

Terraprobe

**Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing**

GEOCRES No:
30M5-264

**FOUNDATION INVESTIGATION & DESIGN REPORT
HIGH MAST LIGHTING
QUEEN ELIZABETH HIGHWAY
FROM BRANT STREET TO BURLOAK DRIVE
AGREEMENT No. 2006-E-0026, W.P. 2831-02-01
MINISTRY OF TRANSPORTATION, ONTARIO
CENTRAL REGION**

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted along the alignment of the Queen Elizabeth Highway (QEW) for proposed high mast lighting structures. This project is the Ministry of Transportation of Ontario undertaking to rehabilitate and widen the QEW from Brant Street to Burloak Drive.

The purpose of this investigation was to explore the subsurface conditions at the site and, based on the data obtained, to provide borehole location plans, records of boreholes, laboratory test results and a description of the subsurface conditions.

Terraprobe conducted the investigation as a sub-consultant to Giffels Associates Limited, under The Ministry of Transportation of Ontario Agreement No. 2006-E-0026, W.P. 2831-02-01.

The following documents are referenced in the preparation of this report:

- Terraprobe Ltd., "Foundation Investigation & Design Report, Overhead/Cantilevered Sign Support Structures, Queen Elizabeth Highway from Brant Street to Burloak Drive", W.P. 2831-02-01, MTO Central Region, dated August 29, 2008.
- Thurber Engineering Ltd., "Foundation Investigation & Design Report, Culvert, SWM Pond, Utility Crossings and Watermain Protection, QEW Widening, Third Line to Burloak Drive", G.W.P. 169-00-00, Submitted to McCormick Rankin Corporation, dated January 22, 2007.
- Thurber Engineering Ltd., "Geotechnical Investigation, Proposed 750 mm Watermain, Burloak Drive at QEW, Oakville, Ontario", File No. 19-9714-0, Submitted to RRL Burloak Inc., dated February 21, 2006.
- MTO, "Foundation Investigation Report, The Structure and Culvert at Appleby Line Interchange", W.P. 125-66-09, Site 10-148, QEW, District 4, dated April 20, 1977.



2 SITE DESCRIPTION

This project is located in the Regional Municipality of Halton, City of Burlington, Ontario, and extends a distance of approximately 8.2 km from Sta.11+700 to Sta.10+330. Within the project limits, this divided highway comprises of six lanes, and fully paved shoulders. There is an existing storm sewer located close to the median centreline of the highway. There are four interchanges within the project limits viz. Guelph Line, Walkers Line, Appleby Line and Burloak Drive.

The highway crosses over several major facilities. These include a bridge over the CN Rail tracks (Stn. 12+350), and the following creek culvert crossings: Tuck Creek (Stn. 15+370), Shoreacres Creek (Stn. 16+765), West Appleby Creek (Stn. 17+870), Appleby Creek (18+275), and Sheldon Creek (18+725). There are several other smaller culvert and utility crossings beneath the highway.

The site is located in the physiographic region of Southern Ontario referred to as the Iroquois Plain¹. This strip of land is approximately 3 km wide and is located between the shoreline of the former glacial lake, Lake Iroquois and Lake Ontario. The topography is flat to moderately rolling and the terrain slopes gently towards Lake Ontario.

The soils generally consist of fine grained silts and clays, underlain by silty clay glacial till. The overburden soils are further underlain by bedrock of the Queenston Formation which is predominantly shale that exists at relatively shallow depths within the project limits. Very often the basal portion of this till is distinctly red in colour from large amounts of incorporated Queenston shale.

3 SITE INVESTIGATION AND FIELD TESTING

The site investigation and field testing for this project were carried out during the period July 30, 2007 to January 25, 2008, and consisted of drilling and sampling a total of 53 boreholes to depths ranging from 3.1 m to 10.8 m. High mast lighting boreholes are denoted as HML-1 to HML-16. Boreholes that were drilled for overhead and cantilevered sign support structures as part of this assignment are also included in this report.

The drilling and sampling and bedrock coring operations along the median centreline of the highway could not be completed together within the allowable nightly lane closure times. Separate visits were therefore required to undertake bedrock coring and these boreholes are identified with letters, for example HML-16A, CS-6A, etc. The approximate borehole locations are shown on the attached Borehole Location Drawings in Appendix E.

Based on drawings provided by Giffels Associates Limited the borehole locations were established in the field by Terraprobe, and the locations were surveyed by J.D. Barnes Limited, who provided Terraprobe with their coordinates and geodetic elevations. Utility locates were obtained by Terraprobe prior to drilling.

¹ Chapman and Putnam, "The Physiography of South Ontario", 3rd Edition, 1984.



The drilling, sampling and in-situ testing operations were conducted using both truck-mounted and track-mounted drill rigs owned and operated by D.B.W. Drilling Limited of Ajax, Ontario. Solid stem auger drilling techniques were used to advance the boreholes. Samples were obtained at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT) in the overburden soils. Boreholes were also advanced approximately 3.1 m into bedrock by NQ size diamond coring techniques. Groundwater conditions in the open boreholes were observed throughout the drilling operations and upon completion of the boreholes. All the boreholes were sealed using bentonite. The pavement structure was reinstated and the pavement surface was acceptably patched with cold mix asphalt.

Members of Terraprobe's engineering staff observed the drilling, and supervised the sampling, in-situ testing and coring operations on a full time basis. The supervisors logged the boreholes and processed the recovered soil samples and rock cores for transport to Terraprobe's Brampton laboratory for further examination and testing.

4 LABORATORY TESTING

The recovered soil samples were subjected to Visual Identification (VI) and natural moisture content determination. Selected samples were subjected to gradation analysis and Atterberg Limits tests were also conducted on selected samples retrieved from the cohesive deposits. The results of this testing program are shown on the Record of Borehole sheets in Appendix A and C; and the grain size distribution curves and plasticity charts are illustrated in Appendix B and D.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets in Appendix A and C for details of the encountered soil stratigraphy. An overall description of the stratigraphy is given in the following paragraphs. However, the factual data presented in the Record of Borehole Sheets governs any interpretation of the site conditions.

In general, the site is underlain by a flexible pavement, fill material, and native overburden deposits of very stiff to hard silty clay glacial till, compact sandy silt till and hard silty clay till (till/shale complex). The overburden soils are further underlain by shale bedrock of the Queenston Formation. Topsoil ranging from 100 to 130 mm in thickness was encountered in boreholes extended in the interchange areas.

5.1 Topsoil

Boreholes drilled in the interchange areas encountered a layer of topsoil ranging from 100 to 200 mm in thickness. Topsoil thickness will vary between and beyond boreholes.

5.2 Pavement Structure

The pavement structure where encountered consists of 100 to 360 mm of asphaltic concrete, underlain by 200 to 900 mm of granular fill.



Grain size distribution curves of samples of this fill material are presented in Figure B1, D1. The results show grain size distributions consisting of 0 to 37% gravel, 49 to 81% sand, and 14 to 19% silt and clay size particles.

Standard Penetration tests in the granular fill yielded 'N' values of 11 to more than 100 blows for 0.3 m penetration, indicating a compact to very dense relative density. The measured moisture content of samples from this fill varied from 0% to 8% by weight.

5.3 Silty Clay and Clayey Silt Fill

Silty clay and clayey silt fill were encountered across the site in some of the boreholes. The fill extends to depths generally ranging from 0.9 to 2.9 m (Elev. 112.7 m to Elev. 118.7 m). Locally in HML-3 and HML-11 the fill extends to depths of 4.9 and 7.0 m below ground surface, i.e. Elev. 110.8 m and 111.7 m, respectively.

Grain size distribution curves of samples of this fill material are presented in Figures B2, B3, D2. These results show grain size distributions consisting of 0 to 36% gravel, 9 to 36% sand, 31 to 61% silt and 14 to 51% clay size particles.

Samples of the silty clay and clayey silt fill were also subjected to Atterberg Limits tests and the results are illustrated in Figure B4, B5, D3. The summarized index values from these tests are presented herein.

| | |
|---------------------------|-----------|
| Liquid Limit: | 19 to 49% |
| Plastic Limit: | 14 to 25% |
| Plasticity Index: | 5 to 24% |
| Natural Moisture Content: | 8 to 26% |

These values are characteristic of clayey soils of low to intermediate plasticity.

Standard Penetration tests in the silty clay and clayey silt fill material yielded 'N' values ranging from 5 to 25 blows for 0.3 m penetration and pocket penetrometer tests conducted on samples of this fill gave undrained shear strengths ranging from 75 kPa to 225 kPa. Based on these results the fill is considered to have a firm to very stiff consistency.

The moisture content of samples of this fill ranged from 5% to 36% by weight.

5.4 Silty Clay Till

Silty clay glacial till was encountered across the site extending to depths ranging from 1.1 to 4.3 m below ground surface or to elevations ranging from Elev. 109.7 m to Elev. 120.6 m.

Grain size distribution curves of tested samples of this silty clay till are shown in Figure B6, B7, and D4. The results generally show a grain size distribution consisting of 0 to 20% gravel, 1 to 27% sand, 35 to 75% silt and 16 to 43% clay size particles. Random cobble and boulder inclusions can also be expected to occur in till soils.



Samples of the silty clay till were also subjected to Atterberg Limits tests and the results are plotted on the plasticity chart in Figure B8, B9, and D5. The index values from these tests are summarized below:

| | |
|---------------------------|-----------|
| Liquid Limit: | 20 to 40% |
| Plastic Limit: | 14 to 21% |
| Plasticity Index: | 8 to 19% |
| Natural Moisture Content: | 12 to 23% |

These values are characteristic of clayey soils of generally low to intermediate plasticity.

Standard Penetration tests in the silty clay till gave 'N' values ranging from 10 to more than 100 blows for 0.3 m penetration and pocket penetrometer tests on relatively undisturbed samples yielded undrained shear strengths ranging from 125 kPa to more than 225 kPa. Based on these results the silty clay till is considered to have a stiff to hard consistency.

The moisture content of samples from this deposit ranged from 8% to 23% by weight.

5.5 Silty Clay Till - Till/Shale Complex

The lower portions of the glacial till, above the shale bedrock, are difficult to distinguish from the upper, highly weathered shale. This transition zone of material is sometimes referred to as till/shale complex. The unit may often be described as residual soil or completely weathered shale bedrock. Shale and limestone slabs may occur within this deposit.

The till/shale complex extends to depths ranging from 1.4 to 4.8 m below ground surface or to elevations ranging from Elev. 108.9 m to 117.8 m.

The results of grain size distribution tests conducted on samples obtained from this deposit are shown in Figures B10, D6. These results show a grain size distribution consisting of 0 to 20% gravel, 8 to 29% sand, 37 to 66% silt and 14 to 32% clay size particles.

Samples of the till/shale complex were also subjected to Atterberg Limits tests and the results are plotted on the plasticity chart in Figures B11 and D7. The index values from these tests are summarized below:

| | |
|---------------------------|-----------|
| Liquid Limit: | 22 to 30% |
| Plastic Limit: | 14 to 18% |
| Plasticity Index: | 7 to 13% |
| Natural Moisture Content: | 8 to 25% |

These values are characteristic of clayey soils of low plasticity.

Standard Penetration tests in the till/shale complex gave 'N' values ranging from 15 to more than 100 blows for 0.3 m penetration and pocket penetrometer tests on relatively



undisturbed samples yielded undrained shear strengths of 200 kPa to greater than 225 kPa. Based on these results the till/shale complex is considered to have a generally very stiff to hard consistency.

The moisture content of samples from this deposit ranged from 2% to 24% by weight.

5.6 Bedrock

The bedrock beneath the site is of the Queenston Formation, a deposit predominantly comprised of thickly bedded to massive brick red shale of Ordovician age. The rock contains within the shale matrix occasional layers of limestone, sandstone and siltstone, and occasionally green calcareous shale layers. There is typically a horizontal zone of weathering at the contact between the weak rock of the Queenston Formation and the glacial soil overburden. In the Ontario Ministry of Transportation and Communications document RR229, *Evaluation of Shales for Construction Projects*, there is reproduced from Skempton, Davis and Chandler, *a typical weathering profile of a low durability shale*, that characterizes the shale surface into three grades of weathering and four zones described as follows:

| | Zone | Description | Notes |
|---------------------|------|--|---|
| Fully Weathered | IVb | soil like matrix only | indistinguishable from glacial drift deposits, slightly clayey, may be fissured |
| Partially Weathered | IVa | soil like matrix with occasional pellets of shale less than 3 mm diameter | little or no trace of rock structure, although matrix may contain relic fissures |
| | III | soil like matrix with frequent angular shale particles up to 25 mm diameter | moisture content of matrix greater than the shale particles |
| | II | angular blocks of unweathered shale with virtually no matrix separated by weaker chemically weathered but intact shale | spheroidal chemical weathering of shale pieces emanating from relic joints and fissures, and bedding planes |
| Unweathered (sound) | I | shale | regular fissuring |

At the base of the Glacial Till deposit there is sometimes found a zone of silty clay and fragmented shale that can be interpreted as the lowest portion of the till or as partially weathered rock of Zone III. The distinction is subjective and depends on the investigator. The surface of the bedrock as indicated on the Borehole Logs from this investigation is to be consistently interpreted as the surface of Zone II in the profile.

Shale bedrock was encountered within the depth of investigation. The bedrock was penetrated by solid stem augering, and samples were obtained by split spoon sampling. The bedrock was also cored approximately three metres using NQ-sized diamond drilling techniques.



Tabulated below are the bedrock depth and elevation at the borehole locations.

| BH No. | Depth to Bedrock (m) | Top of Bedrock Elevation (m) |
|----------------------------|----------------------|------------------------------|
| OS-5 & OS-5A | 4.2 | 109.2 |
| HML-1 & HML-1A | 4.8 | 108.9 |
| OS-6 & OS-6A | 3.6 | 111.2 |
| HML-2 & HML-2A | 3.0 | 112.0 |
| CS-5 & CS-5A | 2.9 | 112.2 |
| HML-3 & HML-3A | 4.9 | 110.8 |
| HML-4 & HML-4A | 3.4 | 113.3 |
| OS-7 & OS-7A | 2.3 | 114.6 |
| HML-5 & HML-5A | 2.9 | 114.9 |
| OS-8 & OS-8A | 1.5 | 116.3 |
| HML-6 & HML-6A | 1.4 | 115.5 |
| OS-9 & OS-9A | 2.9 | 113.9 |
| HML-7 & HML-7A | 2.0 | 117.0 |
| OS-10 & OS-10A | 1.4 | 117.8 |
| HML-8 & HML-8A | 2.1 | 117.0 |
| CS-6 & CS-6A | 2.1 | 116.1 |
| HML-9 & HML-9A | 2.1 | 116.1 |
| OS-11 & OS-11A & OS-11B | 0.6 | 117.7 |
| HML-10 & HML-10A | 1.9 | 116.5 |
| OS-12 & OS-12A | 0.7 | 117.8 |
| HML-11 & HML-11A | 7.0 | 111.7 |
| OS-13 | 7.1 | 111.7 |
| HML-12 & HML-12A | 2.7 | 116.7 |
| OS-14 & OS-14A | 2.0 | 117.2 |
| HML-13 | 2.1 | 112.4 |
| HML-14 | 2.9 | 114.5 |
| HML-15 | 4.4 | 117.2 |
| BH 10 | 1.6 | 116.4 |
| HML-16 & HML-16A | 4.1 | 114.0 |
| UC 1 | 1.4 | 117.5 |
| WM 6 | 4.3 | 114.1 |
| WM 8 | 2.2 | 118.9 |
| WM 9 | 1.1 | 120.6 |

The bedrock is described as partially weathered generally in the top 2± metres, and unweathered below. It is medium to thickly bedded with low to medium strength shale and occasional interbeds of medium to high strength greenish grey limestone. Total core recovery typically ranged from 80% to 100%. The RQD values generally ranged from 0% to 89%, indicating very poor to good rock quality. Vertical and subvertical joints, as well



as multiple horizontal bedding planes, were observed in the rock cores, which contributed to the relatively low RQD values.

5.7 Water Levels

In general, the groundwater table along the alignment follows the ground surface topography. At the west project limit, the groundwater table is estimated to be about Elev. 112.3 m and rises easterly to about Elev. 116.8 m, near Sta. 16+375 and then falls to about Elev. 114.5 m at Sta. 16+750, near Shoreacres Creek. Easterly, beyond Shoreacres Creek the water table rises to about Elev. 118.6 m near Sta. 17+175. The groundwater table then falls gradually to about Elev. 113.0 m at Station 18+750 (near Sheldon Creek) then rises gradually to about Elev. 118.2 m at the east project limit.


In the interchange areas there is a downward gradient from north to south with water table levels varying from Elev. 117 m to Elev. 114.0 m at the Walkers Line interchange, from Elev. 118.5 m to Elev. 118.0 m at the Appleby Line interchange. The water table is at about Elev. 117.5 m at the Burloak Drive interchange.


Perched water can also be expected to occur where permeable layers of sand and gravelly sand are underlain by relatively impermeable layers of silty clay and clayey silt soils.


All groundwater observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.

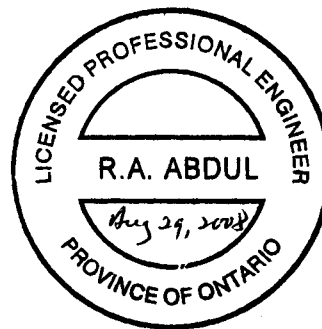


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PART 2: ENGINEERING DISCUSSION AND RECOMMENDATIONS

6 GENERAL

This report provides geotechnical recommendations for the design of high mast lighting along the Queen Elizabeth Highway (QEW) and within the Walker's Line, Appleby Line, and Burloak Drive interchanges, from Brant Street to Burloak Drive, in the City of Burlington, Ontario.

The discussion and recommendations presented in this report are based on our understanding of the project and on the factual data obtained in the course of the investigations.

7 SUMMARIZED SUBSURFACE CONDITIONS

In general, the site is underlain by a flexible pavement, topsoil, fill material, and native overburden deposits of stiff to hard silty clay glacial till, and hard silty clay till (till/shale complex). The overburden soils are further underlain by shale bedrock of the Queenston Formation.

The groundwater is estimated to generally follow the ground surface topography falling towards the creeks located within the project limits. In the interchange areas the water table generally exhibits a downward gradient from north to south, but is fairly level in the vicinity of the Burloak Drive interchange. Perched water can also be expected to occur where permeable layers of sand and gravelly sand are underlain by relatively impermeable layers of silty clay and clayey silt soils. The groundwater will also fluctuate seasonally and after severe weather events.



8 DESIGN CONSIDERATIONS

Generally, the high mast lighting structures can be supported on a single caisson (i.e. drilled and cast-in-place concrete pile) foundation. The depth of the caisson would vary depending on the design of the high mast lighting structure, and the subsurface conditions encountered. The design can be carried out in accordance with the following documents and papers.

- Canadian Highway Bridge Design Code and Commentary (2000). CAN/CSA-S6-00 and S6.1-00.
- Ministry of Transportation, Ontario (1994) "Procedures for the Design of High Mast Pole Foundations", Design Section, Structural Office.
- BROMS, B.B.: Lateral Resistance of Piles in Cohesive Soils, Journal of the Soil Mechanics and Foundation Division, ASCE, Vol. 90 No. SM2, Paper No. 3825, March 1964.
- BROMS, B.B.: Lateral Resistance of Piles in Cohesive Soils, Journal of the Soil Mechanics and Foundation Division, ASCE, Vol. 90 No. SM3, Paper No. 3909, March 1964.
- BROMS, B.B.: Design of Laterally Loaded Piles, Journal of the Soil Mechanics and Foundation Division, ASCE, Vol. 91. Paper No. SM3, May 1965.

The recommended soil parameters for the design of augered caisson foundation units are given in Table 8.0.

Table 8.0 – Recommended Soil Parameters

| BH No. (Pole No.) | Elevation (m) | | Type of Soil | Consistency or Compactness Condition | q _u (kPa) | φ (degrees) | γ (kN/m ³) | Water Level Depth (Elevation) (m) |
|-------------------------------------|------------------|-------|--------------|--|-------------------------|----------------|---------------------------|--|
| | From | To | | | | | | |
| HML-1 & HML-1A (P2,P3) | 113.5 | 113.1 | Fill | Compact | - | 29 | 18.5 | 0.8* (112.9)* |
| | 113.1 | 109.7 | Cohesive | Hard | 400 | - | 22.0 | |
| | 109.7 | 108.9 | Cohesive | Hard | 500 | - | 22.5 | |
| | 108.9 | 107.8 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 107.8 | 105.3 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-2 & HML-2A (P5) | 114.8 | 114.5 | Fill | Compact | - | 29 | 18.5 | 1.0* (114.0)* |
| | 114.5 | 113.6 | Fill | Stiff | 200 | - | 18.5 | |
| | 113.6 | 112.9 | Cohesive | Very Stiff | 400 | - | 21.5 | |
| | 112.9 | 112.0 | Cohesive | Hard | 500 | - | 22.5 | |
| | 112.0 | 110.4 | Cohesive | Hard | 1000 | - | 23.0 | |
| HML-3 & HML-3A (P7,P8,P15) | 110.4 | 108.9 | Cohesive | Hard | 1500 | - | 23.0 | |
| | 115.4 | 114.7 | Fill | Compact | - | 29 | 18.5 | 1.6* (114.1)* |
| | 114.7 | 110.8 | Fill | Firm to Stiff | 150 | - | 18.0 | |
| | 110.8 | 108.4 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 108.4 | 106.5 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-4 & HML-4A (P16,P17) | 116.5 | 116.1 | Fill | Dense | - | 30 | 18.5 | 0.8* (115.9)* |
| | 116.1 | 115.3 | Fill | Stiff | 200 | - | 18.5 | |
| | 115.3 | 113.8 | Cohesive | Hard | 400 | - | 22.0 | |
| | 113.8 | 113.3 | Cohesive | Hard | 500 | - | 22.5 | |
| | 113.3 | 110.6 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 110.6 | 109.0 | Cohesive | Hard | 1500 | - | 23.0 | |



Table 8.0 – Recommended Soil Parameters

| BH No. (Pole No.) | Elevation (m) | | Type of Soil | Consistency or Compactness Condition | q _u (kPa) | φ (degrees) | γ (kN/m ³) | Water Level Depth (Elevation) (m) |
|--|------------------|-------|--------------|--|-------------------------|----------------|---------------------------|--|
| | From | To | | | | | | |
| HML-5 & HML-5A (P19,P20) | 117.6 | 117.1 | Fill | Compact | - | 29 | 18.5 | 1.2* (116.6)* |
| | 117.1 | 116.4 | Fill | Stiff | 200 | - | 18.5 | |
| | 116.4 | 114.9 | Cohesive | Hard | 500 | - | 22.5 | |
| | 114.9 | 113.0 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 113.0 | 110.1 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-6 & HML-6A (P23) | 116.8 | 116.3 | Fill | Compact | - | 29 | 18.5 | 0.8* (116.1)* |
| | 116.3 | 115.5 | Cohesive | Hard | 500 | - | 22.5 | |
| | 115.5 | 112.6 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 112.6 | 110.7 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-7 & HML-7A (P25,P26) (P27) | 118.8 | 118.4 | Fill | Compact | - | 29 | 18.5 | 0.8* (118.2)* |
| | 118.4 | 117.6 | Cohesive | Stiff | 400 | - | 19.5 | |
| | 117.6 | 117.0 | Cohesive | Hard | 500 | - | 22.5 | |
| | 117.0 | 114.1 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 114.1 | 112.8 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-8 & HML-8A (P29,P30) (P32,P37) | 118.9 | 118.5 | Fill | Compact | - | 29 | 18.5 | 0.8* (118.3)* |
| | 118.5 | 117.7 | Fill | Stiff | 200 | - | 18.5 | |
| | 117.7 | 117.0 | Cohesive | Hard | 400 | - | 22.0 | |
| | 117.0 | 115.4 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 115.4 | 112.9 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-9 & HML-9A (P39) | 118.0 | 117.4 | Fill | Compact | - | 29 | 18.5 | 0.9* (117.3)* |
| | 117.4 | 116.8 | Fill | Stiff | 200 | - | 19.0 | |
| | 116.8 | 116.1 | Cohesive | Hard | 500 | - | 22.5 | |
| | 116.1 | 112.9 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 112.9 | 112.0 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-10 & HML-10A (P42) | 118.2 | 117.8 | Fill | Compact | - | 29 | 18.5 | 0.8* (117.6)* |
| | 117.8 | 116.5 | Cohesive | Very Stiff to Hard | 500 | - | 22.5 | |
| | 116.5 | 113.6 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 113.6 | 112.2 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-11 & HML-11A (P45) | 118.5 | 118.0 | Fill | Compact | - | 29 | 18.5 | 1.7* (117.0)* |
| | 118.0 | 111.7 | Fill | Stiff to Very Stiff | 200 | - | 18.5 | |
| | 111.7 | 109.1 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 109.1 | 108.4 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-12 & HML-12A (P46,P47) | 119.2 | 118.7 | Fill | Compact | - | 29 | 18.5 | 1.4* (118.0)* |
| | 118.7 | 118.0 | Cohesive | Stiff | 300 | - | 21.5 | |
| | 118.0 | 116.7 | Cohesive | Hard | 500 | - | 22.5 | |
| | 116.7 | 115.6 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 115.6 | 113.2 | Cohesive | Hard | 1500 | - | 23.0 | |
| HML-13 (P10,P11) (P14) | 114.4 | 113.8 | Cohesive | Stiff | 300 | - | 20.0 | 0.5* (114.0)* |
| | 113.8 | 112.4 | Cohesive | Hard | 400 | - | 22.0 | |
| | 112.4 | 109.7 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 109.7 | 108.3 | Cohesive | Hard | 1500 | - | 23.0 | |
| | 117.3 | 116.7 | Cohesive | Stiff | 200 | - | 20.0 | |
| HML-14 (P9,P12) (P13) | 116.7 | 115.3 | Cohesive | Very Stiff to Hard | 400 | - | 22.0 | 0.4* (117.0)* |
| | 115.3 | 114.5 | Cohesive | Hard | 500 | - | 22.5 | |
| | 114.5 | 113.6 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 113.6 | 110.8 | Cohesive | Hard | 1500 | - | 23.0 | |
| | 121.5 | 118.7 | Cohesive | Stiff to Very Stiff | 300 | - | 18.5 | |
| HML-15 (P31,P34) (P36) | 118.7 | 117.9 | Cohesive | Stiff | 200 | - | 19.5 | 3.1* (118.5)* |
| | 117.9 | 117.2 | Cohesive | Hard | 500 | - | 22.5 | |
| | 117.2 | 115.6 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 115.6 | 114.4 | Cohesive | Hard | 1500 | - | 23.0 | |
| | 118.0 | 116.7 | Fill | Firm to Stiff | 150 | - | 18.5 | |
| HML-16 & HML-16A (P50,P54) (P55) | 116.7 | 114.4 | Cohesive | Very Stiff to Hard | 400 | - | 21.0 | 0.6* (117.5)* |
| | 114.4 | 114.0 | Cohesive | Hard | 500 | - | 22.5 | |
| | 114.0 | 109.5 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 109.5 | 106.8 | Cohesive | Hard | 1500 | - | 23.0 | |
| | | | | | | | | |



Table 8.0 – Recommended Soil Parameters

| BH No. (Pole No.) | Elevation (m) | | Type of Soil | Consistency or Compactness Condition | q _u (kPa) | φ (degrees) | γ (kN/m ³) | Water Level Depth (Elevation) (m) |
|---|------------------|-------|--------------|--|-------------------------|----------------|---------------------------|--|
| | From | To | | | | | | |
| OS-5 & OS-5A (P1) | 113.2 | 112.6 | Fill | Compact | - | 29 | 18.5 | 1.1* (112.3)* |
| | 112.6 | 110.5 | Cohesive | Very Stiff to Hard | 400 | - | 22.0 | |
| | 110.5 | 109.2 | Cohesive | Hard | 500 | - | 22.5 | |
| | 109.2 | 106.8 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 106.8 | 105.8 | Cohesive | Hard | 1500 | - | 23.0 | |
| OS-6 & OS-6A (P4) | 114.5 | 114.2 | Fill | Compact | - | 29 | 18.5 | 0.9* (113.9)* |
| | 114.2 | 112.7 | Fill | Firm to Stiff | 100 | - | 18.5 | |
| | 112.7 | 111.2 | Cohesive | Very Stiff | 500 | - | 22.5 | |
| | 111.2 | 110.2 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 110.2 | 107.7 | Cohesive | Hard | 1500 | - | 23.0 | |
| CS-5 & CS-5A (P6) | 115.0 | 114.5 | Fill | Compact | - | 29 | 18.5 | 0.9* (114.2)* |
| | 114.5 | 113.0 | Cohesive | Stiff to Very Stiff | 400 | - | 21.5 | |
| | 113.0 | 112.2 | Cohesive | Hard | 500 | - | 22.5 | |
| | 112.2 | 110.1 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 110.1 | 108.9 | Cohesive | Hard | 1500 | - | 23.0 | |
| OS-7 & OS-7A (P18) | 116.7 | 116.4 | Fill | Compact | - | 29 | 18.5 | 0.9* (116.0)* |
| | 116.4 | 115.5 | Fill | Stiff | 150 | - | 18.5 | |
| | 115.5 | 114.6 | Cohesive | Hard | 500 | - | 22.5 | |
| | 114.6 | 110.7 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 110.7 | 109.3 | Cohesive | Hard | 1500 | - | 23.0 | |
| OS-8 & OS-8A (P21,P22) | 117.5 | 116.3 | Fill | Compact | - | 29 | 18.5 | 1.0* (116.8)* |
| | 116.3 | 114.4 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 114.4 | 112.3 | Cohesive | Hard | 1500 | - | 23.0 | |
| OS-9 & OS-9A (P24) | 116.5 | 116.2 | Fill | Compact | - | 29 | 18.5 | 2.3* (114.5)* |
| | 116.2 | 113.9 | Fill | Firm to Stiff | 100 | - | 18.5 | |
| | 113.9 | 110.3 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 110.3 | 108.0 | Cohesive | Hard | 1500 | - | 23.0 | |
| OS-10 & OS-10A (P28) | 118.9 | 118.6 | Fill | Compact | - | 29 | 18.5 | 0.6* (118.6)* |
| | 118.6 | 118.3 | Fill | Stiff | 100 | - | 18.5 | |
| | 118.3 | 117.8 | Cohesive | Stiff | 250 | - | 19.5 | |
| | 117.8 | 114.0 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 114.0 | 112.5 | Cohesive | Hard | 1500 | - | 23.0 | |
| CS-6 & CS-6A (P38) | 117.9 | 117.6 | Fill | Compact | - | 29 | 18.5 | 1.5* (116.7)* |
| | 117.6 | 116.1 | Fill | Stiff | 200 | - | 18.5 | |
| | 116.1 | 113.0 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 113.0 | 112.2 | Cohesive | Hard | 1500 | - | 23.0 | |
| OS-11, OS-11A & OS-11B (P40,P41) | 118.0 | 117.7 | Fill | Compact | - | 29 | 18.5 | 0.4* (117.9)* |
| | 117.7 | 115.1 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 115.1 | 112.8 | Cohesive | Hard | 1500 | - | 23.0 | |
| OS-12 & OS-12A (P43,P44) | 118.1 | 117.8 | Fill | Dense | - | 30 | 19.0 | 0.5* (118.0)* |
| | 117.8 | 114.6 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 114.6 | 112.7 | Cohesive | Hard | 1500 | - | 23.0 | |
| OS-13 (P45) | 118.5 | 116.7 | Fill | Compact to Dense | - | 29 | 18.5 | 5.8* (113.0)* |
| | 116.7 | 111.7 | Fill | Stiff | 200 | - | 18.5 | |
| | 111.7 | 111.1 | Cohesive | Hard | 1000 | - | 23.0 | |
| OS-14 & OS-14A (P48,49) | 118.9 | 118.5 | Fill | Dense | - | 30 | 19.0 | 1.0* (118.2)* |
| | 118.5 | 117.2 | Cohesive | Very Stiff | 300 | - | 21.0 | |
| | 117.2 | 115.5 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 115.5 | 113.1 | Cohesive | Hard | 1500 | - | 23.0 | |
| BH 10 (P33,P35) | 118.0 | 116.4 | Cohesive | Stiff to Hard | 200 | - | 19.5 | 0.8* (117.2)* |
| | 116.4 | 114.6 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 114.6 | 109.9 | Cohesive | Hard | 1500 | - | 23.0 | |



Table 8.0 – Recommended Soil Parameters

| BH No. (Pole No.) | Elevation (m) | | Type of Soil | Consistency or Compactness Condition | q_u (kPa) | ϕ (degrees) | γ (kN/m ³) | Water Level Depth (Elevation) (m) |
|----------------------|------------------|-------|--------------|--|----------------|---------------------|----------------------------------|--|
| | From | To | | | | | | |
| UC 1 (P51,P52) | 118.7 | 117.9 | Fill | Compact | - | 29 | 18.5 | 2.1 (116.8) |
| | 117.9 | 117.5 | Cohesive | Hard | 400 | - | 21.5 | |
| | 117.5 | 116.5 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 116.5 | 114.3 | Cohesive | Hard | 1500 | - | 23.0 | |
| WM 6 (P58) | 118.2 | 114.1 | Cohesive | Very Stiff to Hard | 400 | - | 21.5 | 0.9* (117.5)* |
| | 114.1 | 112.0 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 112.0 | 100.1 | Cohesive | Hard | 1500 | - | 23.0 | |
| WM 8 (P56) | 120.9 | 119.6 | Fill | Very Stiff | 200 | - | 18.5 | 3.6* (117.5)* |
| | 119.6 | 118.8 | Cohesive | Hard | 400 | - | 21.5 | |
| | 118.8 | 118.0 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 118.0 | 105.8 | Cohesive | Hard | 1500 | - | 23.0 | |
| WM 9 (P53) | 121.6 | 120.6 | Cohesive | Hard | 400 | - | 21.5 | 4.4 (117.4) |
| | 120.6 | 119.3 | Cohesive | Hard | 1000 | - | 23.0 | |
| | 119.3 | 104.1 | Cohesive | Hard | 1500 | - | 23.0 | |

♦ = estimated

The notations used in Table 8.0 are defined below:

- ϕ = apparent angle of friction for cohesionless soils in degrees.
- q_u = unconfined compressive strength in kPa ($q_u=2 \times C_u$) for cohesive soils
- C_u = undrained shear strength in kPa.
- γ = bulk unit weight of soil in kN/m³.

In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of a caisson and the caisson sidewall adhesion within the upper 1.2 m below final grade, should be neglected in the foundation design. It is also recommended that all surficial weak or variable soils be neglected in determining lateral resistance.

When designing for the portion of a caisson below the groundwater level, the submerged unit weight should be used.

The required depth of the drilled shaft will be governed by lateral loads, including wind loads. Appropriate load and resistance factors should be applied for caisson design.

9 CONSTRUCTION CONSIDERATIONS

The boreholes indicate the presence of fill material, silty clay till, silty clay till (and till/shale complex), sandy silty till, and shale bedrock of the Queenston Formation. The glacial till deposits can be expected to contain random cobbles and boulders. Cobbles and boulders if encountered during excavation can increase the level of construction effort required for caisson installation, such as increasing the time required for drilling etc. Bidders should be advised of these conditions and be required to provide adequate equipment to handle the obstructions.

The cohesive silty clay and clayey silt fill material, silty clay till (and till/shale complex) deposit and the bedrock are expected to be self-supporting. Due to the relatively low permeability of these strata minor water seepage is expected in caisson holes, even below the groundwater table.



Where relatively more pervious and granular soils (e.g. sand and gravelly sand, and sand and silt till) are encountered, dry cave-ins may occur in unsupported holes made in these cohesionless soils above the groundwater table. Below the groundwater table, these water bearing soils can be expected to yield water. The use of dewatering techniques to lower the groundwater table during construction is unlikely to be economically viable due to the limited construction effort required.

Where the water bearing layers are rather thin and the soil is relatively fine grained, it may be possible to effect construction by pouring the concrete rapidly upon completion of the excavation. In other cases, however, the coarse tills and the sand and gravelly sand layers may cause cave-ins and/or excessive groundwater seepage.

In view of these conditions, it is recommended that temporary liner(s) be available on site to support the caisson sidewalls and to provide seepage cut-off as and where required.

The concrete should be poured expeditiously on completion of the caisson hole. It is recommended that the concrete be placed by the tremie method as soon as the hole reaches its desired depth. The liner should be withdrawn as concrete is placed. During liner withdrawal, the level of concrete in the caisson hole must always be at least 0.6 m above the bottom of the temporary liner.

We recommend that the following notes be included in the contract documents:


- At the foundation locations the strata may consist of fill material, silty clay till (also till shale complex), sand and silt till and shale bedrock. Groundwater is likely to be encountered above the base of the excavations.
- The contractor shall maintain the stability of the soil along the sides and in the bases of the holes for the concrete footings at all times from the commencement of their construction to the placing of the concrete.
- Dewatering and/or temporary liners may be required to maintain a sufficiently dry condition for proper construction of the caisson hole and the placement of concrete.

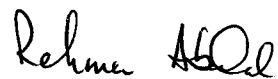
It is envisaged that caisson construction will likely be carried out in the till/shale complex and the shale bedrock which are known to contain hard seams and layers and shale and limestone slabs. Bidders should be advised of these conditions and be required to provide adequate equipment. It is probable that some combination of augering with rock teeth, coring bits, pneumatic breakers or chisels will be required.


Caisson construction should be monitored by qualified geotechnical personnel to verify the soil conditions and to confirm that those conditions are consistent with the design assumptions in this report.

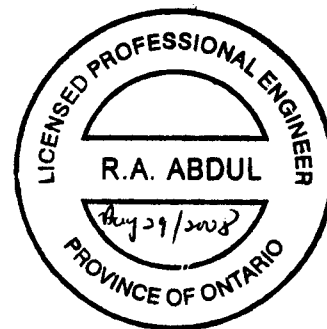


Terraprobe Limited

for 
Engineering Analysis and Report Preparation by:
Jason Crowder, Ph.D., P.Eng.,
Geotechnical Engineer

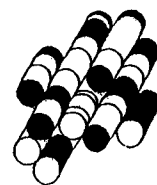

Report Reviewed by:
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Michael Tanos, P.Eng.,
Principal, Designated MTO Contact



APPENDICES

Terraprobe Limited



LIMITATIONS AND RISK

Procedures

The soil conditions were confirmed at the borehole locations only and conditions may vary between and beyond the boreholes. The boundaries between the various strata as shown on the logs are based on non-continuous sampling. These boundaries represent an inferred transition between the various strata, rather than a precise plane of stratigraphic change.

This investigation has been carried out using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by Terraprobe and other engineering practitioners, working under similar conditions and subject to the time, financial and physical constraints applicable to this project. The discussions and recommendations that have been presented are based on the factual data obtained.

It must be recognized that there are special risks whenever engineering or related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with the most stringent level of care may fail to detect certain conditions. Terraprobe has assumed for the purposes of providing design parameters and advice, that the conditions that exist between sampling points are similar to those found at the sample locations. The conditions that Terraprobe has interpreted to exist between sampling points can differ from those that actually exist.

It may not be possible to drill a sufficient number of boreholes or sample and report them in a way that would provide all the subsurface information that could affect construction costs, techniques, equipment and scheduling. Contractors bidding on or undertaking work on the project should be directed to draw their own conclusions as to how the subsurface conditions may affect them, based on their own investigations and their own interpretations of the factual investigation results, cognizant of the risks implicit in the subsurface investigation activities.

Changes In Site And Scope

It must be recognized that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site have the potential to alter subsurface conditions. Groundwater levels are particularly susceptible to seasonal fluctuations.

The design advice is based on the factual data obtained from this investigation made at the site by Terraprobe and are intended for use by the owner and its retained designers in the design phase of the project. If there are changes to the project scope and development features, or there is any additional information relevant to the interpretations made of the subsurface information, the geotechnical design parameters and comments relating to constructibility issues and quality control may not be relevant or complete for the revised project. Terraprobe should be retained to review the implications of such changes with respect to the contents of this report

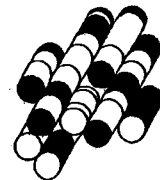
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APPENDIX A

Record of Borehole Sheets

High Mast Lighting

Terraprobe Limited



EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg. FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

| c_u (kPa) | 0 - 12 | 12 - 25 | 25 - 50 | 50 - 100 | 100 - 200 | >200 |
|-------------|-----------|---------|---------|----------|------------|------|
| | VERY SOFT | SOFT | FIRM | STIFF | VERY STIFF | HARD |

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

| N (BLOWS/0.3m) | 0 - 5 | 5 - 10 | 10 - 30 | 30 - 50 | >50 |
|----------------|------------|--------|---------|---------|------------|
| | VERY LOOSE | LOOSE | COMPACT | DENSE | VERY DENSE |

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY IS:

| RQD (%) | 0 - 25 | 25 - 50 | 50 - 75 | 75 - 90 | 90 - 100 |
|---------|-----------|---------|---------|---------|-----------|
| | VERY POOR | POOR | FAIR | GOOD | EXCELLENT |

JOINTING AND BEDDING:

| SPACING | 50mm | 50 - 300mm | 0.3m - 1m | 1m - 3m | >3m |
|----------|------------|------------|------------|---------|------------|
| JOINTING | VERY CLOSE | CLOSE | MOD. CLOSE | WIDE | VERY WIDE |
| BEDDING | VERY THIN | THIN | MEDIUM | THICK | VERY THICK |

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

| | | | |
|----|---------------------|----|---------------------------|
| SS | SPLIT SPOON | TP | THINWALL PISTON |
| WS | WASH SAMPLE | OS | OSTERBERG SAMPLE |
| ST | SLOTTED TUBE SAMPLE | RC | ROCK CORE |
| BS | BLOCK SAMPLE | PH | TW ADVANCED HYDRAULICALLY |
| CS | CHUNK SAMPLE | PM | TW ADVANCED MANUALLY |
| TW | THINWALL OPEN | FS | FOIL SAMPLE |

STRESS AND STRAIN

| | | |
|--------------------------------------|-----|-------------------------------|
| u_w | kPa | PORE WATER PRESSURE |
| r_u | 1 | PORE PRESSURE RATIO |
| σ | kPa | TOTAL NORMAL STRESS |
| σ' | kPa | EFFECTIVE NORMAL STRESS |
| τ | kPa | SHEAR STRESS |
| $\sigma_1, \sigma_2, \sigma_3$ | kPa | PRINCIPAL STRESSES |
| ϵ | % | LINEAR STRAIN |
| $\epsilon_1, \epsilon_2, \epsilon_3$ | % | PRINCIPAL STRAINS |
| E | kPa | MODULUS OF LINEAR DEFORMATION |
| G | kPa | MODULUS OF SHEAR DEFORMATION |
| μ | 1 | COEFFICIENT OF FRICTION |

MECHANICAL PROPERTIES OF SOIL

| | | |
|----------------|-------------------|--------------------------------------|
| m_v | kPa ⁻¹ | COEFFICIENT OF VOLUME CHANGE |
| C_c | 1 | COMPRESSION INDEX |
| C_s | 1 | SWELLING INDEX |
| C_α | 1 | RATE OF SECONDARY CONSOLIDATION |
| C_v | m ² /s | COEFFICIENT OF CONSOLIDATION |
| H | m | DRAINAGE PATH |
| T_v | 1 | TIME FACTOR |
| U | % | DEGREE OF CONSOLIDATION |
| σ'_{vo} | kPa | EFFECTIVE OVERBURDEN PRESSURE |
| σ'_p | kPa | PRECONSOLIDATION PRESSURE |
| τ_f | kPa | SHEAR STRENGTH |
| c' | kPa | EFFECTIVE COHESION INTERCEPT |
| ϕ' | ° | EFFECTIVE ANGLE OF INTERNAL FRICTION |
| c_u | kPa | APPARENT COHESION INTERCEPT |
| ϕ_u | ° | APPARENT ANGLE OF INTERNAL FRICTION |
| τ_R | kPa | RESIDUAL SHEAR STRENGTH |
| τ_r | kPa | REMOULDED SHEAR STRENGTH |
| S_x | 1 | SENSITIVITY = c_u / τ_r |

PHYSICAL PROPERTIES OF SOIL

| | | | | | | | | |
|----------------|-------------------|--------------------------------|-----------|-----|---------------------------------------|-----------|-------------------|---|
| ρ_s | kg/m ³ | DENSITY OF SOLID PARTICLES | e | 1.0 | VOID RATIO | e_{min} | 1.0 | VOID RATIO IN DENSEST STATE |
| γ_s | kN/m ³ | UNIT WEIGHT OF SOLID PARTICLES | n | 1.0 | POROSITY | I_p | 1 | DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$ |
| ρ_w | kg/m ³ | DENSITY OF WATER | w | 1.0 | WATER CONTENT | D | mm | GRAIN DIAMETER |
| γ_w | kN/m ³ | UNIT WEIGHT OF WATER | S_r | % | DEGREE OF SATURATION | D_u | mm | n PERCENT - DIAMETER |
| ρ | kg/m ³ | DENSITY OF SOIL | w_L | % | LIQUID LIMIT | C_u | 1 | UNIFORMITY COEFFICIENT |
| γ | kN/m ³ | UNIT WEIGHT OF SOIL | w_p | % | PLASTIC LIMIT | h | m | HYDRAULIC HEAD OR POTENTIAL |
| ρ_d | kg/m ³ | DENSITY OF DRY SOIL | w_s | % | SHRINKAGE LIMIT | q | m ² /s | RATE OF DISCHARGE |
| γ_d | kN/m ³ | UNIT WEIGHT OF DRY SOIL | I_p | % | PLASTICITY INDEX = $(w_L - w_p)$ | v | m/s | DISCHARGE VELOCITY |
| ρ_{sat} | kg/m ³ | DENSITY OF SATURATED SOIL | I_L | 1 | LIQUIDITY INDEX = $(w - w_p) / I_p$ | i | 1 | HYDRAULIC GRADIENT |
| γ_{sat} | kN/m ³ | UNIT WEIGHT OF SATURATED SOIL | I_c | 1 | CONSISTENCY INDEX = $(w_L - w) / I_p$ | k | m/s | HYDRAULIC CONDUCTIVITY |
| ρ' | kg/m ³ | DENSITY OF SUBMERGED SOIL | e_{max} | 1.0 | VOID RATIO IN LOOSEST STATE | j | kN/m ² | SEEPAGE FORCE |
| γ' | kN/m ³ | UNIT WEIGHT OF SUBMERGED SOIL | | | | | | |

RECORD OF BOREHOLE No HML-1

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802137.8 E:280920.0 ORIGINATED BY SK
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 15.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|---------------|----------------------------|-----------------|---|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | |
| | | | | | | | | 20 40 60 80 100 | ○ UNCONFINED + FIELD VANE ● POCKET PEN × LAB VANE | | | WATER CONTENT (%) | | | GR SA SI CL |
| 113.7 | Ground Surface | | | | | | | 20 40 60 80 100 | | | | | | | |
| 0.0 | 180mm ASPHALT | | | | | | | | | | | | | | |
| 0.2 | FILL - Gravelly Sand, some silt, compact, brown, dry | | 1 | SS | 27 | | | | | | | | | | |
| 113.1 | | | | | | | | | | | | | | | |
| 0.6 | SILTY CLAY some sand, trace gravel, occasional fine sand seams, hard, brown, moist (GLACIAL TILL) | | 2 | SS | 39 | | 113 | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 3 | SS | 59 | | 112 | | | | | | | | 5 27 43 25 |
| | | | | | | | | | | | | | | | |
| | | | 4 | SS | 42 | | 111 | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | clayey silt, trace shale fragments, reddish brown | | 5 | SS | 129/ 23cm | | 110 | | | | | | | | 4 24 56 16 |
| 109.7 | | | | | | | | | | | | | | | |
| 4.0 | SILTY CLAY TILL with shale, hard, reddish brown, damp (TILL-SHALE COMPLEX) | | 6 | SS | 100/ 10cm | | 109 | | | | | | | | |
| 108.9 | | | | | | | | | | | | | | | |
| 4.8 | SHALE BEDROCK reddish brown (Queenston Formation) | | 7 | SS | 100/ 2.5cm | | 108 | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | 107 | | | | | | | | |
| 105.8 | | | 8 | AS | - | | 106 | | | | | | | | |
| 7.9 | End of Borehole Auger Refusal at 7.9m Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-1A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802137.8 E:280920.0 ORIGINATED BY HA
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 18.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|-----------------|---|--|--|-------------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | |
| 113.7 | Ground Surface | | | | | | | 20 40 60 80 100 | 20 40 60 80 100 | 10 20 30 | | | GR SA SI CL | |
| 0.0 | Augered to 5.4m, refer to BH HML-1 for inferred soil stratigraphy. | | | | | | | | | | | | | |
| 108.3 | SHAILE BEDROCK | | | | | | | | | | | | | |
| 5.4 | Reddish brown, partially weathered to 5.9m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Shale = 65% Limestone = 35% (Queenston Formation) | | 1 | RUN | NQ | | | | | | | | | RUN#1 TCR=100% SCR=97% RQD=63% |
| | | | 2 | RUN | NQ | | | | | | | | | RUN#2 TCR=100% SCR=100% RQD=82% |
| 105.3 | End of Borehole | | | | | | | | | | | | | |
| 8.4 | | | | | | | | | | | | | | |

NTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08


ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-2A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802625.8 E:281164.1 ORIGINATED BY LH
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 04.10.07 CHECKED BY RA

| SOIL PROFILE | | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|--|--------|---------|------------|--------------------|----------------------------|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | | | | |
| 115.0 0.0 | Ground Surface Augered to 3.0m, refer to BH HML-2 for inferred soil stratigraphy. | | | | | | | | | | | | | | | | | |
| 112.0 3.0 | SHALE BEDROCK Reddish brown, partially weathered to 4.6m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Rusty subvertical joint at 4.0m. Shale = 78% Limestone = 22% (Queenston Formation) |  | 1 | RUN | NQ | | | | | | | | | | | | | |
| | | | 2 | RUN | NQ | | | | | | | | | | | | | |
| 108.9 6.1 | End of Borehole | | | | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

ONTARIO MOT. 1-07-2145 SIGNS AND LIGHTS.GPJ. ONTARIO MOT. GDT 24/04/08

RECORD OF BOREHOLE No HML-3

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802915.0 E:281399.1 ORIGINATED BY SK
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 01.08.07 - 02.08.07 CHECKED BY RA

| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT | | LIQUID LIMIT | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|--------|------|----------------------------|-----------------|---|-----------------|---|-----|-----------------|----------------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | 20 40 60 80 100 | 20 40 60 80 100 | w_p | w | w_L | | |
| 115.7 | Ground Surface | | | | | | | | | | | | |
| 0.0 | 280mm ASPHALT | | | | | | | | | | | | |
| 115.4 | | | | | | | | | | | | | |
| 0.3 | FILL - Gravelly Sand, some silt, compact, brown, dry | | 1 | SS | 29 | | | | | | | | |
| 114.7 | | | 2 | SS | 23 | | | | | | | | |
| 1.0 | FILL - Silty Clay, trace to some sand, trace gravel, firm to stiff, brown, damp to moist | | 3 | SS | 10 | | | | | | | | |
| | | | 4 | SS | 7 | | | | | | | | |
| | trace shale fragments | | 5 | SS | 7 | | | | | | | | |
| | | | | | | | | | | | | | |
| 110.8 | reddish brown | | 6 | SS | 65 | | | | | | | | |
| 4.9 | SHALE BEDROCK reddish brown (Queenston Formation) | | 7 | SS | 100/ 10cm | | | | | | | | |
| | | | 8 | AS | - | | | | | | | | |
| 106.5 | End of Borehole | | 9 | SS | 100/ 2.5cm | | | | | | | | |
| 9.2 | Auger Refusal at 9.2m Borehole was open and unstabilized water level at 8.5m upon completion of drilling. | | | | | | | | | | | | |

ONTARIO MOT. 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-3A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802915.0 E:281399.1 ORIGINATED BY HA
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 04.10.07 CHECKED BY RA

| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|--------|------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 115.7 0.0 | Ground Surface | | | | | | | | | | | | | | | |
| | Augered to 5.6m, refer to BH HML-3 for inferred soil stratigraphy. | | | | | | | | | | | | | | | |
| 110.1 5.6 | SHALE BEDROCK | | | | | | | | | | | | | | | |
| | Reddish brown, partially weathered to 7.3m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Irregular, stained subvertical joints at 7.3, 8.2m. | | 1 | RUN | NQ | | | | | | | | | | | |
| | Shale = 80% Limestone = 20% (Queenston Formation) | | 2 | RUN | NQ | | | | | | | | | | | |
| 106.8 8.9 | End of Borehole | | | | | | | | | | | | | | | |

RUN#1
TCR=98%
SCR=90%
RQD=15%

RUN#2
TCR=100%
SCR=100%
RQD=49%

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-4

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803256.5 E:281683.0 ORIGINATED BY SK
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 15.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|---------------|---|------------|---------|------|---------------|----------------------------|-----------------|---|--------------|--------------|------------------------------------|-------------------------------------|-----------------------------------|--|---|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | WATER CONTENT (%) |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | ● POCKET PEN | | | | | | |
| 116.7 | Ground Surface | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | GR SA SI CL |
| 0.0 | 180mm ASPHALT | | | | | | | | | | | | | | | |
| 0.2 | FILL - Gravelly Sand, some silt, dense, brown, dry | | 1 | SS | 31 | | | | | | | | | | | |
| 116.1 | FILL - Silty Clay, sandy, trace gravel, organics, stiff, brown / dark brown, moist | | 2 | SS | 12 | | | | | 125kPa | | | | | | 3 24 52 21 |
| 115.3 | | | | | | | | | | | | | | | | |
| 1.4 | SILTY CLAY some sand, trace gravel, occasional fine sand seams and partings, trace to some shale fragments, hard, brown, moist (GLACIAL TILL) | | 3 | SS | 100/ 15cm | | | | | 175kPa | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 4 | SS | 82 | | | | | >225kPa | | | | | | 7 17 47 29 |
| 113.8 | | | | | | | | | | | | | | | | |
| 2.9 | SILTY CLAY TILL - with shale, hard, reddish brown, damp (TILL-SHALE COMPLEX) | | 5 | SS | 100/ 15cm | | | | | | | | | | | |
| 113.3 | | | | | | | | | | | | | | | | |
| 3.4 | SHALE BEDROCK reddish brown (Queenston Formation) | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 6 | SS | 100/ 2.5cm | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 7 | AS | - | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 109.0 | | | | | | | | | | | | | | | | |
| 7.7 | End of Borehole | | 8 | SS | 100/ 1cm | | | | | | | | | | | |
| | Auger Refusal at 7.7m | | | | | | | | | | | | | | | |
| | Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No HML-4A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803256.5 E:281683.0 ORIGINATED BY HA
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 25.10.07 CHECKED BY RA

| SOIL PROFILE | | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|--------|---------|------------|--------------------|----------------------------|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | | | | |
| 116.7 0.0 | Ground Surface | | | | | | | | | | | | | | | | | |
| | Augered to 4.3m, refer to BH HML-4 for inferred soil stratigraphy. | | | | | | | | | | | | | | | | | |
| 112.4 4.3 | SHALE BEDROCK | | | | | | | | | | | | | | | | | |
| | Reddish brown, partially weathered to 6.1m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Irregular, stained subvertical joints at 5.0, 5.5, 6.4m; intermittent, thin clay seams in Run 1 and Run 2. Shale = 84% Limestone = 16% (Queenston Formation) | | 1 | RUN | NQ | | | | | | | | | | | | RUN#1 TCR=100% SCR=73% RQD=33% | |
| | | | 2 | RUN | NQ | | | | | | | | | | | | RUN#2 TCR=97% SCR=85% RQD=35% | |
| 109.4 7.3 | End of Borehole | | | | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT GDT 24/04/08

RECORD OF BOREHOLE No HML-5

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803578.3 E:281943.0 ORIGINATED BY SK
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 17.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|---------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|--|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 117.8 | Ground Surface | | | | | | | 20 40 60 80 100 | | | | | | |
| 0.0 | 180mm ASPHALT | | | | | | | | | | | | | |
| 0.2 | FILL - Gravelly Sand, some silt, compact, brown, dry | | 1 | SS | 20 | | | | | | | | | |
| 117.1 | FILL - Clayey Silt, sandy, some gravel, stiff, brown, dry to damp | | 2 | SS | 9 | | 117 | | | | | | | 12 30 42 16 |
| 116.4 | SILTY CLAY TILL with shale, hard, reddish brown, damp (TILL-SHALE COMPLEX) | | 3 | SS | 50 | | 116 | | | | | | | |
| 1.4 | | | 4 | SS | 121 | | | | | | | | | 20 29 37 14 |
| 114.9 | | | 5 | SS | 100/ 13cm | | 115 | | | | | | | |
| 2.9 | SHALE BEDROCK reddish brown (Queenston Formation) | | 6 | SS | 100/ 13cm | | 114 | | | | | | | |
| | | | 7 | AS | - | | 113 | | | | | | | |
| | | | | | | | 112 | | | | | | | |
| 110.1 | End of Borehole | | 8 | SS | 100/ 2.5cm | | 111 | | | | | | | |
| 7.7 | Auger Refusal at 7.7m Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-5A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803578.3 E:281943.0 ORIGINATED BY LH
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
 DATUM Geodetic DATE 11.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 117.8 | Ground Surface | | | | | | | 20 | 40 | 60 | 80 | 100 | | |
| 0.0 | Augered to 4.6m, refer to BH HML-5 for inferred soil stratigraphy. | | | | | | | 20 | 40 | 60 | 80 | 100 | | |
| 113.2 | | | | | | | | | | | | | | |
| 4.6 | SHALE BEDROCK | | | | | | | | | | | | | |
| | Reddish brown, partially weathered to 4.8m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. 12mm thick gouge filled joint at 9.9m | | 1 | RUN | NQ | | | | | | | | | RUN#1 TCR=98% SCR=98% RQD=45% |
| | Shale = 80% Limestone = 20% (Queenston Formation) | | 2 | RUN | NQ | | | | | | | | | RUN#2 TCR=100% SCR=100% RQD=71% |
| 110.2 | End of Borehole | | | | | | | | | | | | | |
| 7.6 | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-6

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803894.2 E:282198.2 ORIGINATED BY SK
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 17.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|---------------|---|------------|---------|------|---------------|----------------------------|--|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|---|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | WATER CONTENT (%) |
| | | | | | | | | 20 40 60 80 100 | | | | | | | | | | |
| | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE | | | | | | | | | | | |
| 116.9 | Ground Surface | | | | | | | | | | | | | | | | | |
| 0.0 | 130mm ASPHALT | | | | | | | | | | | | | | | | | |
| 0.1 | FILL - Gravelly Sand, some silt, compact, brown, dry | | 1 | SS | 30 | | | | | | | | | | | 27 56 (17) | | |
| 116.3 | | | | | | | | | | | | | | | | | | |
| 0.6 | SILTY CLAY TILL with shale, hard, reddish brown, dry (TILL-SHALE COMPLEX) | | 2 | SS | 66 | | | | | | | | | | | | | |
| 115.5 | | | | | | | | | | | | | | | | | | |
| 1.4 | SHALE BEDROCK reddish brown (Queenston Formation) | | 3 | SS | 100/ 13cm | | | | | | | | | | | | | |
| | | | 4 | AS | - | | | | | | | | | | | | | |
| | | | 5 | SS | 100/ 2.5cm | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | 6 | AS | - | | | | | | | | | | | | | |
| 110.7 | | | | | | | | | | | | | | | | | | |
| 6.2 | End of Borehole Auger Refusal at 6.2m Borehole was open and dry upon completion of drilling. | | 7 | SS | 100/ 2.5cm | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

+ 3, x 3: Numbers refer to
Sensitivity


○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-6A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803894.2 E:282198.2 ORIGINATED BY HA
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 12.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|--|---------|------|------------|----------------------------|-----------------|---|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| 116.9 0.0 | Ground Surface | | | | | | | | | | | | | | | |
| | Augered to 2.4m, refer to BH HML-6 for inferred soil stratigraphy. | | | | | | | | | | | | | | | |
| 114.5 2.4 | SHALE BEDROCK Reddish brown, partially weathered to 4.3m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish gray limestone. Intermittent thin clay seams in Run 1 and Run 2; irregular, rough subvertical joint at 3.6m. Shale = 88% Limestone = 12% (Queenston Formation) |  | 1 | RUN | NQ | | | | | | | | | | | RUN#1 TCR=98% SCR=90% RQD=32% |
| | | | 2 | RUN | NQ | | | | | | | | | | | RUN#2 TCR=100% SCR=97% RQD=13% |
| 111.4 5.5 | End of Borehole | | | | | | | | | | | | | | | |

ONTARIO MOT. 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

ONTARIO MOT. 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-7

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804219.8 E:282459.6 ORIGINATED BY SK
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 17.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|---------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 119.0 | Ground Surface | | | | | | | 20 40 60 80 100 | | | | | | |
| 0.0 | 200mm ASPHALT | | | | | | | | | | | | | |
| 0.2 | FILL - Gravelly Sand, some silt, compact, brown, dry | | 1 | SS | 21 | | | | | | | | | |
| 118.4 | | | | | | | | | | | | | | |
| 0.6 | SILTY CLAY trace sand, trace gravel, stiff, reddish brown, moist (GLACIAL TILL) | | 2 | SS | 10 | | | | | | | | | |
| 117.6 | | | | | | | | | | | | | | |
| 1.4 | SILTY CLAY TILL - with shale, hard, reddish brown, moist (TILL-SHALE COMPLEX) | | 3 | SS | 57 | | | | | | | | | |
| 117.0 | | | | | | | | | | | | | | |
| 2.0 | SHAILE BEDROCK reddish brown (Queenston Formation) | | 4 | SS | 100/ 14cm | | | | | | | | | |
| | | | 5 | SS | 100/ 13cm | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 6 | AS | - | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 112.8 | | | 7 | SS | 100/ 2.5cm | | | | | | | | | |
| 6.2 | End of Borehole Auger Refusal at 6.2m Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | |

+ 3, x 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-7A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804219.8 E:282459.6 ORIGINATED BY LH
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
 DATUM Geodetic DATE 12.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| | | | | | | | | 20 40 60 80 100 | | | | | | |
| 119.0 0.0 | Ground Surface | | | | | | | | | | | | | |
| | Augered to 3.0m, refer to BH HML-7 for inferred soil stratigraphy. | | | | | | | | | | | | | |
| 116.0 3.0 | SHALE BEDROCK | | | | | | | | | | | | | |
| | Reddish brown, partially weathered to 4.9m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. 20mm thick clay seams at 3.7m and 4.3m; subvertical joint at 4.2m. | | 1 | RUN | NQ | | | | | | | | | RUN#1 TCR=100% SCR=100% RQD=15% |
| | Shale = 83% Limestone = 17% (Queenston Formation) | | 2 | RUN | NQ | | | | | | | | | RUN#2 TCR=100% SCR=100% RQD=41% |
| 112.9 6.1 | End of Borehole | | | | | | | | | | | | | |

+ 3 , x 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-8

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804535.7 E:282711.5 ORIGINATED BY SK
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 17.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
|---------------|---|------------|---------|------|---------------|----------------------------|-----------------|---|----------------------------|------------------------------------|-------------------------------------|-----------------------------------|--|--|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) |
| | | | | | | | | ○ UNCONFINED ● POCKET PEN | + FIELD VANE × LAB VANE | | | | | | |
| 119.1 | Ground Surface | | | | | | | 20 40 60 80 100 | | | | | | | |
| 0.0 | 200mm ASPHALT | | | | | | 119 | | | | | | | | |
| 0.2 | FILL - Gravelly Sand, some silt, compact, brown, damp | | 1 | SS | 17 | | | | | | | | | | |
| 118.5 | FILL - Silty Clay, sandy, trace gravel, trace organics, stiff, reddish brown / dark brown, moist | | 2 | SS | 11 | | 118 | 150kPa● | | | | | 2 21 44 33 | | |
| 0.6 | | | | | | | | | | | | | | | |
| 117.7 | SILTY CLAY some sand, trace gravel, hard, brown, damp (GLACIAL TILL) | | 3 | SS | 39 | | | >225kPa● | | | | | | | |
| 1.4 | | | | | | | 117 | | | | | | | | |
| 117.0 | | | | | | | | | | | | | | | |
| 2.1 | SHALE BEDROCK reddish brown (Queenston Formation) | | 4 | SS | 100/ 15cm | | 116 | | | | | | | | |
| | | | 5 | SS | 100/ 8cm | | | | | | | | | | |
| | | | | | | | 115 | | | | | | | | |
| | | | 6 | AS | - | | 114 | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 112.9 | End of Borehole | | 7 | SS | 100/ 2.5cm | | 113 | | | | | | | | |
| 6.2 | Auger Refusal at 6.2m Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No HML-8A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804535.7 E:282711.5 ORIGINATED BY HA
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 13.10.07 CHECKED BY RA

| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|--------|------|----------------------------|-----------------|---|--------------------|--|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | |
| 119.1 | Ground Surface | | | | | | 20 40 60 80 100 | | | | |
| 0.0 | Augered to 2.5m, refer to BH HML-8 for inferred soil stratigraphy. | | | | | | | | | | |
| 116.6 | | | | | | | | | | | |
| 2.5 | SHALE BEDROCK Reddish brown, partially weathered to 3.7m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Intermittent, thin clay seams in Run 1. Irregular, stained, rough subvertical joints at 3.1m and 3.3m. Shale = 83% Limestone = 17% (Queenston Formation) | | 1 | RUN | NQ | | | | | | |
| | | | 2 | RUN | NQ | | | | | | |
| 113.5 | | | | | | | | | | | |
| 5.6 | End of Borehole | | | | | | | | | | |

RECORD OF BOREHOLE No HML-9

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804868.6 E:282978.4 ORIGINATED BY SK
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 17.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|---------|------|---------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| | | | | | | | | 20 40 60 80 100 | | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | | | | | | |
| | | | | | | | | ● POCKET PEN × LAB VANE | | | | | | |
| | | | | | | | | 20 40 60 80 100 | | | | | | |
| 118.2 | Ground Surface | | | | | | | | | | | | | |
| 0.0 | 240mm ASPHALT | | | | | | | | | | | | | |
| 0.2 | FILL - Gravelly Sand, some silt, compact, brown, dry | | 1 | SS | 18 | | 118 | | | | | | | 28 56 (16) |
| 117.4 | FILL - Silty Clay, trace sand, trace gravel, stiff, reddish brown, moist | | 2 | SS | 13 | | 117 | >225kPa● | | ○ | | | | 7 19 47 27 |
| 116.8 | SILTY CLAY TILL - with shale, hard, reddish brown, damp (TILL-SHALE COMPLEX) | | 3 | SS | 54 | | | >225kPa● | | ○ | | | | |
| 116.1 | SHALE BEDROCK reddish brown (Queenston Formation) | | 4 | SS | 100/ 13cm | | 116 | | | ○ | | | | |
| 2.1 | | | 5 | SS | 100/ 10cm | | 115 | | | ○ | | | | |
| | | | 6 | AS | - | | 114 | | | ○ | | | | |
| | | | | | | | 113 | | | | | | | |
| 112.0 | End of Borehole | | 7 | SS | 100/ 2.5cm | | 112 | | | ○ | | | | |
| 6.2 | Auger Refusal at 6.2m Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | |

NTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-9A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804868.6 E:282978.4 ORIGINATED BY HA
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 13.10.07 CHECKED BY RA

| SOIL PROFILE | | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|--------|---------|------------|--------------------|----------------------------|-----------------|---|--|--|--|--|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | |
| 118.2 0.0 | Ground Surface | | | | | | | | | | | | | | |
| | Augered to 3.0m, refer to BH HML-9 for inferred soil stratigraphy. | | | | | | | | | | | | | | |
| 115.2 3.0 | SHALE BEDROCK | | | | | | | | | | | | | | |
| | Reddish brown, partially weathered to 5.3m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Intermittent, thin clay seams in Run 1 and Run 2. Rough, stained, subvertical joint at 4.0m. | | 1 | RUN | NQ | | | | | | | | | | RUN#1 TCR=97% SCR=80% RQD=43% |
| | Shale = 87% Limestone = 13% (Queenston Formation) | | 2 | RUN | NQ | | | | | | | | | | RUN#2 TCR=100% SCR=96% RQD=40% |
| 112.1 6.1 | End of Borehole | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No HML-10

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4805200.0 E:283243.0 ORIGINATED BY SK
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 19.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|---------------|----------------------------|-----------------|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● POCKET PEN x LAB VANE | | | | | | | |
| 118.4 | Ground Surface | | | | | | | 20 40 60 80 100 | | | | | | | |
| 0.0 | 180mm ASPHALT | | | | | | | | | | | | | | |
| 0.2 | FILL - Gravelly Sand, some silt, compact, brown, dry | | 1 | SS | 19 | | 118 | | | | | | | | |
| 117.8 | | | | | | | | | | | | | | | |
| 0.6 | SILTY CLAY TILL with shale, very stiff to hard, reddish brown, damp (TILL-SHALE COMPLEX) | | 2 | SS | 25 | | | | | | | | | | |
| | | | 3 | SS | 100/ 13cm | | 117 | | | | | | | | |
| 116.5 | | | | | | | | | | | | | | | |
| 1.9 | SHALE BEDROCK reddish brown (Queenston Formation) | | 4 | SS | 100/ 2.5cm | | 116 | | | | | | | | |
| | | | 5 | SS | 100/ 2.5cm | | 115 | | | | | | | | |
| | | | | | | | 114 | | | | | | | | |
| | | | 6 | AS | - | | | | | | | | | | |
| | | | | | | | 113 | | | | | | | | |
| 112.2 | End of Borehole | | 7 | SS | 100/ 1cm | | | | | | | | | | |
| 6.2 | Auger Refusal at 6.2m Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | |

+ 3, X 3: Numbers refer to
Sensitivity


○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-10A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4805200.0 E:283243.0 ORIGINATED BY LH
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 12.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|--|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|--|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| 118.4 | Ground Surface | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | GR SA SI CL |
| 0.0 | Augered to 2.4m, refer to BH HML-10 for inferred soil stratigraphy. | | | | | | 118 | | | | | | | | | | |
| | | | | | | | 117 | | | | | | | | | | |
| 116.0 | | | | | | | 116 | | | | | | | | | | RUN#1 TCR=80% SCR=80% RQD=52% |
| 2.4 | SHALE BEDROCK Reddish brown, partially weathered to 4.8m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Subvertical joints at 3.2, 3.3, 3.7m; 25mm thick gouge filled joint at 3.8m. Shale = 79% Limestone = 21% (Queenston Formation) |  | 1 | RUN | NQ | | 115 | | | | | | | | | | RUN#2 TCR=100% SCR=100% RQD=16% |
| | | | 2 | RUN | NQ | | 114 | | | | | | | | | | RUN#3 TCR=100% SCR=100% RQD=50% |
| | | | 3 | RUN | NQ | | 113 | | | | | | | | | | |
| 112.9 | End of Borehole | | | | | | | | | | | | | | | | |
| 5.5 | | | | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

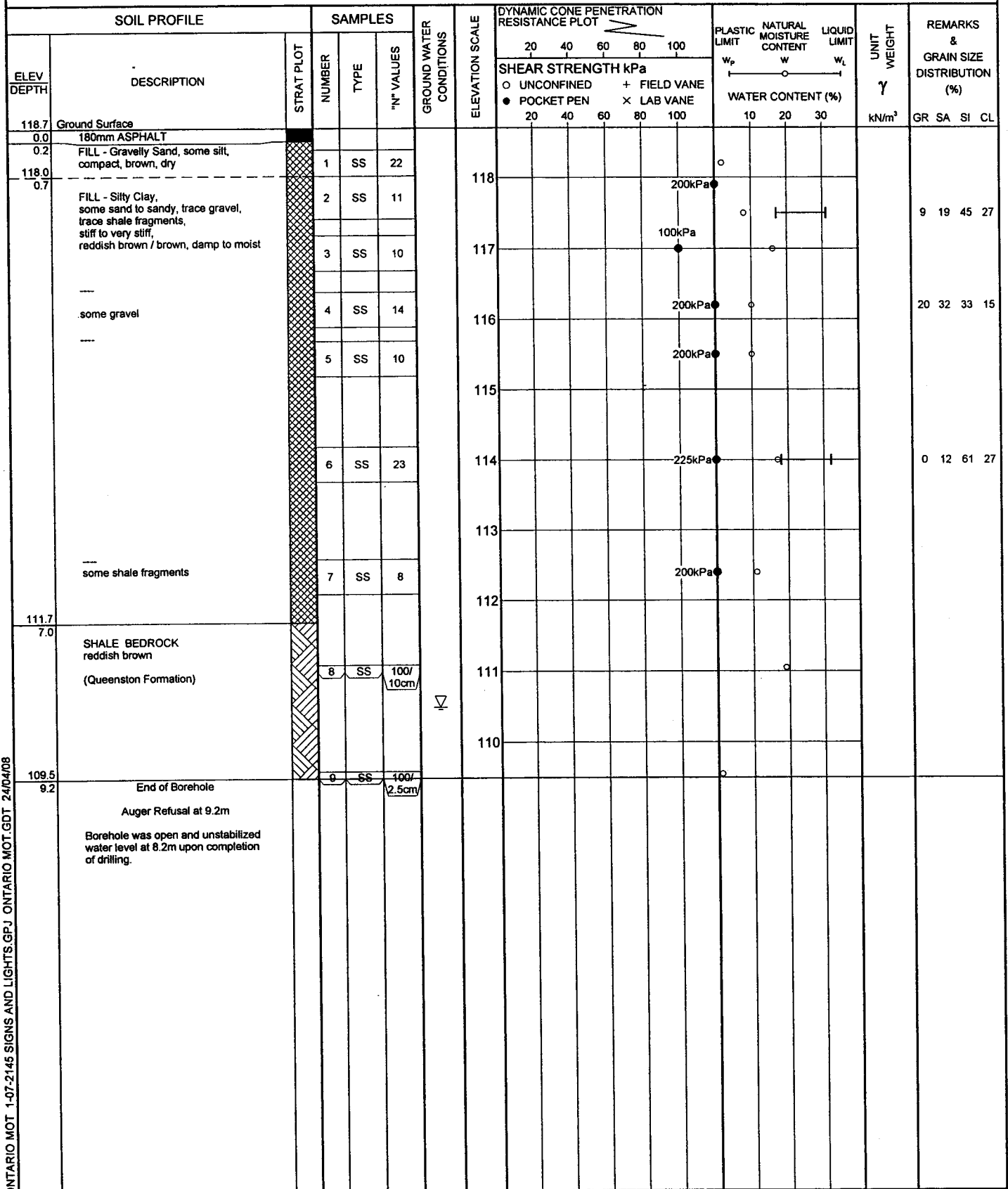
ONTARIO MOT. 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-11

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4805469.8 E:283457.1 ORIGINATED BY SK
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 19.08.07 CHECKED BY RA



ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

METRIC

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | PLASTIC LIMIT w_p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|----------------|------------|---------|------|------------|-------------------------|-------------------------------------|--|------------------------|---------------------------------|-----------------------|--|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 40 60 80 100 | | | | | |
| | | | | | | | | SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE | | | | | |
| 118.7 | Ground Surface | | | | | | 20 40 60 80 100 | | | | | | |
| | | | | | | | WATER CONTENT (%) 10 20 30 | | | | | | |

[illegible]

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GOT 24/04/08

RECORD OF BOREHOLE No HML-12

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4805778.6 E:283702.1 ORIGINATED BY SK
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 19.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | |
|---------------|-------------|------------|---------|------|------------|----------------------------|-----------------|---|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | | | | | | | | 20 40 60 80 100 | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|-------|--|--|---|----|-------------|--|-----|--|--|---------|---|--|--|---|----------|
| 119.4 | Ground Surface | | | | | | | | | | | | | | |
| 0.0 | 190mm ASPHALT | | | | | | | | | | | | | | |
| 0.2 | FILL - Gravelly Sand, some silt, compact, brown, damp | | 1 | SS | 22 | | 119 | | | | | | | | |
| 118.7 | | | | | | | | | | | | | | | |
| 0.7 | SILTY CLAY TILL with shale, stiff to hard, reddish brown, damp (TILL-SHALE COMPLEX) | | 2 | SS | 15 | | | | | 200kPa | ○ | | | 6 | 12 53 29 |
| | | | 3 | SS | 57 | | 118 | | | >225kPa | ○ | | | | |
| | | | 4 | SS | 78 | | 117 | | | >225kPa | ○ | | | 3 | 8 62 27 |
| 116.7 | | | 5 | SS | 100/ 5cm | | 116 | | | | ○ | | | | |
| 2.7 | SHALE BEDROCK reddish brown (Queenston Formation) | | 6 | AS | - | | 115 | | | | ○ | | | | |
| | | | 7 | SS | 100/ 1cm | | 114 | | | | ○ | | | | |
| 113.2 | End of Borehole | | | | | | | | | | | | | | |
| 6.2 | Auger Refusal at 6.2m Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | |


+ 3, x 3. Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-12A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4805778.6 E:283702.1 ORIGINATED BY LH
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
 DATUM Geodetic DATE 18.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | 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 | | |
| 119.4 0.0 | Ground Surface | | | | | | | | | | | | | | | GR SA SI CL | | | | |
| 116.4 3.0 | SHALE BEDROCK Reddish brown, partially weathered to 3.8m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. 50mm clay seam at 5.4m, vertical joints at 5.0-5.1m. Shale = 79% Limestone = 21% (Queenston Formation) |  | 1 | RUN | NQ | | | | | | | | | | | RUN#1 TCR=91% SCR=74% RQD=17% RUN#2 TCR=100% SCR=100% RQD=30% | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 113.4 6.0 | End of Borehole | | | | | | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

METRIC

[illegible]

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-14

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803120.8 E:281431.1 ORIGINATED BY JS
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 23.01.08 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|---------------|--|------------|---------|------|--------------------|----------------------------|-----------------|---|---------------------------|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|-------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| | | | | | | | | 20 40 60 80 100 | ○ UNCONFINED + FIELD VANE | | | WATER CONTENT (%) | | | kN/m ³ | GR SA SI CL |
| | | | | | | | | 20 40 60 80 100 | ● POCKET PEN × LAB VANE | | | | | | | |
| 117.4 | Ground Surface | | | | | | | | | | | | | | | |
| 0.0 | 100mm TOPSOIL | | | | | | | | | | | | | | | |
| 0.1 | trace rootlets, stiff | | 1 | SS | 11 | | 117 | | | | | | | | | |
| | SILTY CLAY | | | | | | | | | | | | | | | |
| | some sand, some gravel, | | 2 | SS | 17 | | | | | | | | | | 20 20 35 25 | |
| | occasional shale fragments, | | | | | | 116 | | | | | | | | | |
| | very stiff to hard, | | 3 | SS | 39 | | | | | | | | | | | |
| | brown / reddish brown, moist | | | | | | | | | | | | | | | |
| | (GLACIAL TILL) | | | | | | | | | | | | | | | |
| 115.3 | | | | | | | | | | | | | | | | |
| 2.1 | SILTY CLAY TILL - with shale, | | 4 | SS | 100/ 23cm | | 115 | | | | | | | 22.8 | 5 20 57 18 | |
| | clayey silt till to 2.4m depth, | | | | | | | | | | | | | | | |
| | hard, reddish brown, damp | | | | | | | | | | | | | | | |
| | (TILL-SHALE COMPLEX) | | | | | | | | | | | | | | | |
| 114.5 | | | | | | | | | | | | | | | | |
| 2.9 | SHALE BEDROCK | | 5 | SS | 100/ 5cm/ NQ | | 114 | | | | | | | | RUN#1 | |
| | Reddish brown, partially weathered to | | 1 | RUN | | | | | | | | | | | TCR=50% | |
| | 3.8m, then unweathered, medium to | | | | | | | | | | | | | | SCR=35% | |
| | thickly bedded, low to medium | | | | | | | | | | | | | | RQD=0% | |
| | strength shale with occasional | | 2 | RUN | NQ | | 113 | | | | | | | | RUN#2 | |
| | interbeds of medium to high strength | | | | | | | | | | | | | | TCR=100% | |
| | greenish grey limestone. | | | | | | | | | | | | | | SCR=95% | |
| | Clay filled subvertical joints at | | | | | | | | | | | | | | RQD=44% | |
| | 6.0-6.2m. | | | | | | | | | | | | | | | |
| | Shale = 86% Limestone = 14% | | | | | | | | | | | | | | | |
| | (Queenston Formation) | | 3 | RUN | NQ | | 112 | | | | | | | | RUN#3 | |
| | | | | | | | | | | | | | | | TCR=98% | |
| | | | | | | | | | | | | | | | SCR=98% | |
| | | | | | | | | | | | | | | | RQD=60% | |
| 110.8 | | | | | | | 111 | | | | | | | | | |
| 6.7 | End of Borehole | | | | | | | | | | | | | | | |
| | Borehole filled with drill water upon completion of drilling. | | | | | | | | | | | | | | | |

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-15

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804734.7 E:282730.2 ORIGINATED BY JS
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 25.01.08 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|--------------|------------------------------------|-------------------------------------|-----------------------------------|--|---|-------------------|--------------|------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) | | | |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | | | | | | | ● POCKET PEN | × LAB VANE | |
| 121.6 | Ground Surface | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | |
| 0.0 | 100mm TOPSOIL | | | | | | | | | | | | | | | | | |
| 0.1 | FILL - Silty Clay and Gravel, some sand to sandy, trace organic inclusions, trace shale fragments, stiff to very stiff, reddish brown, damp | | 1 | SS | 25 | | | | | | | | | | | | | |
| | | | 2 | SS | 11 | | | | | | | | | | | | | |
| | | | 3 | SS | 23 | | | | | | | | | | | | | |
| | ---- asphalt from 1.9-2.0m | | 4 | SS | 17 | | | | | | | | | | | | | |
| 118.7 | | | | | | | | | | | | | | | | | | |
| 2.9 | SILTY CLAY - some sand, trace gravel, organic stained, stiff, brown, moist (GLACIAL TILL) | | 5 | SS | 13 | | | | | | | | | | | | | |
| 117.9 | | | | | | | | | | | | | | | | | | |
| 3.7 | SILTY CLAY TILL - with shale, hard, reddish brown, moist (TILL-SHALE COMPLEX) | | 6 | SS | 83 | | | | | | | | | | | | | |
| 117.2 | | | | | | | | | | | | | | | | | | |
| 4.4 | SHALE BEDROCK | | 7 | SS | 100/ 23cm | | | | | | | | | | | | | |
| | Reddish brown, partially weathered to 6.0m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Highly fractured at 5.8-6.0m, 40mm thick clay seam at 7.1m. | | | | | | | | | | | | | | | | | |
| | Shale = 92% Limestone = 8% | | | | | | | | | | | | | | | | | |
| | (Queenston Formation) | | 1 | RUN | NQ | | | | | | | | | | | | | |
| 114.4 | | | | | | | | | | | | | | | | | | |
| 7.2 | End of Borehole | | 2 | RUN | NQ | | | | | | | | | | | | | |
| | Borehole filled with drill water upon completion of drilling. | | | | | | | | | | | | | | | | | |

+ 3, x 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-16

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4806042.7 E:284039.8 ORIGINATED BY JS
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 18.01.08 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|---------------|----------------------------|--------------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| 118.1 | Ground Surface | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | 100mm TOPSOIL | | 1 | SS | 7 | | 118 | | | | | | | | | | |
| 0.1 | FILL - Silty Clay, sandy, some gravel, trace organics, firm to stiff, reddish brown / brown, moist | | 2 | SS | 9 | | 117 | | | | | | | | | | 15 35 32 18 |
| 116.7 | | | | | | | | | | | | | | | | | |
| 1.4 | SILTY CLAY trace sand, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL) | | 3 | SS | 35 | | 116 | | | | | | | | | | |
| | | | 4 | SS | 20 | | | | | | | | | | | | |
| | reddish brown | | 5 | SS | 20 | | 115 | | | | | | | | | 20.8 | 0 4 60 36 |
| 114.4 | | | | | | | | | | | | | | | | | |
| 3.7 | SILTY CLAY TILL - with shale, hard, reddish brown, moist (TILL-SHALE COMPLEX) | | 6 | SS | 50/ 15cm | | 114 | | | | | | | | | | |
| 114.0 | | | | | | | | | | | | | | | | | |
| 4.1 | SHALE BEDROCK reddish brown (Queenston Formation) | | 7 | SS | 100/ 13cm | | 113 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 8 | SS | 100/ 2.5cm | | 112 | | | | | | | | | | |
| | | | | | | | 111 | | | | | | | | | | |
| | | | 9 | SS | 100/ 2.5cm | | 110 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 108.9 | End of Borehole | | 10 | SS | 100/ 2.5cm | | 109 | | | | | | | | | | |
| 9.2 | Borehole was open and unstabilized water level at 0.6m upon completion of drilling. | | | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

RECORD OF BOREHOLE No HML-16A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4806042.7 E:284039.8 ORIGINATED BY JS
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
 DATUM Geodetic DATE 24.01.08 CHECKED BY RA

| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|--------|------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 118.1 0.0 | Ground Surface | | | | | | | | | | | | | | | |
| | Augered to 4.9m, refer to BH HML-16 for inferred soil stratigraphy. | | | | | | | | | | | | | | | |
| 113.2 4.9 | SHALE BEDROCK | | 1 | SS | 50/ 5cm | | | | | | | | | | | |
| | Reddish brown, partially weathered to 8.6m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. | | 2 | SS | 100/ 10cm | | | | | | | | | | | |
| | Shale = 83% Limestone = 17% (Queenston Formation) | | 3 | SS | 100/ 2.5cm | | | | | | | | | | | |
| | | | 1 | RUN | NQ | | | | | | | | | | | RUN#1 TCR=85% SCR=85% RQD=28% |
| | | | 2 | RUN | NQ | | | | | | | | | | | RUN#2 TCR=99% SCR=99% RQD=89% |
| | | | 3 | RUN | NQ | | | | | | | | | | | RUN#3 TCR=100% SCR=100% RQD=78% |
| 106.8 11.3 | End of Borehole | | | | | | | | | | | | | | | |
| | Borehole filled with drill water upon completion of drilling. | | | | | | | | | | | | | | | |

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

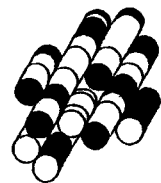
ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 24/04/08

APPENDIX B

Laboratory Test Results

High Mast Lighting

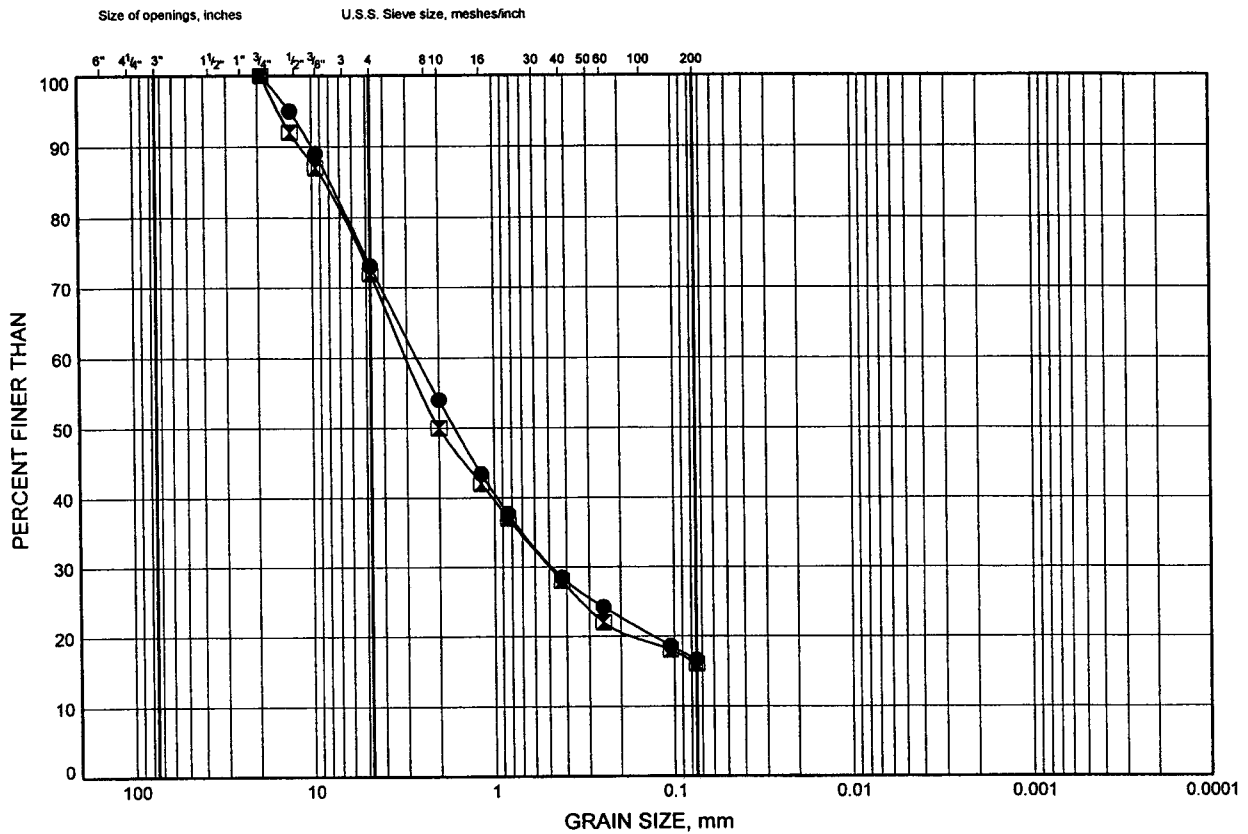
Terraprobe Limited



GRAIN SIZE DISTRIBUTION

FIGURE B1

Gravelly Sand (Fill)



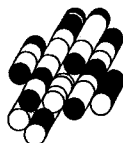
| | | | | | | |
|-------------|--------|------|--------|--------|------|---------------|
| COBBLE SIZE | COARSE | FINE | COARSE | MEDIUM | FINE | SILT and CLAY |
| | GRAVEL | | SAND | | | FINE GRAINED |

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

| | | | |
|---|-------|-----|-------|
| ● | HML-6 | 0.5 | 116.5 |
| □ | HML-9 | 0.5 | 117.7 |

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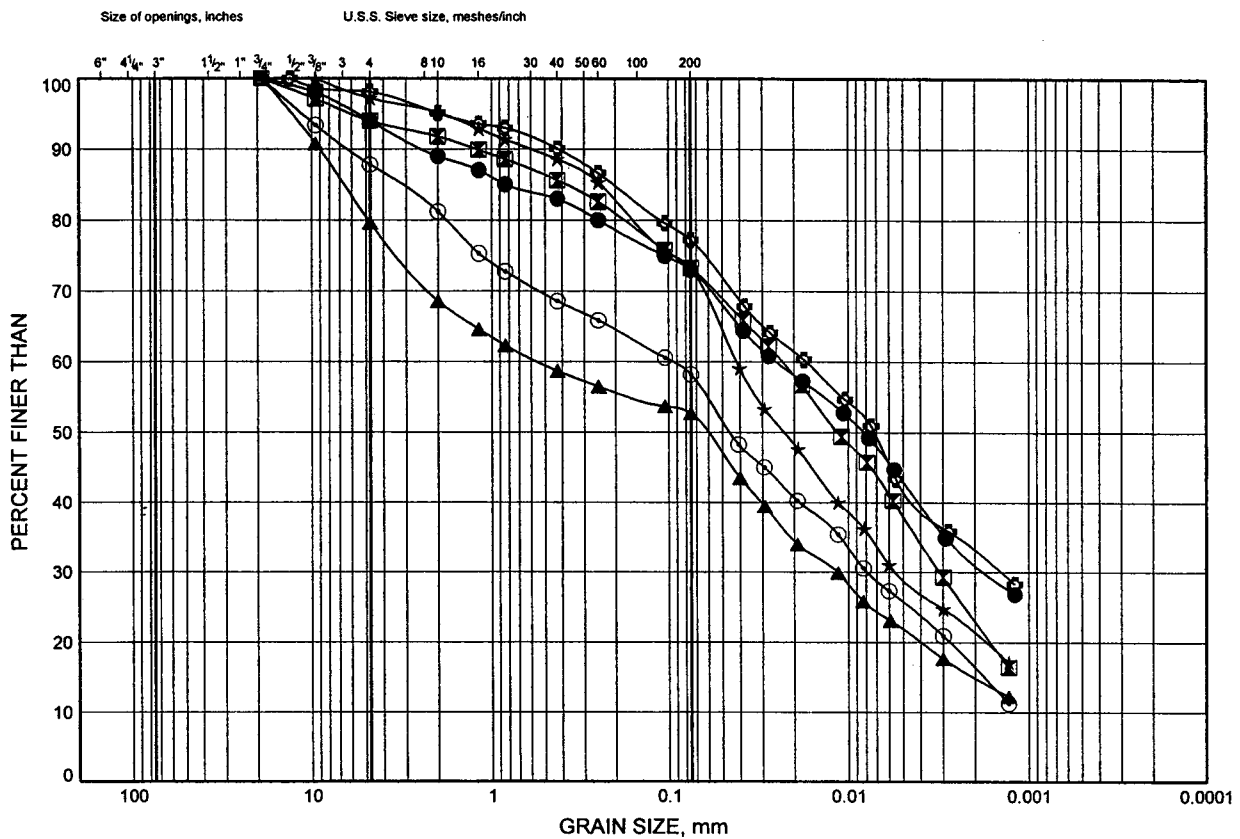
Prep'd DB

Chkd. JC

GRAIN SIZE DISTRIBUTION

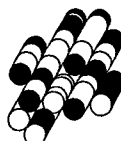
FIGURE B2

Silty Clay and Clayey Silt (Fill)



| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ● | HML-2 | 1.0 | 114.0 |
| ⊠ | HML-3 | 1.7 | 114.0 |
| ▲ | HML-3 | 4.7 | 111.0 |
| ★ | HML-4 | 0.9 | 115.8 |
| ⊙ | HML-5 | 1.0 | 116.8 |
| ⊕ | HML-8 | 0.9 | 118.2 |

Date April 2008
Project 2831-02-01

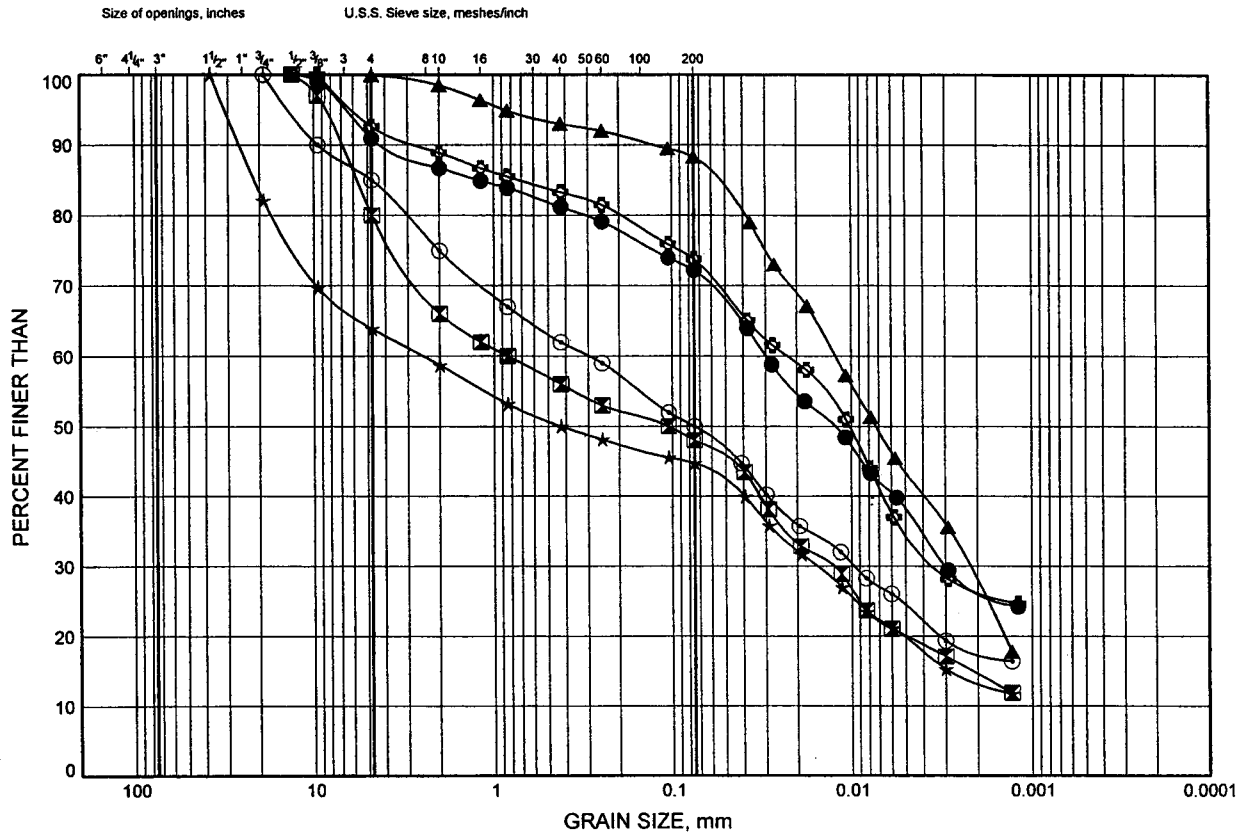


Prep'd DB
Chkd. JC

GRAIN SIZE DISTRIBUTION

FIGURE B3

Silty Clay (Fill)

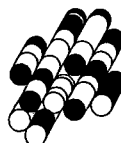


| COBBLE SIZE | COARSE | FINE | COARSE | MEDIUM | FINE | SILT and CLAY |
|----------------|--------|------|--------|--------|------|---------------|
| | GRAVEL | | SAND | | | FINE GRAINED |

| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ⊗ | HML-9 | 1.1 | 117.1 |
| ● | HML-11 | 1.2 | 117.5 |
| ⊠ | HML-11 | 2.5 | 116.2 |
| ▲ | HML-11 | 4.7 | 114.0 |
| ★ | HML-15 | 1.7 | 119.9 |
| ⊙ | HML-16 | 1.0 | 117.1 |

Date April 2008

Project 2831-02-01



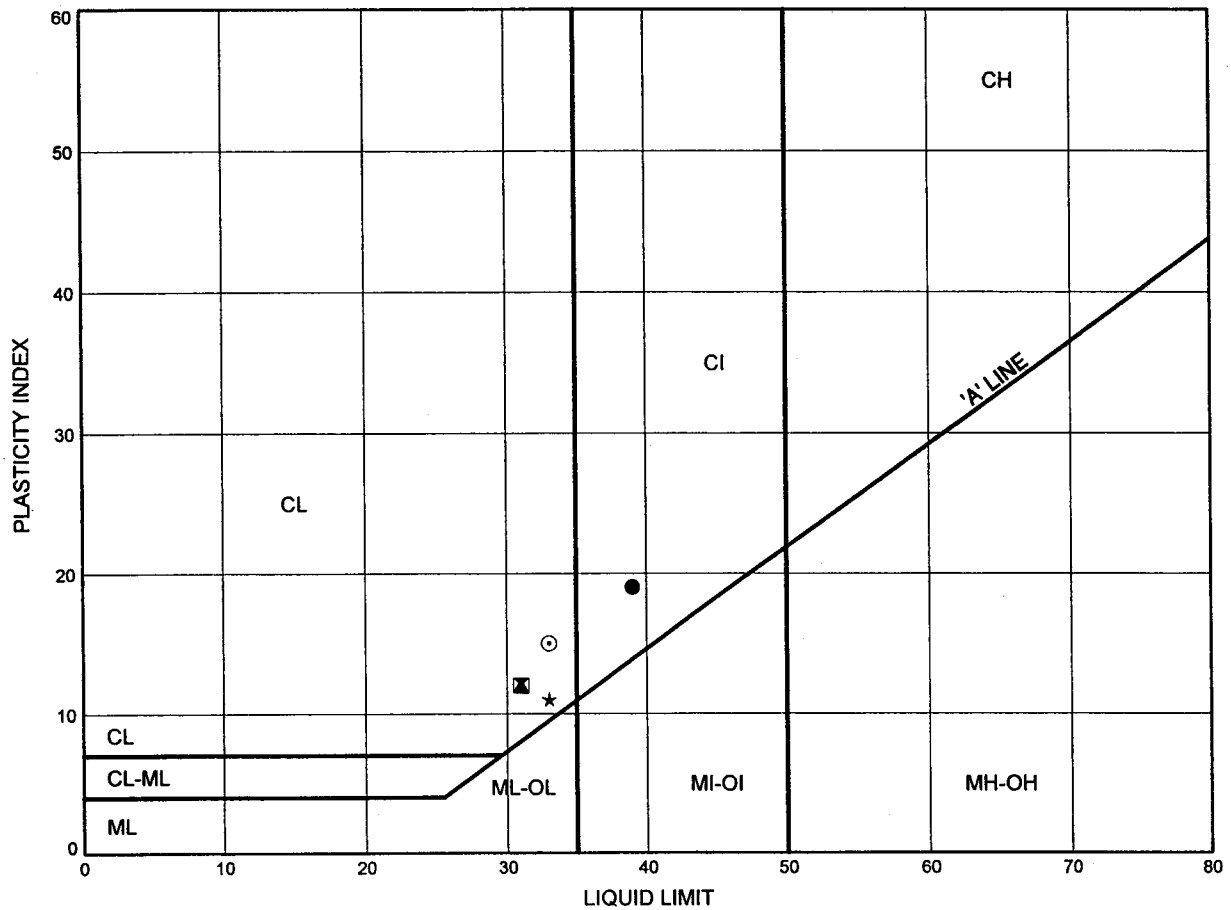
Prep'd DB

Chkd. JC

ATTERBERG LIMITS TEST RESULTS

FIGURE B4

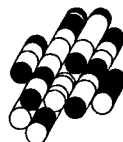
Silty Clay (Fill)



| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ● | HML-2 | 1.0 | 114.0 |
| ⊠ | HML-3 | 1.7 | 114.0 |
| ▲ | HML-3 | 4.7 | 111.0 |
| ★ | HML-4 | 0.9 | 115.8 |
| ⊙ | HML-8 | 0.9 | 118.2 |

Date April 2008

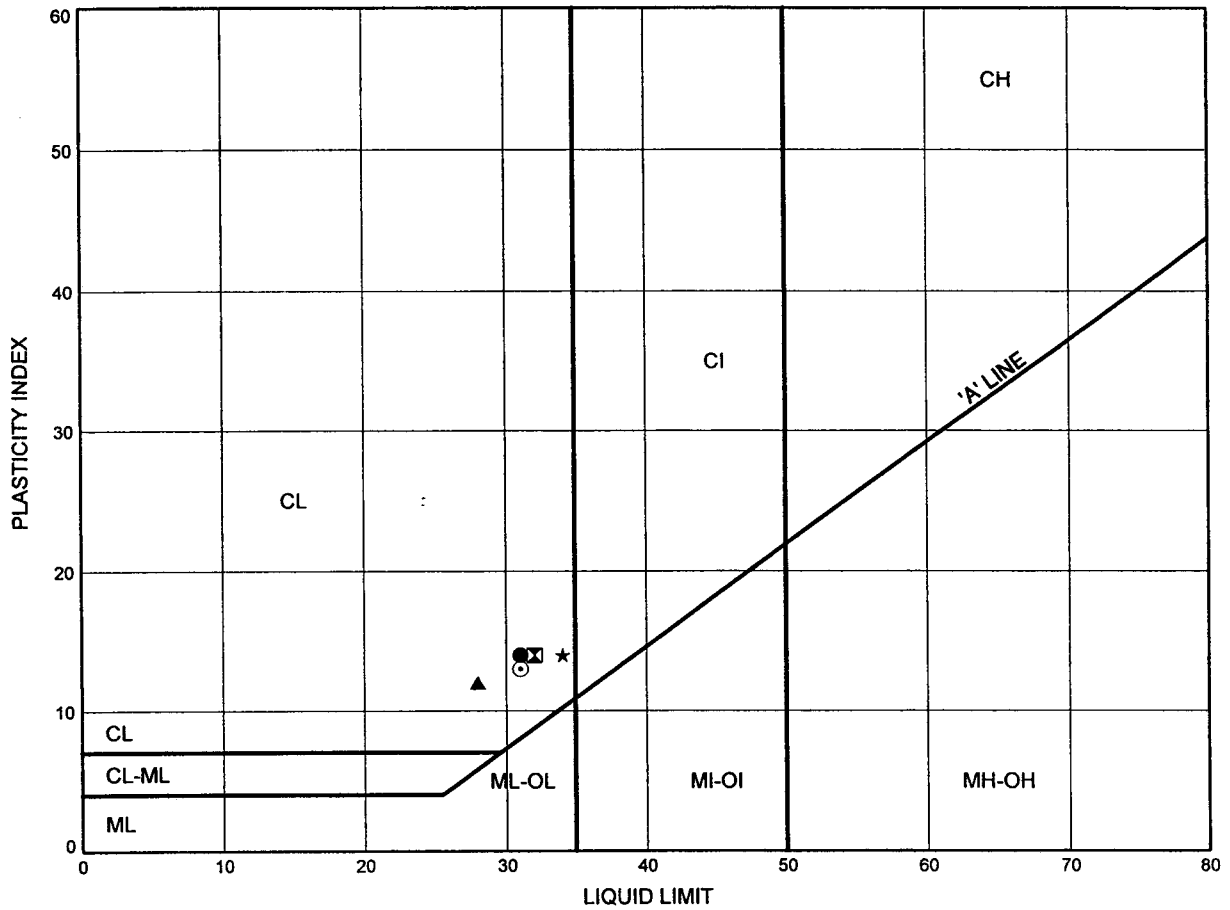
Project 2831-02-01



Prep'd DB

Chkd. JC

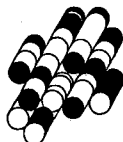
FIGURE B5



| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ○ | HML-9 | 1.1 | 117.1 |
| ● | HML-11 | 1.2 | 117.5 |
| ⊗ | HML-11 | 4.7 | 114.0 |
| ▲ | HML-15 | 1.7 | 119.9 |
| ★ | HML-16 | 1.0 | 117.1 |

Date April 2008

Project 2831-02-01



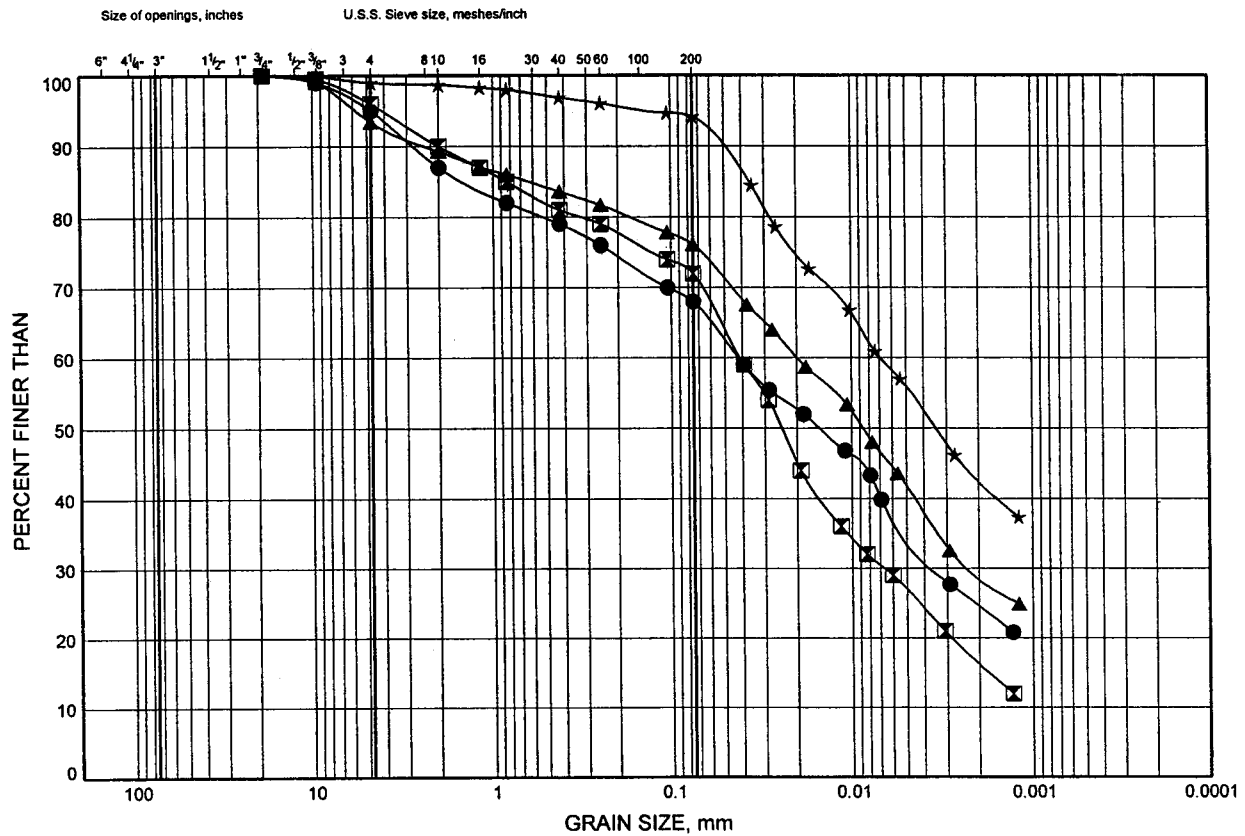
Prep'd DB

Chkd. JC

GRAIN SIZE DISTRIBUTION

FIGURE B6

Silty Clay Till

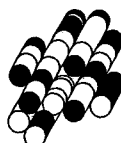


| COBBLE SIZE | COARSE | FINE | COARSE | MEDIUM | FINE | SILT and CLAY |
|----------------|--------|------|--------|--------|------|---------------|
| | GRAVEL | | SAND | | | FINE GRAINED |

| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ● | HML-1 | 1.7 | 112.0 |
| □ | HML-1 | 3.2 | 110.3 |
| ▲ | HML-4 | 2.5 | 114.2 |
| ★ | HML-7 | 0.9 | 118.1 |

Date April 2008

Project 2831-02-01



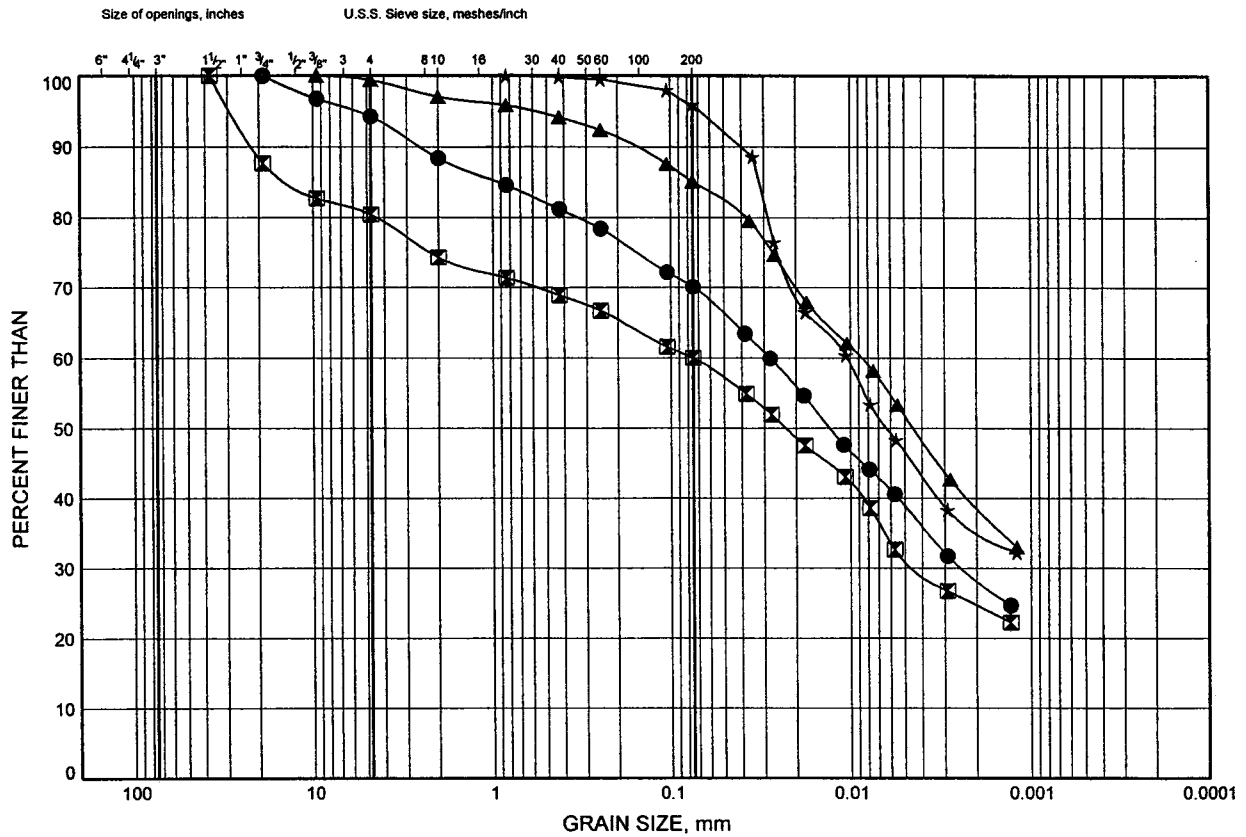
Prep'd DB

Chkd. JC

GRAIN SIZE DISTRIBUTION

FIGURE B7

Silty Clay Till



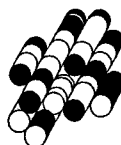
| COBBLE SIZE | COARSE | FINE | COARSE | MEDIUM | FINE | SILT and CLAY |
|----------------|--------|------|--------|--------|------|---------------|
| | GRAVEL | | SAND | | | FINE GRAINED |

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

| | | | |
|---|--------|-----|-------|
| ● | HML-13 | 1.0 | 113.5 |
| ⊠ | HML-14 | 1.0 | 116.4 |
| ▲ | HML-15 | 3.2 | 118.4 |
| ★ | HML-16 | 3.2 | 114.9 |

Date April 2008

Project 2831-02-01



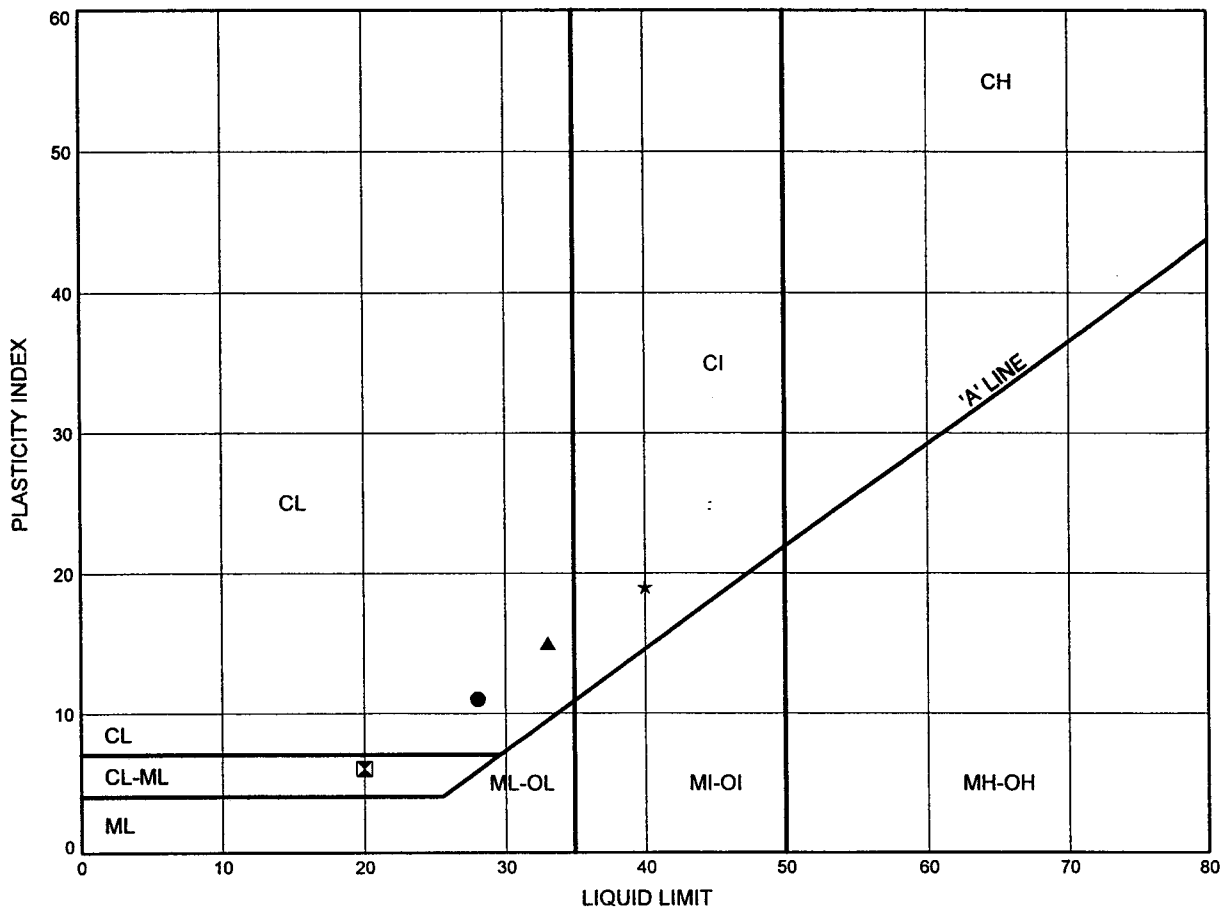
Prep'd DB

Chkd. JC

ATTERBERG LIMITS TEST RESULTS

FIGURE B8

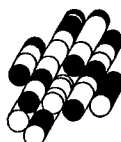
Silty Clay Till



| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ● | HML-1 | 1.7 | 111.8 |
| ⊠ | HML-1 | 3.2 | 110.3 |
| ▲ | HML-4 | 2.5 | 114.2 |
| ★ | HML-7 | 0.9 | 118.1 |

Date April 2008

Project 2831-02-01



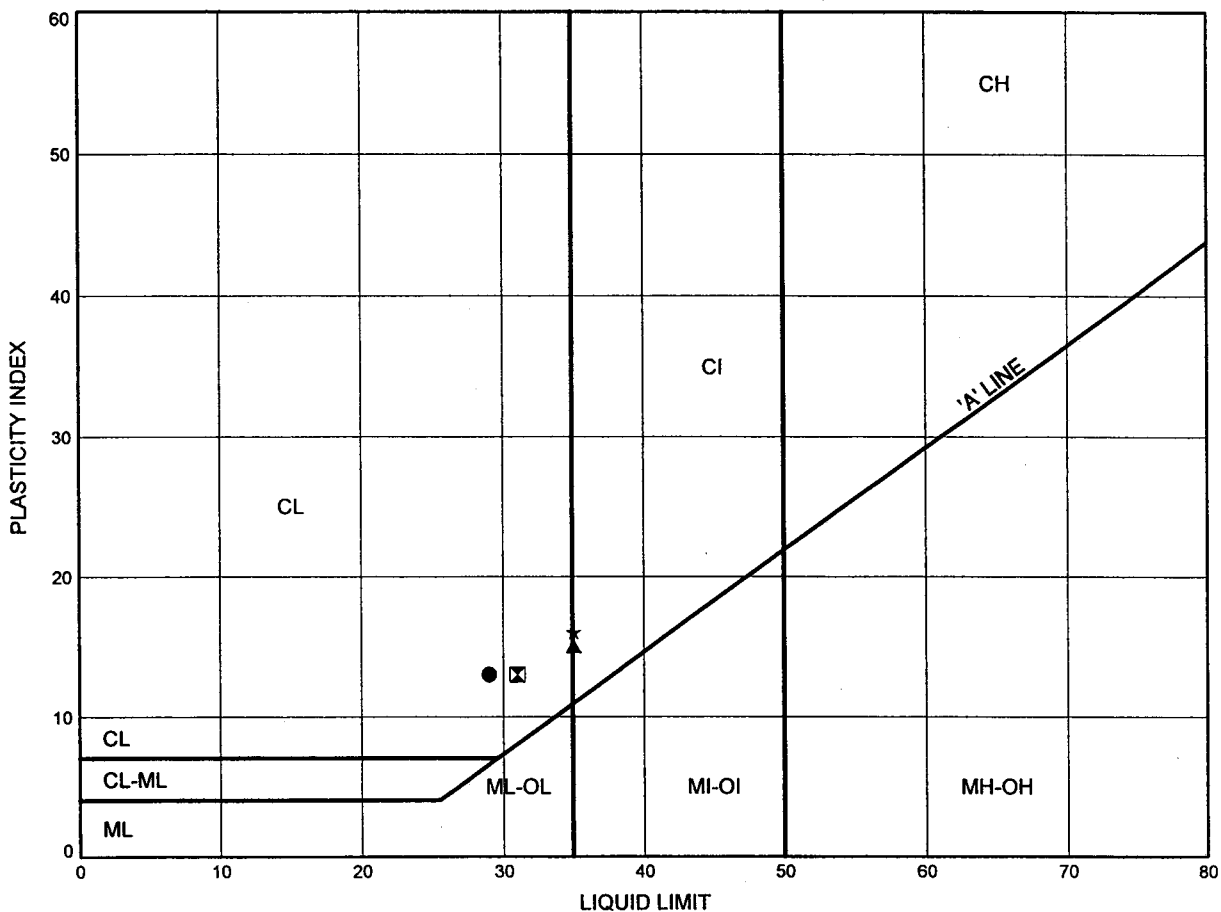
Prep'd DB

Chkd. JC

ATTERBERG LIMITS TEST RESULTS

FIGURE B9

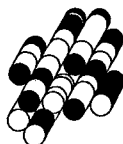
Silty Clay Till



| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ● | HML-13 | 1.0 | 113.5 |
| ⊠ | HML-14 | 1.0 | 116.4 |
| ▲ | HML-15 | 3.2 | 118.4 |
| ★ | HML-16 | 3.2 | 114.9 |

Date April 2008

Project 2831-02-01



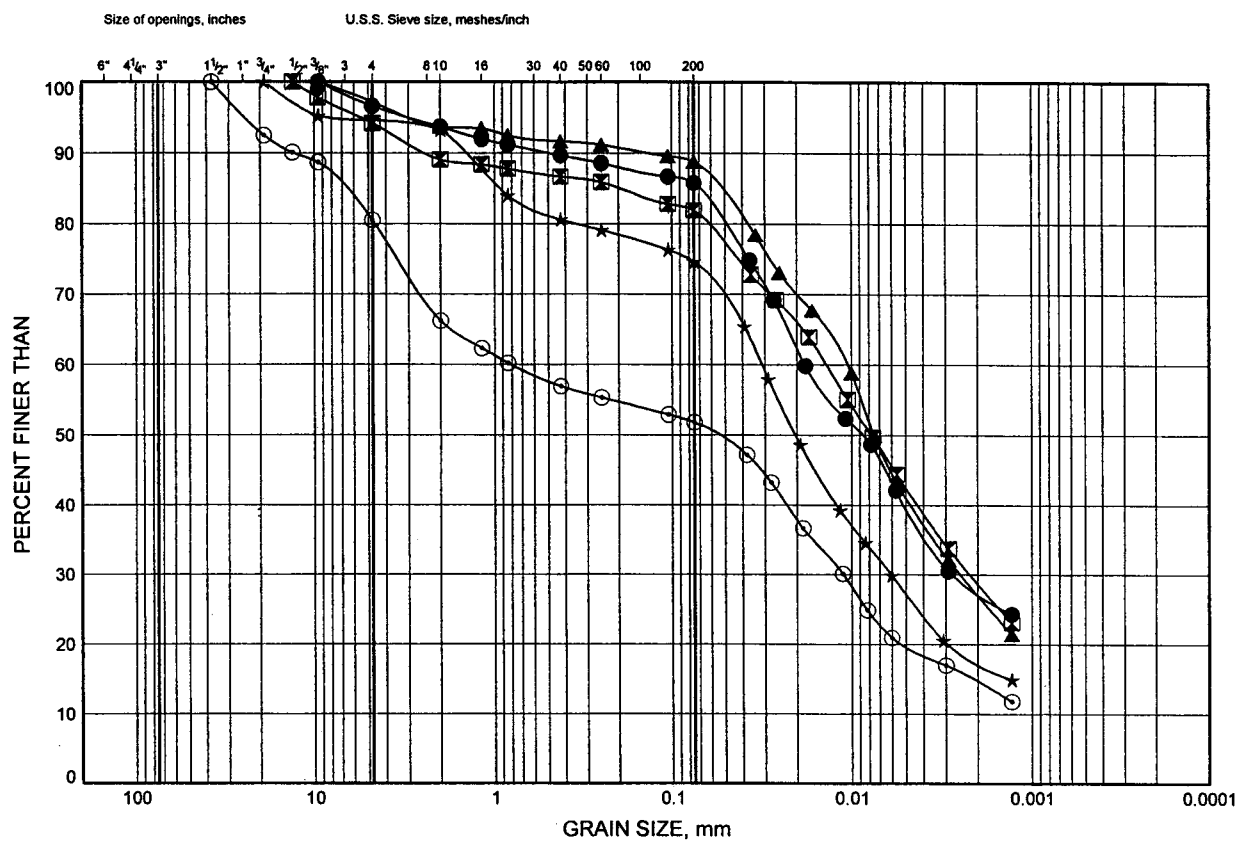
Prep'd DB

Chkd. JC

GRAIN SIZE DISTRIBUTION

FIGURE B10

Silty Clay Till (Till / Shale Complex)



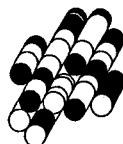
| COBBLE SIZE | COARSE | FINE | COARSE | MEDIUM | FINE | SILT and CLAY |
|-------------|--------|------|--------|--------|------|---------------|
| | GRAVEL | | SAND | | | FINE GRAINED |

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

| | | | |
|---|--------|-----|-------|
| ○ | HML-5 | 2.5 | 115.3 |
| ● | HML-10 | 0.9 | 117.5 |
| ⊠ | HML-12 | 1.0 | 118.4 |
| ▲ | HML-12 | 2.5 | 116.9 |
| ★ | HML-14 | 2.5 | 114.9 |

Date April 2008

Project 2831-02-01



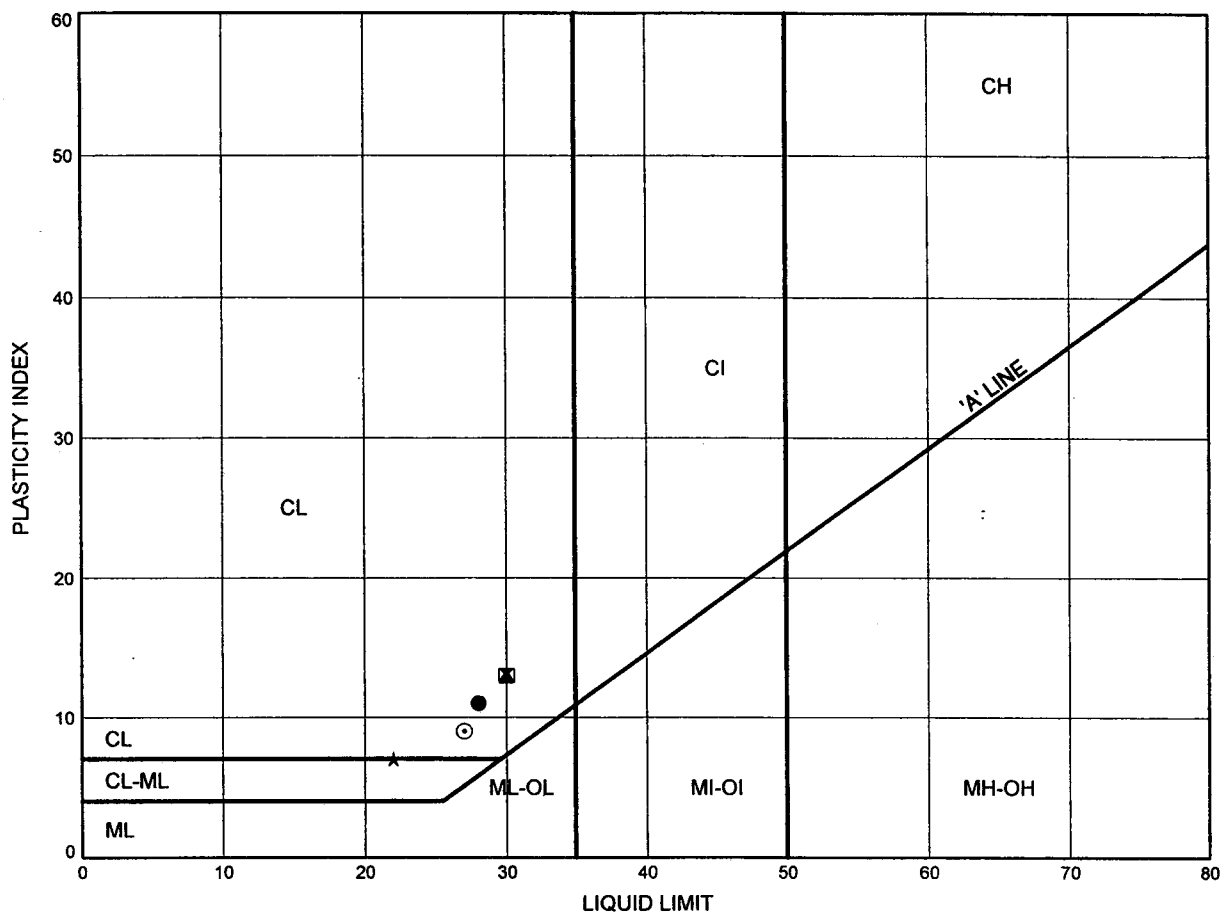
Prep'd DB

Chkd. JC

ATTERBERG LIMITS TEST RESULTS

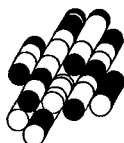
FIGURE B11

Silty Clay Till (Till / Shale Complex)



| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ⊙ | HML-5 | 2.5 | 115.3 |
| ● | HML-10 | 0.9 | 117.5 |
| ⊠ | HML-12 | 1.0 | 118.4 |
| ▲ | HML-12 | 2.5 | 116.9 |
| ★ | HML-14 | 2.5 | 114.9 |

Date April 2008
 Project 2831-02-01



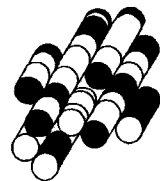
Prep'd DB
 Chkd. JC

APPENDIX C

Record of Borehole Sheets

**Overhead/Cantilevered Sign
Support Structures
and Previous Investigations**

Terraprobe Limited



RECORD OF BOREHOLE No OS-5

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802272.7 E:280876.5 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 01.08.07 - 02.08.07 CHECKED BY RA



| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|--------------|--------------|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | WATER CONTENT (%) |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | ● POCKET PEN | | | | | | |
| 113.4 | Ground Surface | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | 250mm ASPHALT | | | | | | | | | | | | | | | |
| 113.2 | FILL - Sand and Gravel, some silt, compact, brown, dry to damp | | 1 | SS | 11 | | | | | | | | | | 37 49 (14) | |
| 0.3 | | | | | | | | | | | | | | | | |
| 112.6 | SILTY CLAY some sand, trace gravel, occasional fine sand seams, very stiff to hard, brown, moist (GLACIAL TILL) | | 2 | SS | 30 | | | | | | | | | | | |
| 0.8 | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 51 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 4 | SS | 72 | | | | | | | | | | | |
| 110.5 | | | | | | | | | | | | | | | | |
| 2.9 | SILTY CLAY TILL with shale, hard, reddish brown, damp (TILL-SHALE COMPLEX) | | 5 | SS | 100/ 13cm | | | | | | | | | | | |
| 109.2 | | | | | | | | | | | | | | | | |
| 4.2 | SHALE BEDROCK reddish brown (Queenston Formation) | | 6 | SS | 100/ 1cm | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 107.2 | | | | | | | | | | | | | | | | |
| 6.2 | End of Borehole Borehole was open and dry upon completion of drilling. | | 7 | SS | 100/ 1cm | | | | | | | | | | | |

RECORD OF BOREHOLE No OS-5A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802272.7 E:280876.5 ORIGINATED BY JC
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 09.10.07 CHECKED BY RA

| SOIL PROFILE | | SAMPLES | | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|--|--------|------|------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 113.4 | Ground Surface | | | | | | | | | | | | | |
| 0.0 | Augered to 3.4m, refer to BH OS-5 for inferred soil stratigraphy. | | | | | | | | | | | | | |
| 110.0 | | | | | | | | | | | | | | |
| 3.4 | BOULDER |  | 1 | RUN | NQ | | | | | | | | | RUN#1 TCR=25% SCR=25% RQD=0% |
| 109.2 | | | | | | | | | | | | | | |
| 4.2 | SHALE BEDROCK Reddish brown, partially weathered to 6.6m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Shale = 64% Limestone = 36% (Queenston Formation) |  | 2 | RUN | NQ | | | | | | | | | RUN#2 TCR=100% SCR=100% RQD=45% |
| | | | 3 | RUN | NQ | | | | | | | | | RUN#3 TCR=90% SCR=90% RQD=65% |
| 105.8 | End of Borehole | | | | | | | | | | | | | |
| 7.6 | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS GPJ_ONTARIO MOT.GDT 14/04/08

ONTARIO MOT. 1-07-2145 SIGNS AND LIGHTS.GPJ. ONTARIO MOT.GDT 14/04/08

RECORD OF BOREHOLE No OS-6

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802588.6 E:281133.7 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 02.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|-------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|--|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 114.8 | Ground Surface | | | | | | | 20 40 60 80 100 | | | | | | |
| 0.0 | 305mm ASPHALT | | | | | | | | | | | | | |
| 114.5 | | | | | | | | | | | | | | |
| 0.3 | FILL - Gravelly Sand, some silt, compact, brown, damp | | 1 | SS | 21 | | | | | | | | | |
| 114.2 | | | | | | | | | | | | | | |
| 0.6 | FILL - Clayey Silt and Sand, trace organics, firm to stiff, dark brown, moist to wet | | 2 | SS | 14 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 3 | SS | 5 | | | | | | | | | |
| 112.7 | | | | | | | | | | | | | | |
| 2.1 | SILTY CLAY TILL with shale, very stiff, reddish brown, damp (TILL-SHALE COMPLEX) | | 4 | SS | 22 | | | | | | | | 22.6 | 0 36 35 29 |
| | | | | | | | | | | | | | | |
| | | | 5 | SS | 30 | | | | | | | | | |
| 111.2 | | | | | | | | | | | | | | |
| 3.6 | SHALE BEDROCK reddish brown (Queenston Formation) | | | | | | | | | | | | | |
| | | | 6 | SS | 100/ 1cm | | | | | | | | | |
| | | | | | | | | | | | | | | |
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| 108.6 | | | | | | | | | | | | | | |
| 6.2 | End of Borehole | | 7 | SS | 100/ 1cm | | | | | | | | | |
| | Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | |

+ 3, x 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

1 OF 1

METRIC[illegible]

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No CS-5

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802660.7 E:281198.3 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 15.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|---------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 115.1 | Ground Surface | | | | | | | | | | | | | |
| 0.0 | 100mm ASPHALT | | | | | | 115 | | | | | | | |
| 0.1 | FILL-sand and Gravel, trace silt, compact, brown, dry | | 1 | SS | 26 | | | | | | | | | |
| 114.5 | weathered | | 2 | SS | 16 | | | | | | | | | |
| 0.7 | SILTY CLAY some sand, trace gravel, very stiff, brown / reddish brown, dry to moist (GLACIAL TILL) | | 3 | SS | 15 | | 114 | | | | | | 21.7 | 6 21 46 27 |
| 113.0 | SILTY CLAY TILL with shale, hard, reddish brown, damp (TILL-SHALE COMPLEX) | | 4 | SS | 100/ 15cm | | 113 | | | | | | | |
| 2.1 | | | | | | | | | | | | | | |
| 112.2 | | | 5 | SS | 100/ 8cm | | 112 | | | | | | | |
| 2.9 | SHALE BEDROCK reddish brown (Queenston Formation) | | 6 | SS | 100/ 2.5cm | | 111 | | | | | | | |
| | | | | | | | 110 | | | | | | | |
| 108.9 | | | 7 | SS | 100/ 1cm | | 109 | | | | | | | |
| 6.2 | End of Borehole | | | | | | | | | | | | | |
| | Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | |

RECORD OF BOREHOLE No CS-5A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4802660.7 E:281198.3 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
 DATUM Geodetic DATE 17.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 115.1 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | | | | | | | 115 | | | | | | | | | | |
| | | | | | | | 114 | | | | | | | | | | |
| | | | | | | | 113 | | | | | | | | | | |
| 112.1 | | | | | | | 112 | | | | | | | | | | |
| 3.0 | SHALE BEDROCK | | 1 | RUN | NQ | | 111 | | | | | | | | | | RUN#1 TCR=100% SCR=53% RQD=7% |
| | Reddish brown, partially weathered to 5.0m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. 25-50mm thick clay seams at 5.9m and 6.0m. Subvertical stained, smooth joints at 4.6m, 4.7m, and 4.9m. | | 2 | RUN | NQ | | 110 | | | | | | | | | | RUN#2 TCR=100% SCR=88% RQD=61% |
| | Shale = 93% Limestone = 7% (Queenston Formation) | | | | | | | | | | | | | | | | |
| 109.1 | End of Borehole | | | | | | | | | | | | | | | | |
| 6.0 | | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No OS-7

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803329.2 E:281735.3 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 01.08.07 CHECKED BY RA


| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | |
|---------------|--|------------|---------|------|-------------|----------------------------|-----------------|--|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|---|--|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | | | | | |
| | | | | | | | | 20 40 60 80 100 | | | | | | | | | | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE | | | | | WATER CONTENT (%) | | | | | | | | | |
| | | | | | | | | 20 40 60 80 100 | | | | | 10 20 30 | | | | | | | | | |
| 116.9 | Ground Surface | | | | | | | | | | | | | | | | | | | | | |
| 0.0 | 250mm ASPHALT | | | | | | | | | | | | | | | | | | | | | |
| 116.7 | | | | | | | | | | | | | | | | | | | | | | |
| 0.3 | FILL - Gravelly Sand, some silt, compact, brown, damp | | 1 | SS | 21 | | | | | | | | | | | | | | | | | |
| 116.4 | | | | | | | | | | | | | | | | | | | | | | |
| 0.6 | | | | | | | | | | | | | | | | | | | | | | |
| | FILL - Clayey Silt, some sand, trace gravel, stiff, dark brown, moist | | 2 | SS | 15 | | 116 | | | | | | | | | | | | | | | |
| 115.5 | | | | | | | | | | | | | | | | | | | | | | |
| 1.4 | SILTY CLAY TILL - with shale, hard, reddish brown, damp (TILL-SHALE COMPLEX) | | 3 | SS | 87 | | 115 | | | | | | | | | 22.4 | 0 19 49 32 | | | | | |
| 114.6 | | | | | | | | | | | | | | | | | | | | | | |
| 2.3 | SHALE BEDROCK reddish brown (Queenston Formation) | | 4 | SS | 136 | | 114 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | 5 | AS | - | | 113 | | | | | | | | | | | | | | | |
| 112.3 | | | | | | | | | | | | | | | | | | | | | | |
| 4.6 | End of Borehole | | 6 | SS | 100/ 1cm | | | | | | | | | | | | | | | | | |
| | Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No OS-7A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803329.2 E:281735.3 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
 DATUM Geodetic DATE 04.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|--|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| 116.9 0.0 | Ground Surface | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | GR SA SI CL |
| 112.3 4.6 | SHALE BEDROCK Reddish brown, partially weathered to 6.2m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Subvertical, rust-stained joint at 5.0m. Could not recover bottom 0.6m of rock core due to equipment malfunction. Shale = 65% Limestone = 35% (Queenston Formation) |  | 1 | RUN | NQ | | | | | | | | | | | | RUN#1 TCR=100% SCR=100% RQD=49% RUN#2 TCR=70% SCR=70% RQD=28% |
| | | | 2 | RUN | NQ | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 109.3 7.6 | End of Borehole | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No OS-8

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803664.8 E:282006.8 ORIGINATED BY JC
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 01.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|---------------|----------------------------|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| 117.8 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 117.9 | 290mm ASPHALT | | | | | | | | | | | | | | | | |
| 0.3 | FILL - Gravelly Sand, some silt, trace clay, compact, brown, damp | | 1 | SS | 25 | | | | | | | | | | | 31 52 13 4 | |
| | | | 2 | SS | 18 | | | | | | | | | | | | |
| 116.3 | SHALE BEDROCK reddish brown (Queenston Formation) | | 3 | SS | 100/ 5cm | | | | | | | | | | | | |
| 1.5 | | | 4 | SS | 100/ 5cm | | | | | | | | | | | | |
| | | | 5 | SS | 100/ 5cm | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 113.2 | End of Borehole | | 6 | SS | 100/ 2.5cm | | | | | | | | | | | | |
| 4.6 | Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | | | |

ONTARIO MOT. 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 14/04/08

RECORD OF BOREHOLE No OS-8A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803664.8 E:282006.8 ORIGINATED BY JC
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 16.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 117.8 | Ground Surface | | | | | | | | | | | | | | | | GR SA SI CL |
| 0.0 | Augered to 2.4m, refer to BH OS-8 for inferred soil stratigraphy. | | | | | | | | | | | | | | | | |
| 115.4 | SHALE BEDROCK | | | | | | | | | | | | | | | | |
| 2.4 | Reddish brown, partially weathered to unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. 25mm thick clay seams at 2.8m, 3.4m, 5.2m, 5.3m. Subvertical joint at 4.1m. Shale = 84% Limestone = 16% (Queenston Formation) | | 1 | RUN | NQ | | | | | | | | | | | | RUN#1 TCR=97% SCR=80% RQD=15% |
| | | | 2 | RUN | NQ | | | | | | | | | | | | RUN#2 TCR=100% SCR=97% RQD=28% |
| 112.3 | End of Borehole | | | | | | | | | | | | | | | | |
| 5.5 | | | | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 14/04/08

RECORD OF BOREHOLE No OS-9

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4803956.4 E:282242.3 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 01.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|---------|------|-------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 116.8 | Ground Surface | | | | | | | | | | | | | |
| 0.0 | 280mm ASPHALT | | | | | | | | | | | | | |
| 116.5 | | | | | | | | | | | | | | |
| 0.3 | FILL - Sand and Gravel, trace silt, compact, brown, damp | | 1 | SS | 21 | | | | | | | | | |
| 116.2 | | | | | | | | | | | | | | |
| 0.6 | FILL - Silty Clay and Sand, trace gravel, trace shale fragments, firm to stiff, reddish brown, moist | | 2 | SS | 13 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 3 | SS | 6 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | trace organics, wet | | 4 | SS | 9 | | | | | | | | | |
| 113.9 | | | | | | | | | | | | | | |
| 2.9 | SHALE BEDROCK reddish brown (Queenston Formation) | | 5 | SS | 110 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 6 | SS | 100/ 5cm | | | | | | | | | |
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ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 14/04/08

1 OF 1

METRIC

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|-------|------------|---------------|--------------------------------|---------------|----|
| W.P. | 2831-02-01 | LOCATION | Coords: N:4803956.4 E:282242.3 | ORIGINATED BY | JC |
| DIST | HWY QEW | BOREHOLE TYPE | Solid Stem Augers & NQ Coring | COMPILED BY | DB |
| DATUM | Geodetic | DATE | 16.10.07 | CHECKED BY | RA |

[illegible]

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No OS-10

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804282.2 E:282503.1 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 01.08.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|---------------|--|------------|---------|------|-------------|----------------------------|-----------------|---|--------------|------------------------------------|-------------------------------------|-----------------------------------|--|---|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | | | | | | |
| | | | | | | ● QUICK TRIAXIAL | × LAB VANE | | | | | | | | |
| 119.2 | Ground Surface | | | | | | | 20 40 60 80 100 | | | | | | | |
| 0.0 | 340mm ASPHALT | | | | | | | | | | | | | | |
| 118.9 | | | | | | | | | | | | | | | |
| 0.3 | FILL - Gravelly Sand, some silt, compact, brown, damp | | 1 | SS | 28 | | | | | | | | | | |
| 118.6 | | | | | | | | | | | | | | | |
| 0.6 | FILL - Silty Clay, trace sand, trace wood fragments, stiff, dark brown, moist | | 2 | SS | 13 | | | | | | | | | | |
| 118.3 | | | | | | | | | | | | | | | |
| 0.9 | | | | | | | | | | | | | | | |
| 117.8 | SILTY CLAY TILL - with shale, stiff, reddish brown, moist (TILL-SHALE COMPLEX) | | 3 | SS | 66 | | | | | | | | | | |
| 1.4 | | | | | | | | | | | | | | | |
| | SHALE BEDROCK reddish brown (Queenston Formation) | | 4 | SS | 182 | | | | | | | | | | |
| | | | 5 | SS | 100/ 5cm | | | | | | | | | | |
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+ 3, x 3: Numbers refer to
Sensitivity

○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No OS-10A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804282.2 E:282503.1 ORIGINATED BY JC
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 03.10.07 CHECKED BY RA

| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|--------|------|----------------------------|-----------------|---|----|----|----|-----|---|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | 20 | 40 | 60 | 80 | 100 | | |
| 119.2 | Ground Surface | | | | | 119 | | | | | | | |
| 0.0 | Augered to 4.6m, refer to BH OS-10 for inferred soil stratigraphy. | | | | | 118 | | | | | | | |
| | | | | | | 117 | | | | | | | |
| | | | | | | 116 | | | | | | | |
| | | | | | | 115 | | | | | | | |
| 114.6 | SHAILE BEDROCK Reddish brown, partially to fully weathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. 25-75mm thick clay seams at 4.7m, 5.4m, and 5.6m. Shale = 88% Limestone = 12% (Queenston Formation) | | 1 | RUN | NQ | 114 | | | | | | | RUN#1 TCR=100% SCR=95% RQD=0% |
| 4.6 | | | 2 | RUN | NQ | 113 | | | | | | | RUN#2 TCR=100% SCR=75% RQD=0% |
| | | | 3 | RUN | NQ | | | | | | | | RUN#3 TCR=87% SCR=55% RQD=13% |
| 112.5 | End of Borehole | | | | | | | | | | | | |
| 6.7 | | | | | | | | | | | | | |

RECORD OF BOREHOLE No CS-6

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804850.1 E:282957.4 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 31.07.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
|---------------|--|------------|---------|------|---------------|----------------------------|-----------------|---|--------------|--------------|---------------------------------|-------------------------------------|--------------------------------|--|--|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | WATER CONTENT (%) |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | ● POCKET PEN | | | | | | |
| 118.2 | Ground Surface | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | 280mm ASPHALT | | | | | | | | | | | | | | | |
| 117.9 | | | | | | | | | | | | | | | | |
| 0.3 | FILL-Sand and Gravel, trace silt, compact, brown, damp | | 1 | SS | 20 | | | | | | | | | | | |
| 117.6 | | | | | | | | | | | | | | | | |
| 0.6 | | | | | | | | | | | | | | | | |
| | FILL - Silty Clay, some sand, stiff, dark brown, moist | | 2 | SS | 13 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 10 | | | | | | | | | | | |
| 116.1 | | | | | | | | | | | | | | | | |
| 2.1 | SHALE BEDROCK reddish brown (Queenston Formation) | | 4 | SS | 154 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 5 | SS | 100/ 13cm | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | |
| 113.6 | | | | | | | | | | | | | | | | |
| 4.6 | End of Borehole | | 6 | SS | 100/ 2.5cm | | | | | | | | | | | |
| | Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No CS-6A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804850.1 E:282957.4 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
 DATUM Geodetic DATE 20.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--------------|------------------|------------|----|------------------------------------|-------------------------------------|-----------------------------------|--|---|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | WATER CONTENT (%) |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | ● QUICK TRIAXIAL | × LAB VANE | | | | | | | |
| 118.2 | Ground Surface | | | | | | 20 | 40 | 60 | 80 | 100 | 10 | 20 | 30 | kN/m ³ | GR SA SI CL | | |
| 0.0 | Augered to 3.0m, refer to BH CS-6 for inferred soil stratigraphy. | | | | | | 118 | | | | | | | | | | | |
| | | | | | | | 117 | | | | | | | | | | | |
| | | | | | | | 116 | | | | | | | | | | | |
| 115.2 | | | | | | | 115 | | | | | | | | | | | |
| 3.0 | SHALE BEDROCK Reddish brown, partially weathered to 5.2m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Subvertical joints at 3.3m, and 4.1m. Shale = 76% Limestone = 24% (Queenston Formation) | | 1 | RUN | NQ | | 114 | | | | | | | | | RUN#1 TCR=95% SCR=87% RQD=18% | | |
| | | | 2 | RUN | NQ | | 113 | | | | | | | | | RUN#2 TCR=94% SCR=88% RQD=12% | | |
| 112.2 | End of Borehole | | | | | | | | | | | | | | | | | |
| 6.0 | | | | | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS GPJ ONTARIO MOT GDT 140408

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No OS-11

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804981.7 E:283062.5 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 31.07.07 CHECKED BY RA

| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|--------|------|----------------------------|-----------------|---|----|----|----|-----|---------------------------------|-------------------------------------|--------------------------------|------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 118.3 | Ground Surface | | | | | | | | | | | | | | | |
| 0.0 | 290mm ASPHALT | | | | | | | | | | | | | | | |
| 118.0 | | | | | | | | | | | | | | | | |
| 0.3 | FILL - Gravelly Sand, some silt, compact, brown, damp | | 1 | SS | 15 | | | | | | | | | | | 31 52 13 4 |
| 117.7 | | | | | | | | | | | | | | | | |
| 0.6 | SHALE BEDROCK reddish brown (Queenston Formation) | | 2 | SS | 59 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 145 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 4 | SS | 100/ 10cm | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 115.2 | | | 5 | SS | 100/ 5cm | | | | | | | | | | | |
| 3.1 | End of Borehole Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 14/04/08

1 OF 1

METRIC


[illegible]

RECORD OF BOREHOLE No OS-11B

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4804981.7 E:283062.5 ORIGINATED BY JC
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 15.10.07 - 20.10.07 CHECKED BY RA

| SOIL PROFILE | | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|--|--------|---------|------------|--------------------|----------------------------|-----------------|---|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | | | |
| 118.3 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | Augered to 4.0m, refer to BH OS-11 and OS-11A for inferred soil stratigraphy. | | | | | | 118 | | | | | | | | | | |
| | | | | | | | 117 | | | | | | | | | | |
| | | | | | | | 116 | | | | | | | | | | |
| | | | | | | | 115 | | | | | | | | | | |
| 114.3 | | | | | | | 114 | | | | | | | | | | |
| 4.0 | SHALE BEDROCK Reddish brown, unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. 25-50mm thick clay seams at 4.4m and 4.6m. Shale = 87% Limestone = 13% (Queenston Formation) |  | 1 | RUN | NQ | | 113 | | | | | | | | | | RUN#1 TCR=100% SCR=95% RQD=31% |
| 112.8 | | | | | | | | | | | | | | | | | |
| 5.5 | End of Borehole | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No OS-12

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4805317.1 E:283330.3 ORIGINATED BY JC
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 31.07.07 CHECKED BY RA


| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|-------------------------|---|-------------------|-------------------|-------------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 40 60 80 100 | 20 40 60 80 100 | w _p w w _L | WATER CONTENT (%) | GR SA SI CL | | |
| 118.5 | Ground Surface | | | | | | | | | | | | | |
| 0.0 | 360mm ASPHALT | | | | | | | | | | | | | |
| 118.1 | | | | | | | | | | | | | | |
| 0.4 | FILL - Sand, some silt, dense, brown, dry to damp | | 1 | SS | 40 | | | | | | | | | 0 81 (19) |
| 117.8 | | | | | | | | | | | | | | |
| 0.7 | SHALE BEDROCK reddish brown (Queenston Formation) | | 2 | SS | 55 | | | | | | | | | |
| | | | 3 | SS | 100/ 13cm | | | | | | | | | |
| | | | 4 | SS | 100/ 8cm | | | | | | | | | |
| 115.4 | End of Borehole | | 6 | SS | 100/ 8cm | | | | | | | | | |
| 3.1 | Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | |

RECORD OF BOREHOLE No OS-12A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4805317.1 E:283330.3 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
 DATUM Geodetic DATE 14.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | |
|---------------|--|--|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | | 20 40 60 80 100 | | | | | | | | | | 10 20 30 | | |
| 118.5 | Ground Surface | | | | | | | | | | | | | | | | | | | |
| 0.0 | Augered to 2.7m, refer to BH OS-12 for inferred soil stratigraphy. | | | | | | 118 | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 115.8 | SHALE BEDROCK Reddish brown, partially weathered to 3.9m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. Shale = 75% Limestone = 25% (Queenston Formation) |  | 1 | RUN | NQ | | 116 | | | | | | | | | RUN#1 TCR=100% SCR=94% RQD=63% | | | | |
| 2.7 | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | 2 | RUN | NQ | | 115 | | | | | | | | | RUN#2 TCR=100% SCR=98% RQD=51% | | | | |
| | | | | | | | 114 | | | | | | | | | | | | | |
| 112.7 | | | | | | | 113 | | | | | | | | | | | | | |
| 5.8 | End of Borehole | | | | | | | | | | | | | | | | | | | |

NTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 14/04/08

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 14/04/08

RECORD OF BOREHOLE No OS-14

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4805851.6 E:283754.0 ORIGINATED BY JC
 DIST HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 30.07.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | |
|---------------|--|------------|---------|------|--------------|----------------------------|-----------------|---|----|----|----|-----|---|---|--|--|--|------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | | |
| 119.2 | Ground Surface | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | |
| 0.0 | 330mm ASPHALT | | | | | | | | | | | | | | | | | | |
| 118.9 | | | | | | | | | | | | | | | | | | | |
| 0.3 | FILL - Gravelly Sand, some silt, trace clay, dense, brown, damp | | 1 | SS | 36 | | 119 | | | | | | | | | | | 32 53 13 2 | |
| 118.5 | | | | | | | | | | | | | | | | | | | |
| 0.7 | SILTY CLAY TILL with shale, very stiff to hard, red, damp to moist (TILL-SHALE COMPLEX) | | 2 | SS | 25 | | 118 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 117.2 | | | 3 | SS | 30 | | | | | | | | | | | | | | |
| 2.0 | SHALE BEDROCK reddish brown (Queenston Formation) | | 4 | SS | 100/ 13cm | | 117 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 116.1 | | | 5 | SS | 100/ 13cm | | | | | | | | | | | | | | |
| 3.1 | End of Borehole | | | | | | | | | | | | | | | | | | |
| | Borehole was open and dry upon completion of drilling. | | | | | | | | | | | | | | | | | | |

+ 3, X 3

Numbers refer to
Sensitivity


○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No OS-14A

1 OF 1

METRIC

W.P. 2831-02-01 LOCATION Coords: N:4805851.6 E:283754.0 ORIGINATED BY JC
DIST HWY QEW BOREHOLE TYPE Solid Stem Augers & NQ Coring COMPILED BY DB
DATUM Geodetic DATE 02.10.07 CHECKED BY RA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|--|---------|------|------------|----------------------------|-------------------------|---|--------------|---|--|--|--|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p W W _L | | | | |
| 119.2 | Ground Surface | | | | | | 20 40 60 80 100 | 20 40 60 80 100 | 10 20 30 | | | | GR SA SI CL | |
| 0.0 | Augered to 3.0m, refer to BH OS-14 for inferred soil stratigraphy. | | | | | | | | | | | | | |
| 116.2 | SHALE BEDROCK |  | 1 | RUN | NQ | | | | | | | | RUN#1 TCR=95% SCR=99% RQD=0% | |
| 3.0 | Reddish brown, partially weathered to 3.7m, then unweathered, medium to thickly bedded, low to medium strength shale with occasional interbeds of medium to high strength greenish grey limestone. 12-38mm thick clay seams at 4.1m, 4.4m, and 5.5m. Shale = 78% Limestone = 22% (Queenston Formation) | | 2 | RUN | NQ | | | | | | | | RUN#2 TCR=100% SCR=97% RQD=7% | |
| 113.1 | End of Borehole | | | | | | | | | | | | | |
| 6.1 | | | | | | | | | | | | | | |

ONTARIO MOT 1-07-2145 SIGNS AND LIGHTS.GPJ ONTARIO MOT.GDT 14/04/08

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 10

WP 125-66-09 LOCATION Co-ords N 15 762 354; E 927 757 ORIGINATED BY JM
 DIST 4 HWY QEW BORING DATE March 1, 1977 COMPILED BY JM
 DATUM Geodetic BOREHOLE TYPE Solid Augers, B Casing BXL Core & Cone Test CHECKED BY CP

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER ELEV | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT % 10 20 30 | UNIT WEIGHT γ | REMARKS % GR SA SI CL |
|---------------|---|-------------|---------|-----------|-------------|----------------------|---|----|----|----|-----|--|----------------------------|---------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | 'N' VALUES | | 20 | 40 | 60 | 80 | 100 | | | |
| 387.0 | Ground Surface | | | | | | | | | | | | | |
| 0.0 | Clayey Silt | | | | | | | | | | | | | |
| 382.0 | Stiff to Hard | | 1 | SS | 31 | | | | | | | | | |
| 5.0 | Queenston Shale Bedrock Severely to Moderately Weathered | | 2 | SS | 91 | | | | | | | | | |
| | | | 3 | SS | 105/4" | | | | | | | | | |
| | | | 4 | SS | 100/4" | | | | | | | | | |
| | | | 5 | SS | 100/3" | | | | | | | | | |
| | | | 6 | SS | 100/2" | | | | | | | | | |
| | | | 7 | SS | 100/3" | | | | | | | | | |
| 360.5 | | | 8 | BXL RC | 95% rec. | | | | | | | | | |
| 26.5 | End of Borehole Note: Water Level not Established | | | | | | | | | | | | | |

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No UC1

1 OF 1

METRIC

G.W.P. 169-00-00 LOCATION QEW, Third Line to Burloak Drive N 4 806 176.21 E 283 988.78 ORIGINATED BY SLL
HWY QEW BOREHOLE TYPE Solid Stem Auger/NQ Core Barrel COMPILED BY WM
DATUM Geodetic DATE 2006.11.29 - 2006.11.30 CHECKED BY MEF

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|--|------------|---------|------|-------------|----------------------------|-----------------|---|----------------------------|----|------------------------------------|-------------------------------------|-----------------------------------|--|--|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE × LAB VANE | | | | | | | | | |
| 118.9 | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | GR SA SI CL | | | |
| 0.0 | ASPHALT: (140 mm) | | | | | | | | | | | | | | | | | |
| 0.2 | CRUSHER RUN LIMESTONE Compact Brown Moist (FILL) | | 1 | SS | 31 | | | | | | | | | | 30 52 18 (SI+CL) | | | |
| 117.9 | | | 2 | SS | 65 | | | | | | | | | | 0 10 70 20 | | | |
| 1.0 | Silty CLAY, trace sand, occasional shale fragments | | | | | | | | | | | | | | | | | |
| 117.5 | Hard Brown (TILL) | | 3 | SS | 50/ .125 | | | | | | | | | | | | | |
| 1.4 | Highly to moderately weathered, thinly bedded, reddish brown, very weak to medium strong SHALE with greenish grey limestone interbeds | | 4 | SS | 50/ .125 | | | | | | | | | | | | | |
| | Limestone interbeds at 3.0 to 3.07 m, 3.12 to 3.20 m | | 1 | RUN | | | | | | | | | | | RUN 1# TCR=100%, SCR=69%, RQD=22% | | | |
| | Rubble zones at 3.58 to 3.66 and 4.22 to 4.32 m | | 2 | RUN | | | | | | | | | | | RUN 2# TCR=100%, SCR=82%, RQD=12%, UCS=30MPa | | | |
| 114.3 | | | | | | | | | | | | | | | | | | |
| 4.6 | END OF BOREHOLE AT 4.60 m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. | | | | | | | | | | | | | | | | | |
| | WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) 14.12.06 2.10 116.8 | | | | | | | | | | | | | | | | | |

1 OF 2

W.F. 18-4714-0

LOCATION N 4 B06 176.39 E 284 152.39

ORIGINATED BY SL

HWY QEW/Bur Oak Drive

BOREHOLE TYPE Solid Stem Augers/NQ Coring

COMPILED BY WM

DATUM Geodetic

DATE 14.11.05 - 18.11.05

CHECKED BY MR.

DN77X14S 7140.GPJ 15M20B

+ 3, x 3: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WM-6

2 OF 2

METRIC

W.P. 19-4714-0

LOCATION N 4 805 178.38 E 284 152.38

ORIGINATED BY SLL

HWY QEW/Burkhead Drive

BOREHOLE TYPE Solid Stem Augers/NQ Coring

COMPILED BY WM

DATUM Geodetic

DATE 14.11.05 - 15.11.05

CHECKED BY MRA

| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|--------|------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | W _u VALUES | | 20 | 40 | 60 | 80 | 100 | | | | | |
| | vertical joint at 10.01m to 10.03m | | 5 | RUN | | | | | | | | | | | | GR SA S _i CL UCS=21.1MPa |
| | | | 6 | RUN | | | | | | | | | | | | RUN 6# TCR=100%, SCR=100%, ROD=60%, UCS=20.2MPa |
| | | | 7 | RUN | | | | | | | | | | | | RUN 7# TCR=100%, SCR=100%, ROD=77%, UCS=1.5MPa |
| | | | 8 | RUN | | | | | | | | | | | | RUN 8# TCR=100%, SCR=100%, ROD=87%, UCS=46.6MPa |
| | limestone layer at 10.82m to 11.00m, 11.10m to 11.16m, 11.33m to 11.38m, 37.47m to 11.58m, 11.58m to 11.73m, 11.89m to 11.82m, 12.80m to 12.96m, 13.46m to 13.48m, 13.87m to 13.77m, 13.97m to 14.02m, 14.56m to 14.76m | | 9 | RUN | | | | | | | | | | | | RUN 9# TCR=100%, SCR=98%, ROD=80%, UCS=16.6MPa |
| | clay seams at 14.25m to 14.33m | | 10 | RUN | | | | | | | | | | | | RUN 10# TCR=100%, SCR=100%, ROD=100%, UCS=16.6MPa |
| | slightly weathered, strong | | 11 | RUN | | | | | | | | | | | | RUN 11# TCR=100%, SCR=100%, ROD=100%, UCS=38.5MPa |
| 100.1 | END OF BOREHOLE AT 18.24 m, BOREHOLE CROUTED TO SURFACE. | | | | | | | | | | | | | | | |

OKTATS 7140.GPJ 15/02/08

+ 3, x 3: Numbers refer to
Sensitivity

20
15-10-5
(%) STRAIN AT FAILURE

METRIC

CHECKED BY _____ MRA

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No WM-8

2 OF 2

METRIC

W.P. 18-4714-0 LOCATION N 4 805 275.12 E 284 001.88 ORIGINATED BY SLL
 HWY QEW/Bur Oak Drive BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY WM
 DATUM Geodetic DATE 30.11.05 - 06.12.05 CHECKED BY MRA

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ KN/m ³ | 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 | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE | | | | | | | | | | | | |
| | | | | | | | 111 | | | | | | | | 6 | | | | | |
| | weak to strong slightly weathered | | | | | | | | | | | | | | 0 | | | | | |
| | limestone interbeds at 11.28 to 11.35m, 11.51 to 11.61m, 12.35 to 12.52m, 12.65 to 12.68m, 12.98 to 13.08m, 13.16 to 13.21m | | 6 | RUN | | | 110 | | | | | | | | 1 | RUN 6# TCR=100%, SCR=100%, ROD=100%, UCS=MPa | | | | |
| | | | | | | | | | | | | | | | 1 | | | | | |
| | | | | | | | 109 | | | | | | | | 0 | | | | | |
| | | | | | | | | | | | | | | | 1 | RUN 7# TCR=100%, SCR=100%, ROD=100%, UCS=MPa | | | | |
| | | | 7 | RUN | | | 108 | | | | | | | | 1 | | | | | |
| | | | | | | | | | | | | | | | 0 | | | | | |
| | | | | | | | | | | | | | | | 1 | | | | | |
| | | | | | | | 107 | | | | | | | | 0 | RUN 8# TCR=100%, SCR=100%, ROD=100%, UCS=MPa | | | | |
| | | | | | | | | | | | | | | | 0 | | | | | |
| | | | 8 | RUN | | | | | | | | | | | 0 | | | | | |
| | | | | | | | | | | | | | | | 3 | | | | | |
| 105.6 | | | | | | | 106 | | | | | | | | 1 | | | | | |
| 15.3 | END OF BOREHOLE AT 15.29 m. BOREHOLE GROUTED TO SURFACE. | | | | | | | | | | | | | | | | | | | |

+ 3, x 3; Numbers refer to
Sensitivity

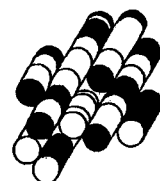
20
10
(%) STRAIN AT FAILURE

APPENDIX D

Laboratory Test Results

Overhead/Cantilevered Sign Support Structures

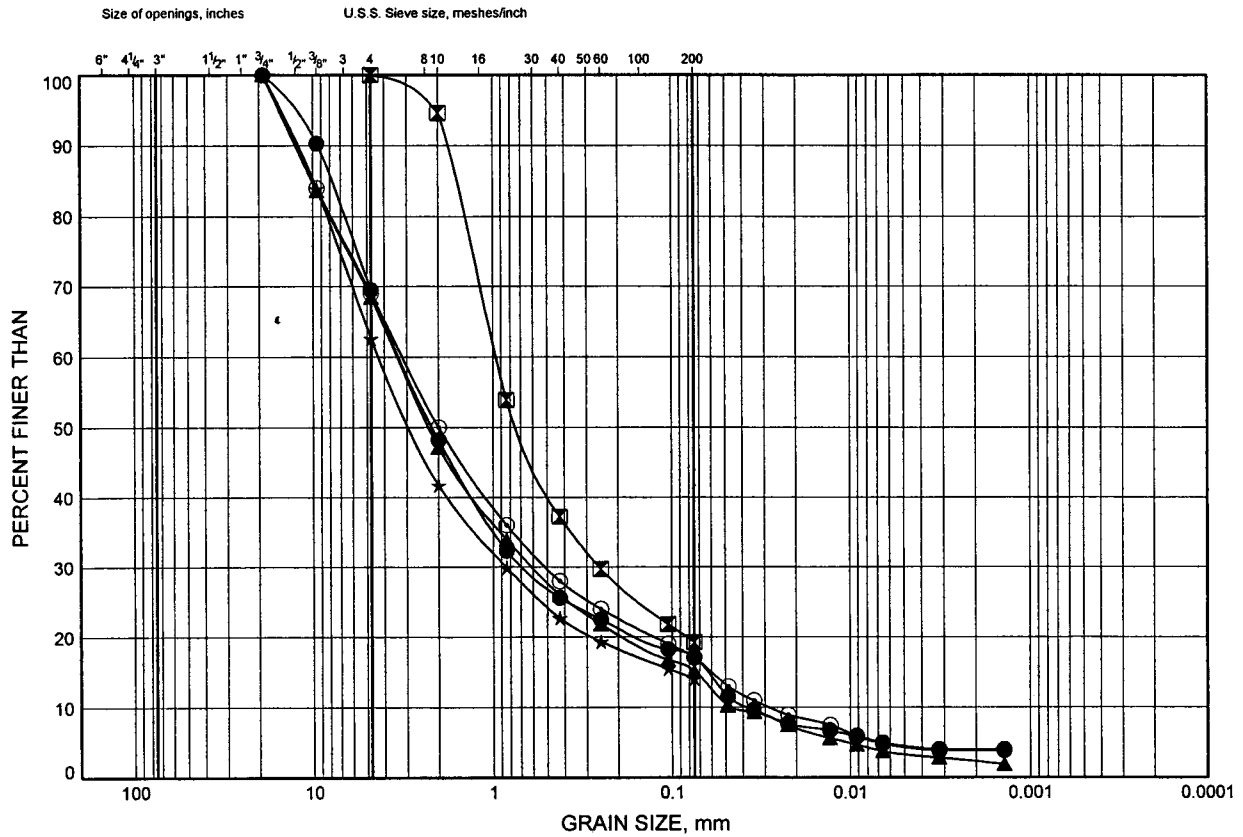
Terraprobe Limited



GRAIN SIZE DISTRIBUTION

FIGURE D1

Gravelly Sand (Fill)

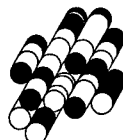


| COBBLE SIZE | COARSE | FINE | COARSE | MEDIUM | FINE | SILT and CLAY |
|-------------|--------|------|--------|--------|------|---------------|
| | GRAVEL | | SAND | | | FINE GRAINED |

| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ★ | OS-5 | 0.5 | 112.9 |
| ⊙ | OS-8 | 0.9 | 116.9 |
| ● | OS-11 | 0.5 | 117.9 |
| ⊠ | OS-12 | 0.5 | 118.0 |
| ▲ | OS-14 | 0.5 | 118.8 |

Date May 2008

Project 2831-02-01



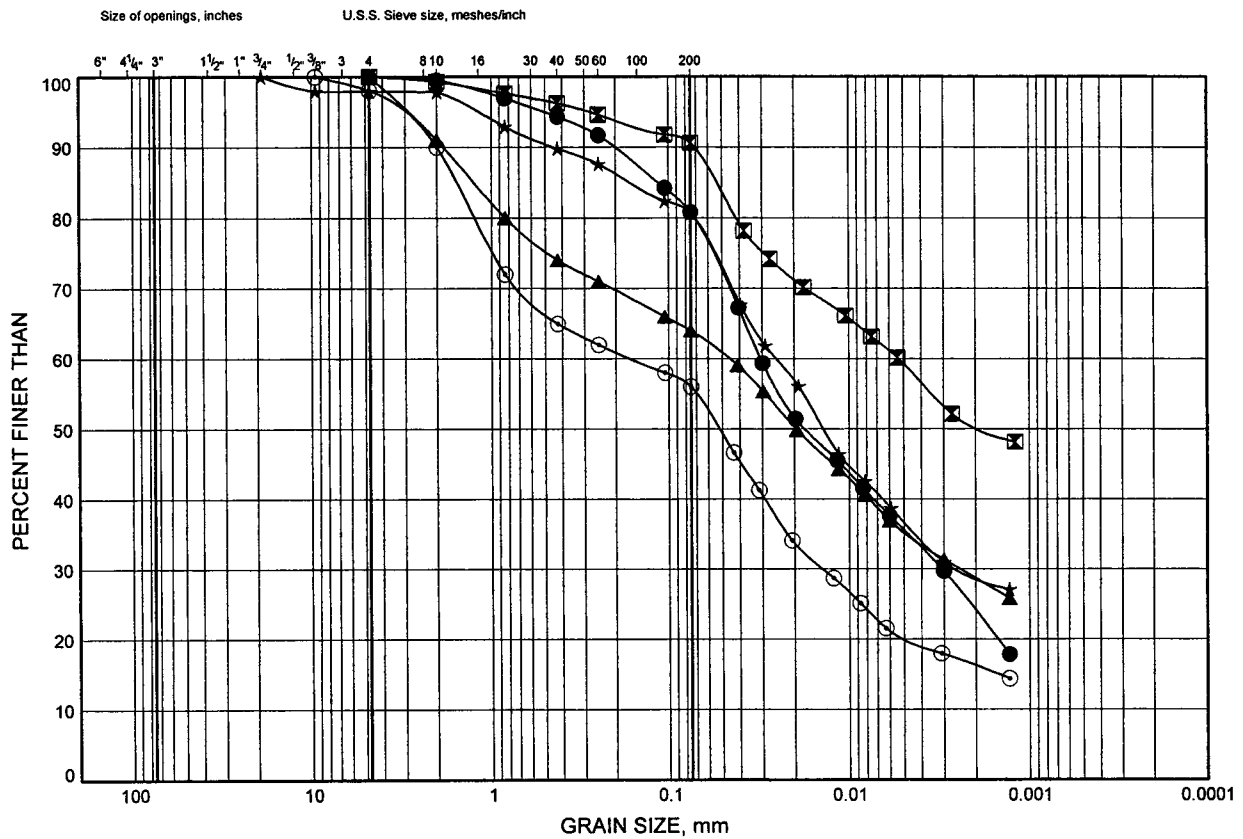
Prep'd DB

Chkd. JC

GRAIN SIZE DISTRIBUTION

FIGURE D2

Silty Clay and Clayey Silt (Fill)



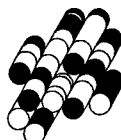
| COBBLE SIZE | COARSE | FINE | COARSE | MEDIUM | FINE | SILT and CLAY |
|----------------|--------|------|--------|--------|------|---------------|
| | GRAVEL | | SAND | | | FINE GRAINED |

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

| | | | |
|---|-------|-----|-------|
| ● | CS-6 | 1.7 | 116.5 |
| ▲ | OS-6 | 0.9 | 113.9 |
| ★ | OS-9 | 0.7 | 116.1 |
| ⊙ | OS-9 | 1.7 | 115.1 |
| ⊠ | OS-10 | 0.7 | 118.5 |

Date May 2008

Project 2831-02-01



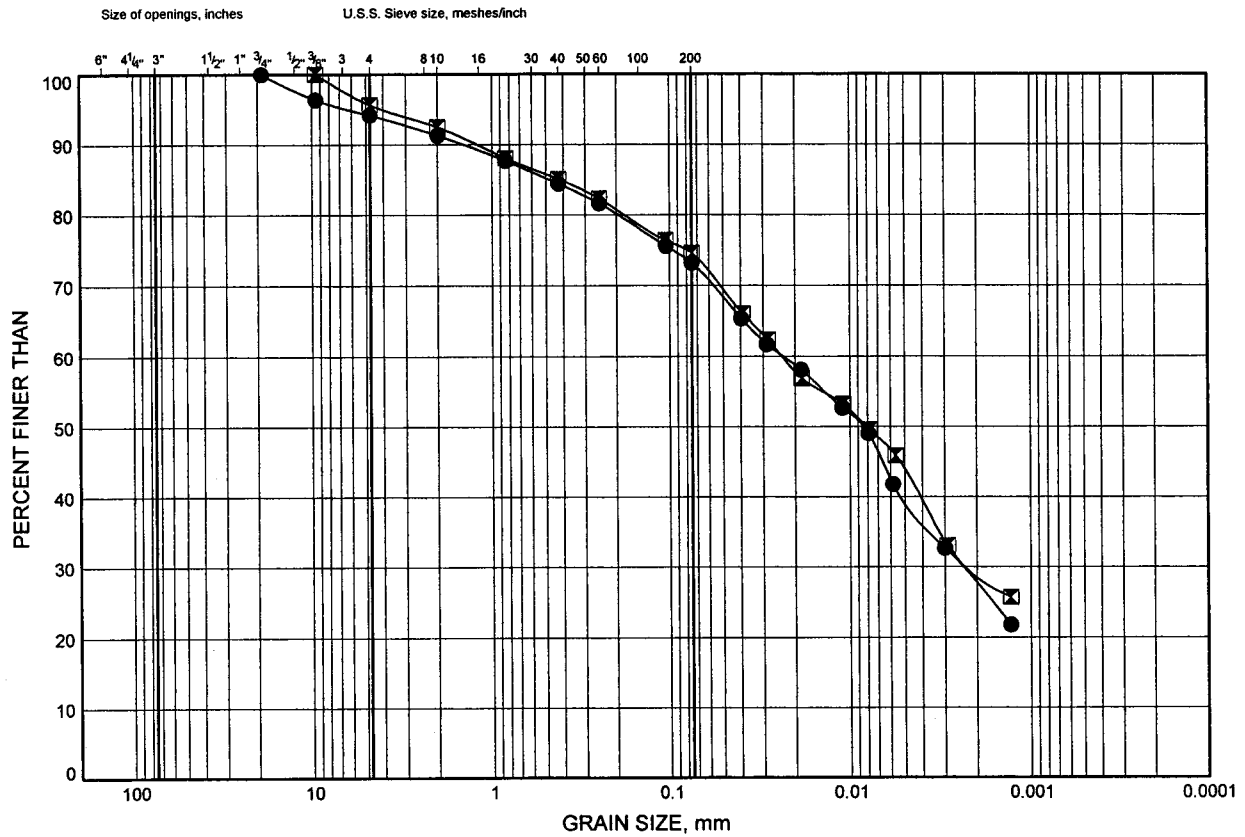
Prep'd DB

Chkd. JC

GRAIN SIZE DISTRIBUTION

FIGURE D4

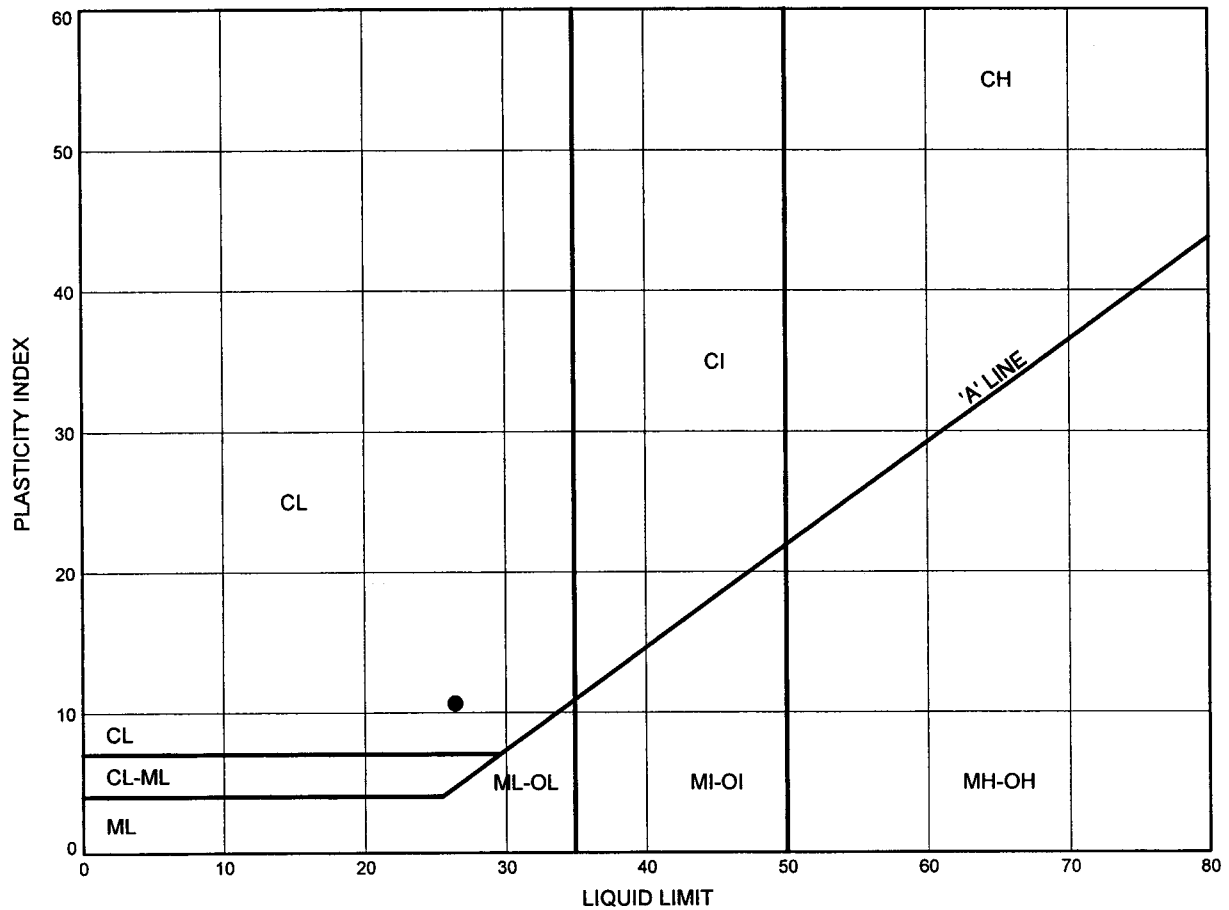
Silty Clay Till



ATTERBERG LIMITS TEST RESULTS

FIGURE D5

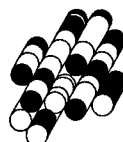
Silty Clay Till



| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ● | OS-5 | 1.7 | 111.7 |

Date May 2008

Project 2831-02-01



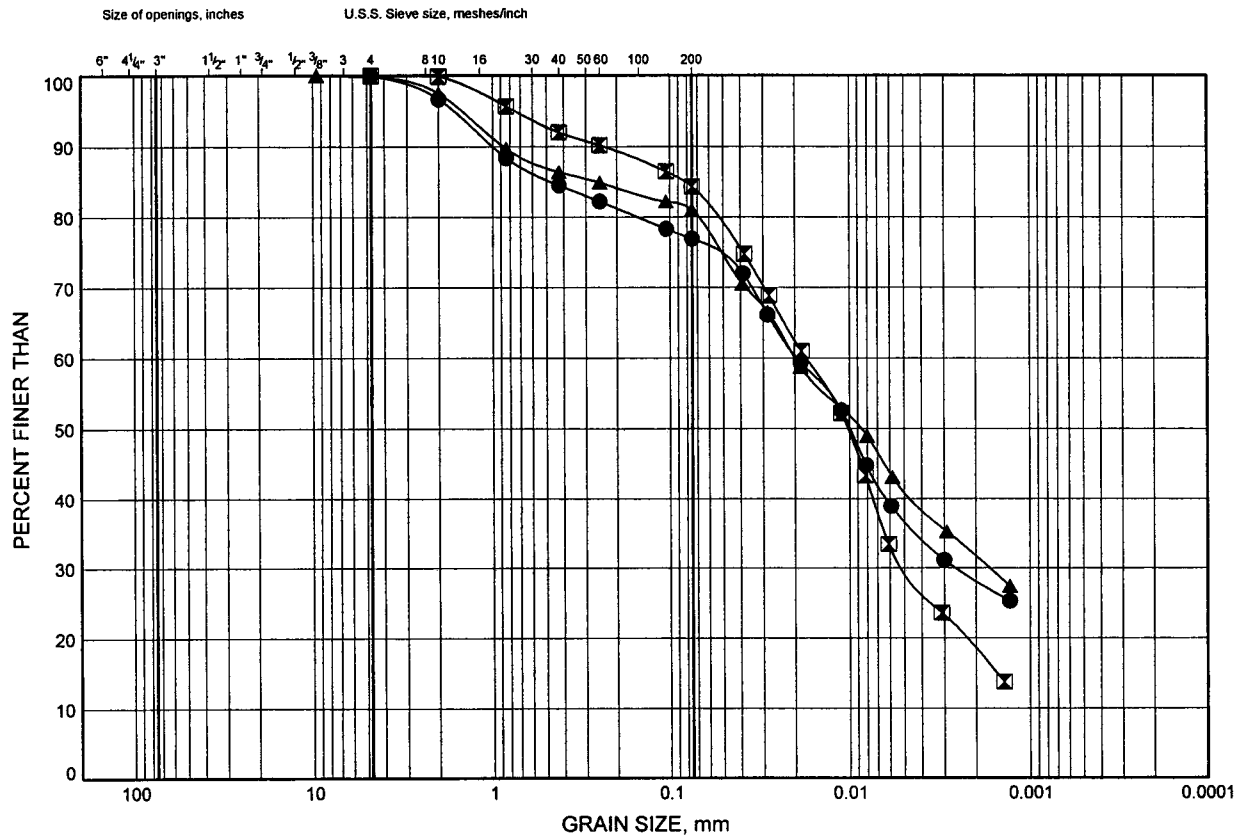
Prep'd DB

Chkd. JC

GRAIN SIZE DISTRIBUTION

FIGURE D6

Silty Clay Till (Till / Shale Complex)

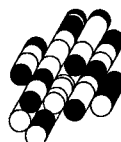


| COBBLE SIZE | COARSE | FINE | COARSE | MEDIUM | FINE | SILT and CLAY |
|----------------|--------|------|--------|--------|------|---------------|
| | GRAVEL | | SAND | | | FINE GRAINED |

| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ☒ | OS-6 | 2.5 | 112.3 |
| ▲ | OS-7 | 1.7 | 115.2 |
| ● | OS-10 | 1.1 | 118.1 |

Date May 2008

Project 2831-02-01



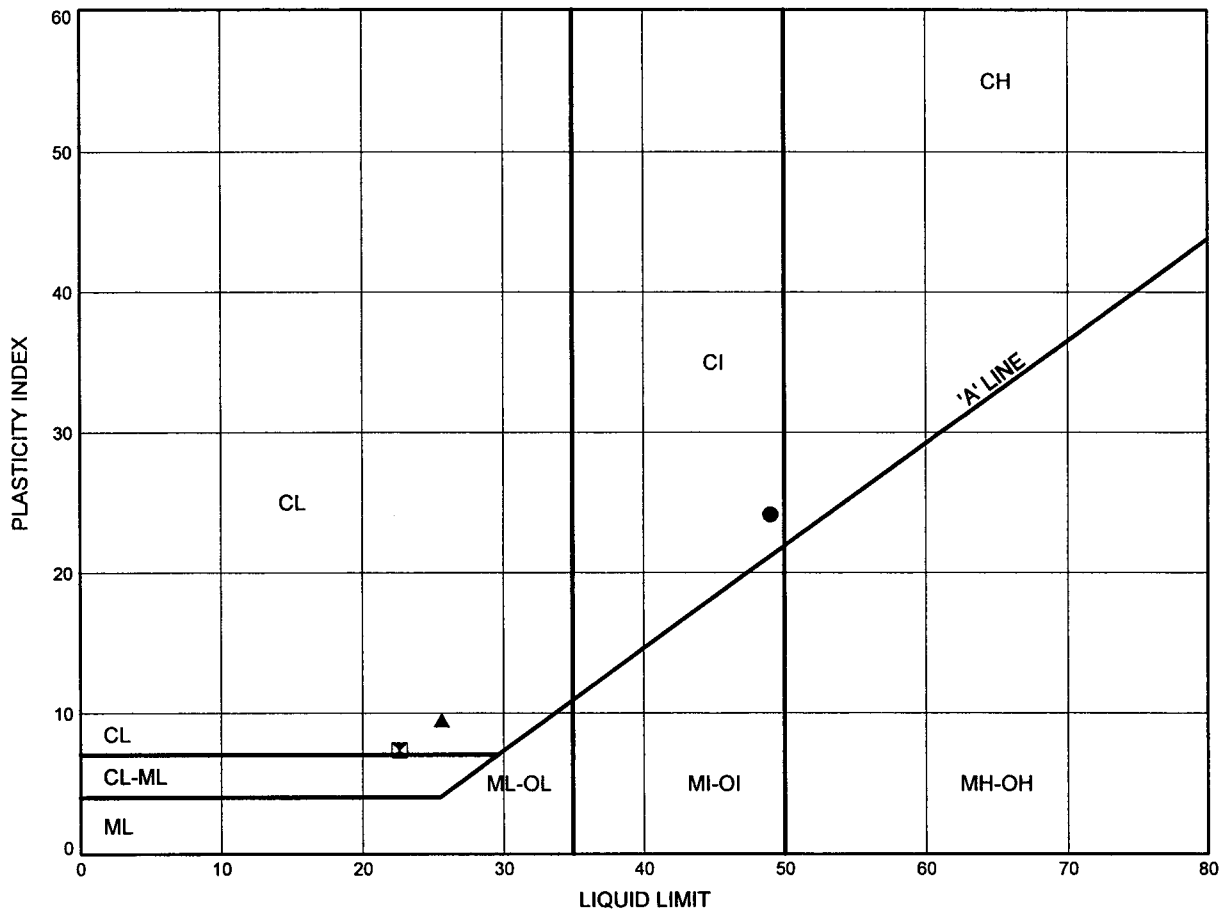
Prep'd DB

Chkd. JC

ATTERBERG LIMITS TEST RESULTS

FIGURE D7

Silty Clay Till (Till / Shale Complex)



| SYMBOL | BOREHOLE | DEPTH (m) | ELEVATION (m) |
|--------|----------|-----------|---------------|
| ☒ | OS-6 | 2.5 | 112.3 |
| ▲ | OS-7 | 1.7 | 115.2 |
| ● | OS-10 | 0.7 | 118.1 |

Date May 2008

Project 2831-02-01



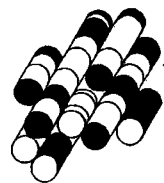
Prep'd DB

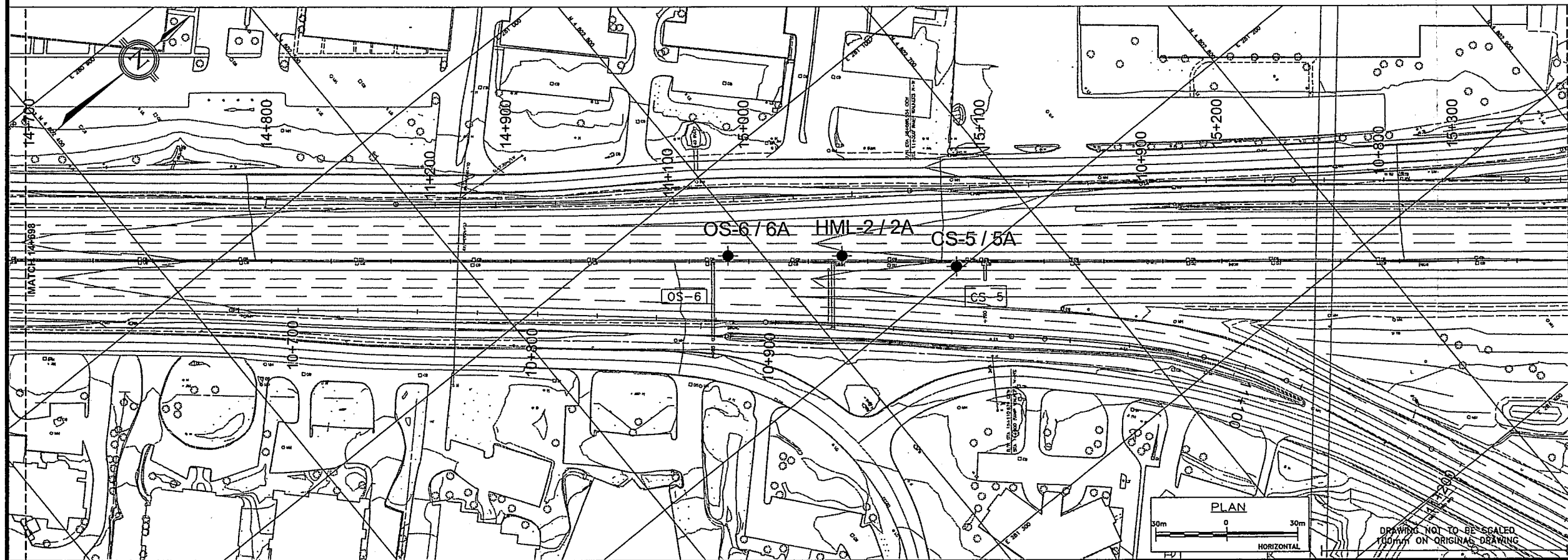
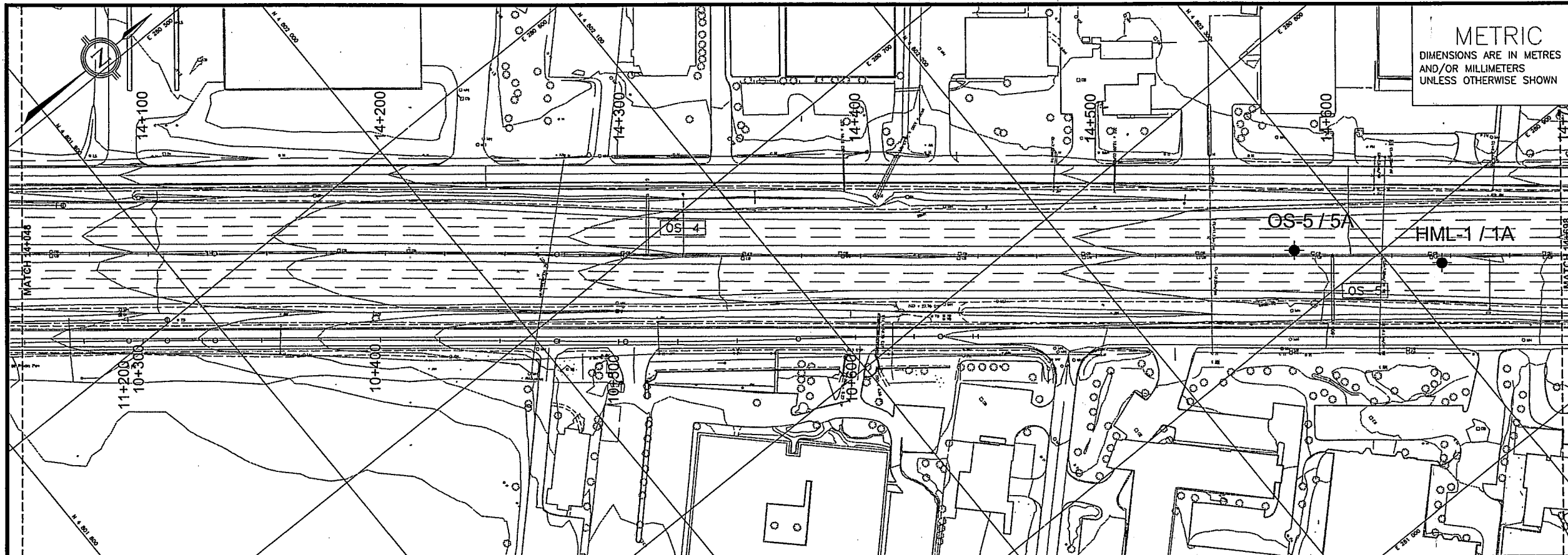
Chkd. JC

APPENDIX E

**Drawing titled
“Borehole Locations”**

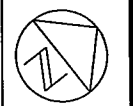
Terraprobe Limited





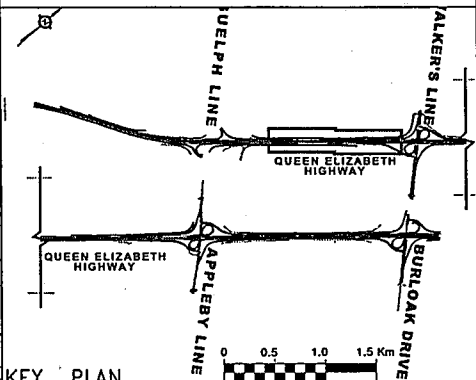
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETERS
UNLESS OTHERWISE SHOWN

CONT No
WP No 2831-02-01



QUEEN ELIZABETH HIGHWAY
BRANT STREET TO BURLOAK DRIVE
HIGH MAST LIGHTING
BOREHOLE LOCATIONS

SHEET
1 OF 6



KEY PLAN

LEGEND

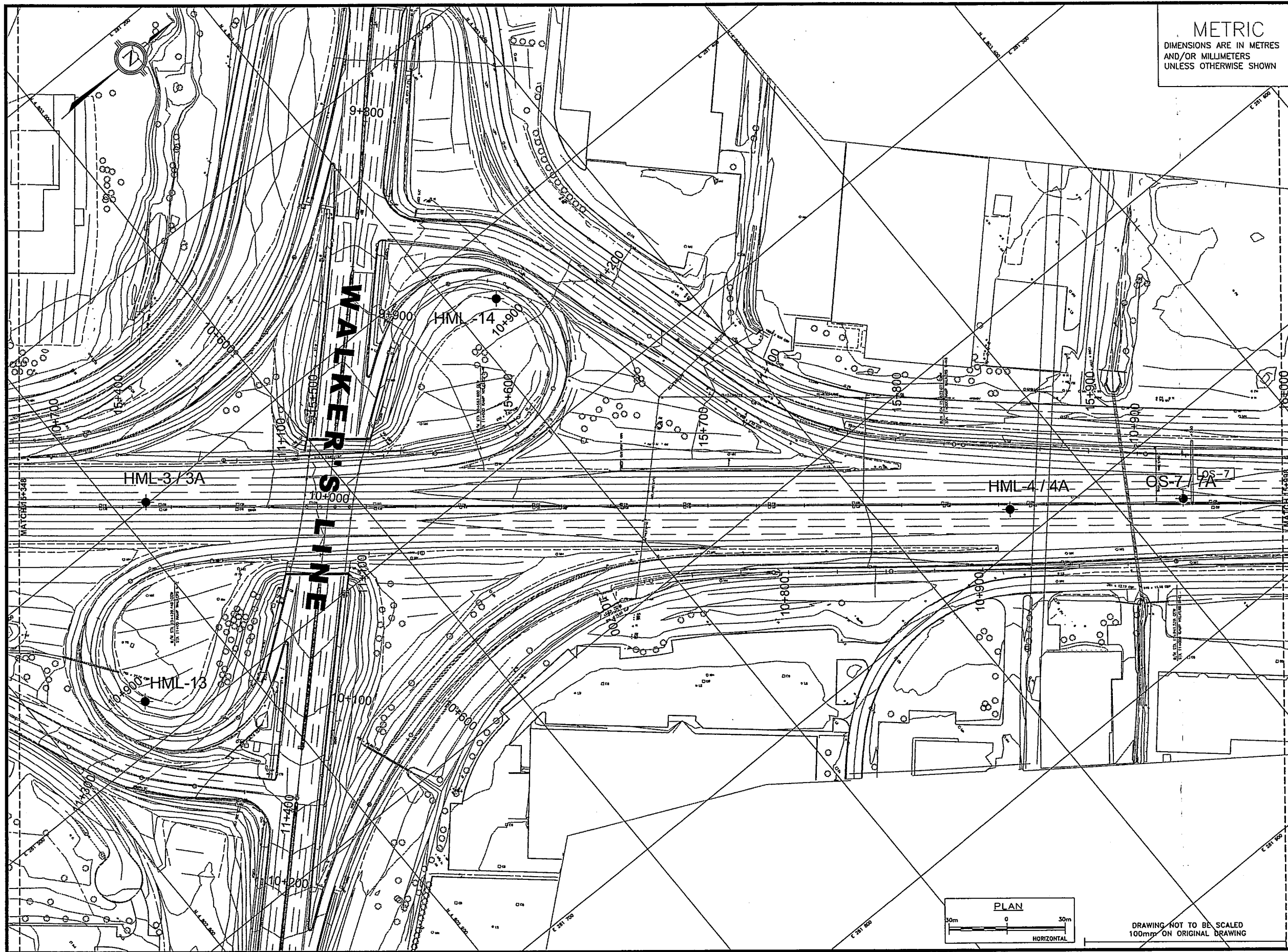
- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60" Cone, 475 J/blow)
- WL at Time of Investigation
- WL in Piezometer
- Piezometer
- Rock Quality Designation
- Auger Refusal

| No | ELEVATION | COORDINATES | |
|-------|-----------|-------------|-----------|
| | | NORTHING | EASTING |
| OS 5 | 113.4 | 4 802 272.7 | 280 876.5 |
| OS 6 | 114.8 | 4 802 588.6 | 281 133.7 |
| CS 5 | 115.1 | 4 802 660.7 | 281 198.3 |
| HML 1 | 113.7 | 4 802 317.8 | 280 920.0 |
| HML 2 | 115.0 | 4 802 625.8 | 281 164.1 |

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore holes the boundaries are assumed from geological evidence.

| REVISIONS | | | |
|-----------------|-----------|-------------|---------------|
| DATE | BY | DESCRIPTION | |
| DESIGN J.C.CODE | CHBDC2006 | LOAD | DATE MAY 2008 |
| DRAWN S.FCHK | J.C. | STRUCT | |



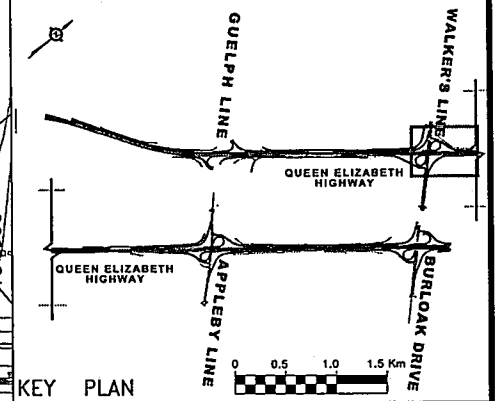
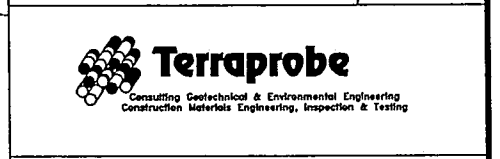
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETERS
UNLESS OTHERWISE SHOWN

CONT No
WP No 2831-02-01

QUEEN ELIZABETH HIGHWAY
BRANT STREET TO BURLOAK DRIVE
HIGH MAST LIGHTING
BOREHOLE LOCATIONS



SHEET
2 OF 6



| KEY PLAN | | LEGEND | |
|----------|---------------------------------------|--------|---------------------------------------|
| ● | Bore Hole | ● | Bore Hole |
| ⊕ | Dynamic Cone Penetration Test (Cone) | ⊕ | Dynamic Cone Penetration Test (Cone) |
| ⊗ | Bore Hole & Cone | ⊗ | Bore Hole & Cone |
| 'N' | Blows/0.3m (Std Pen Test, 475 J/blow) | 'N' | Blows/0.3m (Std Pen Test, 475 J/blow) |
| CONE | Blows/0.3m (60° Cone, 475 J/blow) | CONE | Blows/0.3m (60° Cone, 475 J/blow) |
| ↕ | WL at Time of Investigation | ↕ | WL at Time of Investigation |
| ↕ | WL in Piezometer | ↕ | WL in Piezometer |
| ⊞ | Piezometer | ⊞ | Piezometer |
| 90% | Rock Quality Designation | 90% | Rock Quality Designation |
| A/R | Auger Refusal | A/R | Auger Refusal |

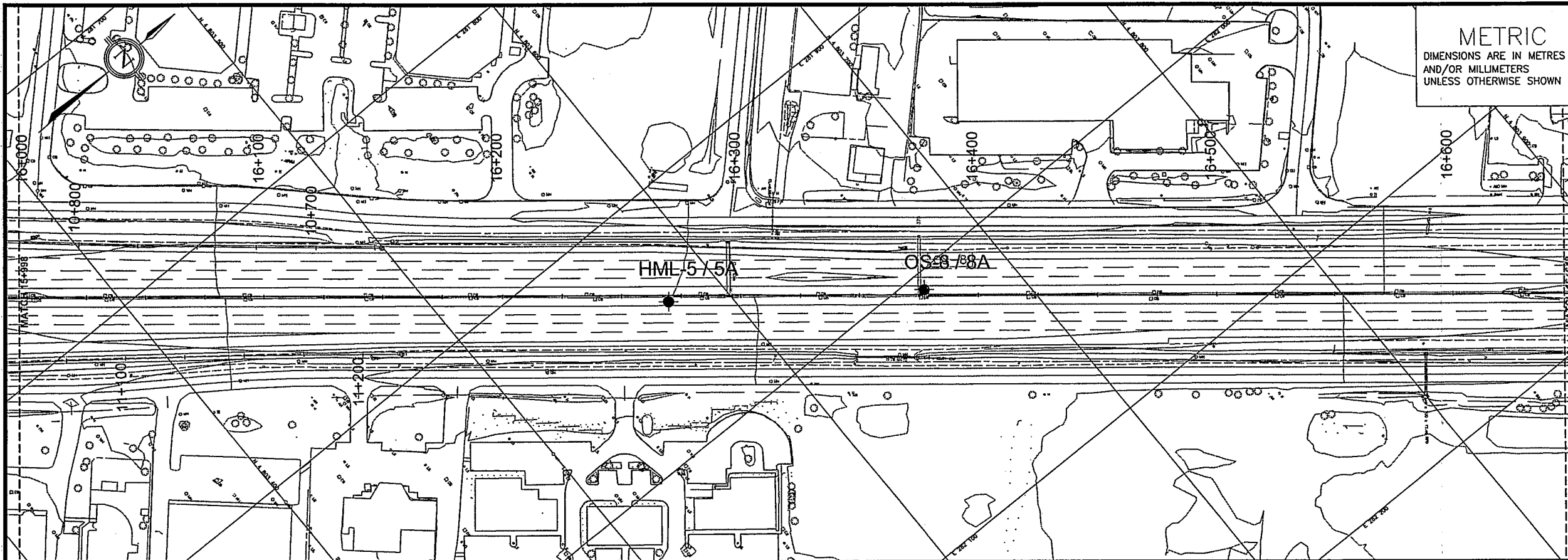
| No | ELEVATION | COORDINATES | |
|--------|-----------|-------------|-----------|
| | | NORTHING | EASTING |
| HML 3 | 115.7 | 4 802 915.0 | 281 399.1 |
| HML 4 | 116.7 | 4 803 256.5 | 281 683.0 |
| HML 13 | 114.5 | 4 802 849.4 | 281 478.8 |
| HML 14 | 117.4 | 4 803 120.8 | 281 431.1 |
| OS 7 | 116.9 | 4 803 329.2 | 281 735.3 |

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore holes the boundaries are assumed from geological evidence.

| REVISIONS | | | |
|-----------|----------|-----------|-------------|
| | DATE | BY | DESCRIPTION |
| DESIGN | J.C. | CHBDC2006 | LOAD |
| DRAWN | S.F. | CHK J.C. | STRUCT |
| DATE | MAY 2008 | | |



DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING



METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETERS
UNLESS OTHERWISE SHOWN

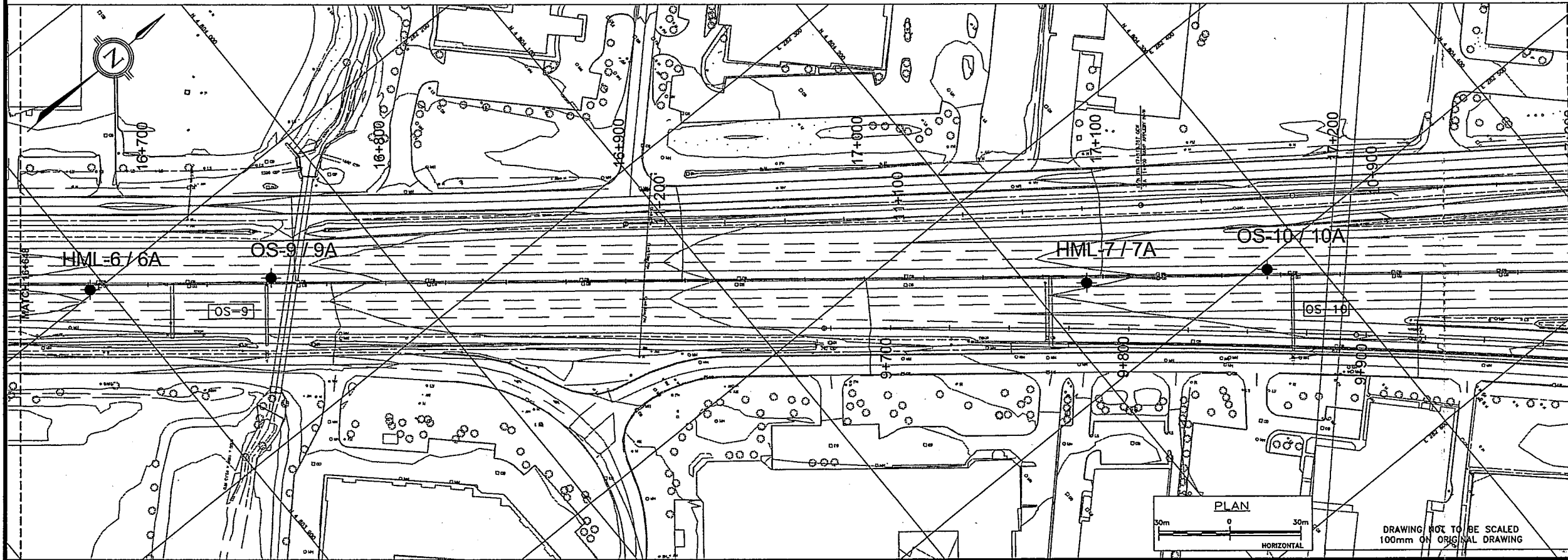
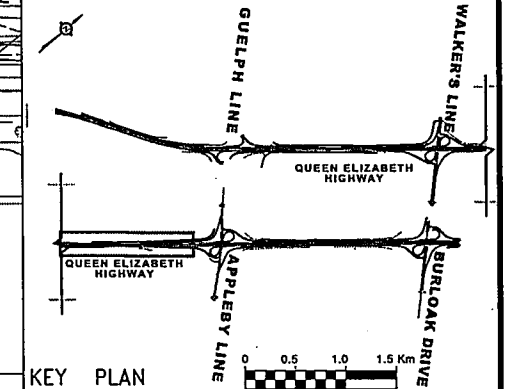
CONT No
WP No 2831-02-01

QUEEN ELIZABETH HIGHWAY
BRANT STREET TO BURLOAK DRIVE
HIGH MAST LIGHTING
BOREHOLE LOCATIONS

Giffels
An Ingenium Group Company

Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing

SHEET
3 OF 6



LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- 'N'
- Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE
- Blows/0.3m (60" Cone, 475 J/blow)
- WL at Time of Investigation
- WL in Piezometer
- Piezometer
- 90%
- A/R
- Rock Quality Designation
- Auger Refusal

| No | ELEVATION | COORDINATES | |
|-------|-----------|-------------|-----------|
| | | NORTHING | EASTING |
| HML 5 | 117.8 | 4 803 578.3 | 281 943.0 |
| HML 6 | 116.9 | 4 803 894.2 | 282 198.2 |
| HML 7 | 119.0 | 4 804 219.8 | 282 459.6 |
| OS 8 | 117.8 | 4 803 664.8 | 282 006.8 |
| OS 9 | 116.8 | 4 803 956.4 | 282 242.3 |
| OS 10 | 119.2 | 4 804 282.2 | 282 503.1 |

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore holes the boundaries are assumed from geological evidence.

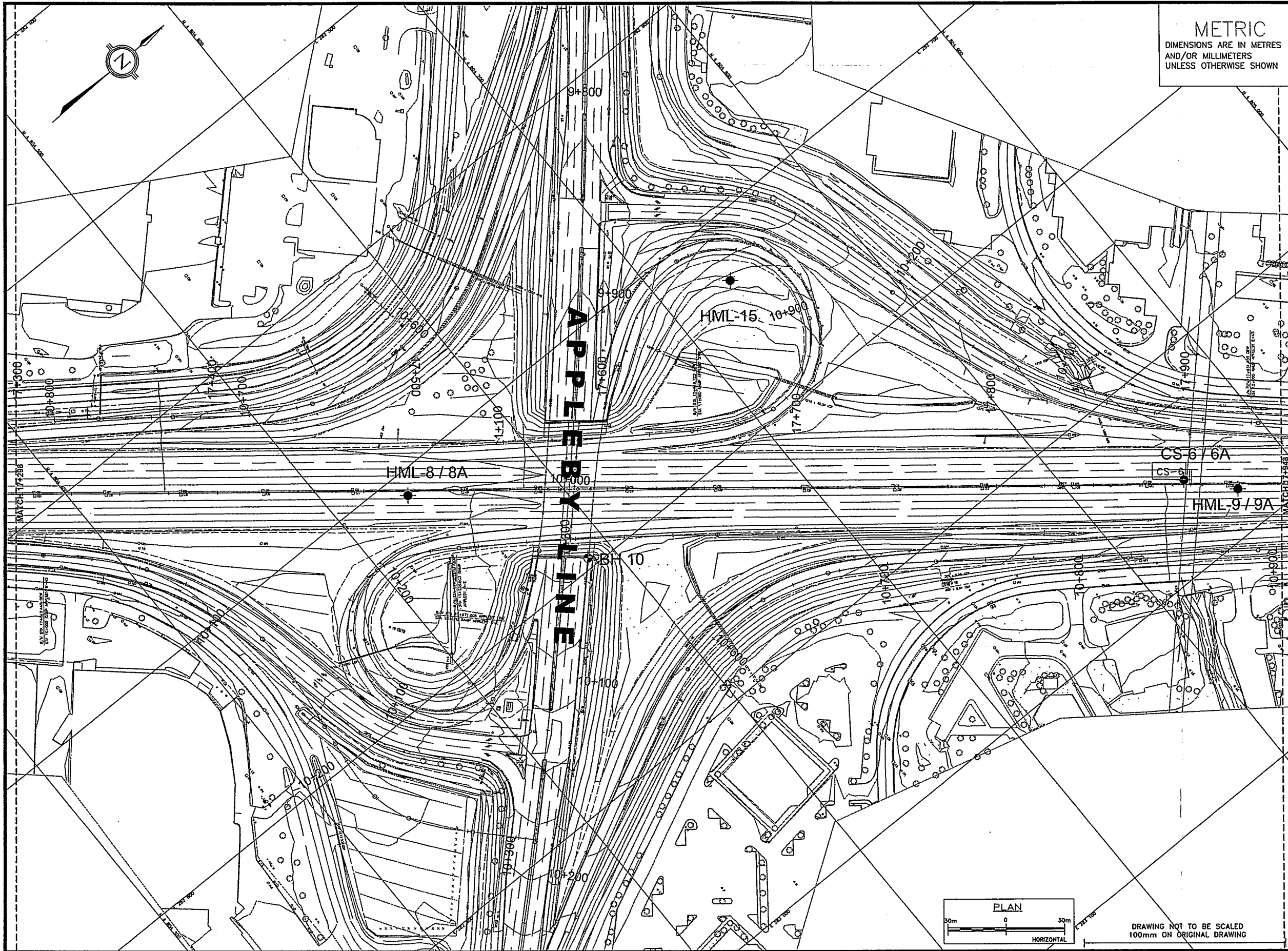
| REVISIONS | DATE | BY | DESCRIPTION |
|-----------|------|------|----------------|
| DESIGN | J.C. | CODE | CHBDC2006 LOAD |
| DRAWN | S.F. | CHK | J.C. STRUCT |

PLAN

30m 0 30m

HORIZONTAL

DRAWING NOT TO BE SCALED
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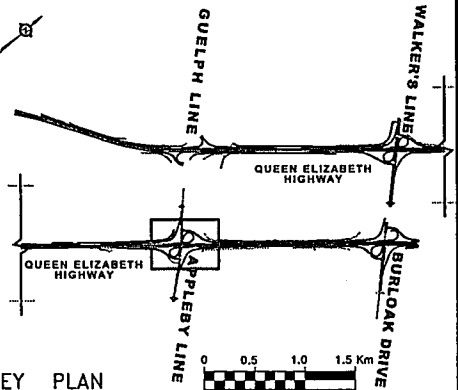
METRIC
DIMENSIONS ARE IN METRES
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CONT No
WP No 2831-02-01



QUEEN ELIZABETH HIGHWAY
BRANT STREET TO BURLOAK DRIVE
HIGH MAST LIGHTING
BOREHOLE LOCATIONS

SHEET
4 OF 6

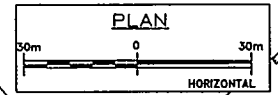


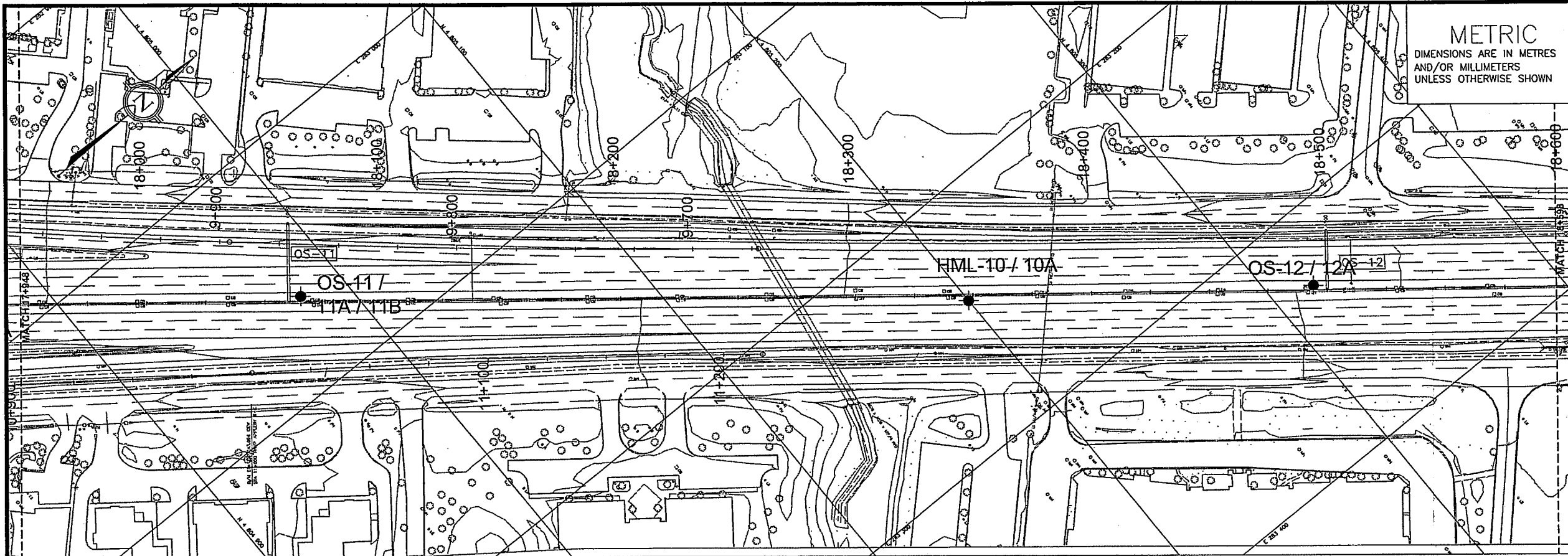
| LEGEND | |
|--------|---------------------------------------|
| | Bore Hole |
| | Dynamic Cone Penetration Test (Cone) |
| | Bore Hole & Cone |
| | Blows/0.3m (Std Pen Test, 475 J/blow) |
| | Blows/0.3m (60° Cone, 475 J/blow) |
| | WL at Time of Investigation |
| | WL in Piezometer |
| | Piezometer |
| | Rock Quality Designation |
| | Auger Refusal |

| No | ELEVATION | COORDINATES | |
|--------|-----------|-------------|-----------|
| | | NORTHING | EASTING |
| HML 8 | 119.1 | 4 804 535.7 | 282 711.5 |
| HML 9 | 118.2 | 4 804 868.6 | 282 978.4 |
| HML 15 | 121.6 | 4 804 734.7 | 282 730.2 |
| CS 6 | 118.2 | 4 804 850.1 | 282 957.4 |
| BH 10 | 118.0 | 4 804 587.0 | 282 795.0 |

NOTE
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| REVISIONS | | | |
|-------------|----------|-------------|--------|
| DATE | BY | DESCRIPTION | |
| DESIGN J.C. | CODE | CHBDC2006 | LOAD |
| DRAWN S.F. | CHK J.C. | | STRUCT |





METRIC
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CONT No
WP No 2831-02-01

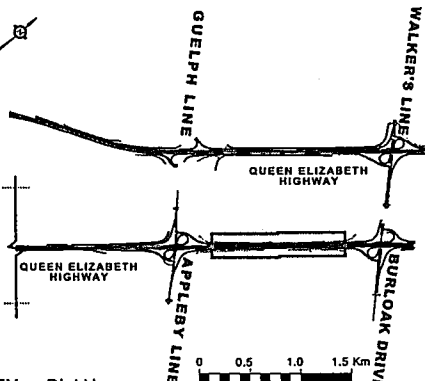
QUEEN ELIZABETH HIGHWAY
BRANT STREET TO BURLOAK DRIVE
HIGH MAST LIGHTING
BOREHOLE LOCATIONS



SHEET
5 OF 6



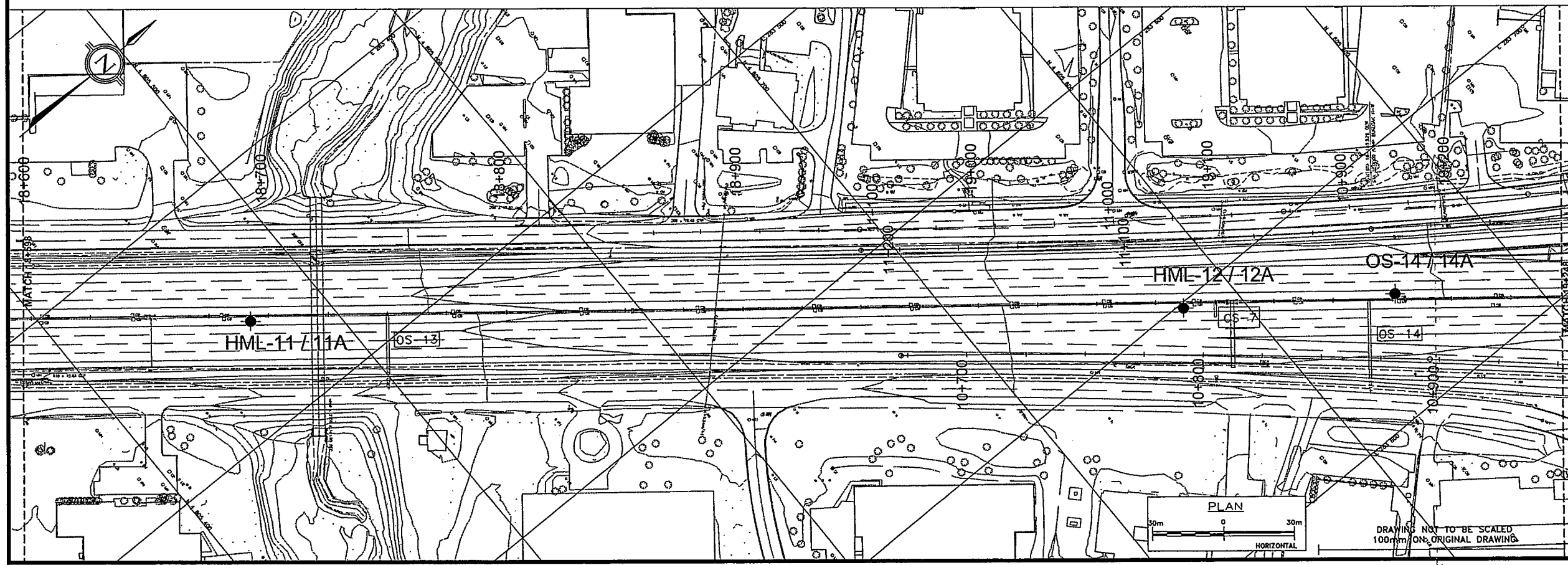
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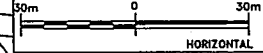
KEY PLAN

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60" Cone, 475 J/blow)
- WL at Time of Investigation
- WL in Piezometer
- Piezometer
- Rock Quality Designation
- Auger Refusal



PLAN

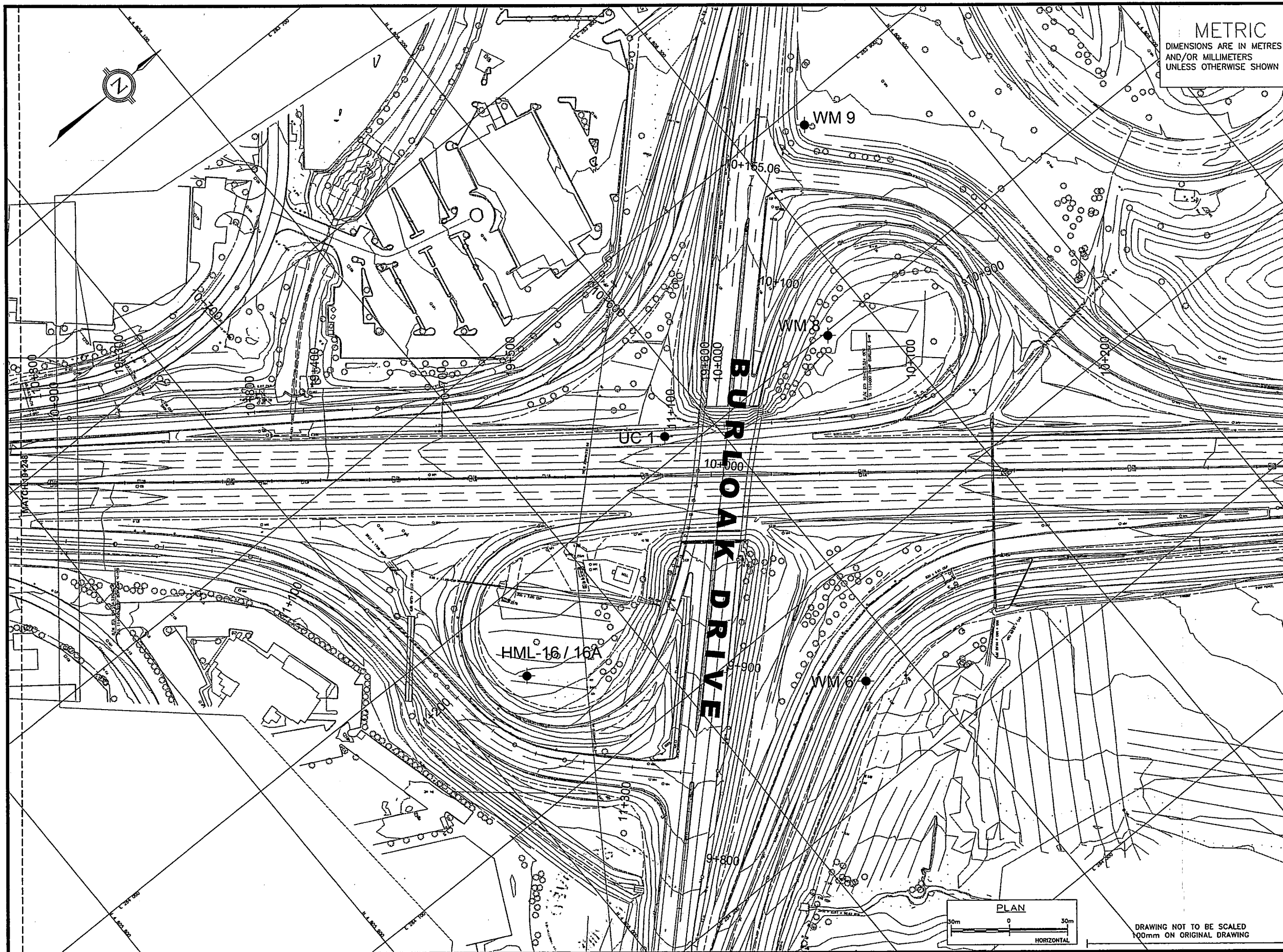


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100mm/ON ORIGINAL DRAWING

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore holes the boundaries are assumed from geological evidence.

| REVISIONS | COORDINATES | | | |
|-----------|-------------|-----------|-------------|-----------|
| | No | ELEVATION | NORTHING | EASTING |
| | OS 11 | 118.3 | 4 804 981.7 | 283 062.5 |
| | OS 12 | 118.5 | 4 805 317.1 | 283 330.3 |
| | OS 14 | 119.2 | 4 805 851.6 | 283 754.0 |
| | HML 10 | 118.4 | 4 805 200.0 | 283 243.0 |
| | HML 11 | 118.7 | 4 805 469.8 | 283 457.1 |
| | HML 12 | 119.4 | 4 805 778.6 | 283 702.1 |
| REVISIONS | REVISIONS | | | |
| | DATE | BY | DESCRIPTION | |
| | DESIGN | J.C. | CODE | CHBDC2006 |
| | DRAWN | S.F. | CHK | J.C. |
| | LOAD | | DATE | MAY 2008 |
| | STRUCT | | | |



METRIC
DIMENSIONS ARE IN METRES
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CONT No
WP No 2831-02-01

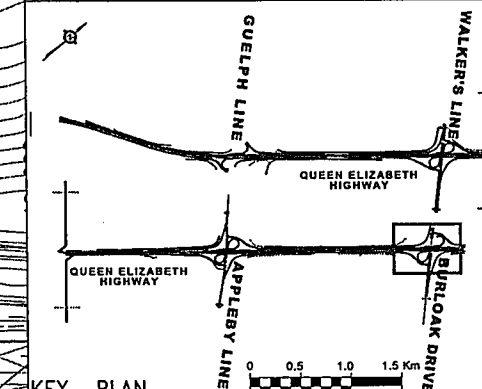
QUEEN ELIZABETH HIGHWAY
BRANT STREET TO BURLOAK DRIVE
HIGH MAST LIGHTING
BOREHOLE LOCATIONS



SHEET
6 OF 6

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KEY PLAN

LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- 'N' Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- ↓ WL at Time of Investigation
- ↕ WL in Piezometer
- ⊕ Piezometer
- 90% Rock Quality Designation
- A/R Auger Refusal

| No | ELEVATION | COORDINATES | |
|--------|-----------|-------------|-----------|
| | | NORTHING | EASTING |
| HML 16 | 118.1 | 4 806 042.7 | 284 039.8 |
| UC 1 | 118.9 | 4 806 176.2 | 283 988.8 |
| WM 6 | 118.4 | 4 806 176.4 | 284 152.4 |
| WM 8 | 121.1 | 4 806 275.1 | 284 001.9 |
| WM 9 | 121.9 | 4 806 334.9 | 283 910.7 |

NOTE

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| REVISIONS | DATE | | | DESCRIPTION | | |
|-----------|------|------|-------------|-------------|------|-------------|
| | DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
| DESIGN | J.C. | CODE | CHBDC2006 | LOAD | DATE | MAY 2008 |
| DRAWN | S.F. | CHK | J.C. | STRUCT | | |

