DST Consulting Engineers Inc.
605 Hewirson Street
Thunder Bay, Ontario, Canada, P7B 5V5
Tel: (807)623-2929 or 1-877-378-3745
Fax: (807) 623-1792
www.dstgroup.com

March 19, 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 5114-06-00, Geocres #41G-21
Mindemoya Creek Bridge, Highway 542, Carnarvon Township, Station 22+549

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 Mindemoya Creek Bridge on Highway 542 in the Town of Mindemoya approximately 0.8 km east of the Highway 551 junction. This work was carried out under Agreement No.: 5013-E-0033, Assignment # 6.

Site work was carried out during the week of February 9th, 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+555 (1.0 m East of the East end of the bridge), 2.1 m left of centreline in the Westbound lane North of the centreline. Borehole 2 was advanced at Station 22+543.5 (1.0 m West of the West end of the bridge), 2.0 m right of centreline in the Eastbound lane South of the centreline. The boreholes were advanced through fill materials and coring of bedrock was required. Borehole 1 was terminated in bedrock at a depth of 5.3 m below surface and Borehole 2 was terminated in bedrock at a depth of 4.1 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 bedrock. 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: Mindemoya Creek 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-with gravel, some to with silt, large cobbles	0.1 to 3.3 m	99.9 to 96.7 m	Unit Weight (γ = 21 kN/m^3) Internal Friction Angle (ϕ = 32 Degrees) Moisture Content between 2% to 8%
Bedrock-Sandstone	3.3 to 5.3 m	96.7 to 94.7 m	RQD* = 50% UCS$^{\#}$ = 78 to 191 Mpa (correlated from point load test)

Table 2: Mindemoya Creek 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-with gravel, some to with silt, large cobbles	0.1 to 2.1 m	99.9 to 97.9 m	Unit Weight (γ = 21 kN/m^3) Internal Friction Angle (ϕ = 32 Degrees) Moisture Content between 2% to 8%
Bedrock-Sandstone	2.1 to 4.1 m	97.9 to 95.9 m	RQD* = 65% UCS$^{\#}$ = 113 to 133 Mpa (correlated from point load test)

$^{\#}$UCS= Unconfined Compressive Strength

*RQD=Rock Quality Designation

The records of boreholes and lab results are enclosed with this letter.

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.

Dr. M W Bo, PhD., P. Eng, P.Geo, Int PE,
C.Geol, C. Eng, Eur Geol, Eur Eng
Senior Vice President / Senior Principal

RECORD OF BOREHOLE No BH1 1 OF 1 METRIC

W.P. 5114-06-00 LOCATION Mindemoya Creek Bridge: STA 22+555, 2.1 m Lt (17T 0410008 E, 5064969 N) ORIGINATED BY SH

DIST HWY 542 BOREHOLE TYPE Hollow Stem Auger - 80 mm ID COMPILED BY DB

DATUM LOCAL DATE 2015 02 17 CHECKED BY BV

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
100.0	GROUND SURFACE										
99.9	ASPHALT										
0.1	FILL-SAND-trace gravel, some to with silt, large cobbles, Very Dense		AS1	AS					●		8 78 (14)
			SS2	SS	50+				●		25 47 (28)
							99				Advanced Using Casing
							98				
							97				
96.7											
3.3	Bedrock- Sandstone, Grey, Moderately weathered RQD = 50% TCR = 100%		RC1	RC			96				
							95				
94.7											
5.3	End of Borehole at 5.3 m										Dry Upon Completion

NR = NO RECOVERY $+^3, \times^3$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

ON_MOT GS-TB-020477 MINDEMOYA CREEK BRIDGE.GPJ DST_MIN.GDT 3/18/15

ENCLOSURE 1

RECORD OF BOREHOLE No BH2 1 OF 1 METRIC

W.P. 5114-06-00 LOCATION Mindemoya Creek Bridge: STA 22+543.5, 2.0 m Rt (17T 0410018 E, 5064973 N) ORIGINATED BY SH

DIST HWY 542 BOREHOLE TYPE Hollow Stem Auger - 80 mm ID COMPILED BY DB

DATUM LOCAL DATE 2015 02 19 CHECKED BY BV

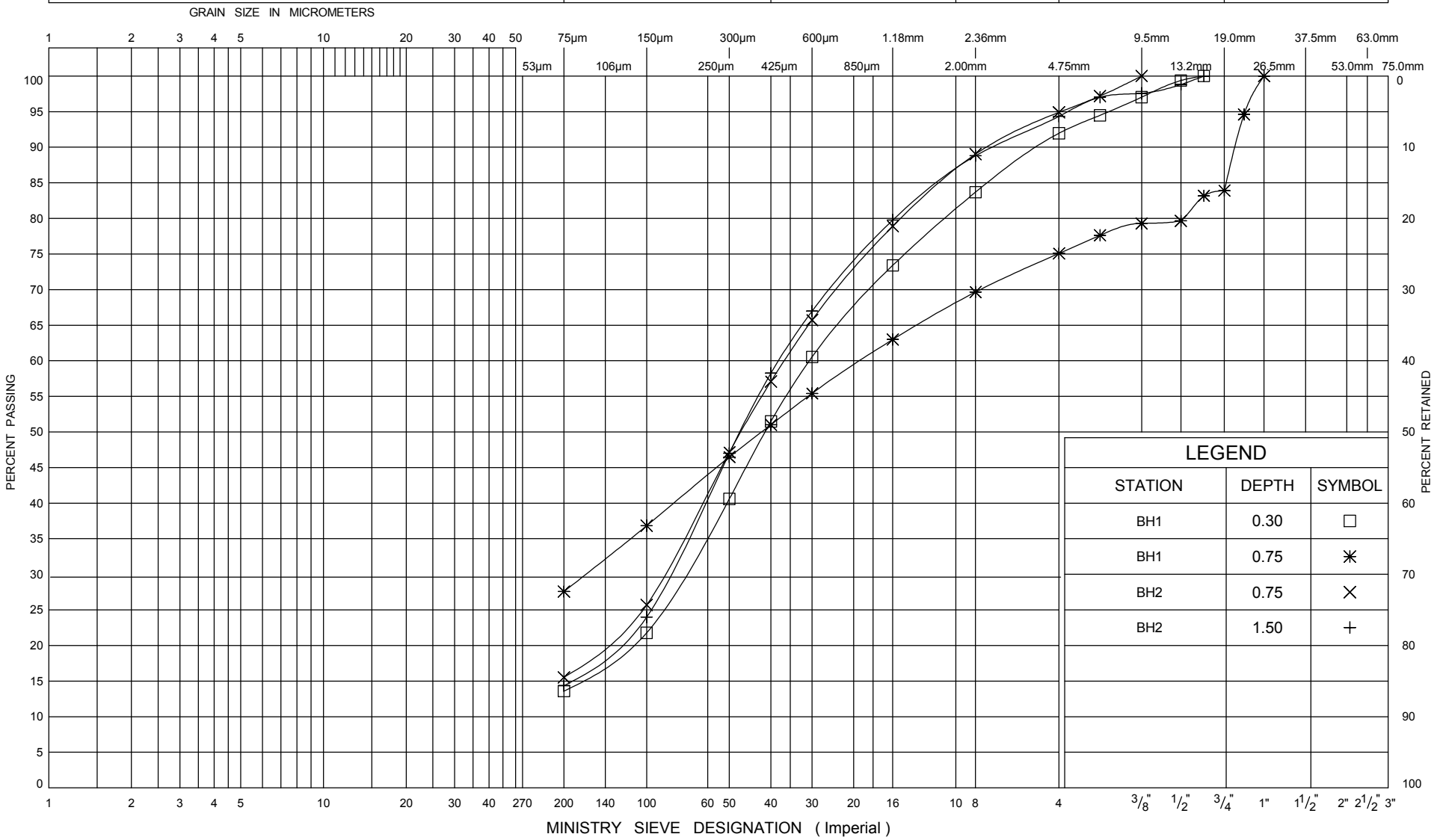
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED + FIELD VANE □ QUICK TRIAXIAL × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL 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
100.0	GROUND SURFACE										
99.9	ASPHALT										
0.1	FILL-SAND-trace gravel, some silt, large cobbles, Very Dense		AS1	AS							
			SS2	SS	50+		99				5 79 (16)
			SS3	SS	50+						6 80 (14)
97.9							98				
2.1	Bedrock-Sandstone, Grey, Moderately weathered RQD = 65% TCR = 100%		RC1	RC			97				
95.9							96				
4.1	End of Borehole at 4.1 m										Dry Upon Completion

NR = NO RECOVERY $+^3, \times^3$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

ON_MOT GS-TB-020477 MINDEMOYA CREEK BRIDGE.GPJ DST_MIN.GDT 3/18/15

ENCLOSURE 2

UNIFIED SOIL CLASSIFICATION SYSTEM



ONTARIO MOT GS STATION GS-TB-020477 MINDEMOYA CREEK BRIDGE.GPJ DST_MIN.GDT 3/2/15

Ministry of Transportation Ontario

GRAIN SIZE DISTRIBUTION
FILL-SAND

ENCLOSURE 1

W P 5013-E-0033

HWY 542