REPORT

Foundation Investigation Report

Amable du Fond Tributary Culvert at Station 12+763 (Site No. 43X-0301/C0)
Highway 630, Lauder Twp., District of Nipissing
GWP 5208-21-00
Agreement No. 5020-E-0014 - Work item No. 8

Submitted to:

D.M. Wills Associates Ltd.

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Submitted by:

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Reference No. CA0008394.9800-R01-R-Rev0

April 5, 2024

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1.0 INTRODUCTION

WSP (formerly Golder Associates Ltd., now a member of WSP Canada Inc.) has been retained by D.M. Wills Associates Ltd. (DM Wills) on behalf of the Ministry of Transportation, Ontario (MTO) to provide foundation investigation and design services for rehabilitation of the Amable du Fond Tributary Culvert along Highway 630 at Station 12+763 in the Township of Lauder, Ontario.

Based on discussion throughout the design process, we understand that the existing unnamed structural culvert (Amable du Fond Tributary Culvert) will be rehabilitated (not replaced) using a trenchless lining option. As the hydraulic capacity of the existing Amable du Fond Tributary Culvert will be reduced by the liner, we understand that additional capacity will be provided by a new overflow/bypass culvert(s) crossing Hwy 630 approximately 150 m to the north of the Amable du Fond Tributary Culvert, as required. The proposed overflow/bypass culvert(s) will replace and/or supplement existing non-structural culverts installed in relatively shallow fill (embankment height less than 2 m) using open cut methods, and the project team has determined that foundation investigation is not required at the overflow/bypass culvert(s) location.

After discussion with the project team, it was agreed that a foundation borehole be advanced near the inlet of the existing Amable du Fond Tributary Culvert to support the design of a potential headwall, if required. This report presents the results of the foundation investigation carried out for the potential headwall near the inlet of the existing Amable du Fond Tributary Culvert.

The foundation investigation services for this project have been delivered under MTO Assignment No. 5020-E-0014 as part of GWP 5208-21-00.

2.0 SITE DESCRIPTION

The orientation (i.e., north, south, east, west) stated in the text of the report is referenced to project north and, therefore, may differ from magnetic north shown on the foundation drawing. For the purposes of this report, Highway 630 is oriented in a north-south direction with the culvert positioned in a skew to the highway in a southeast - northwest direction.

The Amable du Fond Tributary Culvert is located at Station 12+763 along Highway 630 within the Township of Lauder, approximately 15.6 km south of Highway 17. The site location is shown on the key plan in Drawing 1. The existing Amable du Fond Tributary Culvert is a 3 m diameter structural plate corrugated steel pipe (SPCSP) with concrete invert paving, and is about 33.4 m long. The culvert carries the Amable du Fond Tributary watercourse below Highway 630 which flows in an east to west direction. The existing culvert invert is at about Elevation 254.6 m and Elevation 251.9 m at the inlet and outlet location.

Highway 630 has an existing two-lane cross-section with granular shoulders at the culvert location and moderate tree and shrub cover is present within and beyond the MTO right of way. Based on the survey data provided by D.M Wills on August 17, 2023, the highway grade is at approximately Elevation 259.6 m with the ground generally sloping upwards to the south and east. The ground surface at the east and west toe of the Highway 630 embankment are at approximately Elevation 255 m and 253 m, resulting in a 5 m to 6 m high embankment. The existing embankment side-slopes generally range from about 2.7 Horizontal: 1 Vertical (2.7H:1V) on the east (inlet) side to about 2.5H:1V on the west (outlet) side near the culvert location. Locally steeper side-slopes are present directly near the culvert where inferred bedrock was observed at the inlet (south side) and rock fill veneer was observed at the outlet. The ground surface conditions at the culvert location are shown in Photographs 1 to 4 following the text of this report.

Based on our site observations at the time of the field investigation and a review of the available site photographs, the existing embankment in the culvert area appears to be performing satisfactorily. There was no visual evidence of instability (i.e., soil movement) on the embankment side slopes, and no tension cracks near the embankment crest that would be indicative of instability.

3.0 INVESTIGATION PROCEDURES

The field work for this investigation consisted of one borehole (Borehole UC-1), which was drilled on November 9, 2023. The approximate borehole location is shown on Drawing 1.

Borehole UC-1 was located at the east toe of the Highway 630 embankment, to the north of the culvert inlet. The borehole was advanced using a track mounted CME55 drilling rig using a 108 mm inside diameter hollow stem auger, NW casing with wash boring techniques and NQ coring. The drilling rig was supplied and operated by Landcore Drilling of Chelmsford, Ontario.

Soil samples were obtained using a 50 mm outer diameter split-spoon sampler driven by an automatic hammer in general accordance with the Standard Penetration Test (SPT) procedure (ASTM D1586[1]). Soil samples were generally obtained at vertical sampling intervals of about 0.76 m.

The groundwater level in the open borehole was observed during and upon completion of the drilling operations and is described on the Record of Borehole sheet in Appendix A. The borehole was backfilled in general accordance with the intent of Ontario Regulation (O. Reg.) 903, as amended, and the site conditions were restored following completion of the field work.

The field work was supervised on a full-time basis by a member of WSP's technical staff who located the borehole in the field, supervised the drilling, sampling, and logged the borehole. The soil and rock samples were identified in the field, placed in labelled containers / core boxes, and transported to WSP's laboratory in Sudbury for further examination and testing. Laboratory tests such as water content, grain size distribution analyses, Atterberg limit and uniaxial compression strength testing were carried out on selected soil samples and one rock core sample, in general accordance with MTO and/or ASTM Standards, as applicable.

One soil sample was sent to Bureau Veritas located in Sudbury, Ontario, for basic chemical analysis related to potential corrosion of buried steel and concrete elements.

The as-drilled borehole location and elevation was surveyed by a Trimble GPS unit with an accuracy meeting MTO requirements and checked by measuring the distance of the borehole to the existing culvert. The surveyed GPS coordinates were subsequently converted into the NAD 83 CSRS - MTM system. The borehole locations, including geographic coordinates, ground surface elevations referenced to Geodetic datum, and drilled depth is summarized below.

Borehole No.	NAD83 CSRS CBNv6-2010.0 – MTM Zone 10 Coordinates (Geographic Coordinates)		Ground Surface Elevation (m)	Drilled Depth (m)
	Northing (m) (Latitude (°))	Easting (m) (Longitude (°))		
UC-1	5114950.5 (46.172836)	349894.9 (-78.915978)	257.6	7.7 (including 3.6 m bedrock coring)

[1] ASTM D1586 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

Based on the Northern Ontario Engineering Geological Terrain Study (NOEGTS)[2] mapping, the regional soils at the site were deposited as an alluvial plain consisting primarily of sandy soils with silt as a secondary material and is bordered by bedrock knobs.

Based on geological mapping by the Ministry of Northern Development and Mines (MNDM)[3], the site is underlain by bedrock consisting of felsic igneous granite.

4.2 Subsurface Conditions

The detailed subsurface soil, bedrock and groundwater conditions encountered in the borehole advanced during the investigation, together with the results of laboratory tests carried out on selected soil and bedrock samples are presented on the Record of Borehole and Record of Drillhole sheets in Appendix A. The detailed results of the geotechnical laboratory tests are presented in Appendix B. The results of the in-situ field tests (Standard Penetration Test N-values), as presented in the borehole record and in Section 4, are uncorrected. The results of the analytical testing completed on a select soil sample are provided in Appendix C.

The borehole location and soil strata relative to the existing structural culvert alignment are provided in Drawing 1. The stratigraphic boundaries shown on the Record of Borehole sheet and on the interpreted stratigraphic section in Drawing 1 are inferred from observations of the drilling progress and noncontinuous soil sampling and therefore, represent transitions between soil types rather than exact planes of geological change.

The subsurface conditions will vary beyond the borehole location. A summary description of the soil deposits and groundwater conditions encountered in the borehole is provided below. It should be noted that the interpreted stratigraphy shown on Drawing 1 is a simplification of the subsurface conditions.

4.2.1 Topsoil (Fill)

An approximately 40 mm thick layer of topsoil (fill) was encountered at ground surface at Elevation 257.6 m in Borehole UC-1.

4.2.2 Clayey Silt (CL) (Fill)

A 0.6 m thick cohesive sandy clayey silt fill layer was encountered below the topsoil at Elevation 257.5 m in Borehole UC-1.

The Standard Penetration Test (SPT) ‘N’-value measured within the clayey silt fill layer was 9 blows per 0.3 m of penetration suggesting a stiff consistency.

The moisture content measured on one sample of the clayey silt fill was 21%. An Atterberg limits test carried out on one sample of the clayey silt fill measured a liquid limit of about 27%, plastic limit of about 16%, and corresponding plasticity index of about 11%. The Atterberg limits test result is presented on Figure B-1 in Appendix B and indicates that the material is classified as a clayey silt of low plasticity. The results of grain size distribution testing carried out on one sample of the clayey silt fill are presented on Figure B-2 in Appendix B.

[2] Ministry of Natural Resources. 2005. Digital Northern Ontario Engineering Geology Terrain Study. Ontario Geological Survey, Miscellaneous Release – Data 160.

[3] Ministry of Northern Development of Mines, Ontario Geological Survey – MRD126 – Revision 1 1:250 000 Scale Bedrock Geology of Ontario.

4.2.3 Silty Sand (SM) (Fill)

A 1.9 m thick layer of silty sand fill was encountered at Elevation 256.9 m beneath the clayey silt fill in Borehole UC-1.

Two SPT 'N'-values measured within the silty sand deposit were 24 and 49 blows per 0.3 m of penetration indicating a compact to dense state of compactness. A lower 'N'-value of 1 was measured at the transition between the silty sand fill and underlying native gravelly sand where wood pieces were encountered, suggesting a very soft / very loose layer is present at the fill / native interface.

The moisture content measured on one sample from this deposit was 10%. The results of a grain size distribution test carried out on one sample of the silty sand fill are presented on Figure B-3 in Appendix B.

4.2.4 Gravelly Sand (SP-SM)

A 1.5 m thick gravelly sand deposit was encountered at Elevation 255.0 m beneath the silty sand fill in Borehole UC-1.

Two SPT 'N'-values measured within the gravelly sand deposit were 1 and 38 blows per 0.3 m of penetration indicating a very loose to dense state of compactness. The lower 'N' value of 1 was encountered at the fill / native interface as described in the previous section.

The moisture content measured on one sample from this deposit was 16%. The results of a grain size distribution test carried out on one sample of the gravelly sand are presented on Figure B-4 in Appendix B.

4.2.5 Bedrock

Granite bedrock was encountered at 4.1 m depth below the native gravelly sand deposit in Borehole UC-1, corresponding to Elevation 253.5 m. Bedrock was confirmed by coring 3.6 m into the deposit and the retrieved bedrock core is described as grey, medium to coarse grained, strong, granite bedrock. A more detailed description of the condition of the bedrock core is presented in the Record of Drillhole sheet in Appendix A. A photograph of the retrieved bedrock core is shown in Figure B-5 in Appendix B.

A laboratory Uniaxial Compressive Strength (UCS) test was carried out on a selected bedrock core sample and indicates the bedrock is strong. The UCS value is presented on the Record of Drillhole sheet in Appendix A and is summarized below along with the Total Core Recovery and Rock Quality Designation / Classification.

Borehole No.	Total Core Recovery (TCR)	Rock Quality Designation (RQD)	Quality Classification (Table 3.10 of CFEM 2006)	Uniaxial Compressive Strength (MPa)	Strength Classification (Table 3.5 of CFEM 2006)
UC-1	100%	90% – 100%	Excellent	60.8	Strong

4.3 Groundwater Conditions

The groundwater level in Borehole UC-1 was measured inside the hollow stem augers before introducing water as part of NW casing / NQ coring activities. The observed groundwater level should be considered unstabilized and is shown on the borehole record and summarized below.

Borehole No.	Ground Surface Elevation (m)	Depth to Groundwater Level (m)	Groundwater Elevation (m)	Date	Comments
UC-1	257.6	3.1	254.5	November 9, 2023	Inside Hollow Stem Augers Prior to Coring

The groundwater level at this site will be subject to fluctuations both seasonally and as a result of precipitation events, and will be influenced by the water level in the adjacent watercourse. The water level in the watercourse adjacent to the culvert inlet and outlet was measured to be at about Elevation 254.8 m and Elevation 251.5 m respectively in August 2023.

4.4 Analytical Testing Results

One soil sample was submitted to Bureau Veritas for chemical testing/analysis related to potential corrosion of exposed buried steel and concrete elements. The test results are provided in Appendix C and are summarized below.

Borehole No.	Sample No. / Depth (m)	Soluble Chloride (µg/g)	Soluble Sulphate (µg/g)	Conductivity (µmho/cm)	pH	Resistivity (ohm-cm)	Redox Potential (mV)
UC-1	No. 4 / 2.6	<20	30	54	5.75	19,000	440

5.0 CLOSURE

The field drilling program was carried out under the supervision of Mr. Tibor Berecz, P.Eng. under the overall direction of Mr. Matthew Thibeault, P.Eng. This Foundation Investigation Report was prepared by Mr. Tibor Berecz, P.Eng., a Geotechnical Engineer with WSP and reviewed by Mr. Matthew Thibeault, P.Eng., a Senior Geotechnical Engineer with WSP. Mr. Kevin Bentley, M.E.Sc., P.Eng., an MTO Principal Foundations Contact for this project, conducted an independent technical and quality review of the report.

Signature Page

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TB/MT/KJB/ar/ca

https://wsponlinecan.sharepoint.com/sites/ca-ca00083949800/shared documents/06. deliverables/02-foundations/3. final/ca0008394.9800-r01-r-rev0-amable du fond tributary culvert fir 05apr_24.docx

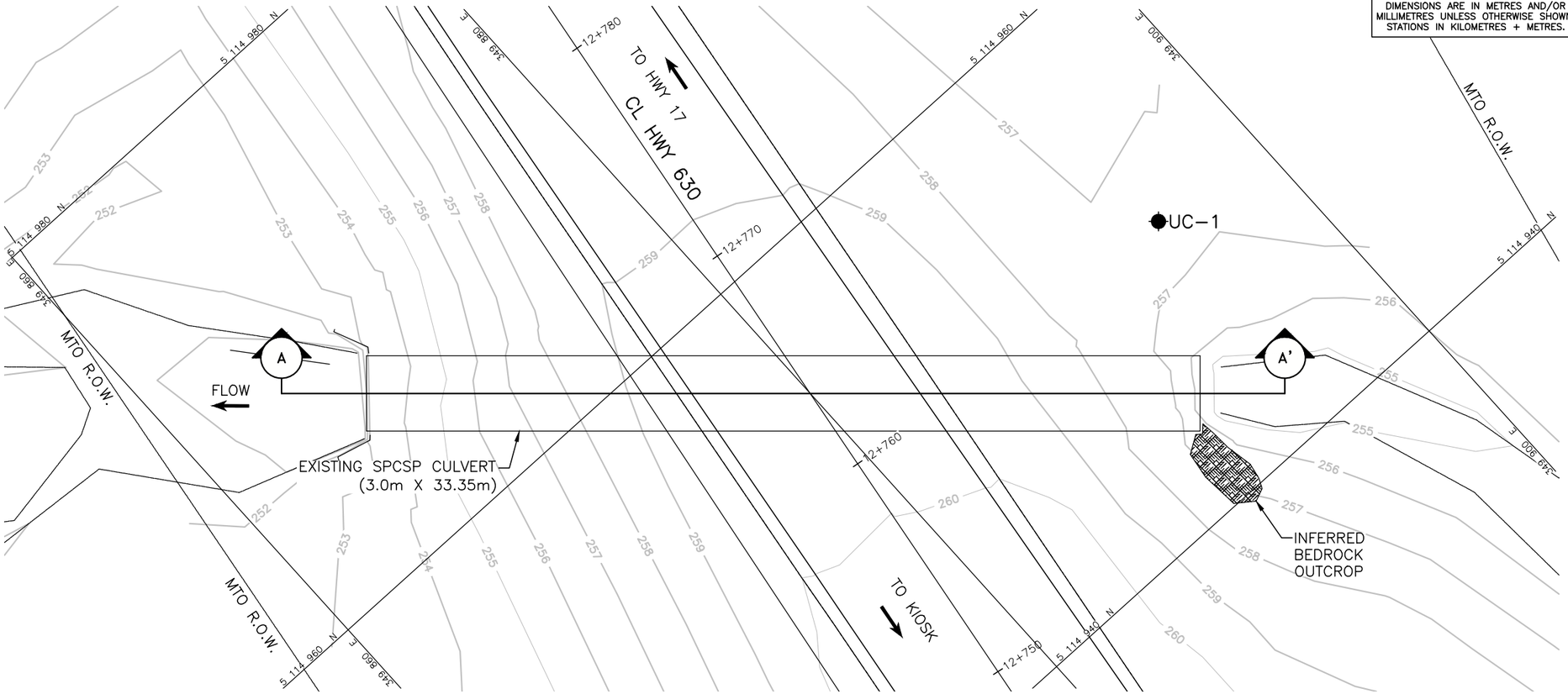
MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 5208-21-00

HIGHWAY 630
AMABLE DU FOND TRIBUTARY CULVERT
SITE NO. 43X-0301/CO
LOCATION AND SOIL STRATA

SHEET



PLAN
SCALE
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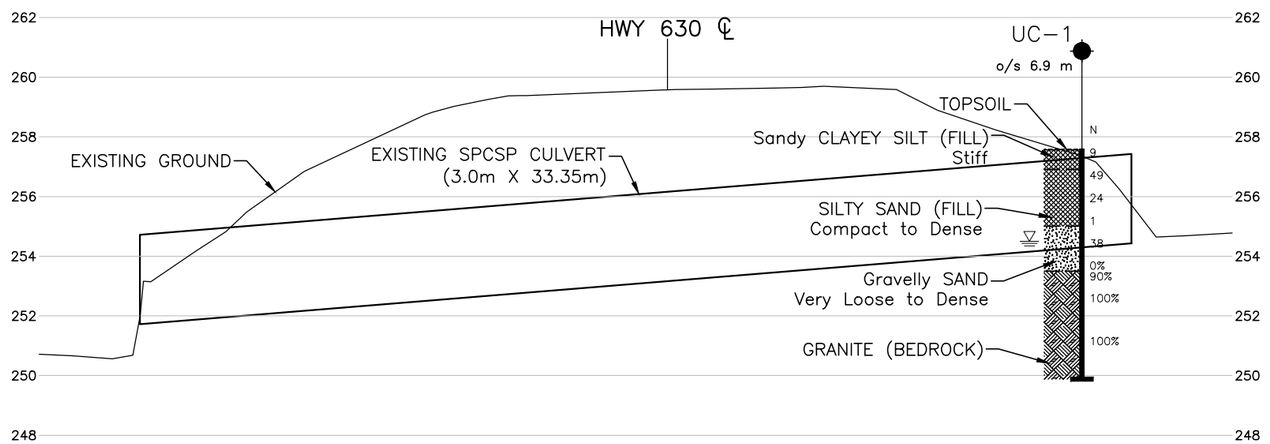

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SCALE
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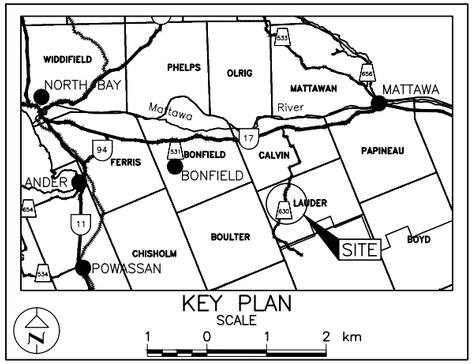

LEGEND

●	Borehole – Current Investigation
N	Standard Penetration Test Value
16	Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
100%	Rock Quality Designation (RQD)
▽	WL upon completion of drilling

• BOREHOLE CO-ORDINATES (NAD 83 MTM ZONE 10)

No.	ELEVATION	NORTHING	EASTING
UC-1	257.6	5114950.5	349894.9

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NOTES
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

REFERENCE
Base plan and Topography provided in digital format by DM Wills, drawing file no. 23-25574 Hwy 630 Kiosk.dwg, Received August 17, 2023.

NO.	DATE	BY	REVISION
.	.	.	.

Geocres No. 31L04-001

HWY. 630	PROJECT NO. CA0008394.9800		DIST. .
SUBM'D. .	CHKD. TB	DATE: 3/25/2024	SITE: 43X-0301/CO
DRAWN: TR	CHKD. MT	APPD. KJB	DWG. 1

PLOT DATE: April 5, 2024
FILENAME: R:\Vancouver\CAD-GIS\Client\Ministry_of_Transportation_Ontario-MTO\Hwy630\09_PROJECTS\CA0008394.9800\1000\MA\001-LOC_Geotech_Invest\02_PRODUCTION\DWG\CA0008394.9800-1000-001-01.dwg

Photograph 1: Highway 630 – Amable du Fond Tributary Culvert Inlet – Facing West (November 2023)

Photograph 2: Highway 630 – Amable du Fond Tributary Culvert Inlet – Facing West (May 2023)

Photograph 3: Highway 630 – Amable du Fond Tributary Culvert East Embankment Slope – Facing West (May 2023)

Photograph 4: Highway 630 – Amable du Fond Tributary East Embankment Slope – Facing North (May 2023)

APPENDIX A

Record of Borehole

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS
MINISTRY OF TRANSPORTATION, ONTARIO

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>200	>8
COBBLES	Not Applicable	75 to 200	3 to 8
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
FINES	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY COMPONENTS[1,2]

Percentage by Mass	Modifier
> 35	Use 'and' to combine primary and secondary component (*i.e.,* SAND and gravel)
> 20 to 35	Primary soil name prefixed with "gravelly, sandy" as applicable
> 10 to 20	some (*i.e.,* some sand)
≤ 10	trace (*i.e.,* trace fines)

1. Only applicable to components not described by Primary Group Name.
2. Classification of Primary Group Name based on Unified Soil Classification System (ASTM D2487) for coarse-grained soils; fine-grained soils described per current MTO Soil Classification System.

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)
An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve friction (f_s) are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC / SC	Rock core / Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample
OD / ID	Outer Diameter / Inner Diameter
HSA / SSA	Hollow-Stem Augers / Solid-Stem Augers

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

COARSE-GRAINED SOILS

Compactness[1]

Term	SPT 'N' (blows/0.3m)[2]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

1. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.
2. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.

FINE-GRAINED SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	< 12	0 to 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	> 200	> 30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time
FoS	factor of safety

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ. where $\gamma = \rho \cdot g$ (i.e., mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_L or LL	liquid limit
w_P or PL	plastic limit
I_P or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
$C_{\alpha(e)}$	secondary compression index
C_α	rate of secondary compression
$C_{\alpha(\varepsilon)}$	modified secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
c′	effective cohesion
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q or q'	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$
2 shear strength = (compressive strength)/2

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERING CLASSIFICATION

Fresh (W1): no visible sign of rock material weathering.

Slightly Weathered (W2): discoloration indicates weathering of rock mass material on discontinuity surfaces. **Less than 5%** of rock mass is altered or weathered.

Moderately Weathered (W3): less than 50% of the rock mass is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones.

Highly Weathered (W4): more than 50% of the rock mass is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones.

Completely Weathered (W5): 100% of the rock mass is decomposed and/or disintegrated to a soil. The original mass structure is still largely intact.

Residual Soil (W6): all rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye

CORE CONDITION

Total Core Recovery (TCR)

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)

The percentage of solid drill core, greater than 100 mm length, recovered at full diameter, as measured along the centerline axis of the core, relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid segments.

DISCONTINUITY DATA

Fracture Index

A count of the number of discontinuities (physical separations) in the rock core, including both naturally occurring fractures and mechanically induced breaks caused by drilling.

Dip with Respect to Core Axis

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole, a discontinuity with a 90° angle is horizontal.

Description and Notes

An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes or mechanically induced features caused by drilling such as ground or shattered core and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

AXJ Axial Joint
BD Bedding
BC Broken Core
CC Continuous Core
CL Closed
CO Contact
CU Curved
CT Coated
FLT Fault
FOL Foliation
FR Fracture
GO Gouge
IN Infilled
IR Irregular
JN Joint
KV Karstic Void
K Slickensided
LC Lost Core
MB Mechanical Break
PL Planar
PO Polished
RO Rough
SA Slightly Altered
SH Shear
SM Smooth
SR Slightly Rough
SY Stylolite
UN Undulating
VN Vein
VR Very Rough

ISRM Intact Rock Material Strength Classification

Grade	Description	Approx. Range of Uniaxial Compressive Strength (MPa)
R0	Extremely weak rock	0.25 – 1.0
R1	Very weak rock	1.0 – 5.0
R2	Weak rock	5.0 – 25
R3	Medium strong rock	25 – 50
R4	Strong rock	50 -100
R5	Very strong rock	100 -250
R6	Extremely strong rock	>250

PROJECT CA0008394.9800

RECORD OF BOREHOLE No. UC-1

1 OF 1 **METRIC**

G.W.P. 5208-21-00 LOCATION N 5114950.5; E 349894.9 NAD83 MTM ZONE 10 (LAT. 46.172836; LONG. -78.915978) ORIGINATED BY TB

DIST HWY 630 BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers, NW Casing and NQ Coring COMPILED BY TR

DATUM GEODETIC DATE November 9, 2023 CHECKED BY MT

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.6	GROUND SURFACE										
0.0	TOPSOIL (40 mm) (FILL)										
0.0	Sandy CLAYEY SILT (CL), trace gravel (FILL) Stiff Brown Moist		1	SS	9		257		○		2 33 42 23
256.9											
0.7	SILTY SAND (SM), trace gravel (FILL) Compact to dense Brown Moist to wet		2	SS	49				○		7 79 (14)
			3	SS	24		256				
	- Wood pieces encountered at 2.6 m depth.		4A 4B	SS	1		255				
255.0											
2.6	Gravelly SAND (SP-SM), trace silt Very loose to dense Grey Wet		5	SS	38	▽			○		22 71 (7)
	- 75 mm diameter cobble and gravel recovered in rock core run No. 1.		1	RC	REC 78%		254				RQD = 0%
253.5											
4.1	GRANITE (BEDROCK) For coring details refer to Record of Drillhole UC-1.		2	RC	REC 100%		253				RQD = 90%
			3	RC	REC 100%		252				RQD = 100%
			4	RC	REC 100%		251				RQD = 100%
249.9							250				
7.7	END OF BOREHOLE NOTE: 1. Water level measured at a depth of 3.1 m below ground surface (Elev. 254.5 m) in augers prior to coring operations.										

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SUD-MTO 001 R:\VANCOUVER\CAD-GIS\CLIENT\MINISTRY_OF_TRANSPORTATION_ONTARIO-MTO\HWY630\12_GINT\CA0008394.9800\CA0008394.9800.GPJ GAL-MISS.GDT 1/2/24 TR

PROJECT: CA0008394.9800

RECORD OF DRILLHOLE: No. UC-1

SHEET 1 OF 1

LOCATION: N 5114950.5; E 349894.9

NAD83 MTM ZONE 10 (LAT. 46.172836; LONG. -78.915978)

INCLINATION: -90° AZIMUTH: ---

DRILLING DATE: November 9, 2023

DRILL RIG: CME 55

DRILLING CONTRACTOR: Landcore Drilling

DATUM: GEODETIC

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate; BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage; PL - Planar; CU- Curved; UN - Undulating; ST - Stepped; IR - Irregular; PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break; BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN	FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX METRES	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY k, cm/s	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		GROUND SURFACE		253.5																	
5	November 9, 2023 NQ Coring	GRANITE Strong Fresh Coarse to medium grained Grey		4.1	2	Grey 100								JNIRRo JNIRRo							UCS = 61 MPa
6					3	Grey 100								JNIRRo JNIRRo							
7					4	Grey 100															
				249.9																	
8		END OF DRILLHOLE		7.7																	

SUD-MTO-RCK R:\VANCOUVER\CAD-GIS\CLIENT\MINISTRY_OF_TRANSPORTATION_ONTARIO-MTO\HWY630\12_GINT\CA0008394.9800\CA0008394.9800.GPJ GAL-MISS.GDT 1/2/24 TR

DEPTH SCALE

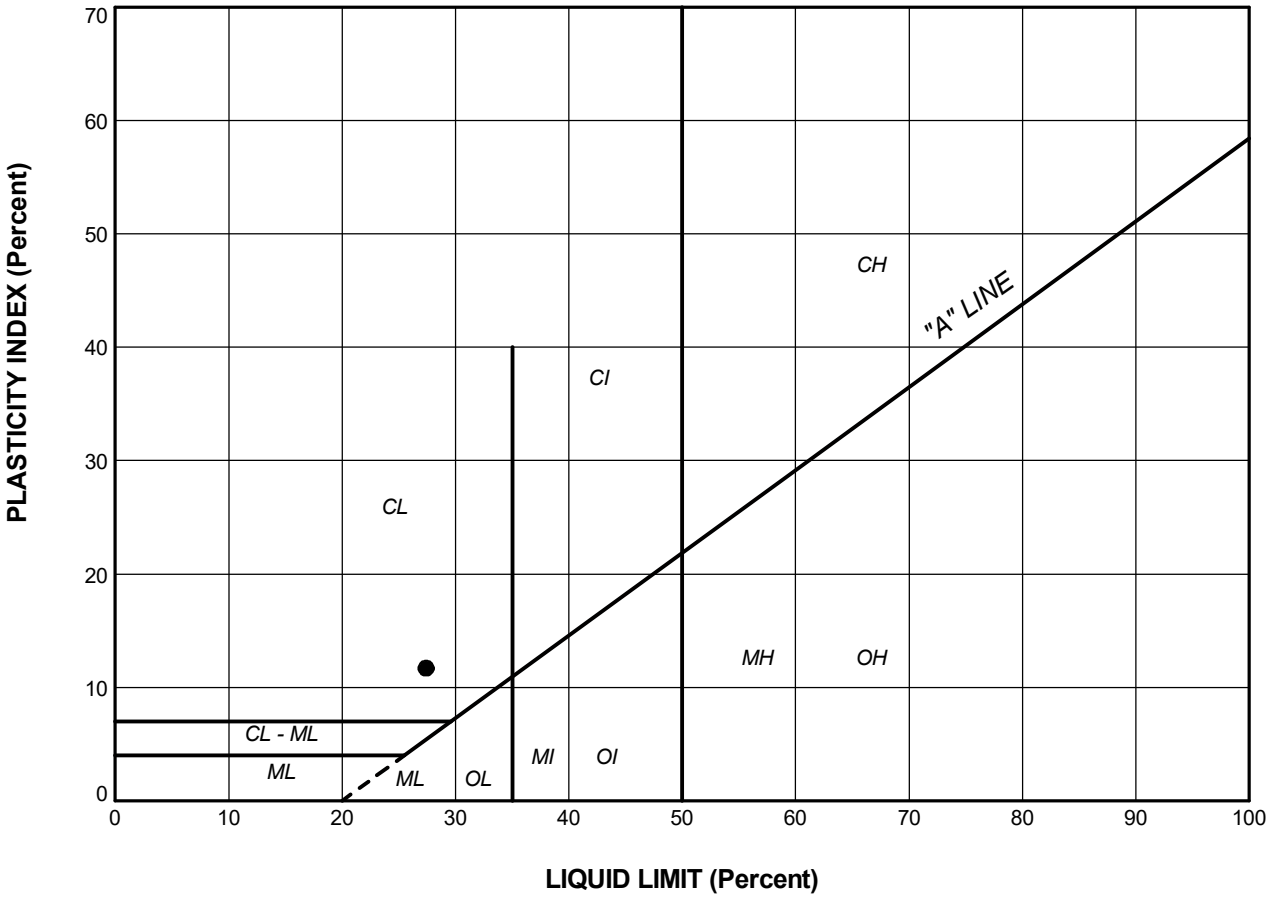
1 : 60

LOGGED: TB

CHECKED: MT

APPENDIX B

Geotechnical Laboratory Test Results



SOIL TYPE
C = Clay
M = Silt
O = Organic

PLASTICITY
L = Low
I = Intermediate
H = High

LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	UC-1	1	27.4	15.7	11.7

PROJECT

HIGHWAY 630
AMABLE DU FOND TRIBUTARY CULVERT

TITLE

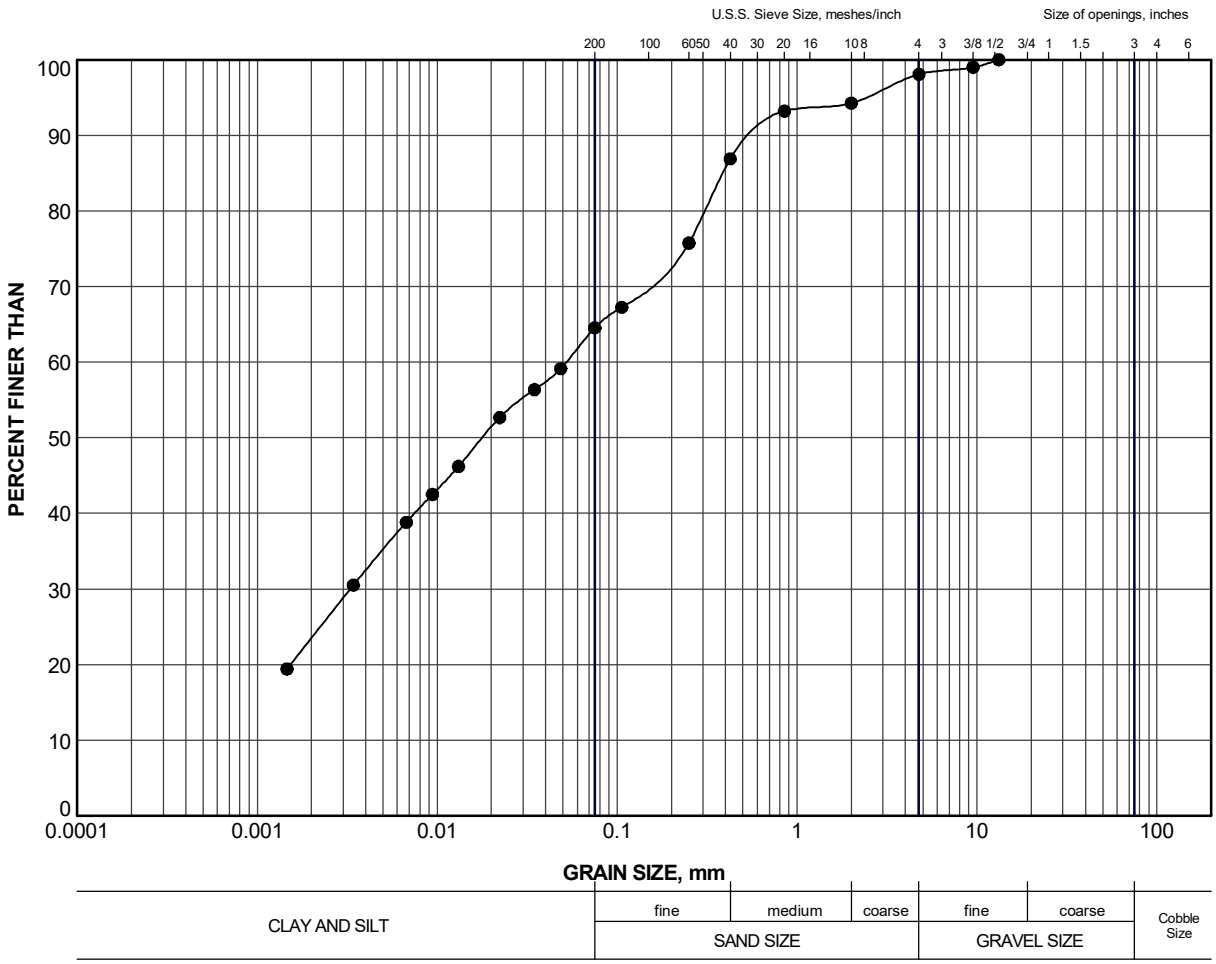
PLASTICITY CHART

SANDY CLAYEY SILT (CL) (FILL)

wsp
SUDBURY, ONTARIO

PROJECT No.	CA0008394.9800		FILE No.	CA0008394.9800.GPJ
DRAWN	TR	Jan 2024	SCALE	N/A REV.
CHECK	MT	Jan 2024		
APPR	KJB	Jan 2024		FIGURE B-1

SUD-MTO PL GLDR_LDN.GDT



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	UC-1	1	257.3

PROJECT

HIGHWAY 630
AMABLE DU FOND TRIBUTARY CULVERT

TITLE

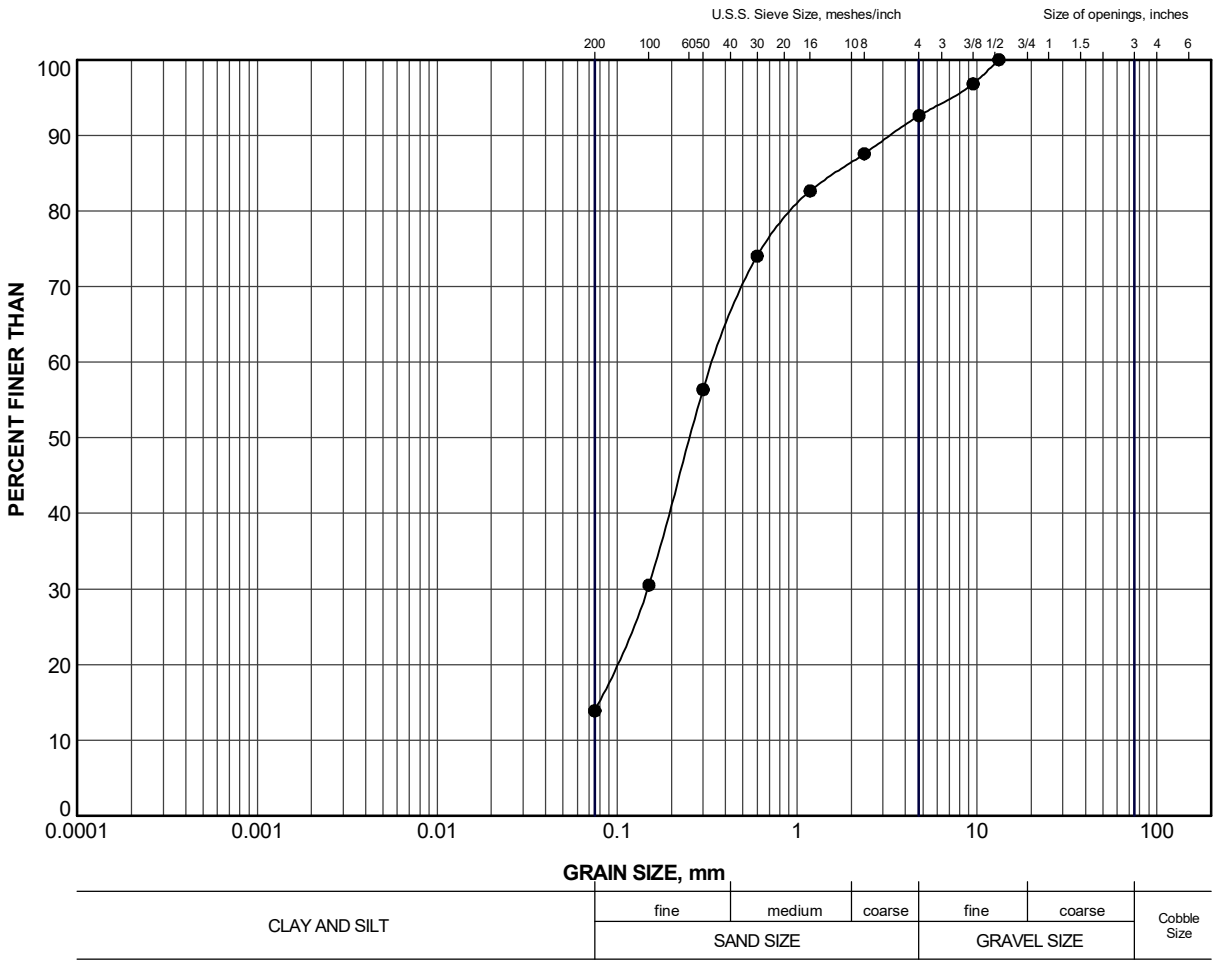
GRAIN SIZE DISTRIBUTION

SANDY CLAYEY SILT (CL) (FILL)

wsp
SUDBURY, ONTARIO

PROJECT No.	CA0008394.9800		FILE No.	CA0008394.9800.GPJ	
DRAWN	TR	Jan 2024	SCALE	N/A	REV.
CHECK	MT	Jan 2024			
APPR	KJB	Jan 2024	**FIGURE**		**B-2**

SUD-MTO GSD_GLDR_LDN.GDT



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	UC-1	2	256.5

PROJECT

HIGHWAY 630
AMABLE DU FOND TRIBUTARY CULVERT

TITLE

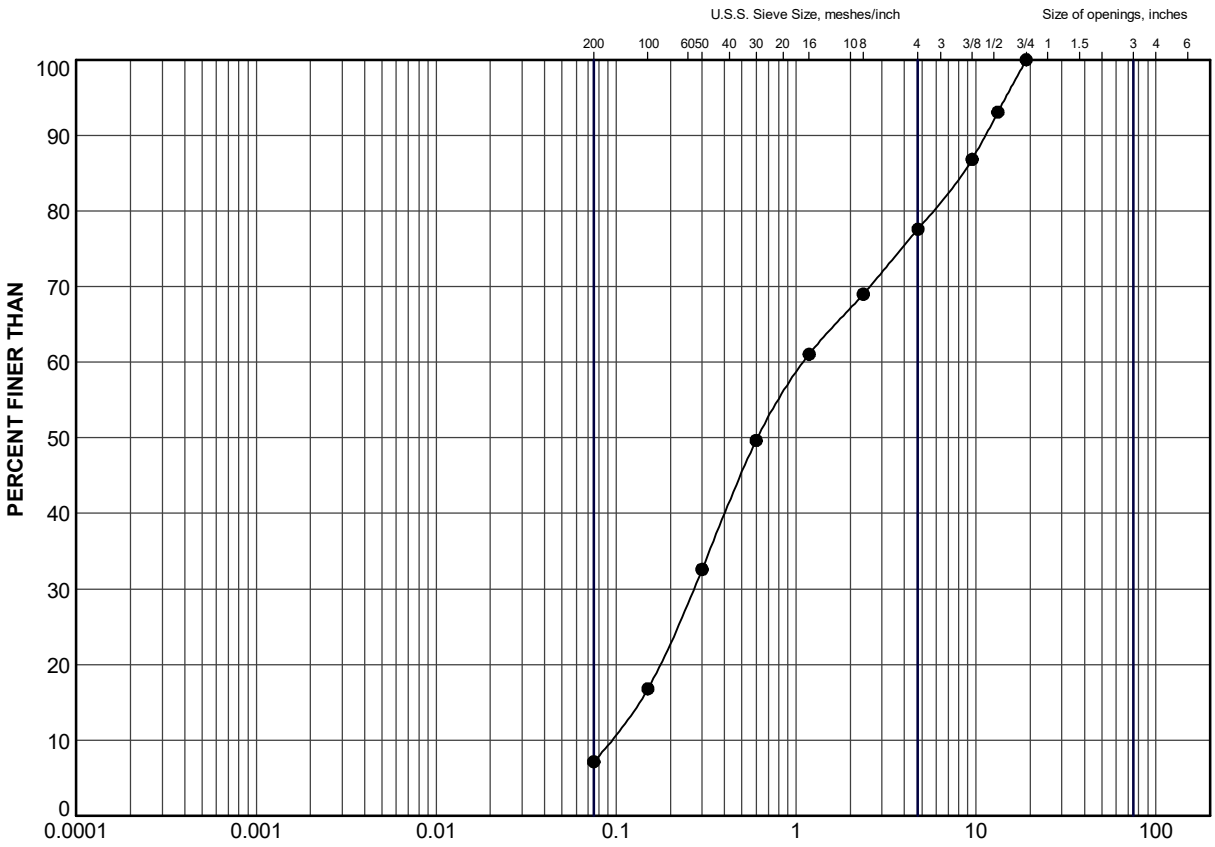
GRAIN SIZE DISTRIBUTION

SILTY SAND (SM) FILL)

SUDBURY, ONTARIO

PROJECT No.	CA0008394.9800		FILE No.	CA0008394.9800.GPJ	
DRAWN	TR	Jan 2024	SCALE	N/A	REV.
CHECK	MT	Jan 2024			
APPR	KJB	Jan 2024	FIGURE	B-3	

SUD-MTO GSD_GLDR_LDN.GDT



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	UC-1	5	254.4

PROJECT

HIGHWAY 630
AMABLE DU FOND TRIBUTARY CULVERT

TITLE

GRAIN SIZE DISTRIBUTION

GRAVELLY SAND (SP-SM)

SUDBURY, ONTARIO

PROJECT No.	CA0008394.9800		FILE No.	CA0008394.9800.GPJ	
DRAWN	TR	Jan 2024	SCALE	N/A	REV.
CHECK	MT	Jan 2024			
APPR	KJB	Jan 2024	**FIGURE**	**B-4**	

SUD-MTO GSD_GLDR_LDN.GDT

Borehole UC-1: Bedrock cored between depths of about 4.1 m to 7.7 m

PROJECT	HIGHWAY 630 AMABLE DU FOND TRIBUTARY CULVERT (SITE NO. 43X-0301/C0) LAUDER TWP., DISTRICT OF NIPISSING			
TITLE	BEDROCK CORE PHOTOGRAPH DRILLHOLE UC-1			
wsp SUDBURY, ONTARIO	PROJECT No. CA0008394.9800			FILE No. ----
	DESIGN	TB		SCALE NTS
	CADD	--		**FIGURE B-5**
	CHECK	MT		
	REVIEW	KJB		

APPENDIX C

Analytical Laboratory Test Results

Your Project #: CA0008394.9800/1000FOUNDATIONS
Site Location: HWY 630-UNKNOWN CREEK CULVERT
Your C.O.C. #: n/a

Attention: Tibor Berecz

WSP Canada Inc.
33 Mackenzie Street
Suite 100
Sudbury, ON
Canada P3C 4Y1

Report Date: 2023/12/04
Report #: R7940886
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3AG662
Received: 2023/11/22, 09:07

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Chloride (20:1 extract)	1	2023/11/27	2023/11/28	CAM SOP-00463	MOE E3013 m
Conductivity	1	2023/11/27	2023/11/27	CAM SOP-00414	OMOE E3530 v1 m
Moisture (Subcontracted) (1, 2)	1	N/A	2023/12/04	AB SOP-00002	CCME PHC-CWS m
Sulphide in Soil (1)	1	N/A	2023/12/04	AB SOP-00080	EPA9030B/SM4500S2-DF
pH CaCl2 EXTRACT	1	2023/11/28	2023/11/28	CAM SOP-00413	EPA 9045 D m
Redox Potential (3)	1	2023/11/27	2023/11/28	CAM SOP-00421	SM 24 2580 B
Resistivity of Soil	1	2023/11/23	2023/11/27	CAM SOP-00414	SM 23 2510 m
Sulphate (20:1 Extract)	1	2023/11/27	2023/11/28	CAM SOP-00464	MOE E3013 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) Offsite analysis requires that subcontracted moisture be reported.

Your Project #: CA0008394.9800/1000FOUNDATIONS
Site Location: HWY 630-UNKNOWN CREEK CULVERT
Your C.O.C. #: n/a

Attention: Tibor Berecz

WSP Canada Inc.
33 Mackenzie Street
Suite 100
Sudbury, ON
Canada P3C 4Y1

Report Date: 2023/12/04
Report #: R7940886
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3AG662

Received: 2023/11/22, 09:07

(3) Oxidation-Reduction Potential (ORP) values are determined using a Ag/AgCl reference electrode. The test is therefore, not SCC accredited for this matrix.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Julie Clement, Technical Account Manager
Email: Julie.CLEMENT@bureauveritas.com
Phone# (613)868-6079

==========

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Bureau Veritas Job #: C3AG662
Report Date: 2023/12/04

WSP Canada Inc.
Client Project #: CA0008394.9800/1000FOUNDATIONS
Site Location: HWY 630-UNKNOWN CREEK CULVERT
Sampler Initials: TB

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		XRF476		
Sampling Date		2023/11/09 13:55		
COC Number		n/a		
	UNITS	UC-1,SA#4 (7.5' 9.5')	RDL	QC Batch
Calculated Parameters				
Resistivity	ohm-cm	19000		9068220
CONVENTIONALS				
Redox Potential	mV	440	N/A	9073665
Inorganics				
Soluble (20:1) Chloride (Cl-)	ug/g	<20	20	9074044
Conductivity	umho/cm	54	2	9073607
Available (CaCl2) pH	pH	5.75		9076699
Soluble (20:1) Sulphate (SO4)	ug/g	30	20	9074144
Sulphide	mg/kg	0.6 (1)	0.5	9090129
Physical Testing				
Moisture-Subcontracted	%	22	0.30	9089916

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Extracted past method specified hold time
Sample contained greater than 10% headspace at time of extraction.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C3AG662
Report Date: 2023/12/04

WSP Canada Inc.
Client Project #: CA0008394.9800/1000FOUNDATIONS
Site Location: HWY 630-UNKNOWN CREEK CULVERT
Sampler Initials: TB

TEST SUMMARY

Bureau Veritas ID: XRF476
Sample ID: UC-1,SA#4 (7.5' 9.5')
Matrix: Soil

Collected: 2023/11/09
Shipped:
Received: 2023/11/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	SKAL/EC	9074044	2023/11/27	2023/11/28	Alina Dobreanu
Conductivity	AT	9073607	2023/11/27	2023/11/27	Kien Tran
Moisture (Subcontracted)	BAL	9089916	N/A	2023/12/04	Simranjeet Batth
Sulphide in Soil	SPEC	9090129	N/A	2023/12/04	Bailey Morrison
pH CaCl2 EXTRACT	AT	9076699	2023/11/28	2023/11/28	Taslima Aktar
Redox Potential	COND	9073665	2023/11/27	2023/11/28	Kien Tran
Resistivity of Soil		9068220	2023/11/27	2023/11/27	Automated Statchk
Sulphate (20:1 Extract)	SKAL/EC	9074144	2023/11/27	2023/11/28	Alina Dobreanu

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	12.3°C

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
9073607	Conductivity	2023/11/27			102	90 - 110	<2	umho/cm	3.5	10
9073665	Redox Potential	2023/11/28			100	95 - 105			7.7	35
9074044	Soluble (20:1) Chloride (Cl-)	2023/11/28	NC	70 - 130	102	70 - 130	<20	ug/g	3.8	35
9074144	Soluble (20:1) Sulphate (SO4)	2023/11/28	NC	70 - 130	104	70 - 130	<20	ug/g	3.4	35
9076699	Available (CaCl2) pH	2023/11/28			100	97 - 103			2.0	N/A
9089916	Moisture-Subcontracted	2023/12/04					<0.30	%		
9090129	Sulphide	2023/12/04	84	75 - 125	93	75 - 125	<0.5	mg/kg	NC	30

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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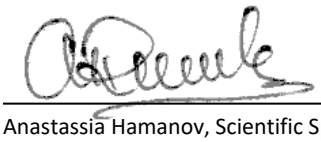
Bureau Veritas Job #: C3AG662
Report Date: 2023/12/04

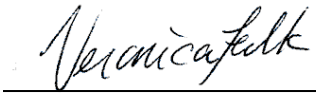
WSP Canada Inc.
Client Project #: CA0008394.9800/1000FOUNDATIONS
Site Location: HWY 630-UNKNOWN CREEK CULVERT
Sampler Initials: TB

VALIDATION SIGNATURE PAGE

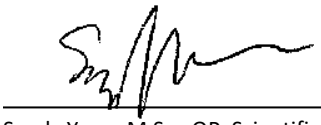
The analytical data and all QC contained in this report were reviewed and validated by:



Anastassia Hamanov, Scientific Specialist



Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics



Sandy Yuan, M.Sc., QP, Scientific Specialist

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Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

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Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266

CHAIN OF CUSTODY RECORD

ENV COC - 00014v3

Page _____ of _____

22-Nov-23 09:07
Julie Clement
C3AG662
SBS ENV-1454

Invoice Information		Report Information (if differs from invoice)		Project Information	
Company:	WSP Canada Inc.	Company:		Quotation #:	
Contact Name:	Tibor Berecz	Contact Name:		P.O. #/ AFE#:	
Street Address:	33 MacKenzie St. Suite 100	Street Address:		Project #:	CA0008394.9800/1000Foundations
City:	Sudbury Prov: ON Postal Code: P3C 4Y1	City:	Prov: Postal Code:	Site #:	
Phone:	647 616 8397	Phone:		Site Location:	Hwy 630 - Unknown Creek culvert
Email:	tibor.berecz@wsp.com	Email:		Site Location Province:	ON
Copies:		Copies:		Sampled By:	Tibor Berecz

Invoice to (requires report) ☐

Regulatory Criteria

REG 153: ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table _____ ☐ Res/Park ☐ Ind/Comm ☐ Agri/other ☐ Med/Fine ☐ Course ☐ For RSC

OTHER: ☐ CCME ☐ Reg 558* ☐ *min 3 day TAT ☐ MISA ☐ PWQO ☐ Reg 406, Table: _____ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality _____ ☐ Other: _____

Include Criteria on Certificate of Analysis (check if yes): ☐

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	Sample Identification	Date Sampled YY	MM	DD	Time (24hr) HH	MM	Matrix	1 FIELD FILTERED	2 FIELD PRESERVED	3 LAB FILTRATION REQUIRED	4 BTEX/ F1	5 F2 - F4	6 VOCs	7 Reg 153 metals and inorganics	8 Reg 153 ICPMS metals	9 Reg 153 metals (Hg, Cr VI, ICPMS metals, HWS - B)	10 Corrosivity Package	11	12	13	14	15	16	17	18	19	20	21 # OF CONTAINERS SUBMITTED	22 HOLD - DO NOT ANALYZE	Comments
1	UC-1, Sa# 4 (7.5'-9.5')	23	11	09	13	55	Soil										X											1		
2	UC-1, Sa#4 (7.5'9.5') dupl.	23	11	09	13	55	Soil																							Sa#4 Duplicate if required
3																														
4																														
5																														
6																														
7																														
8																														
9																														
10																														
11																														
12																														

Regular Turnaround Time (TAT)
☒ 5 to 7 Day ☐ 10 Day

Rush Turnaround Time (TAT) Surcharges apply
☐ Same Day ☐ 1 Day ☐ 2 Day ☐ 3 Day ☐ 4 Day

Date Required: YY MM DD

*UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS AND CONDITIONS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS OR BY CALLING THE LABORATORY LISTED ABOVE TO OBTAIN A COPY

LAB USE ONLY	Yes	No	°C				LAB USE ONLY	Yes	No	°C				LAB USE ONLY	Yes	No	°C				Temperature reading by:
Seal present		✓		12			Seal present							Seal present							
Seal intact		✓		12			Seal intact							Seal intact							
Cooling media present		✓		13			Cooling media present							Cooling media present							
				1	2	3					1	2	3					1	2	3	

	Relinquished by: (Signature/ Print)	Date YY	MM	DD	Time HH	MM	Received by: (Signature/ Print)	Date YY	MM	DD	Time HH	MM	Special instructions
1	Tibor Berecz / Tibor B.	23	11	20			1 Sylvain Sauvé	2023	11	22	09	07	
2							2						

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