
9.5 mm (3/8 inch)	94	
4.75 mm (No. 4)	91	
2 mm (No. 10)	87	
850 µm (No. 20)	83	
425 µm (No. 40)	78	
212 µm (No. 70)	65	
150 µm (No. 100)	62	
75 µm (No. 200)	51.0	

Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry



Classification: ML Sandy silt

General

Results: The test is for informational purposes.

Sieve Analysis Of Soil

ASTM D6913

6/18/2020

4511 West First Street
Suite 4
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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

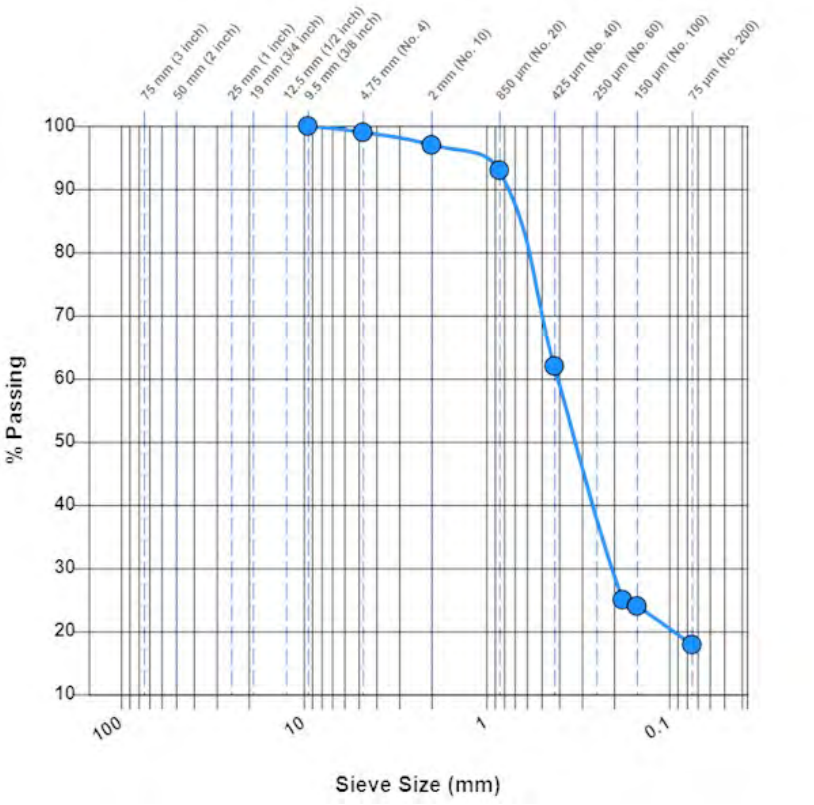
Sample Number: 315528
Sampling Method: Auger Boring ASTM D1452
Boring Number: 83-1-C
Location: In-place
Location Details: Boring 83-1-C Sample 4 7'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Tested Date: 06/17/2020

Alternate ID: 83-1-C Sample 4 7'
Depth (ft): 7
Sampled By: Drill Crew
Lab: 4511 West First Street, Suite 4, Duluth, MN

Laboratory Data

Sieve Size	% Passing	Specification
9.5 mm (3/8 inch)	100	
4.75 mm (No. 4)	99	
2 mm (No. 10)	97	
850 µm (No. 20)	93	
425 µm (No. 40)	62	
180 µm (No. 80)	25	
150 µm (No. 100)	24	
75 µm (No. 200)	17.9	

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



Classification: SM Silty sand

General

Results: The test is for informational purposes.
Remarks: Total weight of dry sample 150.2 grams

Sieve Analysis Of Soil

ASTM D6913

6/18/2020

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Client:

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Houston, TX 77056

Project:

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

Sample Information

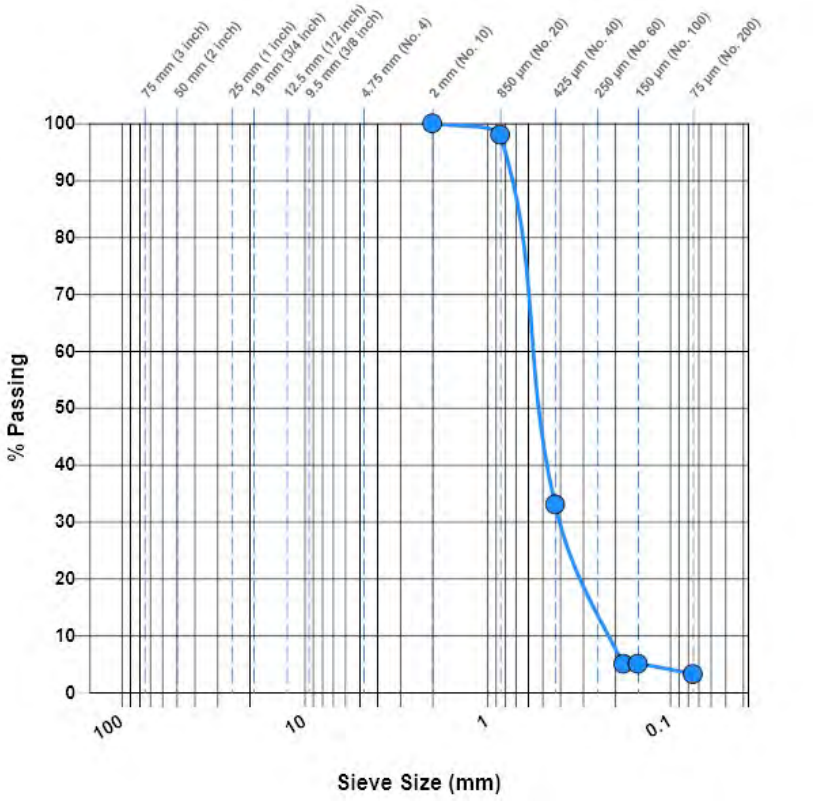
Sample Number: 315530
Sampling Method: Auger Boring ASTM D1452
Boring Number: 83-1-C
Location: In-place
Location Details: Boring 83-1-C Sample 7 15'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Tested Date: 06/17/2020

Alternate ID: 83-1-C Sample 7 15'
Depth (ft): 15
Sampled By: Drill Crew
Lab: 4511 West First Street, Suite 4, Duluth, MN

Laboratory Data

Sieve Size	% Passing	Specification
2 mm (No. 10)	100	
850 µm (No. 20)	98	
425 µm (No. 40)	33	
180 µm (No. 80)	5	
150 µm (No. 100)	5	
75 µm (No. 200)	3.2	

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



Classification: SP Poorly graded sand

General

Results: The test is for informational purposes.
Remarks: Total weight of dry sample 200.9 grams.

Sieve Analysis Of Soil

ASTM D6913

6/19/2020

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Project:

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

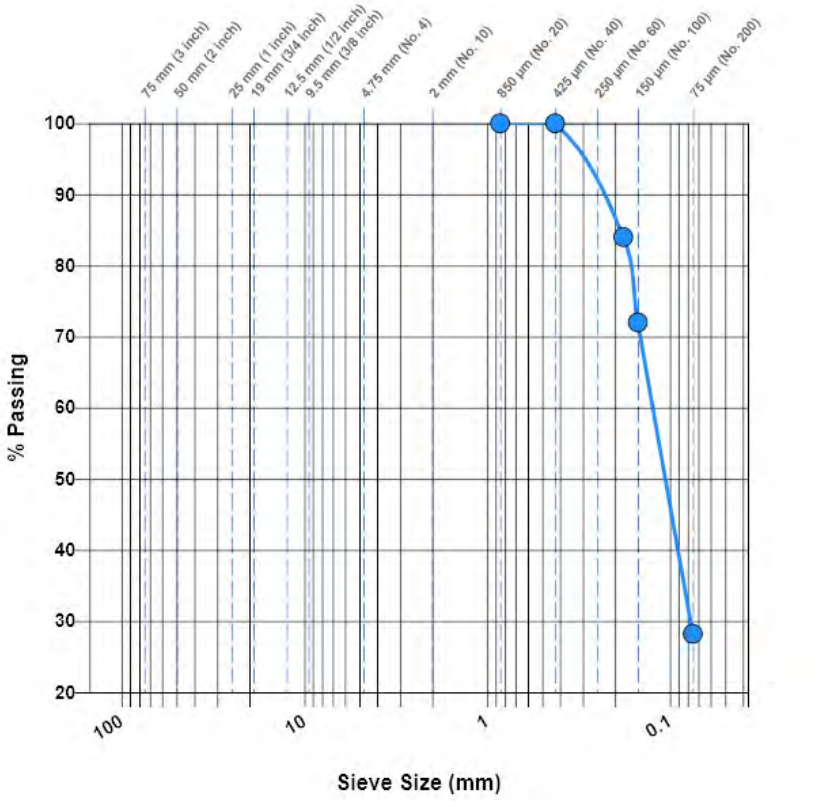
Sample Information

Sample Number:	315531	**Alternate ID:**	83-C-1 Sample 11 35'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	35
Boring Number:	83-C-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 83-C-1 Sample 11 35'		
Sample Date:	06/15/2020		
Received Date:	06/15/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/17/2020		

Laboratory Data

Sieve Size	% Passing	Specification
850 µm (No. 20)	100	
425 µm (No. 40)	100	
180 µm (No. 80)	84	
150 µm (No. 100)	72	
75 µm (No. 200)	28.2	

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 weight of the dry sample 109.4 grams

Sieve Analysis Of Soil

ASTM D6913

6/19/2020

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Houston, TX 77056

Project:

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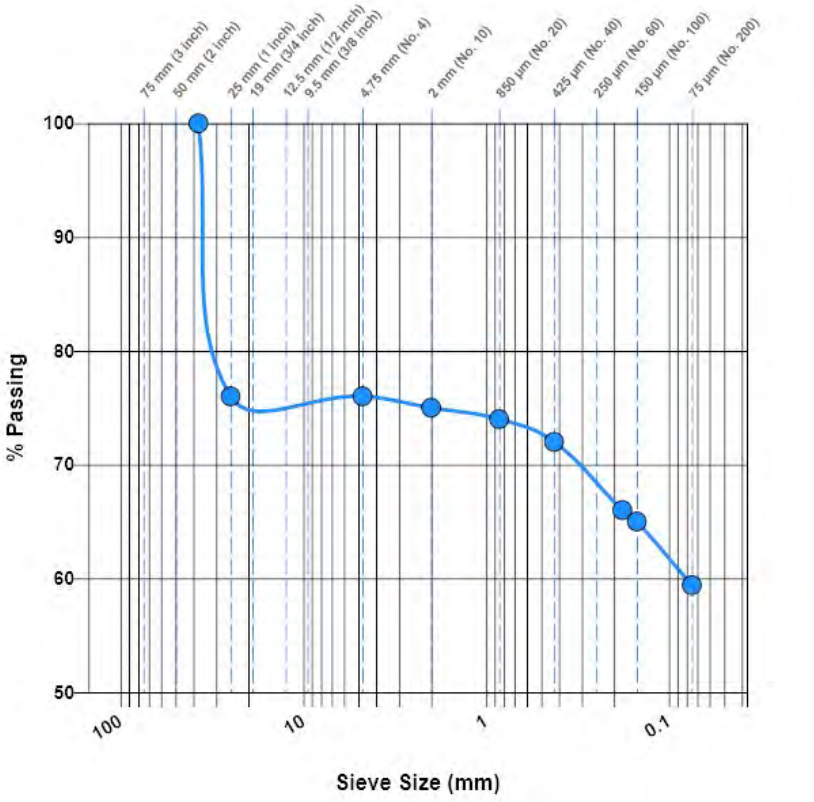
Enbridge Line 5 Re-route
Enbridge Line 5
near Mellen, WI

Sample Information

Sample Number:	315532	**Alternate ID:**	83-C-1 Sample 14 50'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	50
Boring Number:	83-C-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 83-C-1 Sample 14 50'		
Sample Date:	06/15/2020		
Received Date:	06/15/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/17/2020		

Laboratory Data

Sieve Size	% Passing	Specification
37.5 mm (1.5 inch)	100	
25 mm (1 inch)	76	
4.75 mm (No. 4)	76	
2 mm (No. 10)	75	
850 µm (No. 20)	74	
425 µm (No. 40)	72	
180 µm (No. 80)	66	
150 µm (No. 100)	65	
75 µm (No. 200)	59.4	



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

Classification: ML Sandy silt with gravel

General

Results: The test is for informational purposes.
Remarks: Total weight of the dry sample 144.5 grams

Sieve Analysis Of Soil

ASTM D6913

6/19/2020

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Project:

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

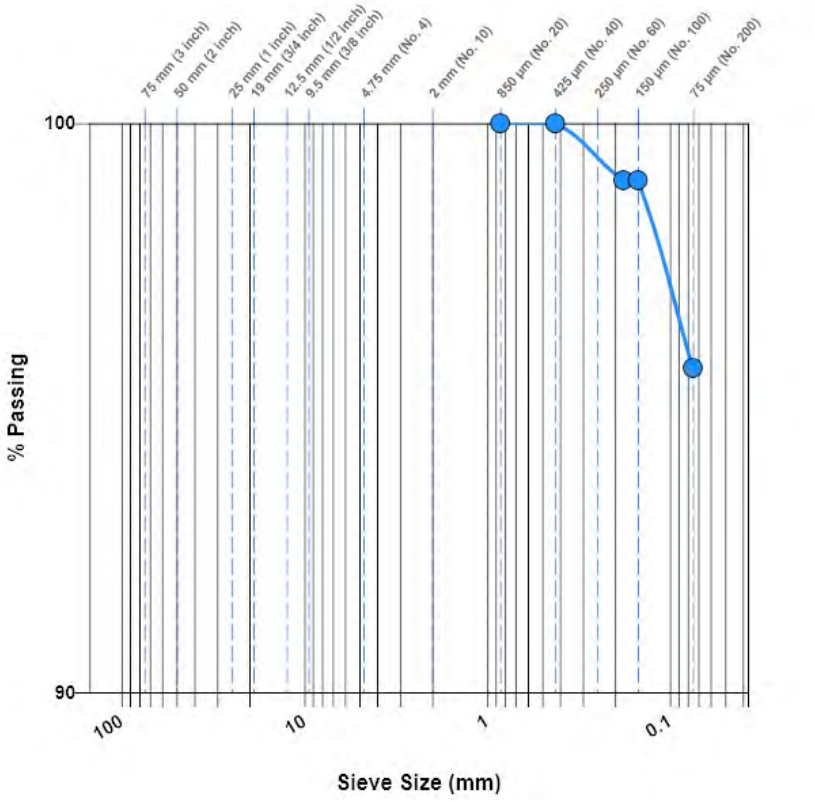
Sample Information

Sample Number:	315533	**Alternate ID:**	83-C-1 Sample 19 75'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	75
Boring Number:	83-C-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 83-C-1 Sample 19 75'		
Sample Date:	06/15/2020		
Received Date:	06/15/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/17/2020		

Laboratory Data

Sieve Size	% Passing	Specification
850 µm (No. 20)	100	
425 µm (No. 40)	100	
180 µm (No. 80)	99	
150 µm (No. 100)	99	
75 µm (No. 200)	95.7	

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



Classification: ML Silt

General

Results: The test is for informational purposes.
Remarks: Total weight of the dry sample 159.7 grams

Sieve Analysis Of Soil

ASTM D6913

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Houston, TX 77056

Project:

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

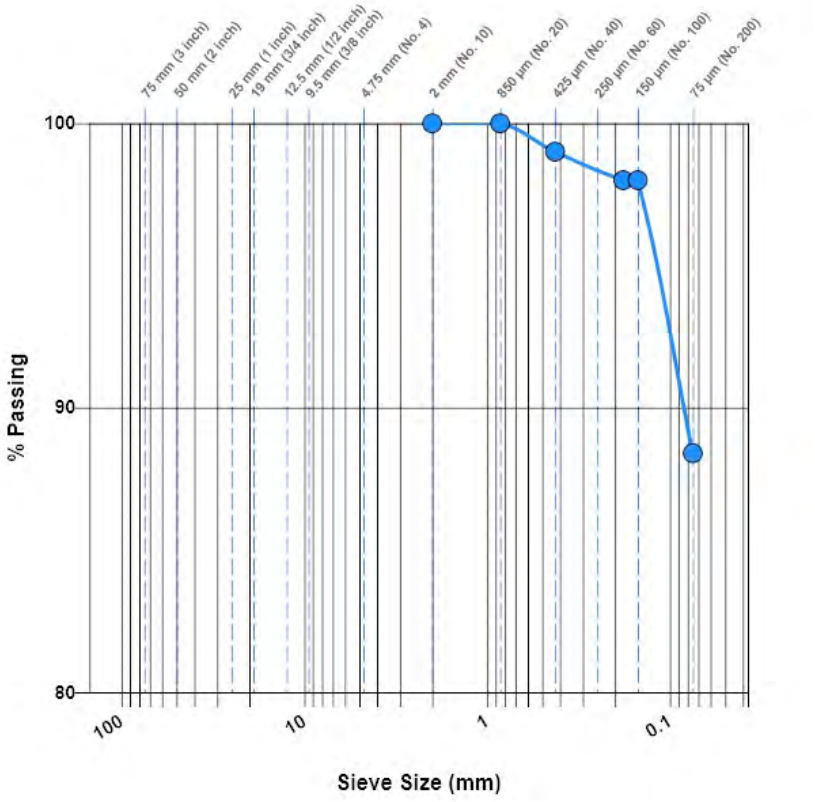
Sample Information

Sample Number:	315534	**Alternate ID:**	83-C-1 24 100'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	100
Boring Number:	83-C-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 83-C-1 Sample 24 100'		
Sample Date:	06/15/2020		
Received Date:	06/15/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/17/2020		

Laboratory Data

Sieve Size	% Passing	Specification
2 mm (No. 10)	100	
850 µm (No. 20)	100	
425 µm (No. 40)	99	
180 µm (No. 80)	98	
150 µm (No. 100)	98	
75 µm (No. 200)	88.4	

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



Classification: ML Silt with sand

General

Results: The test is for informational purposes.
Remarks: Total weight of the dry sample 177.2 grams

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Sieve Analysis Of Soil

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Houston, TX 77056

Project:

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

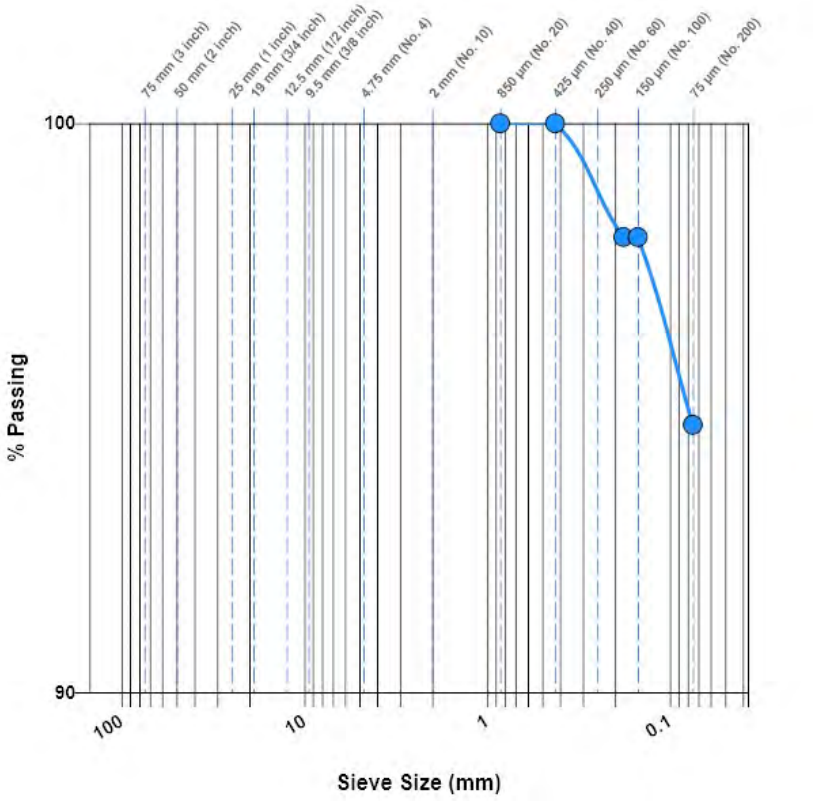
Sample Information

Sample Number:	315535	**Alternate ID:**	83-C-1 29 125'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	125
Boring Number:	83-C-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 83-C-1 Sample 29 125'		
Sample Date:	06/15/2020		
Received Date:	06/15/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/17/2020		

Laboratory Data

Sieve Size	% Passing	Specification
850 µm (No. 20)	100	
425 µm (No. 40)	100	
180 µm (No. 80)	98	
150 µm (No. 100)	98	
75 µm (No. 200)	94.7	

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



Classification: ML Silt

General

Results: The test is for informational purposes.
Remarks: Total weight of the dry sample 208.8 grams

Sieve Analysis Of Soil

ASTM D6913

6/19/2020

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Houston, TX 77056

Project:

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

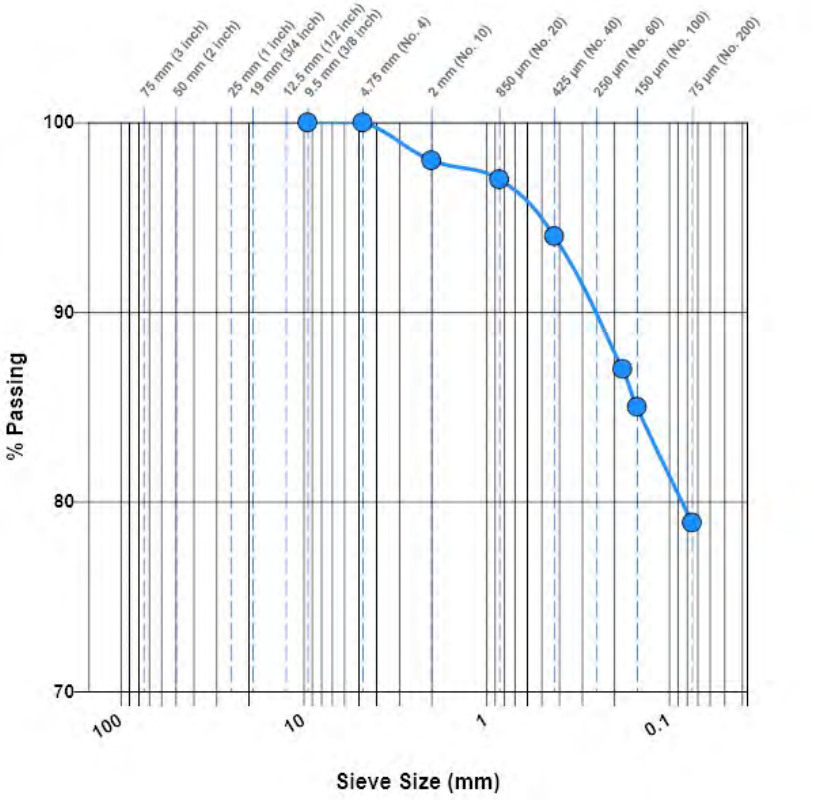
Sample Information

Sample Number:	315536	**Alternate ID:**	83-C-1 34 150'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	150
Boring Number:	83-C-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 83-C-1 Sample 34 150'		
Sample Date:	06/15/2020		
Received Date:	06/15/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	06/17/2020		

Laboratory Data

Sieve Size	% Passing	Specification
9.5 mm (3/8 inch)	100	
4.75 mm (No. 4)	100	
2 mm (No. 10)	98	
850 µm (No. 20)	97	
425 µm (No. 40)	94	
180 µm (No. 80)	87	
150 µm (No. 100)	85	
75 µm (No. 200)	78.9	

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



Classification: ML Sandy silt

General

Results: The test is for informational purposes.

Remarks:
Total weight of the dry sample 218.6 grams

Sieve Analysis Of Soil

ASTM D6913

4/22/2020

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

Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
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Sample Information

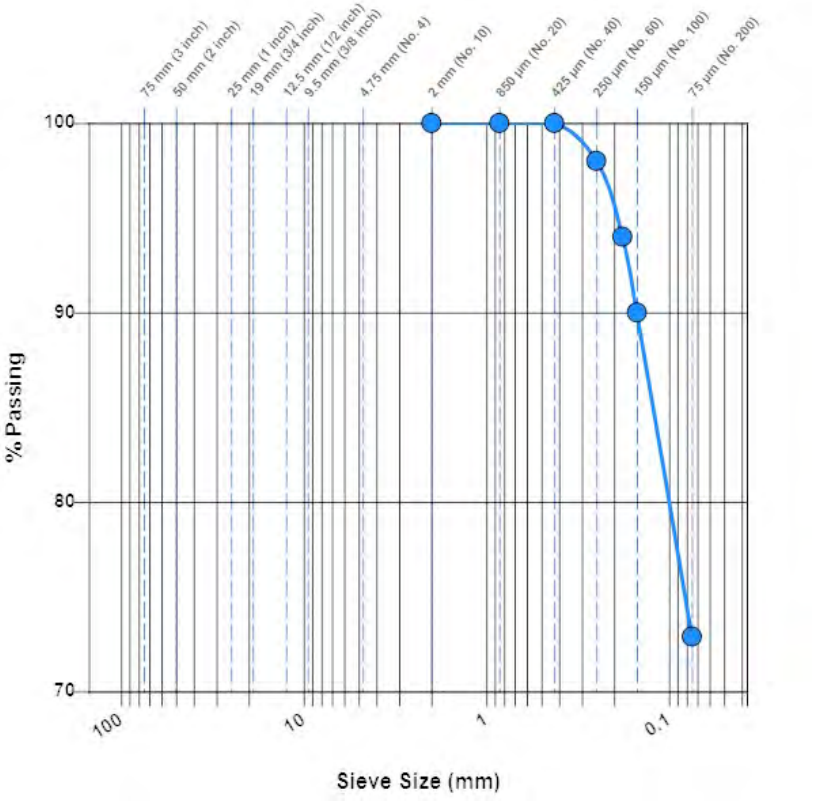
Sample Number:	302576	**Alternate ID:**	Boring 46-WB 4.5'-9'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	4.5-9
Boring Number:	46-WB	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 46-WB 4.5'-9'		
Sample Date:	04/03/2020		
Received Date:	04/17/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/22/2020		

Laboratory Data

Sieve Size	% Passing	Specification
2 mm (No. 10)	100	
850 µm (No. 20)	100	
425 µm (No. 40)	100	
250 µm (No. 60)	98	
180 µm (No. 80)	94	
150 µm (No. 100)	90	
75 µm (No. 200)	72.9	

Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry



Classification: ML Sandy silt

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample 402.8 grams

Sieve Analysis Of Soil

ASTM D6913

4/22/2020

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

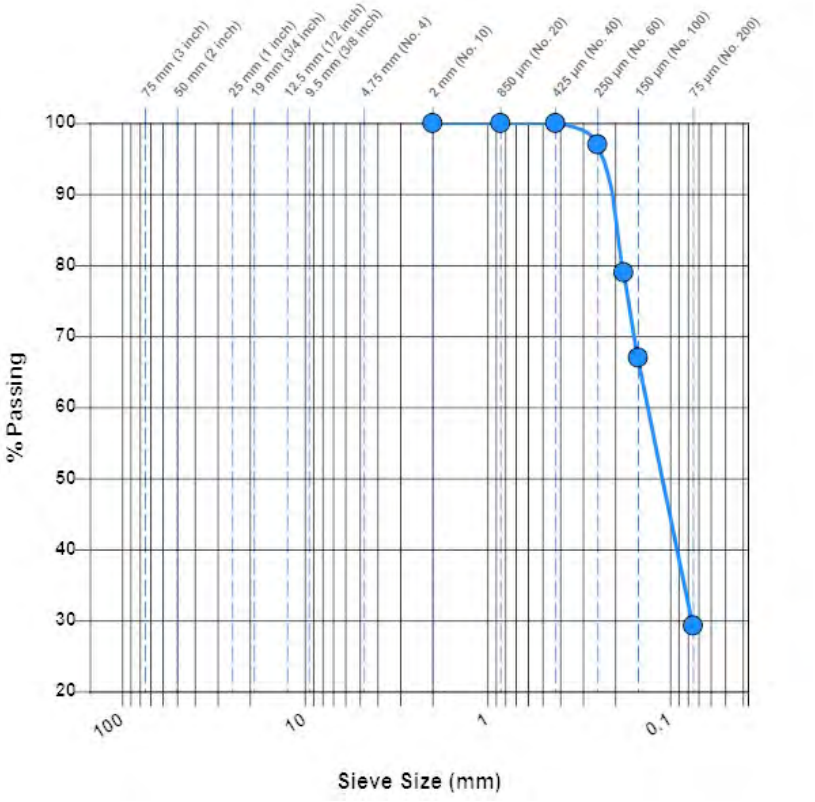
Sample Number:	302578	**Alternate ID:**	46-WB 9.5'-14'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	9.5-14
Boring Number:	46-WB	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 46-WB 9.5'-14'		
Sample Date:	04/03/2020		
Received Date:	04/17/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/22/2020		

Laboratory Data

Sieve Size	% Passing	Specification
2 mm (No. 10)	100	
850 µm (No. 20)	100	
425 µm (No. 40)	100	
250 µm (No. 60)	97	
180 µm (No. 80)	79	
150 µm (No. 100)	67	
75 µm (No. 200)	29.3	

Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry



Classification: SM Silty sand

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample 403.3 grams

Sieve Analysis Of Soil

ASTM D6913

4/22/2020

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Project:

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Enbridge Line 5 Re-route
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Sample Information

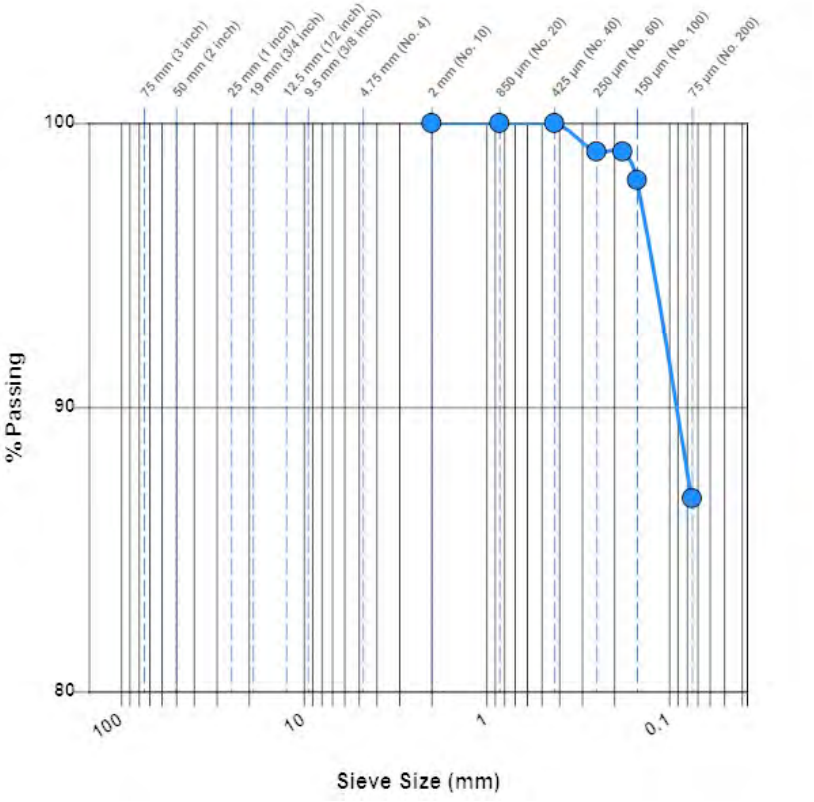
Sample Number:	302579	**Alternate ID:**	46-WB 24.5'-26.5'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	24.5-26.5
Boring Number:	46-WB	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 46-WB 24.5'-26.5'		
Sample Date:	04/03/2020		
Received Date:	04/17/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/22/2020		

Laboratory Data

Sieve Size	% Passing	Specification
2 mm (No. 10)	100	
850 µm (No. 20)	100	
425 µm (No. 40)	100	
250 µm (No. 60)	99	
180 µm (No. 80)	99	
150 µm (No. 100)	98	
75 µm (No. 200)	86.8	

Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry



Classification: ML Silt

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample 273.0 grams

Sieve Analysis Of Soil

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4/22/2020

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Project:

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Enbridge Line 5 Re-route
Enbridge Line 5
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Sample Information

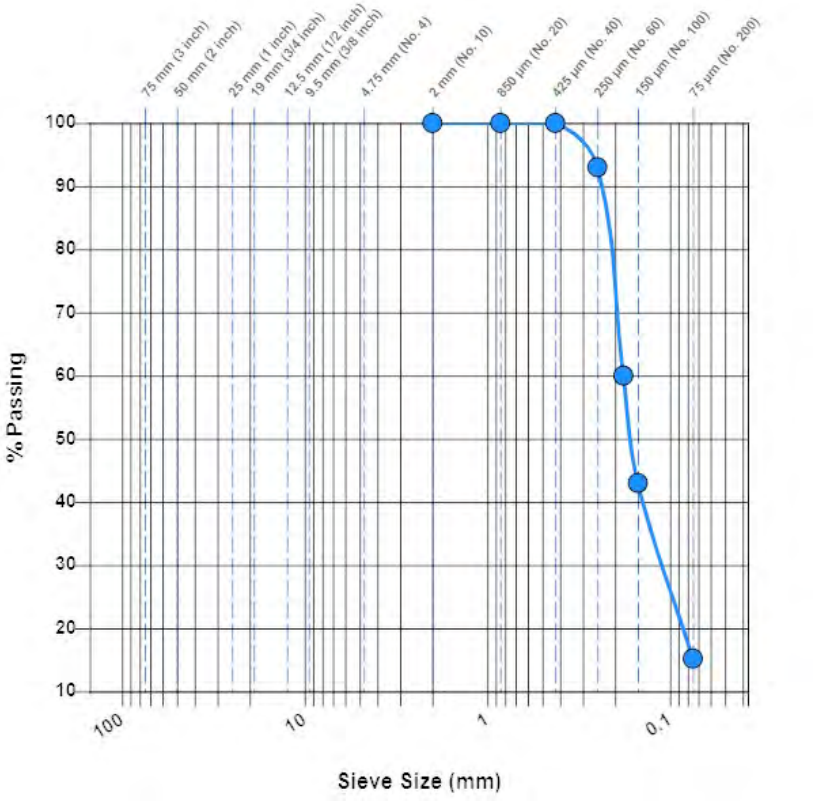
Sample Number:	302580	**Alternate ID:**	46-WB 29.5'-36.5'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	29.5-36.5
Boring Number:	46-WB	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 46-WB 29.5'-36.5'		
Sample Date:	04/03/2020		
Received Date:	04/17/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/22/2020		

Laboratory Data

Sieve Size	% Passing	Specification
2 mm (No. 10)	100	
850 µm (No. 20)	100	
425 µm (No. 40)	100	
250 µm (No. 60)	93	
180 µm (No. 80)	60	
150 µm (No. 100)	43	
75 µm (No. 200)	15.2	

Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry



Classification: SM Silty sand

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample 415.6 grams

Sieve Analysis Of Soil

ASTM D6913

4/22/2020

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:

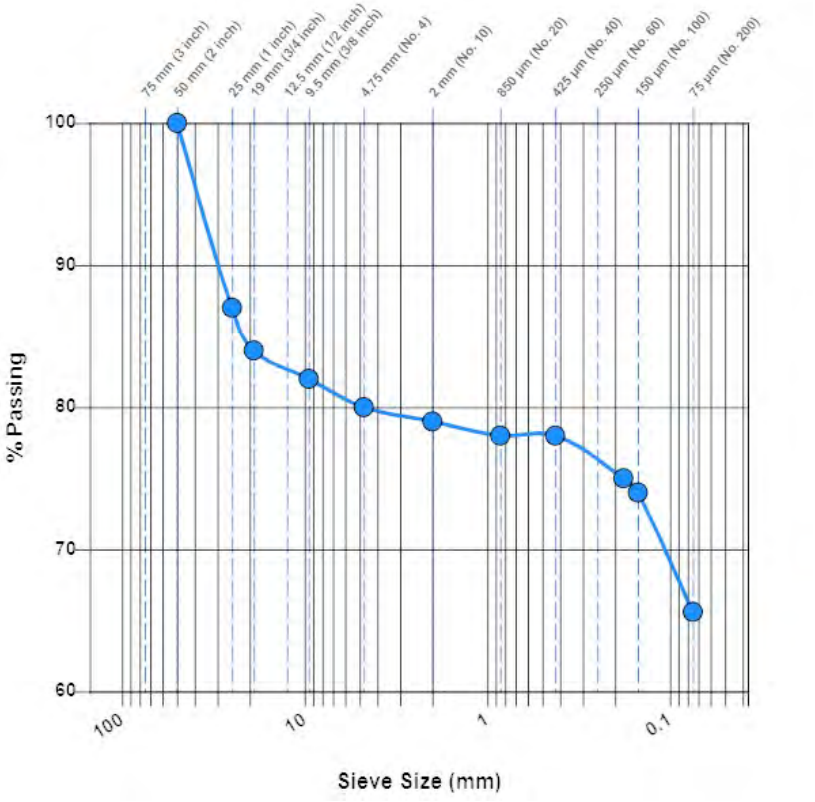
B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	302581	**Alternate ID:**	46-WB 39.5'-46.5'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	39.5-46.5
Boring Number:	46-WB	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 46-WB 39.5'-46.5'		
Sample Date:	04/03/2020		
Received Date:	04/17/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/22/2020		

Laboratory Data

Sieve Size	% Passing	Specification
50 mm (2 inch)	100	
25 mm (1 inch)	87	
19 mm (3/4 inch)	84	
9.5 mm (3/8 inch)	82	
4.75 mm (No. 4)	80	
2 mm (No. 10)	79	
850 µm (No. 20)	78	
425 µm (No. 40)	78	
180 µm (No. 80)	75	
150 µm (No. 100)	74	
75 µm (No. 200)	65.6	



Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry

Classification: ML Sandy silt with gravel

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample 400.4 grams

Sieve Analysis Of Soil

ASTM D6913

4/22/2020

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Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

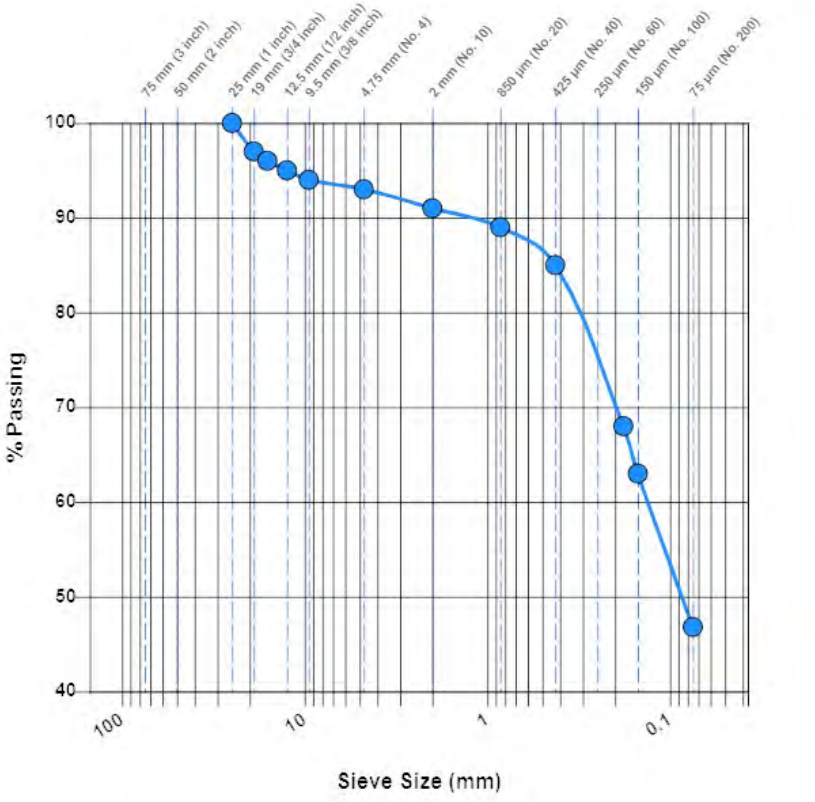
B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	302582	**Alternate ID:**	46-WB 54.5'-61'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	54.5-61
Boring Number:	46-WB	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 46-WB 54.5'-61'		
Sample Date:	04/03/2020		
Received Date:	04/17/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/22/2020		

Laboratory Data

Sieve Size	% Passing	Specification
25 mm (1 inch)	100	
19 mm (3/4 inch)	97	
16 mm (5/8 inch)	96	
12.5 mm (1/2 inch)	95	
9.5 mm (3/8 inch)	94	
4.75 mm (No. 4)	93	
2 mm (No. 10)	91	
850 µm (No. 20)	89	
425 µm (No. 40)	85	
180 µm (No. 80)	68	
150 µm (No. 100)	63	
75 µm (No. 200)	46.8	



Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry

Classification: SM Silty sand

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample 477.8 grams

Sieve Analysis Of Soil

ASTM D6913

4/22/2020

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Project:

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Enbridge Line 5 Re-route
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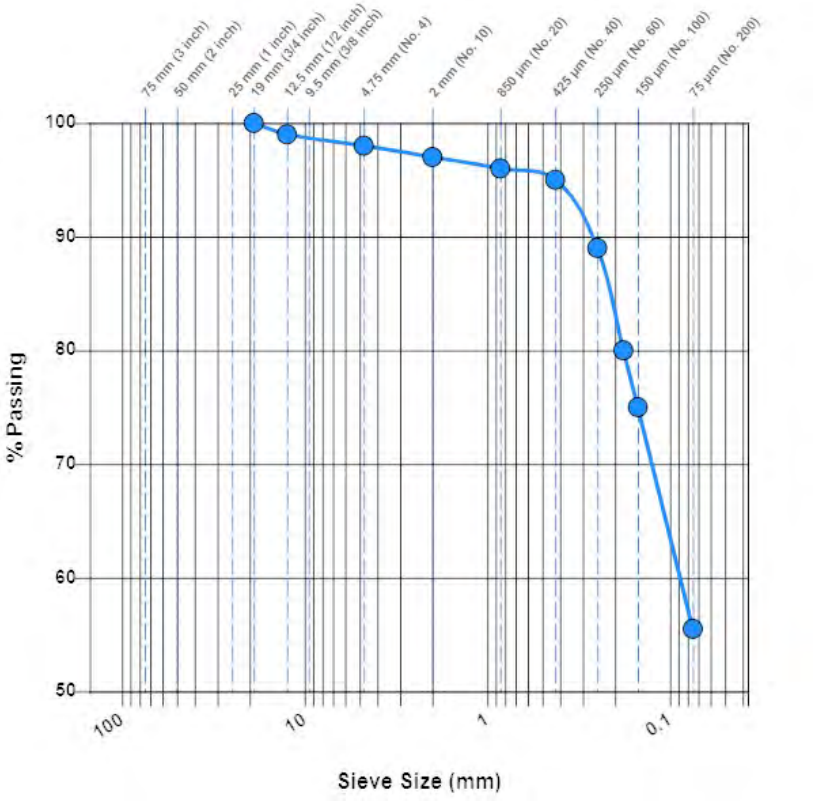
<Blank>, <Blank>

Sample Information

Sample Number:	302583	**Alternate ID:**	46-WB 64.5'-70.4'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	64.5-70.4
Boring Number:	46-WB	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 46-WB 64.5'-70.4'		
Sample Date:	04/03/2020		
Received Date:	04/17/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/22/2020		

Laboratory Data

Sieve Size	% Passing	Specification
19 mm (3/4 inch)	100	
12.5 mm (1/2 inch)	99	
4.75 mm (No. 4)	98	
2 mm (No. 10)	97	
850 µm (No. 20)	96	
425 µm (No. 40)	95	
250 µm (No. 60)	89	
180 µm (No. 80)	80	
150 µm (No. 100)	75	
75 µm (No. 200)	55.5	



Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry

Classification: ML Sandy silt

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample 484.5 grams

Sieve Analysis Of Soil

ASTM D6913

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Project:

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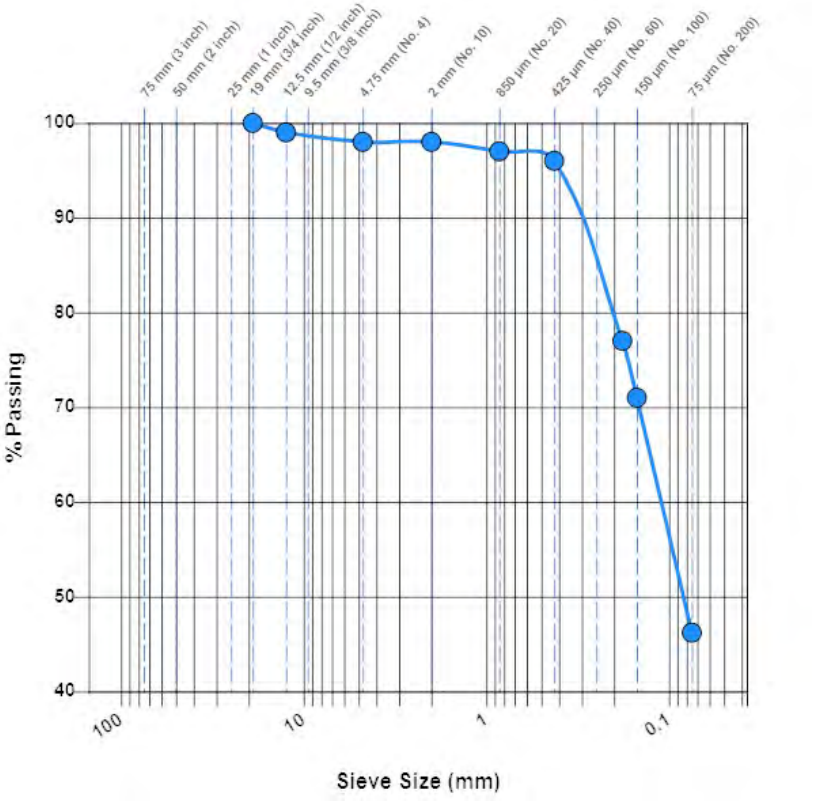
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	302585	**Alternate ID:**	46-WB 74.5'-81'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	74.5-81
Boring Number:	46-WB	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 46-WB 74.5'-81'		
Sample Date:	04/03/2020		
Received Date:	04/17/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/22/2020		

Laboratory Data

Sieve Size	% Passing	Specification
19 mm (3/4 inch)	100	
12.5 mm (1/2 inch)	99	
4.75 mm (No. 4)	98	
2 mm (No. 10)	98	
850 µm (No. 20)	97	
425 µm (No. 40)	96	
180 µm (No. 80)	77	
150 µm (No. 100)	71	
75 µm (No. 200)	46.2	



Test Method: Method A (Composite Sieving)

Specimen Obtained: Oven Dry

Classification: SM Silty sand

General

Results: The test is for informational purposes.

Remarks: Total dry weight of sample 489.0 grams

Sieve Analysis Of Soil

ASTM D6913

4/22/2020

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

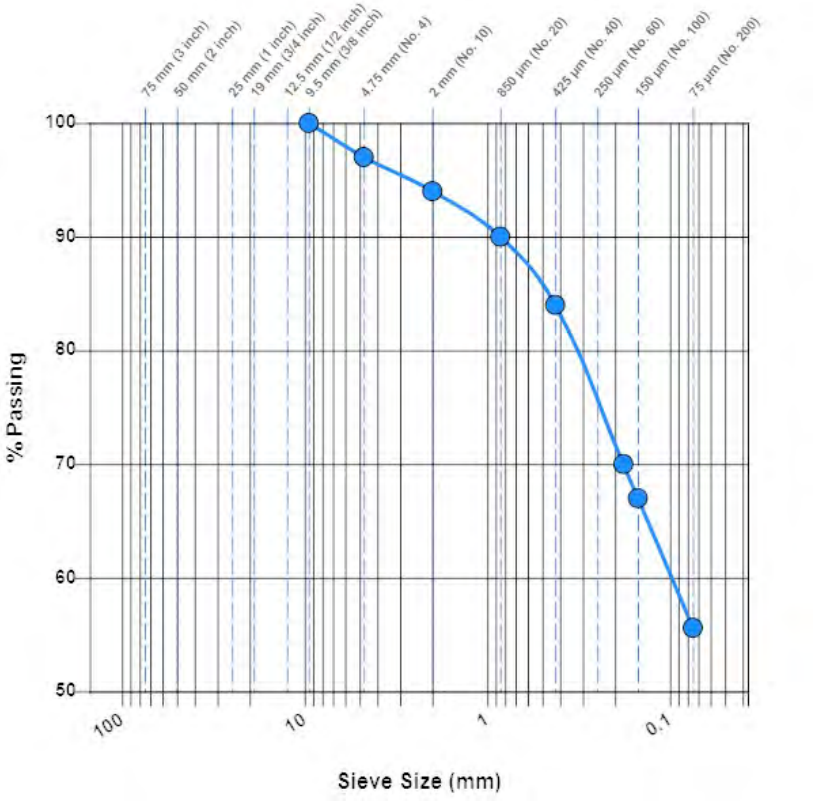
Sample Information

Sample Number:	302587	**Alternate ID:**	46-WB 84.5'-86'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	84.5-86
Boring Number:	46-WB	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Location Details:	Boring 46-WB 84.5'-86'		
Sample Date:	04/06/2020		
Received Date:	04/17/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/22/2020		

Laboratory Data

Sieve Size	% Passing	Specification
9.5 mm (3/8 inch)	100	
4.75 mm (No. 4)	97	
2 mm (No. 10)	94	
850 µm (No. 20)	90	
425 µm (No. 40)	84	
180 µm (No. 80)	70	
150 µm (No. 100)	67	
75 µm (No. 200)	55.6	

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



Classification: ML Sandy silt

General

Results: The test is for informational purposes.
Remarks: Total dry weight of sample 272.0 grams

Sieve Analysis Of Soil

ASTM D6913

7/9/2020

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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:	320059	**Alternate ID:**	47WB-1 18 70'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	70
Boring Number:	47WB-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 47WB-1 Sample 18 70'		
Sample Date:	06/12/2020		
Received Date:	07/06/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	07/08/2020	**Tested By:**	Nelson, Brennan

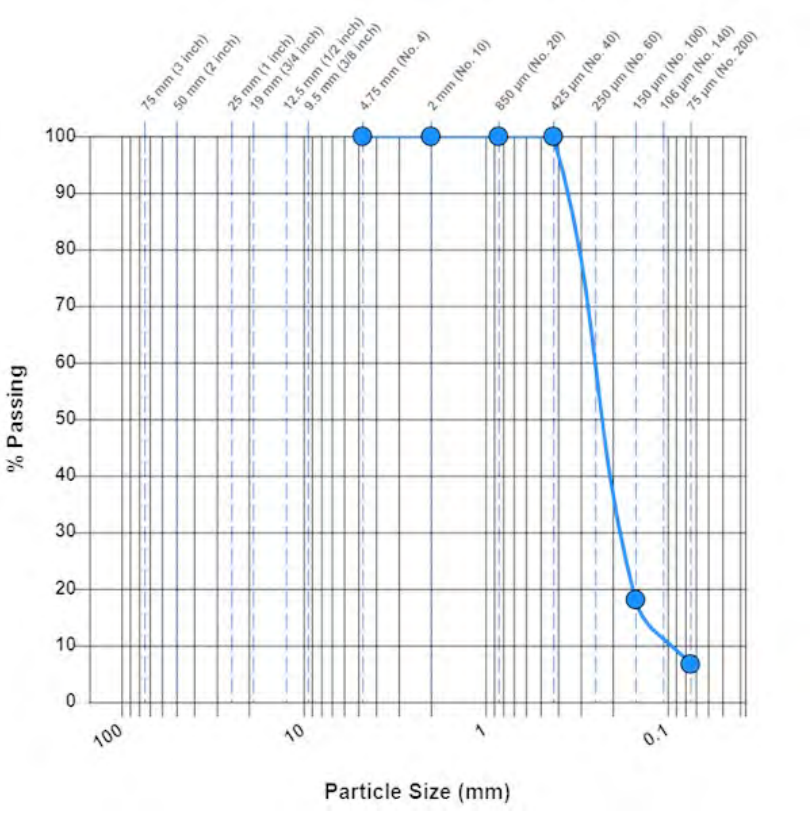
Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
850 µm (No. 20)	100.0	
425 µm (No. 40)	100.0	
150 µm (No. 100)	18.1	
75 µm (No. 200)	6.7	

Sand (%)	Silt & Clay (%)
93.3	6.7

D10	D30	D60
0.084	0.165	0.201

C_U	C_C
2.39	1.61



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 is 176.6 grams.

Sieve Analysis Of Soil

ASTM D6913

7/10/2020

4511 West First Street
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Phone: 218-624-4967

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

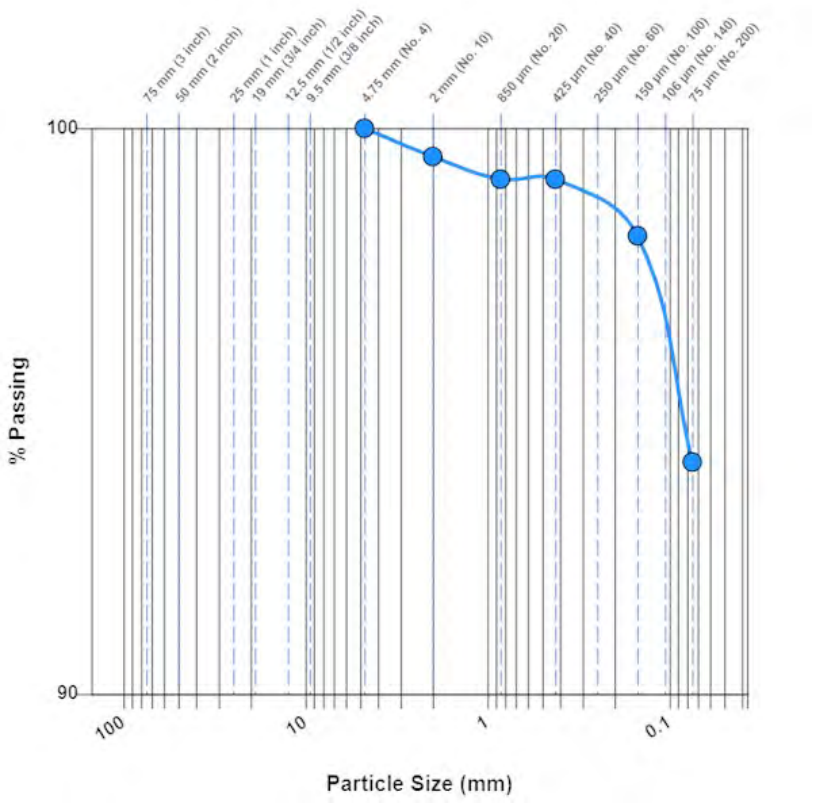
Sample Number:	320084	**Alternate ID:**	47WB-1 25 105'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	105
Boring Number:	47WB-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 47WB-1 Sample 25 105'		
Sample Date:	06/15/2020		
Received Date:	07/06/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	07/08/2020	**Tested By:**	Nelson, Brennan

Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	99.5	
850 µm (No. 20)	99.1	
425 µm (No. 40)	99.1	
150 µm (No. 100)	98.1	
75 µm (No. 200)	94.1	

Sand (%) 5.9

Silt & Clay (%) 94.1



Classification: ML 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 is 171.9 grams.

Sieve Analysis Of Soil

ASTM D6913

7/10/2020

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Phone: 218-624-4967

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

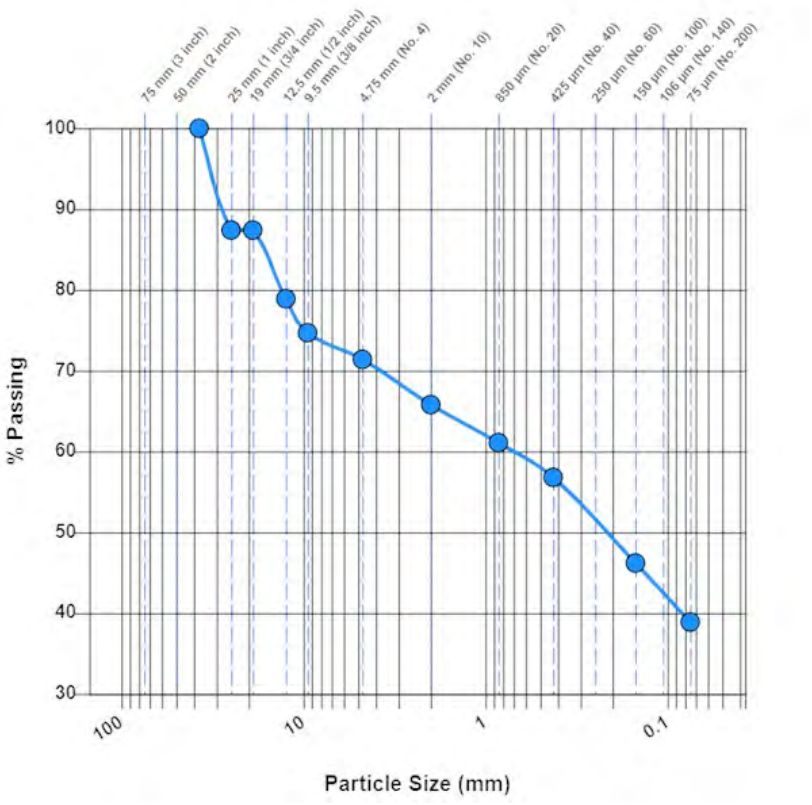
Sample Number:	320060	**Alternate ID:**	47WB-1 30 130'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	130
Boring Number:	47WB-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 47WB-1 Sample 30 130'		
Sample Date:	06/16/2020		
Received Date:	07/06/2020	**Lab:**	4511 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)	87.4	
12.5 mm (1/2 inch)	78.9	
9.5 mm (3/8 inch)	74.7	
4.75 mm (No. 4)	71.4	
2 mm (No. 10)	65.8	
850 µm (No. 20)	61.1	
425 µm (No. 40)	56.8	
150 µm (No. 100)	46.2	
75 µm (No. 200)	38.9	

Gravel (%)	Sand (%)	Silt & Clay (%)
28.6	32.5	38.9

D60
0.741



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 220.3 grams.

Sieve Analysis Of Soil

ASTM D6913

7/9/2020

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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:	320057	**Alternate ID:**	47WB-1 5 10'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	10
Boring Number:	47WB-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 47WB-1 Sample 5 10'		
Sample Date:	06/11/2020		
Received Date:	07/06/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	07/08/2020	**Tested By:**	Nelson, Brennan

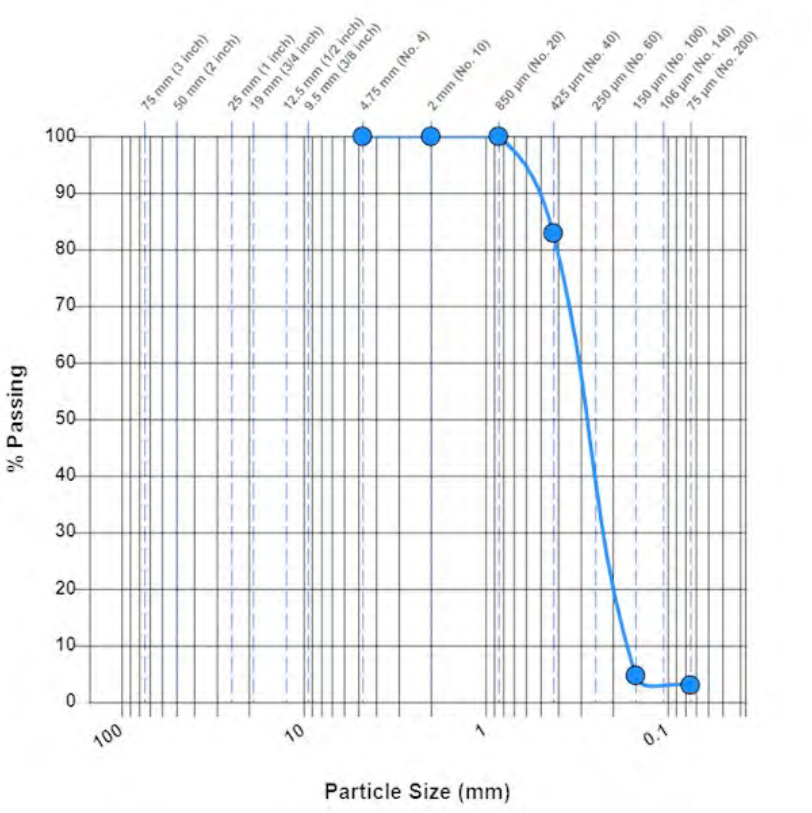
Laboratory Data

Sieve Size	Passing (%)	Specification
850 µm (No. 20)	100.0	
425 µm (No. 40)	82.9	
150 µm (No. 100)	4.7	
75 µm (No. 200)	3.0	

Sand (%)	Silt & Clay (%)
97.0	3.0

D10	D30	D60
0.157	0.182	0.221

C_U	C_C
1.41	0.95



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 sample is 212.9 grams.

Sieve Analysis Of Soil

ASTM D6913

7/9/2020

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

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:	320058	**Alternate ID:**	47WB-1 12 40'
Sampling Method:	Auger Boring ASTM D1452	**Depth (ft):**	40
Boring Number:	47WB-1	**Sampled By:**	Drill Crew
Location:	In-place		
Location Details:	Boring 47WB-1 Sample 12 40'		
Sample Date:	06/12/2020		
Received Date:	07/06/2020	**Lab:**	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	07/08/2020	**Tested By:**	Nelson, Brennan

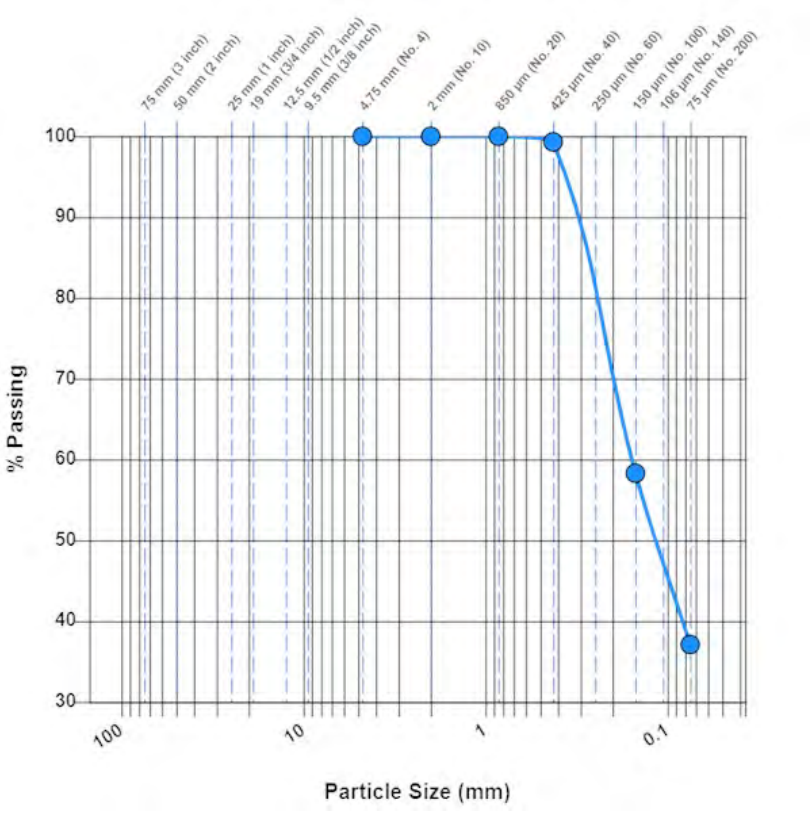
Laboratory Data

Sieve Size	Passing (%)	Specification
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
850 µm (No. 20)	100.0	
425 µm (No. 40)	99.3	
150 µm (No. 100)	58.3	
75 µm (No. 200)	37.1	

Sand (%)
62.9

Silt & Clay (%)
37.1

D60
0.154



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 257.1 grams.

Moisture Content Of Soil

ASTM D2216

4/7/2020

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

Client:

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	300697	**Alternate ID:**	82-C-1 12'-16.5'
Sampling Method:	Auger Boring ASTM D1452	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab**:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020	**Tested By:**	Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
82-C-1	6 & 7	14.0	17.9

General

Results: The test is for informational purposes.

Moisture Content Of Soil

ASTM D2216

4/7/2020

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Phone: 218-624-4967

Client:

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Houston, TX 77056

Project:

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Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	300698	**Alternate ID:**	82-C-1 24.5'-26.5'
Sampling Method:	Auger Boring ASTM D1452	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab**:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020	**Tested By:**	Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
82-C-1	9	25.0	15.8

General

Results: The test is for informational purposes.

Moisture Content Of Soil

ASTM D2216

4/7/2020

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

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	300700	**Alternate ID:**	82-C-1 30'-32'
Sampling Method:	Auger Boring ASTM D1452	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab**:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020	**Tested By:**	Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
82-C-1	10	31.0	17.2

General

Results: The test is for informational purposes.

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Moisture Content Of Soil

ASTM D2216

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Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
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Sample Information

Sample Number:	300701	**Alternate ID:**	82-C-1 35'-37'
Sampling Method:	Auger Boring ASTM D1452	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab**:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020	**Tested By:**	Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
82-C-1	11	36.0	16.4

General

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Moisture Content Of Soil

ASTM D2216

4/7/2020

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Attn: Accounts Payable5400 Westheimer Ct
Houston, TX 77056

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	300702	**Alternate ID:**	82-C-1 60'-67'
Sampling Method:	Auger Boring ASTM D1452	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab**:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020	**Tested By:**	Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
82-C-1	16 & 17	63.0	11.7

General

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

Moisture Content Of Soil

ASTM D2216

4/7/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number:	300704	**Alternate ID:**	82-C-1 85'-92'
Sampling Method:	Auger Boring ASTM D1452	**Sampled By:**	Patterson, Gregg
Location:	In-place		
Sample Date:	04/06/2020		
Received Date:	04/07/2020	**Lab**:	4511 West First Street, Suite 4, Duluth, MN
Tested Date:	04/07/2020	**Tested By:**	Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
82-C-1	21 & 22	88.0	12.6

General

BRAUN INTERTEC
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Moisture Content Of Soil

ASTM D2216

6/18/2020

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: 315528
Sampling Method: Auger Boring ASTM D1452
Location: In-place
Location Details: Boring 83-1-C Sample 4 7'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Tested Date: 06/17/2020

Alternate ID: 83-1-C Sample 4 7'
Sampled By: Drill Crew
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
83-1-C	4	7.5	11.0

General

Results: The test is for informational purposes.

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4511 West First Street
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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

6/18/2020

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: 315530
Sampling Method: Auger Boring ASTM D1452
Location: In-place
Location Details: Boring 83-1-C Sample 7 15'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Tested Date: 06/17/2020

Alternate ID: 83-1-C Sample 7 15'
Sampled By: Drill Crew
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
83-1-C	7	15.0	6.0

General

Results: The test is for informational purposes.

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

Moisture Content Of Soil

ASTM D2216

6/19/2020

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: 315531
Alternate ID: 83-C-1 Sample 11 35'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 83-C-1 Sample 11 35'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/17/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
83-1-C	11	35.0	23.8

General

Results: The test is for informational purposes.

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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

6/19/2020

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: 315532
Alternate ID: 83-C-1 Sample 14 50'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 83-C-1 Sample 14 50'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/17/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
83-1-C	14	50.0	19.2

General

Results: The test is for informational purposes.

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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

6/19/2020

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: 315533
Alternate ID: 83-C-1 Sample 19 75'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 83-C-1 Sample 19 75'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/17/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
83-C-1	19	75.0	26.4

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

6/19/2020

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: 315534
Alternate ID: 83-C-1 24 100'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 83-C-1 Sample 24 100'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/17/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
83-1-C	24	100.0	24.8

General

Results: The test is for informational purposes.

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

Moisture Content Of Soil

ASTM D2216

6/19/2020

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: 315535
Alternate ID: 83-C-1 29 125'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 83-C-1 Sample 29 125'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/17/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
81-1-C	29	125.0	24.6

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

6/19/2020

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: 315536
Alternate ID: 83-C-1 34 150'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 83-C-1 Sample 34 150'
Sample Date: 06/15/2020
Received Date: 06/15/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 06/17/2020
Tested By: Nelson, Brennan

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
83-1-C	34	150.0	18.5

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

4/20/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number: 302576
Alternate ID: Boring 46-WB 4.5'-9'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Patterson, Gregg
Location: In-place
Location Details: Boring 46-WB 4.5'-9'
Sample Date: 04/03/2020
Received Date: 04/17/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 04/20/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
46-WB	3 & 4	7.0	18.4

General

Results: The test is for informational purposes.

Remarks: Total dry weight of material 402.8 grams

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4511 West First Street
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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

4/20/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number: 302578
Alternate ID: 46-WB 9.5'-14'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Patterson, Gregg
Location: In-place
Location Details: Boring 46-WB 9.5'-14'
Sample Date: 04/03/2020
Received Date: 04/17/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 04/20/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
46-WB	5 & 6	11.0	22.6

General

Results: The test is for informational purposes.

Remarks: Total dry weight of material 403.3 grams

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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

4/20/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number: 302579
Alternate ID: 46-WB 24.5'-26.5'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Patterson, Gregg
Location: In-place
Location Details: Boring 46-WB 24.5'-26.5'
Sample Date: 04/03/2020
Received Date: 04/17/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 04/20/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
46-WB	9	25.0	22.6

General

Results: The test is for informational purposes.

Remarks: Total dry weight of material 273.0 grams

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Moisture Content Of Soil

ASTM D2216

4/20/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number: 302580
Alternate ID: 46-WB 29.5'-36.5'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Patterson, Gregg
Location: In-place
Location Details: Boring 46-WB 29.5'-36.5'
Sample Date: 04/03/2020
Received Date: 04/17/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 04/20/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
46-WB	10 & 11	33.0	23.2

General

Results: The test is for informational purposes.

Remarks: Total dry weight of material 481.9 grams

BRAUN INTERTEC
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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

4/20/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number: 302581
Alternate ID: 46-WB 39.5'-46.5'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Patterson, Gregg
Location: In-place
Location Details: Boring 46-WB 39.5'-46.5'
Sample Date: 04/03/2020
Received Date: 04/17/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 04/20/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
46-WB	12 & 13	43.0	20.9

General

Results: The test is for informational purposes.

Remarks: Total dry weight of material 400.4 grams

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4511 West First Street
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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

4/20/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number: 302582
Alternate ID: 46-WB 54.5'-61'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Patterson, Gregg
Location: In-place
Location Details: Boring 46-WB 54.5'-61'
Sample Date: 04/03/2020
Received Date: 04/17/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 04/20/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
46-WB	15 & 16	58.0	13.8

General

Results: The test is for informational purposes.

Remarks: Total dry weight of material 477.8 grams

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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

4/20/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number: 302583
Alternate ID: 46-WB 64.5'-70.4'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Patterson, Gregg
Location: In-place
Location Details: Boring 46-WB 64.5'-70.4'
Sample Date: 04/03/2020
Received Date: 04/17/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 04/20/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
46-WB	17 & 18	67.0	15.3

General

Results: The test is for informational purposes.

Remarks: Total dry weight of material 484.5 grams

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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

4/20/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number: 302585
Alternate ID: 46-WB 74.5'-81'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Patterson, Gregg
Location: In-place
Location Details: Boring 46-WB 74.5'-81'
Sample Date: 04/03/2020
Received Date: 04/17/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 04/20/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
46-WB	19 & 20	78.0	15.5

General

Results: The test is for informational purposes.

Remarks: Total dry weight of material 489.0 grams

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Moisture Content Of Soil

ASTM D2216

4/20/2020

Client:

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

Project:

B2001991
Enbridge Line 5 Re-route
Enbridge Line 5
<Blank>, <Blank>

Sample Information

Sample Number: 302587
Alternate ID: 46-WB 84.5'-86'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Patterson, Gregg
Location: In-place
Location Details: Boring 46-WB 84.5'-86'
Sample Date: 04/06/2020
Received Date: 04/17/2020
Lab: 4511 West First Street, Suite 4, Duluth, MN
Tested Date: 04/20/2020
Tested By: Patterson, Gregg

Laboratory Data

Boring #	Sample #	Depth (ft)	Moisture Content (%)
46-WB	1357.1	85.0	12.0

General

Results: The test is for informational purposes.

Remarks: Total dry weight of material 272.0 grams

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The Science You Build On.

4511 West First Street
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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

7/9/2020

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: 320057
Alternate ID: 47WB-1 5 10'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 47WB-1 Sample 5 10'
Sample Date: 06/11/2020
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 (%)
47WB-1	5	10.0	26.9

General

Results: The test is for informational purposes.

Moisture Content Of Soil

7/9/2020

ASTM D2216

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: 320058
Alternate ID: 47WB-1 12 40'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 47WB-1 Sample 12 40'
Sample Date: 06/12/2020
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 (%)
47WB-1	12	40.0	15.8

General

Results: The test is for informational purposes.

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Suite 4
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Phone: 218-624-4967

Moisture Content Of Soil

ASTM D2216

7/9/2020

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: 320059
Alternate ID: 47WB-1 18 70'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 47WB-1 Sample 18 70'
Sample Date: 06/12/2020
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 (%)
47WB-1	18	70.0	24.5

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: 320084
Alternate ID: 47WB-1 25 105'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 47WB-1 Sample 25 105'
Sample Date: 06/15/2020
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 (%)
47WB-1	25	105.0	21.8

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: 320060
Alternate ID: 47WB-1 30 130'
Sampling Method: Auger Boring ASTM D1452
Sampled By: Drill Crew
Location: In-place
Location Details: Boring 47WB-1 Sample 30 130'
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 (%)
47WB-1	30	130.0	11.1

General

Results: The test is for informational purposes.

Hydrometer And Sieve Analysis

ASTM D422

7/8/2020

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

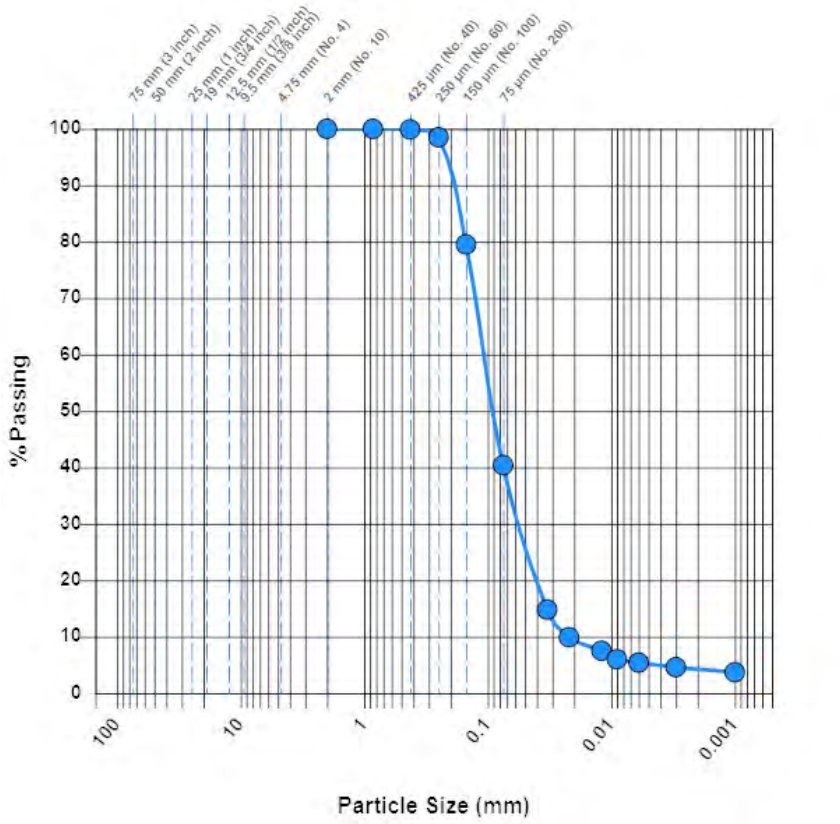
Sample Information

Sample Number:	320587	**Depth (ft):**	30
Boring Number:	83-C-1	**Sampled By:**	Drill Crew
Sample Date:	06/16/2020		
Received Date:	07/08/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	07/08/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
2 mm (No. 10)	100.0	-
850 µm (No. 20)	100.0	-
425 µm (No. 40)	99.9	-
250 µm (No. 60)	98.5	-
150 µm (No. 100)	79.5	-
75 µm (No. 200)	40.4	-
33.1 (µm)	14.8	-
21.6 (µm)	9.9	-
12.2 (µm)	7.5	-
9.0 (µm)	6.0	-
6.4 (µm)	5.4	-
3.1 (µm)	4.6	-
1.4 (µm)	3.7	-



Soil Classification: SM Silty sand

Gravel (%):	0	**Sand (%):**	59.6	**Silt (%):**	35.3	**Clay (%):**	5.1		
D_{60} (µm):	112.6	**D_{30} (µm):**	57.9	**D_{10} (µm):**	22.2	**C_u:**	5.07	**C_c:**	1.34

General

Hydrometer And Sieve Analysis

ASTM D422

5/1/2020

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
<Blank>, <Blank>

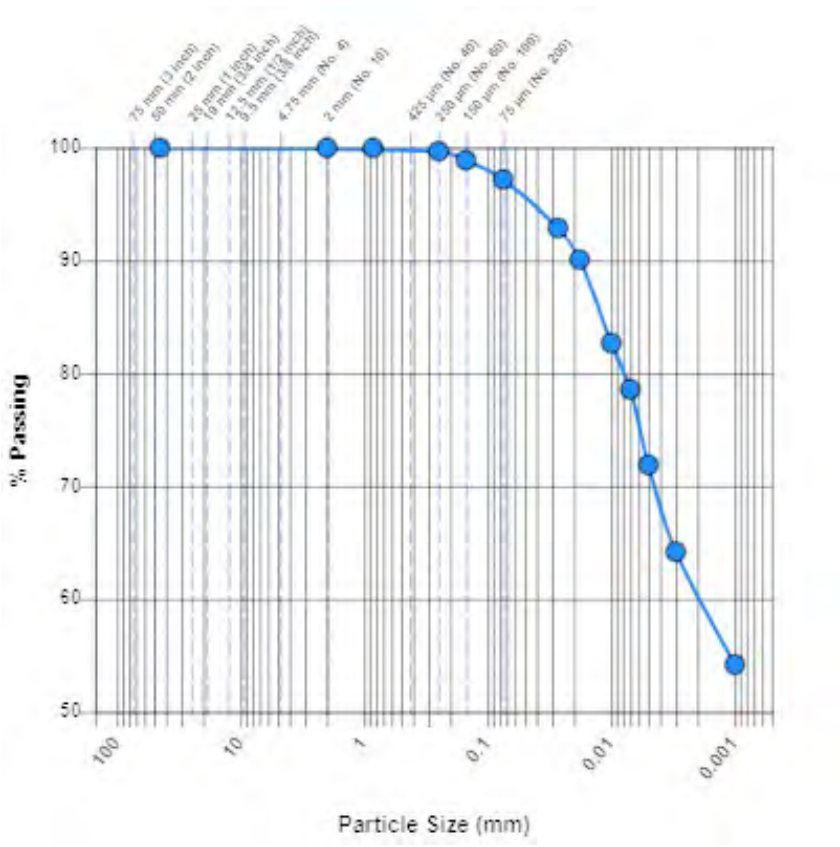
Sample Information

Sample Number:	305492	**Depth (ft):**	14.5-16.5
Boring Number:	46-WB	**Sampled By:**	Drill Crew
Sample Date:	05/01/2020		
Received Date:	05/01/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	05/01/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
2 mm (No. 10)	100.0	-
850 µm (No. 20)	100.0	-
425 µm (No. 40)	100.0	-
250 µm (No. 60)	99.7	-
150 µm (No. 100)	98.9	-
75 µm (No. 200)	97.2	-
27.3 (µm)	92.9	-
17.5 (µm)	90.1	-
10.4 (µm)	82.7	-
7.4 (µm)	78.6	-
5.2 (µm)	71.9	-
2.7 (µm)	64.2	-
1.2 (µm)	54.2	-



Soil Classification: CH Fat clay

Gravel (%):	0	**Sand (%):**	2.8	**Silt (%):**	25.3	**Clay (%):**	71.9

D_{60} (µm): 2.2

General

Braun Intertec Corporation
4511 West First Street, Suite 4
Duluth, MN 55807

Phone: 218.624.4967
Fax: 218.624.0196
Web: braunintertec.com

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

Date: April 13, 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:	3/19 - 4/2
Samples Obtained By:	EPC
Date Received:	4/8/2020
Sample Preparation:	Trim and Polished

Laboratory Data

Location: 82-C-1						ASTM D4543 Limits
Sample Number:	102'-103'	120'-121'	140'-141'	160'-161'	180'-181'	
Date Tested:	4/10/2020	4/10/2020	4/10/2020	4/10/2020	4/10/2020	
Rock Type:	Conglomerate	Conglomerate	Conglomerate	Conglomerate	Conglomerate	
Moisture Condition During Testing:	As Received	As Received	As Received	As Received	As Received	
Diameter (in.):	1.77	1.77	1.77	1.77	1.77	
Length (in.):	4.12	4.17	4.52	4.76	4.75	
Length-to-Diameter Ratio (L/D):	2.3	2.4	2.6	2.7	2.7	$2.0 \leq L/D \leq 2.5$
Side Tolerance, Maximum (in.)	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020	≤ 0.020 in.
End Tolerance, Maximum (in.)	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in.
Perpendicularity Deviation (^{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):	45,030	46,670	15,690	48,810	34,190	
Area (in^2):	2.46	2.46	2.46	2.46	2.46	
Compressive Strength (psi):	18,300	18,970	6,380	19,840	13,900	
Compressive Strength (MPa):	124	129	43	135	94	

Remarks:

Reviewed By:
David Morrison

Project Manager

BRAUN INTERTEC
The Science You Build On.

Braun Intertec Corporation
4511 West First Street, Suite 4
Duluth, MN 55807

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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: April 13, 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:	3/19 - 4/2
Samples Obtained By:	EPC
Date Received:	4/8/2020
Sample Preparation:	Trim and Polished

Laboratory Data

			ASTM D4543 Limits
Location: 82-C-1			
Sample Number:	200-201	212-213	
Date Tested:	4/10/2020	4/10/2020	
Rock Type:	Conglomerate	Conglomerate	
Moisture Condition During Testing:	As Received	As Received	
Diameter (in.):	1.99	1.98	
Length (in.):	4.48	4.76	
Length-to-Diameter Ratio (L/D):	2.3	2.4	$2.0 \leq L/D \leq 2.5$
Side Tolerance, Maximum (in.)	≤ 0.020	≤ 0.020	≤ 0.020 in.
End Tolerance, Maximum (in.)	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in.
Perpendicularity Deviation (^{o})	≤ 0.001 in	≤ 0.001 in	$\leq 0.250^o$
Parallelism Deviation (^{o})	≤ 0.001 in	≤ 0.001 in	$\leq 0.25^o$
Maximum Load (lbs):	32,730	29,410	
Area (in^2):	3.11	3.08	
Compressive Strength (psi):	10,520	9,550	
Compressive Strength (MPa):	71	65	

Remarks:

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: April 24, 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:	4/8/2020
Samples Obtained By:	EPC
Date Received:	4/23/2020
Sample Preparation:	Trim and Polished

Laboratory Data

Location: 46WB

Sample Number:	94'-95'	112'-113'	123'-124'	ASTM D4543 Limits
Date Tested:	4/10/2020	4/10/2020	4/10/2020	
Rock Type:	Shale	Shale	Shale	
Moisture Condition During Testing:	As Received	As Received	As Received	
Diameter (in.):	1.98	1.98	1.98	
Length (in.):	4.72	4.52	4.61	
Length-to-Diameter Ratio (L/D):	2.4	2.3	2.3	$2.0 \leq L/D \leq 2.5$
Side Tolerance, Maximum (in.)	≤ 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.
Perpendicularity Deviation (°)	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.250°
Parallelism Deviation (°)	≤ 0.001 in	≤ 0.001 in	≤ 0.001 in	≤ 0.25°
Maximum Load (lbs):	40,130	32,320	29,650	
Area (in^2):	3.08	3.08	3.08	
Compressive Strength (psi):	13,030	10,490	9,630	
Compressive Strength (MPa):	88	71	65	

Remarks:

Reviewed By:
David Morrison

Project Manager