FOUNDATION INVESTIGATION REPORT
PRELIMINARY DESIGN AND ENVIRONMENTAL ASSESSMENT
QEW BRIDGE TWINNING OVER CREDIT RIVER
MISSISSAUGA, ONTARIO
W.O. 08-20008, ASSIGNMENT NO. 2008-E-0025

GEOCRES Number: 30M12-341

Report to

McCormick Rankin Corporation

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TABLE OF CONTENTS

SECTION **PAGE**

Appendices

FOUNDATION INVESTIGATION REPORT
PRELIMINARY DESIGN AND ENVIRONMENTAL ASSESSMENT
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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a preliminary foundation investigation carried out at the location of the proposed widening of the existing Queen Elizabeth Way (QEW) bridge over the Credit River. This investigation was carried out in support of the preliminary design, environmental assessment and planning for the bridge widening over the river. These works are part of the project involving preliminary design for widening of QEW from West of Hurontario Street to West of Mississauga Road in Mississauga, Ontario.

The purpose of the investigation was to explore the subsurface conditions at selected foundation element locations and, based on the data obtained, to provide a borehole locations and soil strata drawing, records of boreholes, stratigraphic profile and cross-sections, laboratory test results and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained from the present investigation and selected data from previous investigations.

Thurber was retained by McCormick Rankin Corporation (MRC) to carry out the foundation investigation at this site on behalf of the Ministry of Transportation Ontario (MTO) under W.O. 08-20008 and Consultant Assignment No. 2008-E-0025.

2 SITE DESCRIPTION

The existing QEW Credit River bridge is comprised of seven spans and carries six lanes of traffic. These spans include two approach spans over the east valley slope, one approach span over the west valley slope, and four intermediate spans crossing the floodplain and river channel. The bridge twinning is currently proposed to be located immediately to the north of the existing bridge. The existing valley slopes at the bridge location are at an inclination of approximately 1.7H : 1V on the west side and approximately 4H : 1V on the east side, and are moderately vegetated with tall grass, shrubs and some trees.

The river valley is incised up to approximately 19 m below the surrounding plateau. The valley slopes are predominantly formed through shale bedrock. On the plateau, shale underlies overburden soils or fill at shallow depth. The drainage at the site is directed towards Credit River, which flows southward to Lake Ontario.

On the west plateau to the north of QEW, the terrain is relatively flat with residential dwellings located at some distance beyond the proposed bridge footprint. Vegetation is moderate consisting mainly of tall grass, shrubs and occasional small to large trees. An access road cut up to 13 m deep is under construction through the west valley slope to access the west floodplain for bridge rehabilitation purposes. At the east plateau, the vegetation is denser with some residential dwellings located within the proposed bridge footprint. The slope configuration also appears to have been modified by existing fill placed on the original valley slope.

From published geological information, the area of and adjacent to the Credit River valley is situated within the physiographic region known as the Iroquois Plain. In this area, the relatively thin native soil deposits typically consist of cohesive soils (some tills) overlying shale bedrock of the Georgian Bay Formation. The till is known to consist of shale and limestone fragments. Alluvial deposits in the form of clayey silts, silts and fine sands are present within the river floodplain.

3 SITE INVESTIGATION AND FIELD TESTING

The site investigation and field testing for this project consisted of drilling on the plateau and river floodplain for the proposed QEW bridge twinning. The field work was carried out between May 30 and June 9, 2011 during which time Boreholes 11-01 and 11-02 were drilled and sampled to depths of 7.1 and 8.4 m, respectively. The approximate locations of both boreholes are shown on the attached Borehole Locations and Soil Strata Drawing in Appendix C. Boreholes from previous investigations that are considered relevant to this project are also included on the drawing. The following lists the relevant past investigation reports referenced in this report.

- Thurber report titled "Foundation Investigation Report, Construction Access Road for Bridge Rehabilitation, QEW Bridge Over Credit River, Mississauga, Ontario, W.P. 2186-07-00, GEOCRES No. 30M12-324, File:19-92-92, dated April 8, 2011 (Reference 1).
- Trow, Soderman and Associates letter report titled "Core Drilling to Determine Underside of Existing Footings, Oakville Creek and Credit River Bridges, Queen Elizabeth Highway", 58-F-264c, Dept. of Highways of Ontario dated August 1958 (Reference 2).
- Dept. of Highways of Ontario archived drawing, D-2241-1, which includes boreholes advanced in 1933 near the existing foundation locations, 1933 (Reference 3).

For the present investigation, the planned borehole locations were staked and/or marked in the field by Thurber. Utility clearance was obtained at all borehole locations by Thurber prior to drilling. Borehole survey data including northings, eastings and ground surface elevations has been provided by MRC to Thurber.

It is noted that two other boreholes had originally been planned for the east plateau and east floodplain, respectively. Due to access constraints and permission to enter restrictions amongst other constraints, it was concluded following discussions with MRC and MTO that the boreholes on the east side of the river will not be drilled at this time. Instead, the available past borehole information will be utilized to provide preliminary foundation recommendations.

OGS Inc. of Almonte, Ontario supplied and operated a Hilti DD-250E tri-pod for advancing Boreholes 11-01 and 11-02 due to the constraints imposed by the overhead power cables and difficult access for conventional drill rigs down to the floodplain, respectively. Wash boring techniques were used to advance the boreholes through soils and highly weathered bedrock. Prior to wash boring, soil and weathered bedrock samples were obtained at selected intervals using a split spoon sampler in conjunction with the Standard Penetration Testing (SPT). Within the floodplain, soil samples in Borehole 11-02 were obtained using a 50-lb hammer instead of a standard 140-lb hammer. Once the top of weathered bedrock was encountered, both boreholes were further advanced into bedrock by NQ size coring equipment to recover core samples.

Groundwater conditions in the open boreholes were observed throughout the drilling operations. Standpipe piezometers were installed in Boreholes 11-01 and 11-02 to permit monitoring of the groundwater level. At this site, 31 mm to 38 mm diameter Schedule 40 PVC pipes with 1.5 m long slotted screens were installed in the boreholes. The sand screen surrounded the pipe and extended above the slotted portion of the pipe. Bentonite holeplug seals were placed above the sand screen in each installation. Borehole completion details are presented in Table 1 following the text.

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 rock samples for transport to Thurber's laboratory for further examination and testing.

All rock cores were logged, and properties including the Total Core Recovery (TCR), Rock Quality Designation (RQD) and the Fracture Indices (FI) were determined where applicable.

4 LABORATORY TESTING

All recovered soil samples were subjected to visual identification and to natural moisture content determination. The results of this testing are shown on the Record of Borehole sheets in Appendix A. Selected soil samples were subjected to gradation analysis. Atterberg Limits Tests were performed on some of the cohesive samples. The results of this testing program are presented on the Record of Borehole sheets in Appendix A and on the figures in Appendix B.

Suitable rock cores were not available for carrying out the Point Load Test (PLT). Results available from Reference 2 are attached in Table 2 following the text.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets in Appendix A. Details of the encountered soil and rock stratigraphy are presented in these records and on the "Borehole Locations and Soil Strata"

drawing in Appendix C. A summary of bedrock information from current and previous boreholes is shown on an aerial photograph of the site included in Appendix C. A 1933 bridge plan and profile showing the original 1933 boreholes is also included in Appendix C. General description of the stratigraphy based on boreholes advanced during the current and past investigations is given in the following paragraphs. The factual information established at the borehole locations governs any interpretation of site conditions.

In general, the Credit River floodplain is underlain by alluvium and the plateau is underlain by thin deposits of overburden soil. Shale bedrock is present at relatively shallow depths at both locations.

5.1 West Plateau

5.1.1 Topsoil

Topsoil of about 200 mm in thickness was encountered in Borehole 11-01. The access road boreholes (Reference 1) indicated a topsoil thickness ranging from 50 to 150 mm. Although absent in Borehole 11-02, it is anticipated that topsoil is present elsewhere within the floodplain. Topsoil thickness may vary between and beyond the borehole location.

5.1.2 Silty Clay

In Boreholes 11-01 on the plateau, the topsoil is underlain by a deposit of silty clay with trace sand which extends to a depth of 3.3 m below existing ground surface, or approximate Elevation 91.3 m. The silty clay is typically grey in colour at this location. Trace shale fragments were also present within the silty clay.

Standard Penetration Tests (SPT) conducted within the upper portion of this deposit gave 'N' values of 4 and 21 blows per 0.3 m penetration indicating a firm to very stiff consistency. The measured moisture contents of samples recovered from this unit ranged from about 25% to 38%.

Grain size analysis conducted on a sample of this soil is presented in Figures B1. The results indicate that the silty clay contains approximately 2% gravel, 15% sand, 49% silt and 34% clay. Atterberg Limits test was also conducted on a sample from this stratum and the results are presented in Figure B3. The silty clay sample had a measured plasticity index of 17% and a corresponding liquid limit of 38%. These values are indicative of a cohesive soil of intermediate plasticity (group symbol of CI).

It is noted that the overburden stratigraphy in Borehole 11-01 is similar to the overburden encountered in the previous Boreholes 10-01, 10-02 and 10-05 from Reference 1.

5.2 West Floodplain

5.2.1 Alluvium (Clayey Silt and Sand)

Alluvial overburden deposits were encountered in the Credit River floodplain. In Borehole 11-02, the alluvium consists of clayey silt overlying sand deposits. The clayey silt is

approximately 3.5m thick and contains some sand, trace gravel and trace shale fragments. The underside of the clayey silt layer is at Elevation 72.2 m. Based on this borehole and other boreholes in the floodplain from Reference 1, this soil is found to have a firm to very stiff consistency as indicated by SPT 'N' values typically ranging between 5 and 19 blows per 0.3 m penetration, except at locations of shale fragments, inferred cobbles and boulders where the 'N' values are up to the order of 24 to 37 blows. The moisture contents of the clayey silt range from 10% to 18%.

A buried peat layer of 0.6 to 1.0 m thick was encountered in the clayey silt deposit in Boreholes 10-03A and 10-03B from Reference 1 located below the bridge on the floodplain.

Below the clayey silt, sand with trace to some gravel was encountered in Borehole 11-02. Wash boring techniques were used without sampling to advance the boreholes below the clayey silt. Finer soil particles including clay, silt and sand were washed out with the drill water. As such, there were insufficient recovered sand samples to carry out grain size distribution analyses and moisture content determination.

Frequent obstructions were encountered within the lower portion of the clayey silt and throughout the sand. These obstructions may be inferred as cobbles and boulders. The 1933 boreholes from Reference 3 also indicate a mixture of clay, gravel and shale fragments above the bedrock surface.

Grain size analysis conducted on a sample of the clayey silt is presented in Figure B2. The results indicate that the clayey silt contains approximately 0% gravel, 27% sand, 55% silt and 18% clay.

5.3 East Plateau and Valley Slopes

As indicated earlier, no boreholes were drilled on the east plateau or the east valley slope due to access restrictions. The 1933 boreholes indicate the presence of an overburden of a mixture of clay, gravel and shale fragments overlying bedrock at those locations. It must be noted, however, that this information is from 1933 and that the subsurface conditions may have been significantly modified over the years including placement of fill on the valley slopes.

5.4 Shale Bedrock

The overburden soils described above are underlain by shale bedrock. Bedrock was proven by coring below the wash bored depths in Boreholes 11-01 and 10-02. The following table summarizes the depths and elevations of weathered shale encountered at the borehole locations from both the present investigation and boreholes drilled at the existing bridge foundation elements during past investigations.

Foundation Element	Borehole Number	Depth to Weathered Shale (m)	Top of Weathered Shale Elevation (m)
West Abutment (proposed bridge)	11-01	3.3	91.3
	10-02	3.2	91.2
West Abutment (existing bridge)	Hole #1	1.5	91.6
	Trow #1	-	87.4
Pier No. 1 (proposed bridge)	11-02	6.3	69.4
Pier No. 1 (existing bridge)	Trow #3	-	69.0
	Hole #3	5.2	70.4
Pier No. 2 (Piers 4 and 5 of existing bridge)	Trow #6	-	68.4
	Trow #7	-	72.2
	Hole #5	-	69.6
	Hole #6	6.1	73.4
East Abutment (existing bridge)	Trow #10	-	88.0
	Trow #9	-	88.4
	Hole #8	6.7	85.6

The shale encountered at this site is fine grained, thinly bedded and grey in colour that is typical of the Georgian Bay Formation. The shale is interbedded with hard grey limestone layers and clay seams. In Borehole 11-01, the shale is in a highly weathered state within the upper 0.3m. Below this zone, the degree of weathering decreases with depth, and the rock becomes moderately to slightly weathered. The clay seams typically range from 20 to 100mm in thickness, with occasional layers up to 350 mm thick. In Borehole 11-02, the shale is highly weathered throughout the depth of investigation. The clay seams are typically 50 mm thick and an occasional sand seam up to 125 mm thick.

In Borehole 11-01, Total Core Recovery (TCR) of the bedrock was generally between 95% and 100%. The Rock Quality Designation (RQD) values were practically zero indicating a very poor rock quality. However, these low RQD values may be partially attributed to the coring equipment used in the tri-pod setup. In Borehole 11-02, Total Core Recovery (TCR) of the bedrock ranged between 30% and 100%. The Rock Quality Designation (RQD) value was 90% indicating an excellent rock quality for the first run. The RQD values decreased to the range of 10 to 35% indicating poor to very poor rock quality in the remaining runs.

Additional investigation and rock coring is recommended during the detailed design stage at each foundation element of the proposed bridge to confirm the depth of rock and the rock quality at each foundation element.

5.5 Groundwater Conditions

Groundwater conditions were observed in the open boreholes upon completion of drilling. Standpipe piezometers were installed and sealed in Boreholes 11-01 and 11-02 to permit longer term groundwater monitoring. The measured groundwater levels in the piezometers are presented in the following table.

Borehole	Date	Ground Surface Elevation (m)	Groundwater	
			Depth (m)	Elevation (m)
11-01 (sealed in bedrock)	September 30, 2010	94.6	3.2	91.4
10-02 (sealed at soil-bedrock interface)	December 17, 2010	94.4	dry	Dry
10-02 (sealed in bedrock)	December 17, 2010	94.4	9.3	85.1
11-02 (sealed at soil-bedrock interface)	June 8, 2011 October 4, 2011	75.7	0.7 1.5	75.0 74.2

It is anticipated that the groundwater level at the floodplain is largely governed by the water level in the Credit River. The water level in the Credit River was noted to be at Elevation 75.03 m on September 16, 1986. The 100-year storm high water level was reported to be at Elevation 77.72 m.

It is noted that all groundwater observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.

6 MISCELLANEOUS

Borehole locations and ground surface elevations were provided to Thurber by MRC.

The drilling and sampling equipment was supplied and operated by OGS Inc. of Almonte, Ontario. The field work was supervised on a full time basis by Ms. Eckie Siu of Thurber Engineering Ltd.

Laboratory testing was carried out at Thurber's Laboratory in Oakville, Ontario.

Overall supervision of the field program was conducted by Dr. Sydney Pang, P. Eng. Compilation of data and preparation of the report were carried out by Dr. Sydney Pang, P. Eng.

Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects, reviewed the report.

THURBER ENGINEERING LTD.

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Appendix A

Record of Borehole Sheets

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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

C_{pen} 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			

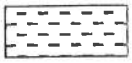
EXPLANATION OF ROCK LOGGING TERMS

ROCK WEATHERING CLASSIFICATION

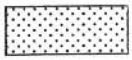
Fresh (FR)	No visible signs of weathering.
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.
Moderately Weathered (MW)	Weathering extends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

SYMBOLS

CLAYSTONE



SILTSTONE



SANDSTONE

COAL

Bedrock (general)

DISCONTINUITY SPACING

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

TERMS

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.

STRENGTH CLASSIFICATION

Rock Strength	**Approximate Uniaxial Compressive Strength (MPa)**	**(psi)**	**Field Estimation of Hardness***
Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
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

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RECORD OF BOREHOLE No 11-01 1 OF 1 METRIC

W.P. W.O. 08-20008 LOCATION N 4 823 959.1 E 295 814.8 QEW Bridge at Credit River ORIGINATED BY SLD

HWY QEW BOREHOLE TYPE Tripod (Hilti) - Wash Boring and Coring COMPILED BY AN

DATUM Geodetic DATE 2011.05.30 - 2011.06.02 CHECKED BY SKP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	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 × LAB VANE) (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
94.6											
0.0	**TOPSOIL**, with roots and organics:										
0.2	(200mm)		1	SS	4				○		
	Silty **CLAY**, trace sand Very Stiff Grey Moist						94				
			2	SS	21				⊢●		2 15 49 34
	trace shale fragments		3	SS	40/ 0.075				○		
			1	RUN			93				
			2	RUN							
			3	RUN							
			4	RUN			92				
			5	RUN							
			4	SS	50/ 0.075				○		
91.3							▼				
3.3	**SHALE**, weathered, grey										
91.0							91				
3.6	END OF SPT SAMPLING TO 3.6m AND START CORING. FOR ROCK DETAILS PLEASE REFER TO 11-01R. Piezometer installation consists of 38mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Sep.30/11 3.2 91.4										

$+^3$, $\times^3$: Numbers refer to Sensitivity

$15 \oplus^{20}_{10} 5$ (%) STRAIN AT FAILURE

ONTMT4S 1174.GPJ 5/18/12

RECORD OF BOREHOLE 11-01R

PROJECT : QEW Mississauga Rd. Overpass
LOCATION : Mississauga, ON
STARTED : May 30, 2011
COMPLETED : June 2, 2011

INCLINATION: Vertical AZIMUTH:

Project No. W.O. 08-20008

SHEET 1 OF 1
DATUM Geodetic

FR-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT J-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED

DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 3 m	DISCONTINUITY DATA DIP wrt Core Axis	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	25 Unconfined 50 Compressive Strength 75 (MPa)	FIELD/LABORATORY TESTING RESULTS
				91.0												
	RUN	**SHALE**, slightly to moderately weathered, fine grained, thinly bedded, grey, with limestone interbeds		3.6	1		100									
4	RUN				2		100									
	RUN	20mm clay seam at 3.7m 30mm clay seam at 3.76m			3		90									
	RUN	10mm clay seams at 3.8m, 3.9m, 4.0m and 4.2m			4		100									
	RUN	Frequent clay seams (20mm to 100mm) from 4.3m to 5.0m 350mm clay seam at 5.0m 200mm rubble zone at 5.4m			5		100									
	RUN	Clay seams (25mm to 75mm) at 5.5m, 5.6m, 5.7m, 5.9m, 6.0m			6		100									
6	RUN				7		100									
	RUN	Clay seams (25mm to 75mm) at 6.2m, 6.3m, 6.4m, 6.6m, 6.7m and 6.8m			8		100									
	RUN				9		100									
	RUN				10		100									
		END OF BOREHOLE AT 7.1m.		87.5 7.1												
8																
10																
12																

FIELD/LABORATORY TESTING RESULTS
- ● Point Load Test Diametral
- ▲ Point Load Test Axial
- ◙ Laboratory UCS Test

Bentonite Seal
89.24
Sand
88.94
Slotted Screen
87.44

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : SLD
CHECKED : SKP

ROCKM 1174.GPJ 5/17/12

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 11-02 1 OF 1 METRIC

W.P. W.O. 08-20008 LOCATION N 4 824 026.4 E 295 840.4 QEW Bridge at Credit River ORIGINATED BY SLD/ES

HWY QEW BOREHOLE TYPE Tripod (Hilti) - Wash Boring and Coring COMPILED BY AN

DATUM Geodetic DATE 2011.06.07 - 2011.06.09 CHECKED BY SKP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE) (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
75.7 / 0.0	Clayey **SILT**, some sand, trace gravel, trace shale fragments Stiff to Very Stiff Brown Moist		1	SS	9*		75		o		
			2	SS	10*				o		0 27 55 18
			3	SS	12*	▼	74		o		
73.3 / 2.4	Frequent obstructions, inferred as cobbles and boulders		4	SS	5*				o		
			5	SS	37*		73		o		
72.2 / 3.5	**SAND**, trace to some gravel Brown						72				
71.9 / 3.8	Frequent obstructions, inferred as cobbles and boulders										
71.1 / 4.6							71				
70.5 / 5.2	Clayey **SILT**, some sand, trace gravel										
70.4 / 5.3	Frequent obstructions, inferred as cobbles and boulders Shale fragements						70				
69.4 / 6.3	END OF SAMPLING AT 6.3m AND START CORING. FOR ROCK DETAILS PLEASE REFER TO 11-02R. Piezometer installation consists of 31mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Jun.08/11 0.7 75.0 Oct.04/11 1.5 74.2										

$+^3$, $\times^3$: Numbers refer to Sensitivity

$15 \oplus \frac{20}{10} 5$ (%) STRAIN AT FAILURE

ONTMT4S 1174.GPJ 5/18/12

RECORD OF BOREHOLE 11-02R

PROJECT : QEW Mississauga Rd. Overpass
LOCATION : Mississauga, ON
STARTED : June 7, 2011
COMPLETED : June 9, 2011

INCLINATION: Vertical AZIMUTH:

Project No. W.O. 08-20008

SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	PENETRATION RATE (m/min)	COLOUR / % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER .3 m	DISCONTINUITY DATA: DIP wrt Core Axis	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	Unconfined Compressive Strength (MPa)	FIELD/LABORATORY TESTING RESULTS
				69.4												
8	NQ Coring RUN RUN RUN RUN	**SHALE**, highly weathered, fine grained, thinly bedded, with strong limestone interbeds 75mm clay seam at 6.5m 50mm sand seam at 6.7m Limestone interbed (up to 25mm thick) at 6.5m 125mm sand seam at 6.7m 50mm sand seam at 6.9m 50mm clay seam at 6.8m 50mm clay seam at 7.0m 50mm sand and gravel layer at 7.1m		6.3 67.3	1 2 3 4	0.006 0.008 0.01 0.008	10 0 0 0									Slotted Screen 68.42 Bentonite 67.36
10		END OF BOREHOLE AT 8.3m. NOTE: SAND BLEW BACK UP THE HOLE AT 7.0m.		8.4												
12																
14																
16																

FR-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT J-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED

FIELD/LABORATORY TESTING RESULTS
- ● Point Load Test Diametral
- ▲ Point Load Test Axial
- ■ Laboratory UCS Test

GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION
WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION
WATER LEVEL (date)

LOGGED : SLD
CHECKED : SKP

ROCKM 1174.GPJ 5/17/12

Appendix B

Laboratory Test Results

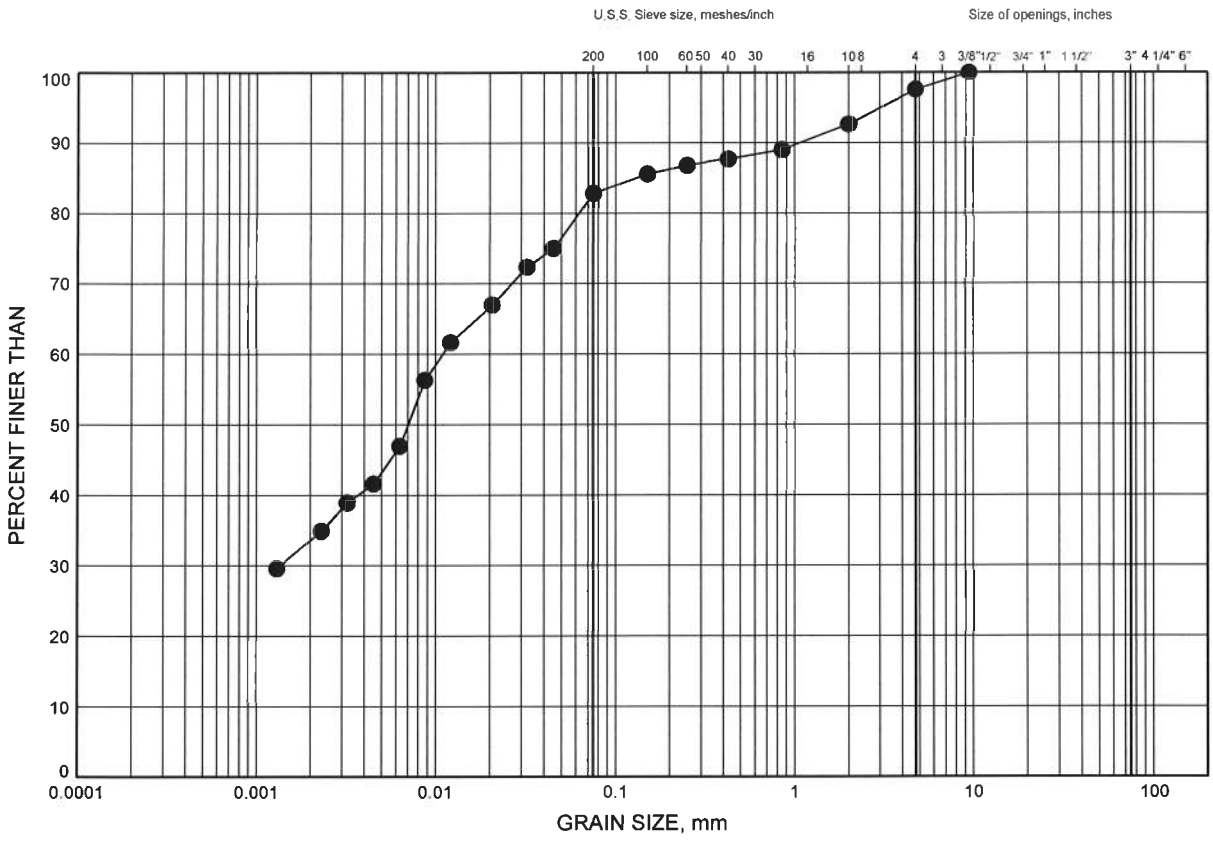
THURBER

QEW Bridge at Credit River

GRAIN SIZE DISTRIBUTION

FIGURE B1

SILTY CLAY



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-01	1.07	93.50

Date May 2012

W.P.# W.O. 08-20008

THURBER

Prep'd MFA

Chkd. SKP

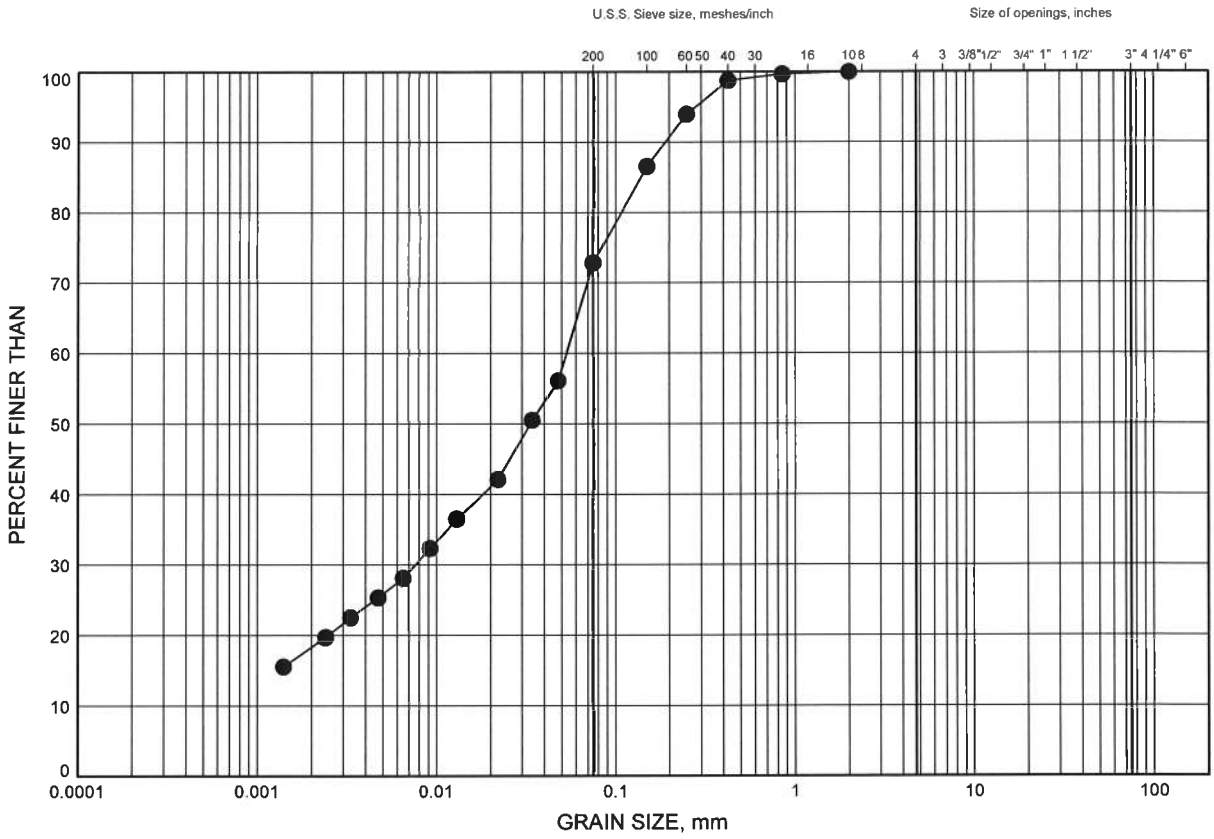
GRAIN SIZE DISTRIBUTION - THURBER 1174.GPJ 5/17/12

QEW Bridge at Credit River

GRAIN SIZE DISTRIBUTION

FIGURE B2

CLAYEY SILT



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-02	0.91	74.83

Date May 2012

W.P.# W.O. 08-20008

THURBER

Prep'd MFA

Chkd. SKP

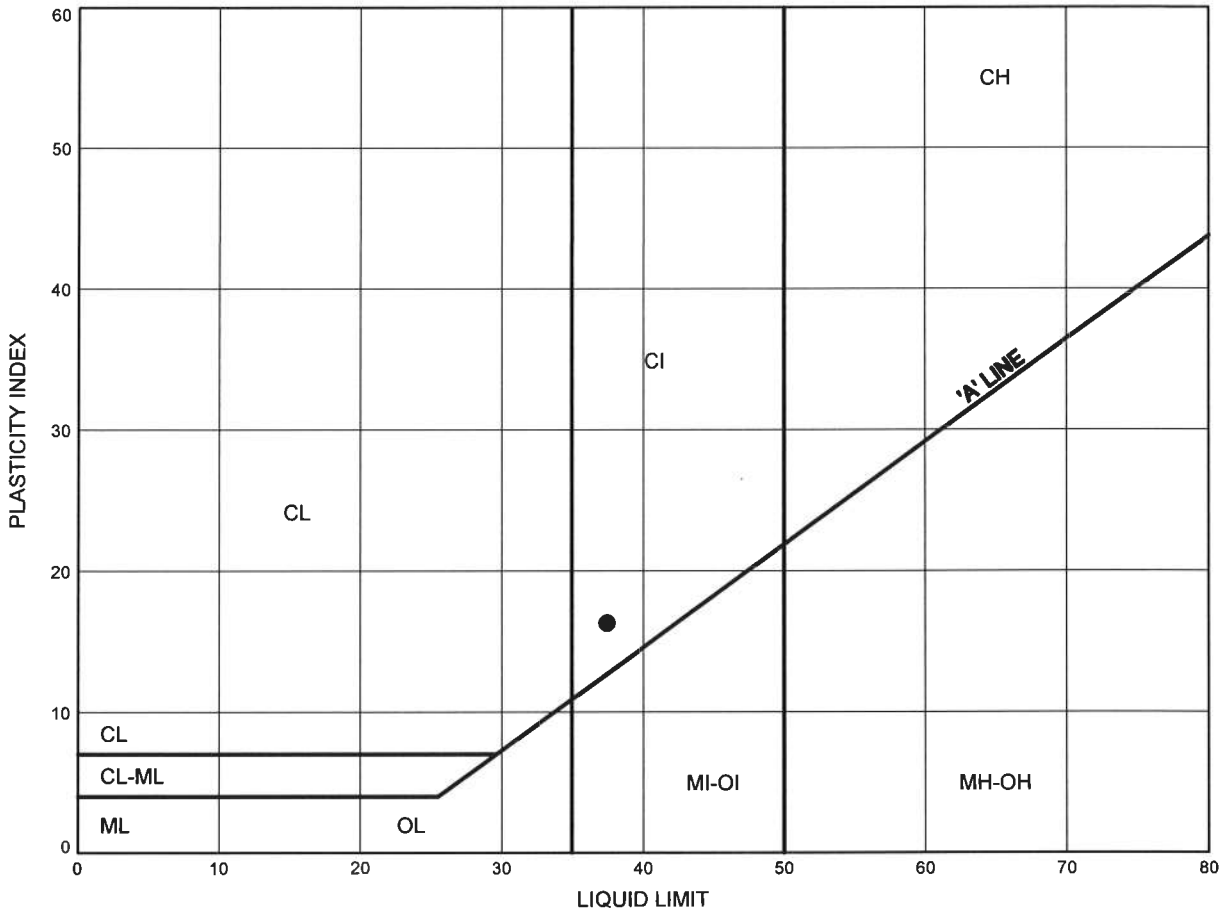
GRAIN SIZE DISTRIBUTION - THURBER 1174.GPJ 5/17/12

QEW Bridge at Credit River

ATTERBERG LIMITS TEST RESULTS

FIGURE B3

SILTY CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-01	1.07	93.50

Date May 2012

W.P.# W.O. 08-20008

THURBER

Prep'd MFA

Chkd. SKP

THURBALT 1174.GPJ 5/17/12

TABLE 2 - Point Load and Unconfined Compressive Strength Test Results
Credit River Access Road

Run	Depth (m)	UCS (MPa)	Rock Type	Test
Borehole		**10-01**		
2	3.4	0.7	Shale	
2	3.6	0.6	Shale	
2	3.9	2.7	Shale	
2	4.4	3.4	Shale	
3	4.7	10.7	Shale	
3	5.1	3.0	Shale	
3	5.4	0.7	Shale	
3	5.7	6.8	Shale	
3	5.8	3.4	Shale	
3	6.2	3.4	Shale	
4	6.5	2.0	Shale	
4	6.9	0.7	Shale	
4	7.3	0.7	Shale	
4	7.6	4.8	Shale	
5	7.9	0.7	Shale	
5	8.3	2.7	Shale	
5	8.7	5.4	Shale	
5	8.9	2.9	Shale	
5	9.2	2.0	Shale	
6	9.6	9.4	Shale	
6	10.0	1.3	Shale	
6	10.2	6.8	Shale	
6	10.7	1.4	Shale	
7	11.0	4.8	Shale	
7	11.6	0.7	Shale	
7	11.7	3.4	Shale	
7	12.2	49.6	Limestone	
Borehole		**10-02**		
1	4.4	0.5	Shale	
1	4.4	0.5	Shale	
2	5.0	0.7	Shale	
2	5.0	0.5	Shale	
2	5.7	0.5	Shale	
2	6.0	0.5	Shale	
2	6.0	8.9	Shale	
3	6.4	1.7	Shale	
3	6.4	3.1	Shale	
3	6.9	4.1	Shale	
3	7.4	0.7	Shale	
3	7.4	8.6	Shale	

Total Rock Core

Rock Type	Shale	Limestone
Average (MPa)	3.3	49.6
Minimum (MPa)	0.6	
Maximum (MPa)	10.7	

Run #	Average (MPa)
2	1.9
3	4.7
4	2.0
5	2.8
6	4.7
7	14.6

Total Rock Core

Rock Type	Shale	Limestone	Shale/Limestone
Average (MPa)	4.2	109.5	26.6
Minimum (MPa)	0.5	95.2	5.1
Maximum (MPa)	13.8	120.4	48.1

Run #	Average (Mpa)
2	2.2
3	3.6
4	2.8
5	1.9
6	5.0
7	19.7

TABLE 2 - Point Load and Unconfined Compressive Strength Test Results
Credit River Access Road

Run	Depth (m)	UCS (MPa)	Rock Type	Test
4	7.8	0.7	Shale	
4	7.8	4.5	Shale	
4	8.7	1.7	Shale	
4	8.7	4.4	Shale	
5	9.5	0.7	Shale	
5	9.5	5.4	Shale	
5	10.1	0.5	Shale	
5	10.1	3.2	Shale	
5	10.5	0.5	Shale	
5	10.5	1.4	Shale	
6	11.0	0.5	Shale	
6	11.0	13.8	Shale	
6	11.8	0.7	Shale	
6	11.8	7.6	Shale	
6	12.4	2.6	Shale	
7	12.5	1.7	Shale	
7	12.5	6.5	Shale	
7	12.9	112.9	Limestone	
7	13.2	1.7	Shale	
7	13.2	4.1	Shale	
7	13.6	10.7	Shale	UC
7	13.7	0.7	Shale	
8	14.0	0.7	Shale	
8	14.0	8.5	Shale	
8	14.8	1.7	Shale	
8	14.8	9.5	Shale	
8	15.1	3.4	Shale	
8	15.1	13.0	Shale	
9	15.5	0.7	Shale	
9	15.5	2.6	Shale	
9	16.0	0.7	Shale	
9	16.0	1.5	Shale	
9	16.4	120.4	Limestone	
10	17.0	0.7	Shale	
10	17.0	3.9	Shale	
10	17.6	0.7	Shale	
10	17.6	2.5	Shale	
10	18.0	0.7	Shale	
10	18.0	3.8	Shale	
11	18.6	10.1	Shale	
11	18.6	12.9	Shale	

8	6.1
9	25.2
10	2.0
11	6.6
12	20.0
13	3.3
14	7.2
15	9.2

TABLE 2 - Point Load and Unconfined Compressive Strength Test Results
Credit River Access Road

Run	Depth (m)	UCS (MPa)	Rock Type	Test
11	19.1	0.7	Shale	
11	19.1	7.3	Shale	
11	19.3	11.9	Shale	UC
11	19.6	0.7	Shale	
11	19.6	2.7	Shale	
12	19.9	3.4	Shale	
12	19.9	11.5	Shale	
12	20.3	1.7	Shale	
12	20.3	7.2	Shale	
12	21.0	95.2	Limestone	
12	21.1	1.7	Shale	
12	21.1	6.3	Shale	
12	21.3	5.1	Shale/Lime	
12	21.3	48.1	Shale/Lime	
13	21.9	0.7	Shale	
13	21.9	5.9	Shale	
14	22.4	5.0	Shale	
14	22.4	9.4	Shale	
15	23.0	5.1	Shale	
15	23.0	8.7	Shale	
15	23.9	6.7	Shale	
15	23.9	12.4	Shale	
15	24.3	13.4	Shale	
Borehole		**10-05**		
1	3.2	1.4	Shale	
2	3.5	0.9	Shale	
2	4.0	0.8	Shale	
2	4.2	1.1	Shale	
2	4.8	4.1	Shale	
3	5.0	0.7	Shale	
3	5.3	8.4	Shale	
3	5.6	1.5	Shale	
3	6.0	1.3	Shale	
3	6.3	1.3	Shale	
4	6.4	1.3	Shale	
4	6.7	8.5	Shale	
4	7.1	2.7	Shale	
4	7.4	10.8	Shale	UC
4	7.5	2.0	Shale	
4	7.8	2.0	Shale/Lime	
5	8.1	1.4	Shale	

Total Rock Core

Rock Type	Shale	Limestone	Shale/Limestone
Average (MPa)	3.0	73.1	3.7
Minimum (MPa)	0.7	27.9	2.0
Maximum (MPa)	10.8	200.5	5.4

Run #	Average (Mpa)
1	1.4
2	1.7
3	2.6
4	4.6
5	9.6
6	3.8
7	7.7
8	4.7
9	61.2

TABLE 2 - Point Load and Unconfined Compressive Strength Test Results
Credit River Access Road

Run	Depth (m)	UCS (MPa)	Rock Type	Test
5	8.5	1.4	Shale	
5	8.9	0.7	Shale	
5	9.0	35.0	Limestone	
6	9.4	3.4	Shale	
6	9.8	0.7	Shale	
6	10.0	2.9	Shale	
6	10.3	5.4	Shale	
6	10.7	6.8	Shale	
7	11.0	2.0	Shale	
7	11.3	27.9	Limestone	
7	11.6	1.3	Shale	
7	11.9	0.7	Shale	
7	12.2	6.8	Shale	
8	12.5	4.7	Shale	
8	13.0	2.7	Shale	
8	13.5	5.9	Shale	
8	13.7	5.4	Shale/Lime	
9	14.1	37.7	Limestone	
9	14.4	200.5	Limestone	
9	14.6	64.3	Limestone	
9	15.0	1.3	Shale	
9	15.2	2.0	Shale	

Appendix C

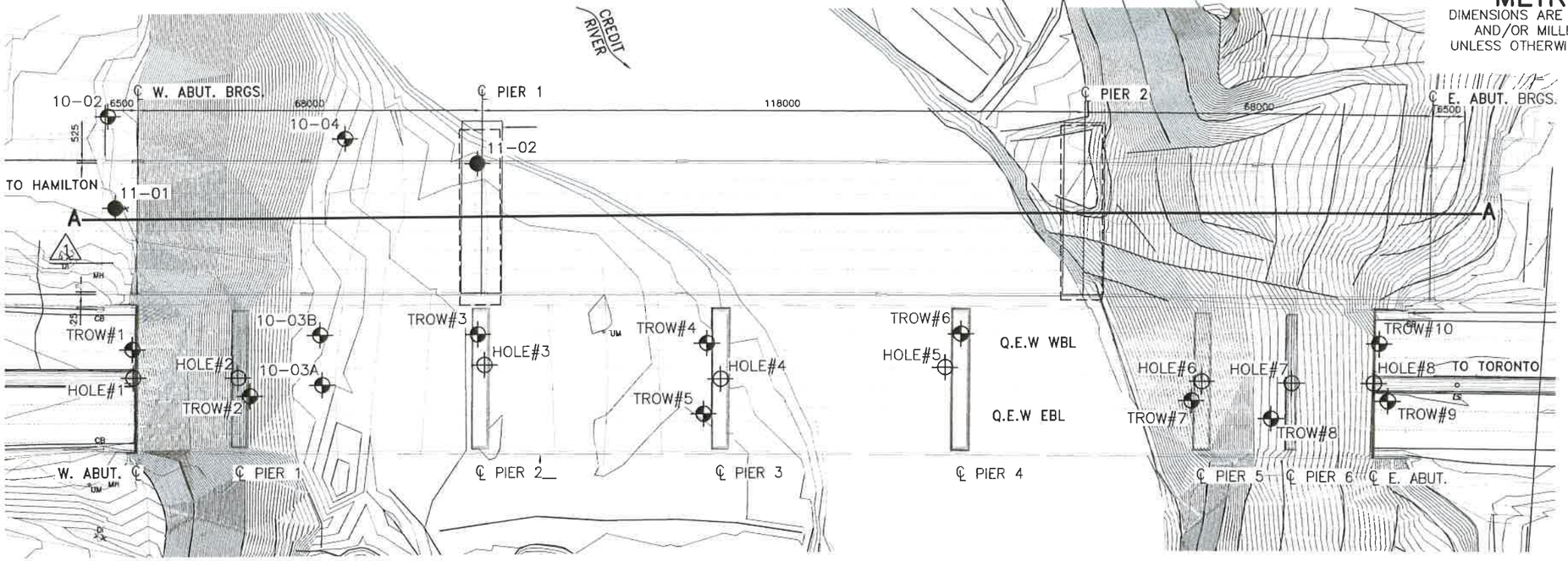
Borehole Locations and Soil Strata Drawing

THURBER

MINISTRY OF TRANSPORTATION, ONTARIO

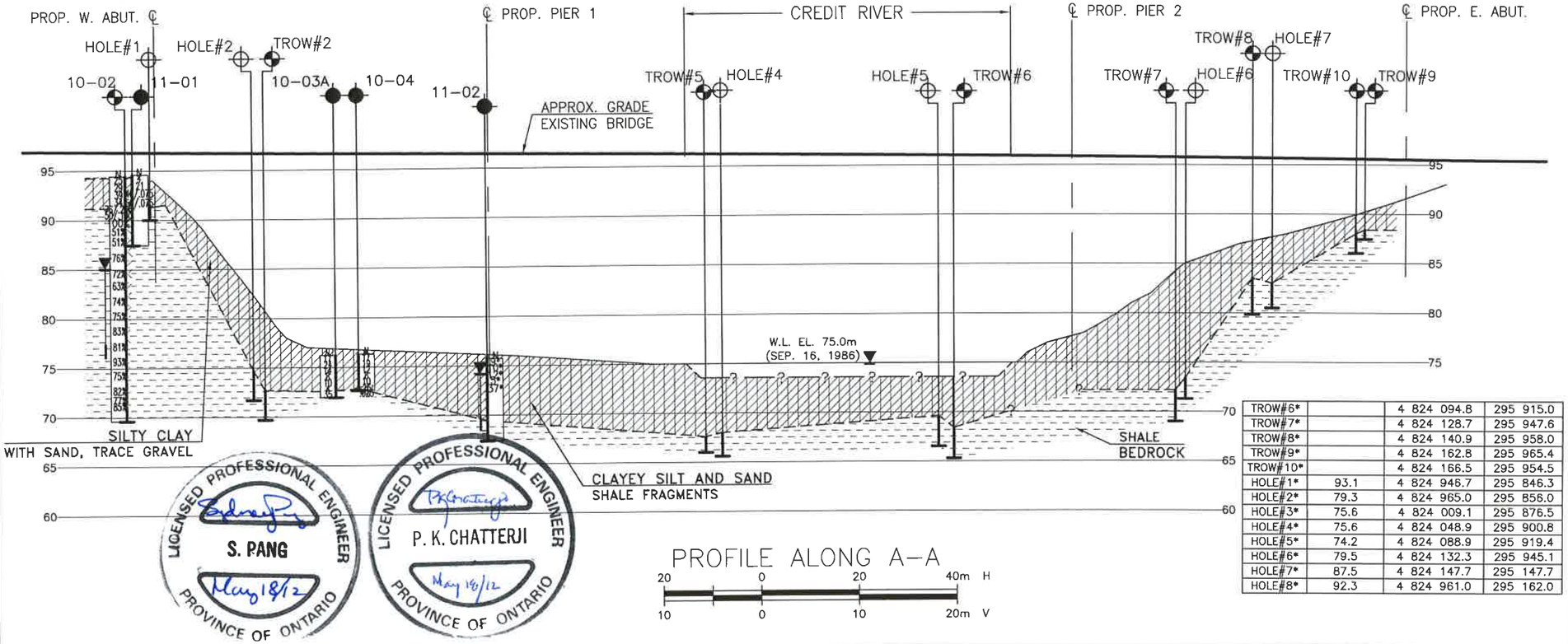
METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN



PLAN

20 0 20 40m



PROFILE ALONG A-A

20 0 20 40m H

10 0 10 20m V

TROW#6*		4 824 094.8	295 915.0
TROW#7*		4 824 128.7	295 947.6
TROW#8*		4 824 140.9	295 958.0
TROW#9*		4 824 162.8	295 965.4
TROW#10*		4 824 166.5	295 954.5
HOLE#1*	93.1	4 824 946.7	295 846.3
HOLE#2*	79.3	4 824 965.0	295 856.0
HOLE#3*	75.6	4 824 009.1	295 876.5
HOLE#4*	75.6	4 824 048.9	295 900.8
HOLE#5*	74.2	4 824 088.9	295 919.4
HOLE#6*	79.5	4 824 132.3	295 945.1
HOLE#7*	87.5	4 824 147.7	295 147.7
HOLE#8*	92.3	4 824 961.0	295 162.0

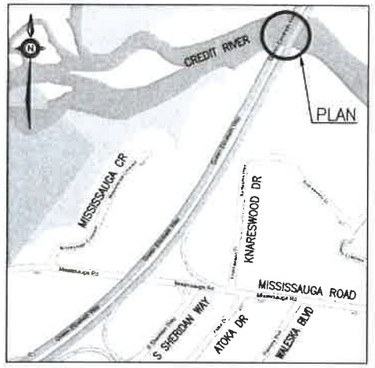
CONT No
WP No 08-20008

SHEET

BRIDGE TWINNING OVER CREDIT RIVER
QUEEN ELIZABETH WAY
BOREHOLE LOCATIONS AND SOIL STRATA

MRC McCORMICK RANKIN A member of MMM GROUP

THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

- Borehole (Current Investigation)
- Borehole (Trow 1958))
- Borehole (Dept. of Highway 1933)
- Approx. Borehole Location (Survey Data Not Available)
- N — Blows /0.3m (Std Pen Test, 475J/blow)
- Water Level
- Head Artesian Water
- Piezometer
- 90% — Rock Quality Designation (RQD)

NO	ELEVATION	NORTHING	EASTING
10-02	94.4	4 823 966.7	295 797.9
10-03A	76.2	4 823 979.0	295 865.1
10-03B	76.3	4 823 983.2	295 856.2
10-04	76.3	4 824 005.7	295 823.9
11-01	94.6	4 823 959.1	295 814.8
11-02	75.7	4 824 026.4	295 840.5
TROW#1*		4 823 949.1	295 841.3
TROW#2*		4 823 965.4	295 860.3
TROW#3*		4 824 010.7	295 870.6
TROW#4*		4 824 049.8	295 893.3
TROW#5*		4 824 042.7	295 905.4

-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) Boreholes from Trow & Dept. of Highways are located on the alignment of the existing bridge, and are offset from the alignment of the proposed bridge.

GEOCRES No. 30M12-341

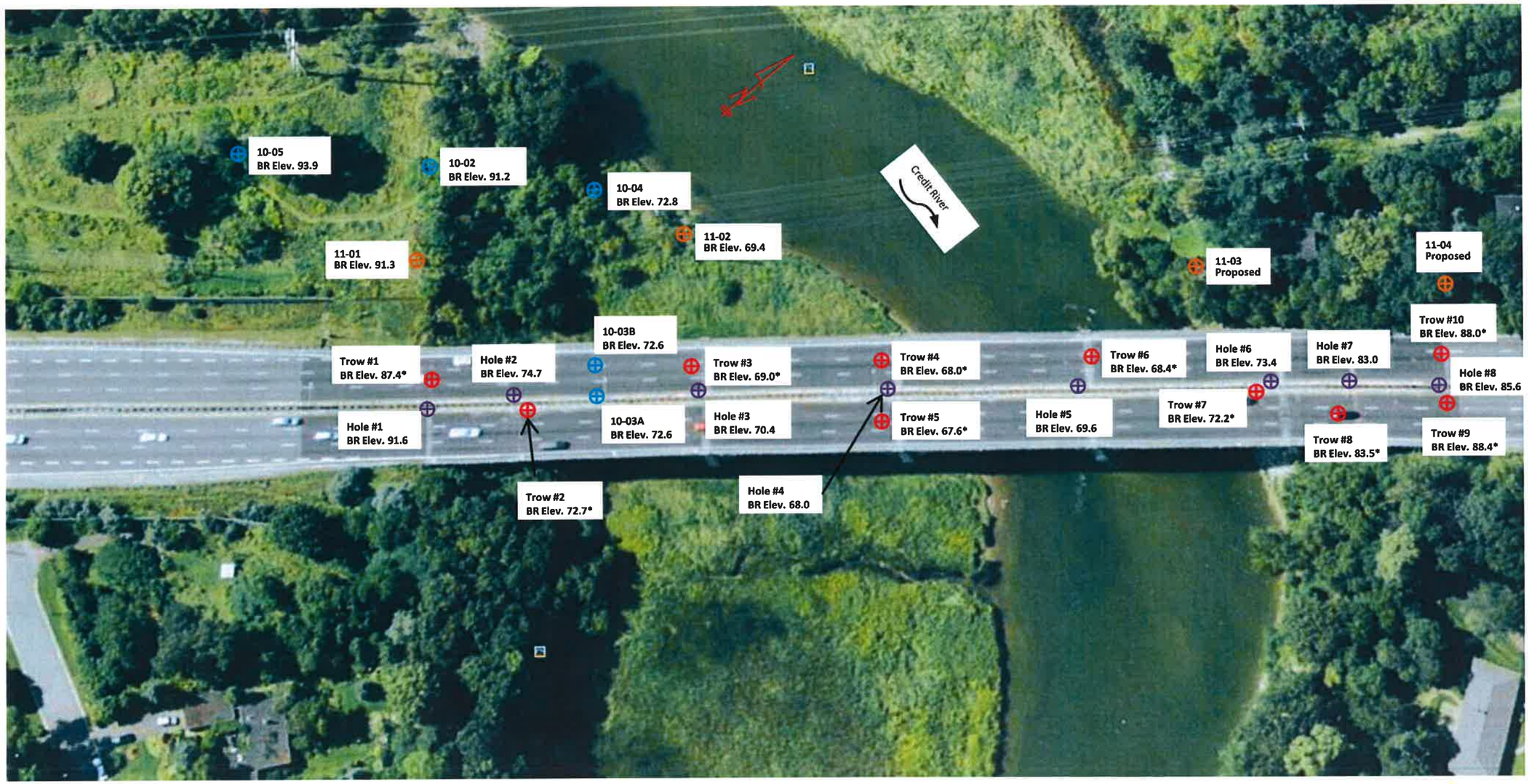
LICENSED PROFESSIONAL ENGINEER
S. PANG
May 18/12
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
May 16/12
PROVINCE OF ONTARIO

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	SKP	CHK SKP	CODE	LOAD	DATE MAY 2012
DRAWN	AN	CHK PKC	SITE	STRUCT	DWG 19-1351-174-1

FILENAME: H:\Drafting\19\1351\174\1st1174-BoreholePlan&Profile(CreditRiver).dwg
PLOTDATE: 5/18/2012 8:12 AM



- ⊕ Existing BH – Dept of Highways 1933
- ⊕ Existing BH – Trow 1958
- ⊕ Existing BH – Thurber 2010 (Access Road)
- ⊕ Existing/Proposed BH – Thurber 2011 (Current Investigation)

Notes

1. * Indicates base of footing/top of bedrock interface elevation.

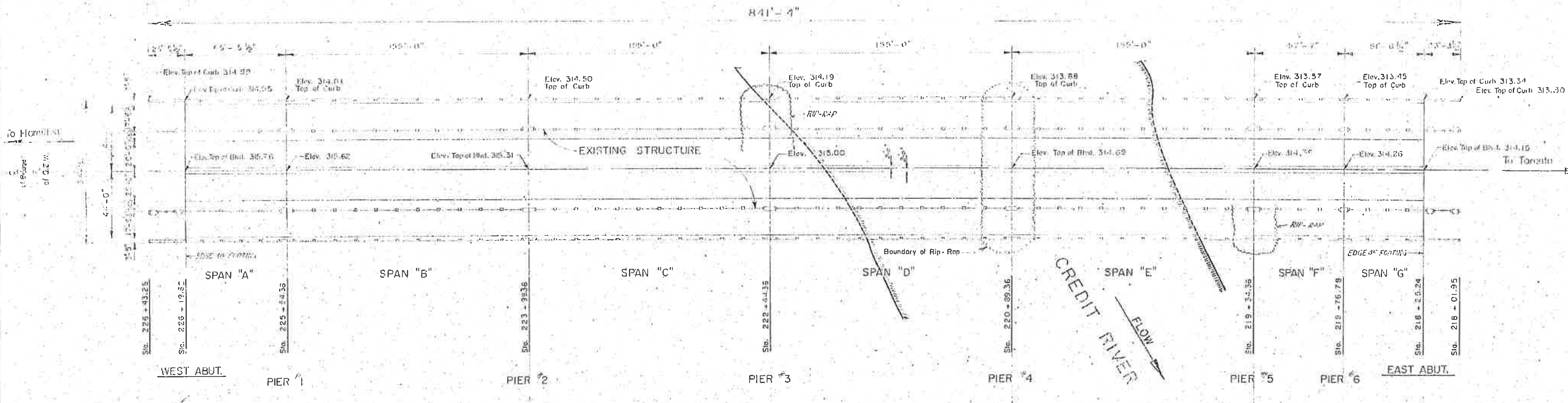
BRIDGE TWINNING OVER
CREDIT RIVER
QUEEN ELIZABETH WAY

BOREHOLE LOCATION PLAN

JOB# 19-1351-174

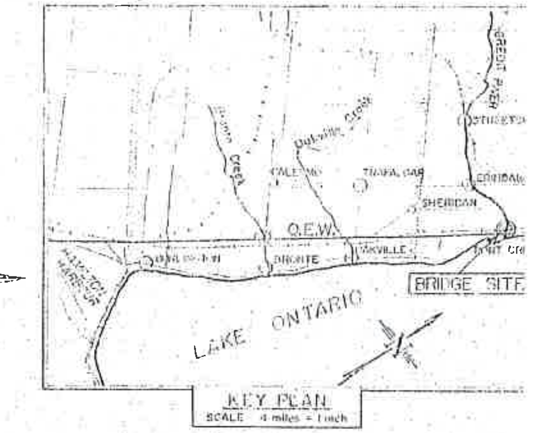
THURBER ENGINEERING LTD.
GEOTECHNICAL ▪ ENVIRONMENTAL ▪ MATERIALS

ENGINEER:	DRAWN:	APPROVED:
SKP	AN	PKC
DATE:	SCALE:	DRAWING No:
MAY 2012	NTS	19-1351-174-2



PLAN

SCALE: 1 INCH = 30 FT.



Note to District Engineer.

Concrete work on this structure must not be commenced until monuments to fix control points have been erected and checked by the District Engineer.

Note to General Contractor.

Structure to be built in accordance with Form No. 9 revised March 1957 and the Special Provisions, extra copies of which may be obtained from the District Engineer.

All construction joints must be approved by the Bridge Engineer.

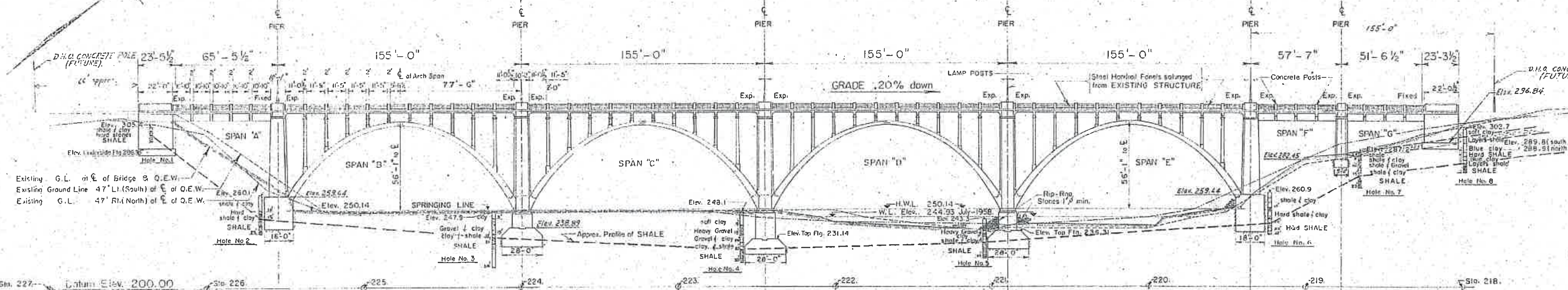
Top of curb to be lined up by instrument.

Concrete Mix.

Footings — 2 500 p.s.i. } Minimum Strength @
All other — 3 000 p.s.i. }

Add 1/4 lb. Pozzolith "S" per bag of cement.

Maximum size aggregate :— Footings 1 1/2"
Remainder 3/4"



ELEVATION (SOUTH)

SCALE: 1 INCH = 30 FT.

Note:—

Stations shown taken from PLAN D-2241-1
Station 218 + 01.95 = Sta. 470 + 01.08
Existing Structure

SEQUENCE OF CONSTRUCTION.

1. CONTRACTOR TO CONSTRUCT ALL FOOTINGS ON BOTH SIDES OF BRIDGE. EACH FOOTING TO BE BACKFILLED BEFORE PROCEEDING TO NEXT FOOTING. ALSO FOOTINGS ON NORTH AND SOUTH SIDES OF EACH PIER OR ABUTMENT TO BE COMPLETED BEFORE PROCEEDING TO NEXT PIER OR ABUTMENT.
2. CONSTRUCT NORTH SIDE OF BRIDGE TO BEARING LEVEL AT PIERS AND ABUTMENTS AND TO TOP OF ARCH COLUMNS.
3. CONSTRUCT TRAFFIC BARRIER ON NORTH SIDE AND REMOVE CONCRETE FROM EXISTING STRUCTURE ON NORTH SIDE ACCORDING TO PLANS. (CONTRACTOR TO TAKE CARE NOT TO DAMAGE NEW STRUCTURE FROM FALLING DEMOLISHED CONCRETE).
4. COMPLETE CONSTRUCTION OF NORTH PORTION AND OPEN THIS PORTION TO TRAFFIC WHEN CONCRETE HAS CURED.
5. CONSTRUCT TRAFFIC BARRIER ON SOUTH SIDE OF EXISTING BRIDGE AND COMPLETE BRIDGE CONSTRUCTION.
6. CONTRACTOR TO DIVERT TRAFFIC TO NEW PORTIONS OF BRIDGE AND REPAIR EXISTING BRIDGE AS SHOWN ON DWG. D-4141-12.

LIST OF DRAWINGS :—

D-4141 - 1 PLAN & ELEVATION
- 2 PLAN AND ELEVATION OF ARCH SPANS
- 3 ELEVATIONS & SECTIONS OF PIERS No2,3,4.
- 4 APPROACH SPANS - EAST.
- 5 SECTIONS AND DETAILS
- 6 ELEVATIONS & SECTIONS OF PIER No. 6
- 7 PIER No. 5
- 8 PIER No. 1
- 9 APPROACH SPAN - WEST
- 10 FOOTINGS
- 11 BEARING PLATES
- 12 METHODS FOR REPAIRING EXISTING BRIDGE
- 13 HANDRAIL PANELS.
- 14 REINFORCING STEEL
- 15 REINFORCING STEEL
- 16 REINFORCING STEEL
- 17 REINFORCING STEEL
- 18 REINFORCING STEEL
- 19 REINFORCING STEEL
- 20 REINFORCING STEEL
- 21 REINFORCING STEEL
- 22 PROPOSED ARCH FALSEWORK.

NOTE:

1. All elevations are based upon those given on drawing D-2241-1 of the original MIDDLE ROAD BRIDGE over the CREDIT RIVER Contract No. 33-48.
2. General Contractor shall be responsible for finishing the bridge bearing seats to the specified elevations to a tolerance plus or minus 1/8 inch. If bridge bearing seats are cast too low general contractor shall provide full bearing steel shim plates to bring bearing seats up to the correct elevations. If bridge bearing seats are cast to high these shall be bush hammered down.
3. Deck to be treated with a 5 % SILICONE solution (see SPECS).
4. Foundation material is considered to be similar to that shown on drawing D-2241-1.
5. All exposed edges to be chamfered 1/2 inch except as noted.
6. Where new concrete is to be poured against existing concrete surface the surface of the existing concrete shall be roughened by the contractor with air hammer and then soaked with water before the new concrete is poured.
7. Footings below shale line to be poured against rock without the use of forms.
8. No explosives to be used for removing old concrete.
9. Old handrail panels, lamp posts. and catch basin tops to be salvaged for new structure.
10. Clear concrete cover: footings 3 inches; superstructure 2 inches; deck 1 inch, except as noted.
11. Original bridge plans during construction to be read in conjunction with these plans. List of original MIDDLE ROAD BRIDGE over the CREDIT RIVER contract No. 33-48. Drawings No. D-2241-1 to 7 Inclusive.

BORING DATA.

The complete soil investigation report BA 782 may be examined at the Bridge office, 280 Davenport Rd. Toronto. THE DEPARTMENT of HIGHWAYS does not guarantee the accuracy of this report nor the boring data shown on this plan.

Elevations of footings shown on original Middle Road Bridge over the Credit River Contract No.33-48 were assumed to be correct.

W.P. 65-

DEPARTMENT OF HIGHWAYS:-ONTARIO
BRIDGE OFFICE:-TORONTO

CREDIT RIVER BRIDGE

WIDENING

THE KING'S HIGHWAY No. Q.E.W. DIST.
CO. PEEL
TWP. TORONTO LOT 5 - 8 CON.

PLAN & ELEVATION

APPROVED
BRIDGE ENGINEER DESIGN ENGINEER

REVISIONS: DATE	BY	DESCRIPTION	REFERENCE PLANS
		REVISED - AS CONSTRUCTED.	D-2241-1
			BA-782 (Soils report)
			E-3448-1
			[illegible]

DESIGN	G.S.	CHECK	C.Z.S.
DRAWING	H.S.	CHECK	C.Z.S.
TRACING		CHECK	
DATE	MARCH, 1959	LOADING	$H_{20}S_{16}$

CONTRACT NUMBERS
DRAWING NUMBER D-4141-1

TWP # 81-203-1-C