APPENDIX A

2011 TEST HOLE LOGS

AECOM Canada Ltd.

GENERAL STATEMENT

NORMAL VARIABILITY OF SUBSURFACE CONDITIONS

The scope of the investigation presented herein is limited to an investigation of the subsurface conditions as to suitability for the proposed project. This report has been prepared to aid in the evaluation of the site and to assist the engineer in the design of the facilities. Our description of the project represents our understanding of the significant aspects of the project relevant to the design and construction of earth work, foundations and similar. In the event of any changes in the basic design or location of the structures as outlined in this report or plan, we should be given the opportunity to review the changes and to modify or reaffirm in writing the conclusions and recommendations of this report.

The analysis and recommendations presented in this report are based on the data obtained from the borings and test pit excavations made at the locations indicated on the site plans and from other information discussed herein. This report is based on the assumption that the subsurface conditions everywhere are not significantly different from those disclosed by the borings and excavations. However, variations in soil conditions may exist between the excavations and, also, general groundwater levels and conditions may fluctuate from time to time. The nature and extent of the variations may not become evident until construction. If subsurface conditions differ from those encountered in the exploratory borings and excavations, are observed or encountered during construction, or appear to be present beneath or beyond excavations, we should be advised at once so that we can observe and review these conditions and reconsider our recommendations where necessary.

Since it is possible for conditions to vary from those assumed in the analysis and upon which our conclusions and recommendations are based, a contingency fund should be included in the construction budget to allow for the possibility of variations which may result in modification of the design and construction procedures.

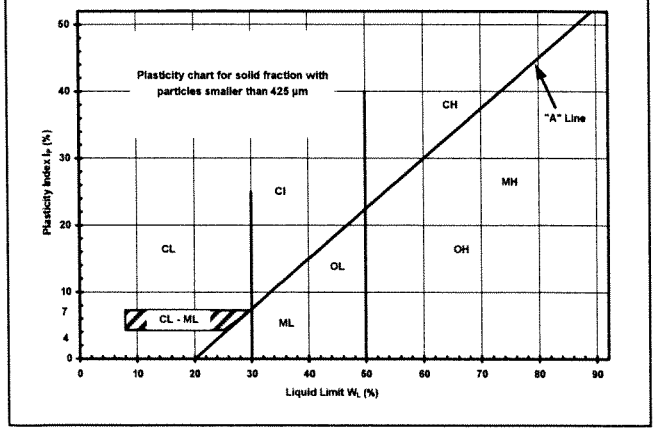
In order to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated, we recommend that all construction operations dealing with earth work and the foundations be observed by an experienced soils engineer. We can be retained to provide these services for you during construction. In addition, we can be retained to review the plans and specifications that have been prepared to check for substantial conformance with the conclusions and recommendations contained in our report.

EXPLANATION OF FIELD & LABORATORY TEST DATA

Description				UMA Log Symbols	USCS Classification	Laboratory Classification Criteria			
						Fines (%)	Grading	Plasticity	Notes
COARSE GRAINED SOILS	GRAVELS (More than 50% of coarse fraction of gravel size)	CLEAN GRAVELS (Little or no fines)	Well graded gravels, sandy gravels, with little or no fines		GW	0-5	$C_U > 4$ $1 < C_C < 3$		Dual symbols if 5-12% fines. Dual symbols if above "A" line and $4<W_P<7$ $C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{(D_{30})^2}{D_{10} x D_{60}}$
			Poorly graded gravels, sandy gravels, with little or no fines		GP	0-5	Not satisfying GW requirements		
		DIRTY GRAVELS (With some fines)	Silty gravels, silty sandy gravels		GM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey gravels, clayey sandy gravels		GC	> 12		Atterberg limits above "A" line or $W_P<7$	
	SANDS (More than 50% of coarse fraction of sand size)	CLEAN SANDS (Little or no fines)	Well graded sands, gravelly sands, with little or no fines		SW	0-5	$C_U > 6$ $1 < C_C < 3$		
			Poorly graded sands, gravelly sands, with little or no fines		SP	0-5	Not satisfying SW requirements		
		DIRTY SANDS (With some fines)	Silty sands, sand-silt mixtures		SM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey sands, sand-clay mixtures		SC	> 12		Atterberg limits above "A" line or $W_P<7$	
FINE GRAINED SOILS	SILTS (Below 'A' line negligible organic content)	$W_L<50$	Inorganic silts, silty or clayey fine sands, with slight plasticity		ML			Classification is Based upon Plasticity Chart	
		$W_L>50$	Inorganic silts of high plasticity		MH				
	CLAYS (Above 'A' line negligible organic content)	$W_L<30$	Inorganic clays, silty clays, sandy clays of low plasticity, lean clays		CL				
		$30<W_L<50$	Inorganic clays and silty clays of medium plasticity		CI				
		$W_L>50$	Inorganic clays of high plasticity, fat clays		CH				
	ORGANIC SILTS & CLAYS (Below 'A' line)	$W_L<50$	Organic silts and organic silty clays of low plasticity		OL				
		$W_L>50$	Organic clays of high plasticity		OH				
HIGHLY ORGAINIC SOILS			Peat and other highly organic soils		Pt	Von Post Classification Limit		Strong colour or odour, and often fibrous texture	

	Asphalt		Till			AECOM
	Concrete		Bedrock (Undifferentiated)			
	Fill		Bedrock (Limestone)			

When the above classification terms are used in this report or test hole logs, the designated fractions may be visually estimated and not measured.



FRACTION		SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		Passing	Retained	Percent	Identifier
Gravel	Coarse	76	19	35-50	and
	Fine	19	4.75		
Sand	Coarse	4.75	2.00	20-35	"y" or "ey" *
	Medium	2.00	0.425		
	Fine	0.425	0.075	10-20	some
Silt (non-plastic) or Clay (plastic)		< 0.075 mm		1-10	trace
* for example: gravelly, sandy clayey, silty					

Definition of Oversize Material

COBBLES: 76mm to 300mm diameter
BOULDERS: >300mm diameter

LEGEND OF SYMBOLS

Laboratory and field tests are identified as follows:

- q_u - undrained shear strength (kPa) derived from unconfined compression testing.
- T_v - undrained shear strength (kPa) measured using a torvane
- pp - undrained shear strength (kPa) measured using a pocket penetrometer.
- L_v - undrained shear strength (kPa) measured using a lab vane.
- F_v - undrained shear strength (kPa) measured using a field vane.
- γ - bulk unit weight (kN/m^3).
- SPT - Standard Penetration Test. Recorded as number of blows (N) from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 51 mm O.D. Raymond type sampler 0.30 m into the soil.
- DPPT - Drive Point Pentrometer Test. Recorded as number of blows from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 50 mm drive point 0.30 m into the soil.
- w - moisture content (W_L, W_P)

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Su (kPa)	CONSISTENCY
<12	very soft
12 – 25	soft
25 – 50	medium or firm
50 – 100	stiff
100 – 200	very stiff
200	hard

The resistance (N) of a non-cohesive soil can be related to compactness condition as follows

N – BLOWS/0.30 m	COMPACTNESS
0 - 4	very loose
4 - 10	loose
10 - 30	compact
30 - 50	dense
50	very dense

PROJECT: Pembina Hwy Culvert Replacement	CLIENT: City of Winnipeg	TESTHOLE NO: **TH 11-01**
LOCATION: West Side of Culvert (N 0632714 / E 5514569)		PROJECT NO.: 60221826
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Acker MP-5, 125 mm SSA	ELEVATION (m): 228.00

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ◕ Field Vane ◕ (kPa) 50 100 150 200

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	ELEVATION
0		TOPSOIL - trace rootlets, organics - black, dry		G1			
		CLAY(Alluvial) silty, trace to some gravel, trace rootlets - brown to grey, dry, stiff					
1		- intermediate to high plasticity - pockets of organics		S2	16	- 4, 8, 8 blows	227
2		- moist - intermediate plasticity		G3			226
		Clay -		S4	11	- 3, 4, 7 blows	
3		- moist, brown, firm to soft		T5			225
4				T6			224
		- silt inclusions		S7	4	- 1, 1, 3 blows	
5		- moist to wet, brown, soft - intermediate to high plasticity		G8			223
6		- dark brownish grey		G9			222
7							221
8		- grey below 7.9 m		G10			220
9							219
10							218
11		END of TEST HOLE AT 10.4 m ON SUSPECTED BOULDER Notes: 1. Auger refusal at 10.4 m. 2. Hole found dry after drilling. 3. Test hole backfilled with bentonite and auger cuttings upon completion.					217
12							216
13							

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LOGGED BY: O.Eissa	COMPLETION DEPTH: 10.36 m
REVIEWED BY: Faris Khalil	COMPLETION DATE: 9/29/11
PROJECT ENGINEER: Faris Khalil	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - PEMBINA HWY.GPJ UMA WINN.GDT 11/25/11

PROJECT: Pembina Hwy Culvert Replacement	CLIENT: City of Winnipeg	TESTHOLE NO: **TH 11-02**
LOCATION: East Side of Culvert (N 0632771 / E 5514572)		PROJECT NO.: 60221826
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Acker MP-5, 125 mm SSA	ELEVATION (m): 228.00

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100; ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100	UNDRAINED SHEAR STRENGTH: + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ◔ Field Vane ◔ (kPa) 50 100 150 200	COMMENTS	ELEVATION
0			TOPSOIL - trace rootlets, organics - black, dry							
			CLAY (Alluvial) - silty, trace sand, some gravel - dark grey to blakish, dry, stiff - intermediate to high plasticity		G1					
1					S2	10	◆	△	- 3, 4, 6 blows	227
			- some organics - blakish grey - hetrogeneous							
2										226
			Clay - silty - brown, moist, firm -intermediate to high plasticity		T3					
3			- homogeneous - silt inclusions							225
4					G4					224
					G5					
5										223
6					G6					222
7			- grey below 7.0 m - high plasticity							221
8					T7					220
9					G8					219
10										218
					G9					
11										217
			SILT (Till) - sandy, some gravel - light brown, saturated to wet, very dense		G10					
12										216
					S11				- 50/ 75 mm	
13			END of TEST HOLE AT 12.7 m in TILL							

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LOGGED BY: O.Eissa	COMPLETION DEPTH: 12.50 m
REVIEWED BY: Faris Khalil	COMPLETION DATE: 9/29/11
PROJECT ENGINEER: Faris Khalil	Page 1 of 2

LOG OF TEST HOLE TEST HOLE LOGS - PEMBINA HWY.GPJ UMA WINN.GDT 11/25/11

PROJECT: Pembina Hwy Culvert Replacement	CLIENT: City of Winnipeg	TESTHOLE NO: **TH 11-02**
LOCATION: East Side of Culvert (N 0632771 / E 5514572)		PROJECT NO.: 60221826
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Acker MP-5, 125 mm SSA	ELEVATION (m): 228.00

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100; ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100	UNDRAINED SHEAR STRENGTH: + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ◕ Field Vane ◕ (kPa) 50 100 150 200	COMMENTS	ELEVATION
13			Notes: 1. Water level measured at 4.6 m below surface upon completition of drilling. 2. Water level measured at 2.5 m below surface on October 23rd, 2011 2. Installed 25 mm diameter standpipe piezometer well at 12.7 m. Complete with 3.35 m of screen and 0.9 m stick up with above ground metal protector. Backfilled with sand to 9.14 m, bentonite to surface.						
14									214
15									213
16									212
17									211
18									210
19									209
20									208
21									207
22									206
23									205
24									204
25									203
26									

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LOGGED BY: O.Eissa	COMPLETION DEPTH: 12.50 m
REVIEWED BY: Faris Khalil	COMPLETION DATE: 9/29/11
PROJECT ENGINEER: Faris Khalil	Page 2 of 2

LOG OF TEST HOLE TEST HOLE LOGS - PEMBINA HWY.GPJ UMA WINN.GDT 11/25/11