FOUNDATION INVESTIGATION REPORT
PAYS PLAT CREEK BRIDGE REPLACEMENT
HIGHWAY 17, DISTRICT OF THUNDER BAY, ONTARIO
G.W.P. 6071-09-00, SITE #48C-19

Geocres Number: 42D-37

Report to

MMM Group Limited

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1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted at the site of the proposed replacement of the Plays Plat Creek Bridge on Highway 17, in the Thunder Bay District, Ontario.

The purpose of the investigation was to explore the subsurface conditions at the site, and based on the data obtained, to provide a borehole location plan, record of borehole sheets, a stratigraphic profile, laboratory test results and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained in the course of the investigation.

Thurber carried out the investigation as a sub-consultant to MMM Group Limited (MMM), under the Ministry of Transportation Ontario (MTO) Agreement Number 6010-E-0011.

2 SITE DESCRIPTION

The bridge site is located on Highway 17 approximately 55 km southeast of Nipigon or 6.0 km northwest of Rossport. The existing bridge is a single span structure with a total span length of 19.8 m between abutments and a width of 11.6 m, as indicated on the contract drawings prepared for rehabilitation of the bridge in July 1996. The existing approach embankments vary in height from 4 m at the abutments to 2 m in a distance of approximately 15 m away from the abutments.

The Pays Plat Creek is a tributary to the Plays Plat River, which flows southerly into the Lake Superior. Both creek and the river flow through a broad flat valley. The land surrounding the site is treed with residences located to the east of the bridge. At this location, Highway 17 travels in a predominantly northwest to southeast direction along the north edge of Lake Superior. Photographs of the bridge and surrounding area are presented in Appendix C.

The site lies within the physiographic region known as the Wawa Subprovince of the Superior Province of the Canadian Shield. Based on Ontario Geological Survey (OGS) Map 2518, titled “Surficial Geology of Northern Ontario”, dated 1987, the site is located in an area of “the mainly glaciofluvial deposits, including shallow water, glaciolacustrine and glaciomarine deposits”. Based on OGS Map 2545, titled “Bedrock Geology of Ontario”, dated 1991, the bedrock is of the Archean age and consists of intrusive rocks, mainly massive to foliated granodiorite and granite.

3 SITE INVESTIGATION AND FIELD TESTING

The site investigation and field testing at this site were carried between June 23 and July 4, 2013. A total of four boreholes, denoted as PPC-01 to PPC-04 were advanced to depths ranging from 15.8 m to 30.7 m below the existing highway embankment. Two dynamic cone penetration tests were advanced to 2.4 m and 19.2 m depth, respectively, to supplement the sampled borehole information. Details of the borehole locations, drilling depths and completion details are summarized in Table 3.1 below.

Table 3.1 – Details of Boreholes

Location	Boreholes	Drilling and Coring Depth/ Base of Hole Elevation (m)	Completion Details
West Approach	PPC-01	15.8 / 171.0	Borehole backfilled with bentonite holeplug to 0.6 m, concrete mix to 0.1 m then asphalt to surface.
West Abutment	PPC-02	30.7 / 156.1	Standpipe piezometer consisting of 19 mm diameter Schedule 40 PVC pipe with a 3 m slotted screen installed. After final water level reading, piezometer was decommissioned.
East Abutment	PPC-03	27.6 / 159.2	Standpipe piezometer consisting of 19 mm diameter Schedule 40 PVC pipe with a 3 m slotted screen installed. After final water level reading, piezometer was decommissioned.
East Approach	PPC-04	15.8 / 171.0	Borehole backfilled with bentonite holeplug and cuttings to 0.6 m, concrete to 0.1 m then asphalt cold patch to surface.

The locations of the boreholes are shown on the attached Borehole Locations and Soil Strata Drawing included in Appendix D.

All boreholes were advanced using a CME55 truck-mounted drill rig in combination with hollow stem augers and NW casing/coring methods. Samples of the encountered soils were obtained from the boreholes at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT). Field vane shear tests were conducted in cohesive soils for determination of undrained shear strengths using MTO Standard "N" size vane and a calibrated torque wrench.

A member of Thurber's technical staff supervised the drilling and sampling operations on a full time basis. The supervisor logged the boreholes and processed the recovered soil and rock samples for transport to Thurber's laboratory for further examination and testing. The ground surface elevations at the borehole locations were obtained from the drawings provided by MMM.

Groundwater conditions in the open boreholes were observed during the drilling operations. Standpipe piezometers consisting of 19 mm PVC pipe with a slotted screen were installed in Boreholes PPC-02

and PPC-03. Following the final water level reading, the piezometers were decommissioned in general accordance with MOE Regulation 903.

4 LABORATORY TESTING

The recovered soil samples were subjected to Visual Identification (VI) and to natural moisture content determination. The results of this testing are shown on the Record of Borehole sheets included in Appendix A. Selected samples were also subjected to grain size analysis and Atterberg Limits testing, and the results of this testing program are summarized on the Record of Borehole sheets in Appendix A, and are shown on the figures included in Appendix B.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets in Appendix A consisting of details of the encountered soils. The stratigraphic boundaries shown on the Record of Borehole sheets are inferred from non-continuous sampling and observations during drilling; therefore they represent transitions between soil types rather than exact geological boundaries. The subsurface conditions may vary between and beyond the borehole locations. The model of the soil stratigraphy is illustrated on the "Borehole Locations and Soil Strata" drawing in Appendix D.

An overall description of the stratigraphy is given in the following paragraphs. However, the factual data presented in the Record of Borehole Sheets governs any interpretation of the site conditions.

The subsurface stratigraphy below the existing embankment fill encountered at the site generally consists of cohesionless glaciofluvial and cohesive glaciolacustrine deposits to the depths investigated. The embankment fill is underlain by a loose to compact cohesionless deposit consisting of sand to sandy silt, which grades at approximately 8.7 m depth to a varved silty clay and clay. This varved silty clay/clay deposit is typically soft to firm in consistency and extends to as much as 20.4 m depth. The compressible layer is underlain by a lower cohesionless deposit grading with depth from silt to gravelly sand. The cohesionless deposit is compact to between 24.4 m and 26.8 m depths, below which it becomes coarser and very dense to depths investigated in the boreholes. Descriptions of the individual strata are presented below.

5.1 Asphalt and Concrete

Asphalt pavement was encountered in all boreholes and dynamic cone penetration holes. The thickness of the asphalt ranged from 65 to 125 mm. Boreholes PPC-02 and PPC-03 were advanced through the approach slabs and encountered 325 and 430 mm thick concrete.

5.2 Embankment Fill

Embankment fill was encountered below the asphalt and the approach slabs in the boreholes. In Boreholes PPC-02 and PPC-03, located in the immediate vicinity of the abutments, the fill extended to 4.1 m depth (Elev. 182.7), and in Boreholes PPC-01 and PPC-04, located approximately 15 m away from the abutments, the fill extended to 2.2 m depth (Elev. 184.6). The thickness of the fill ranged from 2.1 m to 3.6 m.

The fill contains various proportions of sand and gravel and in general, the material can be classified as sand to sand and gravel. Varying content of fine fractions (silt and clay) and occasional cobbles were observed in the fill. The lower zones of the fill in Boreholes PPC-02 and PPC-03 were typically coarser.

SPT 'N' values recorded in the embankment fill ranged from 9 to 89 blows per 0.3 m penetration, indicating a loose to very dense relative density. The higher SPT 'N' values are probably indicative of the presence of cobbles.

Moisture contents of the fill materials ranged from 4 to 22%.

The results of grain size analyses conducted on fill samples are provided on the Record of Borehole sheets in Appendix A, and are illustrated in Figure B1 of Appendix B. The results of grain size analyses for fill materials are summarized below:

Gravel %	0 to 59
Sand %	39 to 97
Silt and Clay %	2 to 9

5.3 Upper Sand to Sandy Silt

A deposit of sand to sandy silt was encountered beneath the fill materials in all boreholes. The thickness of the deposit ranged from 4.6 m to 6.5 m with the lower boundary of the deposit at 8.7 m depth (Elev. 178.1). The composition of the deposit varies with depth and across the site.

SPT 'N' values recorded in this deposit varied between 3 and 19 blows per 0.3 m of penetration indicating a loose to compact relative density. The values of 14 to 19 blows per 0.3 m of penetration were obtained within the sandier zones of the deposit in Boreholes PPC-01 and PPC-04.

The results of grain size analyses conducted on samples of the upper sand to sandy silt are provided on the Record of Borehole sheets in Appendix A, and are illustrated in Figure B2 and B3 of Appendix B. The results of the grain size analyses are summarized below:

	Sand and Silt /Sandy Silt	Sand
Gravel %	0	0
Sand %	20 to 38	82 to 86
Silt %	54 to 65	14 to 18
Clay %	8 to15	

Natural moisture contents of the deposit ranged from 22 to 48%.

5.4 Varved Silty Clay to Clay

A layer of grey, varved silty clay to clay underlies the upper cohesionless deposit in all boreholes. The deposit, where fully penetrated, was between 9.0 m and 11.7 m thick with the lower boundary encountered between 17.7 m and 20.4 m depth (Elev. 169.1 and 166.4). Boreholes PPC-01 and PPC-04 were terminated in this deposit at 15.8 m depth (Elev. 171.0).

The upper zone, approximately 1.5 m to 2 m thick, reflects transition from the upper sand and silt deposit to the varved silty clay/clay, and contains more silt.

SPT 'N' values recorded in the silty clay/clay varied between zero blows per 0.3 m penetration (Weight of Rod to Weight of Hammer) to 5 blows per 0.3 m of penetration. Field vane shear tests (VST) measured undrained shear strengths ranging from 21 to 35 kPa. Based on the SPT and VST data, the consistency of the deposit varied from soft to firm.

The sensitivity of the deposit, calculated as a ratio of undisturbed strength to remoulded strength, ranged from 2 to 8, however typically being 3 to 4, suggesting that the silty clay/clay is of normal sensitivity.

The results of grain size analyses conducted on samples of the clay are provided on the Record of Borehole sheets in Appendix A, and illustrated in Figure B4 of Appendix B. The results are summarized as follows:

Gravel %	0
Sand %	0
Silt %	17 to 34
Clay %	66 to 83

The results of the grain size analysis for one sample of the silty clay collected from the upper/transition zone of the deposit presented in Figure B5 and are as follows:

Gravel %	0
Sand %	6
Silt %	77
Clay %	17

The results of Atterberg Limits testing conducted on samples of the silty clay/clay are provided on the Record of Borehole sheets in Appendix A and are illustrated on the Plasticity Charts (Figures B8 and B9). The results indicated that the clay deposit has liquid limits ranging from 55% to 60% and plasticity indices ranging from 32% to 38%, indicating high plasticity of the deposit. In the upper zone, a liquid limit of 35% and plasticity index of 14% were obtained, indicating low to medium plasticity of the deposit.

Natural moisture contents of the silty clay ranged from 39% to 58%.

5.5 Lower Silt to Sandy Silt

In Boreholes PPC-02 and PPC-03, a silt with various proportions of sand and trace clay was encountered underlying the varved silty clay/clay below the depth of 20.4 m and 17.7 m. The deposit was grey and varied in thickness from 6.4 m to 6.7 m with the lower boundary between 26.8 m and 24.4 m depth (Elev. 160.0 and 162.4).

SPT 'N' values recorded in the silt layer ranged from 12 to 29 blows per 0.3 m penetration, indicating a compact relative density. Natural moisture contents were measured to be between 16 and 23%.

The results of grain size analyses conducted on samples of the deposit are provided on the Record of Borehole sheets in Appendix A and are plotted in Figure B6 of Appendix B. The results are presented below:

Gravel %	0
Sand %	1 to 26
Silt %	67 to 90
Clay %	7 to 9

5.6 Sand to Gravelly Sand

A layer of brown sand with varying proportion of gravel and trace to some silt was encountered in Boreholes PPC-02 and PPC-03 underlying the lower silt/sandy silt below depth of 26.8 m and 24.4 m (Elev. 160.0 and 162.4), respectively. The deposit was classified as sand to gravelly sand, and contained occasional cobbles and boulders. Rock coring technique was used to advance Borehole PPC-02 through the boulders below 28.3 m depth.

Boreholes PPC-02 and PPC-03 were advanced into this deposit for 3.9 m and 3.2 m, respectively, and terminated at 30.7 m and 27.6 m depth (Elev. 156.1 and 159.2).

The deposit was very dense as indicated by SPT 'N' values of more than 100 blows per 0.3 m penetration.

Natural moisture contents of 13% to 30% were measured on samples of this deposit.

The results of grain size analyses conducted on two samples of the sand/gravelly sand are provided on the Record of Borehole sheets in Appendix A and are plotted in Figure B7 of Appendix B. The results are summarized as follows:

Gravel %	0 to 27
Sand %	65 to 86
Silt & Clay %	8 to 14

5.7 Water Levels

Water levels in the boreholes were measured upon completion of drilling operations. Water was used during drilling and coring through boulders, therefore the measured water levels on completion of drilling may not reflect prevailing groundwater levels at the site.

Standpipe piezometers were installed in Boreholes PPC-02 and PPC-03 to monitor groundwater levels after drilling. The water levels measured in the open boreholes and in the piezometers are summarized in Table 5.1.

Table 5.1: Water Level Measurements

Borehole Number	Date	Water Level (Depth/Elev.) in metres	Comments
PPC -01	June 23, 2013	4.7 / 182.1	Water level in open borehole on completion of drilling. Borehole open to 15.8 m depth.
PPC-02	July 3, 2013 May 2, 2014	2.9 / 183.9 3.9 / 182.9	Water level in open borehole on completion of drilling. Water level in piezometer; piezometer sealed at 24.6 m depth.
PPC-03	July 4, 2013 May 2, 2014	0.7 / 186.1 3.8 / 183.0	Water level in open borehole on completion of drilling. Water level in piezometer; piezometer sealed at 21.5 m depth.
PPC-04	June 24, 2013	4.2 / 182.6	Water level in open borehole on completion of drilling. Borehole open to 15.8 m depth.

The preliminary General Arrangement drawing indicates the following water levels in Pays Plats Creek:

Elev. 182.6 – April 2011, and
Elev. 183.8 - High Water Level.

The water level in the creek and groundwater levels are expected to fluctuate seasonally and are subject to precipitation patterns, and may vary from the levels presented above.

6 MISCELLANEOUS

Eastern Ontario Diamond Drilling supplied the drill rig and conducted the drilling, sampling and in-situ testing operations. A truck-mounted CME #55 drill rig was used for the duration of the investigation.

The drilling and sampling operations were supervised in the field by Ms. Eckie Siu and George Azzopardi of Thurber. Mr. Mark Farrant, P.Eng. directed the field operations.

The report was prepared by Ms. Anna Piascik, P.Eng., and reviewed by Mr. Murray Anderson, P.Eng. and Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations projects.

THURBER ENGINEERING LTD.

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Appendix A

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

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

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

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

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

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

NOTE: Hierarchy of Soil Strength Prediction

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

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

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

5. LEGEND FOR RECORDS OF BOREHOLES

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

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

▼ Water Level

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.

EXPLANATION OF ROCK LOGGING TERMS

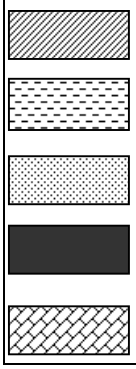
ROCK WEATHERING CLASSIFICATION

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.

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

SYMBOLS



CLAYSTONE

SILTSTONE

SANDSTONE

COAL

BEDROCK

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

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 % 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.

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			

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-01 1 OF 2 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 129.2 E 263 656.0 ORIGINATED BY GA

HWY 17 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY AN

DATUM Geodetic DATE 2013.06.23 - 2013.06.23 CHECKED BY KS

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 ○ 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
186.8	GROUND SURFACE										
0.0	**ASPHALT:**(100mm)										
0.1	**SAND**, trace silt, trace gravel Compact to Very Dense Brown Wet (FILL) Occasional cobbles		1	SS	27		186				0 91 9 (SI+CL)
			2	SS	60						
			3	SS	17		185				
184.6											
2.2	**SAND**, some silt Compact Grey Wet		4	SS	14		184				
			5	SS	19						0 86 14 (SI+CL)
182.7							183				
4.1	Sandy **SILT**, some clay Loose Grey Wet		6	SS	4	▽	182				
			7	SS	4		181				0 20 65 15
			8	SS	4		180				
178.1							179				
8.7	Silty **CLAY**, grading to clay, trace sand, varved Soft to Firm Grey Wet		9	SS	2		178				
							177				

Continued Next Page

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

20 / 15 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 1197.GPJ 2015TEMPLATE(MTO).GDT 4/2/15

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Ontario

THURBER

RECORD OF BOREHOLE No PPC-01 2 OF 2 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 129.2 E 263 656.0 ORIGINATED BY GA

HWY 17 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY AN

DATUM Geodetic DATE 2013.06.23 - 2013.06.23 CHECKED BY KS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page							20 40 60 80 100	20 40 60		
			10	SS	2		176		○		
								4.0 +			
			11	SS	2		175		○		
							174	3.0 +			
			12	SS	2		173		⊢○⊣		0 0 21 79
							172				
171.0			13	SS	4		171		○		
15.8	END OF BOREHOLE AT 15.8m. BOREHEOLE OPEN TO 15.8m AND WATER LEVEL AT 4.7m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.6m, CONCRETE TO 0.1m THEN ASPHALT COLD PATCH TO SURFACE.										

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

15 (20 / 10) 5 (%) STRAIN AT FAILURE

ONTMT4S 1197.GPJ 2015TEMPLATE(MTO).GDT 4/2/15

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-02 1 OF 4 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 133.6 E 263 668.7 ORIGINATED BY GA

HWY 17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN

DATUM Geodetic DATE 2013.06.26 - 2013.07.03 CHECKED BY KS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
186.8	GROUND SURFACE								
0.0	**ASPHALT:** (125mm)								
0.1 / 186.3	**CONCRETE:** (325mm)								
0.5	**SAND**, occasional gravel Compact Brown Wet (FILL)		1	SS	24		186		
185.3							185		
1.5	**SAND** and **GRAVEL**, occasional cobbles Very Dense to Dense Brown Wet (FILL)		2	SS	86				
			3	SS	89		184		
			4	SS	28				59 39 2 (SI+CL)
182.7						▼	183		
4.1	Sandy **SILT**, some clay, occasional roots and wood fibres Very Loose to Loose Grey Wet to Moist		5	SS	6		182		0 31 57 12
			6	SS	3		181		
			7	SS	4		180		
178.1							179		
8.7	Silty **CLAY**, grading to clay, trace sand, varved Soft to Firm Grey Wet		8	SS	5		178		0 6 77 17
							177		

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa 20 40 60 80 100
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) 20 40 60

Continued Next Page

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

20 / 15 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 1197.GPJ 2015TEMPLATE(MTO).GDT 4/2/15

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-02 2 OF 4 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 133.6 E 263 668.7 ORIGINATED BY GA

HWY 17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN

DATUM Geodetic DATE 2013.06.26 - 2013.07.03 CHECKED BY KS

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 ○ 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
	Continued From Previous Page										
	Silty **CLAY**, grading to clay, trace sand, varved Soft to Firm Grey Wet										
			9	SS	4		176		○		
							175				
			10	SS	2		174		○		
								3.0 +			
			1	TW			173				
							172	2.0 +			
			11	SS	2				○ — ●		0 0 18 82
							171				
			12	SS	0		170		○		
							169	3.0 +			
			2	TW			168				
								3.0 +			
							167				

Continued Next Page

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

20 / 15 + 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 1197.GPJ 2015TEMPLATE(MTO).GDT 4/2/15

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-02 3 OF 4 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 133.6 E 263 668.7 ORIGINATED BY GA

HWY 17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN

DATUM Geodetic DATE 2013.06.26 - 2013.07.03 CHECKED BY KS

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 ○ 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
	Continued From Previous Page										
166.4											
20.4	Sandy **SILT**, trace clay Compact Grey Wet		13	SS	29		166 165 164	○	○		
			14	SS	12		163 162	○	○		0 26 67 7
160.0							161 160				
26.8	**SAND**, some silt, trace gravel, occasional cobbles and boulders Very dense Brown Wet Spoon bouncing, cored through cobbles		15	SS	111/ 0.20		159	○	○		0 86 14 (SI+CL)
	Cored through cobbles		16	SS	100/ 0.125		158 157		○		

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

20 / 15 + 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 1197.GPJ 2015TEMPLATE(MTO).GDT 4/2/15

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-02 4 OF 4 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 133.6 E 263 668.7 ORIGINATED BY GA

HWY 17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN

DATUM Geodetic DATE 2013.06.26 - 2013.07.03 CHECKED BY KS

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 (○ 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
	Continued From Previous Page										
	SAND, some silt, trace gravel, occasional cobbles and boulders Very dense Brown										
156.1	Wet		17	SS	122/				○		
30.7	END OF BOREHOLE AT 30.7 m. WATER LEVEL AT 2.9 mbgs IN OPEN BOREHOLE UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) May 02/14 3.9 182.9				0.250						

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

15 20 10 5 (%) STRAIN AT FAILURE

ONTMT4S 1197.GPJ 2015TEMPLATE(MTO).GDT 5/19/15

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-03 1 OF 3 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 132.4 E 263 701.3 ORIGINATED BY ES

HWY 17 BOREHOLE TYPE NW Casing COMPILED BY AN

DATUM Geodetic DATE 2013.07.04 - 2013.07.04 CHECKED BY KS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE
186.8	GROUND SURFACE						
0.0 / 0.1	**ASPHALT:**(65mm)						
186.3	**CONCRETE WITH REBAR**(430mm)						
0.5	**SAND**, some gravel to gravelly, trace silt Loose to Dense Brown Moist (FILL)		1	SS	9		186
	Occasional cobbles		2	SS	31		185
			3	SS	20		184
			4	SS	11	▼	183
182.7							
4.1	**SAND** and **SILT**, trace clay Loose Grey Wet to Moist		5	SS	4		182
	No recovery		6	SS	9		181
			7	SS	5		180 / 179
178.1							
8.7	Silty **CLAY**, grading to clay, trace sand Soft to Firm Grey Wet		8	SS	1		178 / 177

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa 20 40 60 80 100
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

UNIT WEIGHT γ kN/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%)	GR	SA	SI	CL
	28	70	2	(SI+CL)
	0	38	54	8

Continued Next Page

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

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-03 2 OF 3 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 132.4 E 263 701.3 ORIGINATED BY ES

HWY 17 BOREHOLE TYPE NW Casing COMPILED BY AN

DATUM Geodetic DATE 2013.07.04 - 2013.07.04 CHECKED BY KS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Silty **CLAY**, grading to clay, trace sand Soft to Firm Grey Wet										
			1	TW			176	4.0			
							175	3.0			
			9	SS	0		174	4.0			
			10	SS	0		173				0 0 17 83
							172	3.0			
			11	SS	0		171				
								8.0			
			12	SS	0		170				
169.1											
17.7	**SILT**, trace clay, trace sand Compact Grey Wet						169				
			13	SS	18		168				0 1 90 9
							167				

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

20 / 15 / 10 / 5 (%) STRAIN AT FAILURE

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Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-03 3 OF 3 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 132.4 E 263 701.3 ORIGINATED BY ES

HWY 17 BOREHOLE TYPE NW Casing COMPILED BY AN

DATUM Geodetic DATE 2013.07.04 - 2013.07.04 CHECKED BY KS

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 (○ 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
	Continued From Previous Page										
	SILT, trace clay, trace sand Compact Grey Wet						166				
	Occasional coarse sand seam		14	SS	19		165		○		
	Occasional cobbles						164				
162.4							163				
24.4	Gravelly **SAND**, trace silt, occasional cobbles Very dense Brown Wet		15	SS	100/ 0.05		162		○		
			16	SS	134/ 0.175		161		○		27 65 8 (SI+CL)
159.2			17	SS	100/		160		○		
27.6	END OF BOREHOLE AT 27.6 m. WATER LEVEL AT 0.68 mbgs IN OPEN BOREHOLE UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) May 02/14 3.8 183.0				0.125						

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

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

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Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-04 1 OF 2 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 137.0 E 263 716.0 ORIGINATED BY GA

HWY 17 BOREHOLE TYPE NW Casing COMPILED BY AN

DATUM Geodetic DATE 2013.06.24 - 2013.06.24 CHECKED BY KS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
186.8	GROUND SURFACE							20 40 60 80 100	20 40 60		
0.0	**ASPHALT:**(100mm)										
0.1	**SAND**, trace silt Compact Brown Wet (FILL) Cobble (100mm)		1	SS	22		186	○	○		
			2	SS	17			○	○		0 97 3 (SI+CL)
			3	SS	12		185	○	○		
184.6											
2.2	**SAND**, some silt, occasional wood fibres Loose to Compact Grey Wet		4	SS	6		184	○	○		
			5	SS	8			○	○		
						▽	183				
			6	SS	12		182	○	○		
			7	SS	11		181	○	○		
							180				
			8	SS	14		179	○	○		0 82 15 3
178.1											
8.7	Silty **CLAY**, grading to clay, trace sand, varved Soft to Firm Grey Moist		9	SS	2		178	○	○		
							177				

Continued Next Page

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

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

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Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No PPC-04 2 OF 2 METRIC

WP# 6071-09-00 LOCATION Pays Plat Creek N 5 416 137.0 E 263 716.0 ORIGINATED BY GA

HWY 17 BOREHOLE TYPE NW Casing COMPILED BY AN

DATUM Geodetic DATE 2013.06.24 - 2013.06.24 CHECKED BY KS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page							20 40 60 80 100	20 40 60		
	Silty **CLAY**, grading to clay, trace sand, varved Soft to Firm Grey Moist							3.0			
			10	SS	2		176		○		
							175				
			11	SS	2				○		0 0 34 66
							174	4.0			
			12	SS	2		173		○		
							172				
171.0			13	SS	3		171		●		0 0 25 75
15.8	END OF BOREHOLE AT 15.8m. BOREHEOLE OPEN TO 15.8m AND WATER LEVEL AT 4.2m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.6m, CONCRETE TO 0.1m THEN ASPHALT COLD PATCH TO SURFACE.										

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

20
15 5
10
(%) STRAIN AT FAILURE

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Appendix B

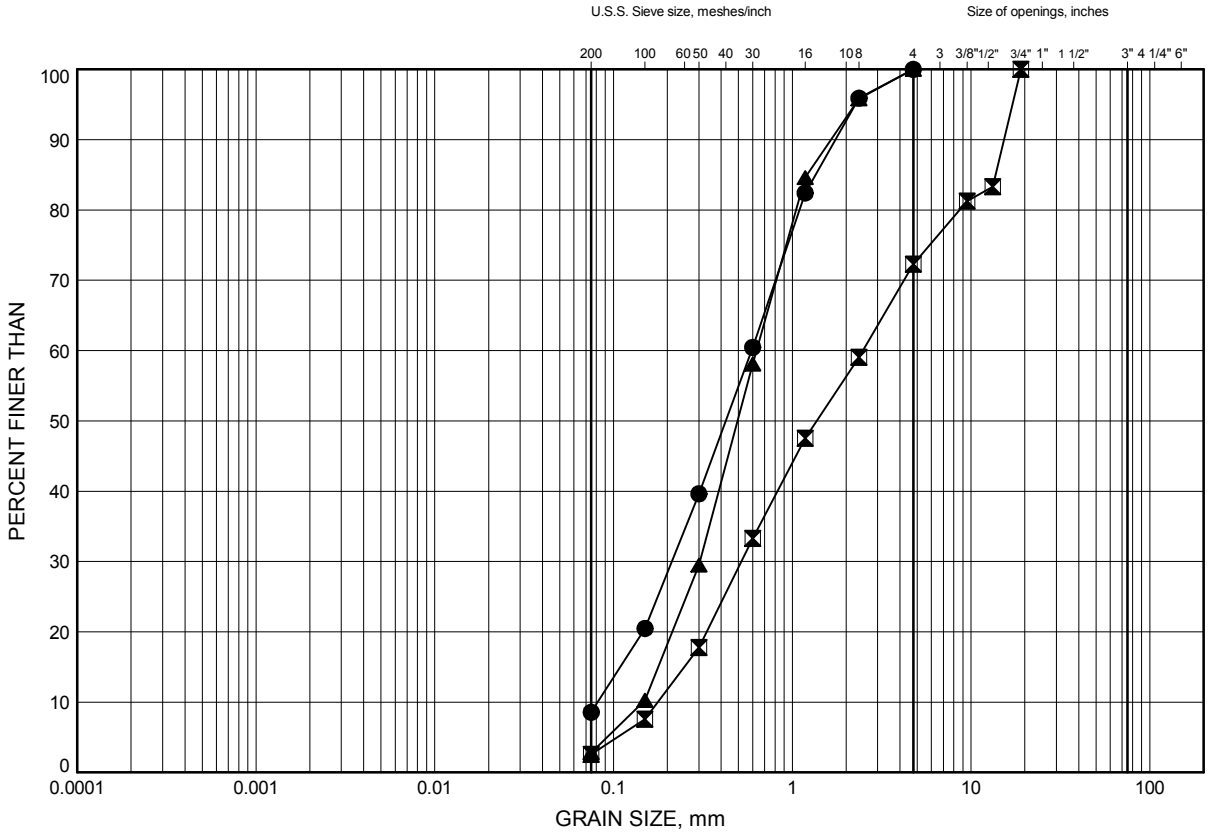
Laboratory Test Results

Pays Plat Creek

GRAIN SIZE DISTRIBUTION

FIGURE B1

SAND/GRAVELLY SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-01	0.38	186.42
⊠	PPC-03	2.59	184.21
▲	PPC-04	1.07	185.73

Date January 2015

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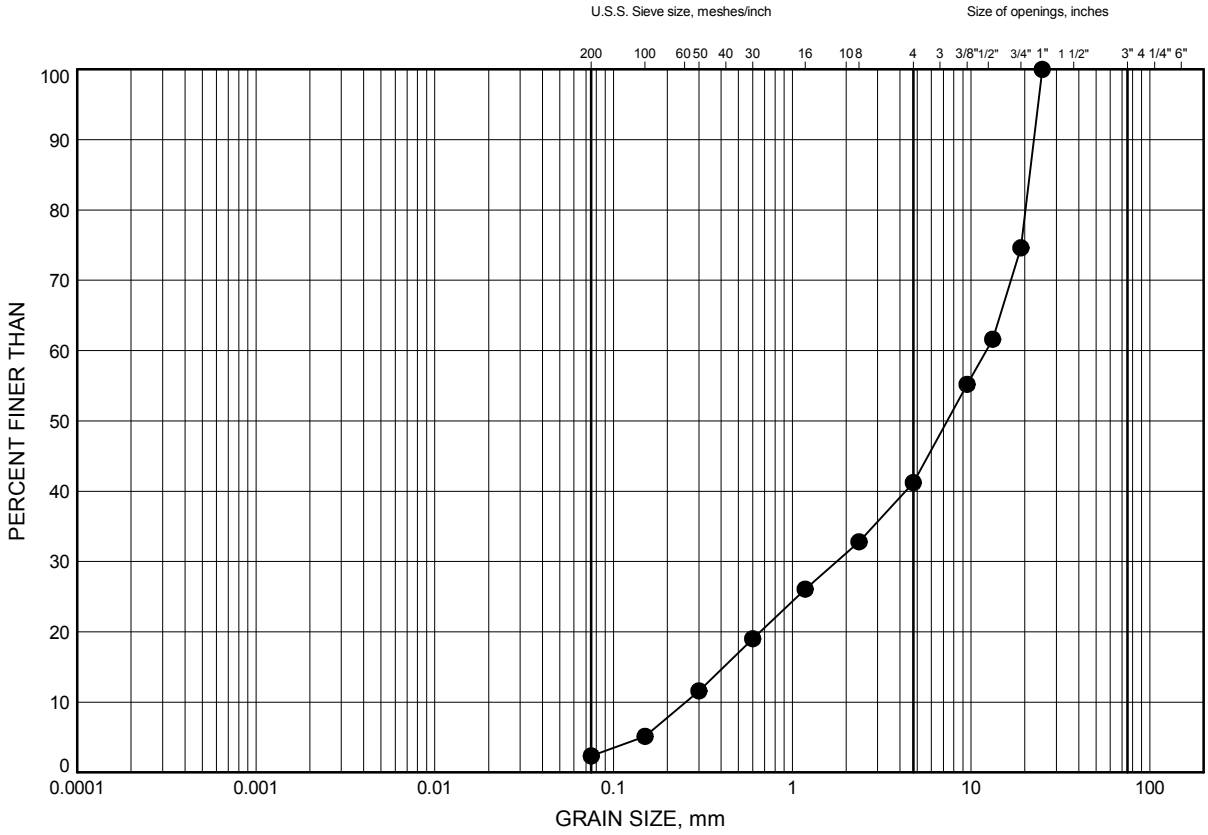
GRAIN SIZE DISTRIBUTION - THURBER 1197.GPJ 1/28/15

Pays Plat Creek

GRAIN SIZE DISTRIBUTION

FIGURE B2

SAND & GRAVEL FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-02	3.35	183.45

Date January 2015

WP# 6071-09-00

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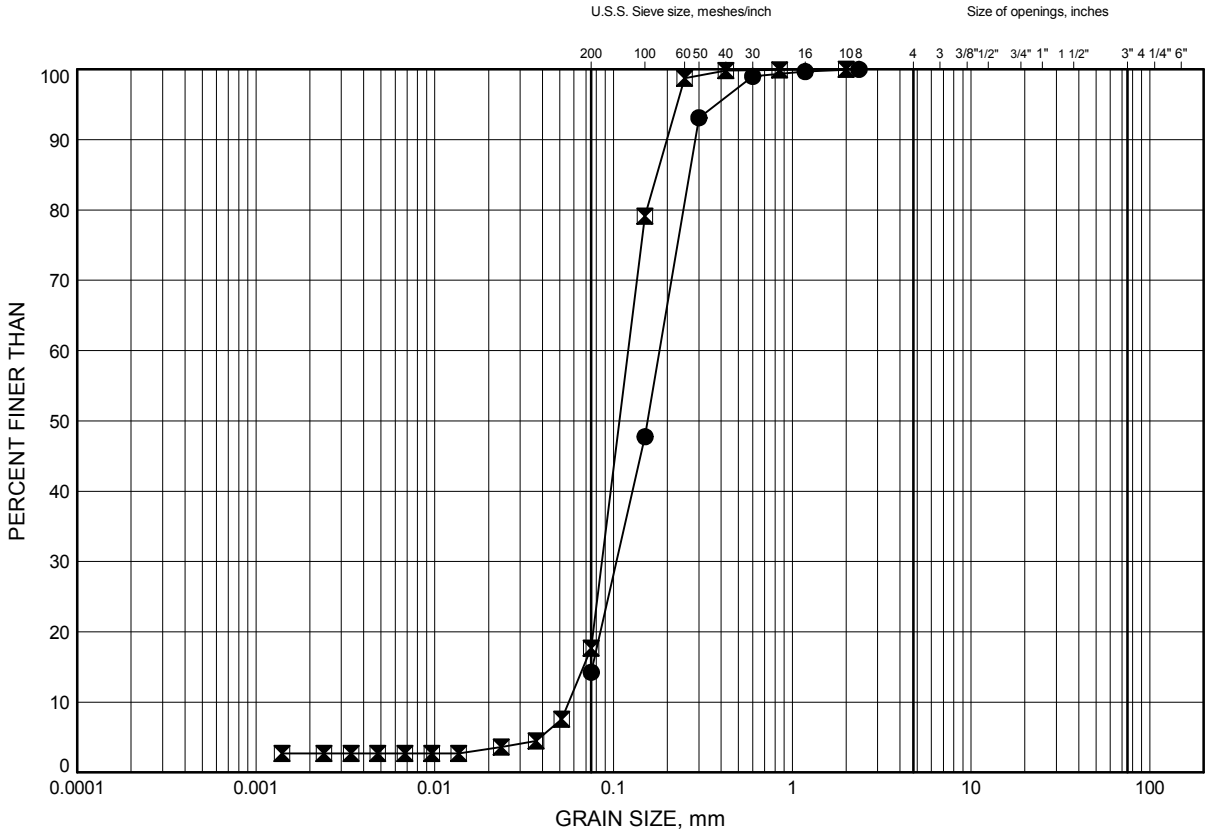
GRAIN SIZE DISTRIBUTION - THURBER 1197.GPJ 1/28/15

Pays Plat Creek

GRAIN SIZE DISTRIBUTION

FIGURE B3

Upper SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-01	3.35	183.45
⧓	PPC-04	7.92	178.88

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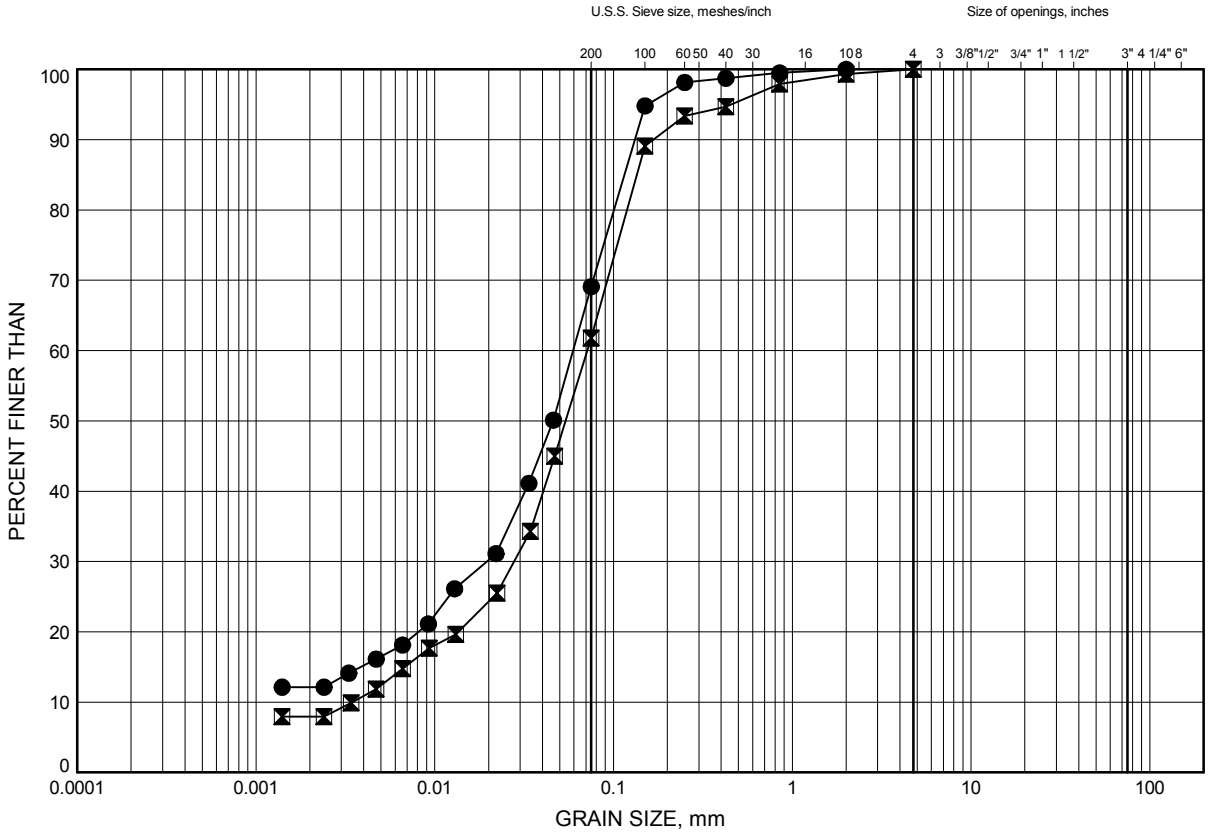
GRAIN SIZE DISTRIBUTION - THURBER 1197.GPJ 1/28/15

Pays Plat Creek

GRAIN SIZE DISTRIBUTION

FIGURE B4

Upper SAND & SILT/SANDY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-02	4.88	181.92
⧓	PPC-03	4.88	181.92

Date January 2015

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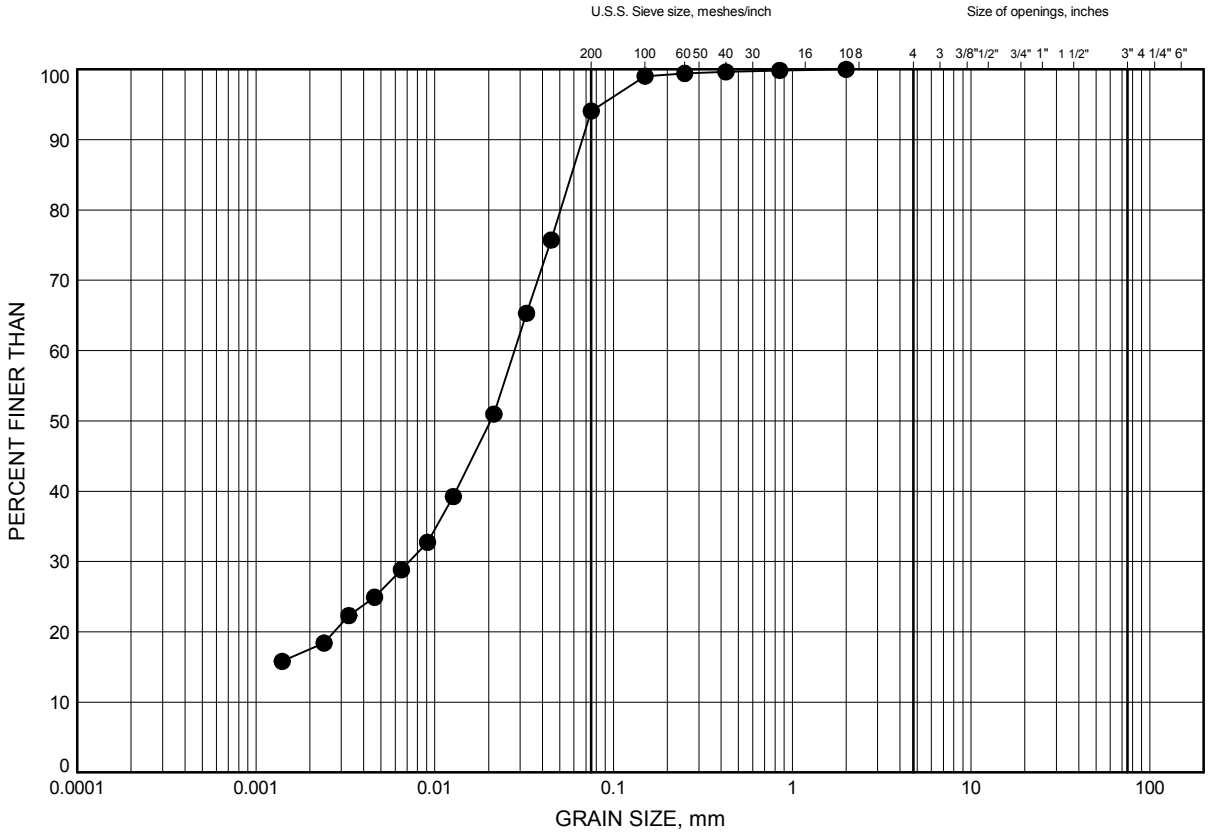
GRAIN SIZE DISTRIBUTION - THURBER 1197.GPJ 1/28/15

Pays Plat Creek

GRAIN SIZE DISTRIBUTION

FIGURE B5

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-02	9.45	177.35

Date January 2015

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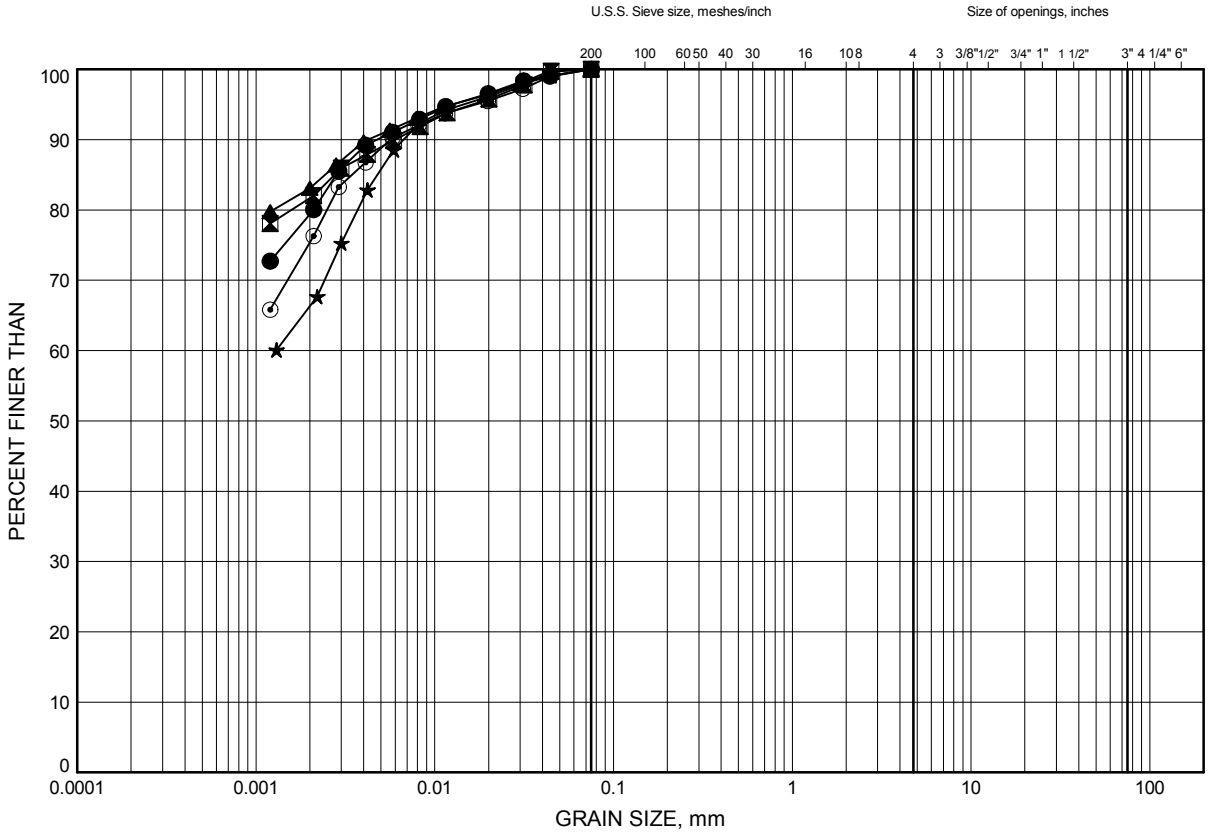
GRAIN SIZE DISTRIBUTION - THURBER 1197.GPJ 1/28/15

Pays Plat Creek

GRAIN SIZE DISTRIBUTION

FIGURE B6

CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-01	14.02	172.78
⊠	PPC-02	15.54	171.26
▲	PPC-03	14.02	172.78
★	PPC-04	12.50	174.30
⊙	PPC-04	15.54	171.26

Date January 2015

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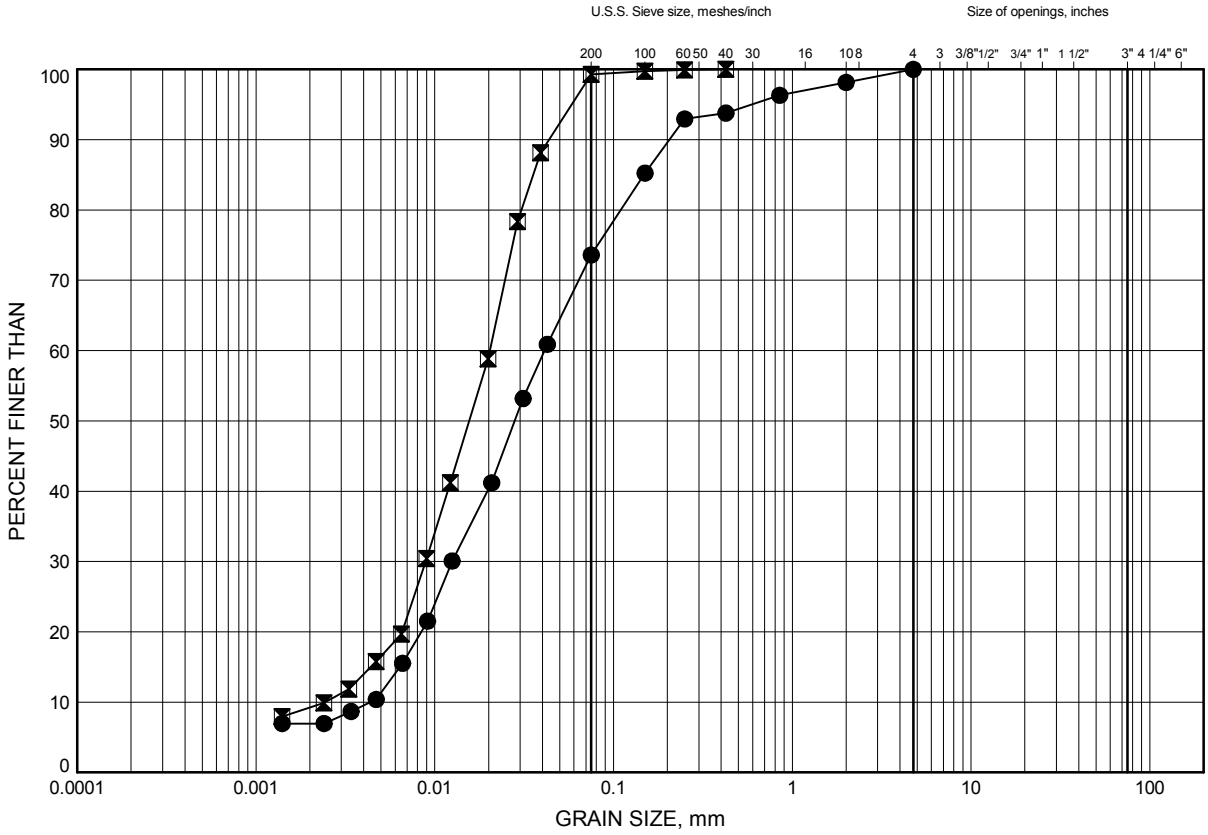
GRAIN SIZE DISTRIBUTION - THURBER 1197.GPJ 1/28/15

Pays Plat Creek

GRAIN SIZE DISTRIBUTION

FIGURE B7

Lower SANDY SILT to SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-02	24.69	162.11
⧓	PPC-03	18.59	168.21

GRAIN SIZE DISTRIBUTION - THURBER 1197.GPJ 1/28/15

Date January 2015

WP# 6071-09-00

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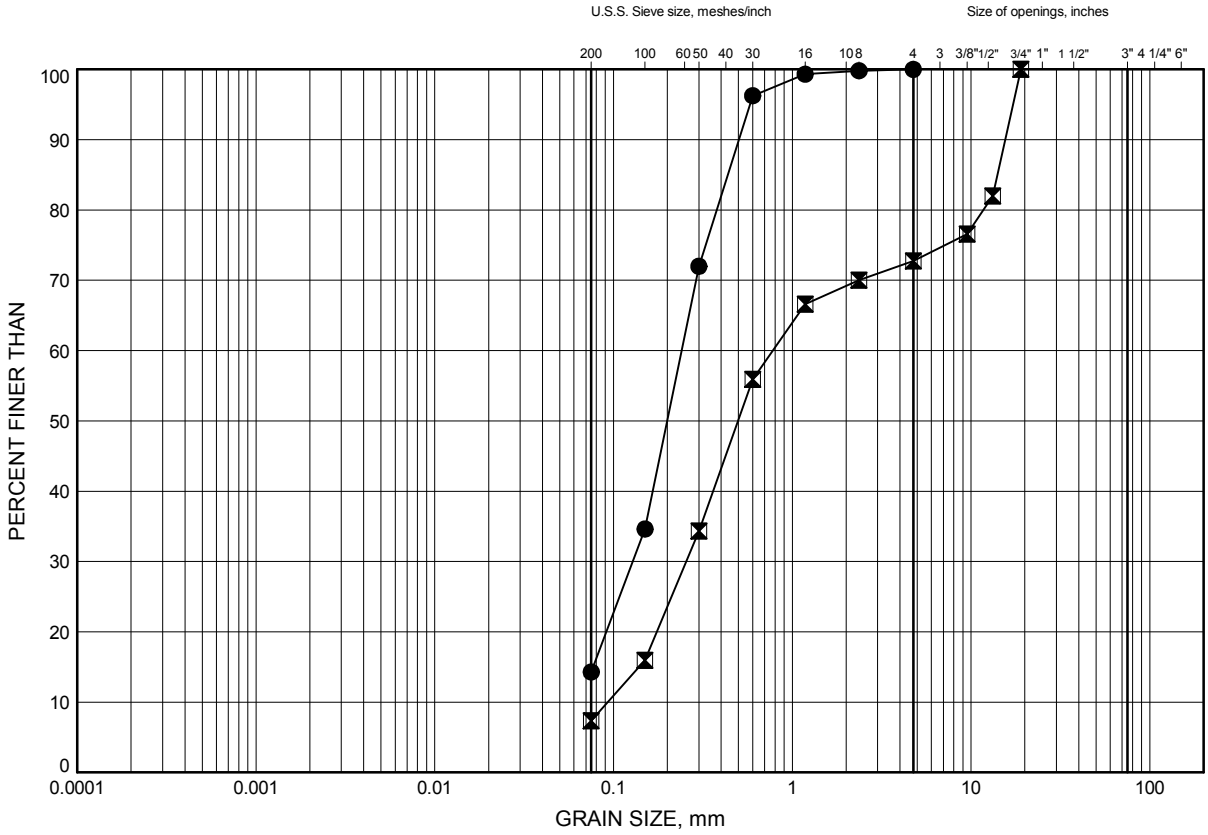
Pays Plat Creek

GRAIN SIZE DISTRIBUTION

FIGURE B8

Lower SAND to GRAVELLY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-02	27.61	159.19
⊠	PPC-03	26.14	160.66

Date January 2015

WP# 6071-09-00

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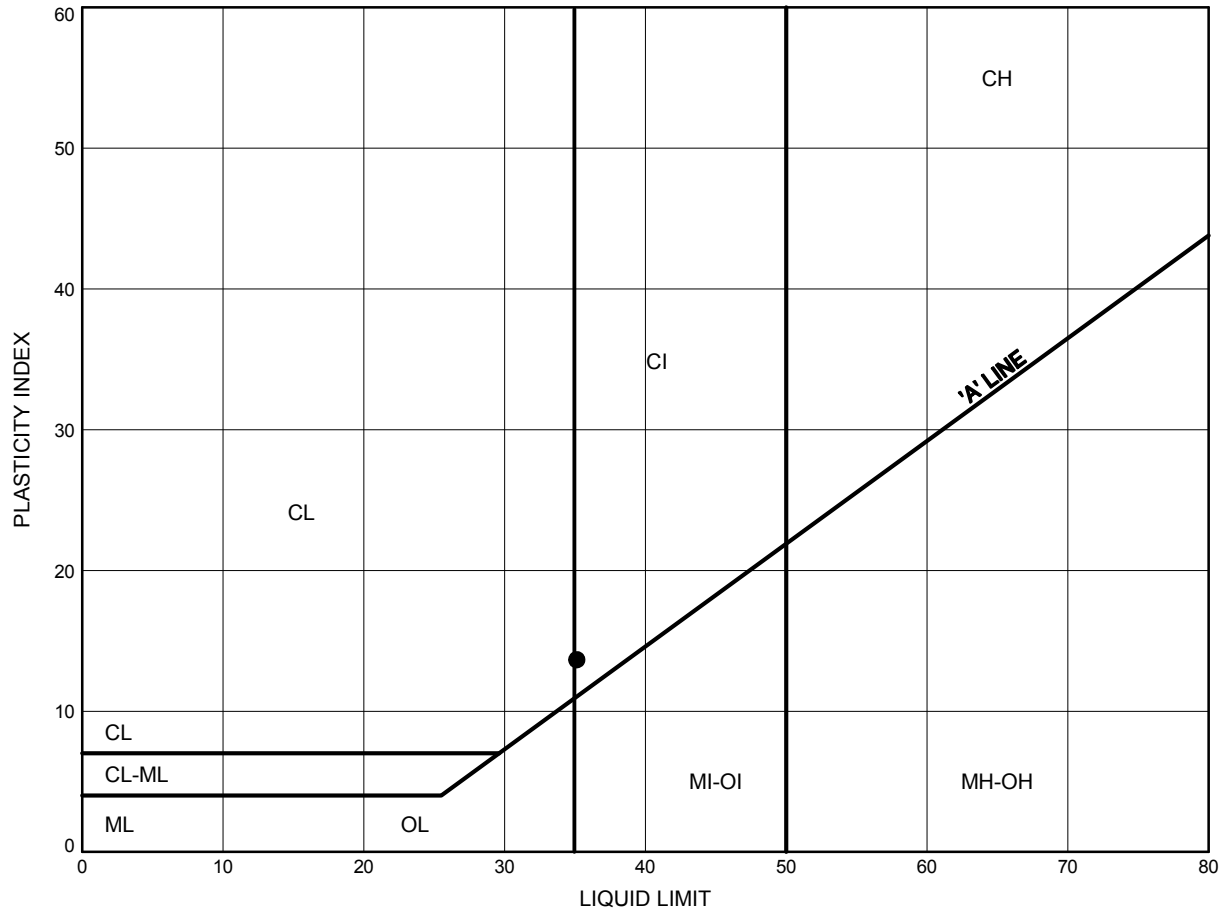
GRAIN SIZE DISTRIBUTION - THURBER 1197.GPJ 1/28/15

Pays Plat Creek

ATTERBERG LIMITS TEST RESULTS

FIGURE B9

SILTY CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-02	9.45	177.35

Date January 2015

WP# 6071-09-00

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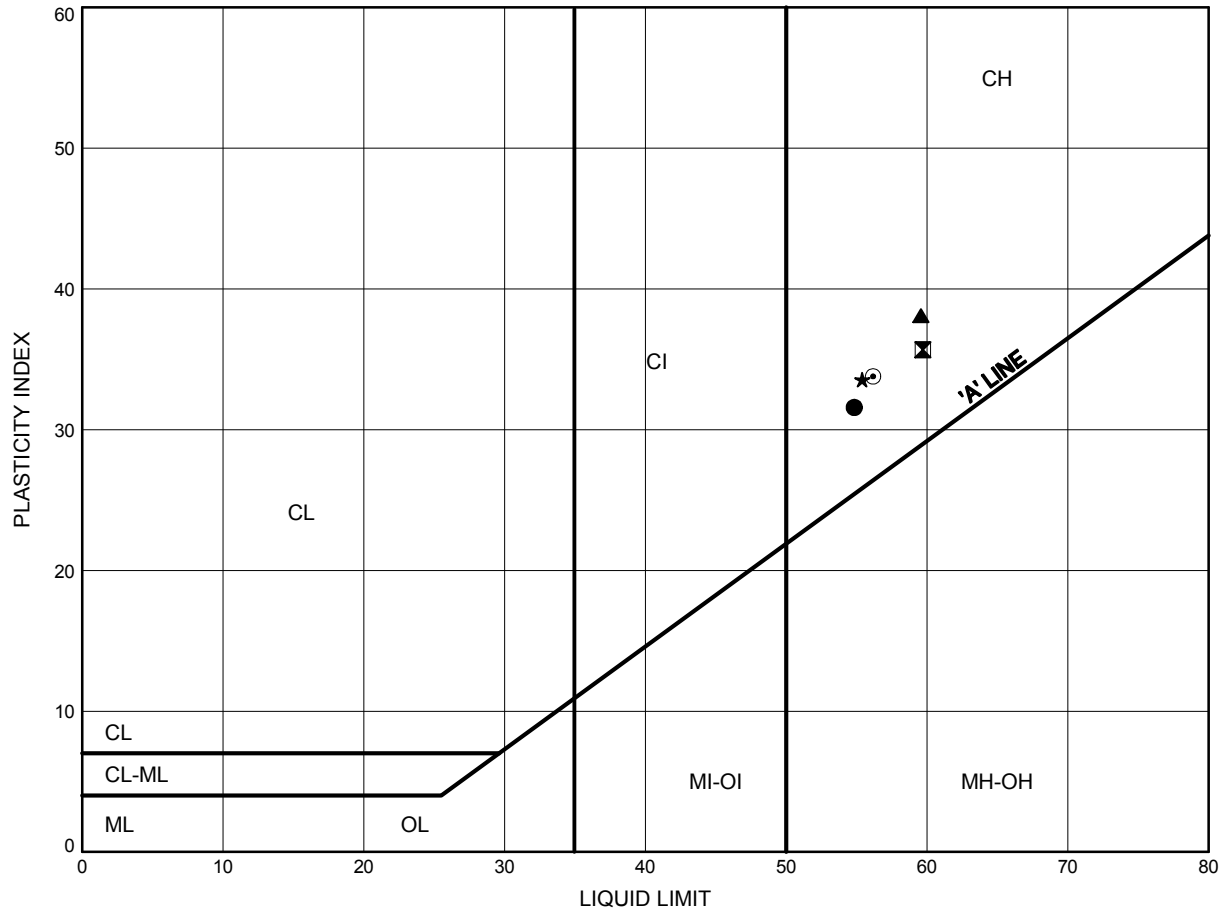
THURBALT 1197.GPJ 1/28/15

Pays Plat Creek

ATTERBERG LIMITS TEST RESULTS

FIGURE B10

CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	PPC-01	14.02	172.78
⊠	PPC-02	15.54	171.26
▲	PPC-03	14.02	172.78
★	PPC-04	12.50	174.30
⊙	PPC-04	15.54	171.26

Date January 2015

WP# 6071-09-00

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THURBALT 1197.GPJ 1/28/15

Appendix C

Site Photographs

Photograph 1 – Pays Plat Creek Bridge Looking East

Photograph 2 – Pays Plat Creek Bridge Looking West

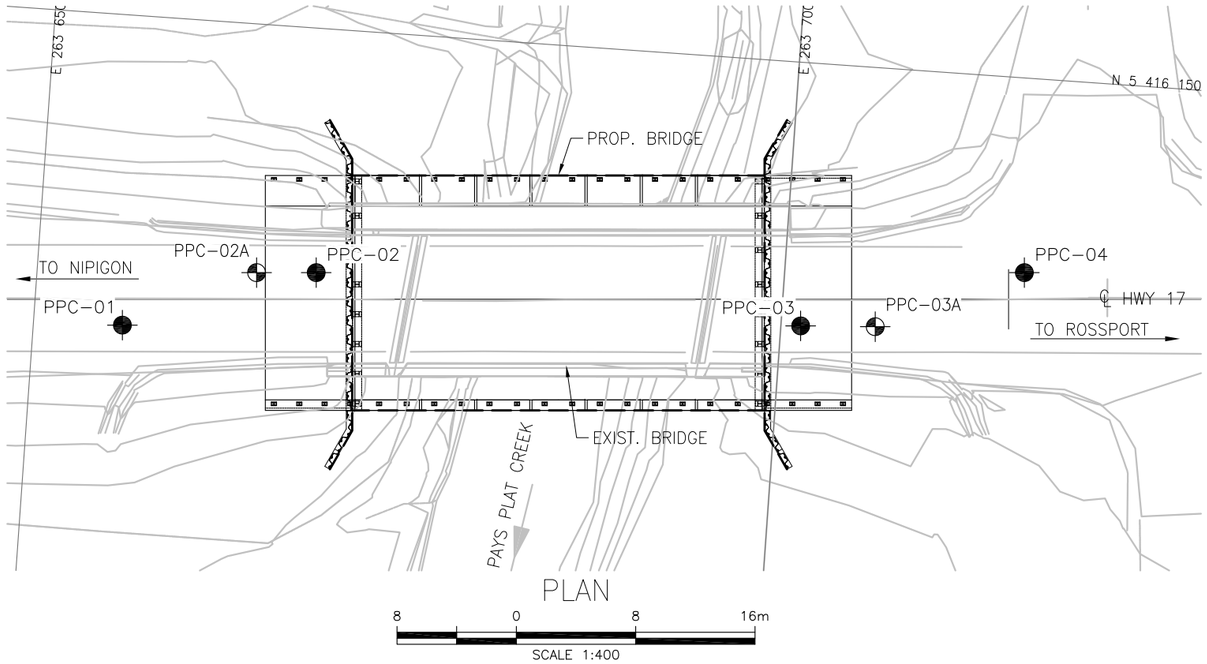
Photograph 3 - North Bridge Elevation - Looking West

Photograph 4 - North Bridge Elevation - Looking East

Appendix D

Borehole Locations and Soil Strata Drawing

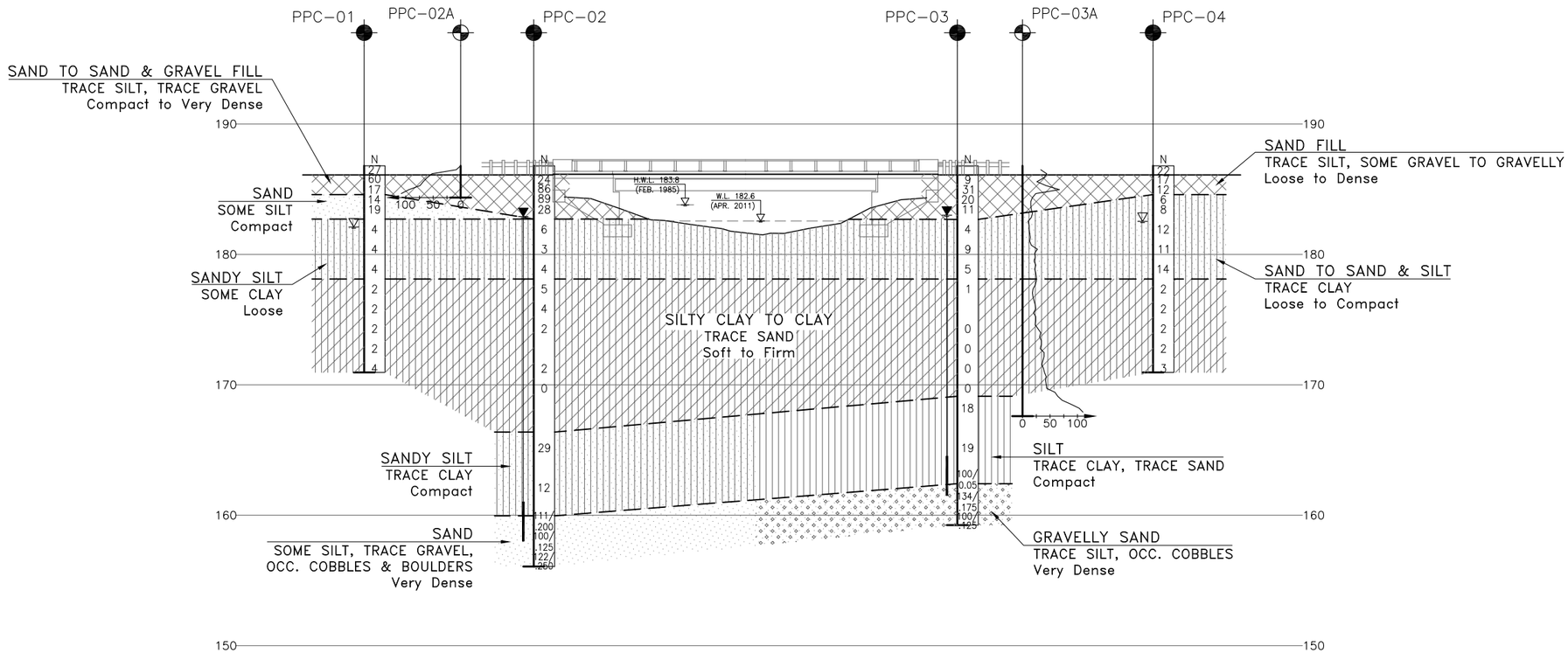
MINISTRY OF TRANSPORTATION, ONTARIO



PLAN

8 0 8 16m

SCALE 1:400



PROFILE ALONG ℄ HWY 17

8 0 8 16m

SCALE 1:400

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

LICENSED PROFESSIONAL ENGINEER
M. R. ANDERSON
May 20/15
PROVINCE OF ONTARIO

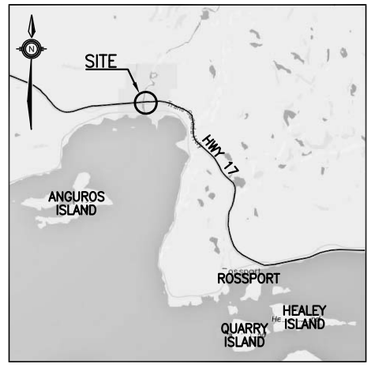
LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
May 20/15
PROVINCE OF ONTARIO

CONT No
WP No 6072-09-01

SHEET

HIGHWAY 17
PAYS PLAT CREEK BRIDGE
BOREHOLE LOCATIONS AND SOIL STRATA

THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

⊕	Borehole
⊕	DCPT (Dynamic Cone Penetration Test)
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level In Open Borehole
▼	Water Level In Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
PPC-01	186.8	5 416 129.2	263 656.0
PPC-02	186.8	5 416 133.6	263 668.7
PPC-02A	186.8	5 416 133.4	263 664.7
PPC-03	186.8	5 416 132.4	263 701.3
PPC-03A	186.8	5 416 132.7	263 706.3
PPC-04	186.8	5 416 137.0	263 716.0

-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.

GEOCRES No. 42D-37

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	MRA	CHK	MRA	CODE		LOAD	DATE MAY 2015
DRAWN	AN	CHK	SKP	SITE	48C-19	STRUCT	DWG 2

FILENAME: H:\Drafting\19\135\1\197\Pays Plat Creek\ted1197-BoreholePlan&Profile (Pays Plat Creek).dwg
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