



COPY

June 13, 2008

File No. 08-0107-07

City of Winnipeg
Water and Waste Department
110-1199 Pacific Avenue
Winnipeg, Manitoba
R3E 3S8

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

RE: Site Investigation – Conway Street Outfall Gate Chamber
2008 Outfall Gate Chamber Upgrading Program

Dear Mr. Strandberg:

This letter report summarizes the results of KGS Group's geotechnical site investigation at the Conway Street Outfall Gate Chamber including soil stratigraphy and groundwater monitoring. Information regarding lateral earth pressure coefficients, potential for blowout of the base of the excavation and suitable backfill soils are also included.

This information is submitted further to our letter of Proposal for Engineering Services dated May 13th, 2008.

1.0 BACKGROUND

It is our understanding that the new gate chamber at the Conway Street Outfall will incorporate new flap gates, positive gates and pump chambers and will be constructed at a proposed depth of 11.0 m at this location, south of the intersection of Conway Street and Portage Avenue at the Assiniboine River.

2.0 SITE INVESTIGATION

On June 5th, 2008 KGS Group supervised the drilling of one test hole (TH08-03) at the site located approximately 4 m from the proposed gate chamber location. 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 truck mounted Acker MP5-T drill rig contracted from Paddock Drilling Ltd. of Brandon, MB. The test hole was advanced using 125 mm solid stem augers to 6.40 m± below existing ground surface. Representative soil samples were collected directly off auger flights at 1.5 m intervals or at changes in soil stratigraphy. All samples were visually inspected for material type and classified according to the Unified Soil Classification System. Clay samples were tested with a field Torvane to estimate undrained shear strength. Upon

completion of the drilling, the test hole was examined for indications of squeezing and seepage. A Casagrande tip standpipe piezometer was installed in the glacial till to measure piezometric levels. Laboratory testing was performed on select soil samples and included moisture content analyses and Atterberg Limit testing.

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

3.0 STRATIGRAPHY

KGS Group's interpretation of the stratigraphy is based upon the test hole (TH08-03) drilled at the site. In general, the stratigraphy consists of topsoil over silt underlain by silty clay over glacial till.

Topsoil

A layer of topsoil approximately 1.2 m± thick was found at the existing ground surface. The topsoil was black in colour, damp, and contained trace amounts of organics, silt and rootlets. Moisture content of a sample obtained from this layer was 22%.

Silt

Silt extended 2.1 m± below the topsoil. The silt was dark brown in colour, dry to damp, and contained trace amounts of rootlets. Moisture content of a sample obtained from this layer was 14%.

Silty Clay

Underlying the silt was silty clay, which extended to a depth of 3.3 m± below ground surface. The clay was dark brown in colour, moist, of intermediate to high plasticity, firm, with undrained shear strength of 20 kPa. The clay contained trace amounts of sand. Moisture contents ranged from 33% to 36% with an overall average of 34%. Atterberg Limit testing at 3.2 m measured a Liquid Limit of 62% and a Plasticity Index of 47% with the material being classified as CH based upon the results.

Silt Till

The silty clay was underlain by silt till which extended to a depth of 6.40 m±. The silt till was orange to brown in colour and became red-brown below 5.8 m±, moist, of low to no plasticity, and contained trace amounts of clay, sand and gravel. Moisture contents ranged from 8% to 17% with an overall average of 11% within the till.

No squeezing or infiltration of water into the test hole was noted upon completion of drilling.

4.0 GROUNDWATER CONDITIONS

The groundwater level in the till was measured a total of two (2) times. The water level was first read immediately after the installation of the piezometer and there was no water observed in

standpipe. A subsequent groundwater reading on June 12, 2008 also observed that there was no water in the standpipe.

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

5.0 CONSTRUCTION CONSIDERATIONS

5.1 BASAL HEAVE AND BLOWOUT

No estimate of basal heave or blowout of the base of the excavation could be made at this time, as there was no observed water observed in the till standpipe at the time of this report.

Since the proposed gate chamber is to be installed at a depth of 11.0 m, which is approximately 7.6 m± into the glacial till, difficult conditions should be anticipated during excavation within the glacial till as boulders and cobbles are known to be present within the till. Groundwater inflows into the excavation from within the till can also be expected even though no groundwater was observed in the standpipe installed as part of this investigation, as the till typically is water bearing.

5.2 LATERAL EARTH PRESSURE COEFFICIENTS

Estimated lateral earth pressure coefficients of the soil are summarized in the table below for soils within the depth of the excavation of approximately 11.0 m.

Table 1 – Active, Passive and At-Rest Lateral Earth Pressure Coefficients

| Soil Type | Estimated Friction Angle (Φ') | Ka | Kp | Ko |
|------------|--------------------------------------|------|------|------|
| Silt | 20° | 0.49 | 2.04 | 0.66 |
| Silty Clay | 18° | 0.53 | 1.89 | 0.69 |
| Till | 35° | 0.27 | 3.69 | 0.43 |

Note : Ka = Active Earth Pressure
Kp = Passive Earth Pressure
Ko = Earth Pressure At-Rest

5.3 BACKFILL

Free draining granular backfill should be placed around the chamber walls for a minimum width of 0.6 m and covered with a low permeability clay cap at ground surface. All backfill should be placed in maximum 150 mm thick lifts and compacted to a minimum of 95% Standard Proctor maximum dry density (SPMDD).

6.0 SUMMARY

We have completed a geotechnical site investigation for the proposed gate chamber expansion at the Conway Street Gate Chamber. The stratigraphy at the site generally consisted of topsoil over a layer of silt above silty clay underlain by glacial till. Construction Design considerations for basal heave and blowout, lateral earth pressure coefficients and backfill are included.

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Mr. Strandberg

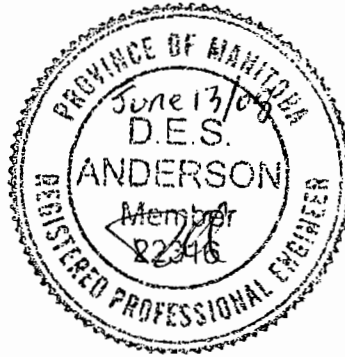
KGS Group thanks you for the opportunity to provide engineering services on this project. If you have any questions please contact the undersigned at 896-1209.

Yours truly,



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

DA/




TEST HOLE LOG

CLIENT CITY OF WINNIPEG - WATER AND WASTE DEPARTMENT
PROJECT 2008 GATE CHAMBER INVESTIGATIONS
SITE CONWAY GATE CHAMBER
LOCATION CONWAY STREET AND PORTAGE AVENUE
DRILLING METHOD 150 mm ø Solid Stem Auger, Acker MP5-T

JOB NO. 08-107-07
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 5-Jun-08
UTM (m) N 5,526,308
 E 626,392

| ELEVATION (m) | DEPTH (m) (ft) | GRAPHICS | DESCRIPTION AND CLASSIFICATION | PIEZ. LOG | DEPTH (m) | SAMPLE TYPE NUMBER | RECOVERY % | SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ | Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ | |
|---------------|----------------|----------|--|-----------|-----------|--------------------|------------|---|---|-------|
| | | | | | | | | | PL | MC LL |
| | | | TOPSOIL - Black, damp, trace to some silt, trace organics, trace rootlets. | | | | | | | |
| | | | SILT - Light brown, dry to damp, trace rootlets. | | | S1 | | | | |
| | | | SILT - Light brown, dry to damp, trace rootlets. | | | S2 | | | | |
| | | | SILTY CLAY - Dark brown, moist, firm, intermediate to high plasticity, increase in sand content with depth, trace sand. | | | S3 | | | | |
| | | | SILTY CLAY - Dark brown, moist, firm, intermediate to high plasticity, increase in sand content with depth, trace sand. | | | S4 | | | | |
| | | | SILT TILL - Orange-brown, moist, non-plastic to low plasticity, trace gravel, trace sand, trace clay. | | | S5 | | | | |
| | | | SILT TILL - Orange-brown, moist, non-plastic to low plasticity, trace gravel, trace sand, trace clay. | | | S6 | | | | |
| | | | SILT TILL - Red-brown, increased moisture, increased angular gravel content, non-plastic, below 5.79 m. | | | S7 | | | | |
| | | | AUGER REFUSAL AT 6.40 m. | | | | | | | |
| | | | Notes: 1. Installed till standpipe with Casagrande tip at 6.4 m with stickup of 1.07 m. 2. No water observed in standpipe on June 5, 2008. | | | | | | | |

SAMPLE TYPE  Auger Grab

CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. ANDERSON

APPROVED  DATE **12/6/08**

SPT & TORVANE 2 P:\PROJECTS\2008\08-0107-07\DESIGN\GEOLOGS\2008 GATE CHAMBER INVESTIGATIONS 5-JUN-08.GPJ