



THURBER ENGINEERING LTD.

**PRELIMINARY FOUNDATION INVESTIGATION REPORT
NESTOR FALLS BRIDGE REHABILITATION OR REPLACEMENT
HIGHWAY 71, NESTOR FALLS, ONTARIO
AGREEMENT 6021-E-0005, WORK ORDER 2
G.W.P. 6055-18-00, SITE NO. 41S-0074/B0
LATITUDE: 49.115225°, LONGITUDE: -93.926147°**

GEOCRES No.: 52F-69

Report

to

HATCH

Date: August 28, 2023
File: 34988



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1. INTRODUCTION

This report presents the factual data obtained from a foundation investigation carried out by Thurber Engineering Ltd. (Thurber) to support the preliminary design for rehabilitation or replacement of the Nestor Falls Bridge. The Nestor Falls Bridge is located on Highway 71, in Nestor Falls, Ontario.

The purpose of this investigation was to explore the subsurface conditions and based on the data obtained, to provide a borehole location plan, stratigraphic profile, records of boreholes, laboratory test results, and a written description of the subsurface conditions.

Thurber carried out the investigation as a sub-consultant to Hatch, under the Ministry of Transportation Ontario (MTO) Retainer Agreement Number 6021-E-0005, Work Order 2.

It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

2. SITE DESCRIPTION

The site is located on Highway 71 approximately 300 m south of Arrowhead Road in Nestor Falls, Ontario. Highway 71 and the existing bridge are aligned in a general north-south direction across Nestor Falls, which flows from Kakabikitchiwan Lake on the east side of Highway 71 to Lake of the Woods (Sabaskong Bay) on the west side.

The Nestor Falls bridge is situated within the community of Nestor Falls. The bridge is located adjacent to the Nestor Falls dam spillway structure, which is on the west of Highway 71 (see Photos D3 and D4 in Appendix D). The site is surrounded by lakes to the east and west, with nearby residential and commercial properties located north and south of the bridge. The surrounding lands are heavily forested with bedrock outcrops visible nearby and along the



highway. The existing bridge is an approximately 15 m long, single span concrete bridge supported on spread footings likely founded on bedrock. Photographs of the bridge and surrounding area are presented in Appendix D.

Based on published geological information, the general site area lies within the physiographic region known as the Canadian Shield, characterized by Precambrian bedrock (Foliated tonalite suite; consisting of folded tonalite to foliated to massive granodiorite) exposed at the ground surface or covered by a discontinuous thin layer of drift.

3. INVESTIGATION PROCEDURES

The site investigation and field-testing program for this project was carried out from November 9th to November 11th, 2022. The field program consisted of drilling and sampling two (2) boreholes, 22-01 and 22-02, to depths of 7.2 m and 9.1 m below the existing ground surface (Elevation 324.9 and 322.9 m), respectfully.

Boreholes 22-01 and 22-02 were drilled through the paved portion of Highway 71. The approximate borehole locations are shown on the attached Borehole Locations and Soil Strata Drawing in Appendix A. The Record of Borehole sheets are included in Appendix B.

Utility clearances were obtained prior to the start of drilling. The ground surface elevations for the boreholes were estimated from field measurements and the topographic drawings provided to Thurber by Hatch. The coordinate system MTM NAD 83, Zone 16 was used for the boreholes.

The boreholes for the project were advanced using a truck-mounted CME75 drill rig, using wash boring techniques and NQ coring. In all boreholes, soil samples were obtained at selected intervals with a 50 mm outside diameter split spoon sampler driven in conjunction with the Standard Penetration Test (SPT). Bedrock coring using an NQ size core barrel was used to advance both boreholes into bedrock.

The drilling and sampling operations were supervised on a full-time basis by a member of Thurber's technical staff. The supervisor logged the boreholes and processed the recovered soil and bedrock samples for transport to Thurber's laboratory for further examination and testing.

The rock cores were logged, and the Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD) and the Fracture Indices (FI) were measured.

Details of the drilling program, including drilling depths and completion details are summarized in Table 3.1 below.

Table 3.1: Borehole Completion Details

Borehole Number	Borehole Depth / Base Elevation (m)	Completion Details
22-01	7.2 / 324.9	Borehole was backfilled with bentonite holeplug to 0.5 m, then concrete to 0.2 m, then asphalt to surface.
22-02	9.1 / 322.9	Borehole was backfilled with bentonite holeplug to 0.5 m, then concrete to 0.2 m, then asphalt to surface.

4. LABORATORY TESTING

All recovered soil samples were subjected to visual identification and natural moisture content determination. Selected samples were subjected to grain size distribution analyses (sieve and hydrometer). Point load tests and two Unconfined Compressive Strength (UCS) tests were conducted on selected rock core samples. The results of this testing program are summarized on the Record of Borehole sheets in Appendix B and are shown on the figures included in Appendix C.

5. DESCRIPTION OF SUBSURFACE CONDITIONS

Details of the encountered soil stratigraphy are presented on the Record of Borehole sheets in Appendix B and on the Borehole Locations and Soil Strata drawing in Appendix A. A general description of the stratigraphy, based on the conditions encountered in the boreholes, is given in the following paragraphs. However, the factual data presented in the Record of Borehole sheets governs any interpretation of the site conditions. It must be recognized that soil conditions may vary between and beyond the borehole locations.

In general, the subsurface stratigraphy below the pavement structure (asphalt and concrete) typically consists of sand to sand and gravel fill overlying granodiorite bedrock. More detailed descriptions of individual strata are presented below.



5.1 Asphalt and Concrete

Both boreholes were drilled through the paved portion of Highway 71, through the concrete bridge approach slabs. The pavement structure in both locations consisted of an asphalt layer of 75 mm thickness, overlying a 200 mm thick concrete slab.

5.2 Sand and Gravel Fill

Sand and gravel fill was encountered below the concrete in Borehole 22-02. The sand and gravel also contained trace silt and occasional large gravel.

The sand and gravel fill was 1.9 m thick, with an underside depth of 2.2 m below ground surface (Elevation 329.8 m).

SPT 'N' values in the sand and gravel fill ranged from 18 to 30 blows per 0.3 m penetration, indicating a compact to dense relative density.

The measured moisture contents ranged from 8 to 13%.

The results of a grain size analysis conducted on a selected sample of the sand and gravel fill is provided on the Record of Borehole sheets in Appendix B and plotted on Figure C1 in Appendix C. The results are summarized as follows:

Soil Particle	Percentage (%)
Gravel	53
Sand	40
Silt & Clay	7

5.3 Sand Fill

Sand fill was encountered below the concrete slab in Borehole 22-01 and below the sand and gravel fill in Borehole 22-02. The sand fill contained trace to some gravel, trace to some silt, trace clay and occasional large gravel and cobbles.

The gravel fill ranged in thickness from 3.6 to 4.2 m, with the underside depth ranging from 4.5 to 5.8 m below ground surface (Elevation 327.6 m to 326.2 m).

SPT 'N' values in the sand fill ranged from 4 to 47 blows per 0.3 m penetration, indicating a loose to dense relative density (typically compact to dense).

The measured moisture contents ranged from 5 to 27%.



The results of grain size analyses conducted on selected samples of the sand fill are provided on the Record of Borehole sheets in Appendix B and plotted on Figure C2 in Appendix C. The results are summarized as follows:

Soil Particle	Percentage (%)
Gravel	5 to 17
Sand	68 to 84
Silt & Clay	11 to 15

5.4 Bedrock

The overburden soils described above are underlain by bedrock. The bedrock is described as granodiorite, is white and grey in colour with pink intrusions, and is slightly weathered to fresh. Bedrock was proven by coring 2.7 to 3.3 m at both borehole locations.

Table 5.1 summarizes the depths and elevations to the top of the bedrock at the borehole locations. Photographs of the rock cores are included in Appendix C.

Table 5.1 - Depths and Elevations of Top of Bedrock

Borehole	Top of Bedrock	
	Depth Below Existing Grade Level (m)	Elevation (m)
22-01	4.5	327.6
22-02	5.8	326.2

Total Core Recovery (TCR) in the bedrock was 100% throughout all runs, and Solid Core Recovery (SCR) ranged between 93% to 100%. The Rock Quality Designation (RQD) determined from the recovered cores ranged between 75% and 100%, which indicates good to excellent rock quality. The Fracture Index (FI) of the rock, expressed as fractures per 0.3 m of core ranged from 0 to 5.

Average unconfined compressive strengths (UCS) of the rock ranged between 175 and 204 MPa. These estimated rock strength values are interpreted from point load tests that were conducted on rock cores recovered from the boreholes. Unconfined Compression Strength (UCS) tests were also conducted on 1 specimen from each of the bedrock core samples. The UCS test results

ranged from 112 to 123 MPa. Based on the test results, the bedrock is typically very strong. The UCS and point load test results are presented in Appendix C.

5.5 Groundwater Conditions

Groundwater conditions were observed during drilling operations and groundwater levels were measured in the open boreholes upon completion of drilling. The measured groundwater levels are summarized in Table 5.2 below.

Table 5.2: Groundwater Measurements

Borehole	Date	Water Level (m)		Remark
		Depth	Elevation	
22-01	November 11, 2022	3.3	328.8	Open Borehole
22-02	November 9, 2022	3.4	328.6	Open Borehole

The groundwater level is likely to reflect the local surface water level at the dam spillway structure. Based on existing survey drawings provided by MTO, in August 2012 the local surface water level was measured at Elevation 328.7 m upstream and Elevation 322.8 m downstream of the dam.

It should also be noted that groundwater levels are short term observations and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after periods of significant and/or prolonged precipitation and spring snow melts. The water level will also vary due to dam control near Nestor Falls.

6. CORROSIVITY AND SULPHATE TEST RESULTS

Samples of the sand fill from Boreholes 22-01 and 22-02, and a sample of surface water collected from upstream of the dam were submitted for analytical testing of corrosivity parameters and sulphate. The laboratory certificates of analysis are presented in Appendix C. The results of the analytical tests are summarized below in Table 6.1.

Table 6.1: Analytical Test Results

Parameter	Units (Soil)	Units (Water)	Sample ID, Depth, Type and Test Results		
			22-01 CORR	22-02 CORR	Nestor Falls
			SS2 1.5 – 2.1 m deep	SS6 4.6 – 5.2 m deep	Surface Water
			Sand Fill, above Groundwater	Sand Fill, below Groundwater	Water
Redox Potential	mV	mV	131	213	224
Sulphide	%	µg/L	<0.04	<0.04	<6
pH	-	-	10.1	11.1	7.31
Chloride	µg/g	mg/L	84	1400	3
Sulphate	µg/g	mg/L	52	100	1.3
Conductivity	µS/cm	µS/cm	294	2120	80
Resistivity	ohm-cm	ohm-cm	3400	471	12,500*

*Calculated based on conductivity result

7. MISCELLANEOUS

Eastern Ontario Diamond Drilling Ltd. of Hawkesbury, Ontario supplied a rubber truck-mounted CME75 drill rig to conduct the drilling, sampling and in-situ testing operations for the boreholes. Traffic control services conforming to Ontario Book 7 were provided by ML Judson Trucking Ltd., of Emo, Ontario.

Geotechnical laboratory testing was carried out in Thurber's geotechnical laboratory. Analytical testing was carried out by SGS Canada Inc.

The field investigation was supervised on a full-time basis by Mr. George Azzopardi of Thurber. Overall supervision of the field program was provided by Ms. Madisan Chiarotto, E.I.T. and Mr. Mark Farrant, P.Eng. of Thurber.

Interpretation of the field data and preparation of this report was carried out by Ms. Madisan Chiarotto, E.I.T. and Mr. Mark Farrant, P.Eng. The report was reviewed by Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.



THURBER ENGINEERING LTD.

Madisan Chiarotto., E.I.T.
Geotechnical Engineering Intern



Mark Farrant, M.Eng., P.Eng.
Associate, Senior Geotechnical Engineer



Dr. P.K. Chatterji, Ph.D., P.Eng.
Designated MTO Principal Contact

STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

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The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

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5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

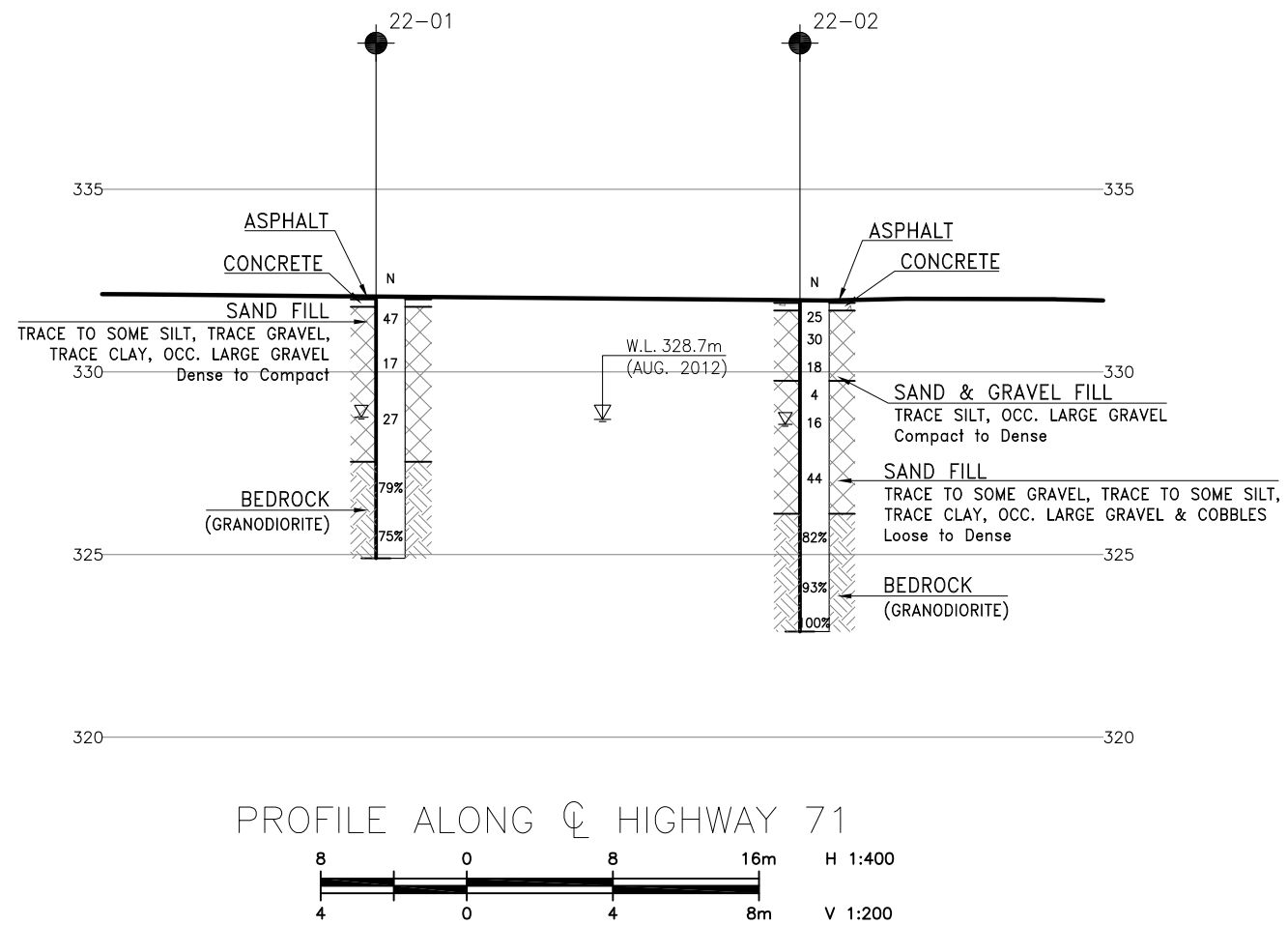
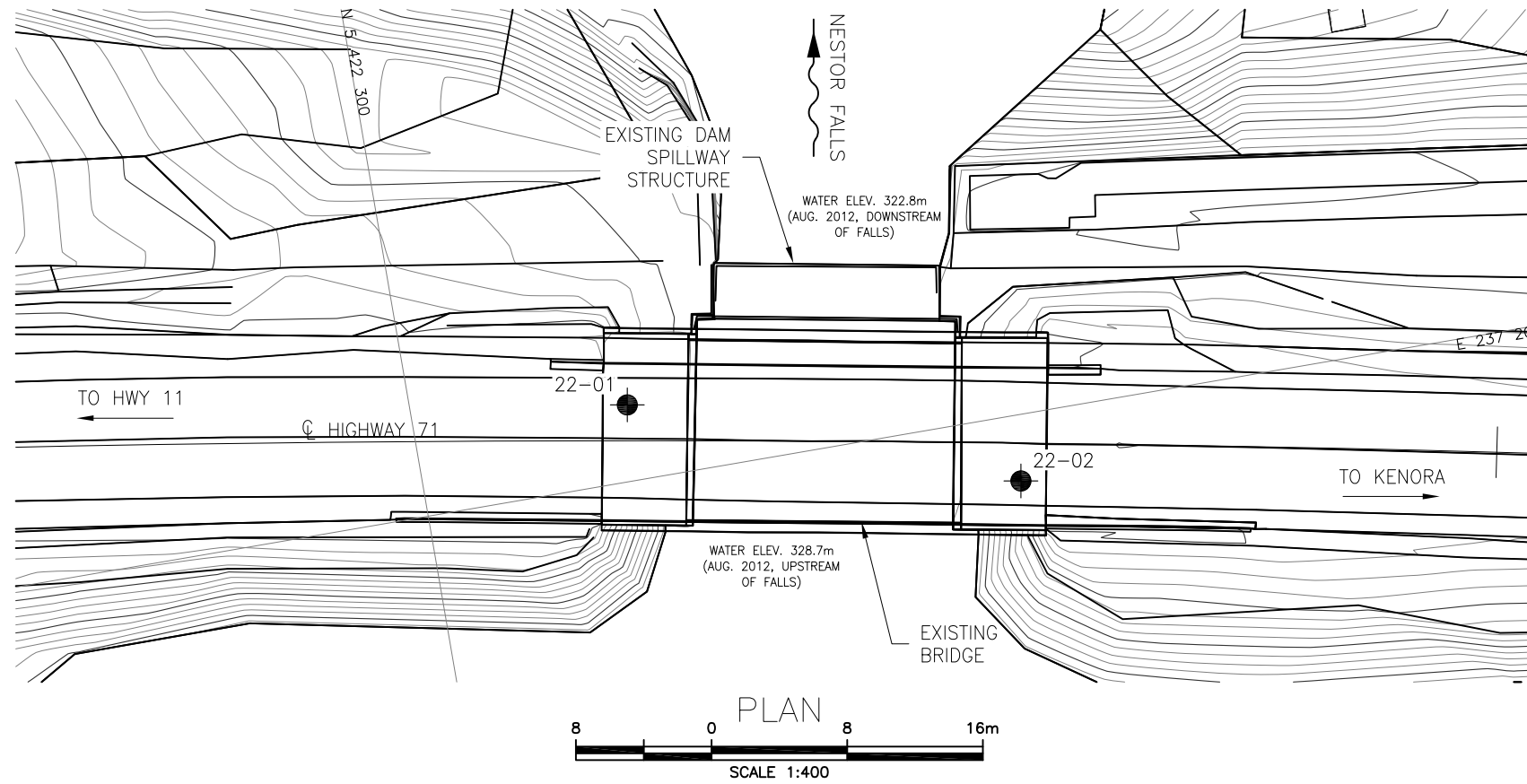
7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.



Appendix A

Borehole Locations and Soil Strata Drawing



METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

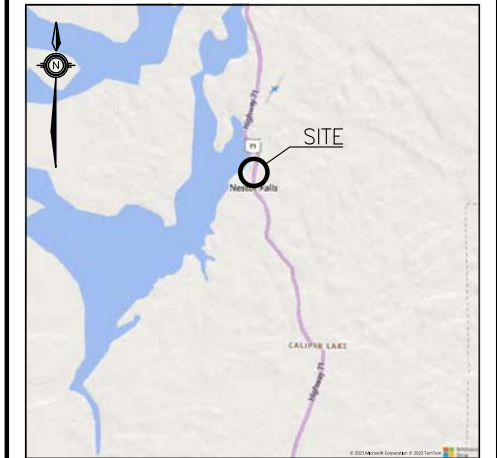


CONT No	
GWP No	6055-18-00

HIGHWAY 71
NESTOR FALLS BRIDGE






BOREHOLE LOCATIONS AND SOIL STRATA

HATCH



KEYPLAN

LEGEND

	Borehole
	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
	Water Level Upon Completion of Drilling
	Water Level in Monitoring Well/Piezometer
	Monitoring Well/Piezometer Screen
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
22-01	332.1	5 442 312.7	237 195.5
22-02	332.0	5 442 334.8	237 203.9

-NOTES-

- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- 2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
- 3) Coordinate system is MTM NAD 83 Zone 16.

GEOCRES No. 52F-69

[illegible]



Appendix B

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT ⁽¹⁾ 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

- 1) Laboratory Triaxial Testing
- 2) Field Insitu Vane Testing
- 3) Laboratory Vane Testing
- 4) SPT value
- 5) Pocket Penetrometer



4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample	TP Thin Wall Piston Sample	
	PH Sampler Advanced by Hydraulic Pressure	PM Sampler Advanced by Manual Pressure	
	WH Sampler Advanced by Self Static Weight	RC Rock Core	SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$

 Water Level
 Shear Strength Determination by Pocket Penetrometer

- (1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS W _L < 50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. (W _L < 30%).
		CI	Inorganic clays of medium plasticity, silty clays. (30% < W _L < 50%).
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS W _L > 50%	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

EXPLANATION OF ROCK LOGGING TERMS

<u>ROCK WEATHERING CLASSIFICATION</u>		<u>SYMBOLS</u>	
Fresh (FR)	No visible signs of weathering.		
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.		CLAYSTONE
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.		SILTSTONE
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.		SANDSTONE
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.		COAL
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.		Bedrock (general)

<u>DISCONTINUITY SPACING</u>		<u>STRENGTH CLASSIFICATION</u>			
Bedding	Bedding Plane Spacing	Rock Strength	Approximate Uniaxial Compressive Strength		Field Estimation of Hardness*
			(MPa)	(psi)	
Very thickly bedded	Greater than 2m	Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Thickly bedded	0.6 to 2m				
Medium bedded	0.2 to 0.6m	Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Thinly bedded	60mm to 0.2m				
Very thinly bedded	20 to 60mm	Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Laminated	6 to 20mm				
Thinly Laminated	Less than 6mm	Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
		Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
		Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
		Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

<u>TERMS</u>	
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.

RECORD OF BOREHOLE No 22-01

1 OF 1

METRIC

GWP# 6055-18-00 LOCATION Nestor Falls Bridge N 5 442 312.7 E 237 195.5 ORIGINATED BY GA
DIST Kenora HWY 71 BOREHOLE TYPE Wash Boring/NQ Coring COMPILED BY MC
DATUM Geodetic DATE 2022.11.11 - 2022.11.11 LATITUDE 49.115242 LONGITUDE -93.926151 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										
332.1	GROUND SURFACE							20	40	60	80	100						
0.0	ASPHALT: (75mm)																	
0.1																		
331.8	CONCRETE: (200mm)																	
0.3																		
	SAND, trace to some silt, trace gravel, trace clay, occasional large gravel Dense to Compact Brown Wet (FILL)		1	SS	47													5 84 11 (SI+CL)
			2	SS	17													
			3	SS	27													8 79 12 1
327.6																		
4.5	BEDROCK (GRANODIORITE) slightly weathered to fresh, very strong, white/grey with pink intrusions																	
	Sub-horizontal fractures at 4.8m and 5.4m		1	RUN														RUN #1 TCR=100% SCR=93% RQD=79% UCS=196MPa (Avg Point Load) UCS=112MPa
	Sub-horizontal fractures at 6.0m																	
			2	RUN														RUN #2 TCR=100% SCR=100% RQD=75% UCS=180MPa (Avg Point Load)
324.9																		
7.2	END OF BOREHOLE AT 7.2m. BOREHOLE OPEN AND WATER LEVEL OBSERVED AT 3.3m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.5m, THEN CONCRETE TO 0.2m, THEN ASPHALT SURFACE.																	

+³, ×³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 22-02

1 OF 2

METRIC

GWP# 6055-18-00 LOCATION Nestor Falls Bridge N 5 442 334.8 E 237 203.9 ORIGINATED BY GA
DIST Kenora HWY 71 BOREHOLE TYPE Wash Boring/NQ Coring COMPILED BY MC
DATUM Geodetic DATE 2022.09.11 - 2022.09.11 LATITUDE 49.115442 LONGITUDE -93.926041 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										
332.0	GROUND SURFACE																	
0.0	ASPHALT (75mm)																	
0.1	CONCRETE (200mm)																	
331.7																		
0.3			1	SS	25													
	SAND and GRAVEL, trace silt, occasional large gravel Compact to Dense Brown Wet (FILL)		2	SS	30													
			3	SS	18													
329.8																		
2.2			4	SS	4													
	SAND, trace to some gravel, trace to some silt, trace clay, occasional large gravel and cobbles Loose to Dense Brown Wet (FILL)		5	SS	16													
			6	SS	44													
326.2																		
5.8			1	RUN														
	BEDROCK (GRANODIORITE) slightly weathered to fresh, very strong, white/grey with pink intrusions		2	RUN														
			3	RUN														
322.9																		
9.1	END OF BOREHOLE AT 9.1m BOREHOLE OPEN AND WATER LEVEL OBSERVED AT 3.4m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.5m,																	

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

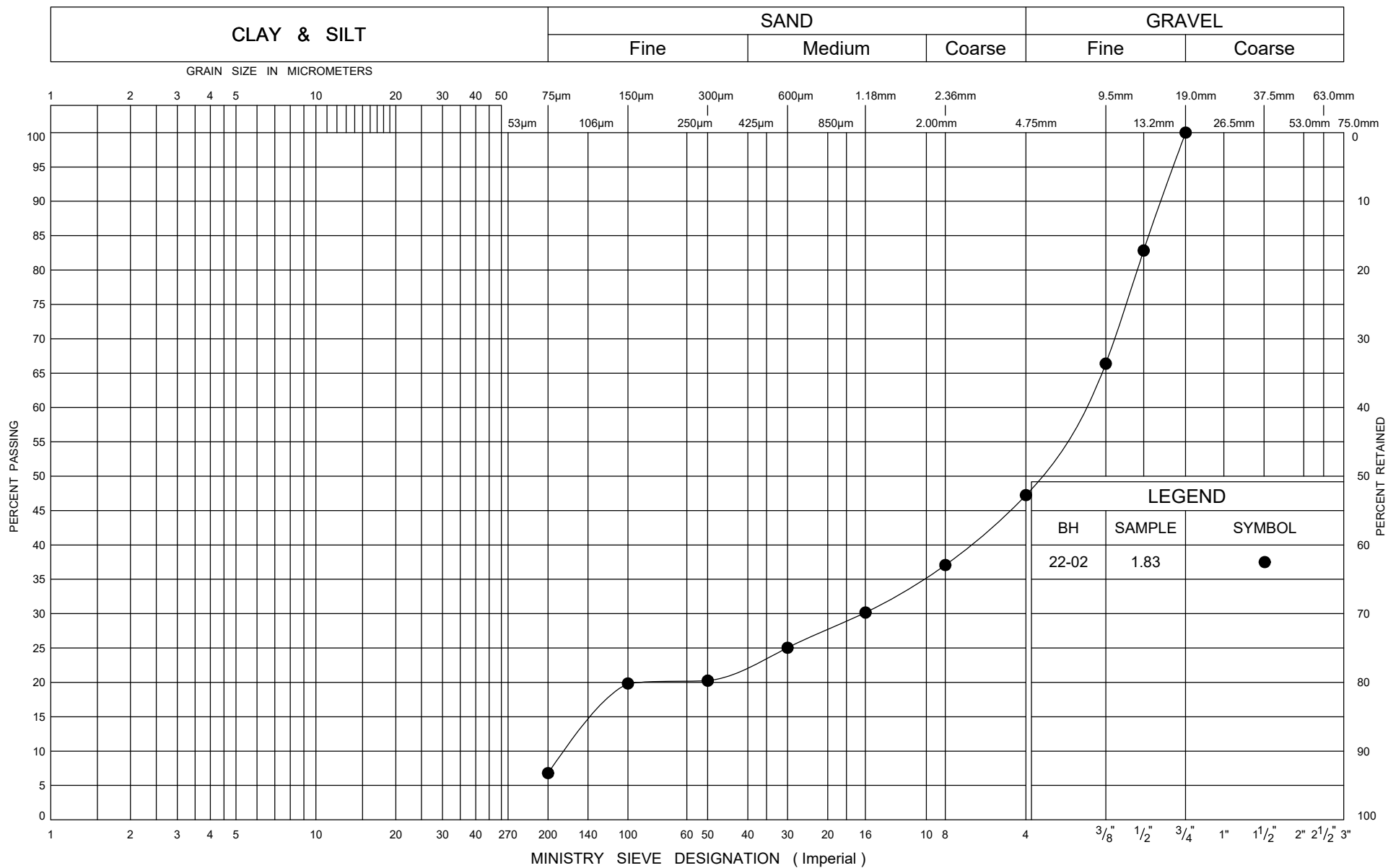
METRIC

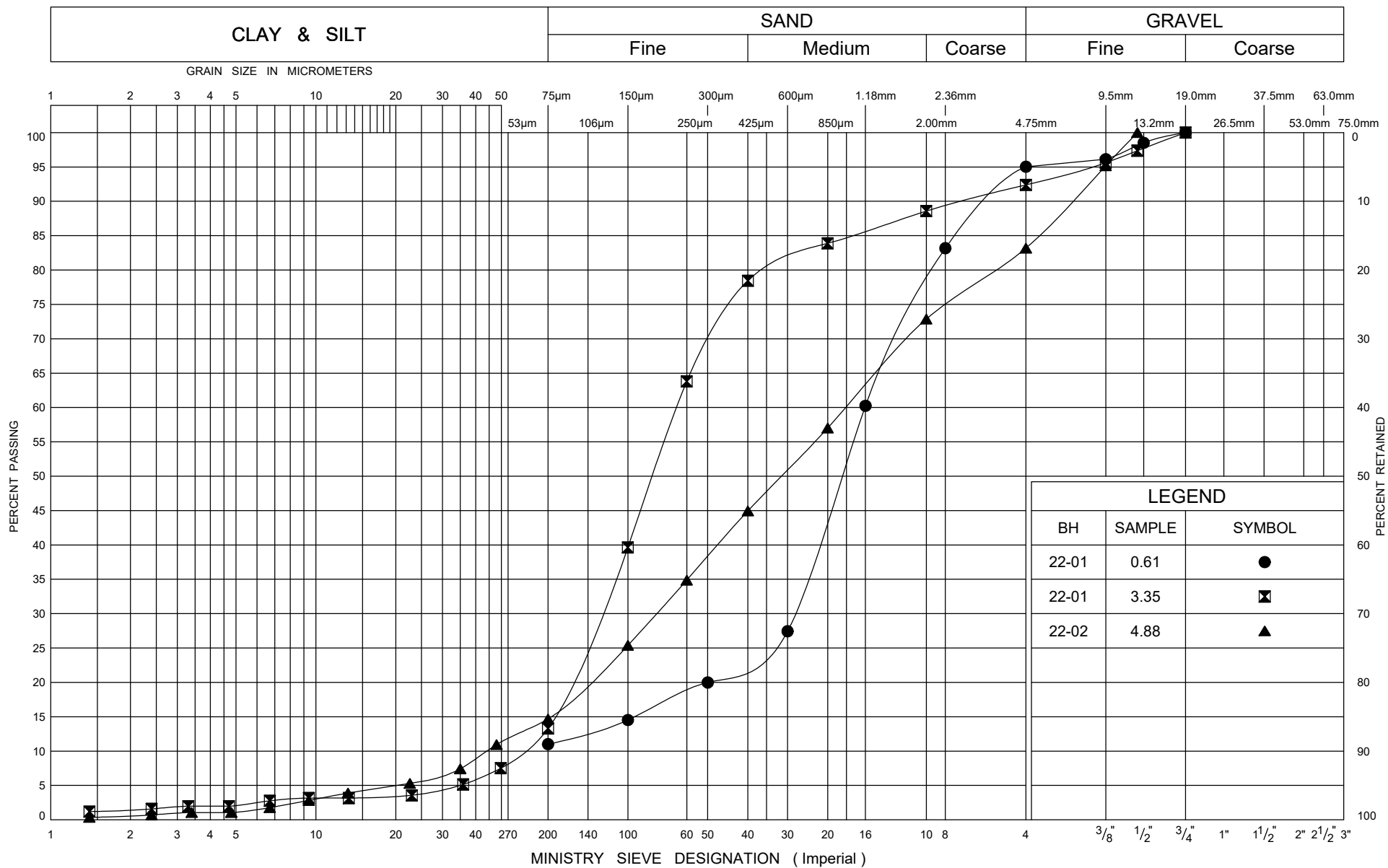
[illegible]



Appendix C

Laboratory Test Results





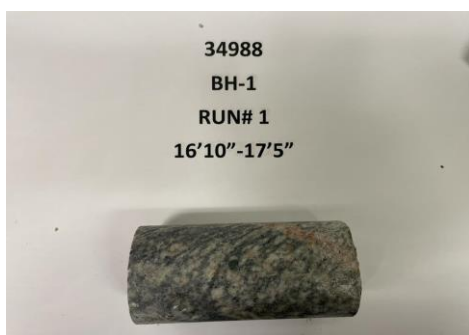
UNCONFINED COMPRESSION TEST REPORT

ASTM D7012-14

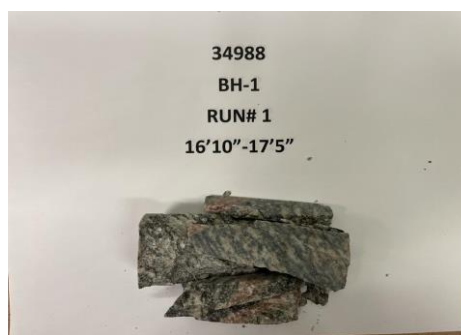
CLIENT:	HATCH	FILE NUMBER:	34988
PROJECT NAME:	Nestor Falls Bridge	REPORT DATE:	21-Jun-23
BOREHOLE No.:	22-01	TEST DATE:	13-Dec-22
SAMPLE No.:	Run 1		
SAMPLE DEPTH:	5.1 to 5.3 m		
DESCRIPTION:	Granodiorite		

Avg. Height (cm):	9.9	Weight (g):	472.2
Avg. Diameter (cm):	4.7	Wet Density (kg/m ³):	2,703
H. to Dia. Ratio**:	2.1:1	Dry Density (kg/m ³):	2,703
Cross Sectional Area (cm ²):	17.65	Moisture Content* (%):	N/A
Sample Volume (cm ³):	174.70		

ORIGINAL SPECIMEN



FRACTURED SPECIMEN



AVG. RATE OF STRAIN TO FAILURE:	0.250 MPa/s
MAXIMUM COMPRESSIVE LOAD:	197.7 kN
UNCONFINED COMPRESSIVE STRENGTH:	112.0 MPa

Note: * The moisture content was obtained before the test.
 ** Dimensions of Specimen conform to ASTM D 4543-04.

TEST DONE BY: AK
 REVIEWED BY:

34988 UCS BH 1 Run 1

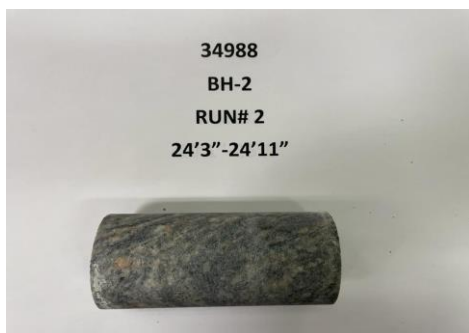
UNCONFINED COMPRESSION TEST REPORT

ASTM D7012-14

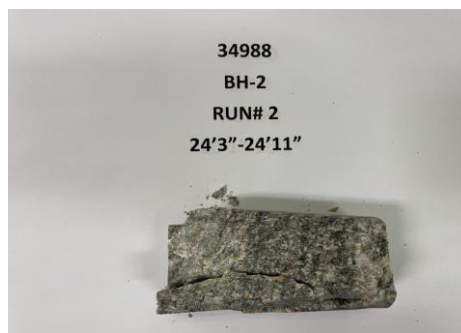
CLIENT:	HATCH	FILE NUMBER:	34988
PROJECT NAME:	Nestor Falls Bridge	REPORT DATE:	21-Jun-23
BOREHOLE No.:	22-02	TEST DATE:	13-Dec-22
SAMPLE No.:	Run 2		
SAMPLE DEPTH:	7.4 to 7.6 m		
DESCRIPTION:	Granodiorite		

Avg. Height (cm):	10.9	Weight (g):	521.9
Avg. Diameter (cm):	4.7	Wet Density (kg/m ³):	2,760
H. to Dia. Ratio**:	2.3:1	Dry Density (kg/m ³):	2,760
Cross Sectional Area (cm ²):	17.35	Moisture Content* (%):	N/A
Sample Volume (cm ³):	189.11		

ORIGINAL SPECIMEN



FRACTURED SPECIMEN



AVG. RATE OF STRAIN TO FAILURE:	0.250 MPa/s
MAXIMUM COMPRESSIVE LOAD:	217.8 kN
UNCONFINED COMPRESSIVE STRENGTH:	123.4 MPa

Note: * The moisture content was obtained before the test.
 ** Dimensions of Specimen conform to ASTM D 4543-04.

TEST DONE BY: AK
 REVIEWED BY:

34988 UCS BH 2 Run 2

Job No: 34988

Project Name: Nestor Falls Bridge

Core Size: NQ **BH No :** 22-01

Date Drilled: 09-Nov-22

Date Tested: 15-Nov-22

Tester: GA

Client: HATCH

[illegible]

Job No: 34988

Project Name: Nestor Falls Bridge

Core Size:	NQ	BH No :	22-02
-------------------	----	----------------	-------

Date Drilled: 09-Nov-22

Date Tested: 15-Nov-22

Tester: GA

Client: HATCH

[illegible]



Photo C1: Borehole 22-01 Bedrock Core Sample (Runs 1 and 2)



Photo C2: Borehole 22-02 Bedrock Core Sample (Runs 1, 2 and 3)



FINAL REPORT

CA40190-NOV22 R1

34988, Nestor Falls, ON

Prepared for

Thurber Engineering Ltd.

First Page

CLIENT DETAILS

Client Thurber Engineering Ltd.

Address 103, 2010 Winston Park Drive
Oakville, ON
L6H 5R7, Canada

Contact Madisan Chiarotto

Telephone 647-548-8390

Facsimile

Email mchiarotto@thurber.ca

Project 34988, Nestor Falls, ON

Order Number

Samples Soil (2)

LABORATORY DETAILS

Project Specialist Maarit Wolfe, Hon.B.Sc

Laboratory SGS Canada Inc.

Address 185 Concession St., Lakefield ON, K0L 2H0

Telephone 705-652-2000

Facsimile 705-652-6365

Email Maarit.Wolfe@sgs.com

SGS Reference CA40190-NOV22

Received 11/14/2022

Approved 12/05/2022

Report Number CA40190-NOV22 R1

Date Reported 12/05/2022

COMMENTS

Temperature of Sample upon Receipt: 4 degrees C

Cooling Agent Present: Yes

Custody Seal Present: Yes

Chain of Custody Number: n/a

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

SIGNATORIES

Maarit Wolfe, Hon.B.Sc





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FINAL REPORT

CA40190-NOV22 R1

Client: Thurber Engineering Ltd.

Project: 34988, Nestor Falls, ON

Project Manager: Madisan Chiarotto

Samplers: George Azzopardi

MATRIX: SOIL

Sample Number	5	6
Sample Name	22-01 CORR	22-02 CORR
Sample Matrix	Soil	Soil
Sample Date	11/11/2022	09/11/2022

Parameter	Units	RL		Result	Result
Corrosivity Index					
Corrosivity Index	none	1		4	14
Soil Redox Potential	mV	no		131	213
Sulphide (Na ₂ CO ₃)	%	0.04		< 0.04	< 0.04
pH	pH Units	0.05		10.1	11.1
Resistivity (calculated)	ohms.cm	-9999		3400	471
General Chemistry					
Conductivity	uS/cm	2		294	2120
Metals and Inorganics					
Moisture Content	%	0.1		7.8	11.5
Sulphate	µg/g	0.4		52	100
Other (ORP)					
Chloride	µg/g	0.4		84	1400



FINAL REPORT

CA40190-NOV22 R1

QC SUMMARY

Anions by IC
Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-IENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO0438-NOV22	µg/g	0.4	<0.4	4	35	99	80	120	80	75	125
Sulphate	DIO0438-NOV22	µg/g	0.4	<0.4	0	35	96	80	120	107	75	125

Carbon/Sulphur
Method: ASTM E1915-07A | Internal ref.: ME-CA-IENVIARD-LAK-AN-020

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide (Na2CO3)	ECS0066-NOV22	%	0.04	< 0.04	ND	20	102	80	120			

Conductivity
Method: SM 2510 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0343-NOV22	uS/cm	2	< 2	3	20	101	90	110	NA		



QC SUMMARY

pH
Method: SM 4500 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0343-NOV22	pH Units	0.05	NA	0		101			NA		

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.

RL Reporting Limit.

↑ Reporting limit raised.

↓ Reporting limit lowered.

NA The sample was not analysed for this analyte

ND Non Detect

Results relate only to the sample tested.

Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.

"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm.

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This report supersedes all previous versions.

-- End of Analytical Report --



Environment, Health & Safety

Request for Laboratory Services and CHAIN OF CUSTODY

- Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No:

Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Nicole Brizant
Received Date (mm/dd/yy): Nov 14/22
Received Time: 17:30

Received By (signature): [Signature]Custody Seal Present: ☒Custody Seal Intact: ☒Cooling Agent Present: ☒Temperature Upon Receipt (°C): 4.44

LAB LIMS #:

CA-40190-NOV22

REPORT INFORMATION		INVOICE INFORMATION		PROJECT INFORMATION																		
Company: <u>Thurber Engineering Ltd.</u>	<input checked="" type="checkbox"/> (same as Report Information)	Quotation #: _____	P.O. #: _____																			
Contact: <u>Madisan Chiarotto</u>	Company: _____	Project #: <u>34988</u>	Site Location/ID: <u>Nestor Falls ON</u>																			
Address: <u>103-2010 Winston Park Drive</u> <u>Oakville, Ontario</u>	Contact: _____	TURNAROUND TIME (TAT) REQUIRED																				
Phone: <u>647-548-8390</u>	Address: _____	<input checked="" type="checkbox"/> Regular TAT (5-7 days) TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day																				
Email: <u>mchiarotto@thurber.ca</u>	Phone: _____	RUSH TAT (Additional Charges May Apply): <input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3 Days <input type="checkbox"/> 4 Days																				
Email: _____	Email: _____	PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION																				
REGULATIONS		NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY																				
Regulation 153/04: <input type="checkbox"/> Table 1 <input type="checkbox"/> R/P/I <input type="checkbox"/> Table 2 <input type="checkbox"/> W/C/C <input type="checkbox"/> Table 3 <input type="checkbox"/> A/O <input type="checkbox"/> Table _____	Soil Texture: <input type="checkbox"/> Coarse <input type="checkbox"/> Medium <input type="checkbox"/> Fine	Other Regulations: <input type="checkbox"/> Reg 347/558 (3 Day min TAT) <input type="checkbox"/> PWQO <input type="checkbox"/> MMR <input type="checkbox"/> CCME <input checked="" type="checkbox"/> Other: <u>O.Reg 406 Table 1</u> <input type="checkbox"/> MISA	Sewer By-Law: <input type="checkbox"/> Sanitary <input type="checkbox"/> Storm Municipality: _____																			
RECORD OF SITE CONDITION (RSC) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		ANALYSIS REQUESTED																				
SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	Metals & Inorganics	PAH <input type="checkbox"/> ABN <input type="checkbox"/> SVOC(all) <input type="checkbox"/>	PCB Total <input type="checkbox"/> Aroclor <input type="checkbox"/>	PHC F1-F4 <input type="checkbox"/> VOC <input type="checkbox"/> BTEX <input type="checkbox"/> BTX <input type="checkbox"/> F2-F4 <input type="checkbox"/>	VOC <input type="checkbox"/> BTEX <input type="checkbox"/> THM <input type="checkbox"/>	Pesticides OC <input type="checkbox"/> OP <input type="checkbox"/>	TCLP M&I <input type="checkbox"/> VOC <input type="checkbox"/> PCB <input type="checkbox"/>	B(a)P <input type="checkbox"/> ABN <input type="checkbox"/> Ignit. <input type="checkbox"/>	Water Pkg Gen. <input type="checkbox"/> Ext. <input type="checkbox"/>	Sewer Use: <input type="checkbox"/>	SVOCs (all) <input type="checkbox"/>	OC Pesticides <input type="checkbox"/>	PA Herbicides <input type="checkbox"/>	SAR/EC <input type="checkbox"/>	Corrosivity Package <input type="checkbox"/>	COMMENTS:	
1 22-01 CORR	<u>11/11/22</u>	AM	1	SOIL																		
2 22-02 CORR	11/9/22	AM	1	SOIL																		
3				SOIL																		
4				SOIL																		
5				SOIL																		
6				SOIL																		
7				SOIL																		
8				SOIL																		
9				SOIL																		
10				SOIL																		
11				SOIL																		
12				SOIL																		
Observations/Comments/Special Instructions																						
Sampled By (NAME): <u>George Azzopardi</u>		Signature: <u>[Signature]</u>		Date: _____ (mm/dd/yy)		Pink Copy - Client																
Relinquished by (NAME): <u>Madisan Chiarotto</u>		Signature: <u>[Signature]</u>		Date: <u>11/14/22</u> (mm/dd/yy)		Yellow & White Copy - SGS																

Revision #: 1.1

Date of Issue: 04 April, 2018



FINAL REPORT

CA40186-NOV22 R

Nestor Falls Bridge, Nestor Falls ON

Prepared for

Thurber Engineering Ltd.

First Page

CLIENT DETAILS

Client Thurber Engineering Ltd.

Address 103, 2010 Winston Park Drive
Oakville, ON
L6H 5R7, Canada

Contact Madisan Chiarotto

Telephone 647-548-8390

Facsimile

Email mchiarotto@thurber.ca

Project Nestor Falls Bridge, Nestor Falls ON

Order Number

Samples Solution (1)

LABORATORY DETAILS

Project Specialist Jill Campbell, B.Sc.,GISAS

Laboratory SGS Canada Inc.

Address 185 Concession St., Lakefield ON, K0L 2H0

Telephone 2165

Facsimile 705-652-6365

Email jill.campbell@sgs.com

SGS Reference CA40186-NOV22

Received 11/14/2022

Approved 12/14/2022

Report Number CA40186-NOV22 R

Date Reported 12/14/2022

COMMENTS

Temperature of Sample upon Receipt: 6 degrees C

Cooling Agent Present: Yes

Custody Seal Present: Yes

SIGNATORIES

Jill Campbell, B.Sc.,GISAS





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FINAL REPORT

CA40186-NOV22 R

Client: Thurber Engineering Ltd.

Project: Nestor Falls Bridge, Nestor Falls ON

Project Manager: Madisan Chiarotto

Samplers: George Azzopardi

MATRIX: WATER

Sample Number 6
Sample Name Nestor Falls
Sample Matrix Solution
Sample Date 11/11/2022

Parameter	Units	RL	Result
General Chemistry			
Conductivity	uS/cm	2	80
Redox Potential	mV	no	224
Sulphide	µg/L	6	< 6
Metals and Inorganics			
Sulphate	mg/L	0.04	1.3
Other (ORP)			
pH	No unit	0.05	7.31
Chloride	mg/L	0.04	3.0



FINAL REPORT

CA40186-NOV22 R

QC SUMMARY

Anions by IC
Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-IENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO0118-DEC22	mg/L	0.04	<0.04	ND	20	101	90	110	98	75	125
Sulphate	DIO0118-DEC22	mg/L	0.04	<0.04	0	20	99	90	110	113	75	125

Conductivity
Method: SM 2510 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0352-NOV22	uS/cm	2	< 2	0	20	100	90	110	NA		

pH
Method: SM 4500 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0352-NOV22	No unit	0.05	NA	0		100			NA		



FINAL REPORT

CA40186-NOV22 R

QC SUMMARY

Redox Potential
Method: SM 2580 I

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Redox Potential	EWL0330-NOV22	mV	no	NA	0	20	103	80	120	NA		

Sulphide by SFA
Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-008

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide	SKA0182-NOV22	ug/L	6	<0.006	ND	20	106	80	120	NA	75	125



FINAL REPORT

CA40186-NOV22 R

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.

RL Reporting Limit.

↑ Reporting limit raised.

↓ Reporting limit lowered.

NA The sample was not analysed for this analyte

ND Non Detect

Results relate only to the sample tested.

Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.

"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

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This report supersedes all previous versions.

-- End of Analytical Report --



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- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

Request for Laboratory Services and CHAIN OF CUSTODY

No:

Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Nicole Bryan
Received Date (mm/dd/yy): Nov 14/22
Received Time: 12:30

Received By (signature): [Signature]
Custody Seal Present: ☒
Custody Seal Intact: ☒

Cooling Agent Present: ☒
Temperature Upon Receipt (°C): 6.66

LAB LIMS #: CA-40186-NOV 22

REPORT INFORMATION	INVOICE INFORMATION	PROJECT INFORMATION
Company: <u>Thurber Engineering Ltd.</u> Contact: <u>Madisan Chiarotto</u> Address: <u>103-2010 Winston Park Drive</u> <u>Oakville, Ontario</u> Phone: <u>647-548-8390</u> Email: <u>mchiarotto@thurber.ca</u> Email:	<input checked="" type="checkbox"/> (same as Report Information) Company: _____ Contact: _____ Address: _____ Phone: _____ Email: _____	Quotation #: _____ P.O. #: _____ Project #: <u>34988</u> Site Location/ID: <u>Nestor Falls Bridge, Nestor Falls ON</u> TURNAROUND TIME (TAT) REQUIRED <input checked="" type="checkbox"/> Regular TAT (5-7days) TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day RUSH TAT (Additional Charges May Apply): <input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3 Days <input type="checkbox"/> 4 Days PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION Specify Due Date: _____ Rush Confirmation ID: _____

REGULATIONS						NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY																	
Regulation 153/04:			Other Regulations:			Sewer By-Law:		ANALYSIS REQUESTED															COMMENTS:
<input type="checkbox"/> Table 1 <input type="checkbox"/> R/P/I <input type="checkbox"/> Table 2 <input type="checkbox"/> I/C/C <input type="checkbox"/> Table 3 <input type="checkbox"/> A/O <input type="checkbox"/> Table _____	Soil Texture: <input type="checkbox"/> Coarse <input type="checkbox"/> Medium <input type="checkbox"/> Fine	<input type="checkbox"/> Reg 347/558 (3 Day min TAT) <input type="checkbox"/> PWQO <input type="checkbox"/> MMR <input type="checkbox"/> CCME <input checked="" type="checkbox"/> Other: <u>O.Reg 406 Table 1</u> <input type="checkbox"/> MISA	<input type="checkbox"/> Sanitary <input type="checkbox"/> Storm Municipality: _____	Field Filtered (Y/N)	Metals & Inorganics	PAH <input type="checkbox"/> ABN <input type="checkbox"/> SVOC (all) <input type="checkbox"/> PCB Total <input type="checkbox"/> Aroclor <input type="checkbox"/> PHC F1-F4 <input type="checkbox"/> VOC <input type="checkbox"/> BTEX <input type="checkbox"/> BTEX/F1 <input type="checkbox"/> F2-F4 <input type="checkbox"/> VOC <input type="checkbox"/> BTEX <input type="checkbox"/> THM <input type="checkbox"/> Pesticides OC <input type="checkbox"/> OP <input type="checkbox"/> TCLP M&I <input type="checkbox"/> VOC <input type="checkbox"/> PCB <input type="checkbox"/> B(a)p <input type="checkbox"/> ABN <input type="checkbox"/> Ignit. <input type="checkbox"/> Water Pkg Gen. <input type="checkbox"/> Ext. <input type="checkbox"/> Sewer Use: _____ SVOCs (all) <input type="checkbox"/> OC Pesticides <input type="checkbox"/> PA Herbicides <input type="checkbox"/> SAR/EC <input type="checkbox"/> Corrosivity <input checked="" type="checkbox"/>																	
RECORD OF SITE CONDITION (RSC) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO																							
SAMPLE IDENTIFICATION		DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX																		
1	Nestor Falls	11/11/22	PM	5	WATER																		
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

Observations/Comments/Special Instructions

Sampled By (NAME): <u>George Azzopardi</u>	Signature: <u>[Signature]</u>	Date: _____ (mm/dd/yy)	Pink Copy - Client
Relinquished by (NAME): <u>Madisan Chiarotto</u>	Signature: <u>[Signature]</u>	Date: <u>11/14/22</u> (mm/dd/yy)	Yellow & White Copy - SGS



Appendix D

Site Photographs



Photo D1: Looking north along east side of Nestor Falls bridge and Highway 71 (Nov. 2022)



Photo D2: Looking south along east side of Nestor Falls bridge and Highway 71 (Nov. 2022)



Photo D3: Looking north along west side of Nestor Falls bridge near spillway structure (Nov. 2022)



Photo D4: Looking east towards west side of Nestor Falls bridge, spillway and falls (Nov. 2022)



Photo D5: Looking north along Highway 71 towards bridge and north approach (Nov. 2022)



Photo D6: Looking south along Highway 71 towards bridge and south approach (Nov. 2022)