



August 4, 2006

File No. 06-0107-14

City of Winnipeg
Water and Waste Department
1500 Plessis Road
Winnipeg, Manitoba
R3C 5G6

ATTENTION: Mr. Darcy Strandberg, C.E.T.
Project Manager

RE: Site Investigation
Assiniboine Avenue Pumping Station
Outfall Replacement

Dear Mr. Strandberg:

This letter summarizes the results of KGS Group's geotechnical site investigation at the Assiniboine Avenue Pumping Station including soil stratigraphy and groundwater monitoring.

This information is submitted further to our letter of Proposal for Engineering Services dated July 19th, 2006.

1.0 SITE INVESTIGATION

On July 24th, 2006 KGS Group supervised the drilling of one test hole (TH06-01) at the site located approximately 2 m west of the existing gate chamber. The UTM coordinates of the test hole are noted on the test hole log, as measured by a handheld GPS unit. The test hole was drilled with the CT 250 Canterra drilling rig contracted from Paddock Drilling Ltd. of Brandon, MB. The drilling was advanced using 125 mm solid stem augers to 15.54 m below the existing ground surface. Representative soil samples were collected directly off auger flights at 1.5 m intervals or at any change in soil stratigraphy. All samples were visually classified in the field according to the Unified Soil Classification System. Clay samples were tested with a field Torvane to evaluate consistency and estimate undrained shear strength. Upon completion of the drilling, the test hole was examined for indications of squeezing and seepage and a Casagrande tipped standpipe piezometer was installed in the glacial till layer.

A summary soil log incorporating all field observations and lab testing is attached to this letter.

2.0 STRATIGRAPHY

KGS Group's interpretation of the stratigraphy is based upon the test hole (TH06-01) drilled at the site. In general, the stratigraphy consists of topsoil over granular fill underlain by silty clay fill over silty clay of alluvial origin underlain by glacial till.

A thin layer of topsoil approximately 0.15 m± thick was found at the existing ground surface. Granular fill extended 0.3 m± below the topsoil. The fill was rounded to subrounded gravel with sandy silt, tan in color and dry. Underlying the granular fill a deposit of silty clay fill extending to a depth of 2.6 m± below ground surface. The clay fill was black to dark brown in color, damp, of intermediate plasticity, soft to stiff in consistency with an undrained shear strength of 65 kPa. The clay fill contained some to with sand and trace amounts of gravel. Beneath the clay fill a deposit of silty clay of alluvial origin extended to a depth of 6.9 m± below ground surface. The alluvial clay was brown in colour and became grey between depths of 4.9 to 6.1 m±, damp to moist, of intermediate plasticity, firm to stiff in consistency with undrained shear strengths ranging from 25 to 75 kPa (overall average of 43 kPa). The clay contained trace amounts of sand and organics and had a diesel fuel odour to a depth of 6.1 m±.

A silt layer was encountered below the alluvial clay extending to a depth of 8.7 m±. The silt was brown in colour, wet, very soft, of low plasticity, and contained trace amounts of sand with increasing sand content below a depth of 8.2 m±. The silt was underlain by silty clay of alluvial origin, which extended to a depth of 11.6 m± below ground surface. The alluvial clay was grey in colour, moist, of intermediate plasticity, firm in consistency with undrained shear strengths ranging from 25 to 55 kPa (overall average of 40 kPa), and contained trace amounts of sand and silt with a till transition occurring between a depth of 10.4 to 11.6 m±. Beneath the alluvial clay a deposit of clay till was encountered, which extended to a depth of 15.54 m where power auger refusal occurred. The clay till was tan in color, wet, soft in consistency, of intermediate plasticity, with sand and gravel and became dense below 14.9 m.

The test hole was sloughing in at a depth of 6.9 m± within the silt layer. Upon completion of the test hole, there was no water in the hole.

3.0 GROUNDWATER CONDITIONS

The groundwater level was measured a total of two (2) times. The first reading was taken immediately after the test hole was drilled and there was no water within the standpipe. A second groundwater reading of 8.98 m below ground surface was taken on August 3rd, 2006.

Groundwater levels vary seasonally and in response to precipitation such that future groundwater conditions at the site may vary from those reported herein.

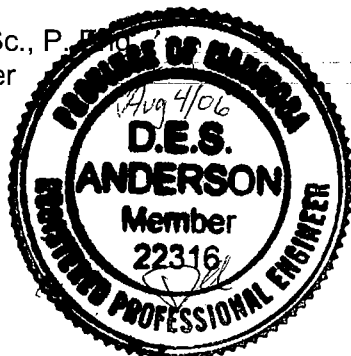
KGS Group thanks you for the opportunity to provide engineering services on this project. If you have any questions please contact the undersigned at 896-1209.

Yours truly,

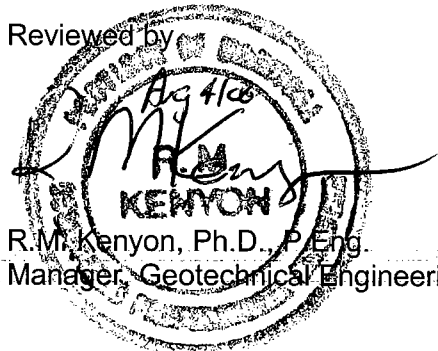


David Anderson, M. Sc., P. Eng.
Geotechnical Engineer

DA/



Reviewed by




R.M. Kenyon, Ph.D., P. Eng.
Manager, Geotechnical Engineering

CLIENT CITY OF WINNIPEG - WATER AND WASTE DEPARTMENT
PROJECT ASSINIBOINE AVENUE PUMPING STATION OUTFALL REPLACEMENT
SITE Assiniboine Ave (FPS)
LOCATION 2 m West of Gate Chamber
DRILLING METHOD 125 mm ø Solid Stem Auger, CT 250 Canterra

JOB NO. 06-107-14
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 24-Jul-06
UTM (m) N 5,527,644
 E 634,048

ELEVATION (m)	DEPTH (m)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	Cu TORVANE (kPa) ◆		
								DYNAMIC CONE (N) blows/ft △	PL	MC	LL
								40 80 120	20 40 60 80	20 40 60 80	20 40 60 80
	0		TOPSOIL (OL) - Black organic, dry, crumbly, low plasticity, trace sand, trace rootlets.			S1					
	0.5		GRANULAR FILL - Tan, dry, subrounded to rounded gravel, with sandy silt.			S2					
	1		SILTY CLAY FILL (CI) - Black to dark brown, damp, stiff, intermediate plasticity, some to with sand, trace gravel.								
	3		SILTY CLAY (CI) - Brown, damp to moist, firm, intermediate plasticity, trace sand, trace organics, alluvial origin. - No organics below 3.05 m.			S3					
	4		- Soft below 4.27 m. - Increased silt content and moisture content with depth.			S4					
	5		- Silty clay turns grey below 4.88 m. - Firm from 5.18 m to 5.64 m.								
	6		- Diesel odour to a depth of approximately 6.10 m. Grain Size: Gravel (0.0%), Sand (4.3%), Silt (69.7%), Clay (26.0%) at 5.94 m. - Silty clay turns brown below 6.10 m. - Stiff from 6.40 m to 6.86 m.			S5					
	7		SILT (ML) - Brown, wet, very soft, trace clay, trace sand.								
	8		- Increased sand content below 8.23 m.			S6					
	9		SILTY CLAY (CI) - Grey, moist, firm, intermediate plasticity, trace sand, alluvial origin. - Soft, increase silt content below 9.14 m.			S7					

SPT & TORVANE 2 P:PROJECTS\200606-0107-14\GEOLOGS\06-107-14LOGS.GPJ

SAMPLE TYPE  Auger Grab

CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
R. DOBSON

APPROVED  DATE **8/4/06**

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	Cu TORVANE (kPa) ◆			
								DYNAMIC CONE (N) blows/ft △	PL	MC	LL	
								40 80 120	20 40 60 80			
35			Grain Size: Gravel (0.0%), Sand (8.1%), Silt (68.7%), Clay (23.2%) at 10.21 m. - Clay transitioning to clay till from 10.36 m to 11.58 m.			S8						
40			CLAY TILL - Tan, moist to wet, very soft, intermediate plasticity, with sand, with gravel.			S9						
45					13.4							
50			- Damp, dense below 14.94 m.			S10						
55					15.2	S11						
60			AUGER REFUSAL AT 15.54 m		15.5							
65			Note: 1. Hole caving below 6.86 m. 2. Installed Cassegrande Tip Standpipe Piezometer at a depth of 15.52 m. 3. No water in the hole.									
70												

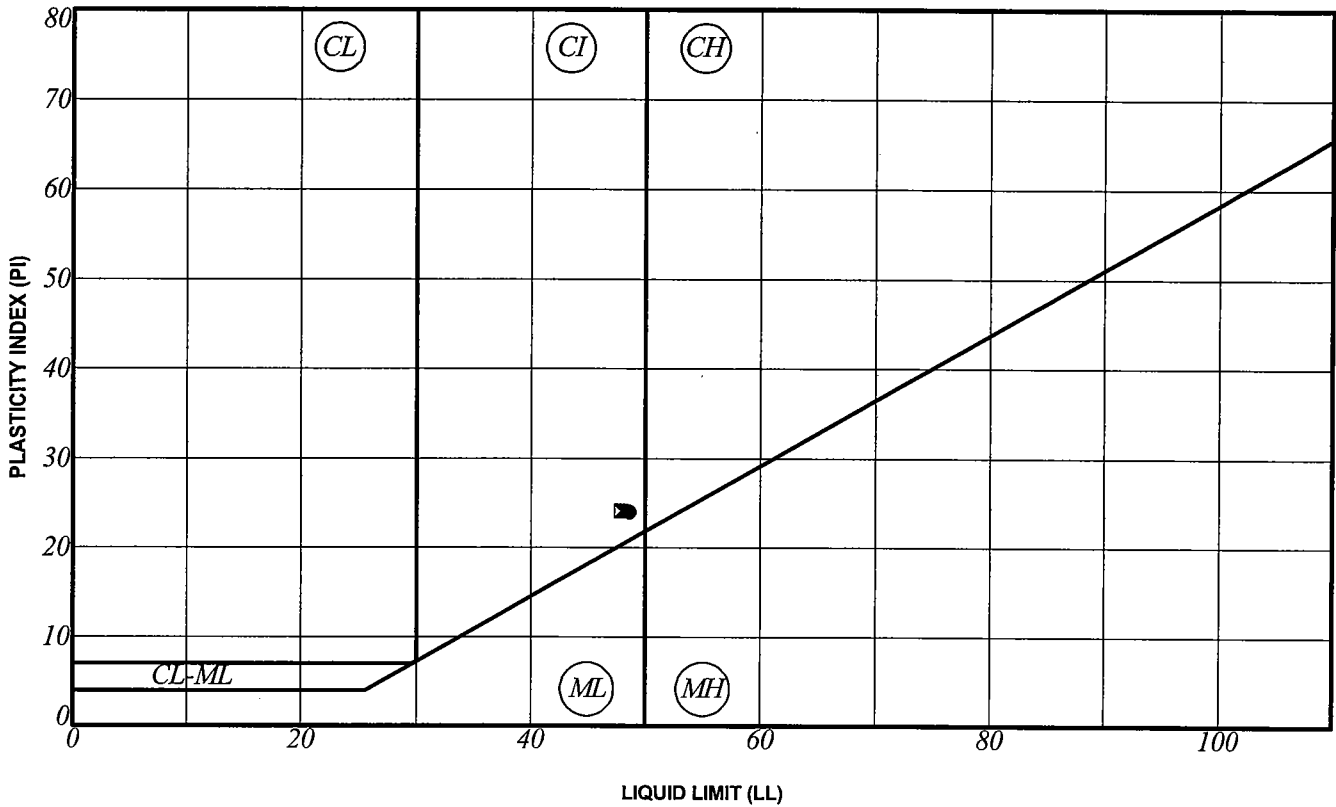
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SAMPLE TYPE Auger Grab

CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
R. DOBSON

APPROVED DATE **8/4/06**



SYMBOL	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	% SAND	% SILT	% CLAY	% MC	CLASSIFICATION
●	TH06-01	5.8	S5	49	25	24	4.3	69.7	26.0	33.2	CI
☒	TH06-01	10.2	S8	48	24	24	8.1	68.7	23.2	29.0	CI

Notes:

- ML - Low Plasticity Silt
- MH - High Plasticity Silt
- CL-ML - Silty Clay
- CL - Low Plasticity Clay
- CI - Intermediate Plasticity Clay
- CH - High Plasticity Clay
- LL - Liquid Limit
- PL - Plastic Limit
- PI - Plasticity Index
- MC - Moisture Content

Notes:

**KGS
GROUP**

**CITY OF WINNIPEG -
WATER AND WASTE
DEPARTMENT**

ASSINIBOINE AVENUE PUMPING STATION OUTFALL REPLACEMENT

A-LINE PLOT

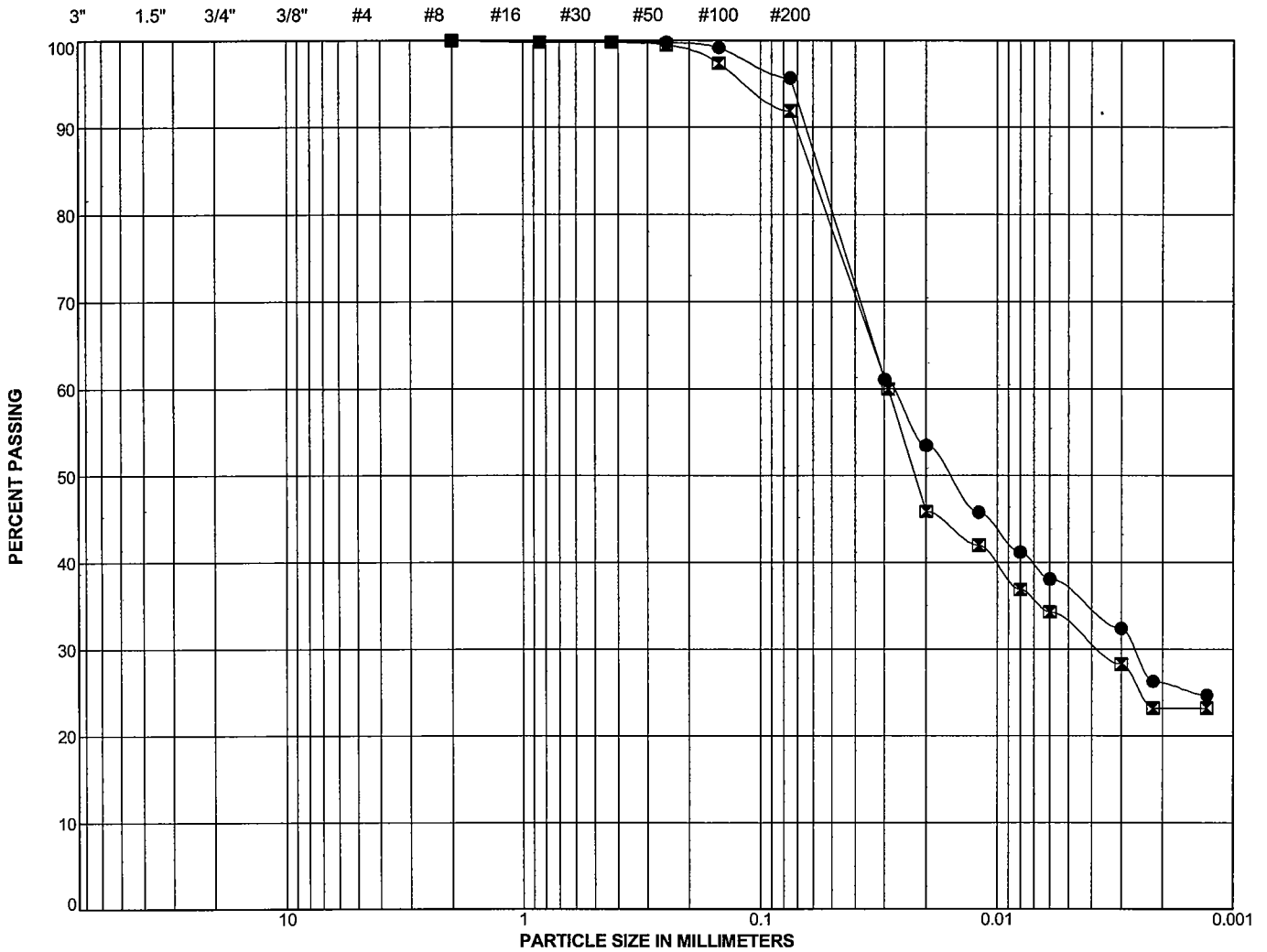
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Figure 1A

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SIEVE ANALYSIS

HYDROMETER ANALYSIS



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

SYMBOL	HOLE	DEPTH (m)	SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	% SILT & CLAY	Cu	Cc	CLASSIFICATION
●	TH06-01	5.8	S5	0.0	4.3	69.7	26.0	95.7			CI
◻	TH06-01	10.2	S8	0.0	8.1	68.7	23.2	91.9			CI

Notes:

	CITY OF WINNIPEG - WATER AND WASTE DEPARTMENT	
	ASSINBOINE AVENUE PUMPING STATION OUTFALL REPLACEMENT	
<h3>GRAIN SIZE ANALYSES</h3>		
Aug 2006	Figure 1B	Page 1 of 1

SIEVE ANALYSIS (2004) 06-107-14LOGS.GPJ 8/4/06