



**PRELIMINARY FOUNDATION INVESTIGATION AND DESIGN REPORT
for**

**HIGH MAST LIGHTING AND OVERHEAD SIGNS
HIGHWAY 404 HOV LANE EXPANSION
FROM HIGHWAY 407 TO GREEN LANE
WO 03-20024
REGIONAL MUNICIPALITY OF YORK, ONTARIO**

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PML Ref.: 14TF003A-HML/OHS
Index No.: 057FIDR
Geocres No.: 30M14-423
August 21, 2015



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PART A
PRELIMINARY FOUNDATION INVESTIGATION REPORT

for
High Mast Lighting and Overhead Signs
Highway 404 HOV Lane Expansion
From Highway 407 to Green Lane
W.O. 03-20024
Regional Municipality of York, Ontario

1. INTRODUCTION

The proposed Highway 404 High Occupancy Vehicle (HOV) lane expansion from Highway 407 northerly for approximately 26 km to Green Lane, in the Regional Municipality of York, Ontario includes the installations of High Mast Lighting (HML) poles and Overhead Sign (OHS) structures.

This preliminary Foundation Investigation Report addresses geotechnical aspects of the design of the conceptually proposed HML poles and OHS structures within the project limits along Highway 404, as shown on Drawings HML-1 to HML-5. The report has been prepared for MMM Group Limited (MMM) on behalf of the Ministry of Transportation, Ontario (MTO). The terms of reference and scope of work for the foundation engineering services are outlined in MTO's Request for Proposal under Agreement No. 2008-E-0037, dated July 2013.

This report is a desktop study based on existing Foundation Reports, and summarizes the relevant subsurface information available from the MTO Pavement and Foundations Section GEOCRES library. The report is intended for preliminary design and planning purposes only, addressing twenty (20) of the HML poles selected at regular intervals along the highway and four (4) of the OHS structures selected near existing subsoil information. Detail design foundation engineering services will be required during the detail design phase.



2. SOURCES OF INFORMATION

The subsurface information used in this report was obtained from the following existing Foundation Reports available from MTO Pavement and Foundation Section's GEOCRES database, as follows:

- Reference 1 - Foundation Investigation Report – “Highway 7 Interchange, Highway 404, District 6, Toronto” Site No. 37-276, W.P. No. 160-74-15. Prepared by Soil Mechanics Section – Ministry of Transportation, dated May 1970. GEOCRES No. 30M14-58.
- Reference 2 - Foundation Investigation Report – “Proposed Crossing at the New Highway 404 (Line ‘A’) and Beaver Creek Diversion” W.O. 70-11102, W.P. 290-61, Township of Markham, County of York, District No. 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated February 9, 1971. GEOCRES No. 30M14-53.
- Reference 3 - Preliminary Foundation Investigation Report – “Beaver Creek Structures, Highway 404 HOV Lane Expansion from Highway 407 to Green Lane”, W.O. No. 03-20024, Regional Municipality of York. Ontario. Prepared by Peto MacCallum Ltd., dated June 8, 2015. GEOCRES No. 30M14-420.
- Reference 4 - Foundation Investigation Report – “Proposed Twin Overpass Structures, Highway 404 and 16th Avenue”, Site No. 37-666, W.P. No. 160-74-25, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated April 5, 1977. GEOCRES No. 30M14-54.
- Reference 5 - Preliminary Foundation Investigation Report – “16th Avenue Overpass Structures, Highway 404 HOV Lane Expansion from Highway 407 to Green Lane”, Site Nos. 37-277 1&2, W.O. No. 03-20024, Regional Municipality of York. Ontario. Prepared by Peto MacCallum Ltd., dated May 27, 2015. GEOCRES No. 30M14-417 (Desktop Study only, no new boreholes drilled).
- Reference 6 - Preliminary Foundation Investigation Report – “Proposed Structure at the Crossing of Highway 404 and the Rouge River Diversion”, W.P. No. 160-74-26 Site No. 37-347, Regional Municipality of York. Ontario. Prepared by Soil Mechanics Section – Ministry of Transportation, dated April 1971. GEOCRES No. 30M14-51.
- Reference 7 - Preliminary Foundation Investigation Report – “Rouge River Bridges, Highway 404 HOV Lane Expansion from Highway 407 to Green Lane”, W.O. No. 03-20024, Regional Municipality of York. Ontario. Prepared by Peto MacCallum Ltd., dated May 27, 2015. GEOCRES No. 30M14-416.



- Reference 8 - Foundation Investigation Report – “Regional Road #25 Interchange Underpass, 2.6 mile north of Highway 7”, Site No. 37-278, W.P. No. 160-74-27, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated April 22, 1977. GEOCRES No. 30M14-50.
- Reference 9 - Foundation Investigation and Design Report – “Regional Road 49 (18th Avenue) Underpass, 3.8 Miles North of Hwy. 7”, Site No. 37-279, W.P. No. 160-74-28, Highway 404, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated January 1971. GEOCRES No. 30M14-110.
- Reference 10 - Foundation Investigation Report – “19th Avenue Underpass, 5.1 Miles North of Hwy. 7”, Site No. 37-882, W.P. No. 160-74-29, Highway 404, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated March 24, 1977. GEOCRES No. 30M14-111.
- Reference 11- Foundation Investigation Report – “Regional Road #14 Interchange Underpass, 6.4 Miles North of Hwy. 7”, Site No. 37-280, W.P. No. 160-74-30, Highway 404, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated November 22, 1979. GEOCRES Nos. 30M14-112 and 30M14-115.
- Reference 12- Foundation Investigation Report – “Wilcox Lake Road Underpass, 1.3 Miles North of Regional Road #14”, Site No. 37-346, W.P. No. 160-74-31, Highway 404, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated February 19, 1981. GEOCRES No. 30M14-117.
- Reference 13 - Foundation Investigation and Design Report – “Bloomington Road Twin Overpass Bridges, Highway 404 Widening, Bloomington Road to Aurora Road”, Site Nos. 37-737 1&2, G.W.P. No. 433-98-00, Regional Municipality of York. Prepared by Golder Associates Ltd., dated December 1999. GEOCRES No. 30M14-275.
- Reference 14 - Foundation Investigation and Design Report – “CNR Overpass Highway 404 Widening, Bloomington Road to Aurora Road”, Site Nos. 37-700 1&2, G.W.P. No. 433-98-00, Regional Municipality of York. Prepared by Golder Associates Ltd., dated January 2000. GEOCRES No. 30M14-274.
- Reference 15- Foundation Investigation Report – “Vandorf Side Road Underpass 4.0 Miles North of Regional Road 14, Highway 404”, Site No. 37-699, W.P. No. 160-74-34, Highway 404, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated April 28, 1978. GEOCRES No. 31M14-156.
- Reference 16 - Foundation Investigation Report – “Regional Road 15 Interchange, 5.4 Miles North of Regional Road 14”, Site No. 37-698, W.P. No. 160-74-36, Highway 404, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated March 28, 1978. GEOCRES No. 31D-255.



Reference 17- Foundation Investigation Report – “Regional Road 12 Interchange, 2.5 Miles North of Regional Road 15” Site No. 37-697, W.P. 160-74-39, Highway 404, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation July 24, 1978. GEOCREs No. 31D-259.

Reference 18 -Foundation Investigation Report – “Regional Road 31 Interchange, 3.8 Miles North of Regional Road 15”, Site No. 37-696, W.P. No. 160-74-40, Highway 404, District 6, Toronto. Prepared by Soil Mechanics Section – Ministry of Transportation, dated September 11, 1978. GEOCREs No. 31D-262.

Reference 19 -Foundation Investigation and Design Report – “Overpass Structures at Herald Road, Highway 404 Extension, Davis Drive to Herald Road”, G.W.P 421-98-00, Regional Municipality of York. Prepared by Golder Associates Ltd., dated May 2000. GEOCREs No. 31D-384.

Selected Record of Borehole sheets from the above listed Foundation Reports are contained in Appendix A. The historical boreholes were renamed to include the GEOCREs numbers as a prefix (for example, Borehole 1 of GEOCREs Report No. 30M14-58 was renamed Borehole 58-1 for this report). Approximate locations of existing boreholes were identified from the coordinates and drawings contained in the GEOCREs reports. The borehole location coordinates have been converted to MTM NAD 83 northing and easting, and their approximate locations are shown in plan on Drawings HML-1 to HML-5. The base drawings were provided by MMM showing the conceptual locations of HML poles and OHS structures.

In addition to the above GEOCREs reports, the following document was also considered:

- Chapman and Putnam. 1984. The Physiography of Southern Ontario, Ontario Geological Society, Special Volume 2, 3rd Edition. Accompanied by Map 2715, Scale 1:600,000.

3. SITE DESCRIPTION AND REGIONAL GEOLOGY

The section of Highway 404 between Highway 407 and Green Lane generally traverses the physiographic regions of “Peel Plain”, “South Slope” and “Oak Ridges Moraine”. Along Highway 404, the “Peel Plain” is present from the southern limit of this project to north of 19th Avenue near the boundary of the City of Markham and the Township of Whitchurch-Stouffville, where it abuts to the “South Slope” plain. The “South Slope” plain extends to about Bethesda Road where it meets the “Oak Ridges Moraine” plain which, in turn, extends beyond the northern limit of this project. The soils in the “Peel Plain” region consist of a till sheet generally following the surface topography. The till is typically comprised of silts and clays with occasional sand and



gravel zones. The “South Slope” region is an interlobate of smoothed moraine, which is faintly drumlinized and scored at intervals by valleys tributary to the Rouge River system. The soils in this region are comprised of glacial tills underlain by sandy to silty deposits. The soils in the “Oak Ridges Moraine” region are generally comprised of sand underlain by glacial till with frequent interbeds of sand, silt and clay.

The land use on either side of Highway 404 along the southern section of this project is mainly residential and/or industrial, while farm fields generally exist on either side of Highway 404 in the northern portion of this project. Several creeks, rivers and Canadian National Railway (CNR) tracks traverse this section of Highway 404.

The overall surface topography along this section of Highway 404 is gently sloping towards south transitioning to a gently flat area at the southern portion of the project. In general, this section of Highway 404, excluding areas near the structures, was constructed at/near original ground surface with grade levels ranging from about Elevation 315 m at the northern limit to about Elevation 185 m at the southern limit of the project. Bedrock is not expected to be encountered within the foundation installation depths for HML or OHS.

4. SUMMARIZED SUBSURFACE CONDITIONS

4.1 General

Descriptions are presented with respect to the selected conceptual HML and OHL sites presumed for preliminary design purposes.

Based on the information provided by MMM, the conceptual locations of the selected 20 HML poles and 4 OHS structures are summarized in Table 4.1.



Table 4.1: HML and OHS Information Summary

Type (Designation)	Proposed Location	Station	GEOCREST Report(s)
OHS (OHS-1)	Highway 404 Southbound, North of Highway 7	~ 14+240	30M14-58
HML (HML-P1)	North of Highway 7	15+120	30M14-53 30M14-420
OHS (OHS-2)	Highway 404 Southbound, South of 16 th Avenue	~ 15+735	30M14-54 30M14-417
HML (HML-P2)	North of 16 th Avenue	17+030	30M14-51 30M14-416
OHS (OHS-3)	Highway 404 Northbound, South of Major MacKenzie Drive East	~ 17+330	
OHS (OHS-4)	Highway 404 Northbound, South of Major MacKenzie Drive East	~ 17+710	30M14-50
HML (HML-P3)	North of Elgin Mills Road East	20+773	30M14-110
HML (HML-P4)	North of Elgin Mills Road East	21+260	
HML (HML-P5)	North of 19 th Avenue	22+383	30M14-111
HML (HML-P6)	North of 19 th Avenue	23+508	30M14-112 30M14-115
HML (HML-P7)	Gormley (Stouffville) Road Interchange	24+432	
HML (HML-P8)	North of Gormley (Stouffville) Road	10+535	
HML (HML-P9)	South of Bethesda Road	11+233	30M14-117
HML (HML-P10)	North of Bethesda Road	11+980	
HML (HML-P11)	North of Bethesda Road	12+840	
HML (HML-P12)	Bloomington Road Interchange	14+130	30M14-275
HML (HML-P13)	South of Vandorf Sideroad	15+828	30M14-274
HML (HML-P14)	North of Vandorf Sideroad	16+224	30M14-156
HML (HML-P15)	South of Aurora Road	17+625	31D-255
HML (HML-P16)	Aurora Road Interchange	18+543	
HML (HML-P17)	Mulock Drive Interchange	22+627	31D-259



Type (Designation)	Proposed Location	Station	GEOCREST Report(s)
HML (HML-P18)	Davis Drive Interchange	24+015	31D-262
HML (HML-P19)	Davis Drive Interchange	10+680	
HML (HML-P20)	Green Lane Interchange	11+323	31D-384

The assumed stratigraphic boundaries have been inferred from interpolation or extrapolation between boreholes and HML/OHS locations, therefore they may not represent exact transitions between soil layers and are only intended for preliminary design and planning purposes. The subsoil conditions at each conceptual or final HML/OHS location may differ from the stratigraphic profile considered herein.

The groundwater conditions are based on the information on the appended Record of Borehole Sheets and may not represent stabilized groundwater conditions at the exact location of each HML/OHS. Some of the measurements were taken over 35 years ago and groundwater conditions may have changed over time. Further, groundwater level is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during spring season.

4.2 Typical Stratigraphic Profiles

The stratigraphic information is presented below on a geographic site basis that combines the HML and OHS applications.

OHS-1 - Station ~ 14+240 (North of Highway 7)

Based on the subsurface information obtained during the geotechnical investigation for the Highway 404 and Highway 7 interchange (30M14-58), the subsoils at this site are generally expected to comprise of an up to about 5.8 m thick layer of compact to very dense sandy silt to silty sand underlain by a deposit of stiff to hard clayey silt till. The glacial till deposit extends to depths between about 11.1 m and 32.5 m. The then existing ground surface ranges from Elevation 191.7 m to 189.2 m across the borehole locations.



The groundwater level was noted to vary between ground surface (i.e. 0 m) and a depth of about 1 m below the then existing ground surface (corresponding to between about Elevation 191 m and 189 m) in open boreholes.

HML-P1 - Station 15+120 (North of Highway 7)

Based on the subsurface information obtained during the geotechnical investigations for the Beaver Creek Bridge at Highway 404 (30M14-53 and 30M14-420), the subsoils at this site are generally expected to consist of an about 6.2 m to 7.2 m thick layer of very loose to compact silty sand fill underlain by a deposit of stiff to hard clayey silt till. The cohesive till deposit extends to depths of about 10.8 m to 13.4 m and overlies a minimum 3.4 m thick deposit of very dense sandy silt till. The then existing ground surface ranges from about Elevation 190.3 m to 186.2 m across the borehole locations.

The groundwater level in the installed piezometers at Highway 404 and Beaver Creek was noted at depths ranging from 0.7 m to 5.2 m below the then existing ground surface (corresponding to between about Elevation 189 m and 185 m).

OHS-2 – Station ~ 15+735 (South of 16th Avenue)

Based on the subsurface information obtained during the geotechnical investigation for the Highway 404 overpass at 16th Avenue (30M14-54), the subsoils at this site are generally expected to consist of an up to about 3.0 m thick layer of loose to compact silty sand (possible fill) underlain by an intermittent layers of glacial till. The till is generally separated into an upper portion of stiff to hard clayey silt till and a lower portion of compact to very dense silt to silty sand. The cohesive portion of the till deposit extends to a depth of about 13.8 m. The then existing ground surface ranges from about Elevations 194.7 m to 194.2 m across the borehole locations.

The groundwater level was noted at depths ranging from 0.5 m to 0.8 m below the then existing ground surface (at about Elevation 194 m) in open boreholes.



HML-P2 - Station 17+030 (North of 16th Avenue) and OHS-3 - Station ~17+330 (South of Major MacKenzie Drive East)

Based on the subsurface information obtained during the geotechnical investigations for the Highway 404 bridge over the Rouge River (30M14-51 and 30M14-416), the subsoils at this site are generally expected to comprise of an up to about 8.7 m thick layer of firm to stiff clayey silt fill underlain by an up to about 9.2 m thick layer of dense to very dense sandy silt to silty sand which in turn overlies a deposit of stiff to hard cohesive till. The then existing ground surface ranges from Elevation 194.5 m to 193.7 m across the borehole locations drilled in 1971, the ground surface noted at Elevation 203.2 m and 202.9 m in the two (2) boreholes drilled in 2014.

The groundwater level was noted to be at about 1.2 m to 1.7 m below the original ground surface (Elevation 193 m to 192 m). In the two (2) boreholes advanced in 2014 from the Highway 404 embankment, the groundwater level was noted at a depth of about 10 m below the existing ground surface (corresponding to about Elevation 193 m to 192 m).

OHS-4 - Station ~ 17+710 (South of Major MacKenzie Drive East)

Based on the subsurface information obtained during the geotechnical investigation for the Major Mackenzie Drive East underpass at Highway 404 (30M14-50), the subsoils at this site are generally expected to comprise of an up to about 2.0 m thick layer of loose to dense granular fill underlain by a layer of firm to very stiff reworked materials (cohesive fill) which overlies a deposit of native clayey silt till. The clayey silt till deposit is hard in consistency and extends to at least 9.4 m depth. The then existing ground surface ranges from Elevation 214.0 m to 211.4 m across the borehole locations.

The groundwater level was noted at depths ranging from 1.5 m to 2.1 m below the then existing ground surface (corresponding to about Elevation 212 m and 210 m) in open boreholes.

HML-P3 - Station 20+773 and HML-P4 - Station 21+260 (North of Elgin Mills Road East)

Based on the subsurface information obtained during the geotechnical investigation for the Elgin Mills Road East underpass at Highway 404 (30M14-110), the subsoils at this site are generally expected to comprise of an approximately 3.0 m to 5.5 m thick layer of compact to very dense silty sand. A deposit of hard clayey silt till was contacted underlying the silty sand deposit.



The then existing ground surface ranges from Elevation 233.6 m to 232.3 m across the borehole locations.

The groundwater level was noted at depths ranging from about 1.7 m to 3.3 m below the then existing ground surface (corresponding to about Elevation 231 m and 230 m) in open boreholes.

HML-P5 - Station 22+383 (North of 19th Avenue)

Based on the subsurface information obtained during the geotechnical investigation for the 19th Avenue underpass at Highway 404 (30M14-111), the subsoils at this site are generally expected to comprise of an up to about 1.5 m thick layer of soft to firm reworked materials (fill) underlain by a deposit of very stiff to hard clayey silt till. The thickness of cohesive till layer varies between about 4.6 m and 7.9 m. A deposit of dense to very dense silty sand was encountered underlying the cohesive till deposit. The then existing ground surface ranges from Elevation 242.3 m to 241.8 m across the borehole locations.

The groundwater level was noted at depths ranging from about 0.3 m to 0.9 m below the then existing ground surface (corresponding to between about Elevation 241 m and 240 m) in open boreholes.

HML-P6 - Station 23+508 (South of Gormley Road), HML-P7 - Station 24+432 (Gormley Road Interchange) and HML-P8 - Station 10+535 (North of Gormley Road)

Based on the subsurface information obtained during the geotechnical investigations for the Gormley Avenue underpass at Highway 404 (30M14-112 and 30M14-115), the subsoils at this site are generally expected to comprise of an approximately 3.2 m to 4.4 m thick stratum of very stiff to hard cohesive till overlying an up to about 5.2 m thick layer of very dense silty sand to sand. The then existing ground surface ranges from Elevation 264.5 m to 261.3 m across the borehole locations.

In the boreholes advanced at the Gormley interchange, artesian groundwater conditions were noted in the underlying silty sand to sand deposit at depths ranging from 2.4 m to 10.0 below the then existing ground surface with measured groundwater between about 1.4 m above the then existing ground surface and 1.2 m below the then existing ground surface (corresponding to between about Elevation 266 m and 261 m).



HML-P9 - Station 11+233 (South of Bethesda Road), HML-P10 - Station 11+980 and HML-P11 – Station 12+840 (North of Bethesda Road)

Based on the subsurface information obtained during the geotechnical investigation for the Bethesda Sideroad underpass at Highway 404 (30M14-117), the subsoils at this site are generally expected to comprise of an approximately 15.2 m to 16.7 m thick deposit of very stiff to hard cohesive till. The till deposit in places has interlayers and pockets of silty sand. The then existing ground surface ranges from Elevation 289.6 m to 289.0 m across the borehole locations.

The groundwater level was noted at depths ranging from 4 m to 7 m below the then existing ground surface (corresponding to between about Elevation 285 m and 282 m) in open boreholes.

HML-P12 - Station 14+130 (Bloomington Road Interchange):

Based on the subsurface information obtained during the geotechnical investigation for the Highway 404 overpass at Bloomington Road (30M14-275), the subsoils are generally expected to consist of an up to about 3.0 m thick layer of fill underlain by an up to about 2.1 m thick deposit of very stiff to hard clayey silt. The clayey silt deposit is underlain by a deposit of generally compact to dense silt and sand to sand extending to at least 12.8 m depth. The then existing ground surface ranges from Elevation 312.0 m to 303.9 m across the borehole locations.

In the installed piezometer at the Highway 404 and Bloomington Road Interchange, the groundwater level was at 4.4 m below the then existing ground surface (corresponding to about Elevation 300 m).

HML-P13 - Station 15+828 (South of Vandorf Sideroad):

Based on the subsurface information obtained during the geotechnical investigation for the Highway 404 overpass at CNR (30M14-274), the subsoils at this site are generally expected to comprise of up to about 6.3 m thick fill layers overlying an up to about 7 m thick deposit of very loose to dense sand. The non-cohesive sand layer is underlain by an up to about 12 m thick deposit of firm to hard clayey silt which overlies a minimum 3.4 m thick deposit of very dense silty sand till. The then existing ground surface ranges from Elevation 315.2 m to 303.2 m across the borehole locations.



In the installed piezometers at the CNR overpass, the groundwater level ranged from 1.8 m to 11.8 m below the then existing ground surface (corresponding to between about Elevation 304 m and 302 m).

HML-P14 - Station 16+224 (North of Vandorf Sideroad):

Based on the subsurface information obtained during the geotechnical investigation for the Vandorf Sideroad underpass at Highway 404 (30M14-156), the subsoils at this site are generally expected to comprise of an up to about 2.7 m thick layer of granular fill with topsoil and other loosened materials immediately below the then existing ground surface. These layers are underlain by a stratum identified as intermittent layers of stiff to hard clayey silt and loose to compact silt of slight plasticity. The intermittent stratum was found to be at least 6.6 m thick and probably up to about 23.0 m thick. A minimum 1.5 m thick layer of hard clayey silt till was encountered underlying the intermittent stratum. The then existing ground surface ranges from Elevation 309.1 m to 303.0 m across the borehole locations.

The groundwater level was noted at depths ranging from 0.5 m to 7.3 m below the then existing ground surface (corresponding to about Elevation 302 m) in open boreholes.

HML-P15 - Station 17+625 (South of Aurora Road) and HML-P16 - Station 18+543 (Aurora Road Interchange):

Based on the subsurface information obtained during the geotechnical investigation for the Aurora Road underpass at Highway 404 (31D-255), the subsoils are generally expected to comprise of an up to about 4.2 m thick deposit of loose to compact silty sand which, in turn, is underlain by a deposit of stiff to hard clayey silt. The thickness of clayey silt deposit varies between about 6.4 m and 10.0 m, and is underlain by a deposit of hard clayey silt till which has a minimum thickness of 7.2 m. The then existing ground surface ranges from Elevation 303.3 m to 298.9 m across the borehole locations.

The groundwater level was noted at depths ranging from 0.2 m to 4.6 m below the then existing ground surface (corresponding to between about Elevation 300 m and 297 m) in open boreholes.



HML-P17 - Station 22+627 (Mulock Drive Interchange):

Based on the subsurface information obtained during the geotechnical investigation for the Mulock Drive underpass at Highway 404 (31D-259), the subsoils are generally expected to consist of an up to about 2.9 m thick deposit of compact silt underlain by a deposit of very stiff to hard clayey silt. The thickness of clayey silt deposit varies between about 10.4 m and 11.9 m, and is underlain by a deposit of hard (very dense) till extending to a depth of about 21.8 m below the then existing ground surface. The then existing ground surface ranges from Elevation 275.2 m to 271.0 m across the borehole locations.

The groundwater level was noted at depths ranging from 1 m to 3 m below the then existing ground surface (corresponding to between about Elevation 273 m and 270 m) in open boreholes.

HML-P18 - Station 24+015 and HML-P19 –Station 10+680 (Davis Drive Interchange):

Based on the subsurface information obtained during the geotechnical investigation for the Davis Drive underpass at Highway 404 (31D-262), the subsoils at this site are generally expected to consist of an about 5.8 to 10.0 m thick deposit of stiff to hard clayey silt which overlies a deposit of very stiff to hard cohesive till extending to a depth of about 15.7 m. The then existing ground surface ranges from Elevation 289.3 m to 286.6 m across the borehole locations.

In the boreholes advanced at the Davis Drive underpass, the groundwater level was not encountered.

HML-P20 - Station 11+323 (Green Lane Interchange):

Based on the subsurface information obtained during the geotechnical investigation for the Highway 404 overpass structure at Green Lane (31D-384), the subsoils at this site are generally expected to consist of an up to about 2.2 m thick deposit of loose to dense sandy silt to silty sand underlain by a deposit of very stiff to hard clayey silt glacial till. The glacial till deposit extends to termination depths of boreholes between about 4.9 to 18.6 m below the then existing ground surface. The then existing ground surface ranges from about Elevation 295.4 m to 291.5 m across the borehole locations.

The groundwater level measured in installed piezometers at the Green Lane overpass ranges from about 3.0 m to 10.7 m below the then existing ground surface (corresponding to between about Elevation 291 m and 282 m).



5. CLOSURE

This preliminary Foundation Investigation Report was prepared by Mr. A. Varshoi, MEng, P.Eng., and reviewed by Mr. R. Ng, MBA, Ph.D., P.Eng, Senior Engineer. The report was independently reviewed by Mr. C. M. P. Nascimento, P.Eng., MTO Designated Principal Contact.

Yours very truly

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MTO Designated Principal Contact

AV/RN/CN:jk

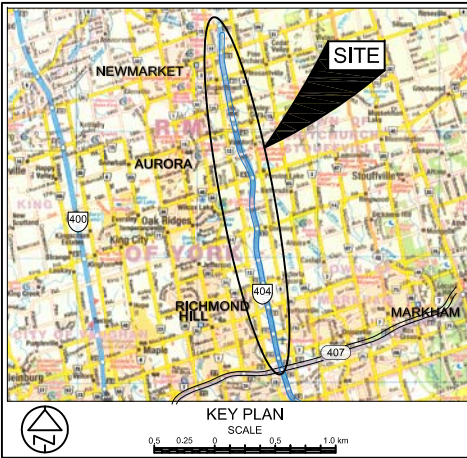
CONT No
WO No 03-20024

HIGHWAY 404 HOV LANE EXPANSION
FROM HWY 407 TO GREEN LANE
BOREHOLE LOCATIONS



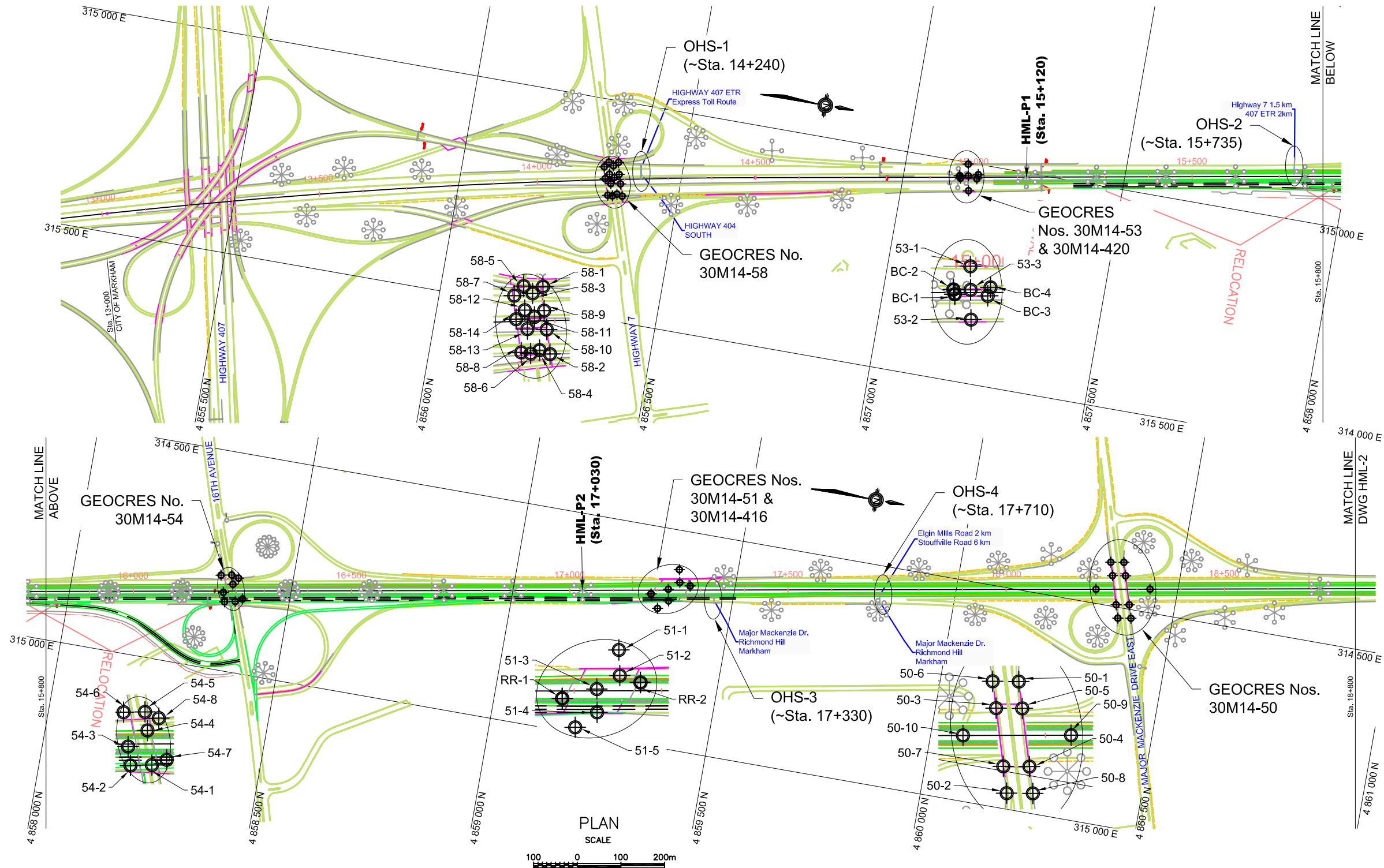
SHEET

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CONSULTING ENGINEERS



LEGEND			
Geocres Borehole			
BH No	ELEVATION	NORTHINGS	EASTINGS
58-1	190.4	4 856 352.1	315 139.0
58-2	191.7	4 856 373.4	315 213.7
58-3	190.6	4 856 341.7	315 148.8
58-4	191.2	4 856 360.9	315 211.4
58-5	189.3	4 856 330.2	315 142.3
58-6	190.9	4 856 351.5	315 217.0
58-7	189.2	4 856 321.5	315 154.9
58-8	190.1	4 856 340.7	315 217.6
58-9	191.0	4 856 358.2	315 165.9
58-10	191.1	4 856 364.9	315 186.8
58-11	191.1	4 856 348.5	315 175.0
58-12	189.6	4 856 336.3	315 169.2
58-13	190.0	4 856 343.0	315 190.0
58-14	189.5	4 856 328.2	315 181.2
53-1	186.4	4 857 141.6	315 003.8
53-2	186.2	4 857 146.5	315 030.3
53-3	188.7	4 857 152.9	315 063.8
BC-1	190.0	4 857 129.6	315 038.3
BC-2	190.3	4 857 127.1	315 033.3
BC-3	190.0	4 857 167.0	315 033.6
BC-4	190.0	4 857 168.5	315 023.5
54-1	194.7	4 858 377.7	314 838.2
54-2	194.3	4 858 353.6	314 842.9
54-3	194.2	4 858 347.2	314 822.0
54-4	194.0	4 858 365.8	314 800.1
54-5	194.0	4 858 359.4	314 779.6
54-6	194.2	4 858 335.3	314 784.2
54-7	194.2	4 858 393.2	314 829.3
54-8	194.2	4 858 376.2	314 783.6

REVISIONS			
DATE	BY	DESCRIPTION	
Geocres No. 30M14-423			
HWY No	404	DIST	CENTRAL
SUBM'D	NA	CHECKED	AV
DATE	Aug. 21, 2015	SITE	
DRAWN	NA	CHECKED	RN
APPROVED	CN	DWG	HML-1



(Legend Continued)

BH No	ELEVATION	NORTHINGS	EASTINGS
50-3	213.4	4 860 347.0	314 430.6
50-4	211.8	4 860 396.3	314 489.8
50-5	213.4	4 860 376.6	314 425.6
50-6	214.0	4 860 337.9	314 400.9
50-7	211.8	4 860 366.7	314 494.8
50-8	211.4	4 860 405.5	314 519.4
50-9	211.7	4 860 437.0	314 446.2
50-10	212.4	4 860 315.1	314 467.9

(Legend Continued)

BH No	ELEVATION	NORTHINGS	EASTINGS
51-1	194.5	4 859 367.3	314 589.5
51-2	194.5	4 859 373.4	314 618.2
51-3	194.4	4 859 350.2	314 638.0
51-4	193.7	4 859 355.1	314 664.2
51-5	194.2	4 859 333.4	314 685.5
RR-1	202.9	4 859 313.0	314 655.4
RR-2	203.2	4 859 398.1	314 621.9
50-1	213.7	4 860 367.4	314 396.0
50-2	211.4	4 860 375.9	314 524.4

(Legend Continues)



REF No. MMM Drawings: Alternative 2 High Mast Ltg.dwg; and
3214004 Hwy 404 Existing and Proposed Overhead Sign.dwg;

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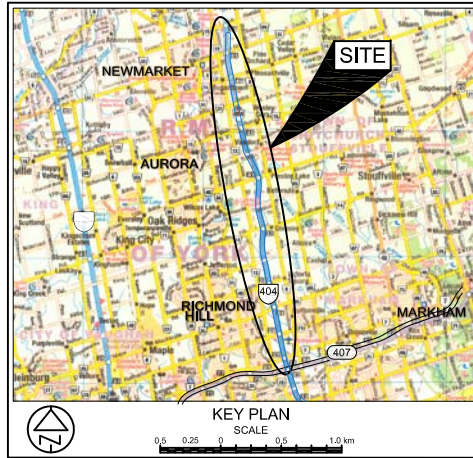
CONT No
WO No 03-20024

HIGHWAY 404 HOV LANE EXPANSION
FROM HWY 407 TO GREEN LANE
BOREHOLE LOCATIONS



SHEET

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS



LEGEND

Geocres Borehole

BH No	ELEVATION	NORTHINGS	EASTINGS
110-1	232.3	4 862 356.2	314 051.2
110-2	233.2	4 862 385.2	314 115.9
110-3	232.7	4 862 368.1	314 062.2
110-4	233.2	4 862 373.6	314 104.6
110-5	233.2	4 862 381.2	314 103.1
110-6	232.6	4 862 364.4	314 049.4
110-7	232.6	4 862 360.8	314 063.4
110-8	233.3	4 862 377.2	314 117.4
110-9	233.1	4 862 389.8	314 127.4
110-10	232.3	4 862 368.7	314 094.5
110-11	233.1	4 862 382.4	314 093.0
110-12	233.6	4 862 377.2	314 129.3
111-1	241.9	4 864 397.5	313 768.7
111-2	242.0	4 864 383.8	313 771.4
111-3	242.3	4 864 385.4	313 735.2
111-3A	241.9	4 864 392.1	313 734.2
111-4	241.8	4 864 372.6	313 737.3
111-5	242.2	4 864 378.3	313 700.7
111-6	242.3	4 864 362.8	313 703.8
112-1	262.2	4 866 645.7	313 691.9
112-2	261.3	4 866 597.9	313 697.1
112-3	263.1	4 866 639.7	313 654.1
112-4	261.9	4 866 579.9	313 660.5
112-5	263.9	4 866 622.0	313 617.5
112-6	263.5	4 866 576.3	313 623.3

(Legend Continues)

REVISIONS	DATE	BY	DESCRIPTION

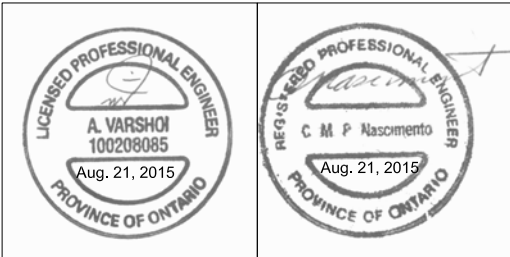
Geocres No. 30M14-423

HWY No	69	DIST	CENTRAL
SUBM'D	NA	CHECKED	AV
DRAWN	NA	CHECKED	RN
DATE	Aug. 21, 2015	APPROVED	CN
SITE		DWG	HML-2



(Legend Continued)

BH No	ELEVATION	NORTHINGS	EASTINGS
115-7	264.5	4 866 671.4	313 595.3
115-8	262.3	4 866 717.7	313 692.8
115-21	264.1	4 866 667.4	313 611.7
115-22	264.2	4 866 700.9	313 607.8
115-23	263.4	4 866 705.5	313 646.2
115-24	263.3	4 866 671.7	313 649.5
115-25	262.6	4 866 709.1	313 684.3
115-26	262.6	4 866 675.9	313 687.9



REF No. MMM Drawings: Alternative 2 High Mast Ltg.dwg; and
3214004 Hwy 404 Existing and Proposed Overhead Sign.dwg;

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CONT No
WO No 03-20024

HIGHWAY 404 HOV LANE EXPANSION
FROM HWY 407 TO GREEN LANE
BOREHOLE LOCATIONS



SHEET

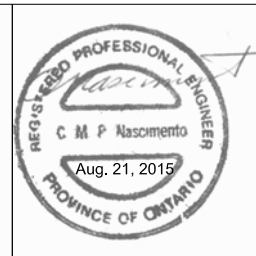
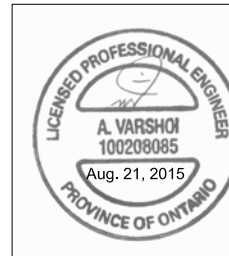


LEGEND			
	Geocres Borehole		
BH No	ELEVATION	NORTHINGS	EASTINGS
117-1	289.3	4 868 690.7	313 357.2
117-2	289.3	4 868 667.2	313 357.2
117-3	289.6	4 868 702.9	313 388.9
117-4	289.0	4 868 677.0	313 358.9
117-5	289.0	4 868 710.5	313 421.2
117-6	289.0	4 868 686.7	313 420.3
275-78-1	308.8	4 870 836.8	313 360.0
275-78-2	309.9	4 870 845.6	313 388.3
275-78-3	312.0	4 870 856.3	313 420.6
275-78-4	306.6	4 870 867.3	313 354.8
275-78-5	310.3	4 870 879.2	313 389.9
275-78-6	310.1	4 870 886.8	313 414.2
275-99-1	303.9	4 870 849.8	313 388.7
275-99-2	303.9	4 870 875.4	313 385.8
275-99-3	310.1	4 870 832.1	313 394.3
275-99-4	310.1	4 870 894.6	313 381.5
274-99-5	307.0	4 872 222.5	313 157.6
274-1	303.6	4 872 458.3	313 153.3
274-3	304.4	4 872 494.3	313 178.6
274-4	303.4	4 872 526.0	313 184.1
274-8	303.2	4 872 494.9	313 134.7
274-9	303.4	4 872 568.1	313 180.7
274-10	303.7	4 872 444.9	313 145.4
274-14	303.7	4 872 431.5	313 154.5
274-16	304.2	4 872 469.0	313 178.0
274-17	304.9	4 872 457.1	313 235.3
274-19	307.7	4 872 373.6	313 149.6

(Legend Continues)

(Legend Continued)

BH No	ELEVATION	NORTHINGS	EASTINGS
274-20	305.8	4 872 412.6	313 178.9
274-21	305.8	4 872 606.4	313 173.4
274-22	303.6	4 872 567.4	313 165.8
274-23	303.6	4 872 541.8	313 130.7
274-114	306.4	4 872 404.6	313 142.0
274-117	308.9	4 872 394.3	313 142.9
274-230	315.2	4 872 380.0	313 159.9



REF No. MMM Drawings: Alternative 2 High Mast Ltg.dwg; and
3214004 Hwy 404 Existing and Proposed Overhead Sign.dwg;

REVISIONS	DATE	BY	DESCRIPTION

Geocres No. 30M14-423

HWY No	404	CHECKED AV	DATE Aug. 21, 2015	DIST CENTRAL
SUBM'D NA		CHECKED RN		SITE --
DRAWN NA		APPROVED CN		DWG HML-3



NOTES:

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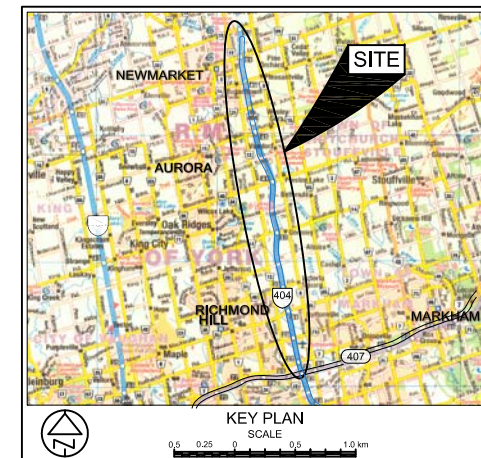
CONT No
WO No 03-20024

HIGHWAY 404 HOV LANE EXPANSION
FROM HWY 407 TO GREEN LANE
BOREHOLE LOCATIONS



SHEET

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS



LEGEND

Geocres Borehole			
BH No	ELEVATION	NORTHINGS	EASTINGS
156-1	303.4	4 872 948.8	313 117.4
156-2	303.0	4 872 936.6	313 120.4
156-3	304.2	4 872 939.0	313 086.3
156-4	305.6	4 872 926.8	313 088.4
156-5	305.5	4 872 929.0	313 055.2
156-6	309.1	4 872 915.2	313 060.4
156-7	303.3	4 872 947.3	313 132.0
255-1	299.6	4 874 864.5	312 238.7
255-2	300.5	4 874 838.6	312 244.1
255-3	301.4	4 874 871.8	312 275.8
255-4	301.2	4 874 851.4	312 279.2
255-5	303.3	4 874 885.8	312 310.0
255-6	302.1	4 874 859.2	312 315.8
255-7	298.9	4 874 830.9	312 219.4



REF No. MMM Drawings: Alternative 2 High Mast Ltg.dwg; and
3214004 Hwy 404 Existing and Proposed Overhead Sign.dwg;

REVISIONS		
DATE	BY	DESCRIPTION

Geocres No. 30M14-423

HWY No	404	DIST	CENTRAL
SUBM'D	NA	CHECKED	AV
DATE	Aug. 21, 2015	SITE	—
DRAWN	NA	CHECKED	RN
APPROVED	CN	DWG	HML-4

CONT No
WO No 03-20024

HIGHWAY 404 HOV LANE EXPANSION
FROM HWY 407 TO GREEN LANE
BOREHOLE LOCATIONS



SHEET

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS



KEY PLAN
SCALE
0.5 0.25 0.5 1.0 km

LEGEND

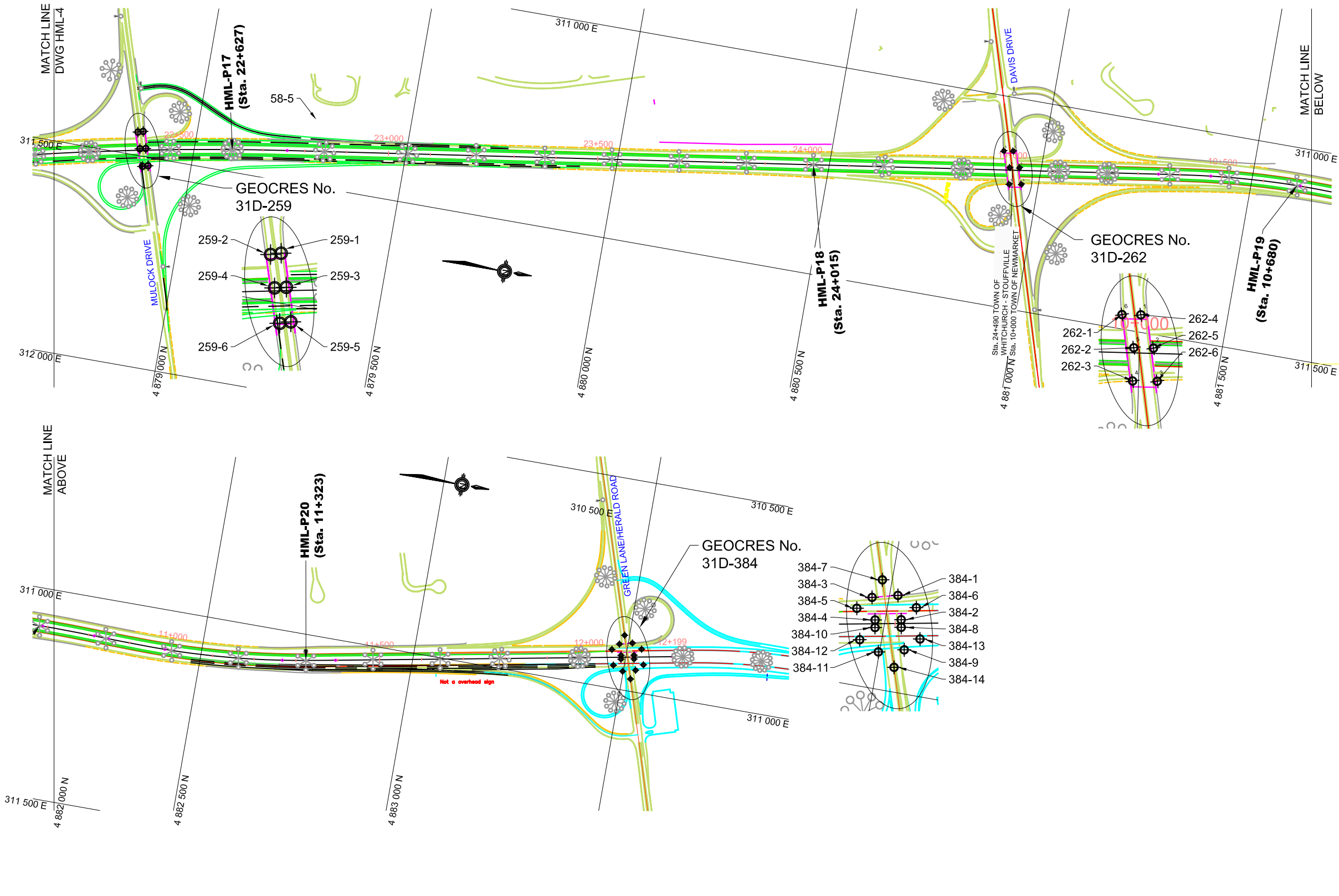
Geocres Borehole

BH No	ELEVATION	NORTHINGS	EASTINGS
259-1	271.0	4 878 872.9	311 441.0
259-2	271.4	4 878 860.7	311 444.7
259-3	273.4	4 878 886.0	311 480.0
259-4	273.0	4 878 872.3	311 483.1
259-5	275.1	4 878 898.5	311 519.7
259-6	275.2	4 878 885.7	311 523.6
262-1	286.6	4 880 904.7	311 130.1
262-2	289.3	4 880 925.4	311 116.7
262-3	287.7	4 880 930.9	311 206.0
262-4	287.7	4 880 926.9	311 126.5
262-5	286.6	4 880 948.6	311 163.1
262-6	289.0	4 880 959.9	311 201.2
384-1	293.0	4 882 988.4	310 870.3
384-2	294.7	4 882 979.9	310 893.0
384-3	295.4	4 882 964.3	310 908.9
384-4	294.4	4 882 988.1	310 918.9
384-5	294.4	4 882 989.6	310 927.8
384-6	295.3	4 882 974.2	310 945.3
384-7	294.6	4 882 998.6	310 955.8
384-8	292.2	4 883 009.9	310 885.3
384-9	291.5	4 883 034.1	310 895.9
384-10	292.8	4 883 018.8	310 913.2
384-11	293.1	4 883 020.4	310 922.2
384-12	292.1	4 883 044.8	310 932.0
384-13	293.5	4 883 028.6	310 948.0
384-14	294.6	4 883 020.2	310 970.7

REVISIONS	DATE	BY	DESCRIPTION

Geocres No. 30M14-423

HWY No	404	DIST	CENTRAL
SUBM'D	NA	CHECKED	AV
DATE	Aug. 21, 2015	SITE	—
DRAWN	NA	CHECKED	RN
APPROVED	CN	DWG	HML-5



PLAN

SCALE



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REF No. MMM Drawings: Alternative 2 High Mast Ltg.dwg; and
3214004 Hwy 404 Existing and Proposed Overhead Sign.dwg;



APPENDIX A

Record of Borehole Sheets from GEOCRETS Database Foundation Reports

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 475 J 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.

COMPOSITION: SECONDARY SOIL COMPONENTS ARE DESCRIBED ON THE BASIS OF PERCENTAGE BY MASS OF THE WHOLE SAMPLE AS FOLLOWS:

PERCENT BY MASS	0 - 10	10 - 20	20 - 30	30 - 40	> 40
	TRACE	SOME	WITH	ADJECTIVE (SILTY)	AND (AND SILT)

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 (R Q D), FOR MODIFIED RECOVERY, IS:

R Q D (%)	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

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE
F V	FIELD VANE		

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
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'_{v0}	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_i	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

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

GEOCRES No. 30M14-58

Boreholes 58-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-1

WP 160-74-15 LOCATION Co-ords. 932,198 N; 033,786 E. ORIGINATED BY DM
 DIST 6 HWY 404 BORING DATE March 13, April 2, 1970 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger, Washboring NX & BX Casing & Cone Test CHECKED BY B

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ PCF	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		20	40	60	80	100	w_p	w	w_L		
624.6	Ground Level															
0.0	Clayey silt with some sand & gravel		1	SS	32	620										
616.1	Hard. Brown		2	SS	51											
8.5	Sandy silt with some gravel		3	SS	27											
			4	SS	39											
	Compact to dense		5	SS	30	610										
605.6			6	SS	22											
19.0	Clayey silt with some sand & gravel		7	SS	13	600										
	(Glacial Till)		8	TW	PM											
	Stiff to hard		9	TW	PM	590										
			10	SS	15											
	Grey		11	SS	134	580										
			12	SS	243	570										
563.1			13	SS	140/4"											
61.5	End of Borehole															

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-2

WP 160-74-15

LOCATION Co-ords. 932,312 N; 034,150 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 6, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, NX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
629.1	Ground Level															
0.0	Sandy silt with some clay		1	SS	35											2 42 (56)
			2	SS	80											
	Dense to very dense		3	SS	72	620										5 42 42 11
617.6			4	SS	57											
11.5	Silty clay to clayey silt, some gravel.		5	SS	110											
	Hard (Glacial Till)															
609.1	Grey		6	SS	132	610										
20.0	Clayey silt with sand and gravel		7	SS	142											
	(Glacial Till)															
	Hard		8	SS	162	600										30 15 31 24
	Grey															
592.6			9	SS	100	4"										
36.5	End of Borehole															

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-3

W.P. 160-74-15

LOCATION Co-ords. 932,173 N; 033,852 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 9-10, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

 CHECKED BY *LD*

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES	20	40	60	80	100	w_p	w	w_L		
625.3	Ground Level														
0.0	Clayey silt, traces of gravel with layers or pockets of silt/sandy silt (Glacial Till)		1	SS	28										
			2	SS	39										0 3 87 10
			3	SS	29										0 36 (64)
			4	SS	165										
			5	SS	26										
			6	SS	52										
	Very stiff to hard		7	SS	37										
	Brown becoming grey		8	SS	27										
			9	SS	60										
			10	SS	101										
578.8			11	SS	135										
46.5	End of Borehole														

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-4

WP 160-74-15

LOCATION Co-ords. 932,247 N; 034,091 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 6-7, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, NX Casing

CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES	20	40	60	80	100	w_p	w	w_L		
627.4	Ground Level				N										
0.0	Sandy silt to silty sand, some clay and gravel		1	SS	20										
			2	SS	35	620									
			3	SS	38										
612.9	Compact to very dense		4	SS	100	4"									
14.5	Clayey silt with some sand & gravel		5	SS	41	610									
	(Glacial Till)		6	SS	150	9"									
	Hard Grey		6A	SS	121	600									
			7	SS	123										
590.9			8	SS	140										
36.5	End of Borehole														

ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-5

WP 160-74-15

LOCATION Co-ords. 932,053 N; 023,832 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 10-13, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

CHECKED BY *LB*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
621.0	Ground Level															
0.0																
			1	SS	22	620										
			2	SS	25											
			3	SS	18	610										0 57 (43)
			4	SS	14											5 40 40 15
			5	SS	16											
			6	SS	22	600										5 33 41 21
			7	SS	32											
			8	SS	36	590										
			9	SS	85											
			10	SS	120	580										
			11	SS	114											
569.5			12	SS	132	570										
51.5	End of Borehole															

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-6

WP 160-74-15

LOCATION Co-ords. 932,161 N; 034,182 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 20, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

 CHECKED BY *LB*

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES	20	40	60	80	100	w_p	w	w_L	
626.4	Ground Level													
0.0			1	SS	33									
			2	SS	30									
			3	SS	36									0 30 (70)
			4	SS	78									17 38 37 8
			5	SS	57									
			6	SS	110	3"								
			7	SS	128									17 38 25 20
			8	SS	137									
589.9			9	SS	140	8"590								
36.5	End of Borehole													

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-7

WP 160-74-15

LOCATION Co-ords. 932,016 N; 033,881 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 10-14, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
620.8	Ground Level															
0.0	Sandy silt traces of clay		1	SS	26	620										
	Dense Brown		2	SS	39											
611.8			3	SS	40											
9.0	Clayey silt with some sand and traces of gravel, Pockets or layers of silt/silty sand (Glacial Till) Very stiff to hard.		4	SS	36	610										0 10 86 4
			5	SS	26											
			6	SS	31	600										5 33 42 20
			7	SS	33											
			8	SS	32	590										
			9	SS	53											
			10	SS	55	580										3 31 40 26
	Grey		11	SS	22											
571.8			12	SS	44	570										
49.0	Silty sand to sand with some clay and gravel. Compact to very dense.		13	SS	14											
			14	SS	31	560										4 88 (8)
			15	SS	135											
			16	SS	138	550										14 42 27 D
544.3			17	SS	128											0 90 (10)
76.5	End of Borehole															

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-8

WP 160-74-15

LOCATION Co-ords. 932,091 N; 034,120 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 16-17, 1970

COMPILED BY ARB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES	20	40	60	80	100	w_p	w	w_L		
623.7	Ground Level														
0.0	Clayey silt with sand & traces of gravel pockets of sandy silt (Glacial Till) Stiff to hard.		1	SS	19										
			2	SS	35										
			3	SS	20										
			4	SS	8										
			5	SS	14										
			6	SS	160										
			7	SS	102										
			8	SS	146										
			9	SS	173										
592.2			10	SS	137										
41.5	End of Borehole														

20
15 ϕ 5 % STRAIN AT FAILURE
10

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-9

WP 160-74-15

LOCATION Co-ords. 932,236 N; 033,906 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 9-10, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L	
626.8	Ground Level					ELEV									GR SA SI CL
0.0	Silty clay		1	SS	26										
620.8	Very Stiff Brown		2	SS	30	620									
6.0	Sandy silt to silty sand with some gravel.		3	SS	44										
611.8	Dense		4	SS	33										
15.0	Clayey silt with some sand and gravel		5	SS	79	610									
			6	SS	82										
			7	SS	58	600									
	Hard (Glacial Till) Gray		8	SS	126										
			9	SS	129	590									
585.3			10	SS	137										
41.5	End of Borehole														

20
15 5 % STRAIN AT FAILURE
10

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 58-10

WP 160-74-15 LOCATION Co-ords. 932,274 N; 034,026 E. ORIGINATED BY DM
 DIST 6 HWY 404 BORING DATE April 8-9, 1970 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Washboring, BX Casing CHECKED BY [Signature]

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES	20	40	60	80	100	w_p	w	w_L		
627.0	Ground Level														
0.0	Sandy silt with some clay and gravel.		1	SS	20										5 28 5' 16
			2	SS	24										19 21 56 4
			3	SS	48										
			4	SS	48										
610.0	Compact to dense		5	SS	39										5 39 41 15
17.0	Clayey silt with some sand.		6	SS	152										
			7	SS	130										
	Hard (Glacial Till) Grey		8	SS	137										
			9	SS	138										
585.5			10	SS	135										1 7 56 36
41.5	End of Borehole														

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-11

WP 160-74-15

LOCATION Co-ords. 932,211 N; 033,972 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 7-8, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
627.0	Ground Level															
0.0	Sandy silt with some clay and gravel		1	SS	16											
			2	SS	18	620										
	Compact to very dense		3	SS	59											14 34 42 10
			4	SS	118											
611.5			5	SS	51	610										5 45 41 9
15.5			6	SS	45											
	Clayey silt with some sand and traces of gravel.		7	SS	48	600										
	(Glacial Till)		8	SS	77											5 47 32 16
	Hard		9	SS	26	590										
	Grey		10	SS	55											
			11	SS	133	580										7 58 (35)
			12	SS	106											
			13	SS	102	570										
565.5			14	SS	104											
61.5	End of Borehole															

20
15 ϕ 5 % STRAIN AT FAILURE
10

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-12

WP 160-74-15

LOCATION Co-ords. 932,085 N; 033,938 E.

ORIGINATED BY EM

DIST 6 HWY 404

BORING DATE April 14-17, 1970

COMPILED BY AXB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

CHECKED BY *do*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
622.1	Ground Level															
0.0	Clayey silt with some sand and traces of gravel, with Pockets of silty sand. (Glacial Till) Very stiff to hard.		1	SS	27	620										3 26 43 28
			2	SS	46											
			3	SS	22											0 93 (7)
			4	SS	26	610										
			5	SS	28											
			6	SS	47											4 35 38 23
			7	SS	50	600										
			8	SS	32											
			9	SS	34	590										
			10	SS	34											
			11	SS	15	580										
			12	TS	PM											
			13	SS	23	570										140
			14	SS	51											
556.6	Silty clay, traces of sand. Hard Grey		15	SS	54	560										
65.5			15A	SS	61	550										
			16	SS	39											
			17	SS	43	540										
			18	SS	51											
529.1	Sandy silt Very Dense Grey		19	SS	67	530										
93.0			20	SS	130											
			21	SS	160	520										0 36 (64)
515.6			22	SS	165											
106.5	End of Borehole															

20
15 ϕ 5 % STRAIN AT FAILURE
10

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58-14

WP 160-74-15

LOCATION Co-ords. 932,053 N; 034,000 E.

ORIGINATED BY DM

DIST 6 HWY 404

BORING DATE April 15, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES	20	40	60	80	100	w_p	w	w_L		
621.7	Ground Level														
0.0															
			1	SS	13						10-1				0 16 (84)
			2	SS	18						o				
			3	SS	19						o				
			4	SS	47						o				8 45 35 12
			5	SS	86						o				
			6	SS	50						o				
	Clayey silt with some sand & traces of gravel		7	SS	30						o				3 41 27 29
	Pockets of sandy silt to silty sand		8	SS	25						10-1				
	Stiff to hard		9	SS	22						o				
	(Glacial Till)		10	SS	14						10-1				
	Brown becoming grey		11	SS	24						o				
			12	SS	51						10-1				
			13	SS	86						10-1				0 1 49 50
			14	SS	55						o				
			15	SS	110						10-1				0 1 61 38
			16	SS	129						o				
			17	SS	124						10-1				
540.2			18	SS	117						o				
81.5	End of Borehole														

20
15 0.5 % STRAIN AT FAILURE
10

GEOCRES No. 30M14-53

Boreholes 53-1, 2 and 3

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 53-1

WP 160-74-24 LOCATION Co-ords. N 15 934 778; E 1 033 423 ORIGINATED BY C.T.J.
 DIST 6 HWY 404 BORING DATE February 7 & 8, 1977 COMPILED BY C.T.J.
 DATUM Geodetic BOREHOLE TYPE 3 1/2" H.S.A. and Wash Boring with Penetration TEST CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		20	40	60	80	100	w_p	w	w_L		
611.4	Ground Level															
0.0	Topsoil					610										
2.0	Silty Sand some clay and organic inclusions		1	SS	3										Organic	
603.5	Gravel		2	SS	27.15"										6.12	0 52 38 10
7.9	Silt traces of sand		3	SS	13											3 10 77 10
601.4	and gravel loose		4	SS	9											6 35 46 13
10.0	Glacial Till		5	SS	15	600										
	Heterogeneous Mixture of Clayey Silt and Sand, traces of Gravel		6	SS	36											
	Stiff to Hard		7	SS	28											
	Silt trace of sand		8	SS	21											4 34 36 26
	Grey		9	SS	46	590										
586.2			10	SS	76											
25.2	End of Borehole		11	SS	100 84"											

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 53-2

W.P. 160-74-24 LOCATION Co-ords N 15 934 794; E 1 033 510 ORIGINATED BY C.T.J.
 DIST 6 HWY 404 BORING DATE February 8 and 9, 1977 COMPILED BY C.T.J.
 DATUM Geodetic BOREHOLE TYPE Solid Stem Auger & Boring with Penetration Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100		
611.0	Ground Level												
0.0	Topsoil					610							
2.0	Silty sand some Clay & organic inclusions		1	SS	2								
605.1	Gravel		2	SS	10								
5.9	Silt trace of sand and gravel loose		3	SS	4								
598.5	Grey		4	SS	10	600							1 0 94 5
12.5	Glacial Till Heterogenous Mixture of Clayey Silt and sand. Traces of Gravel Very stiff to hard Silt, trace of Sand		5	SS	28								3 37 31 29
			6	SS	32								
			7	SS	59	590							1 8 81 10
585.4	Grey		8	SS	150/114"								
25.6	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 53-3

WP 160-74-24 LOCATION Co-ords N 15 934 815; E 1 033 620 ORIGINATED BY C.T.J.
 DIST 6 HWY 404 BORING DATE February 9 & 10, 1977 COMPILED BY C.T.J.
 DATUM Geodetic BOREHOLE TYPE 3 1/2" Hollow Stem Auger with Dynamic Penetration CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
619.2	Ground Level															
0.0	topsoil															
1.0	Traces of Clay		1	SS	10											
			2	SS	18											
			3	SS	24											
	Brown		4	SS	24											
	Gray		5	SS	21											
	Silty fine Sand		6	SS	10											
	to Silt		7	SS	13											
	compact		8	SS	11											
594.7			9	SS	61/8"											
24.5			10	SS	24											
	Glacial Clayey Silt		11	SS	115											
	Till very stiff															
	Gray															
	Heterogeneous Mix.															
	of Clayey Silt and															
	Sand, traces of Gravel															
	Hard															
577.9	Gray		12	SS	142/9"											
41.3	End of Borehole															

20
15 ϕ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

GEOCRES No. 30M14-420

Boreholes BC-1, 2, 3 and 4

RECORD OF BOREHOLE No BC-1

1 of 2

METRIC

G.W.P. 03-20024 LOCATION Coords: 4 857 129.6 N; 315 038.3 E ORIGINATED BY F.P.
 DIST Central HWY 404 BOREHOLE TYPE C.F.S.S.A. and Mud Rotary COMPILED BY N.R.
 DATUM Geodetic DATE September 14-17, 2014 CHECKED BY D.D.

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/m³	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	● QUICK TRIAXIAL	× LAB VANE							
190.0 0.0	Ground Surface						20	40	60	80	100		20	40	60			
183.8 6.2	Silty sand occasional gravelly zones Compact		1	SS	23													
			2	SS	13													
	Clayey silt, with sand		3	SS	16													
	Very stiff Moist																	
	(FILL)		4	SS	17													
	Silty sand		5	SS	33													
	Compact																	
179.2 10.8	Clayey silt with sand, trace gravel Stiff to very stiff		9	SS	13													
	(TILL)																	
			10	SS	9													
			11	SS	16													
	Sandy silt trace clay, trace gravel occasional cobbles Dense to very dense		12	SS	40													
	(TILL)																	
			13	SS	50/5cm													
			14	SS	100/10cm													




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RECORD OF BOREHOLE No BC-1

2 of 2

METRIC

G.W.P. 03-20024 **LOCATION** Coords: 4 857 129.6 N; 315 038.3 E **ORIGINATED BY** F.P.
DIST Central **HWY** 404 **BOREHOLE TYPE** C.F.S.S.A. and Mud Rotary **COMPILED BY** N.R.
DATUM Geodetic **DATE** September 14-17, 2014 **CHECKED BY** D.D.

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									
175.0							20	40	60	80	100						
174.4	Sandy silt trace clay, trace gravel occasional cobbles		15	SS	117/23cm												
15.6	Dense to very dense (TILL) (Cont'd.)																
	End of borehole																
	* 2014 09 14 to 17																
	∇ Water level observed during drilling																
	■ Penetrometer																
	<u>Water Level Readings:</u>																
	Date Depth (m) Elev.																
	Sept.17/2014 2.0 188.0																
	Dec.18/2014 0.7 189.3																
	<u>Piezometer Legend:</u>																
	 Bentonite																
	 Filter sand																
	 Screen																

RECORD OF BOREHOLE No BC-2

1 of 2

METRIC

G.W.P. 03-20024 LOCATION Coords: 4 857 127.1 N; 315 033.3 E ORIGINATED BY F.P.
 DIST Central HWY 404 BOREHOLE TYPE C.F.S.S.A. and Mud Rotary COMPILED BY N.R.
 DATUM Geodetic DATE September 17-19, 2014 CHECKED BY D.D.

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/m³	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	● QUICK TRIAXIAL	× LAB VANE							
190.3	Ground Surface						20	40	60	80	100	20	40	60				
0.0	Silty sand occasional gravelly zones Compact		1	SS	13													
			2	SS	25													
			3	SS	19													
	Clayey silt, with sand		4	SS	15													
	Firm to very stiff		5	SS	35													
			6	SS	31													
			7	SS	6													
	Silty sand occasional silt zones		8	SS	3													
	Very loose to compact		9	SS	22													
	(FILL)																	
183.1																		
7.2	Clayey silt with sand, trace gravel		10	SS	14													
	Stiff to hard																	
	(TILL)																	
			11	SS	27													
			12	SS	50/8cm													
			13	SS	81													
176.9																		
13.4	Sandy silt trace clay, trace gravel occasional cobbles		14	SS	50/8cm													
	Very dense																	
	(TILL)																	






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RECORD OF BOREHOLE No BC-2

2 of 2

METRIC

G.W.P. 03-20024 LOCATION Coords: 4 857 127.1 N; 315 033.3 E ORIGINATED BY F.P.
 DIST Central HWY 404 BOREHOLE TYPE C.F.S.S.A. and Mud Rotary COMPILED BY N.R.
 DATUM Geodetic DATE September 17-19, 2014 CHECKED BY D.D.

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 ● QUICK TRIAXIAL × LAB VANE											
						20 40 60 80 100											
175.3	Sandy silt trace clay, trace gravel occasional cobbles Very dense (Cont'd.) (TILL)		15	SS	74/8cm												
173.3																	
17.0	End of borehole																
	* 2014 09 17 to 19  Water level observed during drilling <u>Water Level Readings:</u> Date Depth Elev. (m) Dec.18/2014 5.2 185.9 <u>Piezometer Legend:</u>  Bentonite  Filter sand  Screen																

RECORD OF BOREHOLE No BC-3

1 of 2

METRIC

G.W.P. 03-20024 LOCATION Coords: 4 857 167.0 N; 315 033.6 E ORIGINATED BY F.P.
 DIST Central HWY 404 BOREHOLE TYPE C.F.S.S.A. and Mud Rotary COMPILED BY N.R.
 DATUM Geodetic DATE September 22 & 23, 2014 CHECKED BY D.D.

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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
190.0	Ground Surface						20	40	60	80	100									
0.0	Silty sand occasional gravelly zones Compact		1	SS	13								○							
	Clayey silt, with sand		2	SS	9		189						○							
	Stiff to very stiff		3	SS	12		188						○							
			4	SS	12		187						○			2 48 32 18				
			5	SS	17		186						○							
			6	SS	18		185						○							
	Silty sand occasional silt zones Very loose to loose		7	SS	5		184						○							
	(FILL)		8	SS	7		183						○							
			9	SS	3		182						○							
183.3	Clayey silt with sand, trace gravel Very stiff to hard						181						○			1 30 37 32				
6.7	(TILL)		10	SS	21		180						○							
			11	SS	38		179						○			2 48 42 8				
	Sandy silt trace clay, trace gravel Very dense		12	SS	59		178						○							
			13	SS	105		177						○			9 31 34 26				
176.6	Sandy silt trace clay, trace gravel Very dense						176						○							
13.4	(TILL)		14	SS	100/13cm								○							
													○							
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


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RECORD OF BOREHOLE No BC-3

2 of 2

METRIC

G.W.P. 03-20024 **LOCATION** Coords: 4 857 167.0 N; 315 033.6 E **ORIGINATED BY** F.P.
DIST Central **HWY** 404 **BOREHOLE TYPE** C.F.S.S.A. and Mud Rotary **COMPILED BY** N.R.
DATUM Geodetic **DATE** September 22 & 23, 2014 **CHECKED BY** D.D.

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						
175.0																
174.5	Sandy silt trace clay, trace gravel		15	SS	100/15cm											
15.5	Very dense (TILL) (Cont'd.) End of borehole															
	* 2014 09 23															
	∇ Water level observed during drilling															
	<u>Water Level Readings:</u>															
	Date Depth Elev. (m)															
	Dec.18/2014 0.7 189.3															
	<u>Piezometer Legend:</u>															
	 Bentonite															
	 Filter sand															
	 Screen															

RECORD OF BOREHOLE No BC-4

1 of 2

METRIC

G.W.P. 03-20024 LOCATION Coords: 4 857 168.5 N; 315 023.5 E ORIGINATED BY F.P.
 DIST Central HWY 404 BOREHOLE TYPE C.F.S.S.A. and Mud Rotary COMPILED BY N.R.
 DATUM Geodetic DATE September 23-26, 2014 CHECKED BY D.D.

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		
								20	40	60	80	100						20	40	60
190.0	Ground Surface																			
0.0	PAVEMENT STRUCTURE																			
189.7	Silty sand		1	SS	37															
0.3	occasional gravelly zones		2	SS	29															
	Compact																			
	Clayey silt, with sand		3	SS	18															
	occ. cobbles and boulders																			
	Stiff to		4	SS	19															
	very stiff																			
	(FILL)		5	SS	19												3 34 39 24			
			6	SS	13															
	Silty sand		7	SS	6															
	occasional silt zones																			
	Loose		8	SS	6															
			9	SS	5												1 80 17 2			
183.0	Clayey silt																			
7.0	with sand, trace gravel		10	SS	10															
	Stiff to																			
	hard																			
	(TILL)																			
			11	SS	36															
	Silty sand																			
	trace clay, trace gravel																			
	Very dense		12	SS	65												5 62 30 3			
			13	SS	103												4 34 44 18			
176.6	Sandy silt																			
13.4	trace clay, trace gravel		14	SS	50/8cm															
	Very dense																			
	(TILL)																			
	Cont'd																			

Cont'd

RECORD OF BOREHOLE No BC-4

2 of 2

METRIC

G.W.P.	03-20024	LOCATION	Coords: 4 857 168.5 N; 315 023.5 E	ORIGINATED BY	F.P.
DIST	Central	HWY	404	BOREHOLE TYPE	C.F.S.S.A. and Mud Rotary
				COMPILED BY	N.R.
DATUM	Geodetic	DATE	September 23-26, 2014	CHECKED BY	D.D.

[illegible]

GEOCRES No. 30M14-54

Boreholes 54-1, 2, 3, 4, 5, 6, 7 and 8

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 54-1

FOUNDATION SECTION

JOB 70-11103

LOCATION Co-ords. 15,938,832 N; 1,032,502 E

ORIGINATED BY VK

W.P. 393-64

BORING DATE December 4, 1971

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Washbore with NX, BX Casing

CHECKED BY *UK*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT % w_p — w — w_L
							20	40	60	80	100	○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB. VANE				
638.9	Ground Level																
0.0	Clayey silt, trace of some sand.		1	SS	16												
630.9	Very Stiff to Hard		2	SS	40												
8.0	Brown		3	SS	16												
	Grey		4	SS	25												
620.9			5	SS	26												
18.0	Silt to silty sand	6	SS	12													
	Compact	7	SS	11													
608.9	Grey	8	SS	30													
30.0	Clayey silt with some sand	9	SS	142													
	Hard Grey	10	SS	85													
595.9		11	SS	50													
43.0	Silt to silty sand with some gravel	12	SS	42													
	Loose to Dense	13	SS	8													
	Grey	14	SS	13													
		15	SS	24													
543.9		16	SS	29													
95.0	Clayey silt	17	SS	280													
	Very stiff - hard	18	SS	98													
	Grey	19	SS	100/2"													
525.9																	
113.0	Silty sand with trace of gravel, occ. layers of clayey silt to silt																
518.9	Gravel fill																
120.0	End of Borehole																

20
1-5 % STRAIN AT FAILURE
in

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 54-2

FOUNDATION SECTION

JOB 70-11103 LOCATION Co-ords. 15,938,753 N; 1,032,917 E.

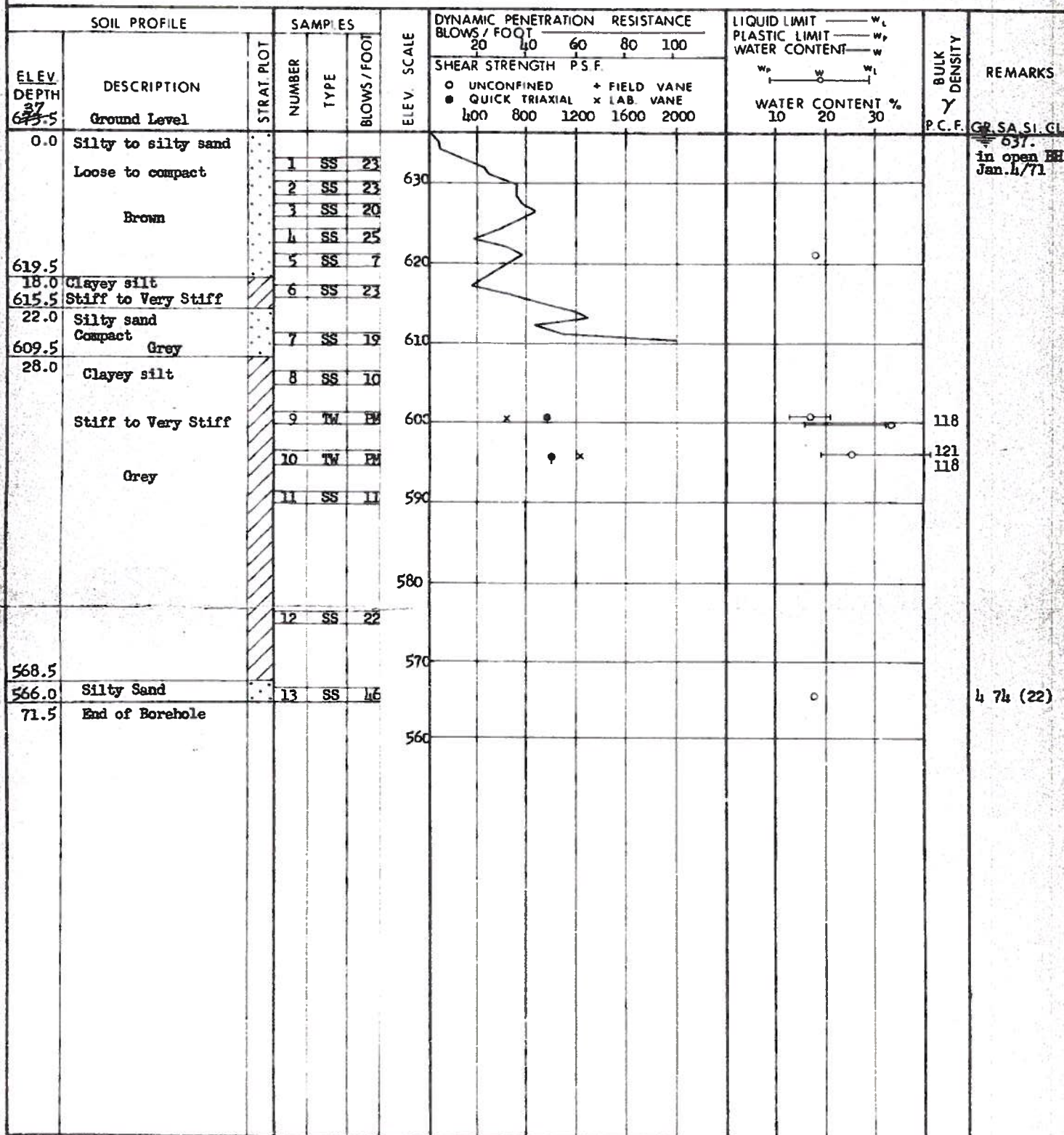
ORIGINATED BY VK

W.P. 393-64 BORING DATE January 4, 1971

COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE Washboring-MX & BX Casing

CHECKED BY



DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 54-3

FOUNDATION SECTION

JOB 70-11103

LOCATION Co-ords. 15,938,732; 1,032,849 E.

ORIGINATED BY VK

W.P. 393-64

BORING DATE January 15, 1971

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Wash & drive NX, BX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	BLOWS / FOOT					WATER CONTENT %				
						20	40	60	80	100					
						SHEAR STRENGTH P.S.F.									
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB. VANE									
						400	800	1200	1600	2000	10	20	30		
637.2	Ground Level														
0.0	Silty sand, trace of clay		1	SS	24										GR. SA. SI. CL. 636.7 in open BH Jan. 15/71 0 47 50 3
627.7	Compact Brown		2	SS	27										
9.5	Clayey silt, trace of sand		3	SS	15										
621.2	Firm to Stiff. Grey		4	TM	PM									135	0 0 53 47
16.0	Silt to silty sand		5	TM	PM					3080				130	
613.0	Compact Grey		6	SS	22										
24.0	Clayey silt		7	SS	14										124 117 0 0 46 54
	Stiff to Very Stiff		8	SS	12										
			9	TM	PM					87.0					
	Grey		10	TM	PM										
			11	SS	22										
586.2			12	SS	71										
51.0	Silty sand with some gravel, trace of clay.														
580.2	Very Dense														
57.0															
	Clayey silt with trace of sand and gravel		13	SS	31										
	Hard Grey		14	SS	165										
554.2			15	SS	71										
83.0			16	SS	36										
	Silty sand with some gravel, occ. clayey silt seam up to 2" thick.														
	Dense to Very Dense Grey		17	SS	68										
532.2			18	SS	240										1 22 60 17
105.0	Clayey silt with some sand.														
522.2	Hard. Grey		19	SS	316										
115.0	Silty sand														
116.5	End of Borehole														

 20
 10-5 % STRAIN AT FAILURE
 10

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 54-4

FOUNDATION SECTION

JOB 70-11103 LOCATION Co-ords. 15,938,793 N; 1,032,777 E. ORIGINATED BY VK
 W.P. 393-64 BORING DATE December 9, 1970 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE Washboring BX Casing CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WATER CONTENT %				
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE				w_p — w — w_L					
636.5	Ground Level														
0.0	Sand to silty sand Loose to compact brown grey		1	SS	6										GR SA SI CL = 635.8 in open BH Dec. 9/70 2 54 32 12
626.5			2	SS	17										
10.0	Clayey silt with some sand Stiff to Hard Grey		3	SS	26										0 16 40 44
			4	SS	21										
			5	SS	13										
			6	SS	15										
			7	SS	17										
603.5			8	SS	35										
33.0	Silt to silty sand Compact to Dense Grey		9	SS	12										
593.5			10	SS	32										0 11 82 7
43.0	Clayey silt with some sand & trace of gravel. Very stiff to hard Grey		11	SS	49										
			12	SS	184										143 3 23 52 22
			13	SS	94										
			14	SS	22										
569.5															
67.0	Silty sand with some gravel		15	SS	16										
	Clayey silt		16	SS	30										
	Compact to Dense Grey		17	SS	34										
539.0															
97.5	Clayey silt with trace of sand and gravel. Hard Grey		18	SS	138										
524.5															
112.0	Silty sand with some gravel. Very Dense Grey		19	SS	150/3"										
511.5															
125.0	End of Borehole														

20
 15-5 % STRAIN AT FAILURE
 10

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 54-5

FOUNDATION SECTION

JOB 70-11103 LOCATION Co-ords. 15,938,772 N; 1,032,710 E. ORIGINATED BY VK
 W.P. 393-64 BORING DATE December 18, 1971 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE Washbore with NX, BX Casing CHECKED BY —

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH PSF. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w_L WATER CONTENT % 10 20 30	BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER						
636.6	Ground Level								
0.0	Clayey silt with trace of sand		1	SS	9				
	Stiff to Very Stiff		2	SS	22				
	Uniform sand. Compact		3	SS	20				
	Grey		4	SS	13				
621.6			5	SS	15				
15.0	Sandy silt. Compact		6	SS	51				
618.6	Grey		7	SS	11				
18.0	Clayey silt, with trace of sand and gravel.		8	SS	11				
	Hard		9	SS	107				
	Grey		10	SS	89				
595.1									
41.5	End of Borehole								

DEPARTMENT OF HIGHWAYS- ONTARIO MATERIALS & TESTING OFFICE			RECORD OF BOREHOLE No. 54-6				FOUNDATION SECTION			
JOB 70-11103		LOCATION Co-ords. 15,938,693 N; 1,032,725 E.		ORIGINATED BY VK						
W.P. 393-64		BORING DATE January 11, 1971		COMPILED BY VK						
DATUM Geodetic		BOREHOLE TYPE Washbore with NX, BX Casing		CHECKED BY						
ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w	BULK DENSITY γ	REMARKS
			NUMBER	TYPE		20	40			
637.1	Ground Level					SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE				
0.0	Clayey silt, trace of sand and gravel, occ. silt seam Firm to Hard Grey		1	SS	6					
			2	SS	34					
			3	SS	31					
			3A	TM	PM					
			4	SS	28					
			4A	TM	PM					
			5	SS	17					
			5A	TM	PM					
			6	SS	24					
613.1										
24.0	Silty sand Dense to Very Dense Grey		7	SS	34					
			8	SS	34					
			9	SS	44					
595.1			10	SS	80					
42.0	Clayey silt, trace of sand and gravel Very Stiff to Hard Grey		11	SS	26					
			12	SS	22					
			13	SS	100/3"					
563.1			14	SS	141					
74.0	Sandy silt to silty sand, trace of gravel Very Dense Grey		15	SS	88					
			16	SS	61					
536.1			17	SS	27					
101.0	Clayey silt, trace of sand and gravel Very Stiff to Hard Grey		18	SS	100/5"					
			19	SS	100/5"					
522.1			20	SS	125/6"					
115.0	Silty sand, Very Dense									
116.0	End of Borehole									

20
10-5 % STRAIN AT FAILURE
0

RECORD OF BOREHOLE NO 54-7

W/P 160-74-25 LOCATION Co-ords N 15 935 933, E 1 022 871 ORIGINATED BY BD
 DIST 6 HWY 404 BORING DATE August 31, 1971 COMPILED BY HS
 DATUM Geodetic BOREHOLE TYPE Washboring-M & BW Casing CHECKED BY

ELEV DEPTH	PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			UNIT WEIGHT γ	REMARKS
			NUMBER	TYPE	VALUES		30	40	60	80	100	W _p	W	W _L		
637.1	Ground Level															
0.0	Topsoil		1	SS	3											
	Sandy silt with trace of gravel & Organics		2	SS	36	630										
628.6	Very Loose to Compact															
8.5	Clayey silt. Loose to Dense		3	SS	43											
	Grey		4	SS	10	620										
			5	SS	8											
613.1																
24.0	Silty Sand. Compact. Grey		6	SS	15	610										
			7	SS	23											
601.1																
36.0	Clayey silt with trace of sand and gravel.		8	SS	26	600										
			9	SS	27											
593.6	Very Stiff. Grey															
43.5	Silty sand.		10	SS	30	590										
588.6	Compact. Grey															
48.5			11	SS	38											
	Clayey silt with some sand and gravel					580										
	Very Stiff to Hard		12	SS	118											
	Grey					570										
			13	SS	28											
564.1																
73.0	Silty sand to sandy silt with some gravel and occ. layer of clayey silt		14	SS	17	560										
	Loose to Very Dense					550										
			15	SS	13											
						540										
	Grey		16	SS	4											
532.3																
104.8																

Continued

20
15 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 54-7 Continued

WP 160-74-25 LOCATION Co-ords. N 15 938 833; E 1 032 871 ORIGINATED BY ED
 DIST 6 HWY 404 BORING DATE August 31, 1971 COMPILED BY HS
 DATUM Geodetic BOREHOLE TYPE Washboring-NW & BW Casing CHECKED BY _____

SOIL PROFILE			SAMPLES		GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE FLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		20	40	60	80	100	w_p	w	w_L		
532.3			17	SS 57	530										
104.8			18	SS 110/8"											
			19	SS 140/9"	520										
516.8			20	SS 96/5"											
120.5	Clayey silt with some sand and gravel. Hard Gray		21	SS 142/5"	510										
506.8			22	SS 150/3"											
130.3	End of Borehole														

20
15 ϕ 5 % STRAIN AT FAILURE
10

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 54-8

W.P. 160-74-25 LOCATION Co-ords. N 15 932 827; E 1 032 723 ORIGINATED BY BD
 DIST 6 HWY 404 BORING DATE August 24, 1971 COMPILED BY HS
 DATUM Geodetic BOREHOLE TYPE Washboring - MC & BW Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ P.C.F.	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100					w_p — w — w_L			
							SHEAR STRENGTH P.S.F.								
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
637.3	Ground Level														
0.0	Topsoil		1	SS	4										
	Silty sand		2	SS	53	630									
	Loose to Very Dense														
626.3	Brown		3	SS	16										
11.0	Clayey silt with		4	TW	PM	620									
	trace of sand and		5	SS	6										
	gravel		6	SS	11	610									
	Stiff to Very Stiff		7	TW	PM										
	Grey		8	TW	PM										
			9	SS	11	600									
597.8	Sandy silt to silty		10	SS	28										
39.5	sand.		11	SS	20	590									
	Compact to Dense		12	SS	37										
586.4	Grey		13	SS	23	580									
50.9	Clayey silt with some		14	SS	30										
	sand and gravel		15	SS	105	570									
	Very Stiff to Hard		16	SS	66										
	Grey		17	SS	64	560									
			18	SS	40										
554.3	Silty sand to sandy		19	SS	30	550									
83.0	silt with some gravel		20	SS	31										
			21	SS	28	540									
			22	SS	28										
532.5															
104.8															

Continue



20
15 0-5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 54-8 Continued

W.P. 160-74-25 LOCATION Co-ords. N 15 938.827; E 1 032 723 ORIGINATED BY BD
 DIST 6 HWY 404 BORING DATE August 24, 1971 COMPILED BY ES
 DATUM Geodetic BOREHOLE TYPE Washboring - 1 1/2" & 3" Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ P.C.F.	REMARKS			
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100					w_p — w — w_L				% GR SA SI CL			
							SHEAR STRENGTH P.S.F.					WATER CONTENT %							
							O UNCONFINED * FIELD VANE ● QUICK TRIAXIAL X LAB VANE												
532.5							400	800	1200	1600	2000								
104.8	Compact to Very Dense Grey		23	SS	150	530													
			24	SS	96	510													
513.8			25	SS	150	520													
123.5	Clayey silt with some sand and gravel.		26	SS	132	510													
	Hard Grey		27	SS	100														
504.8																			
132.5	End of Borehole																		

OFFICE REPORT ON SOIL EXPLORATION

GEOCRES No. 30M14-51

Boreholes 51-1, 2, 3, 4 and 5

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 51-1

WP 160-74-26 LOCATION Co-ords. N 15 942 080; E 1 032 064 ORIGINATED BY VK
 DIST 6 HWY 404 BCRING DATE January 15, 1971 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE Washboring-IX Casing; Cons CHECKED BY ES

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES					
638.2	Ground Level									
1.0	Topsoil		1	SS	17					
	Silty sand with some gravel		2	SS	16					
	Compact to Very Dense		3	SS	40					
	Brown		4	SS	66					
	Grey		5	SS	26					
623.2	Gravel		6	SS	34					
15.0			7	SS	45					
16.5			8	SS	187					
612.2	Clayey Silt									
25.0										
27.0										
606.7	End of Borehole									
31.5										

OFFICE REPORT ON SOIL EXPLORATION

20
 5 > 5 % STRAIN AT FAILURE
 0

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 51-2

W/P 160-74-26 LOCATION Co-ords. N 15 942 100; E 1 032 158 ORIGINATED BY VK
 DIST 6 HWY 404 BORING DATE Jan. 20, 1971 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE Wash-boring-HX Casing; Cone CHECKED BY VC

SOIL PROFILE		SAMPLES		GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w WATER CONTENT % $w_p \quad w \quad w_L$	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. FLOT	NUMBER					
538.0	Ground Level							
1.0	Silty sand with some gravel-trace of clay.		1	SS	23			
			2	SS	16			7 72 19 2
	Brown		3	SS	24			
	Grey		4	SS	60			
			5	SS	48			9 79 10 2
			6	SS	64			
			7	SS	167			
607.0			8	SS	165			
31.0	End of Borehole							

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 51-3

WP 160-74-26 LOCATION Co-ords N 15 942 024; E 1 032 223 ORIGINATED BY VK
 DIST 6 HWY 404 BORING DATE January 21, 1971 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE Washboring-1X Casing; Cone CHECKED BY ES

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w WATER CONTENT % w_p — w — w_L	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES					
637.9	Ground Level									
1.0	Silty sand with gravel-trace of clay		1	SS	3					
			2	SS	19					
	Loose - Very Dense		3	SS	64					
	Brown		4	SS	42					
			5	SS	67					
617.9	Boulder		6	SB	100					
20.0	End of Borehole									

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 51-4

W.P. 160-74-26 LOCATION Co-ords. N 15 042 040; E 1 032 309 ORIGINATED BY VK
 DIST 6 HWY 404 BORING DATE January 21, 1971 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE Washboring-XX Casing; Cone CHECKED BY R C

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		20	40	60	80	100		
635.5	Ground Level											
1.0	Topsoil		1	SS	13							
	Silty sand with some gravel-trace of clay		2	SS	17							8 82 (10)
	Compact to Very Dense		3	SS	44							
	Brown		4	SS	60							34 55 10 1
617.5			5	SS	91							
18.0	Clayey silt		6	SS	156	6"						
19.5			7	SS	157	6"						
609.0	End of Borehole											
26.5												

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 51-5

WP 160-74-26 LOCATION Co-ords N 15 941 969; E 1 832 379 ORIGINATED BY VK
 DIST 6 HWY 406 BORING DATE Jan. 20, 1971 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE Washboring-NX Casing; Cone CHECKED BY T. C.

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLCT		LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES		20 40 60 80 100		w_p w w_L			
637.1	Ground Level											GR SA SI CL
1.0	Silty sand with some gravel-trace of clay		1	SS	9	630						16 73 (11)
	Loose to Very Dense		2	SS	13							
	Brown		3	SS	67							
			4	SS	73							
			5	SS	148	620						1 57 38 4
			6	SS	135/4"							
611.1			7	SS	130/5"							
26.0	End of Borehole											

20
50-5 % STAIN AT FAILURE
0

OFFICE REPORT ON SOIL EXPLORATION

GEOCRES No. 30M14-416

Boreholes RR-1 and 2

RECORD OF BOREHOLE No RR-1

1 of 2

METRIC

G.W.P.	03-20024	LOCATION	Coords: 4 859 313.0 N; 314 655.4 E	ORIGINATED BY	F.P.
DIST	Central	HWY	404	BOREHOLE TYPE	Continuous Flight Hollow Stem Augers
DATUM	Geodetic	DATE	October 6-8, 2014	COMPILED BY	N.R.
				CHECKED BY	D.D.

SOIL PROFILE			SAMPLES		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
202.9 0.0	Ground Surface Clayey silt, organics sand and gravel inclusions Stiff Brown Moist _____ Silt and sand, trace clay Compact Brown Moist _____ Wet Loose to compact		1	SS	9
			2	SS	13
			3	SS	16
			4	SS	5
			5	SS	15
			6	SS	20
			7	SS	10
			8	SS	10
			9	SS	17
	(FILL)		10	SS	23
194.2 8.7	Silty sand trace clay, trace gravel Dense to Grey Moist very dense to wet sand layers sand and silt layer		11	SS	44
			12	SS	42
			13	SS	45
			14	SS	50/13cm

RECORD OF BOREHOLE No RR-1

2 of 2

METRIC

G.W.P.	03-20024	LOCATION	Coords: 4 859 313.0 N; 314 655.4 E	ORIGINATED BY	F.P.
DIST	Central	HWY	404	BOREHOLE TYPE	Continuous Flight Hollow Stem Augers
DATUM	Geodetic	DATE	October 6-8, 2014	COMPILED BY	N.R.
				CHECKED BY	D.D.

[illegible]

RECORD OF BOREHOLE No RR-2

1 of 2

METRIC

G.W.P.	03-20024	LOCATION	Coords: 4 859 398.1 N; 314 621.9 E	ORIGINATED BY	F.P.
DIST	Central	HWY	404	BOREHOLE TYPE	Continuous Flight Hollow Stem Augers
				COMPILED BY	N.R.
DATUM	Geodetic	DATE	October 5 & 6, 2014	CHECKED BY	D.D.

[illegible]

RECORD OF BOREHOLE No RR-2

2 of 2

METRIC

G.W.P. 03-20024 LOCATION Coords: 4 859 398.1 N; 314 621.9 E ORIGINATED BY F.P.
DIST Central HWY 404 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY N.R.
DATUM Geodetic DATE Ocotober 5 & 6, 2014 CHECKED BY D.D.

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/m³	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 ● QUICK TRIAXIAL × LAB VANE												
188.2							20	40	60	80	100									
	Silty sand trace to some clay trace gravel clayey silt seams Dense Brown Wet Cont'd.) Gravelly sand layers some silt, trace clay Very dense Grey Wet		15	SS	34															
			16	SS	50/8cm															
185.5																				
17.7	Clayey silt trace sand, trace gravel Hard Grey Moist silty clay layers		17	SS	104/23cm															
	silty sand layers (TILL)																			
			18	SS	50/10cm															
183.1																				
20.1	End of borehole																			
		</																		

GEOCRES No. 30M14-50

Boreholes 50-1, 2, 3, 4, 5, 6, 7, 8, 9 and 10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 50-1

WP 160-74-27 LOCATION Co-ords. N 945 338; E 031 485 ORIGINATED BY Frankl
DIST 6 HWY 404 BORING DATE June 12, 1962 COMPILED BY Frankl
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY

SOIL PROFILE		SAMPLES		GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	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 VALUES					
701.0	Ground Level							
0.0	Fill, Clayey silt with sand, gravel and organics		1 SS 13					
697.0	Stiff to Hard		2 SS 44					
4.0			3 SS 61					
			4 SS >100					
			5 SS >100					
			6 SS >100					
	Brown		7 SS >100					
	Grey		8 SS >100					
	Het. Mix. of clayey silt sand & gravel							
	Glacial till		9 SS >100					
	Hard							
670.0			10 SS >100					
31.0	End of Borehole							

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 50-2

WP 160-74-27 LOCATION Co-ords. N 945 380; E 031 735 ORIGINATED BY Franki
 DIST 6 HWY 404 BORING DATE June 12, 1962 COMPILED BY Franki
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY _____

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS % GR SA SI C
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE					
693.5	Ground Level								
0.0	Fill, Clayey silt with some sand, gravel and organics		1	SS	4				
688.5	Soft to Hard		2	SS	10				
5.0	Traces of organics		3	SS	24				
	Het. Mix. of Clayey silt, sand and gravel		4	SS	43				
			5	SS	40				
			6	SS	84				
			7	SS	100				
	Glacial Till		8	SS	100				
	Hard		9	SS	100				
	Brown								
	Grey		10	SS	100				
622.5			11	SS	100				
31.0	End of Borehole								

OFFICE REPORT ON SOIL EXPLORATION

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 50-3

WP 160-74-27 LOCATION Co-ords N 945 315; E 031 536 ORIGINATED BY Franki
 DIST 6 HWY 404 BORING DATE June 13, 1962 COMPILED BY Franki
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY _____

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w WATER CONTENT % w_p — w — w_L	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
700.0	Ground Level								
0.0	Fill Clayey silt with sand, gravel & organics, Stiff to Hard		1	SS	12				
			2	SS	16				
696.8			3	SS	40				
6.0	Het. Mix. of Clayey silt, sand and gravel		4	SS	100				
			5	SS	100				
			6	SS	100				
	Brown		7	SS	100				
	Grey		8	SS	100				
	Glacial Till		9	SS	100				
	Hard		10	SS	100				
679.5									
20.5	End of Borehole								

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 50-4

WP 160-74-27 LOCATION Co-ords N 945 400; E 031 685 ORIGINATED By Franki
 DIST 6 HWY 404 BORING DATE June 14, 1962. COMPILED BY Franki
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY _____

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	VALUES	20	40	60	80	100	w_p	w	w_L	
695.0	Ground Level													
0.0	Fill Clayey silt with some sand, gravel and organics. Firm to very stiff		1	SS	6									
			2	SS	7									
689.0			3	SS	19									
6.0	Net. Mix. of clayey silt, sand and gravel - Glacial Till		4	SS	13									
			5	SS	100									
	Hard		6	SS	100									
	Brown		7	SS	100									
	Gray		8	SS	100									
670.0			9	SS	100									
25.0	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 50-5

WP 160-74-27 LOCATION Co-ords N 945 352; E 031 528 ORIGINATED BY Frankl
 DIST 6 HWY 404 BORING DATE June 13, 1962 COMPILED BY Frankl
 DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT NUMBER	TYPE	N° VALUES					
700.0	Ground Level								
695.5	4.5 End of Cone Penetration								
					690				

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

WP	<u>160-74-27</u>	LOCATION	<u>Co-ords N 945 303; E 031 491</u>	ORIGINATED BY	<u>Franki</u>
DIST	<u>6 HWY 404</u>	BORING DATE	<u>June 13, 1962</u>	COMPILED BY	<u>Franki</u>
DATUM	<u>Geodetic</u>	BOREHOLE TYPE	<u>Cone Test</u>	CHECKED BY	<u></u>

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT	LIQUID LIMIT w_L	UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	"N" VALUES		20 40 60 80 100	PLASTIC LIMIT w_p		
702.0	Ground Level					ELEV	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE			
696.5						700				
5.5	End of Cone Penetration					690				

15-20 % STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

WP 160-74-27 LOCATION Co-ords N 945 366; E 031 690 ORIGINATED BY Franki
DIST 6 HWY 404 BORING DATE June 13, 1962. COMPILED BY Franki
DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT	LIQUID LIMIT — w_L	UNIT WEIGHT γ	REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100	PLASTIC LIMIT — w_p			WATER CONTENT — w
							SHEAR STRENGTH				WATER CONTENT %
695.0	Ground Level						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	w_p — w — w_L		% GR SA SI CL	
0.0						690					
685.0											
10.0	End of Cone Penetration					680					

20
15-5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 50-8

W/P 160-74-27 LOCATION Co-ords N 945 415; E 031 727 ORIGINATED BY Franki
 DIST 6 HWY 404 BORING DATE June 13, 1962 COMPILED BY Franki
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	WATER CONTENT % w_p — w — w_L			
693.5	Ground Level														
0.0	Fill														
	Clayey silt with some sand, gravel & organics. Soft to stiff		1	SS	4										
687.0			2	SS	11										
6.5	Trace of organics		3	SS	8										
			4	SS	6										
682.0	Glacial Till Hard		5	SS	90										
11.5	End of Borehole														

20
15 0.5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 50-9

WP 160-74-27 LOCATION Co-ords. N 945 462; E 031 618 ORIGINATED BY AKB
 DIST 6 HWY 404 BORING DATE November 30, 1970. COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

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
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100			
694.4	Ground Level													
0.0	Ret. Mix. of clayey silt, sand and traces of gravel		1	SS	38	690								
	Glacial Till		2	SS	36									
	Brown becoming grey		3	SS	69									8 32 44 16
	Hard		4	SS	75	680								Hole Dry
673.9			5	SS	116									
20.5	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 50-10

WP 160-74-27 LOCATION Co-ords. N 945 271; E 051 652 ORIGINATED BY AKS
 DIST 6 HWY 404 BORING DATE November 30, 1976 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w $w_p \quad w \quad w_L$ WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
696.7	Ground Level													
0.0	Het. Mix. of Clayey silt, sand and traces of gravel Glacial Till Hard Brown becoming Grey		1	SS	31	690								
			2	SS	55									
			3	SS	79									
			4	SS	76	680								2 31 49 1
676.2			5	SS	100, 11"									
20.5	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

20
15 ϕ 5 % STRAIN AT FAILURE
10

GEOCRES No. 30M14-110

Boreholes 110-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 110-1

WP 160-74-28 LOCATION Co-ord N 15 951 885; E 1 030 320 ORIGINATED BY Franki
 DIST 6 HWY 404 BORING DATE June 7, 1962 COMPILED BY Franki
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY S

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	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	VALUES					
762.0	Ground Level									
761.8	Road F111		1	SS	12	760				
2.5	Stratified Clay & silt		2	SS	46					
	Silty Sand with Gravel		3	SS	41					
			4	SS	73					
	Dense to Very Dense		5	SS	>100					
750.0			6	SS	>100	750				
12.0	Het. Mix. of Clayey Silt, Sand & Gravel (Glacial Till)		7	SS	>100					
743.5	Hard		8	SS	>100					
18.5	End of Borehole									

OFFICE REPORT ON SOIL EXPLORATION

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 110-2

WP 150-74-28 LOCATION Co-ords N 15 951 980; E 1 030 532 ORIGINATED BY Franki
DIST 6 HWY 404 BORING DATE June 7, 1962 COMPILED BY Franki
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	W VALUES		20	40	60	80	100	w_p	w	w_L		
765.0	Ground level		1	SS	13											
0.5	Topsoil		2	SS	13											
2.5	Silty sand with Gravel		3	SS	73											
	Dense to very Dense		4	SS	100											
			5	SS	92											
			6	SS	100											
			7	SS	100											
745.0			8	SS	100											
19.0	Het. Mix of Clayey silt, sand and Gravel (Glacial Till)		9	SS	100											
735.0	Hard		10	SS	-											
30.0	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

20
15 5 % STRAIN AT FAILURE
10

RECORD OF BOREHOLE NO 110-3

WP 160-74-28 LOCATION Co-ords N 15 951 924; E 1 030 356 ORIGINATED BY Frankl
 DIST 6 HWY 404 BORING DATE June 8, 1962 COMPILED BY Frankl
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY _____

SOIL PROFILE		STRAT. PLOT	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		NUMBER	TYPE	N' VALUES		20	40	60	80	100			
763.5	Ground Level													
0.0	Road Fill	XX	1	SS	14									
1.0	Top soil		2	SS	12									
2.0	Silty Sand with Gravel		3	SS	46									
	Compact to Very Dense		4	SS	61									
			5	SS	>100									
751.5			6	SS	>100									
12.0	Het. Mix. of Clayey Silty Sand & Gravel		7	SS	>100									
747.5	(Glacial Till); Hard		8	SS	>100									
16.0	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE NO 110-4

WP 160-74-26

LOCATION Co-ords N 15 951 942; E 1 030 495

ORIGINATED BY Frankl

DIST 6 HWY 404

BORING DATE June 11, 1962

COMPILED BY Frankl

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger & Cone Test

CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	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					
765.0	Ground Level								
0.0	Road FILL		1	SS	16				
0.5	Topsoil		2	SS	24				
2.0	Silty Sand with Gravel Compact to Very Dense		3	SS	50				
			4	SS	>100				
			5	SS	>100				
			6	SS	>100				
			7	SS	>100				
			8	SS	>100				
750.0			9	SS	>100				
15.0	Het. Mix. of Clayey Silt, Sand & Gravel (Glacial Till)		10	SS	>100				
740.5	Hard		11	SS	>100				
24.5	End of Borehole		12	SS	>100				

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 110-5

W.P. 160-74-26 LOCATION Co-ords N 15 951 967; E 1 030 490 ORIGINATED BY Franki
 DIST 6 HWY 404 BORING DATE June 11, 1962 COMPILED BY Franki
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS % GR SA SI C
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES					
755.0	Ground Level									
0.6	Topsoil	1	SS	18						
2.5	Silty Sand with Gravel	2	SS	24						
		3	SS	24						
		4	SS	88						
754.5	Compact to Very Dense	5	SS	100						
		6	SS	>100						
10.5	End of Borehole									

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 110-6

WP 160-74-28 LOCATION Co-ords H 15 951 912; E 1 030 314 ORIGINATED BY Frankl
 DIST 6 HWY 404 BORING DATE June 7, 1962 COMPILED BY Frankl
 DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
763.0	Ground Level															
0.0	Probably Fill & Topsoil															
760.0																
3.0	Probably Silty Sand															
757.8																
5.5	End of Cone															

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

WP 160-74-28 LOCATION Co-ords N 15 951 900; E 1 030 360 ORIGINATED BY Franki
DIST 6 HWY 404 BORING DATE June 8, 1962 COMPILED BY Franki
DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY FS

[illegible]

15 ²⁰ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 110-9

W/P 160-74-28 LOCATION N 15 951 395; E 1 030 570 ORIGINATED BY AKB
 DIST 6 HWY 404 BORING DATE November 30, 1970 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100		
764.9	Ground Level												
0.0	Topsoil												
1.0	Sandy silt, to silty sand with some clay and gravel		1	SS	85	760							2 42 48 8
			2	SS	123								
	Very Dense		3	SS	100								3 24 64 9
748.9			4	SS	100	750							
16.0	Het. Mix. of Clayey silt, sand, traces of gravel (Glacial Till)		5	SS	100	750							
742.4	Hard Grey		6	SS	100	750							
22.5	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 110-10

WP 160-74-26 LOCATION N 15 951 926; E 1 030 462 ORIGINATED BY AKB
 DIST 6 HWY 404 BORING DATE Nov. 27, 1970 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

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
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
762.0	Ground Level													
0.0	Topsoil													
1.0	Sandy silt to sand with some gravel		1	SS	68	760								2 45 47
			2	SS	155									
	Very Dense		3	SS	100	750								8 81 61
747.0			4	SS	100	750								
15.0	Het. Mix. of Clayey silt, Sand & Gravel													
741.5	(Glacial Till, Hard		5	SS	100	750								
20.5	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

20
15 0-5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 110-11

WP 160-74-28

LOCATION Co-ords N 15 951 971; E 1 030 457

ORIGINATED BY VK

DIST 6 HWY 404

BORING DATE February 28, 1977

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE 3 1/2" Hollow Stem Auger & Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N° VALUES		20	40	60	80	100	w_p	w	w_L	
764.6	Ground Level														
0.0	Topsoil														
1.0	Silty sand and some gravel		1	SS	31	760									10 62 (28)
			2	SS	78										
			3	SS	141										
	Dense to very Dense		4	SS	143	9"									
			5	SS	178	9" 750									18 52 24 6
748.6			6	SS	100	2"									
16.0	Het. Mix. of Clayey Silt, sand & Gravel (Glacial Till)		7	SS	150	5"									
			8	SS	156	8"									5 20 55 20
	Hard														
738.8			9	SS	100	3"	740								
25.8	End of Borehole														

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 110-12

WP 160-74-28 LOCATION Co-ords H 15 951 954; E 1 030 576 ORIGINATED BY VK
 DIST 6 HWY 404 BORING DATE February 28, 1977 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE 3 1/2" Hollow Stem Auger CHECKED BY RS

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	N' VALUES		20	40	60	80	100			
766.3	Ground Level													
0.0	Topsoil													
1.0	Silty sand with some gravel		1	SS	24									0 50 41 9
			2	SS	63									28 56 (16)
			3	SS	78									60 33 (7)
	Gravelly Sand		4	SS	121									
			5	SS	63									
	Compact to Very Dense		6	SS	176	750								
747.3														
19.0	Het. Mix. of Clayey Silt, sand and Gravel (Glacial till)		7	SS	100	2"								40 25 27 8
740.2	Hard													
26.1	End of Borehole													

20
15 0-5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

GEOCRES No. 30M14-111

Boreholes 111-1, 2, 3, 3A, 4, 5 and 6

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 111-1

WP 160-74-29 LOCATION Co-ords. 15,958,582 N; 1,029,393 E. ORIGINATED BY AKB
 DIST 6 HWY 404 BORING DATE November 23, 1970 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger & Cone Test CHECKED BY FS

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L WATER CONTENT % 10 20 30	UNIT WEIGHT γ PCF	REMARKS % GR SA SI C
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES				
793.7	Ground Level								
0.0	Clayey silt with sand & traces of gravel Occ. layers of silt (Glacial Till) Hard Brown to Grey		1	SS	31				
			2	SS	127				
			3	SS	111				
			4	SS	100/5				
			5	SS	118				
771.7			6	SS	79				
22.0	Silty sand with traces of gravel & occ. seams of clayey silt. Dense to very dense		7	SS	39				
762.2			8	SS	54				
31.5	End of Borehole								

20
15 ϕ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 111-2

WP 160-74-29 LOCATION Co-ords. 15,958,537 N; 1,029,402 E. ORIGINATED BY AKB
 DIST 6 HWY 404 BORING DATE November 24, 1970 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY _____

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 %	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
794.0	Ground Level													
0.0	Clayey silt with traces of gravel Occ. layers of sandy silt Hard (Glacial Till) Brown to Grey		1	SS	39	790								
			2	SS	82									
			3	SS	67									
			4	SS	109	780								0 45 45 10
			5	SS	72									
772.0														
22.0	Silty sand with traces of gravel & occ. seams of clayey silt		6	SS	24	770								0 17 81 2
			7	SS	40									
	Compact to very Dense													
759.5			8	SS	100	760								
35.0	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 111-3

WP 160-74-29 LOCATION Co-ords. 15,958,542 N; 1,029,283 E. ORIGINATED BY AKB
 DIST 6 HWY 404 BORING DATE November 23, 1970 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

SOIL PROFILE		STRAT PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT		LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS		
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES		20	40	60	80			100	w_p
795.0	Ground Level													
0.0														
790.0	Reworked Zone		1	SS	9	790								
5.0	Clayey silt, traces of sand and gravel Occ. layers of silt (Glacial Till) Hard Brown changing to Grey		2	SS	51									
			3	SS	46									
			4	SS	106	780								1 9 43 47
			5	SS	80									
770.0			6	SS	99	770								
25.0	Silty sand with traces of gravel & occ. seams of clayey silt													
764.5	Very Dense		7	SS	72									0 3 96 1
30.5	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 111-3A

WP 160-74-29 LOCATION Co-ords. 15,958,564 N; 1,029,280 E. ORIGINATED BY VK
 DIST 6 HWY 404 BORING DATE February 22, 1977 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Augers CHECKED BY VK

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 C
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
793.6	Ground Level													
0.0	Topsoil													
790.6	Reworked Zone		1	SS	2	790								3 32 44 21
3.0	Clayey silt with sand, trace of gravel (Glacial Till) Very stiff to hard		2	SS	16									
			3	SS	38									
			4	SS	55									
			5	SS	146	780								2 24 54 20
			6	SS	82									
			7	SS	98									
			8	SS	63									
			9	SS	55	770								
767.6			10	SS	58									
26.0	Silty sand with traces of gravel & occ. seams of clayey silt		11	SS	15									0 37 62 1
763.1	Compact to v. dense		12	SS	65									
30.5	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 111-4

WP 160-74-29 LOCATION Co-ords. 15,958,500 N; 1,029,290 E. ORIGINATED BY VK
 DIST 6 HWY 404 BORING DATE February 24, 1977 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Augers & Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	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
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES					
793.2	Ground Level									
0.0	Topsoil									GR 5A SIL C
789.2	Reworked Zone		1	SS	4	790				3 28 43 26
4.0	Clayey silt with sand and trace of gravel (Glacial Till) Very stiff to hard		2	SS	25					5 31 38 26
			3	SS	69					
			4	SS	81					
			5	SS	61	780				
778.2			6	SS	24					
15.0	Silty sand with trace of gravel & occ. thin seams of clayey silt		7	SS	103					2 9 48 41
			8	SS	123	770				
			9	SS	32					
762.2	Dense to very dense		10	SS	22					0 16 79 5
31.0	End of Borehole									

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 111-5

WP 160-74-29 LOCATION Co-ords. 15,958,519 N; 1,029,170 E. ORIGINATED BY AKB
 DIST 6 HWY 404 BORING DATE November 23, 1970 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w_L		
794.7	Ground Level														
0.0	Clayey silt, traces of sand and gravel Occ. layers of silt (Glacial Till) Hard Brown to Grey		1	SS	61	790									
			2	SS	78										
			3	SS	100	8"									
			4	SS	61	780									5 34 39 22
775.2			5	SS	109										
19.5	Silty sand with traces of gravel & occ. seams of clayey silt		6	SS	14	770									
764.2	Compact to v. dense		7	SS	100	10"									7 83 (10)
30.5	End of Borehole														

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 111-6

WP 160-74-29 LOCATION Co-ords. 15,958,468 N; 1,029,180 E. ORIGINATED BY AKB
 DIST 6 HWY 404 BORING DATE November 24, 1970 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

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
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100			
795.0	Ground Level													
0.0	Clayey silt with some sand & traces of gravel Occ. layers of silt Glacial Till Hard Brown to Grey		1	SS	24	790						0		0 44 50 6
			2	SS	82							0		
			3	SS	112							0		
			4	SS	58	780						0		
776.0			5	SS	16									
19.0	Silty sand with traces of gravel & occ. seams of clayey silt		6	SS	56	770						0		
764.5	Compact to v. dense		7	SS	100							0		8 88 (4)
30.5	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

GEOCRES No. 30M14-112

Boreholes 112-1, 2, 3, 4, 5 and 6

FOUNDATION SECTION

ORIGINATED BY **AKB**

COMPILED BY AKB

CHECKED BY [Signature]

[illegible]

[illegible]

[illegible]

FOUNDATION SECTION

FOUNDATION SECTION

JOB	70-11107	LOCATION	Co-ords. 15,965,880 N; 1,028,897 E.	ORIGINATED BY	AKB
W.P.	300-61	BORING DATE	Nov. 25, 1970	COMPILED BY	AKB
DATUM	Geodetic	BOREHOLE TYPE	Auger	CHECKED BY	<i>[Signature]</i>

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE										LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.					WATER CONTENT %								
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					w_p — w — w_L 10 20 30								
865.8	Ground Level																			
0.0	Sandy silt, traces of clay & gravel		1	SS	17	860														
	Very Stiff to Hard		2	SS	117															
	Brown & Grey		3	SS	69															
849.3			4	SS	100	850														
16.5	End of Borehole		5	SS	90															

[illegible]

GEOCRES No. 30M14-115

Boreholes 115-7, 8, 21, 22, 23, 24, 25 and 26

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 115-7

WP 160-74-30 LOCATION Co-ords. N 15 966 042; E 1 028 824 ORIGINATED BY CK
 DIST 6 HWY 404 BORING DATE Sept 7-9, 1971 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Auger & Washboring BX Casing CHECKED BY AKB

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
867.9	Ground Level															
0.0	Clayey Silt with sand, traces of gravel (Glacial Till)		1	SS	44											
	Hard		2	SS	34											
			3	SS	35											
853.4	Sand, some gravel		4	SS	51											
14.5			5	SS	64											
	Silty sand to Sand		6	WS												
			7	SS	64											
			8	SS	172											
	Very Dense															
836.1			9	SS	106											
31.8	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO115-8

WP 160-74-30 LOCATION Co-ords N 15 966 194; E 1 029 144 ORIGINATED BY CK
 DIST 6 HWY 404 BORING DATE Sept. 9-10, 1971 COMPILED BY PK
 DATUM Geodetic BOREHOLE TYPE Auger 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			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100					w_p — w — w_L				
							SHEAR STRENGTH					WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					10 20 30				
860.7	Ground Level					860									GR 5A SI CL	
0.0	Clayey silt with sand, trace of gravel. (Glacial Till)		1	SS	38										2 29 58 11	
			2	SS	32											
			3	SS	34											
	Hard		4	SS	38											
			5	SS	36											
839.2			6	SS	67	840										
21.5	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 115-21

WP 160-74-30 LOCATION Co-ords. N 15 966 029; E 1 028 878 ORIGINATED BY JB
 DIST 6 HWY 404 BORING DATE February 24, 1972 COMPILED BY JB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w $w_p \rightarrow w \rightarrow w_L$ 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			
866.4	Ground Level													
0.0	Clayey silt with sand, traces of gravel (Glacial Till)		1	SS	41	860								3 30 47 20
			2	SS	161									
855.9	Hard		3	SS	67									
10.5	End of Borehole Note: Water Level not established													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 115-22

WP 160-74-30 LOCATION Co-ords. N 15 966 139; E 1 028 865 ORIGINATED BY JB
 DIST 6 HWY 404 BORING DATE February 25, 1972. COMPILED BY JB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY OP.

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
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
866.8	Ground Level													
0.0	Clayey silt with sand, traces of gravel (Glacial Till)		1	SS	26									
			2	SS	53	850								
856.3	Very Stiff to Hard		3	SS	127									3 36 37 24
10.5	End of Borehole Note: Water Level Not Established													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 115-23

WP 160-74-30 LOCATION Co-ords. N 15 966 154; E 1 028 991 ORIGINATED BY JB
 DIST 6 HWY 404 BORING DATE February 25, 1972. COMPILED BY JB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY *[Signature]*

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			
864.1	Ground Level													
0.0	Clayey silt with sand, traces of gravel (Glacial Till) Very Stiff to Hard		1	SS	24	860								6 25 44 25
			2	SS	54									
853.6			3	SS	48									
10.5	End of Borehole Note: Water Level not established													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 115-24

WP 160-74-30 LOCATION Co-ords. N 15 966 043; E 1 029 002 ORIGINATED BY JB
 DIST 6 HWY 404 BORING DATE February 25, 1972 COMPILED BY JB
 DATUM Geodetic BOREHOLE TYPE Auger 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			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
863.8	Ground Level															
0.0	Clayey silt with sand, traces of gravel (Glacial Till)		1	SS	34	860										
			2	SS	75											
853.8	Hard		3	SS	100	76"										
10.0	End of Borehole Note: Water Level not Established															

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 115-25

WP 160-74-30 LOCATION Co-ords. N 15 966 166: E 1 029 116 ORIGINATED BY JB
 DIST 6 HWY 404 BORING DATE February 25, 1972 COMPILED BY JB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY JP

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES	20	40	60	80	100	W_P	W	W_L		
861.4	Ground Level														
0.0	Clayey Silt with sand, traces of gravel (Glacial Till)		1	SS	41										3 44 37 16
			2	SS	38										
850.9	Hard		3	SS	56										
10.5	End of Borehole Note: Water Level not established														

20
15 ϕ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 115-26

WP 160-74-30 LOCATION Co-ords N 15 966 057; E 1 029 128 ORIGINATED BY JB
 DIST 6 HWY 404 BORING DATE February 25, 1972. COMPILED BY JB
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY GP

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 C
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100			
861.7	Ground Level													
0.0	Clayey silt with sand, traces of gravel (Glacial Till) Very Stiff to Hard		1	SS	24	860								
			2	SS	37									
851.2			3	SS	84									
10.5	End of Borehole Note: Water Level not Established													

20
15 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

GEOCRES No. 30M14-117

Boreholes 117-1, 2, 3, 4, 5 and 6



Ministry of
Transportation and
Communications
Ontario

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 117-77-1

6

W P 160-74-31 LOCATION Co-ords. N. 15,972,667; E 1,028,043 ORIGINATED BY V.K.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY G.P.
DATUM Geodetic DATE December 7, 1977 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L		
949.0	Ground Level												
0.0	GROUND												
1.0			1	SS	17								
			2	SS	25								
938.0			3	SS	27		940						0 26 44 30
11.0	Brown Clay		4	SS	25								
			5	SS	20								
	GLACIAL TILL: Heterogeneous Mixture Of Clayey Silt, Sand And Occasional Trace Of Gravel Very Stiff To Hard		6	SS	25		930						
			7	SS	17								4 21 46 29
			8	SS	18		920						
914.0			9	SS	56								
35.0	(With Occasional Layers Or Pockets of Silty Sand)		10	SS	48		910						0 30 44 26
897.5			11	SS	127		900						5 45 29 21
51.5	End Of Borehole												

+3, x³: Numbers refer to
Sensitivity

20
15 + 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 117-77-2

7

W P 160-74-31 LOCATION Co-ords. N. 15,972,590; E. 1,028,043 ORIGINATED BY V.K.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY G.P.
DATUM Geodetic DATE December 12, 1977 CHECKED BY _____

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20	40	60	80	100			
949.0	Ground Level													
0.0	Topsoil													GR SA SI CL
1.0			1	SS	28									2 25 45 28
			2	SS	46									
			3	SS	43									
			4	SS	50									2 26 38 34
			5	SS	42									
931.0	Brown		6	SS	38									
18.0	GLACIAL TILL:		7	SS	33									
	Heterogeneous Mixture		8	SS	38									5 30 44 21
	Of Clayey Silt, Sand													
	And Occasional Trace													
	Of Gravel													
	Very Stiff To Hard													
915.0			9	SS	83									
36.0			10	SS	97									4 24 45 27
	(With Occasional Lay													
	ers Or Pockets Of													
	Silty Sand)													
898.0			11	SS	162									
51.0	End Of Borehole													

³, ⁵: Numbers refer to
Sensitivity

20
15 \div 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 117-77-3

8

W P 160-74-31 LOCATION Co-ords. N. 15,972,707; E 1,028,147 ORIGINATED BY V.K.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY G.P.
DATUM Geodetic DATE December 8, 1977 CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE						
950.0	Ground Level									
0.0	Topsoil									
1.0	GLACIAL TILL Heterogeneous Mixture Of Clayey Silt, Sand And Occasional Trace Of Gravel Very Stiff To Hard		1	SS	16					2 39 50 9
			2	SS	24					
			3	SS	12					
			4	SS	26					0 22 47 31
			5	SS	24					
929.0	Brown Gray		6	SS	28					
21.0			7	SS	19					
			8	SS	22					0 31 42 27
916.0	With Occasional Layers Or Pockets Of Silty Sand)		9	SS	152					
34.0			10	SS	150.6"					
			11	SS	190.6"					0 18 68 14
			12	SS	152.11"					
894.1	End Of Borehole									
55.9										

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 117-77-4

9

W P 160-74-31

LOCATION Co-ords. N. 15, 972,622; E 1,028,147

ORIGINATED BY V.K.

DIST 6 HWY 404

BOREHOLE TYPE Solid Stem Auger & Cone Test

COMPILED BY G.P.

DATUM Geodetic

DATE December 13, 1977

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
948.0	Ground Level												
0.0	Topsoil												
1.0			1	SS	40								
			2	SS	27								
			3	SS	43								
			4	SS	46								
933.0	Brown		5	SS	32								
15.0	Grey		6	SS	26								
	GLACIAL TILL: Heterogeneous Mixture Of Clayey Silt, Sand And Occasional Trace Of Gravel Very Stiff To Hard		7	SS	18								
			8	SS	75								
914.0			9	SS	100 6"								
34.0	(With Occasional Lay- ers Or Pockets Of Silty Sand)		10	SS	100 6"								
897.1			11	SS	141 11"								
50.9	End Of Borehole												

OFFICE REPORT ON SOIL EXPLORATION

*3, x5: Numbers refer to
Sensitivity

20
15-5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 117-77-5

10

W P 160-74-31 LOCATION Co-ords. N.15,972,732; E 1,028,253 ORIGINATED BY V.K.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY G.P.
DATUM Geodetic DATE December 8, 1977 CHECKED BY

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					
948.0	Ground Level														
0.0	Topsoil														
1.0			1	SS	18										
			2	SS	30										
			3	SS	45										
			4	SS	42										
			5	SS	43										
930.0	Brown		6	SS	15										
18.0	Grey		7	SS	28										
	GLACIAL TILL:		8	SS	29										
	Heterogeneous Mixture		9	SS	107										
	Of Clayey Silt, Sand		10	SS	104/6"										
	And Occasional Trace														
	Of Gravel														
	Very Stiff To Hard														
914.0															
34.0															
	(With Occasional Lay- ers Or Pockets Of Silty Sand)														
897.2															
50.8	End Of Borehole														

OFFICE REPORT ON SOIL EXPLORATION

*3, *5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 117-77-6

11

W P 160-74-31 LOCATION Co-ords. N.15,972.654: P.1,028,250 ORIGINATED BY V.K.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY C.P.
DATUM Geodetic DATE December 9, 1977 CHECKED BY

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					
948.0	Ground Level																
0.0	Topsoil																
1.0	GLACIAL TILL		1	SS	26												
	Heterogeneous Mixture		2	SS	37												
	of Clayey Silt, Sand		3	SS	44												
	and Occasional Trace		4	SS	51												
	of Gravel		5	SS	49												
	Very Stiff to Hard																
929.0	Brown		6	SS	21												
19.0	Grey		7	SS	25												
			8	SS	97												
918.0			9	SS	61												
30.0	(With Occasional Lay- ers Or Seams Of Silty Sand)		10	SS	130.5"												
897.0			11	SS	203												
51.0	End Of Borehole																

OFFICE REPORT ON SOIL EXPLORATION

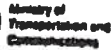
3, x⁵ Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

GEOCRES No. 30M14-275

Boreholes 275-78-1, 2, 3, 4, 5 and 6

Boreholes 275-99-1, 2, 3 and 4



RECORD OF BOREHOLE No 275-78-1

ORIGINATED BY OL. J.

COMPILED BY OL. J.

CHECKED BY UJ.

[illegible]

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 275-78-1 cont.

W P 160-74-32 LOCATION Coords. N 15 979 708, E 1 028 052 ORIGINATED BY OL. J.
DST 6 HWY 404 BOREHOLE TYPE Hollow Stem Auger BX Casting and Cone Test COMPILED BY OL. J.
DATUM Geodetic DATE February 27, 1978 CHECKED BY 2.1

[illegible]

RECORD OF BOREHOLE No 275-78-2

[illegible][illegible]

RECORD OF BOREHOLE No 275-78-3

160-74-32 LOCATION Coords. N 15 979 772, E 1 028 251 ORIGINATED BY 01, J.
 HWY 404 BOREHOLE TYPE Hollow Stem Augers and Cone Test COMPILED BY 01, J.
 Geodetic DATE February 28, 1978 CHECKED BY V.T.

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 (%) GR SA SI CL
DEPTH (ft)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20	40	60	80	100					
1021.2	Ground Level															
1020.7	Silty Top Soil															
	Clayey silt, with Sand		1	SS	6											0 49 33 18
	Firm to stiff		2	SS	21											
1009.7																
	Sand		3	SS	66											
	Trace to some gravel		4	SS	79											0.88 (4)
	very dense		5	SI	103											
995.7																
28.0	Silty fine sand with occasional layers of silt		6	SS	54											
	boulder		7	SS	100	2 1/2"										
	very dense		8	SS	83											2 13 81 4
	silt		9	SS	149											
977.2																
46.5	End of borehole															

3, 5: Numbers refer to Sensitivity

20
 15 1/2 (%) STRAIN AT FAILURE
 10

Highway Engineering Division-Engineering Materials Office-Soil Mechanics Section

RECORD OF BOREHOLE No 275-78-4

W.P. 160-74-32 LOCATION Coords. N 15 979 808 E 1 028 035 ORIGINATED BY Ol. J
 DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Auger BX Casing & Cone Test COMPILED BY Ol. J
 DATUM Geodetic DATE May 7, 1978 CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED ♦ FIELD VANE ● QUICK TRIAXIAL × LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	"N" VALUES						
1005.9	Ground Level										
0	Silty Top Soil										
1.0	Clayey Silt with Sand		1	SS	14						
	Stiff to very stiff		2	SS	38						0 10 84 6
993.9			3	SS	43						
12.0	Silty fine sand with occasional layers of silt. Compact to very dense.		4	SS	37						
	----- silt		5	SS	51						0 13 71 16
	Generally		6	SS	27						
	Dense to very dense		7	SS	28						0 49 49 2
			8	SS	22						
			9	SS	4						
			10	SS	32						
944.4			11	SS	56						
61.5	End of borehole										

RECORD OF BOREHOLE No 275-78-5

WP 160-74-32 LOCATION Coords. N 15 979 847 N 1 028 150 ORIGINATED BY 01. J
DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Auger BX Casing & Cone Test COMPILED BY 01. J
DATUM Geodetic DATE March 3 & 7 1978 CHECKED BY *WJ*

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
								SHEAR STRENGTH									
						</											

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 275-78-5 cont.

PROJECT 160-74-32 LOCATION Courde. N 15 979 847 E 1 020 150 ORIGINATED BY OL. J.
 DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Auger BX Casing & Cone Test COMPILED BY OL. J.
 DATUM Geodetic DATE March 7, 1978 CHECKED BY *[Signature]*

SOIL PROFILE		STRAT PLOT	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 (%) GR SA SI CL
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
716.4	Cont.																
701.5																	
			15	SS	15A	11"	810										2 31 62 5
							900										
691.4			16	SS	71												
676.5	End of borehole																

RECORD OF BOREHOLE No 275-78-6

160-74-32 LOCATION Coords. N 15 979 872 E 1 028 230 ORIGINATED BY OL. J.
 5 HWY 404 BOREHOLE TYPE Hollow Stem Auger BX Casing & Cone Test COMPILED BY OL. J.
 Datum Geodetic DATE March 1 & 2 1978 CHECKED BY *WJ*

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 (%) GR SA SI CL
DEPTH Feet	DESCRIPTION	NUMBER	TYPE	W VALUES			20	40	60	80	100				
0.0	Ground Level														
1.0	Silty Top Soil														
2.0	Clayey silt with sand and a trace of gravel	1	SS	9											
3.0	Firm to very stiff	2	SS	32											3 23 52 20
14.0	Sand Trace of gravel Dense to very dense	3	SS	92											
19.5		4	SS	30											0 96 (4)
22.0	Silty Fine Sand with	5	SS	64											
	Occasional layers of Silt	6	SS	33											0 12 69 19
	Low plasticity.	7	SS	36											
	Generally	8	SS	19											
	Dense to very dense	9	SS	39											
		10	SS	75											
		11	SS	69											
		12	SS	106											
		13	SS	99											
925.8 91.5		14	SS	35											

3, 5: Numbers refer to
Sensitivity

20
15 ± 5 (%) STRAIN AT FAILURE
10

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 275-78-6 cont.

PROJECT 160-74-32 LOCATION Coards. N 15 979 872 E 1 028 230 ORIGINATED BY OL J.
 DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Auger BX Casing & Cone Test COMPILED BY OL J.
 DATUM Geodetic DATE March 3 & 6 1978 CHECKED BY slf

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	W VALUES			20	40	60	80	100					
925.0 91.5	Cont.																
	Silty fine Sand Very dense		15	SS	100	1/2"											0 85 (15)
			16	SE	195	1/8"											
			17	SS	62												
			18	SS	71												
885.0 131.5	End of Borehole																

*3, *5: Numbers refer to Sensitivity

20
15 * 5 (%) STRAIN AT FAILURE

PROJECT 991-8024		RECORD OF BOREHOLE No 275-99-1		1 OF 2	METRIC
W.P. 433-88-00		LOCATION N 4870628.02; E 313378.93		ORIGINATED BY DKB	
DIST 8 HWY 404		BOREHOLE TYPE 114mm SOLID STEM AUGERS		COMPILED BY DKB	
DATUM GEODETIC		DATE 9.8.99		CHECKED BY AJW	

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 ● QUICK TRIAXIAL	+ FIELD VANE x REMOULDED					
303.88 0.10	Topsail Sand, some silt, trace gravel Compact Brown Moist (Fill)		1	50 DO	18									
302.61 1.27	Clayey Silt, trace gravel and sand Hard Brown Moist		2	50 DO	22									
			3	50 DO	41									
301.14 2.74	Silt and Sand to Silty Sand, occ. layers of silt Compact to Dense Brown Moist to wet		4	50 DO	70									
300.13 3.76			5	50 DO	38									
299.38 4.50	Silt		6	50 DO	34									
			7	50 DO	20									
			8	50 DO	24									
			9	50 DO	20									
			10	50 DO	17									
			11	50 DO	23									
			12	50 DO	24									
291.08 12.80	END OF BOREHOLE													

ON MOT 991-8024.GPJ ON MOT GDT 2411698

Continued Next Page

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

PROJECT 991-8024		RECORD OF BOREHOLE No 275-99-1				2 OF 2		METRIC									
W.P. 433-98-00		LOCATION N 4870628.02; E 313378.93				ORIGINATED BY DKB											
DIST 6 HWY 404		BOREHOLE TYPE 114mm SOLID STEM AUGERS				COMPILED BY DKB											
DATUM GEODETIC		DATE 9.8.99				CHECKED BY AJW											
SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W _p	W	W _L		
	Note: 1. Water level measured in open borehole at 3.4m depth (Elev. 300.5) upon completion of drilling. 2. Water level measured in piezometer at 4.4m depth (Elev. 299.5) on August 18/99. 3. Water level measured in piezometer at 4.4m depth (Elev. 299.5) on August 24/99 and October 19/99.																

ON MOT 991-8024.GPJ ON MOT.GDT 24/11/99

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

PROJECT 991-8024		RECORD OF BOREHOLE No 275-99-3		1 OF 1		METRIC	
W.P. 433-88-00		LOCATION N 4870910.30; E 313384.64		ORIGINATED BY DKB			
DIST 6 HWY 404		BOREHOLE TYPE 114mm SOLID STEM AUGERS		COMPILED BY DKB			
DATUM GEODETIC		DATE 10.8.99		CHECKED BY AJW			

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	W _u VALUES			SHEAR STRENGTH kPa						
								UNCONFINED ○	FIELD VANE +					
310.14	Topsoil													
0.15	Silty Sand, trace gravel		1	50 DO	19									
309.44	Compact Brown Moist (FII)		2	50 DO	12									
0.70	Clayey Sil, trace to some sand, trace gravel, occ. silty sand seams/pocketa, occ. organics		3	50 DO	16									
307.93	Stiff to very stiff Brown Moist (FII)		4	50 DO	39									
2.21	Clayey Sil, trace to some sand, trace gravel, Very stiff to hard Brown Moist		5	50 DO	24									
	Sand layer noted at 2.97m-3.35m depth.		6	50 DO	39									
305.87	Sand, trace silt, trace gravel Dense to very dense Brown Dry to moist		7	50 DO	45									8 87 5 0
4.27			8	50 DO	75									
302.97	Clayey Sil, some sand, trace gravel Hard Brown Moist		9	50 DO	50/15									
7.17														
302.22														
7.92	END OF BOREHOLE													
	Note: 1. Open borehole dry upon completion of drilling. 2. Piezometer dry on August 18/99. 3. Piezometer dry on August 24/99.													

PROJECT 991-8024 RECORD OF BOREHOLE No 275-99-4 1 OF 1 **METRIC**

W.P. 433-88-00 LOCATION N 4970872.81; E 313371.74 ORIGINATED BY DKB

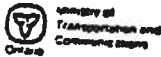
DIST 8 HWY 404 BOREHOLE TYPE 114mm SOLID STEM AUGERS COMPILED BY DKB

DATUM GEODETIC DATE 10.8.99 CHECKED BY AJW

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					
310.09 0.00	Topsoil						310										
0.15	Silty Sand, trace gravel Compact Brown Moist (Fill)		1	50 DO	10												
			2	50 DO	18												
308.64 1.45	Clayey Silt, trace to some sand, trace gravel, occ. silty sand seams/pockets, occ. organics Very stiff Brown Moist (Fill)		3	50 DO	17												
			4	50 DO	19												
307.12 2.97	Clayey Silt, trace to some sand, trace gravel Very stiff Brown Moist		5	50 DO	22												
	Sand layer noted from 3.35m to 3.74m depth.		6	50 DO	24												
305.59 4.50	Silt, trace sand Compact to very dense Brown Moist to wet		7	50 DO	19												
			8	50 DO	34												
			9	50 DO	50/15												
302.17 7.82	END OF BOREHOLE																
	Note: Open borehole dry upon completion of drilling.																

GEOCRES No. 30M14-274

Boreholes 274-1, 3, 4, 8, 9, 10, 14, 16, 17, 19, 20, 21, 22, 23, 114, 117 and 230



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-1

W P 160-74-33 LOCATION Coorids. N 13.938.028 E 1.027.174 ORIGINATED BY M.H.
DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Augers and Cone Test COMPILED BY M.H.
DATUM Geodetic DATE March 9, 1978 CHECKED BY J.T.

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
996.2	Ground Surface													
0.0	Organic Silt, Some Sand Loose													
990.2			1	TU	PH									
6.0			2	SS	4									9 27 48 16
			3	SS	5									
			4	SS	8									2 36 44 18
			5	SS	8									3 24 57 16
			6	SS	20									
			7	SS	27									
			8	SS	26									
			9	SS	65									0 1 79 20
			10	SS	37									
			11	SS	55									0 10 74 16
			12	SS	47									
			13	SS	50									11 10 73 6
			14	SS	56									
919.2														
77.0	Heterogeneous Mixture, Clayey Silt, Sand and Gravel (Glacial Till) Hard		15	SS	60/4"									
			16	SS	178									4 37 43 16
894.7														
101.5	End of Borehole		17	SS	150/2"									

3, 5: Numbers refer to 20
Sensitivity 15 ± 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION



Highway Engineering Division
Engineering Materials Office
Soil Mechanics Section

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-3

W P 150-74-33

LOCATION Coords. N 15,985,146 E 1,027,455

DIST 6 HWY 404

BOREHOLE TYPE Hollow Stem Augers and Cone Test

ORIGINATED BY H.M.

DATUM Geodetic

DATE March 7 & 8, 1978

COMPILED BY H.M.

CHECKED BY J.L.

OFFICE REPORT ON SOIL EXPLORATION

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 (%) GR SA SI C
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES			SHEAR STRENGTH				W _p	W	W _L		
								UNCONFINED + FIELD VANE QUICK TRIAXIAL & LAB VANE 400 800 1200 1600 2000								
WATER CONTENT (%) 20 40 60																

999.6	Ground Surface														
0.0	Silt, Some Sand Loose to Compact					No Water Level Established									
992.6			1	SS	11										0 26 68 6
6.0	Clayey Silt to Silt of Slight Plasticity		2	SS	1		990								0 2 69 29
	Soft		3	SS	PH										
			4	SS	PH		980								
974.6															
24.0	Sand, Some Silt Some Gravel		5	SS	8										27 44 24 5
	Loose to Compact		6	SS	6		970								7 69 (24)
			7	SS	70										20 75 (5)
959.6			8	SS	18		960								0 7 81 12
39.0	Clayey Silt to Silt of Slight Plasticity		9	SS	41										
	Silt		10	SS	18		950								
	Very Stiff to Hard		11	SS	22										
			12	SS	67		940								
			13	SS	41										
225.6			14	SS	60/5"		930								
73.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel		15	SS	145		920								
	Hard Glacial Till														
907.1			16	SS	100/1"		910								
91.5	End of Borehole														
	Note: Water Level Not Established														

3, 10³ : Numbers refer to Sensitivity
20
15 10 5 (%) STRAIN AT FAILURE



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-4

W P 250-74-33 LOCATION Coords. N 15,995,250; E 1,027,475
DIST 6 HWY 406 BOREHOLE TYPE Hollow Stem Augers and Cone Test ORIGINATED BY P.L.L.
DATUM Geodetic DATE March 8, 1978 COMPILED BY M.H.
CHECKED BY J.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE 400 800 1200 1600 2000	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ PCF	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAI PLOT	NUMBER	TYPE	'N' VALUES						
995.3	Ground Surface										
0.0	Clayey Silt to Silt of Slight Plasticity With Random Seams of Silt and Fine Sand		1	TV	PH		990				
			2	TV	PH						
	Very Soft Soft to Stiff		3	TV	PH		980				
972.3			4	TV	PH						
23.0	Silt, Some Sand Trace Clay Loose to Compact		5	SS	9		970			130	0 29 61 10
			6	SS	11						
957.3			7	SS	16		960				
38.0	Sand, Some Silt Some Gravel Compact		8	SS	17						
949.8			9	SS	18		950			7 51 38 4	
45.5	Clayey Silt to Silt of Slight Plasticity Some Sand Hard		10	SS	50						
			11	SS	38		940			7 33 55 15	
933.8			12	SS	70						
61.5	End of Borehole										

3, x5: Numbers refer to Sensitivity
20
15
10
5 (%) STRAIN AT FAILURE



HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-8

W.P. 160-74-33

LOCATION Coords. N 15,955,148; E 1,027,313

ORIGINATED BY O.J.

DIST 6 HWY 404

BOREHOLE TYPE Hollow Stem Augers and Cone Test

COMPILED BY

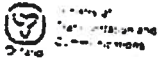
DATUM Geodetic

DATE March 7, 1978

CHECKED BY

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 (%) GR SA SI CL
ELEV. DEPTH	DESCRIPTION	STAT PLOT	NUMBER	TYPE			VALUES	20					
994.7	Ground Surface												
0.0	Organic Silt Very Soft to Soft												
	Organic Clay Very Soft		1	SS	PH								On 17% W 148%
984.0			2	SS	0/1"								
10.0	Clayey Silt to Silt of Slight Plasticity		3	SS	1/16"								
	Very Soft		4	SS	10								14 23 50 13
	Stiff to Hard		5	SS	9								
	Some Sand		6	SS	9								
			7	SS	18								
			8	SS	25								2 23 61 14
			9	SS	55								0 1 80 19
	Sand, Some Silt, Compact		10	SS	28								10 42 34 14
936.7			11	SS	55								
58.0	Heterogeneous Mixture, Clayey Silt Sand and Gravel Hard (Glacial Till)		12	SS	145								9 50 31 10
			13	SS	100/2"								
			14	SS	100/3"								
			15	SS	100/4"								14 44 32 10
928.2			16	SS	100/5"								
96.5	End of Borehole												

*3, x5: Numbers refer to
Sensitivity20
15
10
5 (%) STRAIN AT FAILURE



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-9

W P 160-74-33

LOCATION Coords. N 15,985,385; E 1,027,464

ORIGINATED BY O.J.

DIST 6 HWY 404

BOREHOLE TYPE Hollow Stem Augers

COMPILED BY O.J.

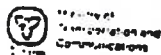
DATUM Geodetic

DATE March 10 & 13, 1978

CHECKED BY J.J.

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	400 800 1200 1600 2000					
995.4	Ground Surface													
0.0	Organic Silt Very Soft													
	Organic Clay Very Soft		1	TV	PH									W 116% On L 13% On 10%
979.4			2	SS										
16.0	Sand, Some Silt Some Gravel Compact		3	SS	2									17 74 (9)
			4	SS	14									1 54 35 10
968.4			5	SS	20									
27.0	Clayey Silt to Silt of Slight Plasticity Very Stiff		6	SS	19									
961.4			7	SS	20									
34.0	Sandy Gravel		8	SS	41									
956.4	Compact		9	SS	41									
39.0	Clayey Silt to Silt of Slight Plasticity Some Sand Hard		10	SS	17									
			11	SS	55									
935.4			12	SS	150									
60.0	Heterogeneous Mixture Clayey Silt Sand and Gravel (Glacial Till) Hard		13	SS	72									
			14	SS	100/4"									
203.9			15	SS	100/2"									
91.5	End of Borehole													

*3, *5: Numbers refer to
Sensitivity20
15
10
5
0
(%) STRAIN AT FAILURE



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-10

W P 160-74-33 LOCATION Coords. N 15,996.984; E 1,027,348
DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Augers and Cone Test
DATUM Geodetic DATE March 13, 1978
ORIGINATED BY S.L.
COMPILED BY H.H.
CHECKED BY J.F.

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
996.4	Ground Surface															
0.0	Organic Silt Very Soft to Soft		1	SS	1											
			2	PS	PH											
986.4			3	SS	1											
10.0	Clayey Silt to Silt of Slight Plasticity With Random Seams or Pockets of Silt and Fine Sand Very Soft to Soft		4	TH	PH											
			5	SS	1											
			6	TH	PH											
			7	SS	1											
			8	TH	PH											
	Clayey Silt to Silt of Slight Plasticity Some Sand		9	TH	PH											
			10	TH	PH											
	Stiff Very Stiff to Hard		11	SS	17											
			12	SS	18											
			13	SS	33											
			14	SS	29											
911.4																
85.0	Heterogeneous Mixture, Clayey Silt Sand and Gravel Glacial Till Zoned															
899.9			15	SS	100/5"											
96.5	End of Borehole															

3, x³ : Numbers refer to Sensitivity
20
15 ϕ 5 (%) STRAIN AT FAILURE



Division of
Transportation and
Communications

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

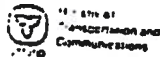
RECORD OF BOREHOLE No 274-14

W P 160-74-33 LOCATION Coords. N 15,984,940; E 1,027,378 ORIGINATED BY D.C.
 DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY M.M.
 DATUM Geodetic DATE May 24, 1978 CHECKED BY E.J.

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										WATER CONTENT (%)		
								SHEAR STRENGTH										20 40 60		
								○ UNCONFINED ♦ FIELD VANE												
								● QUICK TRIAXIAL x LAB VANE												
								400 800 1200 1600 2000												
996.4	Ground Surface															GR SA SI CL				
0.0	Sand With Silt		1	SS	2											2 50 40 8				
	Loose		2	SS	11															
			3	SS	4															
	Soft Clayey Silt		4	SS	5											1 52 39 1				
			5	SS	4															
			6	SS	5															
977.4																				
19.0	Clayey Silt to Silt of Slight Plasticity Some Sand Very Stiff		7	SS	7											10 17 50 23				
968.4			8	SS	8															
28.0	Silt Compact to Dense		9	TH	PH															
			10	SS	14															
			11	SS	25															
			12	SS	18															
			13	SS	36															
			14	SS	38															

PROFILE REPORT ON SOIL EXPLORATION

3, 5: Numbers refer to Sensitivity
 20
 15 \rightarrow 5 (%) STRAIN AT FAILURE
 10



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-16

W P 160-74-33

LOCATION Coords. N 15,985,063; E 1,027,455

DIST 6

HWY 404

BOREHOLE TYPE Hollow Stem Augers

ORIGINATED BY D.C.

DATUM Geodetic

DATE May 31 & June 1, 1978

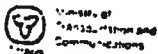
COMPILED BY H.M.

CHECKED BY J.J.

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION [%]	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH							WATER CONTENT (%)
								UNCONFINED QUICK TRIAXIAL	FIELD VANE LAB VANE						
999.0	Ground Surface							20 40 60 80 100						GR SA SI CL	
0.0	Organic Silt With Sand		1	SS	3									On 4%	
993.0	Soft		2	SS	10									2 26 57 15	
5.0	Clayey Silt to Silt of Slight Plasticity With Random Seams of Silt and Fine Sand		3	SS	9									0 18 66 16	
			4	SS	5										
983.0	Firm to Stiff		5	SS	9										
15.0	Silt, Some Sand Compact		6	SS	10										
			7	SS	11										
			8	SS	11										
			9	SS	11									2 29 63 6	
963.0															
35.0	Clayey Silt to Silt of Slight Plasticity Very Stiff		10	SS	23									2 10 54 34	
			11	TV	PH										
		</													

3, 5: Numbers refer to
Sensitivity20
15 5 (%) STRAIN AT FAILURE
10

SEE ALSO SOIL EXPLORATION



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-17

W P 160-74-33

LOCATION Coords. N 15,985,024; E 1,027,490

ORIGINATED BY DC.

DIST 6

HWY 404

BOREHOLE TYPE Hollow Stem Augers 0-55, Washboring With Casing

COMPILED BY J.J.

DATUM

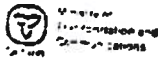
Geodetic

DATE June 1, 1978 and June 2, 1978

CHECKED BY J.J.

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				
1000.3	Ground Surface															
998.3	Organic Silt With Sand Very Soft		1	SS	5		1000									GR SA SI CL
998.3	Sand, Some Silt		2	SS	13											
	Compact		3	SS	17											
990.3			4	SS	26		990									
			5	SS	43											
10.0	Clayey Silt to Silt of Slight Plasticity Some Sand With Pockets of Sand and Gravel up to 1 Ft. Thick Every 4 Feet		6	SS	21											
			7	SS	17											
			8	SS	23		980									22 15 38 25
	Very Stiff		9	SS	36											
971.9	Silt		10	SS	14		970									
29.0	Compact to Dense															
							960									
			11	SS	18		950									
							940									
							930									
923.3																
77.0	Heterogeneous Mixture, Clayey Silt Sand and Gravel (Glacial Till)		12	SS	100/ 1"		920									
	Hard		13	SS	93/ 6"											29 37 24 10
			14	SS	110/ 2"		910									
903.8			15	SS	110/ 4"											
96.5	End of Borehole															

3, x 5: Numbers refer to
Sensitivity20
15 5 (%) STRAIN AT FAILURE
10



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-19

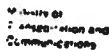
W/P 150-74-33 LOCATION Coords. N 15,984,750; E 1,027,362
DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Augers 0-60, Washboring With Casing 60-107
DATUM Geodetic DATE June 6, 1978
ORIGINATED BY D.C.
COMPILED BY J.J.
CHECKED BY R.J.

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 VALUES			20	40	60	80	100				
1009.4	Ground Surface															
0.0	Sand, Some Gravel		1	SS	4											
	Dense		2	SS	19											30 56 (16)
998.4			3	SS	37		1000									
11.0	Clayey Silt to Silt of Slight Plasticity Some Sand		4	SS	14											1 32 51 16
987.4	Hard		5	SS	34		990									
22.0	Silt, Some Sand Compact		6	SS	10											
981.4			7	SS	10											
28.0	Clayey Silt to Silt of Slight Plasticity Some Sand Hard		8	SS	40		980									0 37 59 4
			9	SS	40											
			10	SS	149		970									
			11	SS	182											
			12	SS	182		960									
			13	SS	94/6											
			14	SS	100/5"		950									
			15	SS	100/6"		940									
932.4			16	SS	100/5"											
77.0	Heterogeneous Mixture, Clayey Silt, Sand and Gravel		17	SS	100/5"		930									
	Silt		18	SS	100/5"											
	Hard		19	SS	100/5"		920									
	Glacial Till		20	SS	100/5"											
902.9			21	SS	100/5"		910									8 47 34 11
106.5	End of Borehole		22	SS	100/5"											

OFFICE REPORT ON SOIL EXPLORATION

*3, *5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE



RECORD OF BOREHOLE No 274-20

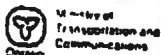
W P 160-74-33 LOCATION Coords. N 13,984,878; E 1,027,458 ORIGINATED BY D.C.
DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Augers 0-50, Washboring With Casing COMPILED BY J.J.
DATUM Geodetic DATE June 8, 1978 CHECKED BY 21

[illegible]

*3, *5: Numbers refer to Sensitivity

15 ϕ 5 (%) STRAIN AT FAILURE

TABLE THREE UN SOIL EXPLANATION



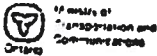
HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-21

W P 160-74-33 LOCATION Coords. N 15,983,514; E 1,027,440 ORIGINATED BY D.C.
DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY J.J.
DATUM Geodetic DATE June 9, 1978 CHECKED BY J.J.

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAI PLOT	NUMBER	TYPE	W _p VALUES			20	40	60	80	100					
1003.3	Ground Surface		1	SS	3		1000										GR SA SI CL
0.0	Trace Organics		2	SS	5												On 4%
996.3	Sand, Some Silt Loose		3	SS	27												2 67 25 6
7.0			4	SS	18												0 19 66 15
			5	TV	PH		990										
			6	SS	24												
			7	SS	24												
	Some Sand		8	SS	38		980										
	Clayey Silt to Silt of Slight Plasticity		9	SS	36												
			10	SS	24		970										
	Very Stiff to Hard		11	SS	30		960										
			12	SS	126/ 6"		950										0 2 80 18
928.3			13	SS	100/ 5"		940										
75.0	Heterogeneous Mixture, Clayey Silt Sand and Gravel Hard		14	SS	100/ 4"		930										7 43 38 12
916.8							920										
86.5	End of Borehole																

3, 2: Numbers refer to 20
Sensitivity 15 \diamond 3 (%) STRAIN AT FAILURE



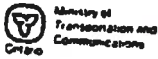
HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-22

W P 160-74-33 LOCATION Coords. N 15,985,386; E 1,027,415
DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Augers (0-65 ft.) and Washboring
DATUM Geodetic DATE June 12-14, 1978 (65 ft.)
ORIGINATED BY D.G.
COMPILED BY H.N.
CHECKED BY W.J.

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	VALUES		20	40	60	80	100					
996.0	Ground Surface															
995.0	Organic Silt		1	SS	5											
2.0	Sand, Some Silt Some Gravel		2	SS	15											
	Loose to Compact		3	SS	6											
			4	SS	17											
			5	SS	17											
979.0			6	SS	9											
17.0	Clayey Silt to Silt of Slight Plasticity		7	SS	11											
	Very Stiff		8	SS	10											
			9	SS	15											
			10	SS	24											
943.0			11	SS	113											
53.0	Heterogeneous Mixture, Clayey Silt		12	SS	88											
	Sand and Gravel		13	SS	120/ 5"											
	Glacial Till		14	SS	100/ 3 1/2"											
	Hard Cobbles		15	SS	100/ 6"											
919.5			16	SS	114/ 6"											
76.5	End of Borehole															

3, 4, 5: Numbers refer to 20
Sensitivity 15 ϕ 3 (%) STRAIN AT FAILURE



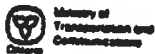
HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 274-23

W P 160-74-33 LOCATION Coords. N 15,985,302; E 1,027,300 ORIGINATED BY D.C.
DIST 6 HWY 404 BOREHOLE TYPE Rally Stem Augers COMPILED BY H.W.
DATUM Geodetic DATE June 14-15, 1978 CHECKED BY R.J.

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 ₁ VALUES			20 40 60 80 100									WATER CONTENT (%)
								SHEAR STRENGTH					20 40 60				
996.2	Ground Surface																
994.9	Organic Silt		1	SS	6											GR SA SI CL	
2.0	Sand, Some Silt		2	SS	16											Om 22	
990.2	Compact																
6.0	Clayey Silt to Silt of Slight Plasticity Very Stiff to Hard		3	SS	20		990									2 21 41 36	
			4	SS	24												
			5	SS	27												
			6	SS	31		980										
			7	SS	28												
			8	SS	37		970									0 2 77 21	
			9	SS	22												
			10	SS	71		960										
			11	SS	104												
							950										
948.2	Silt Very Dense		12	SS	100/ 5"											10 43 32 13	
941.2																	
55.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel Cobbles Hard Glacial Till		13	SS	105/ 6"		940										
			14	SS	100/ 5"												
							930										
924.7	End of Borehole																
71.5																	

SOIL PROFILE AND SURFACE EXPLANATION



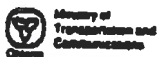
Ministry of
Transportation and
Communications
Ontario

RECORD OF BOREHOLE No 274-114

IMPERIAL

W P 160-74-56 LOCATION Co-ords. N 15 984 832; E 1 027 337 ORIGINATED BY AHT
DIST 6 HWY 406 BOREHOLE TYPE Washbora COMPILED BY RH
DATUM Geodetic DATE 83 06 13-14 CHECKED BY SP

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIMIT MOISTURE CONTENT		UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	W VALUES		SHEAR STRENGTH		W _p	W _L		
							○ UNCONFINED	♦ FIELD VANE	WATER CONTENT (%)			
							○ QUICK TRIAXIAL	× LAB VANE	10	20	30	
1005.4	Ground Surface											GR SA SI CL
0.0	Fill		1	SS	2							8 30 48 14
	Clayey Silt to Silt		2	SS	2							
	of Slight Plasticity		3	SS	2							
	some sand, trace		4	SS	2							
	gravel		5	SS	4							12 32 47 9
	Soft to Firm		6	SS	6							
991.6			7	SS	4							1 29 56 14
13.8	Sand, some silt		8	SS	14							
	Loose to Compact		9	SS	10							
			10	SS	11							
			11	SS	6							
			12	SS	12							
982.4			13	SS	24							
23.0	Clayey Silt to Silt		14	SS	19							
	of Slight Plasticity		15	SS	23							29 21 40 10
	some sand with		16	SS	22							
	seams of sand		17	SS	18							
	and silt		18	SS	9							
	Stiff to Very Stiff		19	SS	12							2 25 62 11
965.4												
40.0			20	SS	23							0 0 92 8
	Silt											
	trace of clay		21	SS	37							
			22	SS	35							0 0 92 8
			23	SS	42							
			24	SS	27							
			25	SS	33							0 0 96 4
	Compact		26	SS	19							
	to		27	SS	6							
	Dense		28	SS	31							
919.4												
86.0	Heterogeneous Mixture		29	SS	54							
	Clayey Silt, sand											
913.9	and gravel											
	(Glacial Till) Hard		30	SS	154							
91.5	End of Borehole											
	• Note: Groundwater Level Not Established											



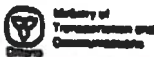
RECORD OF BOREHOLE No 274-117

IMPERIAL

W P 160-74-36 LOCATION Co-ords. N 15 984 819; E 1 027 340 ORIGINATED BY JH
DIST 6 HWY 404 BOREHOLE TYPE Washboring COMPILED BY JH
DATUM Geodetic DATE 83 06 23-24 CHECKED BY GP

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	% VALUES			20	40	60	80	100					
1013.5	Ground Surface																
0.0	Fill		1	SS	3		1010										2 22 56 20
	Clayey Silt		2	SS	1												6 25 54 15
	some sand		3	SS	4												
	Soft to Stiff		4	SS	12												
			5	SS	10												
			6	SS	11												
			7	SS	8												
997.4			8	SS	24		1000										
	Clayey Silt		9	SS	9												
16.1	Clayey Silt to Silt of Slight Plasticity		10	SS	17												
	some sand		11	SS	11												
990.5	Stiff to Very Stiff		12	SS	12												
23.0			13	SS	11												
987.5	Sand, some silt		14	SS	31		990										
	Compact		15	SS	26												
26.0			16	SS	21												
	Silt, some sand		17	SS	27												
	Compact		18	SS	14												
979.0			19	SS	20												
34.3			20	SS	13		980										
	Clayey Silt, some sand		21	SS	17												
975.0	Very Stiff																
38.5			22	SS	22												
			23	SS	32		970										
			24	SS	33												
			25	SS	24												
	Silt		26	SS	28												
	trace clay		27	SS	41		960										
			28	SS	31												
			29	SS	38												
			30	SS	28		950										
			31	SS	22												
			32	SS	42												
917.5			33	SS	73		940										
96.0	Heterogeneous Mixture																
	Clayey Silt Sand and																
912.6	Gravel (Glacial Till) Hard		34	SS	100/4"		930										
100.9	End of Borehole						920										
	* Note																
	Groundwater Level																
	Not Established																

*³, *⁵: Numbers refer to 20
10 ± 5 (%) STRAIN AT FAILURE



RECORD OF BOREHOLE No 274-230

IMPERIAL

W P 160-74-56

LOCATION

Co-ords. N 15 984, 771; E 1 027 396

ORIGINATED BY LP

DIST 6

HWY 404

BOREHOLE TYPE

Hollow Stem Auger

COMPILED BY LP

DATUM

Geodetic

DATE

83 12 14, 15 & 16

CHECKED BY SP

OFFICE REPORT ON SOIL EXPLORATION

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 VALUES		20	40	60	80	100					
1034.1	Ground Elevation															
0.0																
	<u>Fill</u> Clayey Silt to Silt of Slight Plasticity some sand Very Stiff		1	SS	3	1030										1 27 55 17
			2	SS	9											
			3	SS	13	1020										
			4	SS	11											
1011.1			5	SS	14	1010										0 14 60 26
23.0	Clayey Silt to Silt of Slight Plasticity Some Sand Very Stiff to Hard		6	SS	29											
			7	SS	45	1000										2 33 50 15
			8	SS	38											
989.1			9	SS	41	990										0 25 72 3
45.0	Silt some sand Dense		10	SS	36											
987.1																
51.0			11	SS	43	980										
	Clayey Silt to Silt of Slight Plasticity Very Stiff to Hard		12	TV	FR	970										
			13	SS	80	960										0 1 94 5
						950										
						940										
			14	SS	11											
			15	SS	18	930										0 2 92 6
927.1			16	SS	130.8"											
107.0	Silt Very Dense															
923.1			17	SS	132.9"	920										10 46 33 11
111.0	Heterogeneous mixture Clayey Silt, Sand and Gravel															
914.1	Hard		18	SS	160.4"											
120.0	End of Borehole															

• Note: Groundwater
Level not established• 3, 4 : Numbers refer to
Sensitivity20
15 + 5 (%) STRAIN AT FAILURE
10

GEOCRES No. 30M14-156

Boreholes 156-1, 2, 3, 4, 5, 6 and 7

RECORD OF BOREHOLE No 156-1

W P 160-74-34 LOCATION Co-ords N 15,986,637; E 1,027,256 ORIGINATED BY G.P.
DIST 6 HWY 404 BOREHOLE TYPE 3 1/2" ID. Hollow Stem Auger & Cone Test COMPILED BY R.S.
DATUM Geodetic DATE February 14 and 17, 1978 CHECKED BY

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						
995.4	Ground Level													
0.0	Roadway Fill													
990.9	Silty Sand and Gravel													
4.5	Topsoil													
986.0	Sandy Gravel Traces of Silt Brown													
9.4														
	Irregular Layers of Clayey Silt and Silt of Slight Plasticity Also Random Layers or Pockets of Silt		1	TW	PH									0 2 87 11
	Grey		2	TW	PH									
	Stiff		3	TW	PH								126	
958.4			4	TW	PH									0 2 76 22
37.0	End of Borehole													
953.9														
41.5	End of Cone Test													



RECORD OF BOREHOLE No 156-2

W P 160-74-34 LOCATION Coords. N 15,986,597; E 1,027,266 ORIGINATED BY G.P.
DIST 6 HWY 404 BOREHOLE TYPE 3 1/2" I.D. Hollow Stem Augers - Washboring & Cone COMPILED BY R.S.
DATUM Geodetic DATE February 8, 9 & 10, 1978 Test CHECKED BY J.S.

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	PSF					
994.0	Ground Level													
0.0	Topsoil													
986.6	Sandy Gravel Traces of Silt Compact Brown		1	SS	15		990							
7.4			2	SS	19									
			3	SS	18									0 2 83 15
			4	TW	PH		980		S=4.8					
			5	SS	6									
			6	TW	PH				S=5.3					
			7	SS	5		970		S=3.8					
			8	TW	PH									0 1 (99)
			9	SS	13		960							
952.0			10	SS	50									6 3 74 17
42.0			11	SS	53		950							0 2 92 6
			12	SS	52									
			13	SS	41		940							
			14	SS	81									
			15	SS	36		930							
			16	SS	51									0 3 91 6
			17	SS	49		920							
913.5			18	SS	104									2 25 58 15
80.5			19	SS	200, 4"		910							
			20	SS	222, 7"		900							
898.4														
95.6														

+3, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 156-3

W P 160-74-34 LOCATION Coords. N 15,986,605; E 1,027,154 ORIGINATED BY C.P.
DIST 6 HWY 404 BOREHOLE TYPE 3 1/2" I.D. Hollow Stem Augers & Cone Test COMPILED BY R.S.
DATUM Geodetic DATE February 14, 15 & 16, 1978 CHECKED BY _____

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 PSF						
								20 40 60 80 100						
								400 800 1200 1600 2000						
								UNCONFINED + FIELD VANE						
								QUICK TRIAXIAL x LAB VANE						
998.1	Ground Level													
0.0	Roadway fill													
993.7	silty sand traces of gravel compact		1	SS	19									
4.4	Topsail		2	SS	15									
	Silt		3	SS	7									
	Loose to Compact		4	SS	12									
	Brown Gray		5	SS	23									
	Irregular layers of clayey silt and silt of slight plasticity also random layers or pockets of silt stiff to very stiff		6	TW	PH									
			7	TW	PH									
			8	SS	13									
			9	SS	18									
957.1			10	SS	39									
41.0			11	SS	31									
	Silt, traces of clay & fine sand gray Dense to compact		12	SS	55									
			13	SS	23									
			14	SS	21									
			15	SS	17									
916.1	clayey silt		16	SS	18									
82.0	Glacial till		17	SS	73									
	Het. mixture of clayey silt, sand & traces of gravel		18	SS	166/10"									
903.6	Gray Hard		19	SS	182/6"									
94.3	End of Borehole													



RECORD OF BOREHOLE No 156-4

W P 160-74-36 LOCATION Coords. N 15, 986, 565; E 1,027,161 ORIGINATED BY G.P.
DIST 6 HWY 404 BOREHOLE TYPE 3 1/2" I.D. Hollow Stem Augers & Cone Test COMPILED BY R. S.
DATUM Geodetic DATE February 10 and 13, 1978 CHECKED BY RS

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						
1002.5	Ground Level													
0.0	Topsoil													
	Gravelly Sand		1	SS	21		1000							
	Fine to medium sand Traces of Gravel and silt, Brown Compact		2	SS	12									3 93 (4)
991.5			3	SS	18									
11.0			4	SS	10		990							0 4 86 10
	Silt Compact		5	SS	10									
			6	TW	PH		980							0 3 90 7
	Brown Grey		7	SS	11									
	Irregular layers of Clayey silt and silt of slight plasticity also random layers or pockets of silt Stiff to Hard		8	TW	PH		970							7 2 77 14
			9	SS	14									
			10	TW	PH		960							0 4 81 15
			11	SS	39									
			12	SS	67									0 5 85 10
941.0	Silt V. Dense		13	SS	84		950							
60.5	End of Borehole													

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 156-5

W P 160-74-34 LOCATION Coords. N 15,986,572; E 1,027,052 ORIGINATED BY G.P.
DIST 6 HWY 404 BOREHOLE TYPE 3 1/2" I.D. Hollow Stem Augers & Cone Test COMPILED BY R.S.
DATUM Geodetic DATE February 13 & 14, 1978 CHECKED BY R.S.

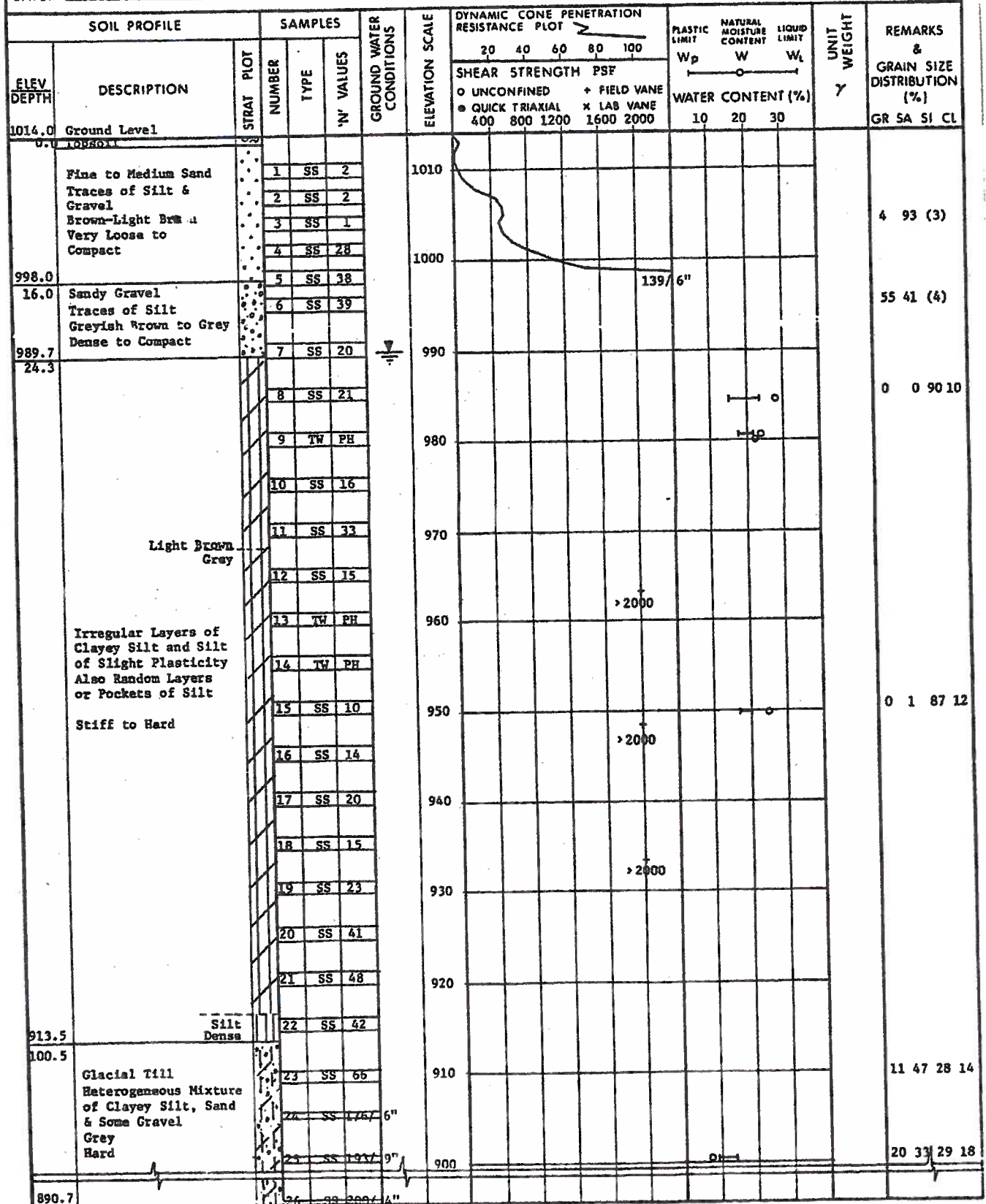
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	W _p	W	W _L	PCF		
1002.2	Ground Level													
0.0	Roadway Fill						1000	3	Frozen Ground					
997.2	Silty Sand, Traces of Gravel & Organics Compact		1	SS	12									
5.0	Impure		2	SS	5									
990.2	Fine to Medium Sand Traces of Silt & Gravel Compact		3	SS	8									
12.0	Brown to Light Brown		4	SS	11		990							
	Brown Grey		5	SS	12									
	Silt, traces of Fine Sand & Seams of Clayey Silt Compact		6	TW	PH		950							
			7	SS	15									
			8	SS	14		970							
	Irregular Layers of Clayey Silt and Silt of Slight Plasticity, Also Random seams of Layers or silty clay		9	SS	14									
956.7	Pockets of Silt Stiff to Very Stiff		10	TW	PH		960							
45.5	End of Borehole		11	SS	19									
947.2							950							
55.0	End of Cone													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 156-6

W P 160-74-34 LOCATION Coords. N 15,986,527; E 1,027,069 ORIGINATED BY G.P.
DIST 6 HWY 404 BOREHOLE TYPE 3 1/2" I.D. Hollow Stem Augers & Cone Test COMPILED BY G.P.
DATUM Geodetic DATE February 6 & 7, 1978 CHECKED BY ES



RECORD OF BOREHOLE No 156-7

W P 160-74-34 LOCATION Coords. N 15,986,632; E 1,027,304 ORIGINATED BY G.P.
DIST 6 HWY 404 BOREHOLE TYPE 3/4" I.D. Hollow Stem Augers COMPILED BY R.S.
DATUM Geodetic DATE February 17, 1978 CHECKED BY RS

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					
995.0	Ground Level																
0.0	Roadway Fill																
989.0	Silty Sand and Gravel																
6.0	Topsoil																
986.0	Sand																
9.0																	
	Brown Gray Irregular Layers of Cl. Silt & Silt of Slight Plasticity, Also Random Layers or Pockets of Silt, Stiff		1	TW	PH											134	0 2 85 13
			2	TW	PH												
974.3			3	TW	PH												0 1 89 10
30.7	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION

GEOCRES No. 31D-255

Boreholes 225-1, 2, 3, 4, 5, 6 and 7



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 225-1

W P 160-74-36 LOCATION Coords N 15,992.922; E 1,024.373 ORIGINATED BY VK
 DIST 6 HWY 404 BOREHOLE TYPE 3 1/2 inch I.D.H.S. Auger COMPILED BY VK
 MATERIAL Granitic DATE December 13, 1977 CHECKED BY CP

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						
983.0	Ground Level													
0.0	Topsoil													
	Clayey Silt With Thin Lenses or Pockets of Silt and Sand		1	SS	14		980							0 0 80 20
			2	SS	14									
			3	SS	9									
			4	SS	8		970							0 23 62 15
	Brown Gray		5	SS	17									
			6	SS	14									0 4 85 11
			7	SS	22		960							
	Stiff to Very Stiff													
953.0			8	SS	82									
30.0	Glacial Till Heterogeneous Mixture of Clayey Silt and Sand, Occasional Gravel - Random Layers of Silt and Sand		9	SS	100.5"		950							0 41 50 9
			10	SS	100.4"									
	Hard						940							
932.7			11	SS	100.3"									
50.3	End of Borehole													



Ministry of
Transportation and
Communications

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 225-2

W P 160-74-36 LOCATION Coords. N 15,992,837; E 1,024,391 ORIGINATED BY VK
DIST 6 HWY 404 BOREHOLE TYPE 3 1/2 Inch I.D.H.S. Auger COMPILED BY VK
DATUM Geodetic DATE December 16, 1977 CHECKED BY *CP*

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						W _p	W	W _L	
								SHEAR STRENGTH									WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE								
986.0	Ground Level													GR SA SI CL			
0.0	Organic Silt With Sand																
982.0			1	SS	8												
4.0	Clayey Silt With Thin Lenses or Pockets of Silt and Sand		2	SS	8		980							0 2 70 28			
			3	SS	15												
	Silt, Dense		4	SS	36									0 4 92 4			
			5	SS	23		970										
	Brown Grey		6	SS	15												
	Stiff to Very Stiff		7	SS	22		960							0 35 54 11			
958.0																	
28.0	Glacial Till Heterogeneous Mixture of Clayey Silt and Sand Occasional Gravel - Random Zones of Silt and Sand		8	SS	151												
			9	SS	100	6"	950							2 36 44 18			
			10	SS	100	3"											
							940										
935.5	Hard		11	SS	100	6"								0 56 34 10			
50.5	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10



Ministry of
Transportation and
Communications

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 225-3

W P 160-74-36 LOCATION: Coords. N 15,992,946; E 1,024,495 ORIGINATED BY: VK
DIST 6 HWY 404 BOREHOLE TYPE 3 1/2 Inch I.D.H.S. Auger COMPILED BY: VK
DATUM Geodetic DATE December 14, 1977 CHECKED BY: [Signature]

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
989.0	Ground Level															
0.0	Topsoil															
	Clayey Silt With Thin Lenses or Pockets of Silt and Sand		1	SS	15											
			2	SS	18											
			3	SS	26											
			4	SS	19											
			5	SS	14											
	Brown Grey		6	SS	14											
			7	SS	11											
	Stiff to Very Stiff		8	SS	14											
956.0																
33.0	Glacial Till Heterogeneous Mixture of Clayey Silt and Sand Occasional Gravel - Random Zones of Silt and Sand Hard		9	SS	100/5"											
			10	SS	100/6"											
938.5																
50.5	End of Borehole															

+3, x5: Numbers refer to 20
15-5 (%) STRAIN AT FAILURE



Highway Engineering
Division
Construction and
Communications

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 225-4

W P 160-74-35 LOCATION Cords. N 15,992,879; E 1,024,506 ORIGINATED BY VK
 DIST 6 HWY 404 BOREHOLE TYPE 3 1/2 Inch I.D.H.S. Auger COMPILED BY VK
 DATUM Geodetic DATE December 19, 1977 CHECKED BY [Signature]

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					
989.0	Ground Level												
0.0	Topsoil		1	SS	15								
	Clayey Silt With Thin Lenses of Silt and Sand		2	SS	30								
			3	SS	22								
			4	SS	22								
			5	SS	32								
	Brown Grey		6	SS	20								
	Very Stiff		7	SS	17								
961.0			8	SS	100	6"							
28.0	Glacial Till Heterogeneous Mixture of Clayey Silt and Sand Occasional Gravel - Random Zones of Silt and Sand		9	SS	100	6"							
			10	SS	100	6"							
938.5	Hard		11	SS	100	5"							
50.5	End of Borehole												

+3, x5: Numbers refer to
Sensitivity

20
15
10
5
0
5
10
15
20
(%) STRAIN AT FAILURE



Highway
Engineering Division
Communications

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 225-5

W P 160-74-36 LOCATION Coords. N 15,992,992; E 1,024,507 ORIGINATED BY VK
DIST 6 HWY 404 BOREHOLE TYPE 3/4 Inch I.D.H.S. Auger COMPILED BY VK
DATUM Geodetic DATE December 14, 1977 CHECKED BY

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					
995.0	Ground Level																
990.0	Silty Fine Sand Grey Brown		1	SS	8												0 65 31 4
	Loose to Compact		2	SS	16												0 66 29 5
			3	SS	24												
981.0			4	SS	17												
14.0	Clayey Silt With Thin Lenses of Silt and Sand		5	SS	18												0 1 64 35
	Brown Grey		6	SS	59												
			7	SS	50												
	Stiff to Hard		8	SS	51												0 1 73 26
960.0																	
35.0	Glacial Till		9	SS	67												
	Heterogeneous Mixture of Clayey Silt and Sand Occasional Gravel - Random Zones of Silt and Sand		10	SS	127												
944.0	Hard		11	SS	172	11"											2 39 45 14
51.0	End of Borehole																

3, x 5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 225-6

W P 160-74-36 LOCATION Coord. N 15,992,908; E 1,024,626 ORIGINATED BY VK
 DIST 6 HWY 404 BOREHOLE TYPE 3 1/2 Inch I.D.H.S. Auger COMPILED BY VK
 DATUM Meadville DATE December 16, 1977 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L		
991.0	Ground Level												
986.0	Silty Fine Sand - Brown Loose		1	SS	8		990						0 69 26 5
5.0	Clayey Silt With Thin Lenses of Silt and Sand		2	SS	15								0 5 70 25
	(Brown)		3	SS	25								
	(Grey)		4	SS	29		980						
			5	SS	33								0 3 73 24
			6	SS	123		970						
	Stiff to Hard		7	SS	52								
964.0													
27.0	Glacial Till Heterogeneous Mixture of Clayey Silt and Sand Occasional Gravel - Random Layers of Sand		8	SS	100/	5"	960						0 33 49 18
			9	SS	150/	10"							
	Sand		10	SS	167		950						
	Hard												
940.5													
50.5	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 225-7

W P 160-74-36 LOCATION Coords. N 15,972,812; E 1,024,310 ORIGINATED BY VK
 DIST 6 HWY 404 BOREHOLE TYPE 3 1/2 Inch I.D.H.S. Auger COMPILED BY VK
 DATUM Geodetic DATE December 20, 1977 CHECKED BY GP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	FLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
984.0	Ground Level												
0.0	Topsoil		1	SS	11								
978.0	Silty Fine Sand - Brown Compact		2	SS	8								
6.0	Clayey Silt With Thin Lenses of Silt and Sand		3	SS	20								0 4 70 26
			4	SS	37								0 6 81 13
	Brown Grey		5	SS	21								
	Stiff to Very Stiff		6	SS	23								0 2 67 31
			7	SS	22								
954.0	Glacial Till		8	SS	47								
30.0	Heterogeneous Mixture of Clayey Silt & Sand												
948.5	Occ. Gravel Hard												
35.5	End of Borehole												4 33 49 14

OFFICE REPORT ON SOIL EXPLORATION

GEOCRES No. 31D-259

Boreholes 259-1, 2, 3, 4, 5 and 6

RECORD OF BOREHOLE No 259-1

W P 160-74-39 LOCATION Coords. N 16.006.073; E 1.021.756 ORIGINATED BY J.J.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Auger and Cone Test COMPILED BY J.J.
DATUM Geodetic DATE May 23, 1978 CHECKED BY J.J.

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	100					
889.5 0.0	Ground Surface													
			1	SS	59									
			2	SS	65									
			3	SS	37									
			4	SS	32									
			5	SS	44									
			6	SS	42									
			7	SS	20									
			8	SS	13									
853.5 36.0	Heterogeneous Mixture of Silt, Sand and Gravel, Trace of Clay (Glacial Till) Very Dense		9	SS	28									
			10	SS	100	5"								
843.5 46.0	Clayey Silt Laminated Frequent Partings of Fine to Medium Sand Hard		11	SS	110	6"								
828.0 61.5	End of Borehole		12	SS	50	2"								

RECORD OF BOREHOLE No 259-2

W P 160-74-39 LOCATION Coords. N 16,006,033; E 1,021,768 ORIGINATED BY J.J.
DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Auger COMPILED BY J.J.
DATUM Geodetic DATE May 24, 1978 CHECKED BY *adp*

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										WATER CONTENT (%)		
								SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE										10 20 30		
890.3	Ground Surface															GR SA SI CL				
0.0	Brown Fissured ----- Gray Clayey Silt Stiff to Very Stiff		1	SS	7	10"	890									0 3 81 16				
2			SS	20	880															
3			SS	35																
4			SS	102																
5			SS	39																
6			SS	24																
7			SS	18																
8			SS	20																
856.3	Heterogeneous Mixture of Sand, Silt and Gravel Trace of Clay (Glacial Till) Very Dense		9	SS	24	3"	850									9 49 33 9				
34.0			10	SS	50/															
841.3	Sand, Some Gravel (See Note Below)		11	SS	100/	3"	840													
49.0																				
830.3	End of Borehole Notes: 1. Sand came up inside the augers to 37 ft. when the augers reached a depth of 50 ft. 2. Only medium gravel was recovered in SS sample #11. It is believed the smaller particles probably had been segregated from the coarser ones due to "boiling". 3. Augering from 50 ft. to 60 ft. was relatively easy. Again the inside of augers were filled with sand and the SS sampler could not be lowered to the sampled depth at 60 ft.																			
60.0																				

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 259-3

W P 160-74-39 LOCATION Conrda. N 16,005,116; E 1,021,884 ORIGINATED BY J.J.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Auger and Cone Test COMPILED BY J.J.
DATUM Geodetic DATE May 25, 1978 CHECKED BY J.J.

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			20 40 60 80 100						
897.1	Ground Surface												
0.0	Clayey Silt:												
	Grey		1	SS	24								
	Very Stiff to Hard		2	SS	35								
			3	SS	46								
			4	SS	50								
			5	SS	60								
			6	SS	43								
			7	SS	33								
			8	SS	18								
			9	SS	22								
858.1			10	SS	57								
39.0	Heterogeneous Mixture of Sand, Silt and Gravel Trace of Clay (Glacial Till)												
	Very Dense		11	SS	75/ 3"								
841.1													
56.0	Clayey Silt Laminated Frequent Partings of Fine to Medium Sand		12	SS	100/ 5"								
	Hard												
825.6			13	SS	100/ 2"								
71.5	End of Borehole												

*3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 259-4

W P 160-74-39 LOCATION Coords. N 16,006,071; E 1,021,894 ORIGINATED BY J.T.
 DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Auger COMPILED BY J.T.
 DATUM Geodetic DATE May 25, 1978 CHECKED BY [Signature]

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				
895.7 0.0	Ground Surface														
	Brown Fissured		1	SS	19										0 15 61 24
	Clayey Silt, Gray		2	SS	20										
			3	SS	43										3 6 76 15
			4	SS	39										
	Very Stiff to Hard		5	SS	65										
			6	SS	35										
			7	SS	18										
			8	SS	18										
	Changing to Quite Sandy		9	SS	23										
856.7 39.0	Heterogeneous Mixture of Sand, Silt and Gravel (Glacial Till)		10	SS	80/ 6"										25 41 29 5
	Very Dense		11	SS	100/ 4"										
839.7 56.0	Clayey Silt Laminated, Frequent Partings of Fine to Medium Sand, Hard		12	SS	40/ 2"										
834.2 61.5	End of Borehole														

*3, *5: Numbers refer to
Sensitivity

20
15 → 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 259-5

W P 160-74-39 LOCATION Coords. N 16,006,157; E 1,022,014 ORIGINATED BY J.J.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Auger to 30', Hollow Stem 30-615' COMPILED BY J.J.
DATUM Geodetic DATE May 23, 1978 to May 24, 1978 CHECKED BY A.F.

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
902.7	Ground Surface													
0.0	Silt, Some Clay Grey Compact		1	SS	28									
			2	SS	21									
893.2			3	SS	22									
9.5	Clayey Silt Grey Very Stiff to Hard		4	SS	26									0 1 88 11
			5	SS	41									
			6	SS	32									
			7	SS	38									
			8	SS	109									
			9	SS	26									
			10	SS	34									
858.7														
44.0			11	SS	100/ 5"									2 47 45 6
841.2			12	SS	100/ 4"									
61.5	End of Borehole Note: Water Level Not Established													



RECORD OF BOREHOLE No 259-6

W.P. 160-74-39 LOCATION Coords. N 16,006.115; E 1,022.027 ORIGINATED BY J.J.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Auger and Cone Test COMPILED BY J.J.
DATUM Geodetic DATE May 29, 1978 CHECKED BY J.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
903.0	Ground Surface												
0.0	Silt, Brown Compact to Dense		1	SS	41		900						
896.0			2	SS	18								
7.0	Brown Grey Clayey Silt Very Stiff to Hard		3	SS	21								
			4	SS	29								
			5	SS	42								
			6	SS	39								
			7	SS	61								
			8	SS	24								
859.0			9	SS	100/ 5"								
44.0	Heterogeneous Mixture of Sand, Silt and Clay (Glacial Till) Very Dense		10	SS	70/ 1"								2 54 34 10
841.5			11	SS	100/ 4"								
61.5	End of Borehole												

GEOCRES No. 31D-262

Boreholes 262-1, 2, 3, 4, 5 and 6



RECORD OF BOREHOLE No 262-1

W P 160-74-40 LOCATION Coords. N 16,012,812; E 1,020,724 ORIGINATED BY T.K.
DIST 6 HWY 404 BOREHOLE TYPE Cone Test COMPILED BY R.S.
DATUM Geodetic DATE August 10, 1978 CHECKED BY CS

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	100					
940.2	Ground Level						940							
931.2														
9.0	End of Cone Test						930							

RECORD OF BOREHOLE No 262-2

W P 160-74-40 LOCATION Coords. N 16,012,883; E 1,020,844 ORIGINATED BY T.K.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Augers and Cone Test COMPILED BY T.K.
DATUM Geodetic DATE August 11, 1978 CHECKED BY TC

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	100					
949.0	Ground Level													
0.0	Clayey Silt Trace of Fine Sand Low Plasticity		1	SS	13	*	940							0 2 83 15
			2	SS	31									0 1 69 30
			3	SS	28									0 0 85 15
			4	SS	50									
			5	SS	81									
			6	SS	58									
	Brown Grey		7	SS	40		930							0 0 82 18
			8	SS	37									
	Stiff to Hard		9	SS	27		920							
916.0														
33.0	Clayey Silt, Some Sand, Trace of Gravel (Cl. Till) Cobble		10	SS	39		910							2 26 61 11
910.5														
38.5	Clayey Silt Trace of Fine Sand		11	SS	35									0 1 78 21
900.0	Hard Cobbles						900							
49.0	Silty Sand, Trace of Clay, Very Dense		12	SS	92									0 64 31 5
897.5														
51.5	End of Borehole * Borehole Dry at Time of Investigation													

3, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No262-3

W P 160-74-40 LOCATION Coords. N 16,012,920; E 1,020,969 ORIGINATED BY T.K.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Augers and Cone Test COMPILED BY T.K.
DATUM Geodetic DATE August 10 and 11, 1978 CHECKED BY ES

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100					
943.8	Ground Level													
0.0	Clayey Silt, Trace of Fine Sand Slight to Low Plasticity Very Stiff to Hard		1	SS	19	*	940							0 1 93 6
			2	SS	26									0 0 85 15
			3	SS	29									
			4	SS	47									
			5	SS	36		930							0 1 84 15
			6	SS	45									
923.3			7	SS	20									
20.5	Clayey Silt With Sand, Trace of Gravel (Glacial Till) Very Stiff		8	SS	35		920							1 25 60 14
914.8	Cobbles													
29.0	Clayey Silt Low Plasticity Hard		9	SS	129/	9"								
907.3			10	SS	75		900							0 0 89 11
36.5	End of Borehole * Borehole Dry at Time of Investigation													

RECORD OF BOREHOLE No262-4

W P 160-74-40 LOCATION Coords. N 16,012,825; E 1,020,985 ORIGINATED BY I.K.
DIST 6 HWY 404 BOREHOLE TYPE Cone Test COMPILED BY R.S.
DATUM Geodetic DATE August 10, 1978 CHECKED BY RS

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100					
944.0	Ground Level													
							940							
							930							
928.0														
16.0	End of Cone													

+3, x5: Numbers refer to 20
Sensitivity 15-25 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 262-5

W P 160-74-40 LOCATION Coords. N 16,012,807; E 1,020,856 ORIGINATED BY T.K.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Augers and Cone Test COMPILED BY T.K.
DATUM Geodetic DATE August 10, 1978 CHECKED BY RS

[illegible]

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to Sensitivity

15 ϕ 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 262-6

W P 160-74-40 LOCATION Coords. N 16,012,739; E 1,020,736 ORIGINATED BY T.K.
DIST 6 HWY 404 BOREHOLE TYPE Solid Stem Augers and Cone Test COMPILED BY T.K.
DATUM Geodetic DATE August 10, 1978 CHECKED BY EC

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
948.2	Ground Level																
0.0	Clayey Silt Trace of Fine Sand		1	SS	28	*											0 1 83 16
	Slight Plasticity		2	SS	35		940										0 0 85 15
	Very Stiff to Hard		3	SS	33												0 0 87 13
			4	SS	17												
			5	SS	41												
			6	SS	41		930										
			7	SS	67												0 2 84 14
924.7																	
23.5	Clayey Silt, Trace of Sand and Gravel (Glacial Till)		8	SS	41		920										
916.7	Hard		9	SS	33												
31.5	End of Borehole																
	* Borehole Dry After 24 Hour Period																

* 3, x 5 : Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

GEOCRES No. 31D-384

Boreholes 384-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14

Continued Next Page

+3, X3. Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT <u>991-1162</u>		RECORD OF BOREHOLE No 384-1		2 OF 2		METRIC	
W.P. <u>421-98-00</u>		LOCATION <u>N 4883009.892, E 310885.324</u>		ORIGINATED BY <u>SB</u>			
DIST <u>6</u> HWY <u>404</u>		BOREHOLE TYPE <u>114mm SOLID STEM AUGERS</u>		COMPILED BY <u>CKB</u>			
DATUM <u>GEODETIC</u>		DATE <u>11.11.99</u>		CHECKED BY <u>ASP</u>			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	W _p W W _L	10 20 30			
	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Grey Moist (Glacial Till)(continued)		14				277							
							276							
							275							
273.84 18.40					16			274						
	END OF BOREHOLE													
	Note: 1. Open Borehole dry upon completion of drilling. 2. Water level measured in piezometer at 10.7m depth (Elev.281.5m) on Nov.23, 1999. 3. Water level measured in piezometer at 9.9m depth (Elev.282.3m) on Dec.17, 1999. 4. Water level measured in piezometer at 9.5m depth (Elev.282.7m) on Jan.4, 2000.													

PROJECT <u>991-1162</u>		RECORD OF BOREHOLE No 384-2		1 OF 1	METRIC
W.P. <u>421-98-00</u>		LOCATION <u>N 4883018.769, E 310913.233</u>		ORIGINATED BY <u>SB</u>	
DIST <u>6</u> HWY <u>404</u>		BOREHOLE TYPE <u>114mm SOLID STEM AUGERS</u>		COMPILED BY <u>DKB</u>	
DATUM <u>GEODETIC</u>		DATE <u>11.10 & 11.99</u>		CHECKED BY <u>ASP</u>	

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	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
			NUMBER	TYPE	N° VALUES			SHEAR STRENGTH kPa						
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x REMOULDED					
292.84	Topsoil													
0.00														
292.39														
0.45	Sandy Silt, trace clay and gravel Loose Brown Moist		1	50 DO	5									
			2	50 DO	8									
291.39														
1.45	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist (Glacial Till)		3	50 DO	41									
			4	50 DO	75/15									
			5	50 DO	85/15									
289.26														
3.58	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Brown becoming grey at 5.5m depth Moist (Glacial Till)		6	50 DO	80/15									
			7	50 DO	100/0									
			8	50 DO	100/0									
			9	50 DO	100/15									
			10	50 DO	100/15									
			11	50 DO	100/15									
			12	50 DO	100/15									
280.50														
12.34	END OF BOREHOLE													
	Note: 1. Open Borehole dry upon completion of drilling													

ON MOT 891-1162 GPJ ON MOT GDT 5/1/00

PROJECT 991-1162			RECORD OF BOREHOLE No 384-3			1 OF 1		METRIC				
W.P. 421-98-00			LOCATION N 4882978.883; E 310893.004			ORIGINATED BY SB						
DIST 6 HWY 404			BOREHOLE TYPE 114mm SOLID STEM AUGERS			COMPILED BY DKB						
DATUM GEODETIC			DATE 9.11.99			CHECKED BY ASP						
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID		UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	W _p	W			W _L
294.74 0.00	Topsoil		1	50 DO	6							
294.14 0.60	Silty Sand, trace gravel Dense Brown Moist		2	50 DO	35							
293.29 1.45	Clayey Silt, some sand, trace gravel, occasional cobbles Very stiff to hard Brown Moist (Glacial Till)		3	50 DO	27							
			4	50 DO	58							
			5	50 DO	84/15							
			6	50 DO	56/15							
			7	50 DO	100/13							
289.35 5.39	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Grey Moist (Glacial Till)		8	50 DO	85/15							
			9	50 DO	100/15							
			10	50 DO	94/15							
			11	50 DO	100/15							
282.40 12.34	END OF BOREHOLE		12	50 DO	109/15							
Note: 1. Open Borehole dry upon completion of drilling.												

ON MDI 991-1162 GPJ ON MDI GDT 5/1/00

PROJECT 991-1162			RECORD OF BOREHOLE No 384-4			1 OF 2			METRIC									
W.P. 421-98-00			LOCATION N 4882988.091; E 310918.905			ORIGINATED BY SB												
DIST 6 HWY 404			BOREHOLE TYPE 114mm SOLID STEM AUGERS			COMPILED BY DKB												
DATUM GEODETIC			DATE 9.11.99			CHECKED BY ASP												
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	20 40 60 80 100	W _p	W	W _L	γ	GR	SA	SI	CL
294.44	0.00	Topsoil		1	50 DO	7		294										
294.14	0.30	Silty Sand, trace gravel Loose to compact Brown Moist		2	50 DO	27		293										
293.22	1.22	Clayey Silt, some sand, trace gravel, occasional cobbles Very stiff to hard Brown Moist (Glacial Till)		3	50 DO	17		292										
				4	50 DO	166/25		291										
				5	50 DO	85/15		290										
				6	50 DO	124		289										
				7	50 DO	100/15		288										
289.00	5.44	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Grey Moist (Glacial Till)		8	50 DO	95/15		287										
				9	50 DO	89/15		286										
				10	50 DO	100/15		285										
				11	50 DO	100/15		284										
				12	50 DO	100/15		283										
				13	50 DO	100/15		282										
				14	50 DO	100/15		281										
								280										

ON MOT 991-1162 GPJ ON MOT GDT 5/1/00

Continued Next Page

+ 3 X 3 Numbers refer to Sensitivity O 3% STRAIN AT FAILURE

PROJECT <u>991-1162</u>		RECORD OF BOREHOLE No 384-4		2 OF 2		METRIC	
W.P. <u>421-98-00</u>		LOCATION <u>N 4882968.091; E 310918.905</u>		ORIGINATED BY <u>Sb</u>			
DIST <u>6</u> HWY <u>404</u>		BOREHOLE TYPE <u>114mm SOLID STEM AUGERS</u>		COMPILED BY <u>DKB</u>			
DATUM <u>GEODETIC</u>		DATE <u>9.11.99</u>		CHECKED BY <u>ASP</u>			

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 ● QUICK TRIAXIAL × REMOULDED										
							20	40	60	80	100							
278.29	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Grey Moist (Glacial Till)(continued)		14	SD	0.85/15													
18.15	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Grey Moist (Glacial Till)		15	SD	0.85/15													
276.06			16	SD	0.85/15													
18.38	END OF BOREHOLE Note: 1. Open Borehole dry upon completion of drilling.																	

ON MOT 991-1162 GPJ ON MOT GOT 5/1/00

PROJECT <u>991-1162</u>		RECORD OF BOREHOLE No 384-5		1 OF 1 METRIC	
W.P. <u>421-98-00</u>		LOCATION <u>N 4882964.270; E 310908.940</u>		ORIGINATED BY <u>SB</u>	
DIST <u>6</u> HWY <u>404</u>		BOREHOLE TYPE <u>114mm SOLID STEM AUGERS</u>		COMPILED BY <u>OKB</u>	
DATUM <u>GEODETIC</u>		DATE <u>9.11.99</u>		CHECKED BY <u>ASP</u>	

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										
295.44	0.00	Topsoil																
294.96	0.48	Silty Sand, trace gravel Compact Brown Moist	1	50 DO	3													
293.99			2	50 DO	15													
1.45		Clayey Silt, some sand, trace gravel, occasional cobbles Very stiff to hard Brown Moist (Glacial Till)	3	50 DO	23													
			4	50 DO	56													
			5	50 DO	98/15													
			6	50 DO	79/15													
290.57	4.67	END OF BOREHOLE	7	50 DO	75/15													
Note: 1. Open Borehole dry upon completion of drilling.																		

ON MOT. 991-1162 GP. ON MOT GDT 5/1/00

PROJECT 991-1162			RECORD OF BOREHOLE No 384-6			1 OF 1			METRIC				
W.P. 421-88-00			LOCATION N 4883034.073, E 310895.891			ORIGINATED BY SB							
DIST 6 HWY 404			BOREHOLE TYPE 114mm SOLID STEM AUGERS			COMPILED BY DKB							
DATUM GEODETIC			DATE 11.11.99			CHECKED BY ASP							
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					
291.49 0.00	Topsoil		1	50 DO	11								
291.04 0.45	Sandy Silt, trace clay and gravel Compact Brown Moist		2	50 DO	14								
290.04 1.45	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist (Glacial Till)		3	50 DO	45								
288.75 2.74	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Brown becoming grey at 7.0m depth Moist (Glacial Till)		4	50 DO	70/15								
			5	50 DO	85/15								
			6	50 DO	83/15								
			7	50 DO	87/15								
			8	50 DO	77/15								
283.59 7.90	END OF BOREHOLE		9	50 DO	85/15								
Note: 1. Water level measured in open borehole at 6.5m depth (Elev 285.0m) upon completion of drilling.													

ON MOT 991-1162 GPJ ON MOT GDT 5/1/00

PROJECT 991-1162		RECORD OF BOREHOLE No 384-7		1 OF 1		METRIC						
W.P. 421-98-00		LOCATION N 4882988.375; E 310870.250		ORIGINATED BY SB								
DIST 6 HWY 404		BOREHOLE TYPE 114mm SOLID STEM AUGERS		COMPILED BY DKB								
DATUM GEODETIC		DATE 9.11.99		CHECKED BY ASP								
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					
293.04												
0.00	Silty Sand, some gravel, trace clay, occasional organics		1	50 DO	7							
292.35	Loose Brown/grey Moist (FI)		2	50 DO	28							
0.69												
291.59	Sandy Silt, trace clay and gravel Compact Brown Moist		3	50 DO	30							
1.45												
	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist (Glacial Till)		4	50 DO	92/15							
			5	50 DO	150/25							
			6	50 DO	100/15							
288.77												
4.27	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Brown becoming grey at 7.0m depth Moist (Glacial Till)		7	50 DO	100/15							
			8	50 DO	90/15							
			9	50 DO	110/15							
			10	50 DO	91/15							
			11	50 DO	92/15							
282.24												
10.80	END OF BOREHOLE											
<p>Note:</p> <ol style="list-style-type: none"> Open Borehole dry upon completion of drilling. Water level measured in piezometer at 6.5m depth (Elev 286.5m) on Nov 23, 1999. Water level measured in piezometer at 3.8m depth (Elev 289.2m) on Dec 17, 1999 and on Jan 4, 2000. 												

ON MOT 991-1162 GPJ ON MOT GDT 5/1/00

PROJECT 991-1162 RECORD OF BOREHOLE No 384-8 1 OF 2 METRIC

W.P. 421-98-00 LOCATION N 4883020.383; E 310922.152 ORIGINATED BY SB

DIST 6 HWY 404 BOREHOLE TYPE 114mm SOLID STEM AUGERS COMPILED BY DKB

DATUM GEODETIC DATE 9.11.99 CHECKED BY ASP

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					
293.05	Topsoil		1	50 DO	8												
292.75	Sandy Silt, trace clay and gravel Loose to dense Brown Moist		2	50 DO	20		292										
291.07	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist (Glacial Till)		3	50 DO	30		291										
289.40	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Grey Moist (Glacial Till)		4	50 DO	80/15		290										
288.57			5	50 DO	102		289										
287.57			6	50 DO	100/15		288										
286.57			7	50 DO	100/15		287										
285.57			8	50 DO	91/15		286										
284.57			9	50 DO	90/15		285										
283.57			10	50 DO	100/15		284										
282.57			11	50 DO	100/15		283										
281.57			12	50 DO	100/15		282										
280.57			13	50 DO	100/15		281										
279.57							280										
278.57							279										
14.48																	

Continued Next Page

+ 3 x 3 Numbers refer to Sensitivity O 3% STRAIN AT FAILURE

PROJECT 991-1162			RECORD OF BOREHOLE No 384-8			2 OF 2		METRIC									
W.P. 421-98-00			LOCATION N 4883020.383; E 310922.152			ORIGINATED BY SB											
DIST 6 HWY 404			BOREHOLE TYPE 114mm SOLID STEM AUGERS			COMPILED BY DKB											
DATUM GEODETIC			DATE 9.11.99			CHECKED BY ASP											
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						
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X REMOULDED					WATER CONTENT (%)					
							20	40	60	80	100	10	20	30			
	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Grey Moist (Glacial Till)(continued)		14	50	DO	10/7/15											2 33 (65)
274.45																	
18.60	END OF BOREHOLE		16	50	DO	10/4/15											
	Note: 1. Open Borehole dry upon completion of drilling.																

ON MOT 991-1162.GPJ ON MOT GDT 5/1/00

PROJECT <u>991-1162</u>		RECORD OF BOREHOLE No 384-9		1 OF 1	METRIC
W.P. <u>421-98-00</u>		LOCATION <u>N 4883028.579; E 310947.987</u>		ORIGINATED BY <u>S8</u>	
DIST <u>6</u> HWY <u>404</u>		BOREHOLE TYPE <u>114mm SOLID STEM AUGERS</u>		COMPILED BY <u>DKB</u>	
DATUM <u>GEODETIC</u>		DATE <u>10.11.99</u>		CHECKED BY <u>ASP</u>	

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		
293.50							20	40	60	80	100							
0.00	Topsoil		1	50 DO	8													
293.20			2	50 DO	16													
0.30	Sandy Silt, trace clay and gravel Loose to dense Brown Moist		3	50 DO	47													
291.29			4	50 DO	82/15													
2.21	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist (Glacial Till)		5	50 DO	74													
			6	50 DO	83													
289.08			7	50 DO	103/15													
4.42	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Grey Moist (Glacial Till)		8	50 DO	100/13													
			9	50 DO	83													
			10	50 DO	105													
			11	50 DO	127													
			12	50 DO	111													
280.90																		
12.60	END OF BOREHOLE																	
	Note: 1. Water level measured in open borehole at 5.9m depth (Elev 286.6m) upon completion of drilling.																	

ON MOT 991-1162 GPJ ON MOT GDT 5/1/00

PROJECT 991-1162		RECORD OF BOREHOLE No 384-10		1 OF 1		METRIC											
W.P. 421-98-00		LOCATION N 4882969.633; E 310927.841		ORIGINATED BY SB													
DIST 6 HWY 404		BOREHOLE TYPE 114mm SOLID STEM AUGERS		COMPILED BY DKB													
DATUM GEODETIC		DATE 8.11.99		CHECKED BY ASP													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)	10 20 30	γ	GR SA SI CL			
294.43	Topsoil		1	50 DO	6		294										
0.00																	
293.98	Silt and Sand, trace clay and gravel Loose to compact Brown Moist		2	50 DO	22		293							1 53 44 2			
0.45			3	50 DO	22												
292.22	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist (Glacial Till)		4	50 DO	92/15		292										
2.21			5	50 DO	119		291										
			6	50 DO	71		290										
			7	50 DO	108		289										
288.87	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Grey Moist (Glacial Till)		8	50 DO	112		288										
5.56			9	50 DO	92/15		287							9 39 (52)			
							286										
							285										
							284										
							283										
282.09	END OF BOREHOLE		12	50 DO	100/15												
12.34																	
Note: 1. Open Borehole dry upon completion of drilling 2. Water level measured in piezometer at 3.7m depth (Elev.290.7m) on Nov.23, 1999. 3. Water level measured in piezometer at 3.2m depth (Elev.291.2m) on Dec.17, 1999. 4. Water level measured in piezometer at 3.1m depth (Elev.291.3m) on Jan.4, 2000.																	

ON MOT 991-1162 GPJ ON MOT GDT 5/1/00

+ 3 X 3 Numbers refer to Sensivity O 3% STRAIN AT FAILURE

PROJECT 991-1162		RECORD OF BOREHOLE No 384-11		1 OF 2		METRIC							
W.P. 421-98-00		LOCATION N 4882998.594; E 310955.788		ORIGINATED BY SB									
DIST 8 HWY 404		BOREHOLE TYPE 114mm SOLID STEM AUGERS		COMPILED BY DKB									
DATUM GEODETIC		DATE 12.11.99		CHECKED BY ASP									
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC NATURAL LIQUID UNIT REMARKS				
ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)	γ	GR SA SI CL
294.56	Topsoil		1	50 DO	4		294						
0.00													
294.11	Silty Sand, trace gravel Loose to compact Brown Moist		2	50 DO	23		293						
0.45													
293.04	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist (Glacial Till)		3	50 DO	33		292						
1.52													
290.90	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Grey Moist (Glacial Till)		4	50 DO	66		291						
3.66													
			5	50 DO	60		290						
			6	50 DO	85		289						
			7	50 DO	95/15		288						
			8	50 DO	100/0		287						
			9	50 DO	95/15		286						
			10	50 DO	100/0		285						
			11	50 DO	80/15		284						
			12	50 DO	85/15		283						
			13	50 DO	100/10		282						
							281						
							280						

PROJECT 991-1162		RECORD OF BOREHOLE No 384-11		2 OF 2		METRIC								
W.P. 421-98-00		LOCATION N 4882998.594; E 310955.788		ORIGINATED BY SB										
DIST 5 HWY 404		BOREHOLE TYPE 114mm SOLID STEM AUGERS		COMPILED BY DKB										
DATUM GEODETIC		DATE 12.11.99		CHECKED BY ASP										
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC NATURAL LIQUID UNIT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)	UNIT WEIGHT γ	GR SA SI CL	
278.50	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Grey Moist (Glacial Till)		14	SD	100/100		279							
16.06			15	SD	100/115		278							
276.16			16	SD	100/115		277							
18.40	END OF BOREHOLE													
Note: 1. Open Borehole dry upon completion of drilling.														

ON MOT 991-1162 GPJ ON MOT GDT 5/100

PROJECT 991-1162		RECORD OF BOREHOLE No 384-12		1 OF 1		METRIC										
W.P. 421-98-00		LOCATION N 4882974.191; E 310945.278		ORIGINATED BY SB												
DIST 6 HWY 404		BOREHOLE TYPE 114mm SOLID STEM AUGERS		COMPILED BY DKB												
DATUM GEODETIC		DATE 8.11.99		CHECKED BY ASP												
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)			
295.33							20	40	60	80	100	W _p	W	W _L		
0.00	Silty Sand, trace gravel Compact Brown Moist		1	50 DO	11											
			2	50 DO	12											
			3	50 DO	24											
293.12																
2.21	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist (Glacial Till)		4	50 DO	56											
			5	50 DO	96											
			6	50 DO	80											
290.46			7	50 DO	78/15											
4.87	END OF BOREHOLE Note: 1. Open Borehole dry upon completion of drilling															

ON MOT 991-1162 GPJ ON MOT GDT 5/100

PROJECT <u>991-1162</u>		RECORD OF BOREHOLE No 384-13		1 OF 1 METRIC	
W.P. <u>421-98-00</u>		LOCATION <u>N 4883044.816, E 310932.002</u>		ORIGINATED BY <u>SB</u>	
DIST <u>6</u> HWY <u>404</u>		BOREHOLE TYPE <u>114mm SOLID STEM AUGERS</u>		COMPILED BY <u>OKB</u>	
DATUM <u>GEODETIC</u>		DATE <u>11.11.99</u>		CHECKED BY <u>ASP</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x REMOULDED 20 40 60 80 100	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								
292.07													
0.00	Topsoil		1	50 DO	8		292						
291.77													
0.30	Sandy Silt, trace clay and gravel Loose to very dense Brown Moist		2	50 DO	38		291						
290.18			3	50 DO	88								
1.89	Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist		4	50 DO	110		290						
289.27													
2.80	(Glacial Till) Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Brown Moist (Glacial Till)		5	50 DO	123		289						
			6	50 DO	105		288						
			7	50 DO	174, 15		287						
			8	50 DO	109, 12		286						
							285						
284.45			9	50 DO	100, 0								
7.62	END OF BOREHOLE Note 1. Open Borehole dry upon completion of drilling.												

ON MOT 991-1162 GPJ ON MOT GDT 5/100

PROJECT 991-1162 RECORD OF BOREHOLE No 384-14 1 OF 1 METRIC

W.P. 421-98-00 LOCATION N 4883020.241; E 310970.723

DIST 6 HWY 404 BOREHOLE TYPE 114mm SOLID STEM AUGERS

DATUM GEODETIC DATE 9.11.99

ORIGINATED BY SB

COMPILED BY DKB

CHECKED BY ASP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT		NATURAL MOISTURE CONTENT	LIQUID LIMIT	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 (%)					
294.58 0.00	Silty Sand, trace gravel, occasional organics Loose Brown/grey Moist (Fill) Clayey Silt, some sand, trace gravel, occasional cobbles Hard Brown Moist (Glacial Till)		1	50 DO	7		20	40	60	80	100	W _p	W	W _L	3 31 (66)
293.89 0.69			2	50 DO	20		20	40	60	80	100	10	20	30	
			3	50 DO	12		20	40	60	80	100	10	20	30	
			4	50 DO	86		20	40	60	80	100	10	20	30	
			5	50 DO	105		20	40	60	80	100	10	20	30	
			6	50 DO	86		20	40	60	80	100	10	20	30	
			7	50 DO	145		20	40	60	80	100	10	20	30	
289.00 5.58	Sandy Clayey Silt, trace to some gravel, occasional cobbles Hard Brown becoming grey at 7.0m depth Moist (Glacial Till)		8	50 DO	100		20	40	60	80	100	W _p	W	W _L	
			9	50 DO	90/15		20	40	60	80	100	10	20	30	
			10	50 DO	85/15		20	40	60	80	100	10	20	30	
			11	50 DO	100/15		20	40	60	80	100	10	20	30	
283.80 10.78	END OF BOREHOLE														
<p>Note:</p> <ol style="list-style-type: none">1. Open Borehole dry upon completion of drilling.2. Water level measured in piezometer at 5.2m depth (Elev.289.4m) on Nov.23, 1999.3. Water level measured in piezometer at 3.2m depth (Elev.291.4m) on Dec.17, 1999.4. Water level measured in piezometer at 3.0m depth (Elev.291.6m) on Jan.4, 2000.															

Note:
1. Open Borehole dry upon
completion of drilling.
2. Water level measured in
piezometer at 5.2m depth
(Elev. 289.4m) on Nov. 23, 1999.
3. Water level measured in
piezometer at 3.2m depth
(Elev. 291.4m) on Dec. 17, 1999.
4. Water level measured in
piezometer at 3.0m depth
(Elev. 291.6m) on Jan. 4, 2000.



PRELIMINARY FOUNDATION DESIGN REPORT

for

**HIGH MAST LIGHTING AND OVERHEAD SIGNS
HIGHWAY 404 HOV LANE EXPANSION
FROM HIGHWAY 407 TO GREEN LANE
WO 03-20024
REGIONAL MUNICIPALITY OF YORK, ONTARIO**

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PART B
PRELIMINARY FOUNDATION DESIGN REPORT

For
High Mast Lighting and Overhead Signs
Highway 404 HOV Lane Expansion
From Highway 407 to Green Lane
WO 03-20024,
Regional Municipality of York, Ontario

6. ENGINEERING RECOMMENDATIONS

6.1 General

This design section of the report provides preliminary foundation recommendations for the design of proposed High Mast Lighting (HML) poles and Overhead Sign (OHS) structures along Highway 404 between Highway 7 and Green Lane in the Regional Municipality of York, Ontario.

The recommendations are intended for preliminary design and planning purposes only, and are based on the factual subsoil and groundwater information obtained from the existing Foundation Reports available from the MTO GEOCRES library. The conceptual locations of twenty (20) HML poles and four (4) OHS structures were selected for this report. Further foundation engineering services will be required to provide detail design recommendations.

It is anticipated that the proposed HML poles and OHS structures will be supported on caisson foundations meeting the requirements in MTO *Guidelines for the Design of High Mast Pole Foundations* and MTO's *Sign Support Manual*, respectively.

Where a caisson is installed in proximity of a slope, the passive resistance within portions of the caisson closer than 3 m in plan to surface of the slope, should be neglected. The stability of the adjacent slope should also be checked considering loads from the caisson to ensure adequate Factor of Safety against slope failures.



6.2 Preliminary Design of High Mast Lighting Foundations

The HML pole foundations should be designed in accordance with MTO's *Guidelines for the Design of High Mast Pole Foundations*, 4th Edition, dated May 2004. The caisson foundation design for support of the HML may be carried out using the preliminary geotechnical design parameters in Table 1.

In the design of caisson foundations, the passive resistance within the upper 1.4 m below ground surface should be neglected to account for frost action as per OPSD 3090.101 (Frost Penetration Depths for Southern Ontario). In accordance with MTO's *Guidelines for the Design of High Mast Pole Foundations (2004)*, the ultimate passive lateral pressure can be taken as two times of the passive lateral earth pressure.

Where undrained shear strength, s_u , is provided for a cohesive soil layer in Table 1, the undrained capacity of the caisson should also be checked to determine whether the drained or undrained case will govern.

A resistance factor of 0.5 should be applied to the calculated ultimate lateral resistance to obtain the factored lateral geotechnical resistance at Ultimate Limit States (ULS), in accordance with the Canadian Highway Bridge Design Code.

6.3 Preliminary Design of Overhead Sign Foundations

The OHS structure foundations should be designed in accordance with the MTO's *Sign Support Manual*, dated 2015.

The standard OHS foundation designs as presented in the *Sign Support Manual (2015)* have been developed based on the following minimum soil conditions:

Non-cohesive soils: Sand with an internal friction angle, Φ' , of 28 degrees in the upper two-thirds of the portion of the caisson foundation below the frost depth, and sand with an internal friction angle, Φ' , of 30 degrees in the lower third of the portion of the caisson below the design frost depth.



Cohesive soils: “Soft” clay with an undrained shear strength, s_u , of 25 kPa in the upper two-thirds of the portion of the caisson foundation below the frost depth, and “firm” clay with an undrained shear strength, s_u , of 50 kPa in the lower third of the portion of the caisson foundation below the design frost depth.

Based on the existing subsurface information, the soil conditions at four (4) OHS locations are expected to have equal to or higher internal friction angles /undrained shear strength than the standard design, and as such the standard caisson foundation design is applicable. The frost penetration depth is equal to 1.4 m, as per Design Aids DA4-2 and DA4-3 (Contours and Tables of Frost Depths for Southern Ontario) of the *Sign Support Manual (2015)*.

6.4 Construction Considerations

Construction of the caisson foundations for the OHS should be in accordance with *Ontario Provincial Standard Specification*, OPSS 915 (Sign Support System). Further, construction of caisson foundations (for HML and OHS) should be in accordance with specifications in OPSS 903 (Deep Foundations).

Water-bearing non-cohesive native or fill soils should be expected to run or flow into the caisson hole during or after the drilling for the caisson foundations. Therefore, appropriate equipment and procedures will be required to minimize ground loss during drilling and concrete placement. This could include the use of temporary or permanent caisson liners, and/or the use of drilling mud.

At HML-P7 and HML-P8 locations, artesian groundwater may be encountered. The construction of caisson foundations should take into account uplift pressure acting upwards at the base of caisson holes and use of drilling mud and tremie concrete placement technique will be required.

Given that subsoils along this section of Highway 404 are generally comprised of glacial till deposits, consideration should be given to presence of cobbles and/or boulders within the glacial till deposit. Appropriate equipment and procedures may be required to penetrate these obstructions as part of the caisson installations.



It is recommended that consideration be given to including Non Standard Special Provisions (NSSPs) in the Contract Documents at Detail Design to warn the contractor of the potential presence of wet non-cohesive soils and presence of cobbles and/or boulders which may affect the installation of the HML and OHS foundations for this project.

7. SCOPE OF ADDITIONAL FOUNDATION INVESTIGATION

The recommendations in this report are preliminary and based on preliminary HML and OHS locations, which may change in the detail design phase. Detail foundation engineering services will be required during the detail design to assess the sufficiency of the existing subsurface information and to acquire additional subsurface information as required for the design and construction of HML poles and OHS structures.



8. CLOSURE

This preliminary Foundation Design Report was prepared by Mr. A. Varshoi, MEng, P.Eng., and reviewed by Mr. R. Ng, MBA, Ph.D., P.Eng., Senior Engineer, with technical input from Mr. D. Dundas, P.Eng., Senior Engineer. The report was independently reviewed by Mr. C. M. P. Nascimento, P.Eng., MTO Designated Principal Contact.

Yours very truly

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TABLE 1 – PRELIMINARY GEOTECHNICAL DESIGN PARAMETERS FOR HIGH MAST LIGHTING POLES

Type (Designation)	Proposed Highway 404 Station	Stratum	Depth ^{(1),(2)} (m)	Design Parameters			Design ⁽⁴⁾ Groundwater Elevation (m)
				$\gamma_b^{(3)}$ (kN/m ³)	S_u (kPa)	Φ' (Deg)	
HML-P1	15+120	<i>Very loose to compact silty sand (fill)</i>	0 – 7.2	20	-	28	189
		<i>Stiff to hard clayey silt till</i>	7.2 – 13.4	21	100	31	
		<i>Very dense sandy silt till</i>	Below 13.4	22	-	32	
HML-P2	17+030	<i>Firm to stiff cohesive (fill)</i>	0 – 8.7	20	-	28	193
		<i>Dense to very dense sandy silt to silty sand</i>	8.7 – 17.9	20	-	30	
		<i>Stiff to hard clayey silt till with pockets of loose to very dense silty sand</i>	Below 17.9	21	100	30	
HML-P3 HML-P4	20+773 21+260	<i>Engineered Fill⁽⁵⁾</i>	–	20	-	28	231
		<i>Compact to very dense silty sand</i>	0 ⁽⁶⁾ – 5.5	21	-	31	
		<i>Hard clayey silt till</i>	Below 5.5	22	200	34	
HML-P5	22+383	<i>Soft to firm reworked material (fill)</i>	0 – 1.5	19	25	27	241
		<i>Very stiff to hard clayey silt glacial till</i>	1.5 – 7.9	22	150	32	
		<i>Compact to very dense silty sand</i>	Below 7.9	21	-	31	



Type (Designation)	Proposed Highway 404 Station	Stratum	Depth ^{(1),(2)} (m)	Design Parameters			Design ⁽⁴⁾ Groundwater Elevation (m)
				Y _b ⁽³⁾ (kN/m ³)	S _u (kPa)	Φ' (Deg)	
HML-P6	23+508	Engineered Fill ⁽⁵⁾	—	20	-	28	266*
HML-P7	24+432	Very stiff to hard clayey silt till	0 ⁽⁶⁾ – 4.4	22	150	32	
HML-P8	10+535	Very dense silty sand to sand	Below 4.4	22	-	34	
HML-P9	11+233	Engineered Fill ⁽⁵⁾	—	20	-	28	285
HML-P10	11+980	Very stiff to hard clayey silt till	Below ground surface (or any fill)	22	150	32	
HML-P11	12+840						
HML-P12	14+130	Fill	0 – 3.0	20	-	28	300
		Very stiff to hard clayey silt	3.0 – 5.1	20	100	31	
		Compact to very dense silt to sand	Below 5.1	21	-	31	
HML-P13	15+828	Fill	0 – 6.3	20	-	28	304
		Very loose to dense sand	6.3 – 13.3	20	-	29	
		Firm to hard clayey silt	13.3 – 25.3	19	75	29	
		Very dense silty sand	Below 25.3	22	-	34	



Type (Designation)	Proposed Highway 404 Station	Stratum	Depth ^{(1),(2)} (m)	Design Parameters			Design ⁽⁴⁾ Groundwater Elevation (m)
				$\gamma_b^{(3)}$ (kN/m ³)	s_u (kPa)	Φ' (Deg)	
HML-P14	16+224	<i>Fill mixed with topsoil</i>	0 – 2.7	19	-	27	302
		<i>Stiff to hard clayey silt with interlayers of silt</i>	2.7 – 24.5	21	75	30	
		<i>Hard clayey silt till</i>	Below 24.5	22	200	34	
HML-P15 HML-P16	17+625	<i>Engineered Fill⁽⁵⁾</i>	–	20	-	28	300
		<i>Loose to compact silty sand</i>	0 ⁽⁶⁾ – 4.2	20	-	29	
	18+543	<i>Stiff to hard clayey silt</i>	4.2 – 14.2	21	75	30	
		<i>Hard clayey silt till</i>	Below 14.2	22	200	34	
HML-P17	22+627	<i>Engineered Fill⁽⁵⁾</i>	–	20	-	28	273
		<i>Compact Silt</i>	0 ⁽⁶⁾ – 2.9	20	-	29	
		<i>Very stiff to hard clayey silt</i>	2.9 – 14.8	21	100	31	
		<i>Hard (very dense) glacial till</i>	Below 14.8	22	200	34	
HML-P18 HML-P19	24+015 10+680	<i>Engineered Fill⁽⁵⁾</i>	–	20	-	28	286**
		<i>Stiff to hard clayey silt</i>	0 ⁽⁶⁾ – 10.0	21	75	30	
		<i>Very stiff to hard clayey silt till</i>	Below 10.0	22	150	32	



Type (Designation)	Proposed Highway 404 Station	Stratum	Depth ^{(1),(2)} (m)	Design Parameters			Design ⁽⁴⁾ Groundwater Elevation (m)
				$\gamma_b^{(3)}$ (kN/m ³)	S_u (kPa)	Φ' (Deg)	
HML-P20	11+323	<i>Engineered Fill</i> ⁽⁵⁾	–	20	-	28	291
		<i>Loose to dense sandy silt to silty sand</i>	0 ⁽⁶⁾ – 2.2	20	-	29	
		<i>Very stiff to hard clayey silt till</i>	Below 2.2	22	150	32	

* Groundwater level corresponding to the artesian conditions.

** Assumed groundwater design level.

- (1) Depths are based on available borehole information at the closest proximity to each HML/OHS location. These depths should be considered only approximate and need further verifications during the detail design phase.
- (2) Although the passive resistance in the upper 1.4 m should be neglected to account for frost action, geotechnical design parameters are provided, in the event that the ground surface varies between the typical stratigraphy profile and the HML/OHS location.
- (3) For soils below the groundwater level, submerged unit weight, i.e., $\gamma_{sub} = \gamma_b - \gamma_w$ should be used.
- (4) Preliminary design groundwater level based on historical data and should be verified during the detail design phase.
- (5) Although fill was not encountered, parameters are provided, in the event that the grade is being raised. Further verification during detail design phase will be required.
- (6) Below ground surface or any overlying fill layer.



Table 2 – Standard Specifications Relevant to Report

DOCUMENT	TITLE
OPSS 903	Construction Specification for Deep Foundations
OPSS 915	Construction Specification for Sign Support Structures
OPSD 3090.101	Foundation Frost Penetration Depths for Southern Ontario