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**FOUNDATION INVESTIGATION REPORT  
PROTECTION SYSTEMS  
QEW WIDENING FROM HIGHWAY 406  
TO GARDEN CITY SKYWAY  
ST. CATHARINES, ONTARIO  
G.W.P. 607-00-00**

Submitted to:

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## 1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been retained by Morrison Hershfield Limited (MH) on behalf of the Ministry of Transportation, Ontario (MTO) to provide foundation engineering services associated with the widening of the Queen Elizabeth Way (QEW) between Highway 406 and the Garden City Skyway in the City of St. Catharines, in the Region of Niagara.

This report addresses the foundation investigation carried out for temporary protection systems at the following locations:

- QEW Niagara-bound lanes from approximately Station 10+700 (just west of Ontario Street) to 12+900 (just west of Geneva Street), for the installation of a median storm sewer.
- QEW Niagara-bound lanes from approximately Station 13+330 to 13+545 (between Geneva Street and Niagara Street) for the installation of a median storm sewer.
- QEW Niagara-bound lanes from approximately Station 12+500 to 12+885 (just west of Geneva Street) and from approximately Station 13+075 to 13+350 (just east of Geneva Street), for temporary widening of the existing shoulder as part of the construction staging operations.

The terms of reference and scope of work for the foundation engineering services are outlined in MTO's Request for Proposal for Agreement No. 2005-A-000564, issued in July 2002, in Section 6.8 of MH's *Technical Proposal* for G.W.P. 607-00-00, and in Golder's letter dated December 22, 2006.

## **2.0 SITE DESCRIPTION**

The proposed temporary protection systems are located along the Niagara-bound lanes of the QEW between approximately Station 10+700 (just east of Martindale Pond and west of Ontario Street) and Station 13+545 (between Geneva Street and Niagara Street).

Throughout the study area, the QEW runs roughly parallel to and north of (below) the Niagara escarpment, and sub-parallel to and south of Lake Ontario; the highway is located closer to the lake near the western portion of the study area, and trends away from the lake toward the eastern portion of the study area.

The terrain along the QEW is generally flat-lying to gently sloping, with a regional slope downward to the north toward Lake Ontario. East of Martindale Pond, the natural ground surface around the QEW climbs gradually toward the east, from about Elevation 92 m to 93 m near Ontario Street to about Elevation 99 m to 101 m near Geneva Street. The QEW grade is slightly higher than the surrounding natural grade from Ontario Street to west of Geneva Street; around Geneva Street, the QEW has been constructed on embankment fill that is up to about 7 m in height, with the QEW grade at approximately Elevation 106 m near Geneva Street.

### **3.0 INVESTIGATION PROCEDURES**

#### **3.1 Current Borehole Investigation**

Twenty-seven boreholes (Boreholes 07-01 to 07-27) were advanced along the proposed alignment for the temporary protection system for the median sewers, between January 23 and February 1, 2007. Ten additional boreholes, which were drilled for the Lake Street underpass median pier (Borehole 306) and for retaining walls and noise barrier walls near Geneva Street (Boreholes W-33 to W-37 and W-42 to W-45), were advanced as part of previous investigations by Golder in December 2004 and June and July 2005. The borehole locations are shown on Drawings 1 and 2.

The field investigation was carried out using truck-mounted drill rigs supplied and operated by Walker Drilling Ltd. of Utopia, Ontario. Boreholes 07-01 to 07-27 were advanced to depths of 8.1 m to 8.2 m below the QEW grade, using 108 mm diameter solid stem augers; Borehole 306 was advanced to a depth of 24.5 m below the QEW grade using solid stem augers; and Boreholes W-33 to W-37 and W-42 to W-45 were advanced to depths of 5.2 m to 15.9 m below the ground surface at the borehole locations, using solid stem augers. Soil samples were obtained at intervals of 0.75 m to 1.5 m in depth, using a 50 mm outer diameter split-spoon sampler driven by an automatic hammer, in accordance with Standard Penetration Test (SPT) procedure.

The groundwater conditions in the open boreholes were observed throughout the drilling operations. All of the boreholes were backfilled to ground surface upon completion of the drilling operations using bentonite pellets.

The field work was supervised on a full-time basis by members of Golder's staff who located the boreholes in the field, arranged for the clearance of underground service locations, directed the drilling, sampling, and logged the boreholes. The soil samples were identified in the field, placed in labelled containers and transported to Golder's laboratory in Mississauga for further examination and geotechnical laboratory testing. Index and classification tests consisting of water content determinations, Atterberg limits and grain size distribution analyses were carried out on selected soil samples.

The as-drilled borehole locations were measured in the field by Golder relative to site features (for Borehole 07-01 to 07-27) or to survey stakes placed by MH (for Boreholes 306, W-33 to W-37 and W-42 to W-45). The ground surface elevations at the borehole locations were determined from the digital terrain model (DTM) for this project. The borehole locations (NAD83 northing and easting coordinates) and ground surface elevations (referenced to geodetic datum) are presented on the Record of Borehole sheets and on Drawings 1 to 2.

### 3.2 Previous Borehole Investigation

In addition to the foundation investigation carried out by Golder as part of the current assignment, use has been made of two boreholes (Boreholes 954-2 and 954-4) which were advanced in 1961; this borehole information was obtained from the following report:

- MTO GEOCREs No. 30M3-28: *Foundation Investigation Report for Proposed Revisions to Crossing of Niagara – St. Catharines – Toronto Electric Railway Over the Queen Elizabeth Way*; dated November 1961.

The locations of Boreholes 954-2 and 954-4 are shown on Drawing 2, and the records for these boreholes are contained in Appendix A. The locations of these boreholes, as presented in the 1961 report, were defined by stations and offsets. These boreholes have been measured onto the current alignment plans, and the MTM NAD83 northing and easting coordinates have been approximated.

## 4.0 GENERAL SITE GEOLOGY AND STRATIGRAPHY

### 4.1 Regional Geological Conditions

The area of the QEW from Highway 406 to the Garden City Skyway lies within the Iroquois Plain physiographic region, as delineated in *The Physiography of Southern Ontario*<sup>1</sup> and *Urban Geology of Canadian Cities*<sup>2</sup>.

The Iroquois Plain extends around the western shore of Lake Ontario; on the south side of the lake, in the St. Catharines area, the Plain is located between the present Lake Ontario shorebluffs and the foot of the Niagara Escarpment. The Plain is comprised of the flat to undulating lake bed and beaches of the former glacial Lake Iroquois, which occupied this area during the last glacial recession.

The surficial soils in the Iroquois Plain are typically comprised of glaciolacustrine clays and silts. However, in the St. Catharines area, surficial deposits of beach sand and gravel are also present. The surficial sands, silts and clays are underlain by an extensive till deposit; portions of the till are considered to be “water-lain” (that is, formed by sediment rain-out either from a floating ice margin or from iceberg dumping), resulting in a predominantly massive, matrix-supported structure, as well as relatively thin sand to silt stringers or interlayers. This extensive till deposit may be underlain by or interlayered with a lower glaciolacustrine clay deposit, although this glaciolacustrine layer is absent in some portions of the Iroquois Plain in the St. Catharines area. Finally, the till and/or glaciolacustrine layer may be underlain by a lower till unit, that typically has increasing gravel content with proximity to the underlying bedrock (Menzies and Taylor, 1998).

The overburden soils are underlain by red shale bedrock of the Queenston Formation. This shale formation contains siltstone interlayers as well as “occasional patches of gypsum” (Menzies and Taylor, 1998).

### 4.2 Site Stratigraphy

The detailed subsurface soil and groundwater conditions as encountered in the boreholes advanced during this investigation, together with the results of the laboratory tests carried out on selected soil samples, are given on the attached Record of Borehole sheets and Figures 1 to 7C

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<sup>1</sup> Chapman, L.J. and D.F. Putnam. *The Physiography of Southern Ontario*, Ontario Geological Survey Special Volume 2, Third Edition, 1984. Accompanied by Map P.2715, Scale 1:600,000.

<sup>2</sup> J. Menzies and E.M. Taylor. “Urban Geology of St. Catharines-Niagara Falls, Region Niagara”. In *Urban Geology of Canadian Cities*, Geological Association of Canada Special Paper 42, Ed. P.F. Karrow and O.L. White, 1998.

following the text of this report. The stratigraphic boundaries shown on the borehole records are inferred from non-continuous sampling, observations of drilling progress and the results of Standard Penetration Tests. These boundaries, therefore, represent transitions between soil types rather than exact planes of geological change. Subsoil conditions will vary between and beyond the borehole locations.

In general, the surficial soils at the site consist of fill materials associated with embankments for the QEW, overlying a thick deposit of clayey silt to silty clay till of firm to hard consistency. Relatively thin surficial deposits of sand to sandy silt and clayey silt were encountered in some of the boreholes, overlying the till deposit. All of the boreholes were typically terminated within the clayey silt to silty clay till at depths ranging from 5.2 m to 25.4 m below the ground surface.

A more detailed description of the subsurface conditions encountered in the boreholes is provided in the following sections.

#### **4.2.1 Fill Materials**

A layer of asphalt, between approximately 100 mm and 300 mm in thickness, was encountered immediately below the ground surface in all of the boreholes except Borehole 07-04 (which was drilled immediately south of the QEW shoulder), Borehole 306 (which was drilled in the median), and Boreholes W-33 to W-36 (which were drilled south of the QEW embankment, adjacent to Dunlop Drive).

Fill material is present below the asphalt pavement in all of the boreholes, and was encountered immediately below the ground surface in Boreholes 306 and W-33 to W-36. The fill varies in thickness from about 0.6 m to 2.9 m west of Geneva Street, and from about 2.8 m to 7.3 m in the vicinity of Geneva Street (where the QEW has been constructed on an embankment that is up to about 7 m in height).

The fill materials vary in composition, but typically consist of sand and gravel or crushed limestone immediately below the asphalt pavement, underlain where the fill is thicker by sand to silty sand or clayey silt fill. Foundry sand was encountered within the embankment fill in some of the boreholes near Geneva Street (Boreholes 07-21 to 07-23 and W-37). A 150 mm to 200 mm thick layer of concrete was encountered within or at the base of the fill in Boreholes W-37 and W-42. The results of grain size distribution tests conducted on eleven selected samples of the fill are shown on Figure 1.

Atterberg limit testing was conducted on three selected samples of the cohesive fill, and measured plastic limits of about 15 to 17 per cent, liquid limits of 22 to 27 per cent, and plasticity indices of

6 to 11 per cent. These results, which are plotted on a plasticity chart on Figure 2, confirm that the tested cohesive fill is a clayey silt of low plasticity.

The measured SPT “N” values within the cohesionless portions of the fill ranged from 5 to 55 blows per 0.3 m of penetration, but are typically between about 5 and 30 blows per 0.3 m of penetration, indicating that the cohesionless fill has a variable, very loose to very dense (but typically loose to compact) relative density. Where foundry sand was encountered within the embankment fill in Boreholes 07-21 to 07-23 and W-37 near Geneva Street, the measured SPT “N” values of 46 to greater than 100 blows per 0.3 m of penetration indicate that this material has a dense to very dense relative density. The measured SPT “N” values within the clayey silt portions of the fill ranged from 3 to 19 blows per 0.3 m of penetration, indicating that this portion of the fill has a soft to very stiff consistency.

#### **4.2.2 Surficial Sand to Sandy Silt**

A surficial deposit of cohesionless soil was encountered in eighteen of the boreholes (Boreholes 07-02, 07-06 to 07-08, 07-12 to 07-20, 07-27, 306, W-36, W-44 and W- 45), below the fill and on top of the clayey silt to silty clay till deposit. Where encountered, the surficial cohesionless soil deposit varied from about 0.1 m to 2.4 m in thickness.

The surficial cohesionless soils vary in composition from sand containing some silt and trace gravel, to sandy silt; clayey silt seams were observed in the deposit at some locations. The results of grain size distribution tests conducted on nine selected samples of the surficial sand to sandy silt deposit are shown on Figure 3; on this figure, the results for Boreholes 07-07, 07-08, 07-14 and 07-19 demonstrate the presence of clayey silt seams within the deposit.

The measured SPT “N” values ranged from 5 to 33 blows per 0.3 m of penetration, but are typically between about 10 and 20 blows per 0.3 m of penetration; these results indicate that the surficial sand to sandy silt has a loose to dense, but typically compact, relative density.

#### **4.2.3 Surficial Clayey Silt**

A surficial clayey silt deposit was encountered in some of the boreholes (Boreholes 07-04, W-35 and W-42) below the topsoil or fill, and on top of the clayey silt to silty clay till deposit. Where encountered, the surficial clayey silt varied from about 0.7 m to 3.0 m in thickness.

The deposit consists of clayey silt containing trace to some sand, trace gravel and organics. The result of a grain size distribution test conducted on one selected sample of the surficial clayey silt deposit is shown on Figure 4. Atterberg limits testing was conducted on one selected sample of the surficial clayey silt deposit, and measured a plastic limit of 16 per cent, a liquid limit of 29 per

cent, and a plasticity index of 13 per cent; this result, which is plotted on a plasticity chart on Figure 5, confirms that this material is a clayey silt of low plasticity.

The SPT “N” values measured within the surficial clayey silt to silty clay ranged from 6 to 25 blows per 0.3 m of penetration, indicating that this material has a firm to very stiff consistency.

#### **4.2.4 Clayey Silt to Silty Clay Till**

An extensive till deposit was encountered beneath the fill and surficial soil deposits, where present, in all of the boreholes. The surface of this deposit was encountered at a depth of between 0.8 m and 7.6 m below the ground surface at the borehole locations, ranging between approximately Elevations 91.6 m and 100.5 m (generally rising toward the east). All of the boreholes were terminated within the till deposit at depths ranging from 5.2 m to 9.8 m below the ground surface; Borehole 306, which was advanced to 24.5 m depth, was also terminated within the till, indicating that the deposit has a thickness of greater than 22.3 m at that location.

The till consists of brown to grey clayey silt to silty clay, containing trace to some sand and trace gravel. Seams of silt and sandy silt were noted within some of the recovered till samples. Interlayers of moist to wet silty sand to sand and silt were encountered within the clayey silt to silty clay till deposit in Boreholes W-42 and W-45; these interlayers vary from 0.2 m to greater than 0.9 m in thickness. The results of grain size distribution testing completed on fifteen selected samples of the clayey silt to silty clay till are shown on Figures 6A and 6B. Although boulders and cobbles were not encountered within the deposit in the boreholes advanced as part of this investigation, the deposit is glacially-derived and may contain cobbles and boulders.

Atterberg limit testing was completed on 44 samples of the till deposit, and measured plastic limits of 12 to 20 per cent, liquid limits of 22 to 40 per cent, and plasticity indices of 9 to 21 per cent. These results, which are plotted on plasticity charts on Figures 7A to 7C, confirm that the till typically consists of a clayey silt of low plasticity, varying locally to a silty clay of intermediate plasticity.

The SPT “N” values measured within the clayey silt to silty clay till deposit ranged from 4 to 56 blows per 0.3 m of penetration. Typically, the lower SPT “N” values of 4 to 8 blows per 0.3 m of penetration were measured within the upper 1 m of the till, or in Boreholes 07-25 to 07-27, W-44 and W-45 east of Geneva Street; in situ vane testing in the boreholes east of Geneva Street measured undrained shear strengths of approximately 75 kPa to 90 kPa, as shown on the borehole records. Elsewhere, the measured SPT “N” values typically vary from about 10 to 30 blows per 0.3 m of penetration. The results of the SPT “N” values and in situ vane testing confirm that the till deposit typically has a stiff to very stiff consistency, though portions of the deposit (as noted above) grade to firm or hard.

### 4.3 Groundwater Conditions

The water levels in the open boreholes were noted during and immediately following the drilling operations. “Perched” groundwater was observed within the surficial sand to sandy silt deposit and at the base of cohesionless fill materials (perched on top of the underlying, less permeable clayey silt to silty clay till deposit) in Boreholes 07-07, 07-08, 07-11 to 07-20, 07-25, 07-26 and 306, all of which were drilled in the winter. Typically, the surficial sand to sandy silt soils were observed to be wet below a depth of 0.8 m to 1.5 m; the observed conditions are noted on the borehole records.

Piezometers were not installed in the boreholes included in this Foundation Investigation Report. However, piezometers have been installed within the clayey silt to silty clay till deposit as part of other subsurface investigation work by Golder for this project. Typically, the water level measured in the piezometers installed for other elements of this project varies from about 1.5 m to 4 m below the natural ground surface at the site. Where encountered as part of the subsurface investigation, lenses or interlayers of cohesionless soil within the clayey silt to silty clay till deposit were observed to be water-bearing.

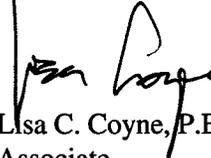
The groundwater levels will be subject to seasonal fluctuations, and will be higher during wetter periods of the year.

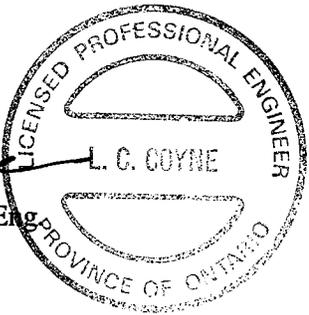
### 5.0 CLOSURE

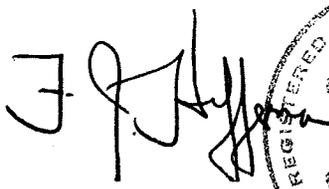
This Foundation Investigation Report was prepared by Ms. Karyn Gallant and reviewed by Ms. Lisa Coyne, P.Eng., an Associate and geotechnical engineer with Golder. Mr. Fin Heffernan, P.Eng., a Designated MTO Contact for Golder, carried out an independent review of the report.

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KG/LCC/FJH/kg/lcc

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## LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

### I. General

|             |                                       |
|-------------|---------------------------------------|
| $\pi$       | 3.1416                                |
| $\ln x$ ,   | natural logarithm of x                |
| $\log_{10}$ | x or log x, logarithm of x to base 10 |
| g           | acceleration due to gravity           |
| t           | time                                  |
| F           | factor of safety                      |
| V           | volume                                |
| W           | weight                                |

### II. STRESS AND STRAIN

|                                |  |
|--------------------------------|--|
| $\gamma$                       | shear strain   |
| $\Delta$                       | change in, e.g. in stress: $\Delta \sigma$                                 |
| $\epsilon$                     | linear strain  |
| $\epsilon_v$                   | volumetric strain  |
| $\eta$                         | coefficient of viscosity   |
| $\nu$                          | poisson's ratio  |
| $\sigma$                       | total stress   |
| $\sigma'$                      | effective stress ( $\sigma' = \sigma - u$ )                                |
| $\sigma'_{vo}$                 | initial effective overburden stress  |
| $\sigma_1, \sigma_2, \sigma_3$ | principal stress (major, intermediate, minor)                              |
| $\sigma_{oct}$                 | mean stress or octahedral stress<br>$= (\sigma_1 + \sigma_2 + \sigma_3)/3$ |
| $\tau$                         | shear stress   |
| u                              | porewater pressure   |
| E                              | modulus of deformation   |
| G                              | shear modulus of deformation   |
| K                              | bulk modulus of compressibility  |

### III. SOIL PROPERTIES

#### (a) Index Properties

|                    |  |
|--------------------|--|
| $\rho(\gamma)$     | bulk density (bulk unit weight*)   |
| $\rho_d(\gamma_d)$ | dry density (dry unit weight)  |
| $\rho_w(\gamma_w)$ | density (unit weight) of water   |
| $\rho_s(\gamma_s)$ | density (unit weight) of solid particles   |
| $\gamma'$          | unit weight of submerged soil ( $\gamma' = \gamma - \gamma_w$ )                                      |
| $D_R$              | relative density (specific gravity) of solid particles ( $D_R = \rho_s / \rho_w$ ) (formerly $G_s$ ) |
| e                  | void ratio   |
| n                  | porosity   |
| S                  | degree of saturation   |

#### (a) Index Properties (continued)

|           |  |
|-----------|--|
| w         | water content  |
| $w_l$     | liquid limit   |
| $w_p$     | plastic limit  |
| $I_p$     | plasticity index = $(w_l - w_p)$   |
| $w_s$     | shrinkage limit  |
| $I_L$     | liquidity index = $(w - w_p)/I_p$  |
| $I_C$     | consistency index = $(w_l - w)/I_p$  |
| $e_{max}$ | void ratio in loosest state  |
| $e_{min}$ | void ratio in densest state  |
| $I_D$     | density index = $(e_{max} - e) / (e_{max} - e_{min})$<br>(formerly relative density) |

#### (b) Hydraulic Properties

|   |  |
|---|--|
| h | hydraulic head or potential                          |
| q | rate of flow   |
| v | velocity of flow                                     |
| i | hydraulic gradient                                   |
| k | hydraulic conductivity (coefficient of permeability) |
| j | seepage force per unit volume                        |

#### (c) Consolidation (one-dimensional)

|             |   |
|-------------|---|
| $C_c$       | compression index (normally consolidated range)       |
| $C_r$       | recompression index (over-consolidated range)         |
| $C_s$       | swelling index  |
| $C_a$       | coefficient of secondary consolidation                |
| $m_v$       | coefficient of volume change                          |
| $c_v$       | coefficient of consolidation                          |
| $T_v$       | time factor (vertical direction)                      |
| U           | degree of consolidation                               |
| $\sigma'_p$ | pre-consolidation pressure                            |
| OCR         | over-consolidation ratio = $\sigma'_p / \sigma'_{vo}$ |

#### (d) Shear Strength

|                  |  |
|------------------|--|
| $\tau_p, \tau_r$ | peak and residual shear strength                         |
| $\phi'$          | effective angle of internal friction                     |
| $\delta$         | angle of interface friction                              |
| $\mu$            | coefficient of friction = $\tan \delta$                  |
| $c'$             | effective cohesion                                       |
| $c_{u,s_u}$      | undrained shear strength ( $\phi = 0$ analysis)          |
| p                | mean total stress $(\sigma_1 + \sigma_3)/2$              |
| $p'$             | mean effective stress $(\sigma'_1 + \sigma'_3)/2$        |
| q                | $(\sigma_1 + \sigma_3)/2$ or $(\sigma'_1 + \sigma'_3)/2$ |
| $q_u$            | compressive strength $(\sigma_1 + \sigma_3)$             |
| $S_t$            | sensitivity  |

- Notes:**
- 1  $\tau = c' + \sigma' \tan \phi'$
  - 2 shear strength = (compressive strength)/2
  - \* density symbol is  $\rho$ . Unit weight symbol is  $\gamma$  where  $\gamma = \rho g$  (i.e. mass density x acceleration due to gravity)

## LIST OF ABBREVIATIONS

The abbreviations commonly employed on Records of Boreholes, on figures and in the text of the report are as follows:

### I. SAMPLE TYPE

|    |                     |
|----|---------------------|
| AS | Auger sample        |
| BS | Block sample        |
| CS | Chunk sample        |
| DO | Drive open          |
| DS | Denison type sample |
| FS | Foil sample         |
| RC | Rock core           |
| SC | Soil core           |
| ST | Slotted tube        |
| TO | Thin-walled, open   |
| TP | Thin-walled, piston |
| WS | Wash sample         |

### III. SOIL DESCRIPTION

#### (a) Cohesionless Soils

| Density Index<br>(Relative Density) | N<br><u>Blows/300 mm or Blows/ft.</u> |
|-------------------------------------|---------------------------------------|
| Very loose                          | 0 to 4                                |
| Loose                               | 4 to 10                               |
| Compact                             | 10 to 30                              |
| Dense                               | 30 to 50                              |
| Very dense                          | over 50                               |

### II. PENETRATION RESISTANCE

#### Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg. (140 lb.) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open sampler for a distance of 300 mm (12 in.)

#### Consistency

|            | kPa        | $c_u, s_u$ | psf            |
|------------|------------|------------|----------------|
| Very soft  | 0 to 12    |            | 0 to 250       |
| Soft       | 12 to 25   |            | 250 to 500     |
| Firm       | 25 to 50   |            | 500 to 1,000   |
| Stiff      | 50 to 100  |            | 1,000 to 2,000 |
| Very stiff | 100 to 200 |            | 2,000 to 4,000 |
| Hard       | over 200   |            | over 4,000     |

#### (b) Cohesive Soils

#### Dynamic Cone Penetration Resistance; $N_d$ :

The number of blows by a 63.5 kg (140 lb.) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

- PH:** Sampler advanced by hydraulic pressure  
**PM:** Sampler advanced by manual pressure  
**WH:** Sampler advanced by static weight of hammer  
**WR:** Sampler advanced by weight of sampler and rod

#### Piezo-Cone Penetration Test (CPT)

A electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm<sup>2</sup> pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance ( $Q_t$ ), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

### IV. SOIL TESTS

|          |   |
|----------|---|
| w        | water content   |
| $w_p$    | plastic limit   |
| $w_l$    | liquid limit  |
| C        | consolidation (oedometer) test  |
| CHEM     | chemical analysis (refer to text)   |
| CID      | consolidated isotropically drained triaxial test <sup>1</sup>                                       |
| CIU      | consolidated isotropically undrained triaxial test with porewater pressure measurement <sup>1</sup> |
| $D_R$    | relative density (specific gravity, $G_s$ )   |
| DS       | direct shear test   |
| M        | sieve analysis for particle size  |
| MH       | combined sieve and hydrometer (H) analysis  |
| MPC      | Modified Proctor compaction test  |
| SPC      | Standard Proctor compaction test  |
| OC       | organic content test  |
| $SO_4$   | concentration of water-soluble sulphates  |
| UC       | unconfined compression test   |
| UU       | unconsolidated undrained triaxial test  |
| V        | field vane (LV-laboratory vane test)  |
| $\gamma$ | unit weight   |

**Note:** 1 Tests which are anisotropically consolidated prior to shear are shown as CAD, CAU.

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**PROJECT** 04-1111-002 **RECORD OF BOREHOLE No 07-01** 1 OF 1 **METRIC**  
**W.P.** 607-00-00 **LOCATION** N 4782216.2 ; E 323649.2 **ORIGINATED BY** GD  
**DIST** Central **HWY** QEW **BOREHOLE TYPE** 108 mm Diameter Solid Stem Augers **COMPILED BY** KG  
**DATUM** Geodetic **DATE** January 23, 2007 **CHECKED BY** LCC

| SOIL PROFILE |   | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |    |  |    |    |    |    |           |
|--------------|---|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|----|--|----|----|----|----|-----------|
| ELEV DEPTH   | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |    |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |    |  |    |    |    |    |           |
|              |   |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 | 20 | 40                              | 60                            | 80                             | 100              | 10                                    | 20                | 30 |  | GR | SA | SI | CL |           |
| 92.5         | GROUND SURFACE  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
| 8.0          | ASPHALT   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
| 91.7         | Sand and gravel (FILL)<br>Brown<br>Moist  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
| 0.8          | CLAYEY SILT, trace sand and gravel (TILL)<br>Very stiff to hard<br>Brown to grey-brown<br>Moist |            | 1      | SS   | 29                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
|              |   |            | 2      | SS   | 46                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    | 0 6 57 37 |
|              |   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
|              |   |            | 3      | SS   | 35                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
|              |   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
|              | Becoming grey below 4.5 m depth   |            | 4      | SS   | 22                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
|              |   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
|              |   |            | 5      | SS   | 20                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
|              |   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
|              |   |            | 6      | SS   | 30                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
| 84.4         | END OF BOREHOLE   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |
| 8.1          | Note:<br>1. Borehole dry upon completion of drilling.   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |           |

MIS-MTO 001 04111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



|                                    |  |                         |
|------------------------------------|--|-------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-03</b>                     | 1 OF 1 <b>METRIC</b>    |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4782228.7 ; E 323845.2</u>               | ORIGINATED BY <u>GD</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>   |
| DATUM <u>Geodetic</u>              | DATE <u>January 24, 2007</u>                           | CHECKED BY <u>LCC</u>   |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |    |    |    |    |    |            |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|----|----|----|----|----|------------|
| ELEV DEPTH   | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |    |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |    |    |    |    |    |            |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 | 20 | 40                              | 60                            | 80                             | 100              | 10                                    | 20                | 30 | GR | SA | SI | CL |            |
| 93.3         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
| 8.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
| 92.5         | Sand and gravel, some silt (FILL)<br>Brown<br>Moist  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
| 0.8          | CLAYEY SILT, trace to some sand,<br>trace gravel (TILL)<br>Very stiff to hard<br>Brown to grey-brown<br>Dry to moist |            | 1      | SS   | 22                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    | 1 12 56 31 |
|              |  |            | 2      | SS   | 39                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
|              |  |            | 3      | SS   | 56                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
|              |  |            | 4      | SS   | 31                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
|              | Becoming grey below 6.1 m depth  |            | 5      | SS   | 35                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
|              |  |            | 6      | SS   | 25                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
| 85.2         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
| 8.1          | Note:<br>1. Borehole dry upon completion of drilling.  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                         |
|------------------------------------|--|-------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-04</b>                     | 1 OF 1 <b>METRIC</b>    |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4782190.7 ; E 323915.8</u>               | ORIGINATED BY <u>GD</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>   |
| DATUM <u>Geodetic</u>              | DATE <u>January 29, 2007</u>                           | CHECKED BY <u>LCC</u>   |

| SOIL PROFILE |   | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |    |    |    |    |    |            |
|--------------|---|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|----|----|----|----|----|------------|
| ELEV. DEPTH  | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |    |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |    |    |    |    |    |            |
|              |   |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 | 20 | 40                              | 60                            | 80                             | 100              | 10                                    | 20                | 30 | GR | SA | SI | CL |            |
| 93.0         | GROUND SURFACE  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
| 89.9         | TOPSOIL<br>CLAYEY SILT, some sand, trace gravel<br>Stiff<br>Brown and grey<br>Moist to wet                        |            | 1      | SS   | 13                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    | 2 14 56 28 |
|              |   |            | 2      | SS   | 8                       |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
| 89.9         | CLAYEY SILT, trace to some sand, trace gravel (TILL)<br>Firm to very stiff<br>Brown to grey-brown<br>Moist to wet |            | 3      | SS   | 4                       |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
|              | Becoming grey below 4.5 m depth   |            | 4      | SS   | 26                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
|              |   |            | 5      | SS   | 23                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
|              |   |            | 6      | SS   | 25                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
| 84.8         | END OF BOREHOLE   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |
| 8.2          | Note:<br>1. Water level in open borehole at 2.4 m depth upon completion of drilling operations.                   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |            |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-05</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4782217.8 ; E 323945.2</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 23, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |   | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |    |    |    |   |
|--------------|---|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|----|----|----|---|
| ELEV. DEPTH  | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |    |    |    |   |
|              |   |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |
| 93.7         | GROUND SURFACE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |
| 93.0         | ASPHALT   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |
| 0.3          | Sand and gravel, some silt (FILL)<br>Compact<br>Light brown to brown<br>Moist                                 |            | 1      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   | 28 | 56 | 13 | 3 |
|              |   |            | 2      | SS   | 11                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |
| 91.6         | CLAYEY SILT, trace to some sand,<br>trace gravel (TILL)<br>Very stiff to hard<br>Brown to grey-brown<br>Moist |            | 3      | SS   | 37                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |
|              | Becoming grey below 4.5 m depth   |            | 4      | SS   | 23                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |
|              |   |            | 5      | SS   | 30                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |
|              |   |            | 6      | SS   | 17                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |
| 85.5         | END OF BOREHOLE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |
| 8.2          | Note:<br>1. Borehole dry upon completion of drilling.   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |    |    |    |   |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE



**PROJECT** 04-1111-002 **RECORD OF BOREHOLE No 07-07** 1 OF 1 **METRIC**  
**W.P.** 607-00-00 **LOCATION** N 4782171.1 ; E 324139.4 **ORIGINATED BY** GD  
**DIST** Central **HWY** QEW **BOREHOLE TYPE** 108 mm Diameter Solid Stem Augers **COMPILED BY** KG  
**DATUM** Geodetic **DATE** January 24, 2007 **CHECKED BY** LCC

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>w | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |    |  |    |    |    |    |            |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|----|--|----|----|----|----|------------|
| ELEV DEPTH   | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |    |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |    |  |    |    |    |    |            |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 | 20 | 40                              | 60                            | 80                             | 100              | 10                                    | 20                | 30 |  | GR | SA | SI | CL |            |
| 94.6         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
| 8.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              | Sand and gravel (FILL)   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
| 93.8         | SAND and SILT, trace gravel, containing clayey silt seams      |            | 1      | SS   | 7                       | ∇               |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    | 5 38 43 14 |
| 0.8          | Dark brown   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
| 93.1         | Loose  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
| 1.5          | Wet  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              | CLAYEY SILT, some sand, trace gravel (TILL)                    |            | 2      | SS   | 21                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              | Very stiff to hard   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              | Brown to grey-brown  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              | Moist to dry   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              | Becoming grey below 4.5 m depth                                |            | 3      | SS   | 45                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              |  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              |  |            | 4      | SS   | 19                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              |  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              |  |            | 5      | SS   | 29                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              |  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              |  |            | 6      | SS   | 26                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
| 86.5         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
| 8.1          | Notes:   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              | 1. Wet soils encountered at about 1.0 m depth during drilling. |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |
|              | 2. Borehole dry upon completion of drilling.                   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |            |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE







|                                    |  |                         |
|------------------------------------|--|-------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-11</b>                     | 1 OF 1 <b>METRIC</b>    |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4782071.1 ; E 324526.7</u>               | ORIGINATED BY <u>GD</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>   |
| DATUM <u>Geodetic</u>              | DATE <u>January 29, 2007</u>                           | CHECKED BY <u>LCC</u>   |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |  |  |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|--|--|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |  |  |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 95.4         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 0.2          | Sand and gravel (FILL)   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 94.6         | Brown Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 0.8          | Sand, trace silt (FILL)  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 93.9         | Compact to very loose  |            | 1      | SS   | 10                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              | Brown Wet  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 1.5          | Clayey silt, some sand, trace gravel (FILL)  |            | 2      | SS   | 3                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 92.3         | Soft Brown Moist   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 3.1          | CLAYEY SILT, trace to some sand, trace gravel (TILL)   |            | 3      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              | Stiff to very stiff  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              | Brown to grey-brown Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              | Becoming grey below 4.5 m depth  |            | 4      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              |  |            | 5      | SS   | 10                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              |  |            | 6      | SS   | 15                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 87.2         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 8.2          | Notes:<br>1. Wet soils encountered at about 1.0 m depth during drilling.<br>2. Borehole dry upon completion of drilling. |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-12</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4782045.3 ; E 324622.4</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 29, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |
| 95.7         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.2          | Sand and gravel (FILL)   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 94.9         | Brown Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.8          | Sandy SILT, trace clay, trace gravel<br>Loose to compact<br>Black to brown<br>Moist to wet                               |            | 1      | SS   | 5                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 2      | SS   | 14                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 92.5         | CLAYEY SILT, trace to some sand, trace gravel (TILL)<br>Very stiff to stiff<br>Brown to grey-brown<br>Moist              |            | 3      | SS   | 16                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 4      | SS   | 17                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 92.5         |  |            | 5      | SS   | 15                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 87.5         |  |            | 6      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 87.5         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 8.2          | Notes:<br>1. Wet soils encountered at about 1.5 m depth during drilling.<br>2. Borehole dry upon completion of drilling. |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                         |
|------------------------------------|--|-------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-13</b>                     | 1 OF 1 <b>METRIC</b>    |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4782020.2 ; E 324719.3</u>               | ORIGINATED BY <u>GD</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>   |
| DATUM <u>Geodetic</u>              | DATE <u>January 29, 2007</u>                           | CHECKED BY <u>LCC</u>   |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |    |    |    |    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |     |    |    |    |    |     |    |    |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|----|----|----|----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-----|----|----|----|----|-----|----|----|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | 20 | 40 | 60 | 80 |                                 |                               |                                |                  |                                       | 100 | 20 | 40 | 60 | 80 | 100 | 10 | 20 |
| 95.8         | GROUND SURFACE   |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 0.2          | Sand and gravel (FILL)<br>Brown<br>Moist   |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 0.8          | Silty SAND, trace gravel<br>Loose to compact<br>Black to brown<br>Moist to wet   |            | 1      | SS   | 7                       |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            | 2      | SS   | 13                      |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 92.8         |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 3.1          | CLAYEY SILT, trace to some sand,<br>trace gravel (TILL)<br>Hard to stiff<br>Brown to grey-brown<br>Moist to wet  |            | 3      | SS   | 31                      |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              | Becoming grey below 4.5 m depth  |            | 4      | SS   | 14                      |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            | 5      | SS   | 20                      |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            | 6      | SS   | 17                      |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 87.6         | END OF BOREHOLE  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 8.2          | Notes:<br>1. Wet soils encountered at about 1.5 m depth during drilling.<br>2. Water level in open borehole at 6.9 m depth upon completion of drilling operations. |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-14</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781995.5; E 324815.9</u>                | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 29, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |    |    |    |    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |     |    |    |    |    |     |    |    |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|----|----|----|----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-----|----|----|----|----|-----|----|----|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | 20 | 40 | 60 | 80 |                                 |                               |                                |                  |                                       | 100 | 20 | 40 | 60 | 80 | 100 | 10 | 20 |
| 96.1         | GROUND SURFACE   |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 0.2          | Sand and gravel (FILL)   |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 95.3         | Brown Moist  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 0.8          | SAND and SILT, trace gravel, containing clayey silt seams<br>Loose to compact<br>Black to brown<br>Moist to wet    |            | 1      | SS   | 8                       |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 94.3         |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
| 1.8          | CLAYEY SILT, trace to some sand, trace gravel (TILL)<br>Stiff to very stiff<br>Brown to grey-brown<br>Moist to wet |            | 2      | SS   | 14                      |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              | Becoming grey below 3.0 m depth  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      |                         |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |
|              |  |            |        |      | </                      |                 |  |    |    |    |    |                                 |                               |                                |                  |                                       |     |    |    |    |    |     |    |    |



|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-16</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781919.1 ; E 325106.5</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 29, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>w | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |
| 96.9         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.2          | Sand and gravel (FILL)   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 96.1         | Brown Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.8          | Silty SAND<br>Loose to compact<br>Brown<br>Moist to wet  |            | 1      | SS   | 10                      |                 |  |                    |    |     |  |                                 |                               |                                |                  | 0 66 28 6                             |
| 95.0         |  |            | 2      | SS   | 11                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 1.9          | CLAYEY SILT, trace to some sand, trace gravel (TILL)<br>Stiff to very stiff<br>Brown to grey-brown<br>Moist<br><br>Becoming grey below 3.0 m depth |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 3      | SS   | 16                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 4      | SS   | 14                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 5      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 6      | SS   | 15                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 88.7         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 8.2          | Notes:<br>1. Wet soils encountered at about 1.0 m depth during drilling.<br>2. Borehole dry upon completion of drilling.                           |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                         |
|------------------------------------|--|-------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-17</b>                     | 1 OF 1 <b>METRIC</b>    |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781894.2 ; E 325203.1</u>               | ORIGINATED BY <u>GD</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>   |
| DATUM <u>Geodetic</u>              | DATE <u>January 31, 2007</u>                           | CHECKED BY <u>LCC</u>   |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>w | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH   | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |
| 97.2         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.2          | Sand and gravel (FILL)   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 96.4         | Brown Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.8          | Silty SAND, some gravel  |            | 1      | SS   | 7                       |                 |  |                    |    |     |  | o                               |                               |                                |                  | 14 49 29 8                            |
| 95.7         | Loose Brown Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 1.5          | SAND, some silt, trace gravel  |            | 2      | SS   | 24                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 94.1         | Compact Brown Wet  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 3.1          | CLAYEY SILT, trace to some sand, trace gravel (TILL)   |            | 3      | SS   | 23                      |                 |  |                    |    |     |  | o                               |                               |                                |                  |                                       |
|              | Very stiff Brown to grey-brown Moist to wet  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              | Becoming grey below 4.5 m depth  |            | 4      | SS   | 21                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 5      | SS   | 22                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 6      | SS   | 19                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 89.0         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 8.2          | Notes:<br>1. Wet soils encountered at about 1.5 m depth during drilling.<br>2. Water level in open borehole at 6.6 m depth upon completion of drilling operations. |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-18</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781869.6 ; E 325300.1</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 30, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |
| 97.1         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.2          | Sand and gravel (FILL)   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 96.3         | Brown Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.8          | Silty SAND, trace gravel   |            | 1      | SS   | 9                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 95.6         | Loose Brown Wet  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 1.5          | CLAYEY SILT, trace sand and gravel (TILL)  |            | 2      | SS   | 22                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              | Very stiff to stiff Brown to grey-brown Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              | Becoming grey below 3.0 m depth  |            | 3      | SS   | 15                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 4      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 5      | SS   | 12                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 6      | SS   | 11                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 88.9         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 8.2          | Notes:<br>1. Wet soils encountered at about 1.0 m depth during drilling.<br>2. Borehole dry upon completion of drilling. |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE



|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-20</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781819.3 ; E 325493.7</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 31, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |  |  |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|--|--|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |  |  |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 97.5         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 0.3          | Sand and gravel (FILL)   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 96.7         | Brown Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 1.0          | Silty SAND<br>Loose<br>Brown<br>Wet  |            | 1      | SS   | 9                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              | CLAYEY SILT, trace to some sand, trace gravel (TILL)<br>Stiff to hard<br>Brown to grey-brown<br>Moist                    |            | 2      | SS   | 33                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              | Becoming grey below 3.0 m depth  |            | 3      | SS   | 15                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              |  |            | 4      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              |  |            | 5      | SS   | 14                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              |  |            | 6      | SS   | 14                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 89.3         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 8.2          | Notes:<br>1. Wet soils encountered at about 0.8 m depth during drilling.<br>2. Borehole dry upon completion of drilling. |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE



|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-22</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781770.9; E 325687.7</u>                | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 31, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |   | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |  |  |
|--------------|---|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|--|--|
| ELEV. DEPTH  | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |  |  |
|              |   |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 102.2        | GROUND SURFACE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 101.9        | ASPHALT   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 0.3          | Sand and gravel (FILL)<br>Brown<br>Moist  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 101.4        | Foundry Sand, some silt, trace gravel (FILL)<br>Very dense<br>Black<br>Moist                          |            | 1      | SS   | 86                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 0.8          |   |            | 2      | SS   | 110                     |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              |   |            | 3      | SS   | 102                     |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 98.2         | CLAYEY SILT, trace to some sand, trace gravel (TILL)<br>Stiff to hard<br>Brown to grey-brown<br>Moist |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 4.0          |   |            | 4      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              |   |            | 5      | SS   | 38                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
|              |   |            | 6      | SS   | 39                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 94.0         | END OF BOREHOLE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |
| 8.2          | Note:<br>1. Borehole dry upon completion of drilling.   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |                   |  |  |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                         |
|------------------------------------|--|-------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-23</b>                     | 1 OF 1 <b>METRIC</b>    |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781746.8 ; E 325784.6</u>               | ORIGINATED BY <u>GD</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>   |
| DATUM <u>Geodetic</u>              | DATE <u>February 1, 2007</u>                           | CHECKED BY <u>LCC</u>   |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |   | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>w | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|---|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH   | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |   |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |   |                                 |                               |                                |                  |                                       |
| 104.7        | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 104.0        | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 0.3          | Sand and gravel (FILL)<br>Brown<br>Moist   |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 103.9        |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 0.8          | Sand and gravel, some silt (FILL)<br>Very dense<br>Brown<br>Moist                        |            | 1      | SS   | 123                     |                 |  |                    |    |     | o |                                 |                               |                                |                  | 35 42 18 5                            |
| 103.2        |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 1.5          | Foundry sand, some silt, trace gravel (FILL)<br>Very dense<br>Black<br>Moist             |            | 2      | SS   | 113                     |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
|              |  |            | 3      | SS   | 67/0.15                 |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
|              |  |            | 4      | SS   | 61/0.15                 |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 98.6         |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 6.1          | Clayey silt with sand, trace gravel (FILL)<br>Very stiff<br>Dark brown to brown<br>Moist |            | 5      | SS   | 19                      |                 |  |                    |    |     |   | 10-1                            |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 97.1         |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 7.6          | CLAYEY SILT, some sand, trace gravel (TILL)<br>Hard<br>Brown<br>Moist                    |            | 6      | SS   | 33                      |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 96.5         |  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
| 8.2          | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |
|              | Note:<br>1. Borehole dry upon completion of drilling.                                    |            |        |      |                         |                 |  |                    |    |     |   |                                 |                               |                                |                  |                                       |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-24</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781636.9 ; E 326202.4</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 31, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| ELEV<br>DEPTH | SOIL PROFILE<br>DESCRIPTION  | STRAT PLOT | SAMPLES |      |            | GROUND WATER<br>CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION<br>RESISTANCE PLOT |    |    |     |  | PLASTIC<br>LIMIT<br>W <sub>p</sub> | NATURAL<br>MOISTURE<br>CONTENT<br>W | LIQUID<br>LIMIT<br>W <sub>L</sub> | UNIT<br>WEIGHT<br>$\gamma$<br>kN/m <sup>3</sup> | REMARKS<br>&<br>GRAIN SIZE<br>DISTRIBUTION<br>(%)<br>GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|----|----|-----|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
|               |  |            | NUMBER  | TYPE | "N" VALUES |                            |                 | SHEAR STRENGTH kPa                          |    |    |     |  |                                    |                                     |                                   |   |  |
|               |  |            |         |      |            |                            | 20              | 40  | 60 | 80 | 100 |  |                                    |                                     |                                   |   |  |
| 102.5         | GROUND SURFACE   |            |         |      |            |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |
| 102.0         | ASPHALT  |            |         |      |            |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |
| 101.7         | Sand and gravel (FILL)<br>Brown<br>Moist   |            |         |      |            |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |
| 101.0         | Sand, some silt, trace gravel (FILL)<br>Very dense<br>Red<br>Moist   |            | 1       | SS   | 55         |                            |                 |   |    |    |     |  |                                    |                                     |                                   | 9 65 20 6                                       |  |
| 100.0         | Silty sand, some gravel (FILL)<br>Compact<br>Grey<br>Moist   |            | 2       | SS   | 15         |                            |                 |   |    |    |     |  |                                    |                                     |                                   | 13 55 24 8                                      |  |
| 99.5          |  |            |         |      |            |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |
| 94.3          | CLAYEY SILT to SILTY CLAY, trace<br>sand and gravel (TILL)<br>Very stiff to stiff<br>Brown to grey-brown<br>Moist to wet |            | 3       | SS   | 22         |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |
|               |  |            | 4       | SS   | 13         |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |
|               |  |            |         |      |            |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |
|               | 5  | SS         | 13      |      |            |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |
|               | 6  | SS         | 11      |      |            |                            |                 |   |    |    |     |  |                                    |                                     |                                   | 0 8 50 42                                       |  |
| 8.2           | END OF BOREHOLE  |            |         |      |            |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |
|               | Note:<br>1. Water level in open borehole at<br>7.8 m depth upon completion of<br>drilling operations.                    |            |         |      |            |                            |                 |   |    |    |     |  |                                    |                                     |                                   |   |  |

MIS-MTO 001 04111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, X<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE



|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-26</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781594.6 ; E 326365.1</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 31, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |
| 102.2        | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.2          | Sand and gravel (FILL)<br>Brown<br>Moist   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 101.4        |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.8          | Silty sand, trace gravel (FILL)<br>Loose<br>Black to brown<br>Moist to wet   |            | 1      | SS   | 9                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 2      | SS   | 4                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 99.1         |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 3.1          | CLAYEY SILT to SILTY CLAY, trace sand and gravel (TILL)<br>Stiff to firm<br>Brown to grey-brown<br>Moist                 |            | 3      | SS   | 9                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 4      | SS   | 9                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              | Becoming grey below 6.0 m depth  |            | 5      | SS   | 7                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 6      | SS   | 8                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 94.0         |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 8.2          | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              | Notes:<br>1. Wet soils encountered at about 1.5 m depth during drilling.<br>2. Borehole dry upon completion of drilling. |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 07-27</b>                     | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781584.4 ; E 326405.4</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>KG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>January 31, 2007</u>                           | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |   | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV. DEPTH  | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |
| 102.0        | GROUND SURFACE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.0          | ASPHALT   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.2          | Sand and gravel (FILL)                                |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 101.2        | Brown Moist   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.8          | SAND and SILT Compact                                 |            | 1      | SS   | 14                      |                 |  |                    |    |     |  |                                 |                               |                                |                  | 0 47 50 3                             |
| 100.5        | Brown Moist   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 1.5          | CLAYEY SILT, trace to some sand, trace gravel (TILL)  |            | 2      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              | Stiff Brown to grey-brown Moist                       |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 3      | SS   | 10                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              | Becoming grey below 4.5 m depth                       |            | 4      | SS   | 9                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 5      | SS   | 9                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 6      | SS   | 8                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 93.8         | END OF BOREHOLE                                       |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 8.2          | Note:<br>1. Borehole dry upon completion of drilling. |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |   |                          |
|------------------------------------|---|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No 306</b>              | 1 OF 2 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781946.9 ; E 325034.1</u>      | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Solid Stem Augers</u> | COMPILED BY <u>SLP</u>   |
| DATUM <u>Geodetic</u>              | DATE <u>December 5, 2004</u>                  | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |   | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>w | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|------------|--------|------|-------------------------|-----------------|--|--------------------|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV. DEPTH  | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |                                 |                               |                                |                  |                                       |
| 96.8         | GROUND SURFACE  |            |        |      |                         |                 |  |                    |                                 |                               |                                |                  |                                       |
| 0.0          | Sand and gravel (FILL)<br>Compact<br>Brown<br>Moist   |            | 1      | SS   | 20                      |                 |  |                    |                                 |                               |                                |                  |                                       |
| 96.0         |   |            |        |      |                         | 96              |  |                    |                                 |                               |                                |                  |                                       |
| 0.8          | Silty SAND to SAND and SILT,<br>trace gravel<br>Loose to compact<br>Brown<br>Wet                        |            | 2      | SS   | 9                       |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            | 3      | SS   | 22                      |                 |  |                    |                                 |                               |                                |                  |                                       |
| 94.5         |   |            |        |      |                         | 95              |  |                    |                                 |                               |                                |                  |                                       |
| 2.3          | CLAYEY SILT, some sand, trace<br>gravel and shale fragments(TILL)<br>Stiff to very stiff<br>Grey<br>Wet |            | 4      | SS   | 17                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            | 5      | SS   | 15                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            | 6      | SS   | 12                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            | 7      | SS   | 8                       |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            | 8      | SS   | 14                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            | 9      | SS   | 14                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            | 10     | SS   | 16                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            | 11     | SS   | 10                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            | 12     | SS   | 6                       |                 |  |                    |                                 |                               |                                |                  |                                       |
| 84.6         |   |            |        |      |                         | 85              |  |                    |                                 |                               |                                |                  |                                       |
| 12.2         | CLAYEY SILT to SILTY CLAY, trace<br>sand, trace gravel and shale<br>fragments<br>Firm<br>Grey<br>Wet    |            | 13     | SS   | 5                       |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         | 84              |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         | 83              |  |                    |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         | 82              |  |                    |                                 |                               |                                |                  |                                       |

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Continued Next Page

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

**RECORD OF BOREHOLE No 306** 2 OF 2 **METRIC**

PROJECT 04-1111-002 W.P. 607-00-00 LOCATION N 4781946.9; E 325034.1 ORIGINATED BY PKS

DIST Central HWY QEW BOREHOLE TYPE 108 mm Solid Stem Augers COMPILED BY SLP

DATUM Geodetic DATE December 5, 2004 CHECKED BY LCC

| SOIL PROFILE  |   | SAMPLES    |        |      | GROUND WATER<br>CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION<br>RESISTANCE PLOT |                    |                 |                 |                 | PLASTIC<br>LIMIT<br>W <sub>p</sub> | NATURAL<br>MOISTURE<br>CONTENT<br>W | LIQUID<br>LIMIT<br>W <sub>L</sub> | UNIT<br>WEIGHT<br>$\gamma$<br>kN/m <sup>3</sup> | REMARKS<br>&<br>GRAIN SIZE<br>DISTRIBUTION<br>(%)<br>GR SA SI CL |
|---------------|---|------------|--------|------|----------------------------|-----------------|---|--------------------|-----------------|-----------------|-----------------|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| ELEV<br>DEPTH | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                            |                 | "N" VALUES                                  | SHEAR STRENGTH kPa |                 |                 |                 |                                    |                                     |                                   |   |  |
|               | --- CONTINUED FROM PREVIOUS PAGE ---  |            |        |      |                            | 20 40 60 80 100 | 20 40 60 80 100                             | 20 40 60 80 100    | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 10 20 30                           |                                     |                                   |   |  |
| 81.5          |   | [Hatched]  |        |      |                            |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 15.3          | CLAYEY SILT, some sand, trace gravel, shale fragments (TILL)<br>Stiff<br>Grey<br>Wet                                  | [Hatched]  | 14     | SS   | 11                         |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 80.5          |   | [Hatched]  |        |      |                            |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 16.3          | SAND and SILT, some gravel, trace to some clay (TILL)<br>Compact<br>Grey<br>Wet                                       | [Hatched]  | 15     | SS   | 14                         |                 |   |                    |                 |                 |                 |                                    |                                     |                                   | 11 44 35 10                                     |  |
| 79.0          |   | [Hatched]  |        |      |                            |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 17.8          | CLAYEY SILT, trace sand and gravel, containing silty sand interlayers (TILL)<br>Very stiff to hard<br>Red<br>Wet      | [Hatched]  | 16     | SS   | 16                         |                 |   |                    |                 |                 |                 | ○                                  |                                     |                                   |   |  |
| 77.0          |   | [Hatched]  |        |      |                            |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 17.0          |   | [Hatched]  | 17     | SS   | 17                         |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 76.0          |   | [Hatched]  |        |      |                            |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 18.0          |   | [Hatched]  | 18     | SS   | 100/20                     |                 |   |                    |                 |                 |                 | ○                                  |                                     |                                   |   |  |
| 75.0          |   | [Hatched]  |        |      |                            |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 74.0          |   | [Hatched]  |        |      |                            |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 73.0          |   | [Hatched]  |        |      |                            |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 72.3          |   | [Hatched]  | 19     | SS   | 100/00                     |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |
| 24.5          | END OF BOREHOLE<br><br>Note:<br>1. Water level in open borehole at 3.1 m depth upon completion of drilling operations |            |        |      |                            |                 |   |                    |                 |                 |                 |                                    |                                     |                                   |   |  |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No W-33</b>                          | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781805.7 ; E 325469.4</u>                   | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>Power Auger, 108 mm Solid Stem Augers</u> | COMPILED BY <u>SG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>June 13, 2005</u>                                  | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |
| 97.0         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.0          | Sand and gravel (FILL)<br>Compact<br>Grey<br>Moist                                   |            | 1      | SS   | 35                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 96.2         |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.8          | CLAYEY SILT, some sand, trace gravel (TILL)<br>Stiff to very stiff<br>Brown<br>Moist |            | 2      | SS   | 18                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 3      | SS   | 20                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 4      | SS   | 12                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 5      | SS   | 10                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 6      | SS   | 12                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |  |            | 7      | SS   | 15                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 91.8         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 5.2          | Note:<br>1. Borehole dry upon completion of drilling operations.                     |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No W-34</b>                          | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781781.9; E 325561.5</u>                    | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>Power Auger, 108 mm Solid Stem Augers</u> | COMPILED BY <u>SG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>June 13, 2005</u>                                  | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |   | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |    |     | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|------------|--------|------|-------------------------|-----------------|--|--------------------|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV. DEPTH  | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |    |     |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         |                 | 20                                       | 40                 | 60 | 80 | 100 |                                 |                               |                                |                  |                                       |
| 97.7         | GROUND SURFACE  |            |        |      |                         |                 |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
| 0.0          | Sand and gravel (FILL)<br>Compact<br>Grey<br>Moist  |            | 1      | SS   | 30                      |                 |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
| 96.9         |   |            |        |      |                         | 97              |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
| 0.8          | CLAYEY SILT, some sand, trace gravel (TILL)<br>Stiff to very stiff<br>Brown/grey<br>Moist |            | 2      | SS   | 11                      |                 |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
|              |   |            | 3      | SS   | 13                      |                 |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
|              |   |            | 4      | SS   | 28                      |                 |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
|              |   |            | 5      | SS   | 27                      |                 |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
|              |   |            | 6      | SS   | 24                      |                 |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
|              |   |            | 7      | SS   | 24                      |                 |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
| 92.5         |   |            |        |      |                         | 93              |  |                    |    |    |     |                                 |                               |                                |                  |                                       |
| 5.2          | END OF BOREHOLE<br><br>Note:<br>1. Borehole dry upon completion of drilling operations.   |            |        |      |                         |                 |  |                    |    |    |     |                                 |                               |                                |                  |                                       |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No W-35</b>                          | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781762.7 ; E 325633.9</u>                   | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>Power Auger, 108 mm Solid Stem Augers</u> | COMPILED BY <u>SG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>June 13, 2005</u>                                  | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>w | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |    |  |    |    |    |    |  |  |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|----|--|----|----|----|----|--|--|
| ELEV DEPTH   | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |    |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |    |  |    |    |    |    |  |  |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 | 20 | 40                              | 60                            | 80                             | 100              | 10                                    | 20                | 30 |  | GR | SA | SI | CL |  |  |
| 98.5         | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 98.0         | Sand and gravel (FILL)   |            | 1      | SS   | 23                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 98.2         | Compact  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 0.3          | Brown  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 97.7         | Moist  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 0.8          | Clayey silt, some sand, trace gravel (FILL)                      |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 97.0         | Very stiff   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 97.7         | Brown  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 1.5          | Moist  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
|              | CLAYEY SILT, some sand, containing organics                      |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
|              | Very stiff   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
|              | Brown/black  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
|              | Moist  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
|              | CLAYEY SILT, some sand, trace gravel (TILL)                      |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
|              | Stiff to very stiff  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
|              | Brown  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
|              | Moist  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 93.3         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |
| 5.2          | Note:<br>1. Borehole dry upon completion of drilling operations. |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |  |    |    |    |    |  |  |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No W-36</b>                          | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781744.4 ; E 325706.6</u>                   | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>Power Auger, 108 mm Solid Stem Augers</u> | COMPILED BY <u>SG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>June 13, 2005</u>                                  | CHECKED BY <u>LCC</u>    |

| ELEV<br>DEPTH | SOIL PROFILE<br>DESCRIPTION   | STRAT PLOT | SAMPLES |      |            | GROUND WATER<br>CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION<br>RESISTANCE PLOT               |    |    |    |     | PLASTIC<br>LIMIT<br>W <sub>p</sub> | NATURAL<br>MOISTURE<br>CONTENT<br>W | LIQUID<br>LIMIT<br>W <sub>L</sub> | UNIT<br>WEIGHT<br>$\gamma$<br>kN/m <sup>3</sup> | REMARKS<br>&<br>GRAIN SIZE<br>DISTRIBUTION<br>(%) |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---|---|
|               |   |            | NUMBER  | TYPE | "N" VALUES |                            |                 | SHEAR STRENGTH kPa  |    |    |    |     |                                    |                                     |                                   |   |   |
|               |   |            |         |      |            |                            |                 | 20  | 40 | 60 | 80 | 100 |                                    |                                     |                                   |   |   |
|               |   |            |         |      |            |                            |                 | ○ UNCONFINED + FIELD VANE<br>● QUICK TRIAXIAL × REMOULDED |    |    |    |     |                                    |                                     |                                   |   |   |
|               |   |            |         |      |            |                            |                 | WATER CONTENT (%)   |    |    |    |     |                                    |                                     |                                   |   |   |
|               |   |            |         |      |            |                            |                 | 20  | 40 | 60 | 80 | 100 | 10                                 | 20                                  | 30                                |   |   |
| 99.1          | GROUND SURFACE  |            |         |      |            |                            |                 |   |    |    |    |     |                                    |                                     |                                   |   |   |
| 98.8          | Sand and gravel (FILL)<br>Compact<br>Brown<br>Moist                                 |            | 1       | SS   | 10         |                            | 99              |   |    |    |    |     |                                    |                                     |                                   |   |   |
| 98.3          | Clayey silt, some sand, trace gravel (FILL)<br>Stiff<br>Brown<br>Moist              |            | 2       | SS   | 17         |                            | 98              |   |    |    |    |     |                                    |                                     |                                   |   |   |
| 97.6          | SILTY SAND, containing organics<br>Compact<br>Brown/black<br>Moist                  |            | 3       | SS   | 17         |                            | 97              |   |    |    |    |     | ○                                  | —                                   | —                                 |   |   |
| 1.5           | CLAYEY SILT, some sand, trace gravel (TILL)<br>Very stiff to hard<br>Brown<br>Moist |            | 4       | SS   | 31         |                            | 96              |   |    |    |    |     |                                    |                                     |                                   |   |   |
|               |   |            | 5       | SS   | 26         |                            | 95              |   |    |    |    |     | ○                                  |                                     |                                   |   |   |
|               |   |            | 6       | SS   | 28         |                            | 94              |   |    |    |    |     |                                    |                                     |                                   |   |   |
|               |   |            | 7       | SS   | 23         |                            | 93              |   |    |    |    |     |                                    |                                     |                                   |   |   |
| 93.9          | END OF BOREHOLE   |            |         |      |            |                            | 94              |   |    |    |    |     |                                    |                                     |                                   |   | 1 11 51 37  |
| 5.2           | Note:<br>1. Borehole dry upon completion of drilling operations.                    |            |         |      |            |                            |                 |   |    |    |    |     |                                    |                                     |                                   |   |   |

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

**RECORD OF BOREHOLE No W-37** 1 OF 1 **METRIC**

PROJECT 04-1111-002 W.P. 607-00-00 LOCATION N 4781736.7 ; E 325782.0 ORIGINATED BY PKS

DIST Central HWY QEW BOREHOLE TYPE 108 mm Diameter Solid Stem Augers COMPILED BY SG

DATUM Geodetic DATE June 16, 2005 CHECKED BY LCC

| SOIL PROFILE |   | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH   | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |
| 104.7        | GROUND SURFACE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.0          | ASPHALT   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.2          | Sand and gravel (FILL)  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 104.1        | Compact Brown Moist   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.6          | Foundry sand (FILL) Very dense Black Moist                            |            | 1      | SS   | 90                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 2      | SS   | 46                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 3      | SS   | 78                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 4      | SS   | 70                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 5      | SS   | 53                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 6      | SS   | 66                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 98.8         | Concrete  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 6.1          | Silty sand (FILL) Loose Black Moist                                   |            | 7      | SS   | 9                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 97.1         | CLAYEY SILT, some sand, trace gravel (TILL) Stiff to hard Brown Moist |            | 8      | SS   | 32                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              | Grey below 9.1 m depth  |            | 9      | SS   | 11                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 95.0         | END OF BOREHOLE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 9.8          | Note:<br>1. Borehole dry upon completion of drilling operations.      |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

**RECORD OF BOREHOLE No W-42** 1 OF 1 **METRIC**

PROJECT 04-1111-002 W.P. 607-00-00 LOCATION N 4781686.7 ; E 325975.7 ORIGINATED BY PKS

DIST Central HWY QEW BOREHOLE TYPE 108 mm Diameter Solid Stem Augers COMPILED BY SG

DATUM Geodetic DATE June 17, 2005 CHECKED BY LCC

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |                   |    |    |    |    |    |  |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|----|----|----|----|----|--|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |    |                                 |                               |                                |                  |                                       | WATER CONTENT (%) |    |    |    |    |    |  |
|              |  |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 | 20 | 40                              | 60                            | 80                             | 100              | 10                                    | 20                | 30 | GR | SA | SI | CL |  |
| 106.1        | GROUND SURFACE   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
| 0.2          | Silty sand, trace gravel, trace slag pieces (FILL)<br>Compact to dense Red Moist |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
|              |  |            | 1      | SS   | 46                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
|              |  |            | 2      | SS   | 17                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
|              |  |            | 3      | SS   | 18                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
|              |  |            | 4      | SS   | 14                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
|              |  |            | 5      | SS   | 27                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
|              |  |            | 6      | SS   | 18                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
| 100.2        | Concrete   |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
| 6.1          | CLAYEY SILT, some sand, containing organics<br>Firm Grey/black Moist/wet         |            | 7      | SS   | 6                       |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
| 98.5         | CLAYEY SILT, some sand, trace gravel (TILL)<br>Hard Brown Moist                  |            | 8      | SS   | 35                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
| 97.0         | Silty SAND<br>Dense Grey Wet   |            | 9      | SS   | 46                      |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
| 96.4         | END OF BOREHOLE  |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |
| 98.8         | Note:<br>1. Borehole dry upon completion of drilling operations.                 |            |        |      |                         |                 |  |                    |    |     |    |                                 |                               |                                |                  |                                       |                   |    |    |    |    |    |  |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No W-43</b>                      | 1 OF 1 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781657.9 ; E 326045.0</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>SG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>July 12, 2005</u>                              | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE |   | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    |    |     |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>w | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|------------|--------|------|-------------------------|-----------------|--|--------------------|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH   | DESCRIPTION   | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            |        |      |                         | 20              | 40                                       | 60                 | 80 | 100 |  |                                 |                               |                                |                  |                                       |
| 100.4        | GROUND SURFACE  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 0.0          | ASPHALT   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              | Sand and gravel (FILL)<br>Compact<br>Brown<br>Moist   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 99.3         |   |            | 1      | SS   | 17                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 1.1          | CLAYEY SILT to SILTY CLAY, trace to some sand, trace gravel (TILL)<br>Stiff to very stiff<br>Brown<br>Moist |            | 2      | SS   | 19                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 3      | SS   | 14                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 4      | SS   | 12                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 5      | SS   | 13                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 6      | SS   | 9                       |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
|              |   |            | 7      | SS   | 12                      |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 93.7         | END OF BOREHOLE   |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |
| 6.7          | Note:<br>1. Borehole dry upon completion of drilling operations.  |            |        |      |                         |                 |  |                    |    |     |  |                                 |                               |                                |                  |                                       |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE



**RECORD OF BOREHOLE No W-45** 1 OF 2 **METRIC**

PROJECT 04-1111-002 W.P. 607-00-00 LOCATION N 4781618.7 ; E 326189.8 ORIGINATED BY PKS

DIST Central HWY QEW BOREHOLE TYPE 108 mm Diameter Solid Stem Augers COMPILED BY SG

DATUM Geodetic DATE July 13, 2005 CHECKED BY LCC

| SOIL PROFILE |  | SAMPLES    |        |      | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                    | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>w | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|--------|------|-------------------------|-----------------|--|--------------------|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV. DEPTH  | DESCRIPTION  | STRAT PLOT | NUMBER | TYPE |                         |                 | "N" VALUES                               | SHEAR STRENGTH kPa |                                 |                               |                                |                  |                                       |
| 101.2        | GROUND SURFACE   |            |        |      |                         |                 |  |                    |                                 |                               |                                |                  |                                       |
| 0.0          | ASPHALT  |            |        |      |                         |                 |  |                    |                                 |                               |                                |                  |                                       |
| 0.1          | Sand and gravel (FILL)<br>Compact<br>Brown<br>Moist  |            | 1      | SS   | 17                      |                 |  |                    |                                 |                               |                                |                  |                                       |
| 99.7         |  |            |        |      |                         |                 |  |                    |                                 |                               |                                |                  |                                       |
| 1.7          | Silty SAND, trace gravel<br>Compact<br>Brown<br>Moist  |            | 2      | SS   | 11                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              | CLAYEY SILT, some sand, trace gravel (TILL)<br>Stiff<br>Grey<br>Moist                                      |            | 3      | SS   | 7                       |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |  |            | 4      | SS   | 6                       |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |  |            | 5      | SS   | 7                       |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |  |            | 6      | SS   | 7                       |                 |  |                    |                                 |                               |                                |                  |                                       |
| 94.3         |  |            |        |      |                         |                 |  |                    |                                 |                               |                                |                  |                                       |
| 6.9          | SILTY CLAY to CLAYEY SILT, trace to some sand, trace gravel (TILL)<br>Stiff to very stiff<br>Grey<br>Moist |            | 7      | SS   | 11                      |                 |  |                    |                                 |                               |                                | 1 7 46 46        |                                       |
|              |  |            | 8      | SS   | 15                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |  |            | 9      | SS   | 11                      |                 |  |                    |                                 |                               |                                |                  |                                       |
|              |  |            | 10     | SS   | 12                      |                 |  |                    |                                 |                               |                                |                  |                                       |
| 87.0         |  |            |        |      |                         |                 |  |                    |                                 |                               |                                |                  |                                       |
| 14.3         | Silty SAND, some gravel, trace clay<br>Compact<br>Red  |            | 11     | SS   | 16                      |                 |  |                    |                                 |                               |                                |                  |                                       |

MIS-MTO.001\_041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

Continued Next Page

+<sup>3</sup>, X<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

|                                    |  |                          |
|------------------------------------|--|--------------------------|
| PROJECT <u>04-1111-002</u>         | <b>RECORD OF BOREHOLE No W-45</b>                      | 2 OF 2 <b>METRIC</b>     |
| W.P. <u>607-00-00</u>              | LOCATION <u>N 4781618.7 ; E 326189.8</u>               | ORIGINATED BY <u>PKS</u> |
| DIST <u>Central</u> HWY <u>QEW</u> | BOREHOLE TYPE <u>108 mm Diameter Solid Stem Augers</u> | COMPILED BY <u>SG</u>    |
| DATUM <u>Geodetic</u>              | DATE <u>July 13, 2005</u>                              | CHECKED BY <u>LCC</u>    |

| SOIL PROFILE  |   | SAMPLES       |        |      | GROUND WATER<br>CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION<br>RESISTANCE PLOT |    |    |    |    | PLASTIC<br>LIMIT<br>W <sub>p</sub> | NATURAL<br>MOISTURE<br>CONTENT<br>W | LIQUID<br>LIMIT<br>W <sub>L</sub> | UNIT<br>WEIGHT<br>$\gamma$<br>kN/m <sup>3</sup> | REMARKS<br>&<br>GRAIN SIZE<br>DISTRIBUTION<br>(%)<br>GR SA SI CL |
|---------------|---|---------------|--------|------|----------------------------|-----------------|---|----|----|----|----|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| ELEV<br>DEPTH | DESCRIPTION   | STRAT PLOT    | NUMBER | TYPE |                            |                 | "N" VALUES                                  | 20 | 40 | 60 | 80 |                                    |                                     |                                   |   |  |
|               | --- CONTINUED FROM PREVIOUS PAGE ---  |               |        |      |                            |                 |   |    |    |    |    |                                    |                                     |                                   |   |  |
| 85.4<br>15.9  | CLAYEY SILT, some sand, trace gravel (TILL)<br>Very stiff<br>Grey<br>Moist              | [Hatched Box] | 12     | SS   | 18                         |                 |   |    |    |    |    |                                    |                                     | [Moisture Content Plot]           |   |  |
|               | END OF BOREHOLE<br><br>Note:<br>1. Borehole dry upon completion of drilling operations. |               |        |      |                            |                 |   |    |    |    |    |                                    |                                     |                                   |   |  |

MIS-MTO 001 041111002AAMTO.GPJ GAL-MISS.GDT 2/26/07

+<sup>3</sup>, X<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

**METRIC**  
 DIMENSIONS ARE IN METRES AND/OR  
 MILLIMETRES UNLESS OTHERWISE SHOWN.  
 STATIONS IN KILOMETRES + METRES.

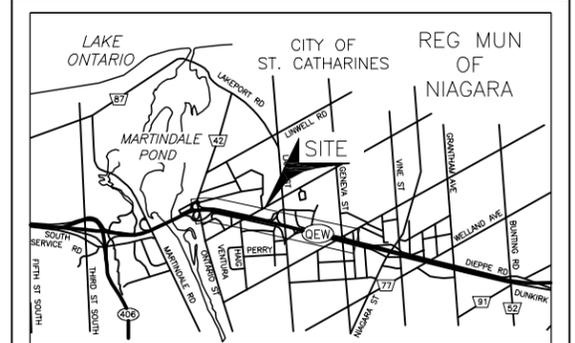
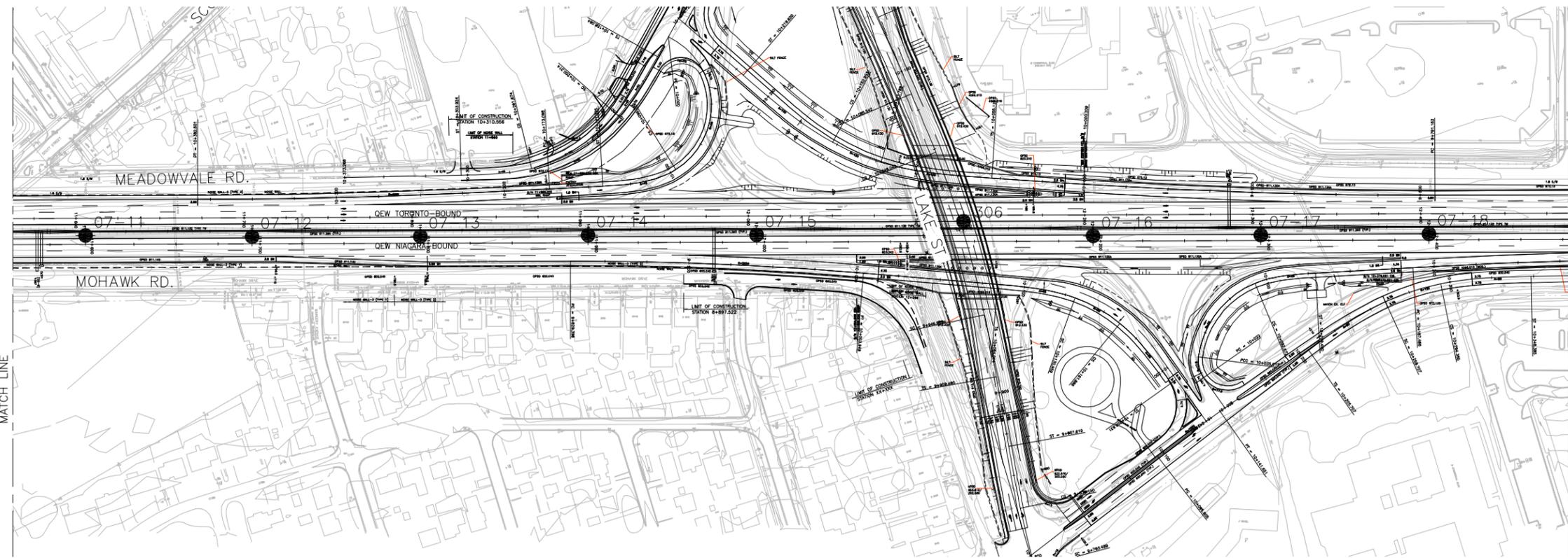
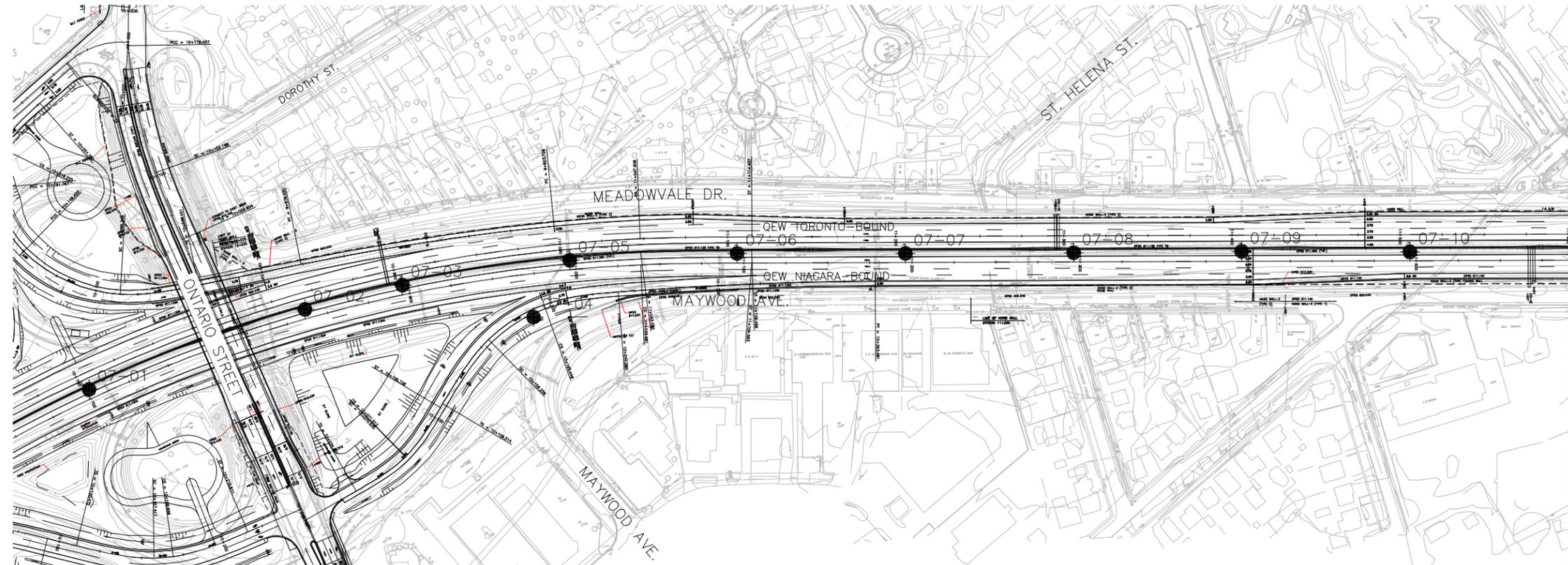
CONT No.  
 WP No. 607-00-00

QEW WIDENING  
 PROTECTION SYSTEMS  
 BOREHOLE LOCATIONS

SHEET



**Golder Associates Ltd.**  
 MISSISSAUGA, ONTARIO, CANADA



**LEGEND**

● Existing Borehole - Golder Investigation

| No.   | ELEVATION | CO-ORDINATES |          |
|-------|-----------|--------------|----------|
|       |           | NORTHING     | EASTING  |
| 07-01 | 92.5      | 4782216.2    | 323649.2 |
| 07-02 | 93.1      | 4782229.5    | 323785.5 |
| 07-03 | 93.3      | 4782228.7    | 323845.2 |
| 07-04 | 93.0      | 4782190.7    | 323915.8 |
| 07-05 | 93.7      | 4782217.8    | 323945.2 |
| 07-06 | 94.1      | 4782196.5    | 324042.5 |
| 07-07 | 94.6      | 4782171.1    | 324139.4 |
| 07-08 | 94.9      | 4782146.1    | 324236.3 |
| 07-09 | 95.1      | 4782121.6    | 324333.2 |
| 07-10 | 95.3      | 4782096.0    | 324429.9 |
| 07-11 | 95.4      | 4782071.1    | 324526.7 |
| 07-12 | 95.7      | 4782045.3    | 324622.4 |
| 07-13 | 95.8      | 4782020.2    | 324719.3 |
| 07-14 | 96.1      | 4781995.5    | 324815.9 |
| 07-15 | 96.2      | 4781970.3    | 324913.0 |
| 07-16 | 96.9      | 4781919.1    | 325106.5 |
| 07-17 | 97.2      | 4781894.2    | 325203.1 |
| 07-18 | 97.1      | 4781869.6    | 325300.1 |
| 306   | 96.8      | 4781946.9    | 325034.1 |



PLOT DATE: February 08, 2007  
 FILENAME: \\projects\2004\04-1111-002 (M, StCatherine)\-LB- (QEW BBS Ontario St. to Geneva St)\041111002.B001.dwg

| NO. | DATE | BY | REVISION |
|-----|------|----|----------|
|     |      |    |          |

Geocres No. \_\_\_\_\_ PROJECT NO. 04-1111-002 DIST. \_\_\_\_\_

|             |           |                |        |
|-------------|-----------|----------------|--------|
| HWY. QEW    | CHKD. KG  | DATE: FEB 2007 | SITE:  |
| SUBM'D. LCC | CHKD. LCC | APPD. LCC      | DWG. 1 |

**METRIC**  
 DIMENSIONS ARE IN METRES AND/OR  
 MILLIMETRES UNLESS OTHERWISE SHOWN.  
 STATIONS IN KILOMETRES + METRES.

CONT No.  
 WP No. 607-00-00

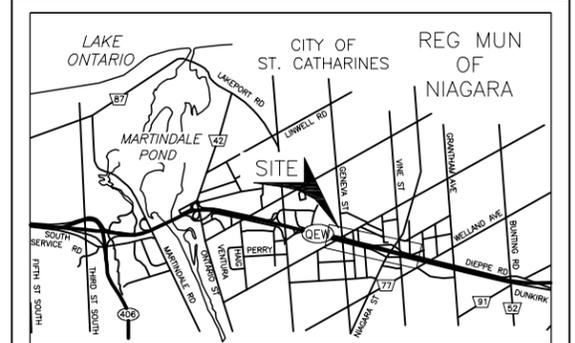
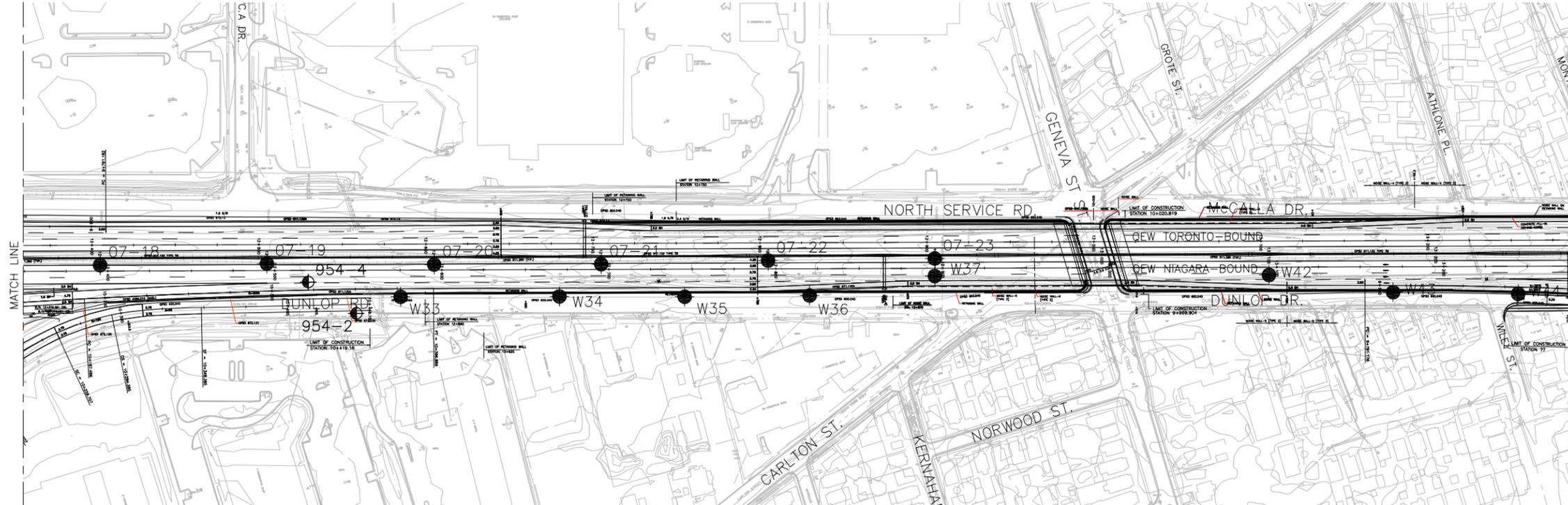


QEW WIDENING  
 PROTECTION SYSTEMS  
 BOREHOLE LOCATIONS

SHEET



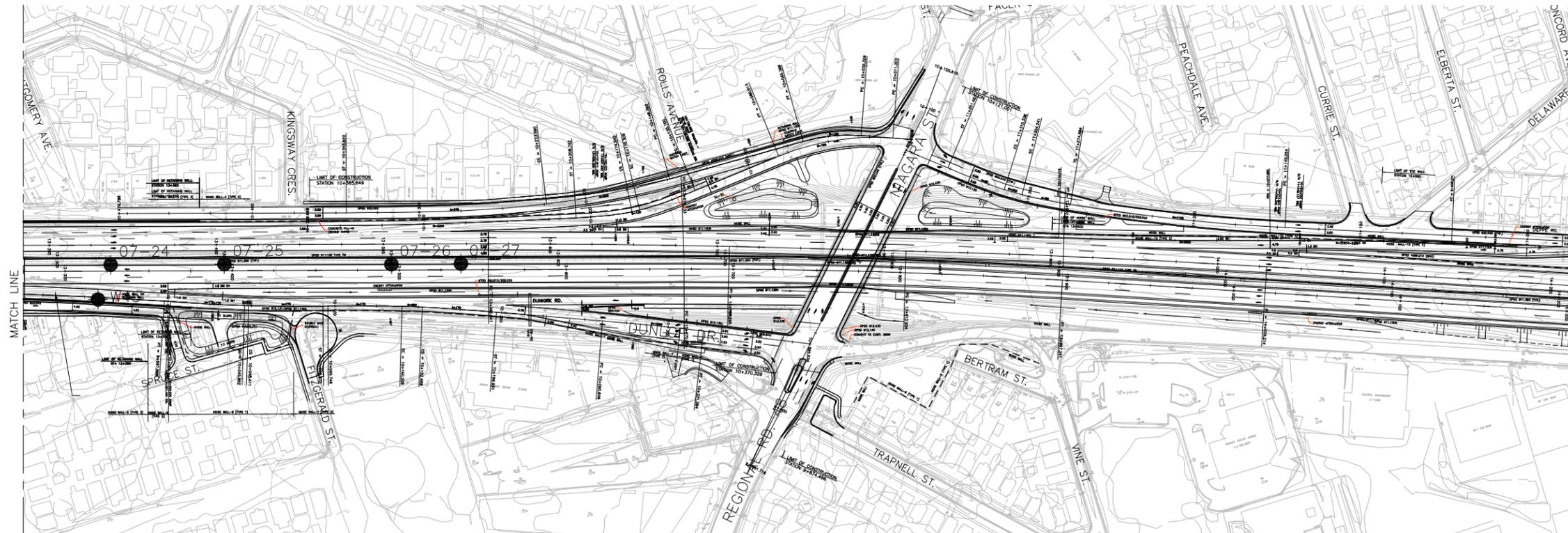
**Golder Associates Ltd.**  
 MISSISSAUGA, ONTARIO, CANADA



**KEY PLAN**  
 SCALE  
 1 0 1 km

**LEGEND**

- Existing Borehole - Golder Investigation
- ⊕ Existing Borehole - Previous MTO Investigation



| No.   | ELEVATION | CO-ORDINATES |          |
|-------|-----------|--------------|----------|
|       |           | NORTHING     | EASTING  |
| 07-18 | 97.1      | 4781869.6    | 325300.1 |
| 07-19 | 96.9      | 4781845.2    | 325396.9 |
| 07-20 | 97.5      | 4781819.3    | 325493.7 |
| 07-21 | 99.2      | 4781794.2    | 325590.5 |
| 07-22 | 102.2     | 4781770.9    | 325687.7 |
| 07-23 | 104.7     | 4781746.8    | 325784.6 |
| 07-24 | 102.5     | 4781636.9    | 326202.4 |
| 07-25 | 101.9     | 4781620.0    | 326268.4 |
| 07-26 | 102.2     | 4781594.6    | 326365.1 |
| 07-27 | 102.0     | 4781584.4    | 326405.4 |
| W-33  | 97.0      | 4781805.7    | 325469.4 |
| W-34  | 97.7      | 4781781.9    | 325561.5 |
| W-35  | 98.5      | 4781762.7    | 325633.9 |
| W-36  | 99.1      | 4781744.4    | 325706.6 |
| W-37  | 104.7     | 4781736.7    | 325782.0 |
| W-42  | 106.1     | 4781686.7    | 325975.7 |
| W-43  | 100.4     | 4781657.9    | 326045.0 |
| W-44  | 100.8     | 4781638.0    | 326117.2 |
| W-45  | 101.2     | 4781618.7    | 326189.8 |
| 954-2 | 97.2      | 4781803.0    | 325441.3 |
| 954-4 | 97.3      | 4781828.3    | 325418.1 |

**PLAN**  
 SCALE  
 30 0 30 60 m

PLOT DATE: February 15, 2007  
 FILENAME: \\projects\2004\04-1111-002 (M4, StCatharines)\-B- (QEW BBS Ontario St. to Geneva St)\041111002.B002.dwg

| NO. | DATE | BY | REVISION |
|-----|------|----|----------|
|     |      |    |          |

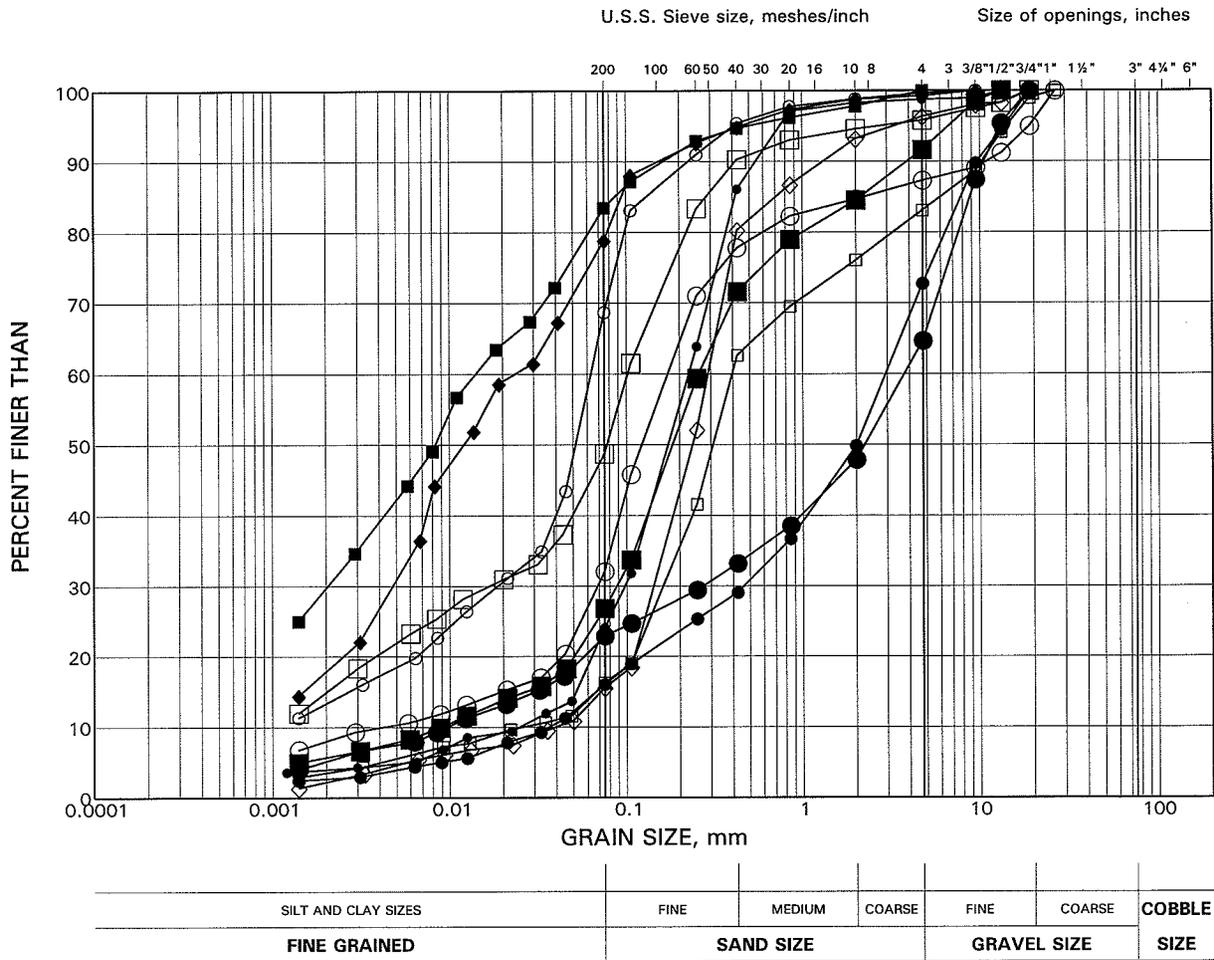
Geocres No. \_\_\_\_\_ PROJECT NO. 04-1111-002 DIST. \_\_\_\_\_

|             |           |                |        |
|-------------|-----------|----------------|--------|
| HWY. QEW    | CHKD. LCC | DATE: FEB 2007 | SITE:  |
| SUBM'D. LCC | CHKD. KG  | APPD. LCC      | DWG. 2 |

# GRAIN SIZE DISTRIBUTION TEST RESULTS

## Fill

FIGURE 1



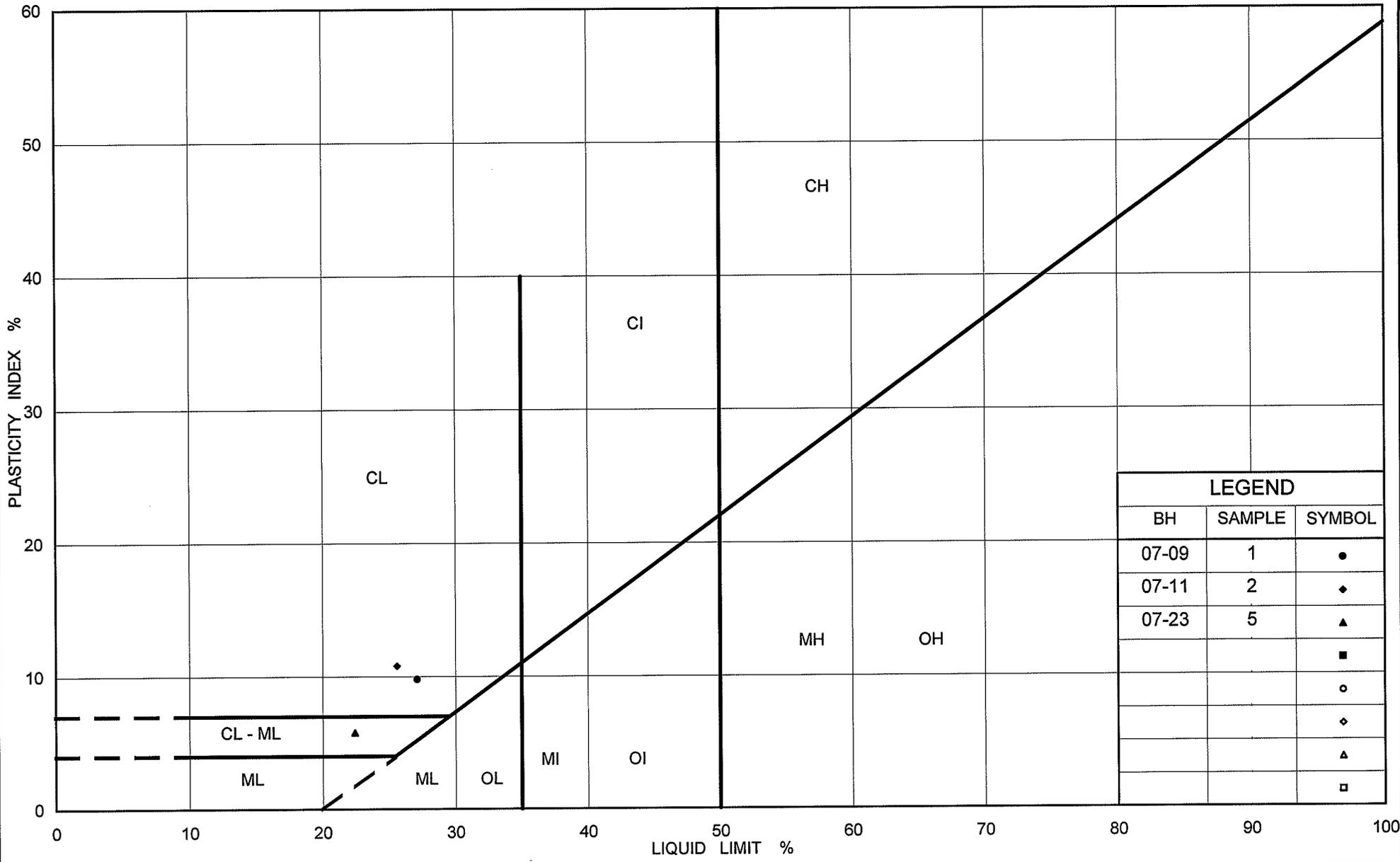
### LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION (m) |
|--------|----------|--------|---------------|
| ●      | 07-05    | 1      | 92.7          |
| ■      | 07-09    | 1      | 94.1          |
| ◆      | 07-11    | 2      | 93.6          |
| ○      | 07-15    | 1      | 95.1          |
| □      | 07-21    | 1      | 98.1          |
| ◇      | 07-22    | 2      | 100.4         |
| ●      | 07-23    | 1      | 103.7         |
| ■      | 07-24    | 1      | 101.5         |
| ○      | 07-24    | 2      | 100.7         |
| □      | 07-25    | 1      | 100.8         |
| •      | W-42     | 3      | 103.5         |

Date February, 2007  
Project 04-1111-002

**Golder Associates**

Prepared by LG  
Checked by *lll*

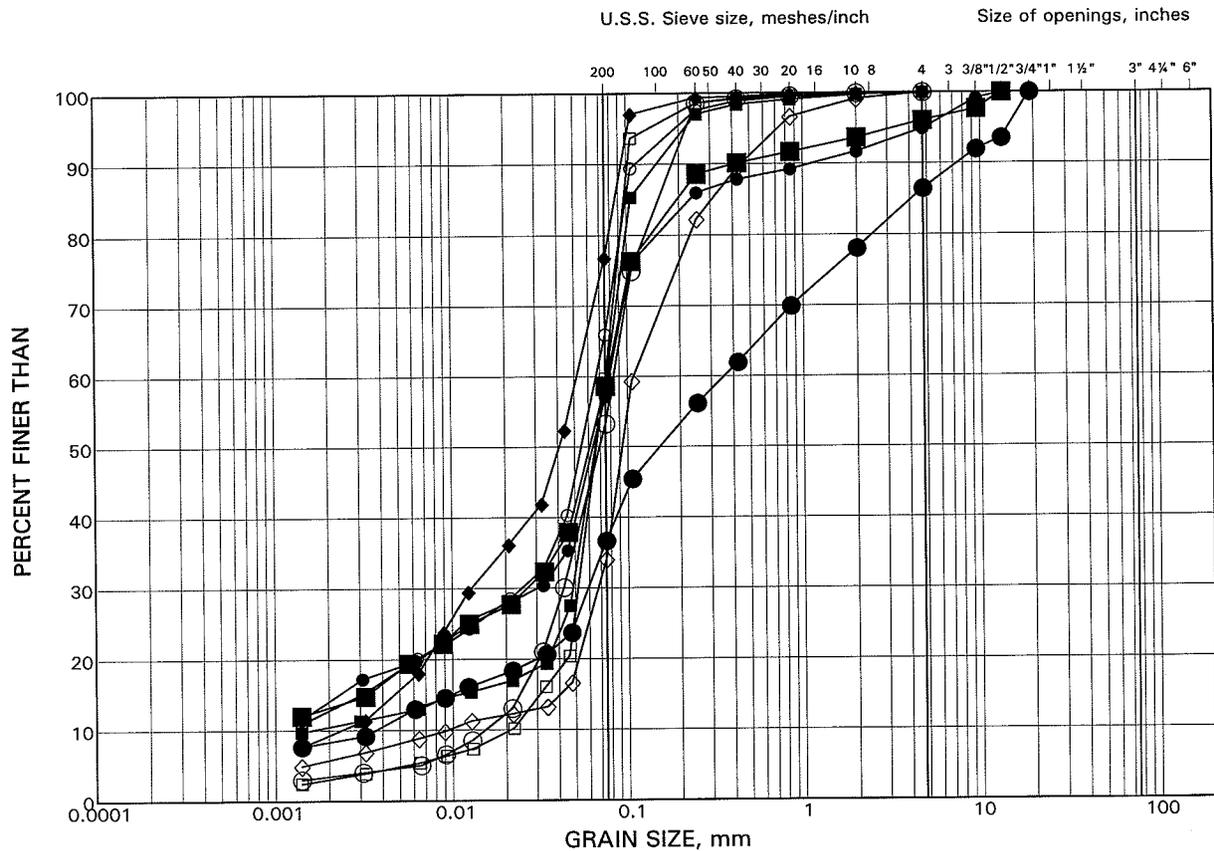


## PLASTICITY CHART Fill

# GRAIN SIZE DISTRIBUTION TEST RESULTS

## Surficial Sand to Sandy Silt

FIGURE 3



|                     |  |           |        |        |             |        |        |
|---------------------|--|-----------|--------|--------|-------------|--------|--------|
| SILT AND CLAY SIZES |  | FINE      | MEDIUM | COARSE | FINE        | COARSE | COBBLE |
| FINE GRAINED        |  | SAND SIZE |        |        | GRAVEL SIZE |        | SIZE   |

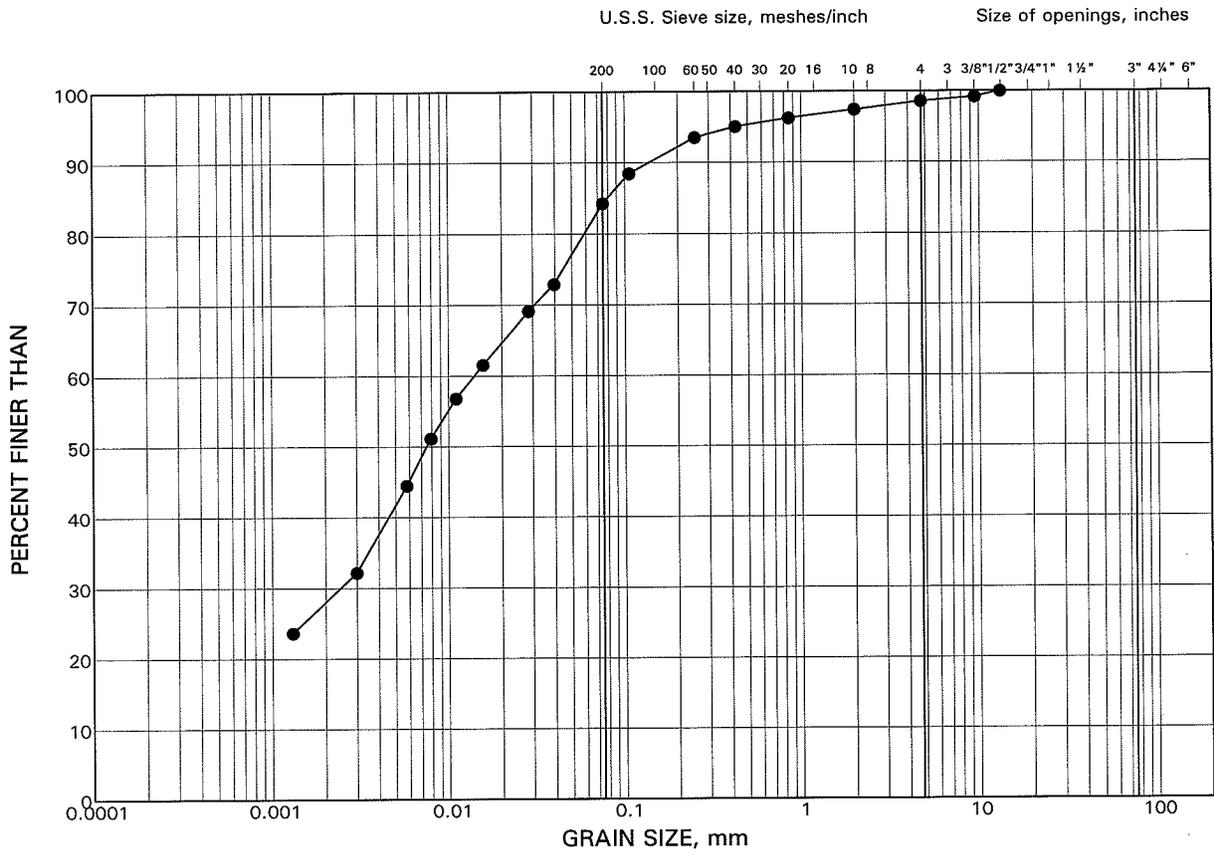
### LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION (m) |
|--------|----------|--------|---------------|
| ●      | 07-07    | 1      | 93.6          |
| ■      | 07-08    | 1      | 93.8          |
| ◆      | 07-12    | 2      | 93.8          |
| ○      | 07-14    | 1      | 95.0          |
| □      | 07-15    | 2      | 94.5          |
| ◇      | 07-16    | 1      | 95.8          |
| ●      | 07-17    | 1      | 96.1          |
| ■      | 07-19    | 1      | 95.8          |
| ○      | 07-27    | 1      | 100.9         |

# GRAIN SIZE DISTRIBUTION TEST RESULT

## Surficial Clayey Silt

FIGURE 4



|                     |  |  |           |        |        |             |        |                |
|---------------------|--|--|-----------|--------|--------|-------------|--------|----------------|
| SILT AND CLAY SIZES |  |  | FINE      | MEDIUM | COARSE | FINE        | COARSE | COBBLE<br>SIZE |
| FINE GRAINED        |  |  | SAND SIZE |        |        | GRAVEL SIZE |        |                |

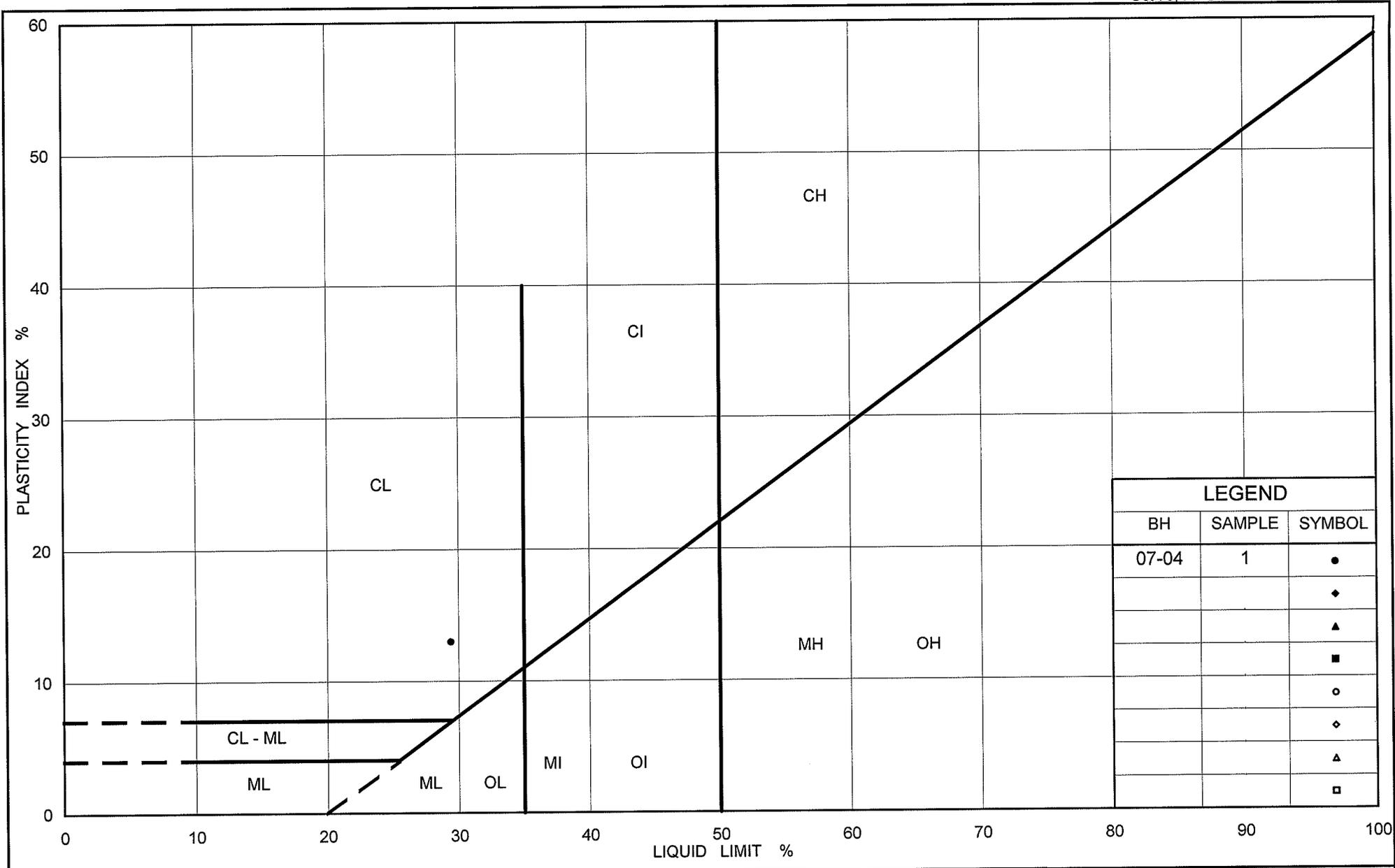
### LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION (m) |
|--------|----------|--------|---------------|
| ●      | 07-04    | 1      | 91.9          |

Date February, 2007  
Project 04-1111-002

**Golder Associates**

Prepared by LG  
Checked by *ll*



| LEGEND |        |        |
|--------|--------|--------|
| BH     | SAMPLE | SYMBOL |
| 07-04  | 1      | ●      |
|        |        | ◆      |
|        |        | ▲      |
|        |        | ■      |
|        |        | ○      |
|        |        | ◇      |
|        |        | △      |
|        |        | □      |


 Ministry of Transportation  
 Ontario

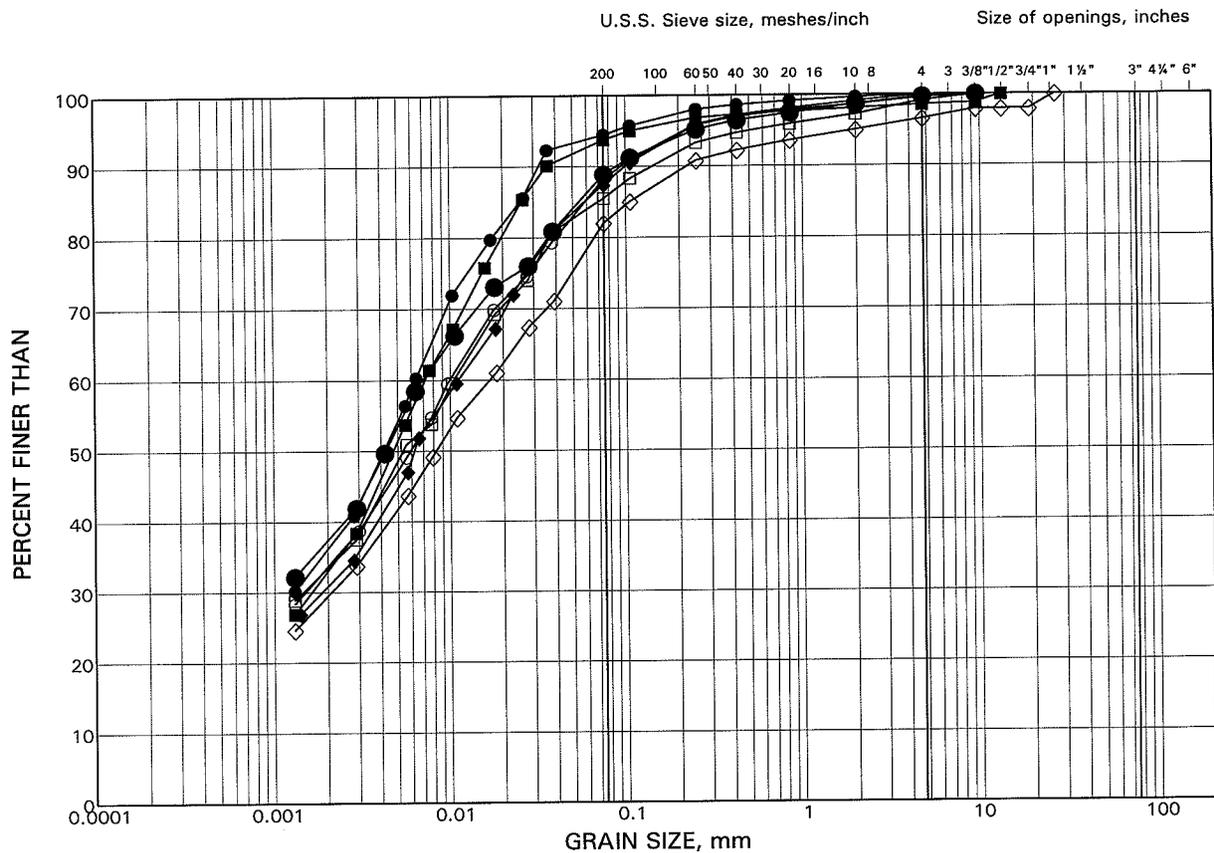
**PLASTICITY CHART**  
**Surficial Clayey Silt**

FIG No. 5  
 Project No. 04-1111-002  
 Checked by *ll*

# GRAIN SIZE DISTRIBUTION TEST RESULTS

## Clayey Silt to Silty Clay Till

FIGURE 6A



|                     |  |           |        |        |             |        |        |
|---------------------|--|-----------|--------|--------|-------------|--------|--------|
| SILT AND CLAY SIZES |  | FINE      | MEDIUM | COARSE | FINE        | COARSE | COBBLE |
| FINE GRAINED        |  | SAND SIZE |        |        | GRAVEL SIZE |        | SIZE   |

### LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION (m) |
|--------|----------|--------|---------------|
| ●      | 07-01    | 2      | 90.7          |
| ■      | 07-02    | 6      | 85.2          |
| ◆      | 07-03    | 1      | 92.3          |
| ○      | 07-06    | 2      | 92.3          |
| □      | 07-10    | 5      | 88.9          |
| ◇      | 07-13    | 5      | 89.4          |
| ●      | 07-18    | 2      | 95.3          |

Date February, 2007  
Project 04-1111-002

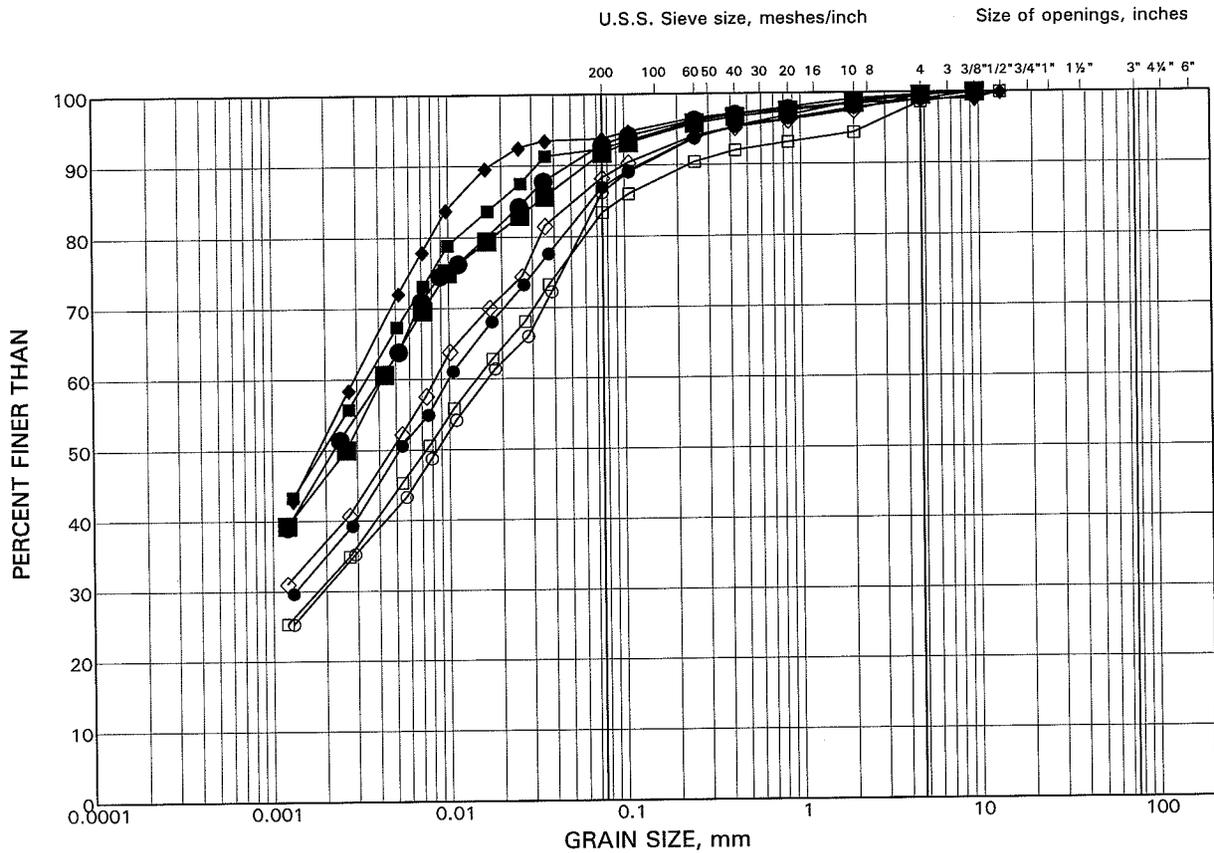
**Golder Associates**

Prepared by LG  
Checked by lll

# GRAIN SIZE DISTRIBUTION TEST RESULTS

Clayey Silt to Silty Clay Till

FIGURE 6B



|                     |  |           |        |        |             |        |        |
|---------------------|--|-----------|--------|--------|-------------|--------|--------|
| SILT AND CLAY SIZES |  | FINE      | MEDIUM | COARSE | FINE        | COARSE | COBBLE |
| FINE GRAINED        |  | SAND SIZE |        |        | GRAVEL SIZE |        | SIZE   |

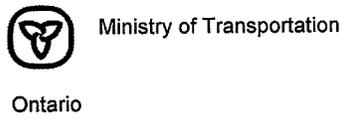
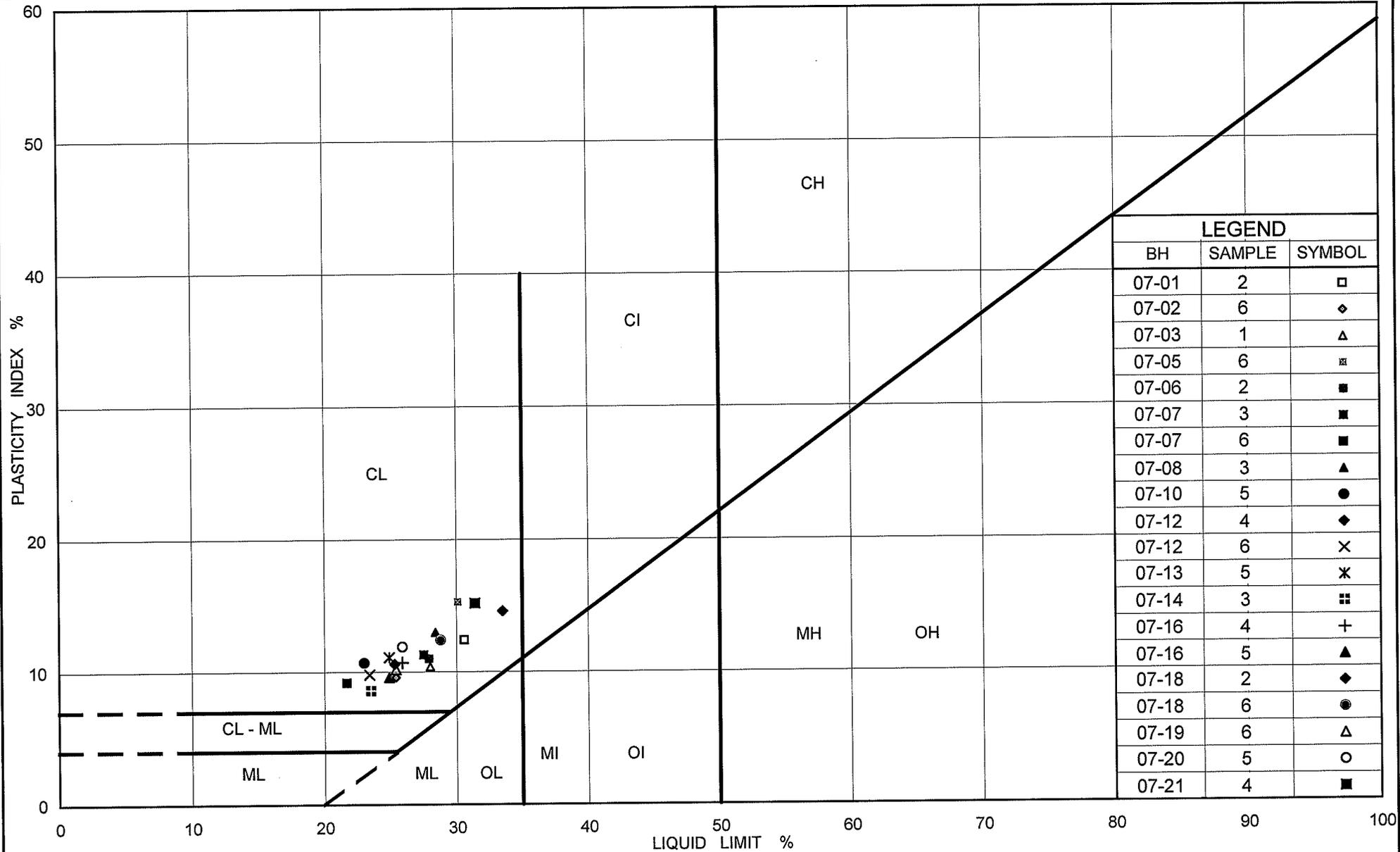
### LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION (m) |
|--------|----------|--------|---------------|
| ●      | 07-20    | 5      | 91.1          |
| ■      | 07-24    | 6      | 94.6          |
| ◆      | 07-26    | 4      | 97.3          |
| ○      | 306      | 9      | 88.9          |
| □      | W-34     | 5      | 94.3          |
| ◇      | W-36     | 7      | 94.2          |
| ●      | W-44     | 2      | 99.0          |
| ■      | W-45     | 7      | 93.3          |

Date February, 2007  
Project 04-1111-002

**Golder Associates**

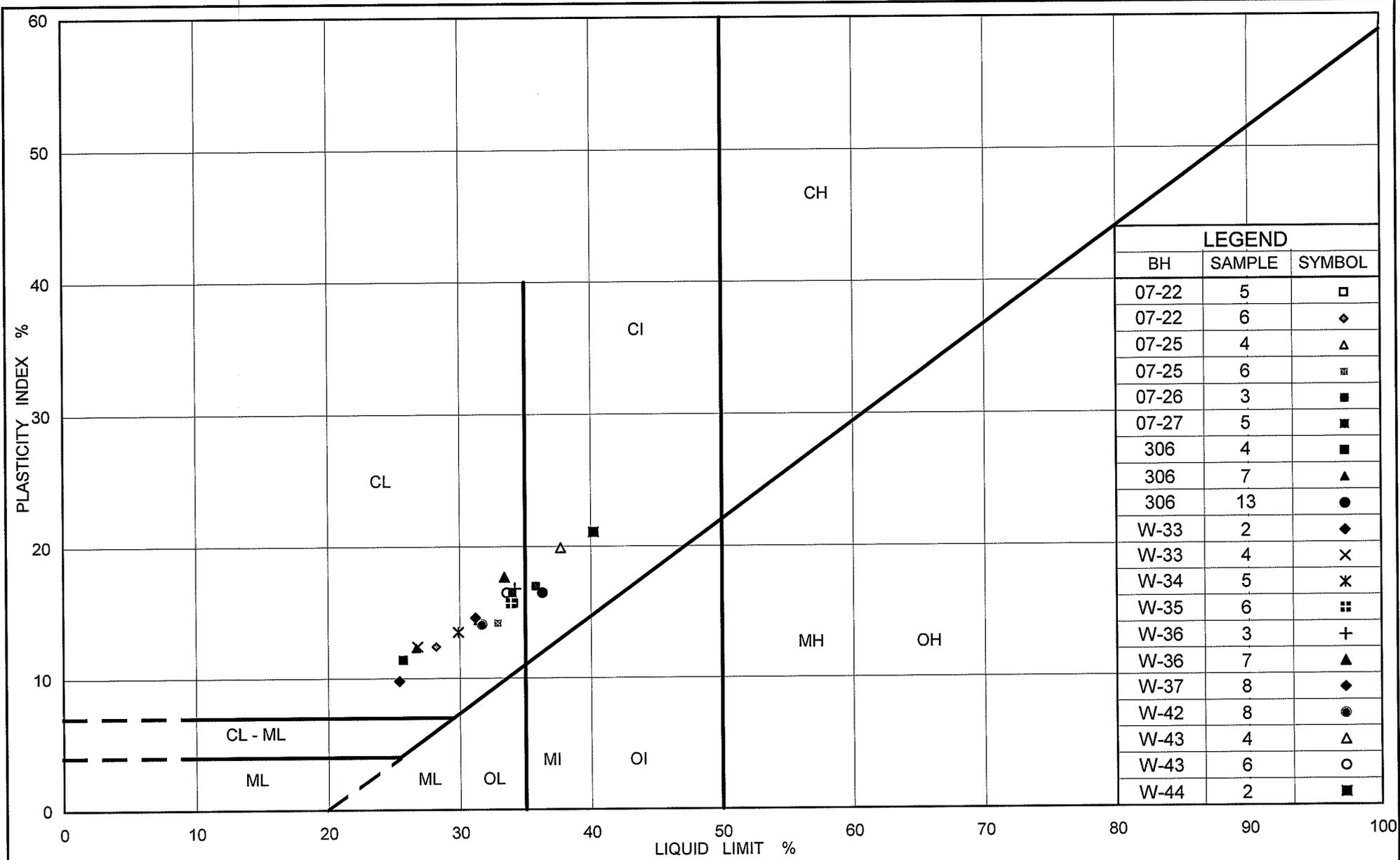
Prepared by LG  
Checked by *lll*



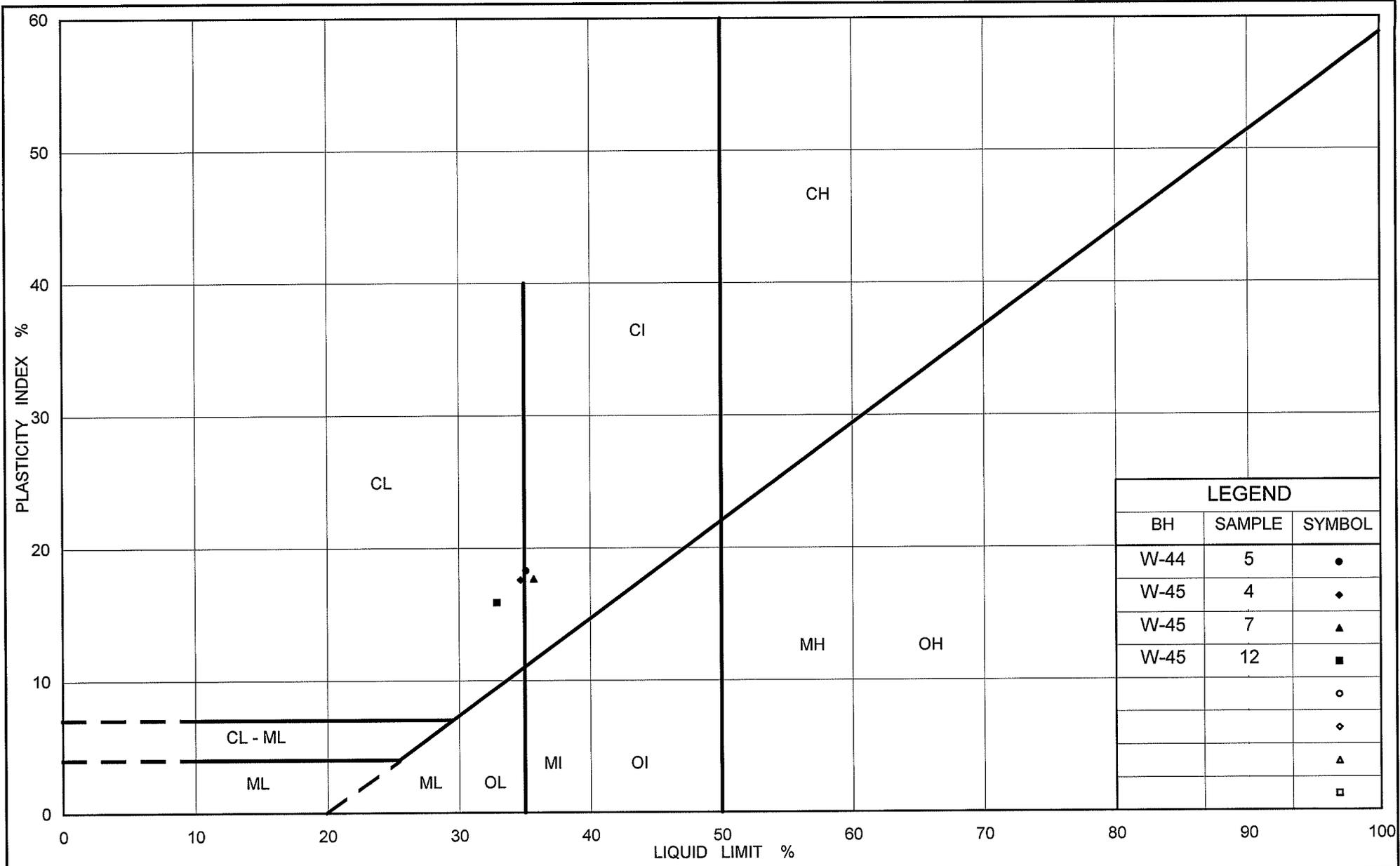
### PLASTICITY CHART

Clayey Silt to Silty Clay Till

FIG No. 7A  
 Project No. 04-1111-002  
 Checked by: *lll*



### PLASTICITY CHART Clayey Silt to Silty Clay Till



| LEGEND |        |        |
|--------|--------|--------|
| BH     | SAMPLE | SYMBOL |
| W-44   | 5      | ●      |
| W-45   | 4      | ◆      |
| W-45   | 7      | ▲      |
| W-45   | 12     | ■      |
|        |        | ○      |
|        |        | ◇      |
|        |        | ▲      |
|        |        | ■      |


 Ministry of Transportation  
 Ontario

**PLASTICITY CHART**  
 Clayey Silt to Silty Clay Till

FIG No. 7C  
 Project No. 04-1111-002  
 Checked by: *ll*

**APPENDIX A**

**RECORDS OF BOREHOLES 954-2 AND 954-4  
1961 INVESTIGATION  
H.G. ACRES & COMPANY LIMITED**

DRILLING REPORT

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS JOB No. 954  
 PROJECT: W.P. 224-61 HOLE No. 954-2  
 SITE: QEW & NS&T Railway Subway SHEET No. 1 of 3  
 CONTRACTOR: F.E. Johnston Drilling Company Limited STARTED 8:00 A.M. October 23 1961  
 FINISHED 11:00 A.M. October 25 1961  
 METHOD OF DRILLING: SOIL Modified wash boring CASING DIAM. NX  
 ROCK CORE DIAM.  
 LOCATION: LATITUDE Sta 87+30 ELEVATIONS: DATUM G.S.C.  
 DEPARTURE 110 ft Right Centreline DRILL PLATFORM -  
 BEARING QEW GROUND SURFACE 315.8  
 INITIAL DIP 90 degrees ROCK SURFACE -  
 OTHER DIPS BOTTOM OF HOLE 257.3  
 WATER TABLE

| DEPTH Feet | SOIL TYPE          | DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC. | S A M P L E |      |           |       | PENETRATION TEST * Blows |         |
|------------|--------------------|---|-------------|------|-----------|-------|--------------------------|---------|
|            |                    |   | NO.         | TYPE | SIZE      | DEPTH |                          | RET'D   |
|            |                    |   |             |      | In.       | Ft.   | In.                      |         |
| 0.0        | Gravel             | Brownish loose fill   |             |      |           |       |                          |         |
|            | Sand Silt and Clay | material  |             |      |           |       |                          |         |
| 2.0        | Gravel             | Brownish mottled grey   |             |      |           |       |                          |         |
|            | Sand Silt and Clay | and yellow highly weathered stiff and dry   | 1           | AQ   | 2         | 5.0   | 15                       |         |
|            |                    |   |             |      |           | 5.5   |                          | 8       |
|            |                    |   |             |      |           | 6.0   |                          | 23      |
|            |                    |   |             |      |           | 6.5   |                          | 35      |
|            |                    |   | 2           | BO   | 2         | 10.0  | 10                       | Pushed  |
|            |                    |   |             |      |           | 10.7  |                          | 1300 lb |
|            |                    |   |             |      |           | 11.0  |                          | 10      |
|            |                    |   |             |      |           | 11.5  |                          | 17      |
| 2.0        | Gravel             | Grey, stiff and no signs  |             |      |           |       |                          |         |
|            | Sand Silt and Clay | of weathering observed  |             |      | Vane Test | 13.0  |                          |         |
|            |                    |   | 3           | BO   | 2         | 15.0  | 12                       |         |
|            |                    |   |             |      |           | 15.5  |                          |         |
| 6.0        | Gravel             | Brownish grey, some   |             |      |           |       |                          |         |
|            | Sand Silt and Clay | varving or layering visible   |             |      |           | 16.0  |                          |         |
|            |                    |   |             |      |           | 16.5  |                          |         |
|            |                    |   |             |      | Vane Test | 17.0  |                          |         |
|            |                    |   | 4           | AQ   | 2         | 17.0  | 12                       |         |
|            |                    |   |             |      |           | 17.5  |                          | 5       |
|            |                    |   |             |      |           | 18.0  |                          | 8       |
|            |                    |   |             |      |           | 18.5  |                          | 26      |

SAMPLING METHOD: A - SPLIT TUBE, B - THIN WALL TUBE, C - PISTON SAMPLER, D - CORE BARREL, E - AUGER, F - WASH  
 SHIPPING CONTAINER: N - INSERT, O - TUBE, P - WATER CONTENT TIN, Q - GLASS JAR, R - CLOTH BAG, S - PLIOFILM BAG, Z - DISCARDED

INSPECTOR: H.W. Ryder  
 LOGGED BY: H.W. Ryder  
 APPROVED: [Signature]  
 DATE: November 1961

H. G. ACRES & COMPANY LIMITED - CONSULTING ENGINEERS  
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS  
 PROJECT: W.P. 224-61  
 SITE: QEW & NS&T Railway Subway

JOB No. 954  
 HOLE No. 954-2  
 SHEET No. 2 OF 3

| DEPTH<br>Feet | SOIL TYPE                       | DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.   | S A M P L E |           |             |              |              | PENETRATION TEST * |        |
|---------------|---------------------------------|---|-------------|-----------|-------------|--------------|--------------|--------------------|--------|
|               |                                 |   | NO.         | TYPE      | SIZE<br>In. | DEPTH<br>Ft. | REF'D<br>In. | Blows              |        |
| 20.0          | Gravel                          | Reddish brown, very stiff. Had to wash ahead of casing, 365 blows with 250-lb hammer to advance casing one foot |             | BZ        | 2           | 20.0         |              |                    |        |
|               |                                 |   |             |           |             | 20.4         |              | 35                 |        |
|               |                                 |   | 5a          | AQ        | 2           | 20.4         | 10           |                    |        |
|               |                                 |   |             |           |             | 20.9         |              | 32                 |        |
|               |                                 |   |             |           |             | 21.4         |              | 37                 |        |
|               |                                 |   |             |           |             | 21.9         |              | 35                 |        |
|               |                                 |   |             | 5b        | AQ          | 2            | 22.5         | 12                 |        |
|               |                                 |   |             |           |             | 23.0         |              | 26                 |        |
|               |                                 |   |             |           |             | 23.5         |              | 28                 |        |
|               |                                 |   |             |           |             | 24.0         |              | 27                 |        |
| 24.5          | Gravel<br>Sand Silt<br>and Clay | Brownish grey, very dense and stiff   |             | Vane Test |             | 23.0         |              |                    |        |
|               |                                 |   | 6           | BO        | 2           | 25.0         | 18           | Pushed             |        |
|               |                                 |   |             |           |             | 25.5         |              | 1400 lb            |        |
|               |                                 |   |             |           |             | 26.0         |              |                    |        |
|               |                                 |   |             |           |             | 26.5         |              |                    |        |
|               |                                 |   |             | Vane Test |             | 28.0         |              |                    |        |
|               |                                 |   |             | 7         | BO          | 2            | 30.0         | 18                 | Pushed |
|               |                                 |   |             |           |             | 30.5         |              | 1000 lb            |        |
|               |                                 |   |             |           |             | 31.0         |              |                    |        |
|               |                                 |   |             |           |             | 31.5         |              |                    |        |
|               | Vane Test                       |   | 33.0        |           |             |              |              |                    |        |
|               | 10                              | AQ  |             | 34.0      | 18          |              |              |                    |        |
|               |                                 |   |             | 36.0      |             |              |              |                    |        |
|               | 8                               | BO  | 2           | 35.0      | 18          | Pushed       |              |                    |        |
|               |                                 |   |             | 35.5      |             | 800 lbs      |              |                    |        |
|               |                                 |   |             | 36.0      |             |              |              |                    |        |
|               |                                 |   |             | 36.5      |             |              |              |                    |        |
| 27.0          | Silty<br>Clay                   | Brownish, medium stiff homogeneous  |             | Vane Test |             | 38.0         |              |                    |        |
|               |                                 |   | 11          | AQ        |             | 38.0         | 18           |                    |        |
|               |                                 |   |             |           |             | 40.0         |              |                    |        |
|               |                                 |   | 9           | BO        | 2           | 40.0         | 18           | Pushed             |        |
|               |                                 |   |             |           |             | 40.5         |              | 800 lbs            |        |
|               |                                 |   |             |           |             | 41.0         |              |                    |        |
|               |                                 |   | 41.5        |           |             |              |              |                    |        |
|               | Vane Test                       |   | 43.0        |           |             |              |              |                    |        |

H. G. ACRES & COMPANY LIMITED — CONSULTING ENGINEERS  
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS

JOB No. 954

PROJECT: W.P. 224-61

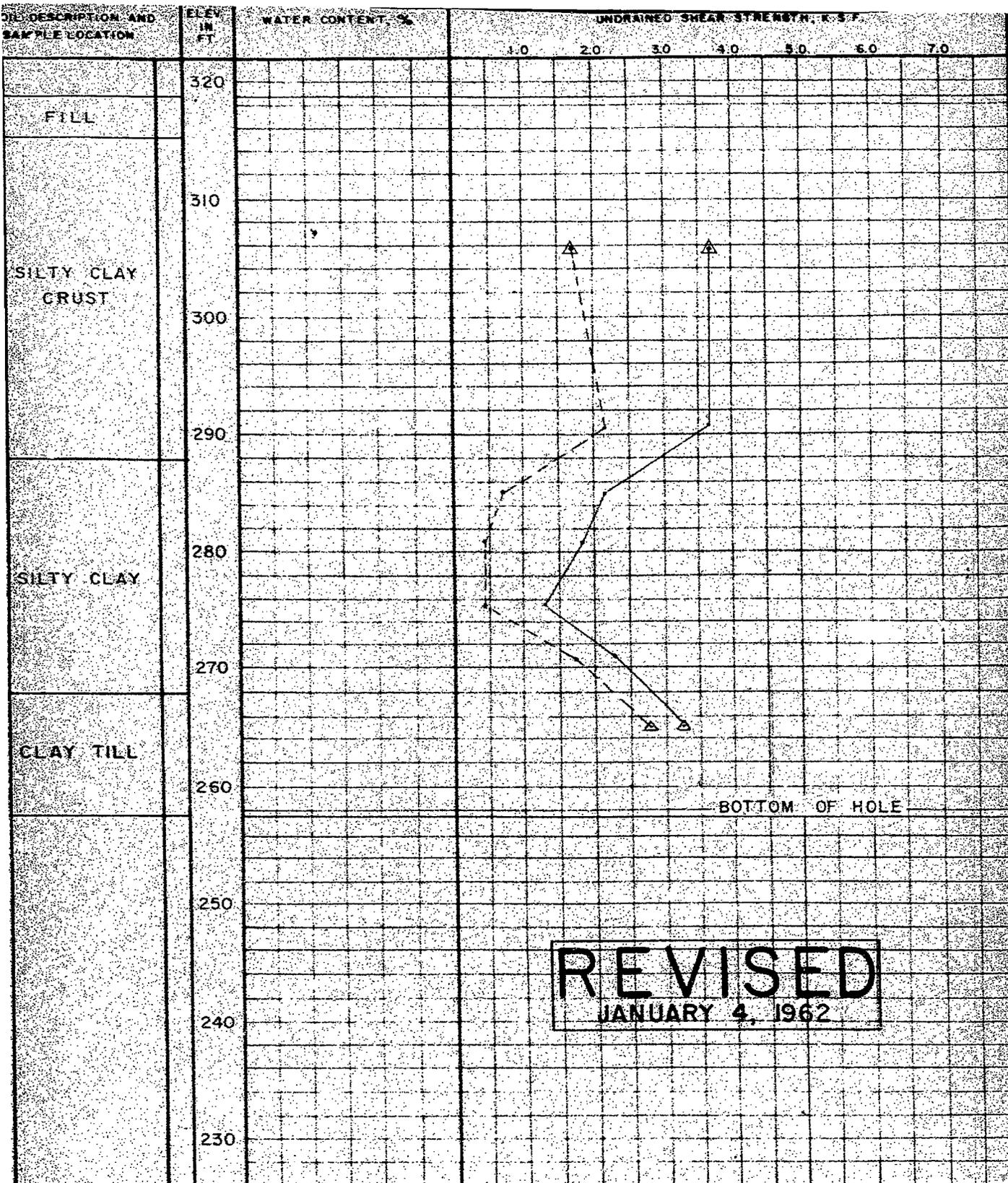
HOLE No. 954-2

SITE: QEW & NS&T Railway Subway

SHEET No. 3 OF 3

| DEPTH<br>Feet | SOIL TYPE                 | DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC. | S A M P L E |      |             |                              | PENETRATION TEST *<br>Blows |
|---------------|---------------------------|---|-------------|------|-------------|------------------------------|-----------------------------|
|               |                           |   | NO.         | TYPE | SIZE<br>In. | DEPTH<br>FT.<br>In.          |                             |
|               |                           |   | 12          | AQ   |             | 42.0                         |                             |
| 5.0           | Silty Clay                | Greyish medium stiff some 1" diameter stones  | 13          | B0   | 2           | 44.0<br>45.0<br>46.2         | 15 Pushed                   |
| 6.2           | Silty Clay                | Greyish brown silty clay with patches and laminations of silt, some gravel present                            |             |      |             | Vane Test<br>46.2            |                             |
|               |                           |   | 14          | AQ   | 2           | 46.2<br>46.7<br>47.2<br>47.7 | 16                          |
|               |                           |   |             |      |             | Vane Test<br>49.0            |                             |
| 10.0          | Gravel Sand Silt and Clay | Reddish brown, very stiff   | 15          | AQ   | 2           | 50.0<br>50.5<br>51.0<br>51.5 | 18<br>12<br>9<br>13         |
|               |                           |   |             |      |             | Vane Test<br>53.0            |                             |
|               |                           |   |             | BZ   | 2           | 55.0<br>55.4                 | 0<br>40                     |
|               |                           |   | 17          | AQ   | 2           | 55.4<br>55.9<br>56.4<br>56.9 | 18<br>14<br>19<br>23        |
|               |                           |   |             |      |             | Vane Test<br>57.2            |                             |
|               |                           |   |             | AQ   | 2           | 60.0<br>60.5                 | 0<br>23                     |
| 1.5           | End of Hole               |   |             |      |             | 61.0<br>61.5                 | 17<br>26                    |

\* Penetration Test  
 This is the number of blows of a 140-pound weight falling 30 inches required to advance the tube sampler or split-  
 spoon to depth indicated



**REVISED**  
JANUARY 4, 1962

- |   |   |  |
|---|---|--|
| <ul style="list-style-type: none"> <li><span style="border: 1px solid black; padding: 2px;">3</span> SOIL SAMPLE</li> <li>○ NATURAL WATER CONTENT</li> <li>— LIQUID LIMIT</li> <li>— PLASTIC LIMIT</li> </ul> | <ul style="list-style-type: none"> <li>○ UNDRAINED COMPRESSION TEST</li> <li>△ FIELD VANE TEST</li> <li>— NATURAL STRENGTH</li> <li>--- REMOULDED STRENGTH</li> </ul> | <p>0</p> <p>15 — ○ — 5</p> <p>10</p> <p>FAILURE STRAIN</p> |
|---|---|--|

**H. G. ACRES & COMPANY LIMITED**  
CONSULTING ENGINEERS  
NIAGARA FALLS CANADA

**SUMMARY OF DRILLING AND TEST RESULTS**  
HOLE 954-2

ONTARIO DEPARTMENT OF HIGHWAYS

APPROVED

DATE NOVEMBER 1961

W.P. 224-61

*J. H. ...*  
H.G. ACRES & COMPANY LTD.

JOB No. 954  
**PLATE 7**

DRILLING REPORT

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS JOB No. 954  
 PROJECT: W.P. 224-61 HOLE No. 954-4  
 SITE: C&W and NS&T Railway Subway SHEET No. 1 OF 2  
 CONTRACTOR: F.E. Johnston Drilling Company Limited  
 STARTED 8:00 A.M. November 7 1961  
 FINISHED 5:00 P.M. November 8 1961  
 METHOD OF DRILLING: SOIL Modified wash boring CASING DIAM. 4"  
 ROCK CORE DIAM.  
 LOCATION: LATITUDE Sta 86+35 ELEVATIONS: DATUM G.S.C.  
 DEPARTURE 49 ft Right Centreline DRILL PLATFORM -  
 BEARING C&W GROUND SURFACE 319.1  
 INITIAL DIP 90 degrees ROCK SURFACE -  
 OTHER DIPS BOTTOM OF HOLE 281.1  
 WATER TABLE

| DEPTH<br>Feet | SOIL TYPE  | DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC        | S A M P L E |      |             |              | PENETRATION TEST #<br>Blows |
|---------------|------------|---|-------------|------|-------------|--------------|-----------------------------|
|               |            |   | NO.         | TYPE | SIZE<br>In. | DEPTH<br>Ft. |                             |
| 0.0           | Silty Sand | Reddish brown backfill  |             |      |             |              |                             |
| 3.5           | Silty Clay | Brownish grey, stiff with some lamination and gravel size particles. Between 25.0 and 30.0 gravel content increases | 1           | CO   | 3           | 5.0          | 18 Pushed<br>1500 lbs       |
|               |            |   |             |      |             | 6.5          |                             |
|               |            |   |             |      |             | 8.0          |                             |
|               |            |   | 2           | CO   | 3           | 10.0         | 20 Pushed<br>1200 lbs       |
|               |            |   |             |      |             | 11.7         |                             |
|               |            |   |             |      |             | 12.0         |                             |
|               |            |   | 3           | CO   | 3           | 15.0         | 20 Pushed<br>1200 lbs       |
|               |            |   |             |      |             | 16.7         |                             |
|               |            |   |             |      |             | 17.0         |                             |
|               |            |   | 4           | CO   | 3           | 20.0         | 20 Pushed<br>1200 lbs       |
|               |            |   |             |      |             | 21.7         |                             |
|               |            |   |             |      |             | 23.0         |                             |
|               |            |   |             |      |             | 25.0         | 0 Unable to push            |

SAMPLING METHOD

- A - SPLIT TUBE
- B - THIN WALL TUBE
- C - PISTON SAMPLER
- D - CORE BARREL
- E - AUGER
- F - WASH

SHIPPING CONTAINER

- M - INSERT
- O - TUBE
- P - WATER CONTENT TIN
- Q - GLASS JAR
- R - CLOTH BAG
- S - FLOPPY BAG
- Z - DISCARDED

INSPECTOR: H.W. Ryder  
 LOGGED BY: H.W. Ryder

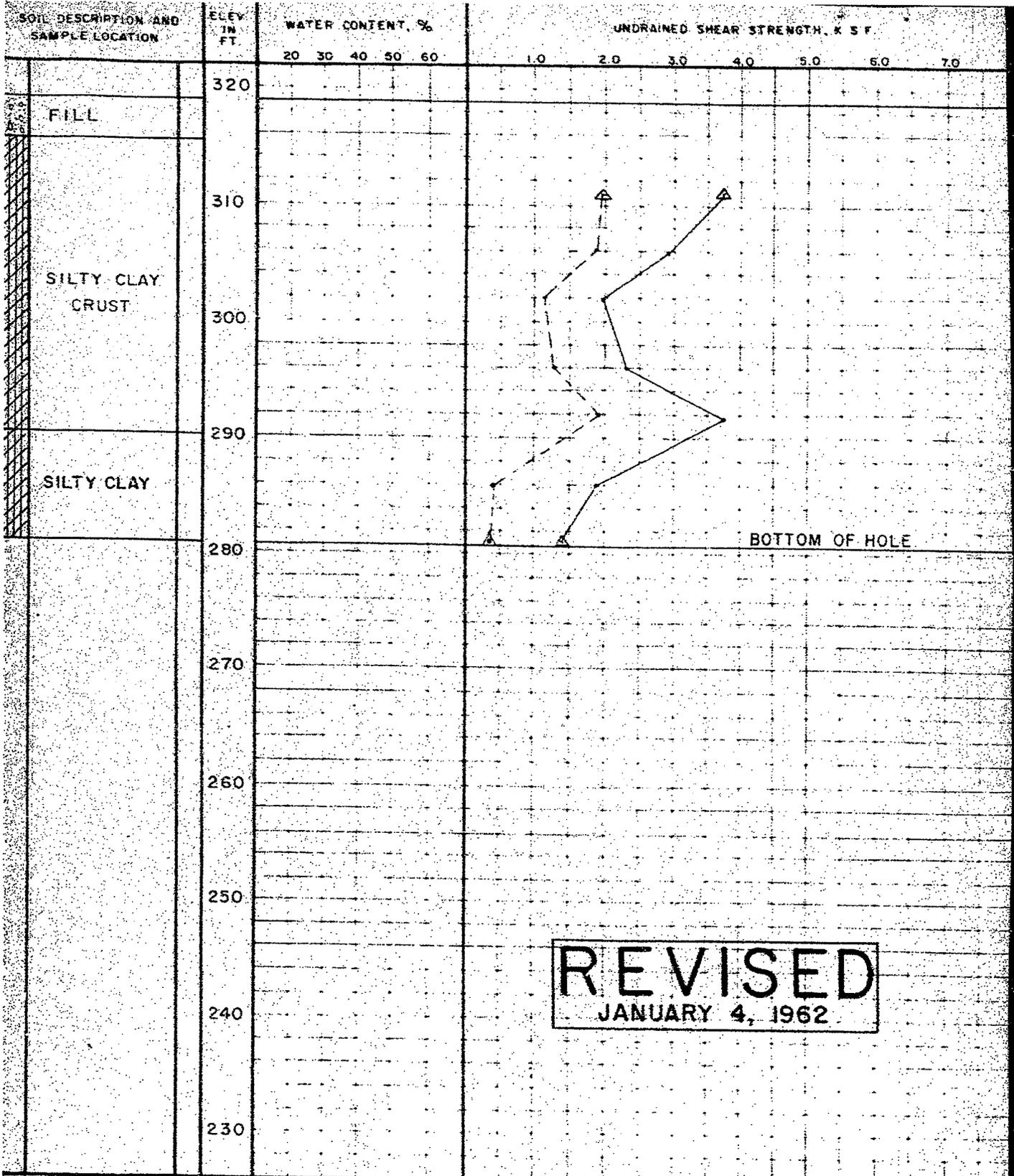
APPROVED: *[Signature]*  
 DATE: November 1961

DRILLING REPORT

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS  
 PROJECT: W.P. 224-61  
 SITE: QEW & NS&T Railway Subway

JOB No. 954  
 HOLE No. 954-4  
 SHEET No. 2 OF 2

| DEPTH<br>Feet | SOIL TYPE | DESCRIPTION, COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.  | SAMPLE |      |             |              |             | PENETRATION TEST<br>Blows |
|---------------|-----------|--|--------|------|-------------|--------------|-------------|---------------------------|
|               |           |  | NO.    | TYPE | SIZE<br>in. | DEPTH<br>Ft. | RISE<br>in. |                           |
|               |           |  | 5      | BO   | 3           | 25.0         | 18          |                           |
|               |           |  |        |      |             | 25.5         |             | 8                         |
|               |           |  |        |      |             | 26.0         |             | 7                         |
|               |           |  |        |      |             | 26.5         |             | 7                         |
|               |           |  |        |      | Vane Test   | 27.0         |             |                           |
|               |           |  | 6      | CO   | 3           | 30.0         | 12          | Unable                    |
|               |           |  |        |      |             | 31.7         |             | to push                   |
|               |           |  |        |      | Vane Test   | 33.0         |             | 30 blows                  |
|               |           |  | 7      | CO   | 3           | 35.0         | 20          | Pushed                    |
|               |           |  |        |      |             | 36.7         |             | 1300 lbs                  |
| 8.0           |           | End of Hole  |        |      | Vane Test   | 38.0         |             |                           |
|               |           | <p><b>* Penetration Test</b><br/>                     This is the number of blows of a 140-pound weight falling 30 inches required to advance the tube sampler or split-spoon to depth indicated</p> |        |      |             |              |             |                           |



**REVISED**  
JANUARY 4, 1962

- |     |                       |     |                            |    |                |
|-----|-----------------------|-----|----------------------------|----|----------------|
| 3   | SOIL SAMPLE           | ○   | UNDRAINED COMPRESSION TEST | ○  | FAILURE STRAIN |
| ○   | NATURAL WATER CONTENT | △   | FIELD VANE TEST            | 15 | 5              |
| --- | LIQUID LIMIT          | --- | NATURAL STRENGTH           | 10 |                |
| --- | PLASTIC LIMIT         | --- | REMOLDED STRENGTH          |    |                |

**H. G. ACRES & COMPANY LIMITED**  
CONSULTING ENGINEERS  
NIAGARA FALLS CANADA

**SUMMARY OF DRILLING AND TEST RESULTS**  
HOLE 954-4

ONTARIO DEPARTMENT OF HIGHWAYS

APPROVED

DATE NOVEMBER 1961

W. P. 224-61

*J. H. ...*  
H. G. ACRES & COMPANY, LTD.

JOB No. 954  
**PLATE 9**