

**FOUNDATION INVESTIGATION REPORT
CP OVERHEAD REPLACEMENT AT WEBBWOOD**

Highway 17, Site 46-160

G.W.P 5198-06-00

Township of Hallam

Geocres Number: 41I-272

Report to

McCormick Rankin Corporation

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G.W.P. 5198-06-00

Township of Hallam

Geocres Number: 411-272

PART 1: FACTUAL INFORMATION

1. INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted at the site of a proposed bridge replacement located south of Webbwood, Ontario. The existing structure carries Highway 17 over the CP tracks.

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, records of boreholes, 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 McCormick Rankin Corporation, under the Ministry of Transportation Ontario (MTO) Assignment Number 5009-E-0032.

2. SITE DESCRIPTION

The site of this investigation is located at the crossing of Highway 17 over CP tracks, approximately 10.5 km west of Highway 6 and just south of the Town of Webbwood, Ontario. At present, the highway crosses the railway tracks on a skewed single span structure.

There is no residential or commercial development in the immediate vicinity of the bridge. A cemetery is located northeast of the structure. The surrounding area is relatively flat and heavily treed.

Photographs of the site included in Appendix C show the general nature of the surrounding land:

1. View of the west side of existing CPR overhead from railtrack
2. Existing slope conditions
3. Surficial erosion on the southeast embankment

4 and 5. Existing Highway 17 conditions at CPR overhead

Physiographically, the site lies within the Canadian Shield, characterized by Precambrian meta-volcanic and meta-sedimentary rocks intruded by later stage diabase dykes. In some areas the Precambrian rocks are covered by sedimentary rocks of the Huronian Supergroup. The bedrock is mantled by glaciolacustrine varved clays and sand and gravel deposits. Locally, however, the bedrock is mantled by deposits of silt and sand.

3. SITE INVESTIGATION AND FIELD TESTING

The site investigation and field testing for this project was carried out from October 17 to 24 and from October 29 to November 1, 2010 and consisted of drilling and sampling a total of six boreholes (numbered WB-01 to WB-06) at the site. Four boreholes were drilled at the existing bridge abutments and two boreholes at the approaches.

Dynamic Cone Penetration Tests (DCPTs) were conducted from the base of Boreholes WB-01, WB-03, WB-04 and WB-06 to depths ranging from 25.0 m to 55.5 m (elevations 150.6 to 181.1). Five additional DCPTs were also conducted in close proximity to the boreholes from surface to depths ranging from 19.8 m to 36.6 m (elevations 169.5 to 186.3).

The borehole locations and termination depths are indicated in Table 3.1.

Table 3.1 – Borehole locations and termination depths

Foundation Unit	Borehole/DCPT	Borehole termination depth/ elevation (m)	DCPT termination depth/elevation ⁽¹⁾ (m)
South Approach	WB-01	15.8/190.3	27.1/179.0
	WB-01D	-	30.5/175.7
South Abutment	WB-02	34.1/172.0	-
	WB-02D	-	19.8/186.3
	WB-04	34.1/171.9	37.8/168.3
	WB-04D	-	25.0/181.1
North Abutment	WB-03	49.4/156.7	55.5/150.6
	WB-03D	-	27.4/178.6
	WB-05	34.1/171.9	-
	WB-05D	-	36.6/169.5
North Approach	WB-06	15.8/190.2	25.0/181.1

⁽¹⁾ DCPTs were terminated upon cone refusal

The approximate locations of the boreholes are shown on the attached Borehole Locations and Soil Strata Drawing in Appendix D. Record of Sheets of Boreholes WB-01 to WB-06 drilled during the present investigation are attached in Appendix A.

The coordinates and elevations of Boreholes WB-01 to WB-06 are given on the drawing and on the individual Record of Borehole Sheets.

Prior to commencement of drilling, utility clearances were obtained for all borehole locations. Road occupancy permits were obtained for boreholes drilled on the existing Highway 17 platform.

The drilling was carried out from the highway grade using a CME75 truck-mounted drill rig. A combination of hollow stem auger, NW casing and mud rotary drilling techniques were used to advance the boreholes. Samples were obtained at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT) in the overburden soils.

Groundwater conditions in the open boreholes were observed throughout the drilling operations. Two standpipe piezometers consisting of 19 mm PVC pipe with a slotted screen were installed in Boreholes WB-02 and WB-05. The locations and completion details of the boreholes and piezometers are shown in Table 3.2.

Table 3.2 – Borehole Completion Details

Foundation Unit	Borehole	Details	
		Piezometer Tip Depth/ Elevation (m)	Completion Details
South Approach	WB-01	None installed	Borehole caved to 12.8 m. Backfilled with cuttings from 12.8 m to 0.15 m, then asphalt to surface.
South Abutment	WB-02	34.1 / 172.0	Piezometer with 3.0 m slotted screen installed at 34.1 m with sand filter to 29.6 m, bentonite holeplug from 29.6 m to 0.15 m, then asphalt to surface. Flushmount casing installed.
	WB-04	None installed	Borehole backfilled with bentonite holeplug to 0.3 m, gravel from 0.3 m to 0.15m, then asphalt to surface.
North Abutment	WB-03	None installed	Borehole backfilled with bentonite holeplug to 0.3 m, gravel from 0.3 m to 0.15 m, then asphalt to surface.
	WB-05	33.5 / 172.6	Piezometer with 6.1 m slotted screen installed at 33.5 m with sand filter to 25.9 m, bentonite holeplug from 25.9 m to 23.2 m, sand and bentonite mixture from 23.2 m to 0.1 m, then asphalt to surface. Flushmount casing installed.
North Approach	WB-06	None installed	Borehole caved to 12.8 m. Backfilled with cuttings from 12.8 m to 0.15 m, then asphalt to surface.

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

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 gradation analysis and the results of this testing program are summarized on the Record of Borehole sheets in Appendix A and shown on the figures included in Appendix B.

5. DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets included in Appendix A. Details of the encountered soil stratigraphy are presented in this appendix and on the “Borehole Locations and Soil Strata” drawings 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 stratigraphy encountered in the six boreholes drilled at this site generally consisted of pavement structure (asphalt and/or concrete) over very loose to compact sand fill. Deposits of native loose to compact sand overlying compact to dense sandy silt and silt were encountered below the sand fill.

5.1 Pavement structure

Pavement structure consisting of approximately 100 mm to 550 mm of asphalt overlying sand fill was encountered in all the boreholes, which were drilled on existing Highway 17 lanes.

Concrete was encountered below the asphalt in Boreholes WB-01 and WB-06, drilled at the south and north approaches, respectively. The thickness of the concrete was 100 mm to 500 mm.

5.2 Fill

Sand fill was encountered below the asphalt and/or concrete in all six boreholes advanced at this site. The sand fill is described as fine grained, light brown to brown and contains trace silt to silty, trace gravel and trace clay.

The thickness of the sand fill ranges from 6.8 m to 9.3 m.

The underside of the fill varies from 7.2 m depth (Elevation 198.9) in Borehole WB-02 drilled at the south approach to a maximum depth of 9.8 m (Elevation 196.3) in Borehole WB-03 drilled near the north abutment.

SPT N-values recorded in the sand fill ranged from 0 to 18 blows per 0.3 m penetration, indicating a very loose to compact relative density.

Measured moisture contents of the sand fill ranged from 5% to 31%.

Grain size distribution curves for samples of the sand fill tested are presented on the Record of Borehole sheets and on Figures B1 and B2 of Appendix B. The results of the laboratory test are summarized as follows:

Soil Particles	(%)
Gravel	0 to 2
Sand	71 to 93
Silt	11 to 27
Clay	1 to 2
Silt & Clay	7

5.3 Sand

A layer of native sand containing trace silt to silty, trace gravel and trace clay was encountered below the sand fill in all the boreholes, except in Borehole WB-03.

The thickness of the native sand ranges from 2.9 m to 4.7 m.

The depth to the base of the native sand ranged from 10.4 m to 13.4 m (Elevations 192.7 to 195.8).

Moisture content results for samples collected from this layer typically ranged from 8% to 25%.

The SPT N-values recorded in this layer ranged from 7 to 27 blows for 0.3 m penetration, indicating loose to compact relative density. An SPT-N value of 32 blows per 0.3 m of penetration, indicating dense relative density, was measured in Borehole WB-02 near 11.0 m depth (Elevation 195.1).

Grain size distribution curves for samples of the native sand tested are presented on the Record of Borehole sheets and on Figure B3 of Appendix B. The results of the laboratory test are summarized as follows:

Soil Particles	(%)
Gravel	0 to 1
Sand	66 to 97
Silt	7 to 30
Clay	2 to 4
Silt & Clay	3

5.4 Sandy Silt

In Boreholes WB-01 to WB-04, a layer of brown to grey sandy silt containing trace clay and sand seams was contacted below the native sand.

In Borehole WB-05, the sandy silt was contacted below a layer of native silt at 14.9 m depth (Elevation 191.1).

The thickness of the sandy silt ranges from 14.0 m to 18.3 m on the west side of the existing structure (Boreholes WB-02 and WB-03) and from 7.6 m to 7.7 m on the east side of the structure (Boreholes WB-04 and WB-05).

Borehole WB-01 was terminated within the sandy silt layer at 15.8 m depth (Elevation 190.3).

Measured moisture contents of this sandy silt layer ranged from 10% to 23%. A high moisture content of 46% was measured in Borehole WB-05 at 19.8 m depth (Elevation 186.3).

SPT N-values recorded in this layer ranged from 7 to 38 blows per 0.3 m penetration, indicating a loose to dense relative density.

Grain size distribution curves for samples of the sandy silt tested are presented on the Record of Borehole sheets and on Figures B4 and B5 of Appendix B. The results of the laboratory test are summarized as follows:

Soil Particles	(%)
Gravel	0
Sand	21 to 52
Silt	45 to 72
Clay	3 to 8

5.5 Silt

Native grey silt containing trace sand, trace clay and occasional sandy layers was contacted below the sandy silt layer at 30.2 m, 23.8 m and 21.0 m depth (Elevations 175.9, 182.3 and 185.1) in Boreholes WB-02, WB-03 and WB-04, respectively. In Boreholes WB-05 and WB-06, the silt layer was contacted below the native sand at 11.9 m and 11.6 m depth (Elevations 194.2 and 194.5). In Borehole WB-05, a lower layer of silt was also contacted at 22.6 m depth (Elevation 183.5).

Clayey silt zones were contacted within the silt layer at various depths, 27.5 m, 36.8 m and 49.0 m (Elevations 178.5, 169.2 and 157.0) in Borehole WB-03.

Boreholes BW-02, BW-04 and BW-05 were terminated within the silt layer at 34.1 m depth (Elevations 172.0 and 171.9). Boreholes BW-03 and BW-06 were also terminated within the silt at 49.4 m and 15.8 m depth (Elevations 156.7 and 190.2), respectively.

Measured moisture contents of the silt layer ranged from 17% to 26%. A high moisture content of 40% was measured in Borehole WB-05 at 27.7 m depth (Elevation 178.4).

SPT N-values recorded in the silt layer ranged from 16 to 46 blows per 0.3 m penetration, indicating a compact to dense relative density. Locally, in Borehole WB-06 the SPT N-values were 7 and 13 blows per 0.3 m of penetration, indicating a loose to compact relative density.

Grain size distribution curves for samples of the silt layer tested are presented on the Record of Borehole sheets and on Figures B6 and B7 of Appendix B. Grain size distribution curves for the samples obtained from the clayey silt zone are presented in Figure B8 of Appendix B. The results of the laboratory test are summarized as follows:

Soil Particles	Silt (%)	Clayey silt zone (%)
Gravel	0	0
Sand	1 to 31	1 to 3
Silt	62 to 88	78 to 81
Clay	6 to 15	18 to 19

5.6 Water Levels

Water levels were observed in the boreholes during and upon completion of drilling. Two standpipe piezometers were installed in two boreholes to monitor water levels after completion of drilling. The water levels measured in the piezometers are summarized in Table 5.1, along with the measurements in the boreholes upon completion of drilling.

Table 5.1 – Water Level Measurements

Foundation Unit	Borehole	Date	Water Level (m)		Comment
			Depth Below	Elevation	
South Approach	WB-01	October 17, 2010	12.2	193.9	Open borehole
South Abutment	WB-02	October 23, 2010	12.2	193.9	Open borehole
		November 1, 2010	18.4	187.7	Piezometer
		November 29, 2010	18.2	187.9	Piezometer
	WB-04	October 29, 2010	12.8	193.3	Open borehole
North Abutment	WB-03	October 21, 2010	12.2	193.8	Open borehole
North Approach	WB-05	October 29, 2010	17.3	188.8	Piezometer
	WB-06	October 18, 2010	12.2	193.8	Open borehole

The piezometric readings indicate that the groundwater level ranges from Elevations 187.7 to 188.8.

All groundwater observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.

6. MISCELLANEOUS

George Downing Estate Drilling Limited of Hawkesbury, Ontario supplied the drill rig and conducted the drilling, sampling and in-situ testing operations. A truck-mounted CME 75 drill rig was used for the investigation.

The drilling and sampling operations in the field were supervised by Mr. Ryan Kromer and Mr. Lukasz Gilarski of Thurber.

Mr. Lukasz Gilarski, directed the field operations.

Interpretation of the data and preparation of the report were carried out by Mr. Alastair E. Gorman, P.Eng., Ms. Lindsey Blaine, E.I.T. and Ms. R. Palomeque Reyna, P.Eng.

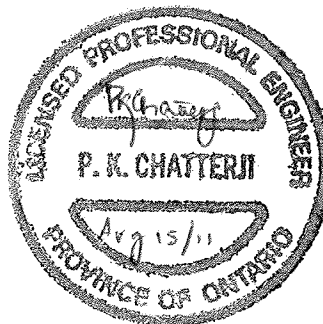
Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations projects, reviewed the report.

THURBER ENGINEERING LTD.

Rocio Palomeque Reyna, P.Eng.
Geotechnical Engineer



P.K. Chatterji, P.Eng.,
Review Principal, Designated MTO Contact



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}

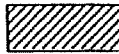




Shear Strength Determination by Pocket Penetrometer

- (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.

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
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

EXPLANATION OF ROCK LOGGING TERMS

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

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

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.

RECORD OF BOREHOLE No WB-01

1 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 323.2 E 235 356.6 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM DATE 2010.10.17 - 2010.10.17 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
206.1														
0.0	ASPHALT: (100mm)													
0.1	CONCRETE: (100mm)													
0.2	SAND, fine grained, silty, trace clay Very Loose to Compact Light Brown Moist (FILL)		1	SS	16									
			2	SS	11									0 74 24 2
			3	SS	2									
			4	SS	1									
			5	SS	1									0 93 7 (SI+CL)
	Trace silt and clay		6	SS	0									
			7	SS	1									
			8	SS	2									
199.0														
7.2	SAND, fine grained, trace silt and clay, some silt seams Loose to Compact Light Brown Moist		9	SS	18									
			10	SS	8									0 97 3 (SI+CL)

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Continued Next Page

+ 3, X 3: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WB-01

2 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 323.2 E 235 356.6 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM DATE 2010.10.17 - 2010.10.17 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
195.8 10.4	Continued From Previous Page SAND, trace silt and clay Loose Brown Moist Sandy SILT, trace clay, some silty sand seams Loose to Compact Light Brown to Grey Moist													
			11	SS	17									
			12	SS	18									
			13	SS	10									
			14	SS	7									
190.3 15.8	End of sampling at 15.8m and start DCPT													

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Continued Next Page

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

RECORD OF BOREHOLE No WB-01

3 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 323.2 E 235 356.6 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM DATE 2010.10.17 - 2010.10.17 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	WATER CONTENT (%) 20 40 60			
							186					
							185					
							184					
							183					
							182					
							181					
							180					
179.0												
27.1	END OF BOREHOLE AT 27.1m. WATER LEVEL AT 12.2m UPON COMPLETION OF DRILLING. BOREHOLE CAVED TO 12.8m, BACKFILLED WITH CUTTINGS TO 0.15m, THEN ASPHALT TO SURFACE.											

ONTMT4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-01D

2 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 323.2 E 235 356.6 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
 DATUM _____ DATE 2010.10.17 - 2010.10.17 CHECKED BY LRB

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES								
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100				20 40 60	GR SA SI CL
196													
195													
194													
193													
192													
191													
190													
189													
188													
187													

Continued Next Page

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

RECORD OF BOREHOLE No WB-01D

3 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 323.2 E 235 356.6 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
 DATUM _____ DATE 2010.10.17 - 2010.10.17 CHECKED BY LRB

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page							20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	20 40 60					
							186							
							185							
							184							
							183							
							182							
							181							
							180							
							179							
							178							
							177							

Continued Next Page

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

RECORD OF BOREHOLE No WB-01D

4 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 323.2 E 235 356.6 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
DATUM DATE 2010.10.17 - 2010.10.17 CHECKED BY LRB

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page						176							
175.7														
30.5	END OF DCPT AT 30.5m UPON CONE REFUSAL.													

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RECORD OF BOREHOLE No WB-02

1 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 315.4 E 235 353.8 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
DATUM DATE 2010.10.22 - 2010.10.23 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)		
								20 40 60 80 100					20 40 60		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE					w _p w w _L		
206.1															
0.0	ASPHALT: (350mm)						206								
205.7															
0.4	SAND, fine grained, some silt, trace clay Very Loose to Loose Brown (FILL)		1	SS	7		205					0 88 11 1			
			2	SS	3		204								
			3	SS	3		203					0 82 16 2			
			4	SS	2		202								
			5	SS	2		201								
			6	SS	4		200								
	Becoming wet		7	SS	3		199								
			8	SS	1		198					0 91 7 2			
198.9							197								
7.2	SAND, fine grained, trace silt, trace clay Loose Brown Wet		9	SS	7										
			10	SS	7										

ONTMT4S 1185.GPJ 3/22/11

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

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

RECORD OF BOREHOLE No WB-02

2 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 315.4 E 235 353.8 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.22 - 2010.10.23 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page													
194.2	SAND, fine grained, trace silt, trace clay Dense Brown Wet		11	SS	32									
11.9	Sandy SILT, trace clay Compact to Dense Grey Wet		12	SS	23									
			13	SS	26									
			14	SS	38									
			15	SS	32									
			16	SS	27									

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

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

RECORD OF BOREHOLE No WB-02

3 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 315.4 E 235 353.8 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.22 - 2010.10.23 CHECKED BY LRB

SOIL PROFILE			SAMPLES			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/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
Continued From Previous Page											
	Sandy SILT, trace clay Compact to Dense Grey Wet		17	SS	28		186				
							185				
			18	SS	29						0 22 72 6
							184				
				19	SS	34		183			
							182				
				20	SS	30		181			
							180				
				21	SS	23		179			
							178				
				22	SS	25		177			
			23	SS	34					0 21 71 8	

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

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

RECORD OF BOREHOLE No WB-02

4 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 315.4 E 235 353.8 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.22 - 2010.10.23 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60					
175.9	Continued From Previous Page						176								
30.2	SILT, trace sand, trace clay Compact to Dense Grey Wet		24	SS	40										
							175								
			25	SS	27		174								0 5 88 7
							173								
172.0			26	SS	43										
34.1	END OF BOREHOLE AT 34.1m. WATER LEVEL AT 12.2m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Nov. 01/10 18.4 187.7 Nov. 29/10 18.2 187.9														

ONTMT4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-02D

1 OF 2

METRIC

W.P. 5198-06-00 LOCATION N 5 125 315.4 E 235 353.8 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
DATUM DATE 2010.10.24 - 2010.10.24 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)			
206.1 0.0	Start DCPT from surface.						206							
							205							
							204							
							203							
							202							
							201							
							200							
							199							
							198							
							197							

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WB-02D

2 OF 2

METRIC

W.P. 5198-06-00 LOCATION N 5 125 315.4 E 235 353.8 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
 DATUM DATE 2010.10.24 - 2010.10.24 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	Continued From Previous Page										
							196				
							195				
							194				
							193				
							192				
							191				
							190				
							189				
							188				
							187				
186.3											
19.8	END OF DCPT AT 19.8m.										

ONTMT4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-03

1 OF 6

METRIC

W.P. 5198-06-00 LOCATION N 5 125 297.7 E 235 351.8 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
DATUM DATE 2010.10.19 - 2010.10.21 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
206.0							20 40 60 80 100								
0.0	ASPHALT: (550mm)														
205.5															
0.5	SAND, fine grained, some silt, trace clay Loose to Very Loose Brown Wet (FILL)		1	SS	6										
			2	SS	1										
			3	SS											
			4	SS	1										
			5	SS	2										
			6	SS	2										
			7	SS	2										
			8	SS	1										
	Trace gravel														
			9	SS	1										

Continued Next Page

+³. X³: Numbers refer to Sensitivity 20 15 10 5 0 5 10 15 20 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WB-03

2 OF 6

METRIC

W.P. 5198-06-00 LOCATION N 5 125 297.7 E 235 351.8 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.19 - 2010.10.21 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
Continued From Previous Page														
	Sandy SILT, trace clay Compact to Dense Brown Wet						196							
			11	SS	22		195							
	Grey		12	SS	24		194							0 36 60 4
			13	SS	29		193							
							192							
			14	SS	34		191							
							190							
			15	SS	31		189							0 46 50 4
							188							
			16	SS	31									
							187							

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

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

METRIC

ONTMT4S 1185.GPJ 3/22/11

+³, ×³: Numbers refer to Sensitivity

RECORD OF BOREHOLE No WB-03

4 OF 6

METRIC

W.P. 5198-06-00 LOCATION N 5 125 297.7 E 235 351.8 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
DATUM DATE 2010.10.19 - 2010.10.21 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page													
	SILT, trace sand to sandy, trace clay Dense Grey Wet		24	SS	46		176							0 31 63 6
							175							
							174							
							173							
			25	SS	36		172							
							171							
							170							
	Clayey silt zones		26	SS	30		169							0 3 78 19
							168							
							167							
			27	SS	30									

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

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

RECORD OF BOREHOLE No WB-03

6 OF 6

METRIC

W.P. 5198-06-00 LOCATION N 5 125 297.7 E 235 351.8 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.19 - 2010.10.21 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT (%) 20 40 60			
							156					
							155					
							154					
							153					
							152					
							151					
150.6												
55.5	END OF BOREHOLE AT 55.5m. WATER LEVEL AT 12.2 UPON COMPLETION DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.30m, GRAVEL TO 0.15m THEN ASPHALT TO SURFACE.											

ONTMT4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-03D

2 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 297.7 E 235 351.8 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
 DATUM DATE 2010.10.21 - 2010.10.21 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page							20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	20 40 60					
							196							
							195							
							194							
							193							
							192							
							191							
							190							
							189							
							188							
							187							

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

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

RECORD OF BOREHOLE No WB-03D

3 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 297.7 E 235 351.8 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
 DATUM DATE 2010.10.21 - 2010.10.21 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	WATER CONTENT (%) 20 40 60			GR SA SI CL
178.6							186					
							185					
							184					
							183					
							182					
							181					
							180					
							179					
27.4	END OF DCPT AT 27.4m.											

ONTMT4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-04

1 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 303.7 E 235 361.9 (Webbwood Bridge) ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.29 - 2010.10.29 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
206.1														
0.0	ASPHALT: (200mm)													
0.2	SAND, fine grained, trace gravel, some silt, trace clay Very Loose Brown Moist (FILL)													
			1	SS	3									
			2	SS	2									
			3	SS	1									
			4	SS	1									0 84 14 2
			5	SS	1									
			6	SS	3									0 85 13 2
			7	SS	3									
196.9														
9.1	SAND, some silt to silty, trace clay, trace gravel Loose to Compact Brown Moist		8	SS	8									

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

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

RECORD OF BOREHOLE No WB-04

2 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 303.7 E 235 361.9 (Webbwood Bridge) ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.29 - 2010.10.29 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE										
								20 40 60 80 100	20 40 60									
	Continued From Previous Page		9	SS	16	▽	196											
			10	SS	23		195									0 66 30 4		
			11	SS	18		194											
			12	SS	18		193											
192.7																		
13.4	SAND, some silt to silty, trace clay Compact Brown to Grey Moist		13	SS	25		192											
							191											
			14	SS	31		190									0 52 45 3		
			15	SS	31		189											
							188											
			16	SS	31		187											

Continued Next Page

+³ . X³ : Numbers refer to
Sensitivity 20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WB-04

3 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 303.7 E 235 361.9 (Webbwood Bridge) ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.29 - 2010.10.29 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page													
185.1	Sandy SILT, trace clay Compact Grey Moist		17	SS	25		186							
21.0	SILT, some sand, trace to some clay Compact to Dense Grey Moist		18	SS	26		185							0 15 79 6
							184							
							183							
							182							
			19	SS	31		181							
							180							
							179							
			20	SS	22		178							0 12 77 11
							177							

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Continued Next Page

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

RECORD OF BOREHOLE No WB-04

4 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 303.7 E 235 361.9 (Webbwood Bridge) ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.29 - 2010.10.29 CHECKED BY LRB

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	SHEAR STRENGTH kPa			WATER CONTENT (%)				
	Continued From Previous Page								20 40 60 80 100				
	SILT, trace to some sand, some clay Compact to Dense Grey Moist		21	SS	19				20 40 60 80 100				
171.9			22	SS	39				20 40 60 80 100				
34.1	End of sampling at 34.1m and start DCPT												
168.3													
37.8	END OF BOREHOLE AT 37.8m. WATER LEVEL OBSERVED AT 12.8m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.30m, GRAVEL TO 0.15m THEN ASPHALT TO SURFACE.												

ONTMT4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-04D

2 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 303.7 E 235 361.9 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
 DATUM _____ DATE 2010.11.01 - 2010.11.01 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
Continued From Previous Page														
							196							
							195							
							194							
							193							
							192							
							191							
							190							
							189							
							188							
							187							

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WB-04D

3 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 303.7 E 235 361.9 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
DATUM DATE 2010.11.01 - 2010.11.01 CHECKED BY LRB

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	W _P W W _L	20 40 60			
	Continued From Previous Page						186							
							185							
							184							
							183							
							182							
181.1														
25.0	END OF DCPT AT 25.0m. BACKFILLED WITH SAND TO 0.2m, THEN ASPHALT TO SURFACE.													

ONTMT4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-05

1 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 321.4 E 235 363.9 (Webbwood Bridge) ORIGINATED BY LG
HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
DATUM DATE 2010.10.30 - 2010.10.31 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	
206.1												
0.0	ASPHALT: (200mm)						206					
0.2	SAND, fine to medium grained, some silt to silty, trace gravel, trace clay Very Loose to Loose Brown Moist (FILL)						205					
			1	SS	6		204					
							203					
			2	SS	6		202					
							201					
			3	SS	2		200					
							199					
			4	SS	7		198					
							197					
197.1			5	SS	2							
9.0	SAND, some silt, trace clay, trace gravel Compact Grey Moist		6	SS	10							

Continued Next Page

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

ONTM4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-05

2 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 321.4 E 235 363.9 (Webbwood Bridge) ORIGINATED BY LG
 HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
 DATUM DATE 2010.10.30 - 2010.10.31 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							
	Continued From Previous Page						20	40	60	80	100	W _P	W	W _L	
	SAND , some silt, trace clay Compact Grey Moist		7	SS	27								○		
194.2															
11.9	SILT , trace sand, trace clay Compact Grey Wet		8	SS	18								○		0 7 87 6
			9	SS	27								○		
191.1															
14.9	Sandy SILT , trace clay Compact Grey Wet		10	SS	21								○		
			11	SS	26								○		
			12	SS	29								○		0 37 59 4

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

+³ × 3³ Numbers refer to
Sensitivity 20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WB-05

3 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 321.4 E 235 363.9 (Webbwood Bridge) ORIGINATED BY LG
HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
DATUM DATE 2010.10.30 - 2010.10.31 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
	Continued From Previous Page		13	SS	30		186							
							185							
			14	SS	25		184							
183.5							183							
22.6	SILT, trace sand, trace clay Compact Grey Wet						182							
			15	SS	20		181							0 5 88 7
							180							
							179							
			16	SS	26		178							
							177							

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

+³ ×³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WB-05

4 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 321.4 E 235 363.9 (Webbwood Bridge) ORIGINATED BY LG
HWY 17 BOREHOLE TYPE Mud Rotary/NW Casing COMPILED BY AN
DATUM DATE 2010.10.30 - 2010.10.31 CHECKED BY LRB

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)			
						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					W _P — W — W _L 20 40 60					
	Continued From Previous Page															
	SILT, some sand to sandy, trace to some clay Dense to Compact Grey Wet		17	SS	45										0 28 62 10	
171.9			18	SS	29											
34.1	END OF BOREHOLE AT 34.1m Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 6.08m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Nov. 29/10 17.3 188.8															

RECORD OF BOREHOLE No WB-05D

2 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 321.4 E 235 363.9 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
DATUM DATE 2010.11.01 - 2010.11.01 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	Continued From Previous Page										
							196				
							195				
							194				
							193				
							192				
							191				
							190				
							189				
							188				
							187				

Continued Next Page

+³. X³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WB-05D

3 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 321.4 E 235 363.9 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
 DATUM DATE 2010.11.01 - 2010.11.01 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	Continued From Previous Page										
							186				
							185				
							184				
							183				
							182				
							181				
							180				
							179				
							178				
							177				

ONTMT4S 1185.GPJ 3/22/11

Continued Next Page

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

RECORD OF BOREHOLE No WB-05D

4 OF 4

METRIC

W.P. 5198-06-00 LOCATION N 5 125 321.4 E 235 363.9 (Webbwood Bridge) ORIGINATED BY RK
 HWY 17 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY AN
 DATUM _____ DATE 2010.11.01 - 2010.11.01 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES								
	Continued From Previous Page												
							176						
							175						
							174						
							173						
							172						
							171						
							170						
169.5													
36.6	END OF DCPT AT 36.6m.												

ONTMT4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-06

1 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 292.6 E 235 359.6 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM DATE 2010.10.18 - 2010.10.18 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT (%) w _p w w _L			
206.0								20 40 60 80 100					
0.0	ASPHALT: (100mm)						206						
0.1	CONCRETE												
205.4													
0.6	SAND, fine grained, trace clay, some silt, trace gravel Very Loose to Compact Light Brown (FILL)		1	SS	14		205						
			2	SS	14								
			3	SS	8		204						0 79 19 2
			4	SS	18		203						
			5	SS	4		202						
			6	SS	7		201						2 80 16 2
			7	SS	7		200						
			8	SS	1		199						
			9	SS	0		198						
197.4													
8.7	SAND, fine to very fine grained, trace to some silt, trace clay Compact Light Brown Moist		10	SS	10		197						

Continued Next Page

+³. X³: Numbers refer to
Sensitivity

20
15 10 5
10 (%) STRAIN AT FAILURE

ONTMT4S 1185.GPJ 3/22/11

RECORD OF BOREHOLE No WB-06

2 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 292.6 E 235 359.6 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM DATE 2010.10.18 - 2010.10.18 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
							20 40 60 80 100	20 40 60 80 100	W _P	W	W _L			
							○ UNCONFINED + FIELD VANE	○ UNCONFINED + FIELD VANE						
							● QUICK TRIAXIAL × LAB VANE	● QUICK TRIAXIAL × LAB VANE						
	Continued From Previous Page													
194.5	SAND, some silt, trace clay Compact Brown Moist		11	SS	15								0 86 12 2	
11.6	SILT, some sand, trace clay Loose to Compact Brown to Grey Moist		12	SS	13									
	Becoming wet		13	SS	13								0 21 72 7	
190.2			14	SS	7									
15.8	End of sampling at 15.8m and start DCPT													

Continued Next Page

+³ × 3³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WB-06

3 OF 3

METRIC

W.P. 5198-06-00 LOCATION N 5 125 292.6 E 235 359.6 (Webbwood Bridge) ORIGINATED BY RK
HWY 17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM DATE 2010.10.18 - 2010.10.18 CHECKED BY LRB

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	W P W L	W P W L	W P W L			
	Continued From Previous Page													
181.1							186							
							185							
							184							
							183							
							182							
25.0	END OF BOREHOLE AT 25.0m. WATER LEVEL AT 12.2m UPON COMPLETION OF DRILLING. BOREHOLE CAVED TO 12.8m, BACKFILLED WITH CUTTINGS TO 0.1m, THEN ASPHALT TO SURFACE.													

ONTMT4S 1185.GPJ 3/22/11

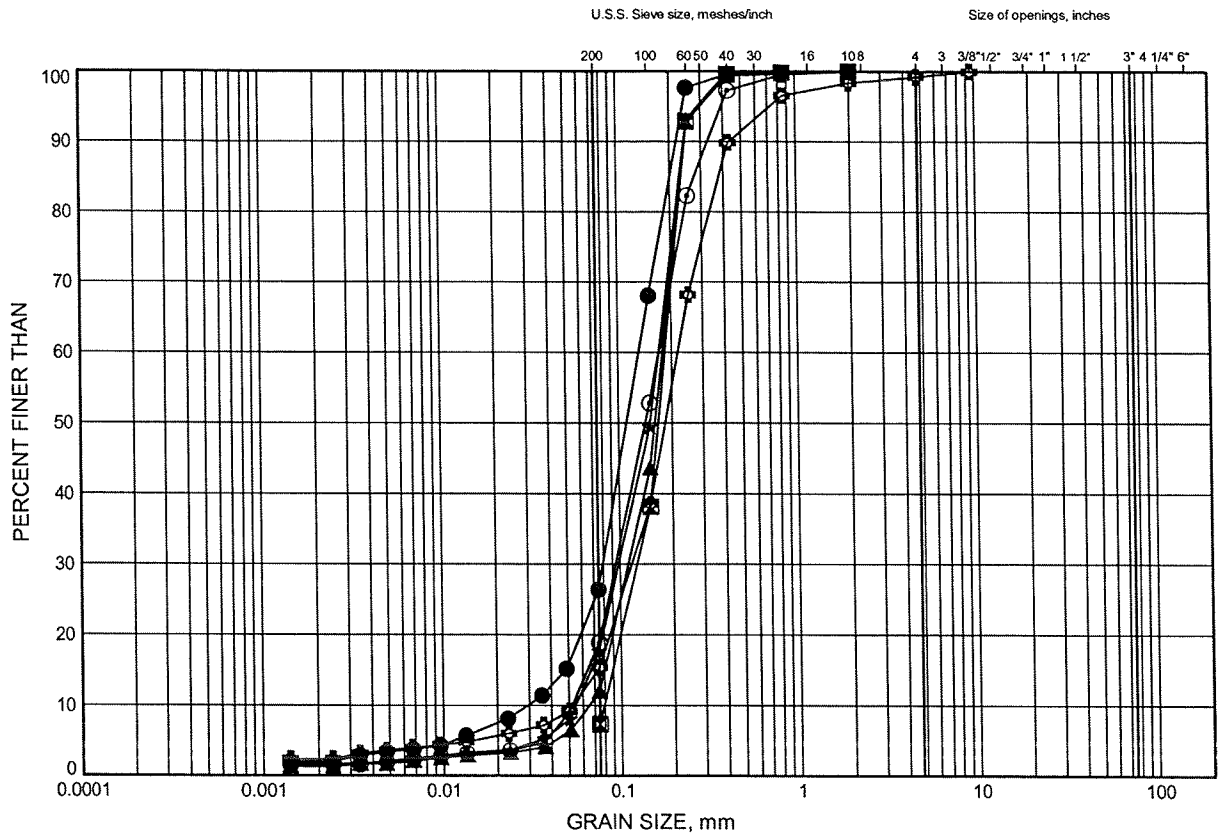
Appendix B

Laboratory Test Results

Ten Bridge Rehabilitations and Two Bridge Replacements
GRAIN SIZE DISTRIBUTION

FIGURE B1

SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WB-01	1.83	204.30
⊠	WB-01	4.11	202.02
▲	WB-02	1.07	205.03
★	WB-02	3.35	202.74
⊙	WB-03	4.88	201.16
⊕	WB-03	6.40	199.64

GRAIN SIZE DISTRIBUTION - THURBER 1185.GPJ 1/27/11

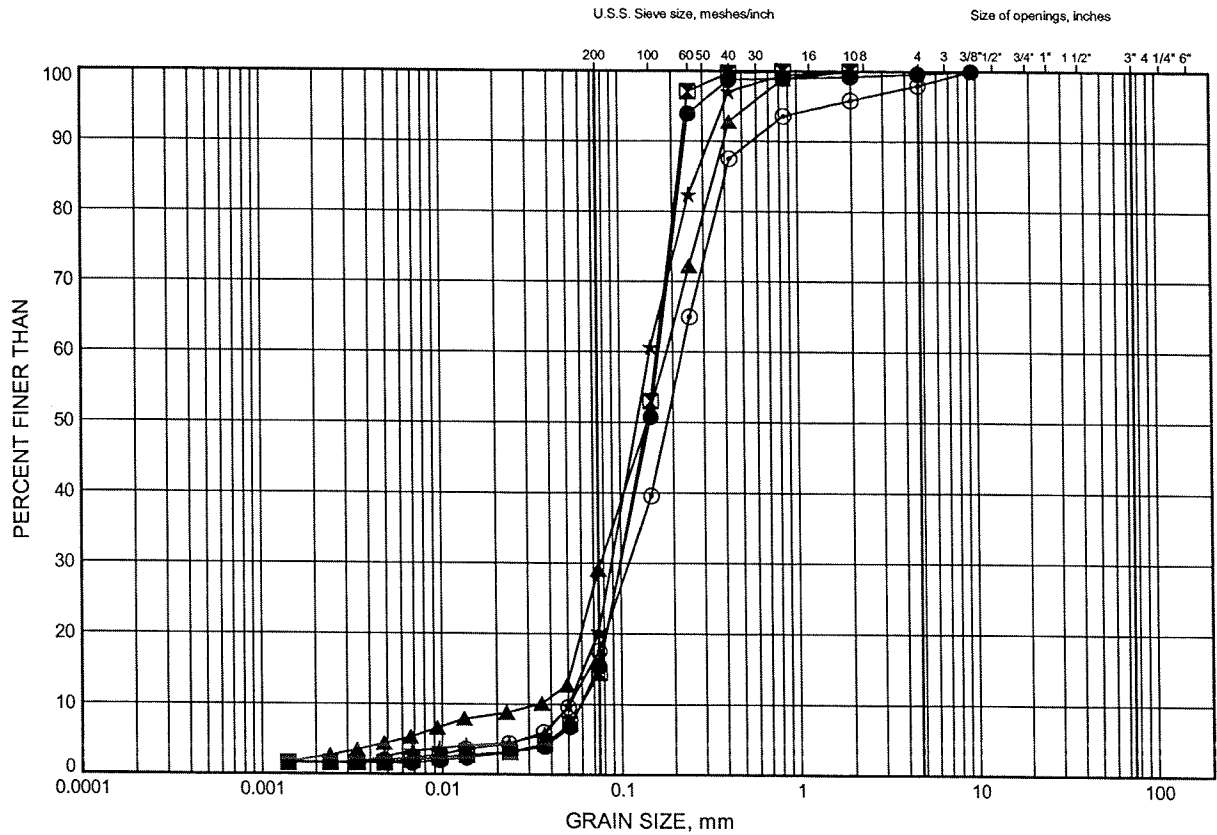
W.P.# .5198-06-00.....
 Prepared By .AN.....
 Checked By .RPR.....



Ten Bridge Rehabilitations and Two Bridge Replacements
GRAIN SIZE DISTRIBUTION

FIGURE B2

SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WB-04	6.40	199.68
⊠	WB-04	7.92	198.16
▲	WB-05	6.40	199.67
★	WB-06	2.59	203.46
⊙	WB-06	5.64	200.41

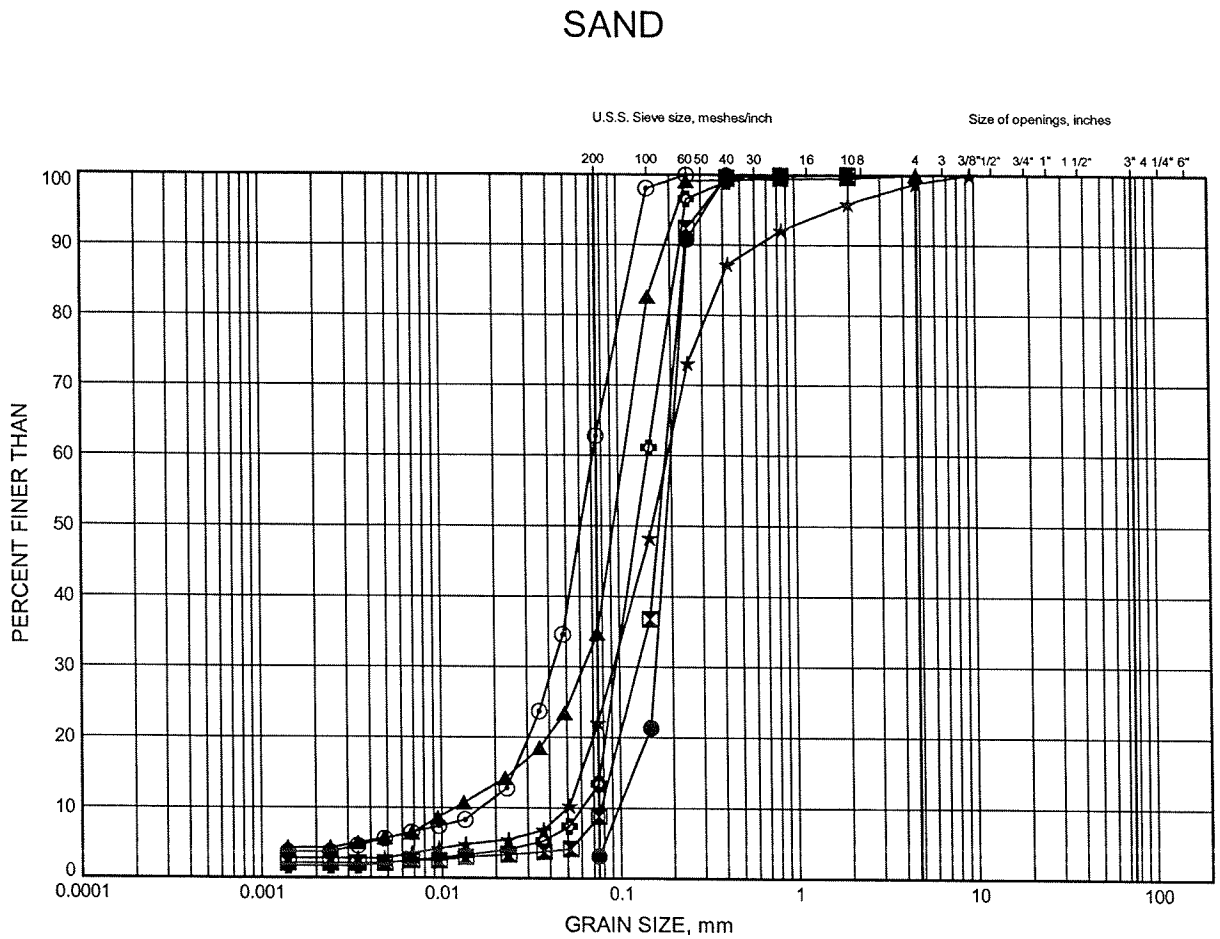
GRAIN SIZE DISTRIBUTION - THURBER 1185.GPJ 1/27/11

W.P.# .5198-06-00.....
Prepared By .AN.....
Checked By .RPR.....



Ten Bridge Rehabilitations and Two Bridge Replacements
GRAIN SIZE DISTRIBUTION

FIGURE B3



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WB-01	9.45	196.68
⊠	WB-02	7.92	198.17
▲	WB-04	10.97	195.11
★	WB-05	9.45	196.62
⊙	WB-05	18.59	187.48
⊕	WB-06	10.97	195.07

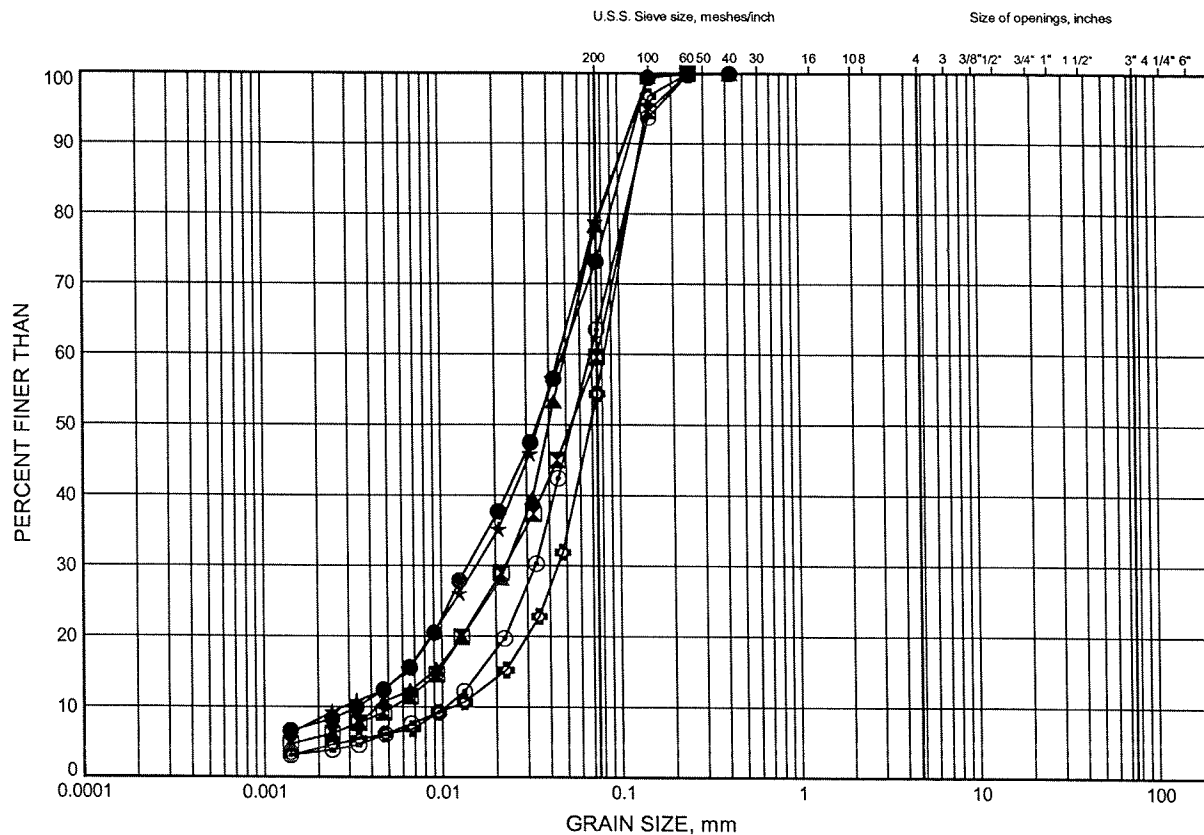


W.P.# 5198-06-00
Prepared By AN
Checked By RPR

Ten Bridge Rehabilitations and Two Bridge Replacements
GRAIN SIZE DISTRIBUTION

FIGURE B4

SANDY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WB-01	14.02	192.11
⊠	WB-02	15.54	190.55
▲	WB-02	21.64	184.46
★	WB-02	29.26	176.84
⊙	WB-03	12.50	193.54
⊛	WB-03	17.07	188.97

GRAIN SIZE DISTRIBUTION - THURBER 1185.GPJ 1/27/11

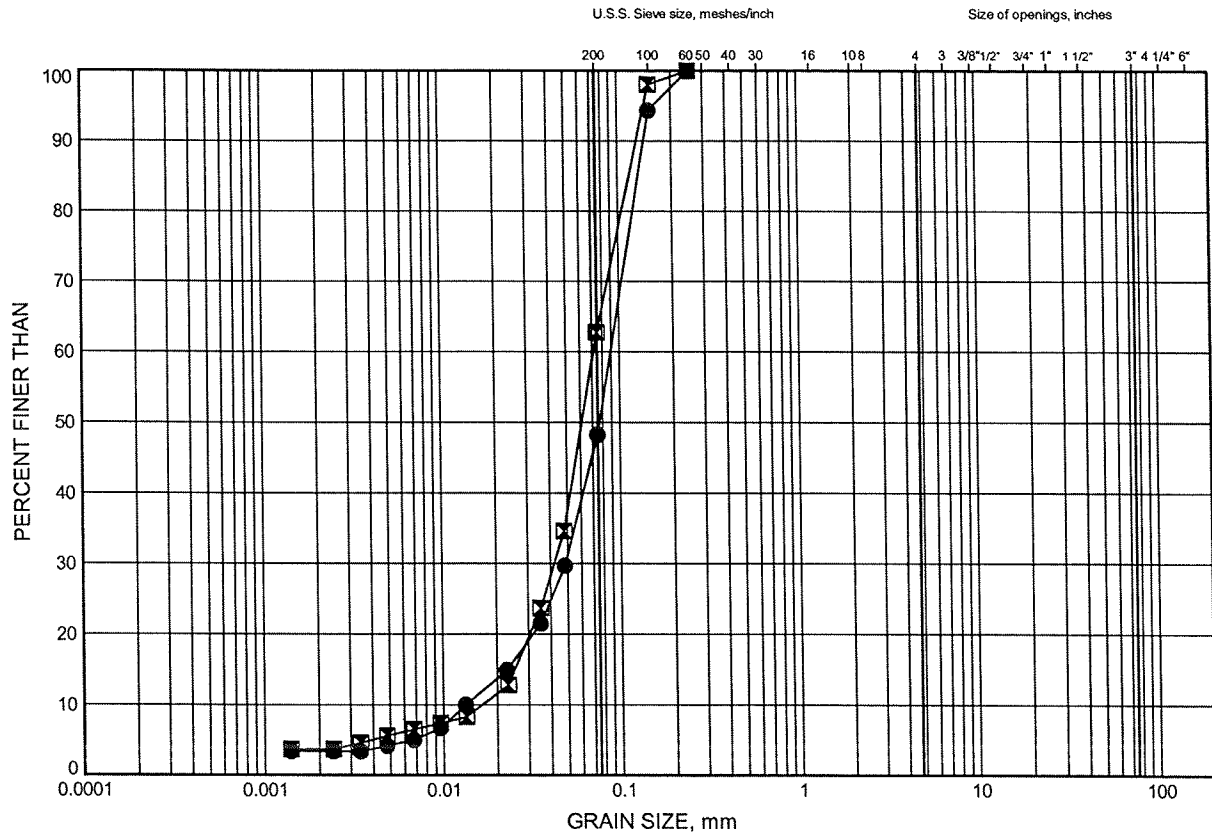
W.P.# .5198-06-00.....
 Prepared By .AN.....
 Checked By .RPR.....



Ten Bridge Rehabilitations and Two Bridge Replacements
GRAIN SIZE DISTRIBUTION

FIGURE B5

SANDY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WB-04	15.54	190.54
⊠	WB-05	18.59	187.48

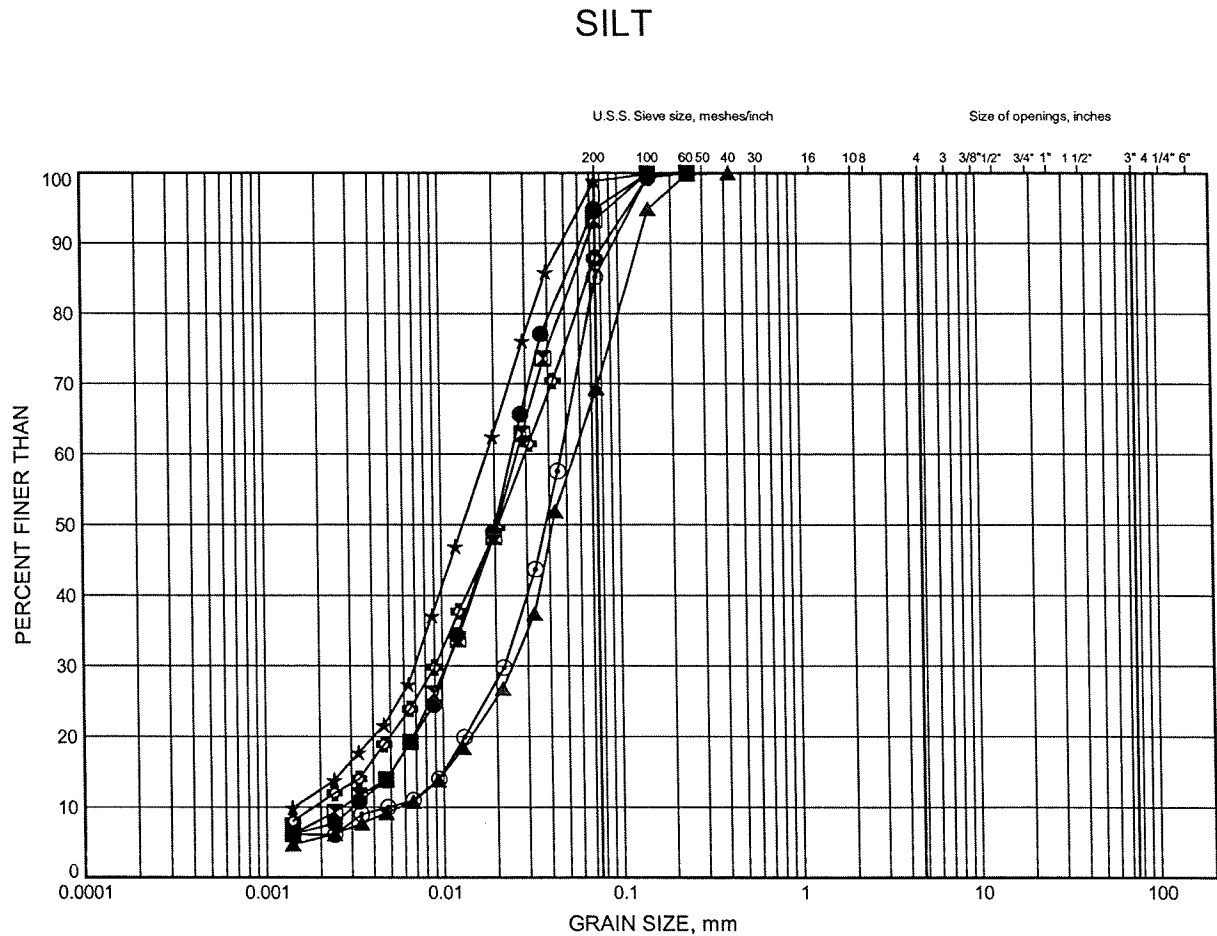
GRAIN SIZE DISTRIBUTION - THURBER 1185.GPJ 1/27/11

W.P.# .5198-06-00.....
 Prepared By .AN.....
 Checked By .RPR.....



Ten Bridge Rehabilitations and Two Bridge Replacements
GRAIN SIZE DISTRIBUTION

FIGURE B6



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WB-02	32.31	173.79
⊠	WB-03	24.69	181.35
▲	WB-03	30.78	175.25
★	WB-03	46.02	160.01
⊙	WB-04	21.64	184.44
⊛	WB-04	27.74	178.35

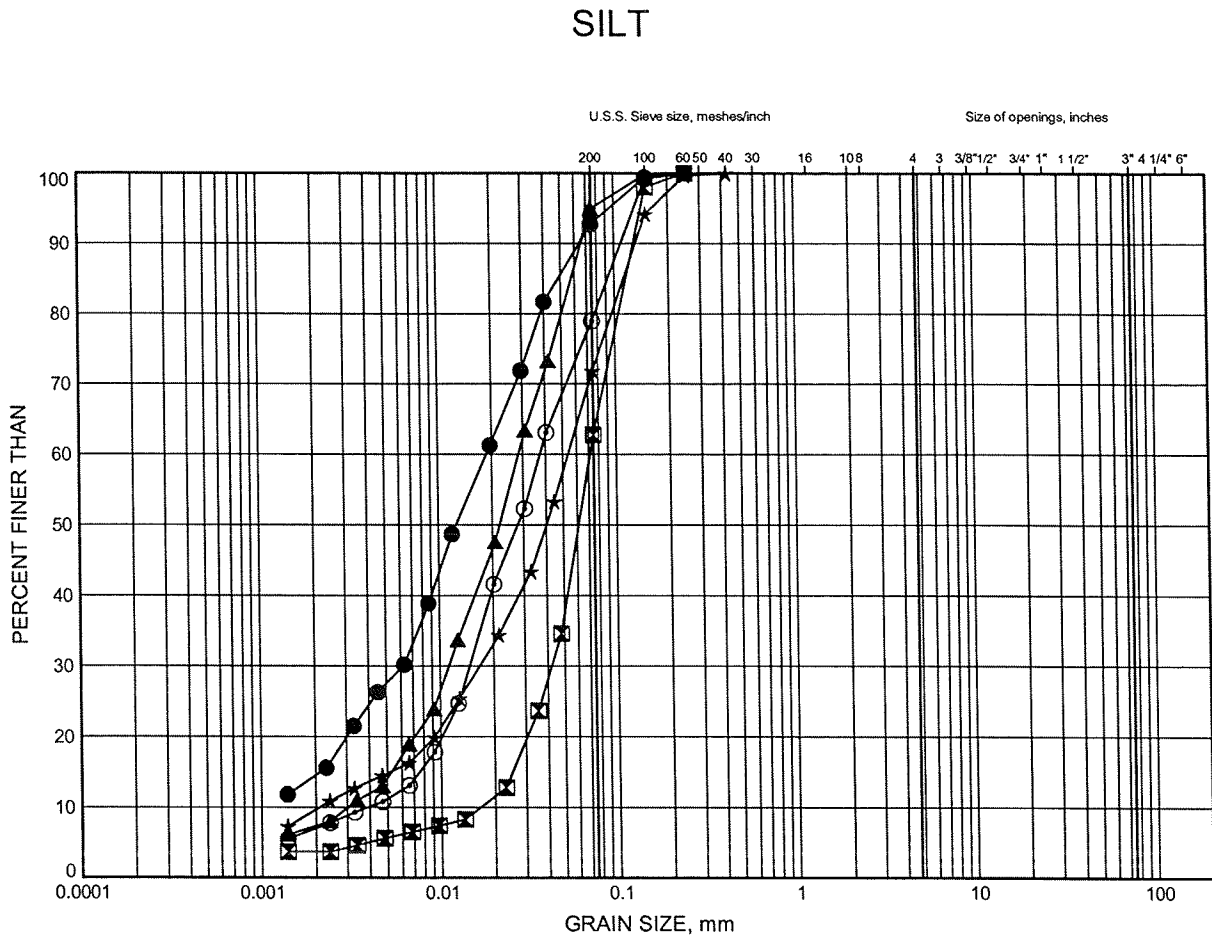
GRAIN SIZE DISTRIBUTION - THURBER 1185.GPJ 1/27/11

W.P.# 5198-06-00.....
Prepared By AN.....
Checked By RPR.....



Ten Bridge Rehabilitations and Two Bridge Replacements
GRAIN SIZE DISTRIBUTION

FIGURE B7



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WB-04	33.83	172.25
⊠	WB-05	18.59	187.48
▲	WB-05	24.69	181.38
★	WB-05	30.78	175.28
⊙	WB-06	14.02	192.03

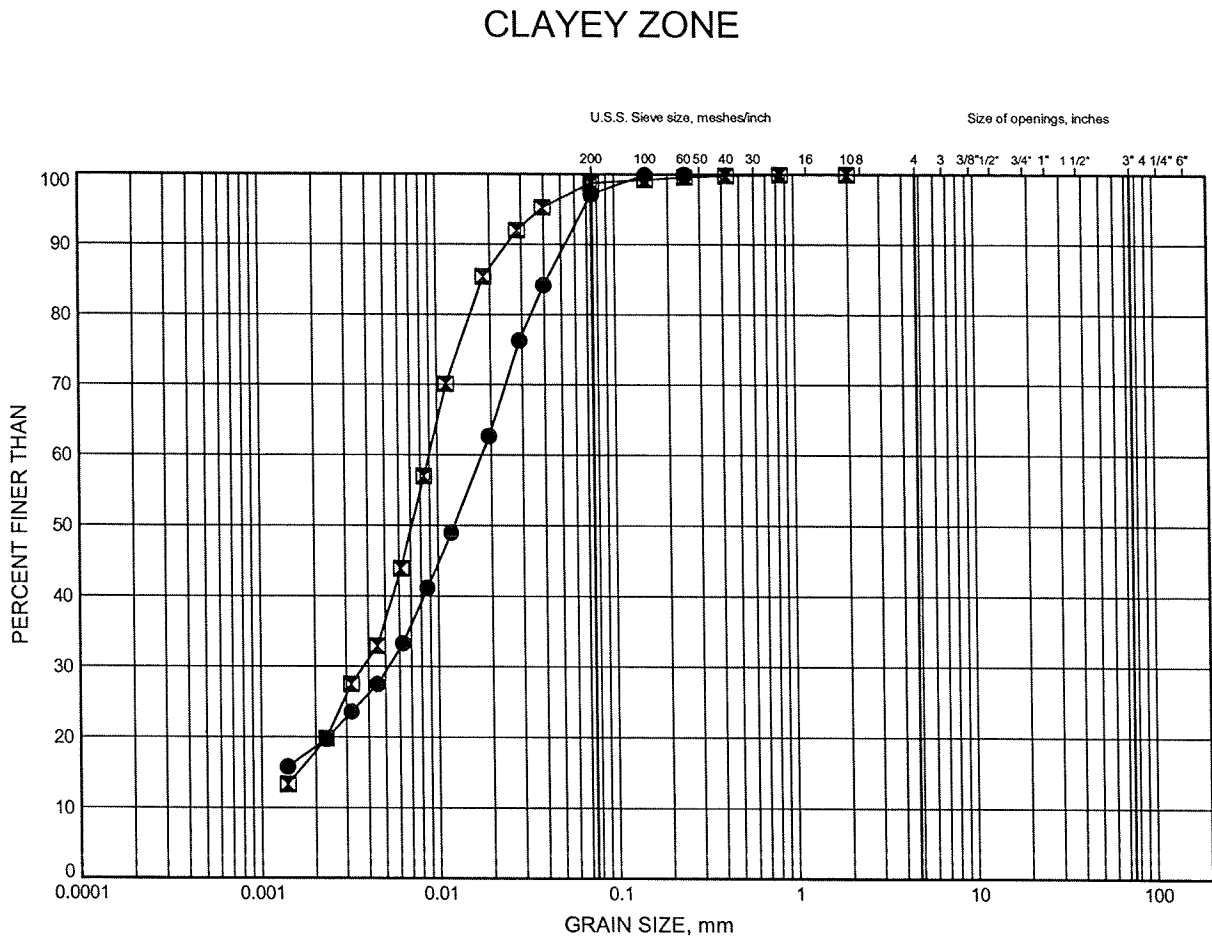
GRAIN SIZE DISTRIBUTION - THURBER 1185.GPJ 1/27/11

W.P.# .5198-06-00.....
 Prepared By .AN.....
 Checked By .RPR.....



Ten Bridge Rehabilitations and Two Bridge Replacements
GRAIN SIZE DISTRIBUTION

FIGURE B8



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WB-03	36.88	169.16
⊠	WB-03	49.07	156.97

GRAIN SIZE DISTRIBUTION - THURBER 1185.GPJ 1/27/11

W.P.# .5198-06-00.....
 Prepared By .AN.....
 Checked By .RPR.....



Appendix C
Selected Photographs



Photograph 1 – View of the west side of existing CPR overhead from railtrack



Photograph 2 – Existing slope conditions



Photograph 3 – Surficial erosion on the southeast embankment



Photographs 4 and 5 – Existing Highway 17 conditions at CPR overhead (Webbwood), looking north

Appendix D

Drawing “Borehole Locations and Soil Strata”

METRIC

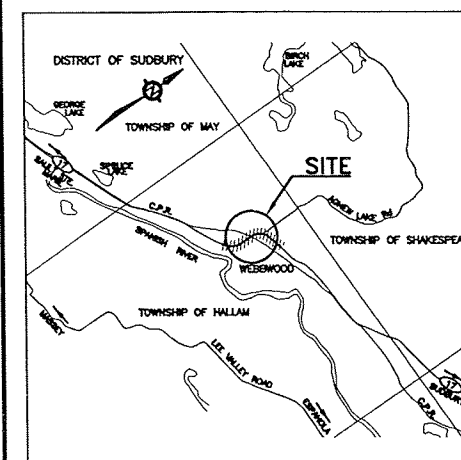
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
WP No 5198-06-00

HIGHWAY 17
WEBBWOOD C.P.
OVERHEAD REHABILITATION
BOREHOLE LOCATIONS AND SOIL STRATA








**McCORMICK RANKIN
CORPORATION**



KEYPLAN

LEGEND

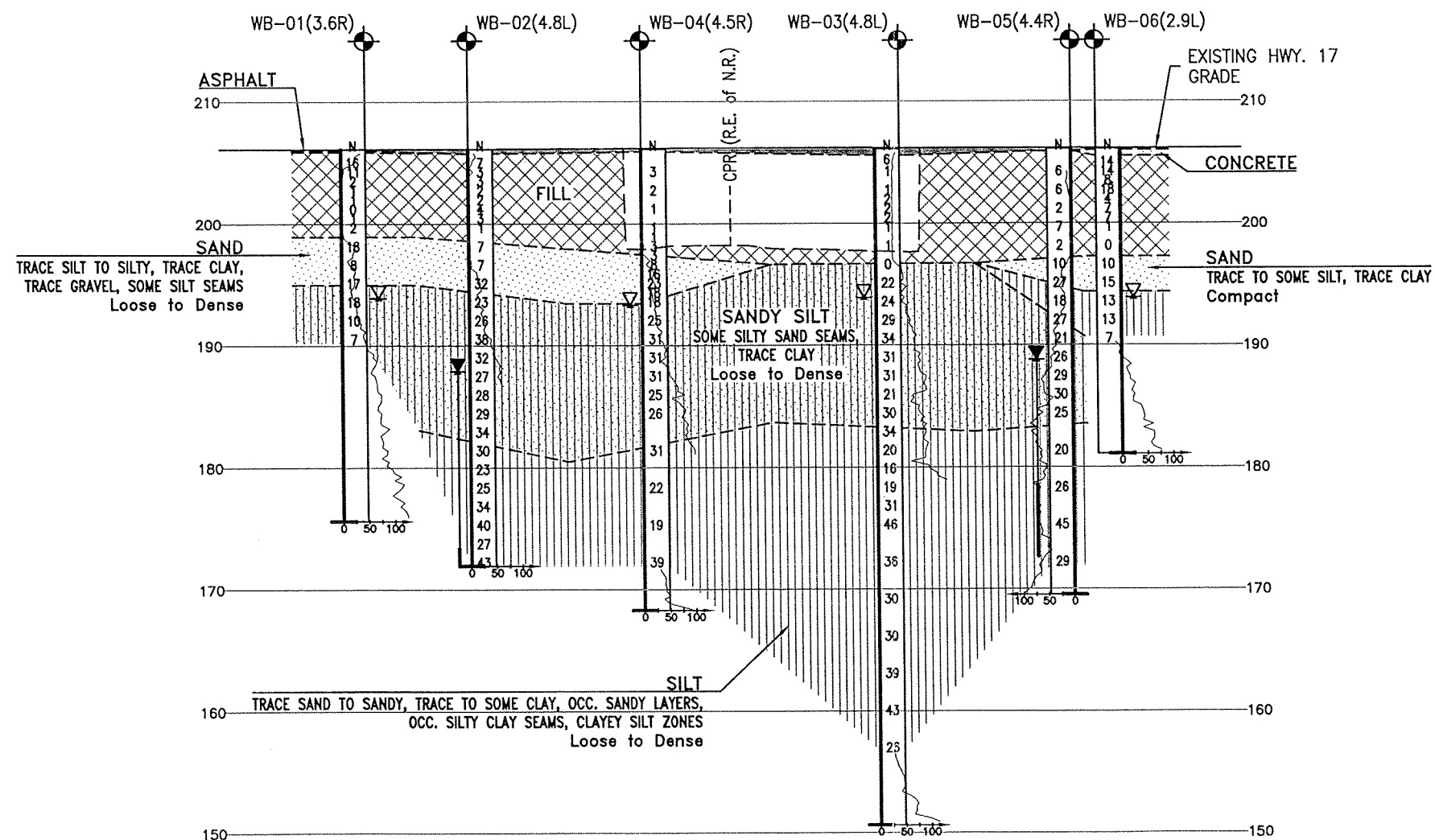
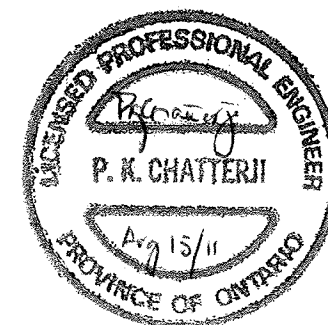
- | | |
|---|---------------------------------------|
|  | Borehole |
|  | Borehole and Cone |
| N | Blows /0.3m (Std Pen Test, 475J/blow) |
| CONE | Blows /0.3m (60° Cone, 475J/blow) |
| PH | Pressure, Hydraulic |
|  | Water Level |
|  | Head Artesian Water |
|  | Piezometer |
| 90% | Rock Quality Designation (RQD) |
| A/R | Auger Refusal |

NO	ELEVATION	NORTHING	EASTING
WB-01	206.0	5 125 292.6	235 359.6
WB-02	206.0	5 125 297.7	235 351.8
WB-03	206.1	5 125 315.4	235 353.8
WB-04	206.1	5 125 303.7	235 361.9
WB-05	206.1	5 125 321.4	235 363.9
WB-06	206.1	5 125 323.2	235 356.6

-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. 411-272



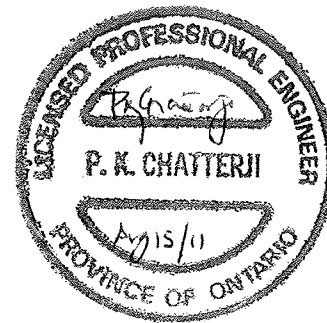
PROFILE ALONG HWY 17



H 1:250

V 1:500

REVISIONS									
	DATE	BY				DESCRIPTION			
	DESIGN	RPR	CHK		CODE	LOAD	DATE	JUN. 2011	
	DRAWN	MFA	CHK	RPR	SITE	STRUCT	DWG	1	

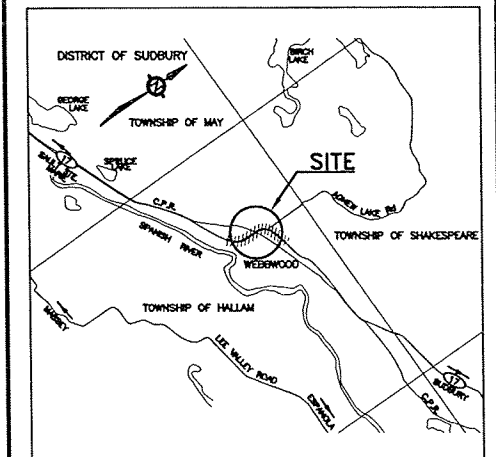


METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
WP No 5198-06-00

HIGHWAY 17
WEBBWOOD C.P.
OVERHEAD REHABILITATION
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



KEYPLAN LEGEND

●	Borehole
◆	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60' Cone, 475J/blow)
PH	Pressure, Hydraulic
W	Water Level
HA	Head Artesian Water
P	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

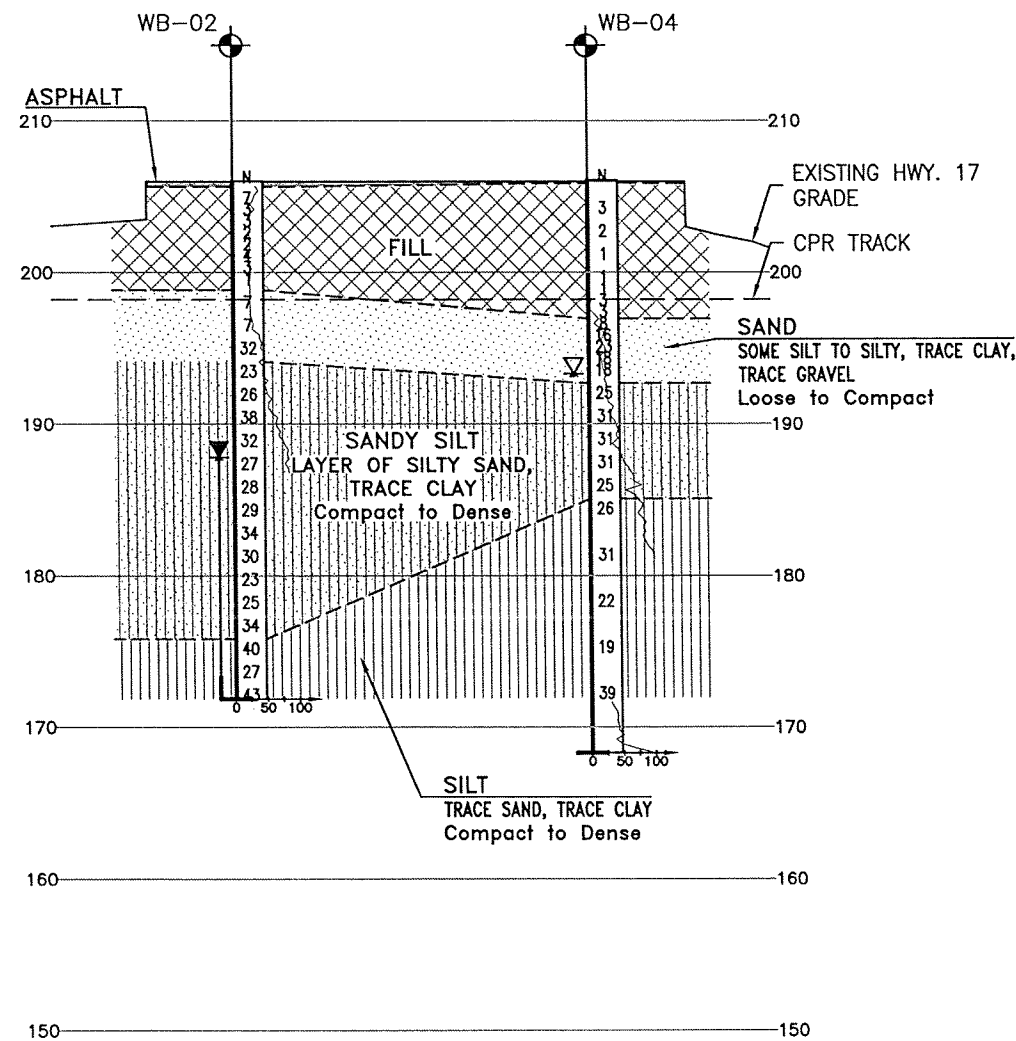
NO	ELEVATION	NORTHING	EASTING
WB-01	206.0	5 125 292.6	235 359.6
WB-02	206.0	5 125 297.7	235 351.8
WB-03	206.1	5 125 315.4	235 353.8
WB-04	206.1	5 125 303.7	235 361.9
WB-05	206.1	5 125 321.4	235 363.9
WB-06	206.1	5 125 323.2	235 356.6

-NOTES-

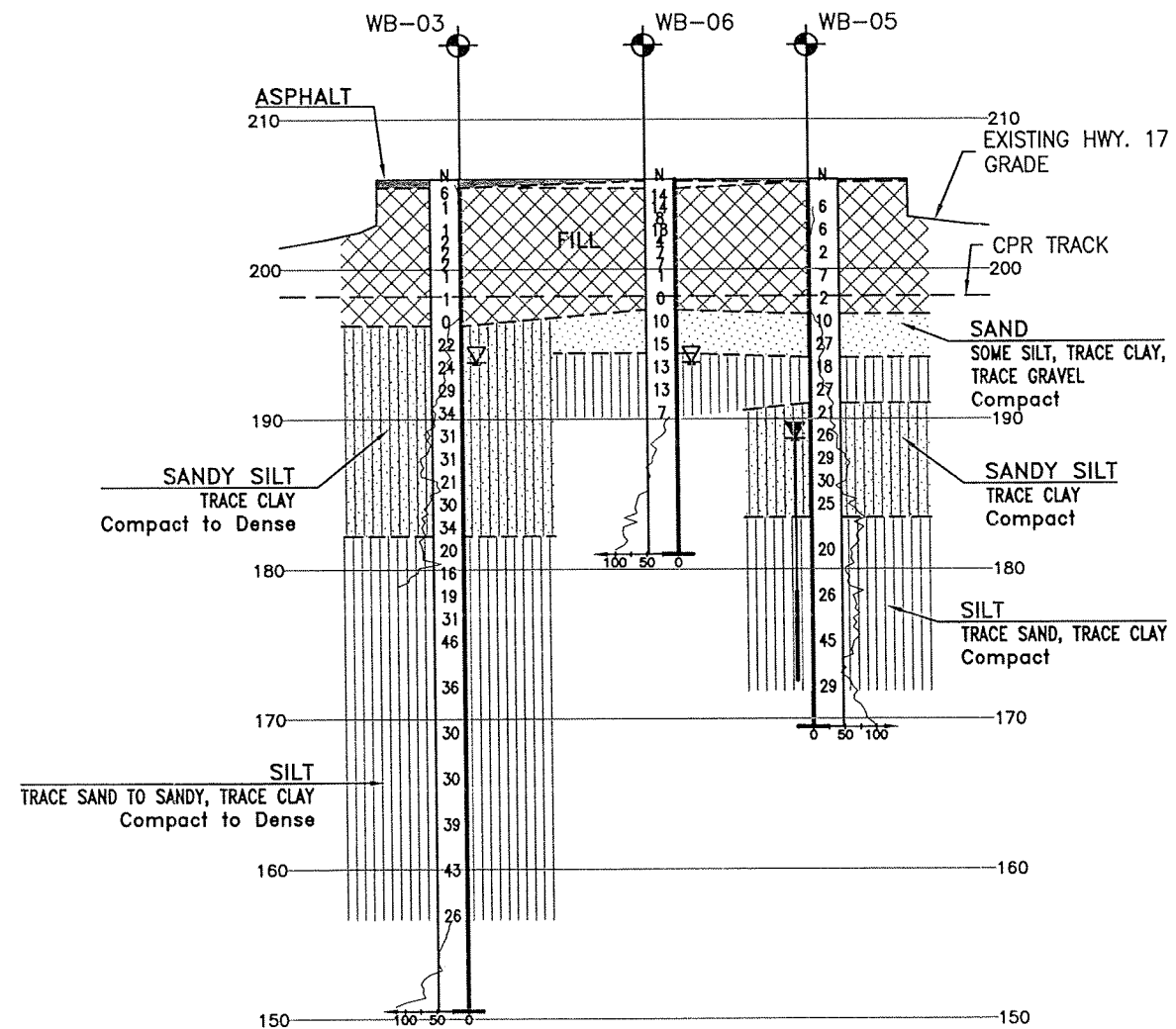
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCREs No. 411-272

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	RPR	CHK	CODE
DRAWN	MFA	CHK	RPR
STRUCT	ISTRUCT	ISTRUCT	DWG 2
DATE	JUN. 2011		



PROFILE ALONG HWY 17
H 1:250
V 1:500



PROFILE ALONG HWY 17
H 1:250
V 1:500