

April 8, 2015

DST Reference No.: GS-TB-020477

J.P Perron, P. Eng.
Ministry of Transportation NER
447 McKeown Avenue, Suite 301
North Bay, Ontario
P1B 9S9

Re: Agreement # 5013-E-0033, Assignment # 6, GWP 5276-07-00, Geocres No.41H-152
Naiscoot River Bridge, Highway 529, Wallbridge Township, Station 22+820

DST Consulting Engineers Inc. (DST) has been retained by the Ministry of Transportation (MTO), Geotechnical Section, Northeastern Region to conduct a geotechnical investigation for the Naiscoot River Bridge on Highway 529 approximately 12.7 km South of the Highway's north junction with Highway 69. This work was carried out under Agreement No.: 5013-E-0033, Assignment # 6.

Site work was carried out on February 24, 25 and 26, 2015 and included the advancement of two geotechnical boreholes at the bridge approaches. To advance the boreholes a CME 750 truck-mounted drill rig was utilized. Borehole 1 was advanced at Station 22+798 (2.0 m East of the East expansion joint), 2.1 m left of centreline in the Eastbound lane South of the centreline. Borehole 2 was advanced at Station 22+842 (2.0 m West of the West expansion joint), and 2.2 m right of centreline in the Westbound lane North of the centreline. The boreholes were advanced through fill materials and coring through cobbles was required. Borehole 1 was terminated in auger refusal at a depth of 7.6 m below surface and Borehole 2 was terminated at a depth of 10.6 m below surface.

The generalized stratigraphy for this site based on the Boreholes 1 and 2 consist of surface layer of asphalt overlaying a granular sand fill layer underlain by a silty clay layer. The following tables summarizes the soils properties encountered in two boreholes. Elevation of 100.0 m has been assumed at the top of the boreholes.

Table 1: Naiscoot River Bridge BH1 Summary

Soil Type	Depth (BH Location)	Elevation (m)	Soil Properties
Asphalt	0 to 0.1 m	100 to 99.9 m	
Fill-SAND-some silt to silty, trace gravel	0.1 to 3.1 m	99.9 to 96.9 m	Unit Weight ($\gamma = 21 \text{ kN/m}^3$) Internal Friction Angle ($\phi = 32$ Degrees) Moisture Content between 5% to 19%
Clay-Silty, grey/brown	3.1 to 4.6 m	96.9 to 95.4 m	Unit Weight ($\gamma = 19 \text{ kN/m}^3$) Drained Friction Angle ($\phi = 24$ Degrees) Undarined Shear Strength ($C_u = 40 \text{ Kpa}$) Moisture Content between 24% to 25%
Clay-silty, red/grey	4.6 to 7.8 m	95.4 to 92.2 m	Unit Weight ($\gamma = 19 \text{ kN/m}^3$) Drained Friction Angle ($\phi = 24$ Degrees) Undarined Shear Strength ($C_u = 40$ to 120 Kpa) Moisture Content between 26% to 35%

Table 2: Naiscoot River Bridge BH2 Summary

Soil Type	Depth (BH Location)	Elevation (m)	Soil Properties
Asphalt	0 to 0.1 m	100 to 99.9 m	
Fill-SAND-some gravel, trace silt	0.1 to 3.0 m	99.9 to 97.0 m	Unit Weight ($\gamma = 21 \text{ kN/m}^3$) Internal Friction Angle ($\phi = 32$ Degrees) Moisture Content between 2% to 7%
Clay-Silty, grey	3.0 to 4.6 m	97.0 to 95.4 m	Unit Weight ($\gamma = 19 \text{ kN/m}^3$) Drained Friction Angle ($\phi = 24$ Degrees) Undarined Shear Strength ($C_u = 40 \text{ Kpa}$) Moisture Content between 30% to 32%
Clay-Silty, red/grey	4.6 to 10.6 m	95.4 to 89.4 m	Unit Weight ($\gamma = 19 \text{ kN/m}^3$) Drained Friction Angle ($\phi = 24$ Degrees) Undarined Shear Strength ($C_u = 38 \text{ Kpa}$) Moisture Content between 24% to 40%

The records of boreholes and laboratory testing results are enclosed with this letter report.

We trust this satisfies your present needs. If you have any questions or comments, please contact the undersigned at your convenience.

Yours Truly,

For DST Consulting Engineers Inc.



Deep Bansal, P.Eng
 Geotechnical Engineer

DST Consulting Engineers Inc.

RECORD OF BOREHOLE No BH1

1 OF 1

METRIC

W.P. 5013-E-0033 LOCATION Naiscoot River Bridge: STA 22+798, 2.1 m Lt (17T 0540326 E, 5057762) ORIGINATED BY SH
DIST HWY 529 BOREHOLE TYPE Hollow Stem Auger - 80 mm ID COMPILED BY DB
DATUM LOCAL DATE 2015 02 24 CHECKED BY BV

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								20 40 60 80 100									
100.0	GROUND SURFACE																
99.9/0.1	Asphalt FILL - SAND -some silt to silty, trace to some gravel, Brown, Loose to very Dense		AS1	AS			99								17 68 (15)		
			SS2	SS	50+											1 72 (27)	
			SS3	SS	5											0 68 (32)	
			SS4	SS	7											1 60 (39)	
96.9																	
3.1	Clay-Silty, grey/brown, Firm		SS5	SS	8			97									
			SS6	SS	6												
95.4																	
4.6	Clay-silty, red/grey, Firm to very stiff		SS7	SS	10				95								
			SS8	SS	10	94											
92.2	End of Borehole at 7.6 m Auger Refusal		SS9	SS	50+	93											
7.8																	

NR = NO RECOVERY

+³, X³: Numbers refer to
Sensitivity

○ 3% STRAIN AT FAILURE

ENCLOSURE 1





ONL MOT GS-TB-020477 NAISCOOT RIVER BRIDGE.GPJ DST_MIN.GDT 4/7/15

RECORD OF BOREHOLE No BH2

1 OF 1

METRIC

W.P. 5013-E-0033 LOCATION Naiscott River Bridge: STA 22+842, 2.2 m Rt (17T 0540303 E, 5057789 N) ORIGINATED BY SH
DIST HWY 529 BOREHOLE TYPE Hollow Stem Auger - 80 mm ID COMPILED BY DB
DATUM LOCAL DATE 2015 02 26 CHECKED BY BV

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 (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED □ QUICK TRIAXIAL	+ FIELD VANE × LAB VANE							
100.0	GROUND SURFACE							20 40 60 80 100						GR SA SI CL		
99.9/0.1	Asphalt FILL - SAND -trace to with silt, some gravel to gravelly, Brown, Loose to very Dense -Cobbles		AS1	AS			99							13 66 (21)		
			SS2	SS	50+											35 57 (8)
	-Cobbles															Advancing using casing
									98							
97.0									97							
3.0	Clay-Silty, Grey, Firm		SS3	SS	4				96							
									95							
95.4									94							
4.6	Clay-silty, Red/Grey, Firm								93							
			SS4	SS	5				92							
							91									
			SS5	SS	4		90									
			SS6	SS	1											
89.4																
10.6	End of Borehole at 10.6 m															

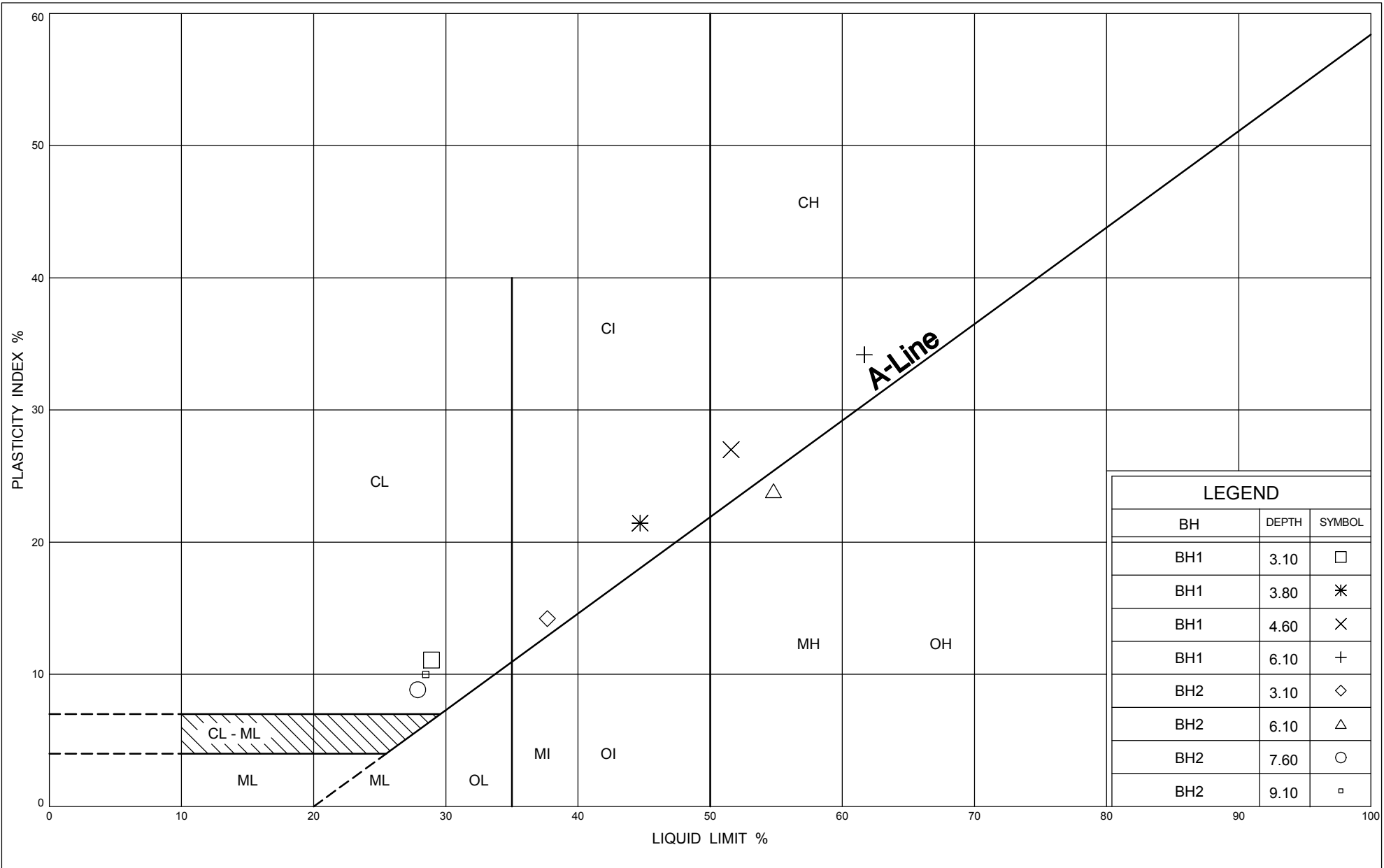
NR = NO RECOVERY

+³, X³: Numbers refer to
Sensitivity

○ 3% STRAIN AT FAILURE

ENCLOSURE 2

ONL MOT GS-TB-020477 NAISCOOT RIVER BRIDGE.GPJ DST_MIN.GDT 4/7/15



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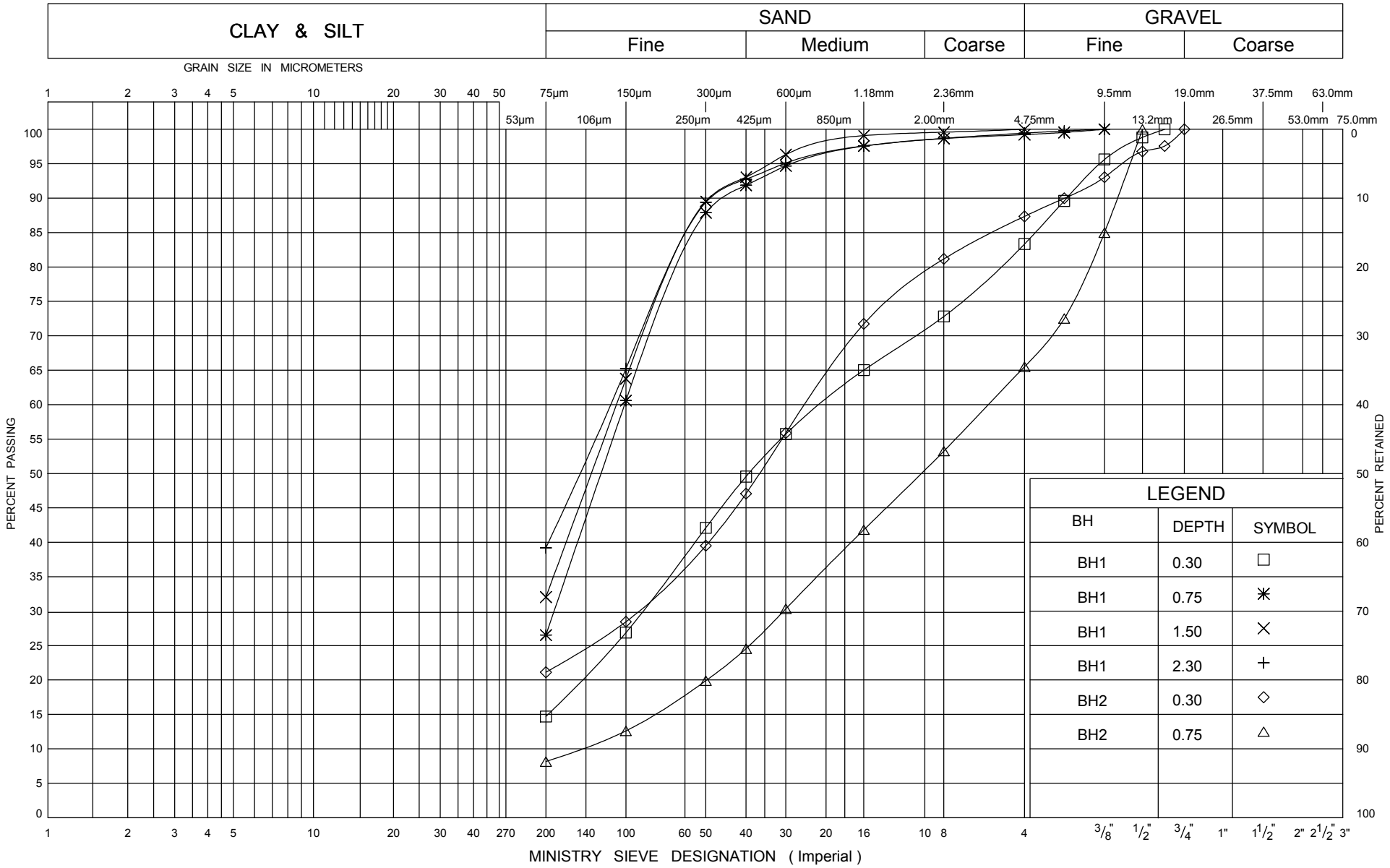
PLASTICITY CHART LOW-INTERMEDIATE-HIGH PLASTIC

ENCLOSURE 1

W P 5013-E-0033

529

UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
SAND

ENCLOSURE 1

W P 5013-E-0033

529



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