



February 2013

FOUNDATION INVESTIGATION REPORT

**SIGN SUPPORT STRUCTURES
HIGHWAY 401 EASTBOUND COLLECTOR REHABILITATION
FROM JANE STREET TO AVENUE ROAD
TORONTO, ONTARIO
G.W.P. 2131-01-00**

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REPORT





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APPENDIX A Records of Boreholes from Previous Investigations

Records of Boreholes 78-103, 78-107; 80-5, 80-6; 80-15; 80-8, 80-13; 80-10, 80-11; 73-4, 73-5, 73-6; 75-2, 75-3; 81-4A, 243-11; 81-3B



PART A

FOUNDATION INVESTIGATION REPORT
SIGN SUPPORT STRUCTURES
HIGHWAY 401 EBC REHABILITATION FROM
JANE STREET TO AVENUE ROAD
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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been retained by URS Canada Inc. on behalf of Ministry of Transportation, Ontario (MTO) to provide foundation engineering services in support of the rehabilitation of the Highway 401 eastbound collector lanes (EBC) between Jane Street and Avenue Road in Toronto, Ontario.

This report addresses the Foundation Investigation for the proposed eight (8) Sign Support Structures to be constructed along Highway 401 approximately at the locations shown on Drawings 1 to 6.

The terms of reference and scope of work for the foundation engineering services are outlined in MTO's Request for Proposal (RFP) for Agreement No. 2009-E-0011, issued on December 16, 2009 and MTO's revised Terms of Reference in the "Addendum for Overhead Sign Structures" received from URS on September 4, 2012. The scope of work for the foundation engineering services is presented in Golder's revised scope change letter dated September 6, 2012.

This Foundation Investigation report is based on a desktop study of existing geotechnical information and summarizes the relevant information available from GEOCRESS.

2.0 SITE DESCRIPTION

Based on the information provided by URS, the proposed Sign Support Structures, designation location and corresponding structure type are summarized below and shown on Drawings 1 to 6.

Sign Support Designation	EBC Sign Location	Reference Stationing	Sign Support Structure Type
Contract 1 - OHS #2	Hwy 401 West - Allen N/S Ramp Station 10+151	Hwy 401W-Allen Rd S	Tri-chord static
Contract 1 - OHS #4	~175 m east of Bathurst Street Station 19+045	Hwy 401 EB Collector	Overhead Truss Changeable message
Contract 1 - OHS #5	~400 m east of Bathurst Street Station 19+378	Hwy 401 EB Collector	Tri-chord static
Contract 1 - OHS #6	~300 m west of Avenue Road Station 19+701	Hwy 401 EB Collector	Tri-chord static
Contract 1 - OHS #7	~50 m west of Avenue Road Station 19+951	Hwy 401 EB Collector	Pole Mounted Changeable Message
Contract 1 - OHS #8	~380 m east of Avenue Road Station 20+391	Hwy 401 EB Collector	Tri-chord static
Contract 2 - OHS #1	~430 m west of Dufferin Street Station 16+248	Hwy 401 EB Collector	Tri-chord static
Contract 2 - OHS #2	Hwy 401 W - Yorkdale E/W Ramp Station 10+468	Hwy 401 W – Yorkdale E/W	Tri-chord static



3.0 BACKGROUND INFORMATION

As part of the Highway 401 construction and widening in the early 1960's, and subsequent rehabilitation/widening works, various subsurface investigations were carried out by or on behalf of the MTO. The subsurface information used in this report was obtained from previous Foundation Investigation Reports prepared by others for structures within the Highway 401 corridor, available from MTO Pavement and Foundations Section's GEOCRES database, as follows:

- **MTO GEOCRES No. 30M11-073:** Report titled "Foundation Investigation for Avenue Road Underpass, Hwy. 401, Twp. Of North York, City of York, District No. 6, W.J. 61-F-91 - - W.P. 193-58," by Department of Highways – Ontario, Materials and Research Section, dated November 1961.
- **MTO GEOCRES No. 30M11-075:** Report titled "Retaining Wall "D" on Ramp "D", south side of Hwy, 401, Hogg's Hollow, District #6, Toronto, Ont., W.P. 85-59 (-1)," by Dominion Soil Investigation Limited, dated October 1962.
- **MTO GEOCRES No. 30M11-078:** Report titled "Report to Department of Highways, Ontario on Soil Conditions, Proposed 401-Spadina Interchange, W.P. 233-61-3, Toronto, Ontario," by Geocon Ltd., dated May 9, 1963.
- **MTO GEOCRES No. 30M11-080:** Report titled "Report to Department of Highways, Ontario on Soil Conditions and Foundations, Proposed Widening Highway #401, Bathurst Street and Avenue Road, W.P. 146-58, Downsview, Ontario," by Geocon Ltd., dated May 24, 1962.
- **MTO GEOCRES No. 30M11-081:** Report titled "Spadina Bridge # 1- W.P. 233-61-2-1, Spadina Bridge #2- W.P. 233-61-2-2, Spadina Bridge #3-W.P. 229-60," prepared by the MTO Foundations Section, dated March 27, 1963.
- **MTO GEOCRES No. 30M11-243:** Report titled "Foundation Investigation and Design Report, Highway 401 W – Dufferin/Yorkdale Ramp over Bridgeland Avenue, Rapid Bridge Replacement, Highway 401 Eastbound Collector Rehabilitation from Jane Street to Avenue Road, Toronto, Ontario, G.W.P. 2225-10-00," by Golder Associates Ltd, dated April 2012.

The available existing information at the overhead sign structure locations is as follows:

Site	Existing / Available Information
Contract 1 - OHS #2 Station 10+151	Two (2) boreholes (78-103 and 78-107) were drilled within 120 m of the proposed sign structure in 1962 by Geocon Ltd (GEOCRES No. 30M11-078).
Contract 1 - OHS #4 Station 19+045	Three (3) boreholes (80-5, 80-6 and 80-15) were drilled within 100 m of the proposed sign structure in 1962 by Geocon Ltd. (GEOCRES No. 30M11-080).
Contract 1 - OHS #5 Station 19+378	Two (2) borehole (80-8 and 80-13) were drilled within 75 m from the proposed sign structure in 1962 by Geocon Ltd. (GEOCRES No. 30M11-080).
Contract 1 - OHS #6 Station 19+701	Two (2) boreholes (80-10 and 80-11) were drilled within 75 m from the proposed sign structure in 1962 by Geocon Ltd. (GEOCRES No. 30M11-080).



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Site	Existing / Available Information
Contract 1 - OHS#7 Station 19+951	Three (3) boreholes (73-4 to 73-6) were drilled within 60 m from the proposed sign structure in 1962 by the Department of Highways, Ontario (GEOCRES No. 30M11-073).
Contract 1 - OHS #8 Station 20+391	Two (2) boreholes (75-2 and 75-3) were drilled within 150 m from the proposed sign structure in 1962 by Dominion Soil Investigation Limited (GEOCRES No. 30M11-075).
Contract 2 - OHS #1 Station 16+248	Two (2) boreholes (81-4A and 243-11) were drilled along the Highway 401W-Yorkdale off-ramp within about 225 m of the proposed sign structure in 1963 and 2011 by the Department of Highways, Ontario (GEOCRES No. 30M11-081) and Golder Associates Ltd. (GEOCRES No. 30M11-243).
Contract 2 - OHS #2 Station 10+468	One (1) borehole (81-3B) was drilled within 100 m of the proposed sign structure in 1963 by the Department of Highways, Ontario (GEOCRES No. 30M11-081).

4.0 PREVIOUS INVESTIGATION PROCEDURES

The previous investigations were carried out between 1962 and 1963 with the exception of the Golder investigation which was carried out in 2011. A total of seventeen (17) existing boreholes are located within 225 m (generally within about 100 m) of the proposed sign support structures (see Drawings 1 to 6) and are considered relevant for the current desktop study.

The procedures used in carrying out the previous investigations are similar to current MTO Foundations standard procedures; that is the boreholes were drilled by truck-mounted drill rigs using continuous flight solid stem or hollow stem augers, or N-size casing methods, and soil sampling was performed at regular intervals of depth (0.75 m to 1.5 m) using a 50 mm outside diameter split-spoon sampler driven by a manual hammer, in accordance with the Standard Penetration Test (SPT) procedure.

The groundwater conditions in the open boreholes were generally observed during or shortly after the drilling operations. Standpipe piezometers were installed in some of the boreholes and the details of the standpipe installations and recorded water levels are shown on the borehole records in Appendix A.

The soil samples were identified in the field and selected samples underwent laboratory testing which typically included standard classification tests (water content, Atterberg limits and grain size distribution) and compressive strength testing (i.e. undrained triaxial tests) on selected samples. The results of the laboratory testing are shown on the borehole records in Appendix A and described in the following sections of this report.

The existing boreholes used in this report have been re-numbered to show the MTO GEOCRES No. followed by the original borehole designation: for example, the boreholes from MTO GEOCRES 30M11-073 have been re-numbered to 73-X, where X is the original borehole number.

The existing borehole locations were identified on the drawings provided in the GEOCRES reports and cross-referenced with the base drawings provided by URS using the Highway 401 centreline and predominant surface features. Thus, the borehole locations are considered approximate and have been converted to MTM NAD83



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northing and easting coordinates and ground surface elevations referenced to Geodetic datum, as summarized below and shown on Drawings 1 to 6.

Sign Support Designation	Borehole No.	MTM NAD83 Northing	MTM NAD83 Easting	Ground Surface Elevation (m)	Borehole Depth (m)
Contract 1 - OHS#2	78-103	4843310.3	308624.7	188.5	13.6
	78-107	4843221.4	308724.5	188.5	15.1
Contract 1 - OHS#4	80-5	4844088.5	310264.9	183.9	6.9
	80-6	4844139.1	310339.6	183.6	7.5
	80-15	4844191.6	310280.7	183.8	7.3
Contract 1 - OHS#5	80-8	4844304.1	310540.2	181.7	6.2
	80-13	4844360.3	310490.6	181.1	6.3
Contract 1 - OHS#6	80-10	4844473.6	310769.9	179.4	7.5
	80-11	4844554.4	310728.6	181.5	7.6
Contract 1 - OHS#7	73-4	4844697.8	311036.3	184.1	7.9
	73-5	4844684.3	311021.0	180.2	9.3
	73-6	4844717.1	311008.0	178.4	9.1
Contract 1 - OHS#8	75-2	4844931.6	311301.7	178.6	9.0
	75-3	4845039.5	311411.5	175.9	9.1
Contract 2 - OHS#1	81-4A	4842981.9	308016.6	191.0	12.9
	*243-11	4842985.1	308026.6	192.5	12.8
Contract 2 - OHS#2	81-3B	4842967.8	308242.2	189.0	6.6

*Borehole co-ordinates and elevation obtained using a licensed surveyor.

5.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

5.1 Regional Geology

This section of Highway 401 is located within the physiographic region known as the Peel Plain, according to *The Physiography of Southern Ontario* (Chapman and Putnam, 1984)¹.

¹ Chapman, L.J. and Putman, D.F., 1984. *The Physiography of Southern Ontario*, Ontario Geological Society, Special Volume 2, Third Edition. Accompanied by Map p. 2715, Scale 1:600,000.



A surficial till sheet, which generally follows the surface topography, is generally present throughout much of this area. The till is typically comprised of clayey silt to silty clay, with occasional sand to silt zones and is mapped in this area as the Halton Till. Shallow, localized deposits of loose sand and silt and/or soft clay can overlie this uppermost till sheet, and these represent relatively recent deposits, formed in small glacial melt water ponds scattered throughout the Peel Plain and concentrated near river valleys, such as the West Don River valley. The recent sand, silt and clay and uppermost till deposits in this area overlie and are interbedded with stratified deposits of sand, silt and clay.

5.2 Subsurface Conditions

The detailed subsurface soil and groundwater condition encountered in the boreholes and the results of in situ and laboratory testing are provided on the borehole records contained in Appendix A. A summary of the laboratory test results is also provided in the following sections. The stratigraphic boundaries shown on the borehole records are considered to have been inferred from non-continuous sampling and, therefore, represent transitions between soil types rather than exact planes of geological change. The subsoil conditions will vary between and beyond the borehole locations.

A detailed description of the subsurface conditions encountered in the boreholes advanced near each specific proposed sign location is provided in the following sections.

5.2.1 Contract 1 – OHS#2 - Station 10+151

The proposed OHS #2 is located on the Highway 401 West - Allen N/S Ramp at approximately Station 10+151. The existing ground surface along the Highway 401 Eastbound Collector (EBC) lanes, in the vicinity of the proposed sign location, is about Elevation 186.9 m.

Based on the available geotechnical information from Boreholes 78-103 and 78-107, the subsoil conditions near OHS #2 consist of silt till with silty sand layers. A more detailed description of the subsurface conditions in the boreholes closest to the OHS #2 site is provided below.

5.2.1.1 Topsoil

A 0.15 m thick layer of topsoil was present at the ground surface at the time of the previous investigation in Boreholes 78-103 and 78-107.

5.2.1.2 Silt Till

Underlying the topsoil, a deposit of silt till was encountered and measured 12.6 m thick in Borehole 78-103 and extends to the bottom of Borehole 78-107 which was terminated at a depth of 15.1 m below ground surface (Elevation 173.5). The silt till consists predominantly of sand and contains silty sand layers that are described in more detail in the next section.

The measured Standard Penetration Test (SPT) 'N'-values within the till range from 20 blows to 87 blows per 0.3 m of penetration with a number of "N"-values recorded as greater than 100 blows per 0.3 m of penetration, indicating a compact to very dense relative density.



An unconfined compressive strength test performed on a sample of the very dense silt till measured about 996 kPa suggesting an undrained shear strength of about 498 kPa.

Two grain size distribution tests performed on samples of the silt till indicate 35 per cent and 50 per cent fines (predominantly silt), 55 per cent and 40 per cent sand, and 10 per cent gravel.

The natural water content measured on one sample of the silt till is 10 per cent.

5.2.1.3 Silty Sand/Silt and Sand

A silt and sand or silty sand layer was encountered within the silt till in both boreholes. The top of this granular layer was encountered at 12.8 m and 11.3 m below the ground surface in Boreholes 78-103 and 78-107, respectively, and was measured to be about 3.7 m thick in Borehole 78-107. Borehole 78-103 was terminated within the silt and sand layer at a depth of 13.6 m below ground surface (Elevation 174.9 m) after penetrating about 0.8 m into the layer.

The measured SPT 'N'-values within the silt and sand and silty sand layer are greater than 100 blows per 0.3 m of penetration, indicating a very dense relative density.

5.2.1.4 Groundwater Conditions

Boreholes 78-103 and 78-107 were dry when checked on Sept. 7, 1962 (about one week after the boreholes were drilled) suggesting the boreholes were left open to allow groundwater levels to stabilize. However, the groundwater level has likely changed over the past 50 years and will be subject to seasonal variations, and will tend to be higher during wet periods of the year.

5.2.2 Contract 1 - OHS#4 - Station 19+045

The proposed OHS #4 is located approximately 175 m east of Bathurst Street at about Station 19+045. The existing Highway 401 EBC pavement surface at this location is at about Elevation 188.8 m.

Based on the available geotechnical information from Boreholes 80-5, 80-6 and 80-15, the subsoil conditions near OHS #4 consist of embankment fill underlain by silt till. A more detailed description of the subsurface conditions in the boreholes located in the vicinity of the proposed OHS #4 site is provided below.

5.2.2.1 Inferred Embankment Fill

The current ground surface at the location of OHS #4 is at about Elevation 188.8 m based on the current topographic plan provided by URS. The ground surface at the borehole locations advanced during the 1962 geotechnical investigation range from Elevation 183.6 m to 183.9 m in Boreholes 80-5, 80-6 and 80-15. Therefore, it is assumed that embankment fill was placed above the previous ground surface as part of the construction of Highway 401 in this area, however, no geotechnical data for the embankment fill is available. Based on the existing topographic plan, it is estimated that the embankment fill is about 5 m thick at the location of the proposed OHS #4.



5.2.2.2 *Topsoil and Silt Fill*

An approximately 0.15 m to 0.3 m thick layer of topsoil was present in Boreholes 80-5, 80-6 and 80-15 at the time of the 1962 investigation. Underlying the topsoil, a silt fill layer was encountered, ranging in thickness from 0.5 m to 1.1 m in all three boreholes.

Dynamic Cone Penetration Test (DCPT) values measured within the fill range between about 3 blows and 17 blows per 0.3 m of penetration.

5.2.2.3 *Silt Till*

A silt till deposit was encountered underlying the fill layer in Boreholes 80-5, 80-6 and 80-15. The boreholes were terminated within this deposit at depths ranging from 6.9 m to 7.5 m (Elevations 177.0 m to 176.1 m) after penetrating into the till deposit between 5.6 m and 6.9 m.

The measured SPT 'N'-values within the silt till deposit range from 28 blows to 100 blows per 0.3 m of penetration, with a number of "N" values recorded as greater than 100 blows per 0.3 m of penetration, indicating a compact to very dense (typically very dense) relative density.

The result of a quick undrained triaxial test and an unconfined test performed on samples of the silt till measured compressive strengths of 345 kPa and 335 kPa, suggesting the silt till has a undrained shear strength of about 170 kPa and 168 kPa respectively.

The natural water content measured on two samples of the silt till is 12 per cent and 13 per cent.

5.2.2.4 *Groundwater Conditions*

A standpipe piezometer was installed in each of the three boreholes and the groundwater level was recorded at depths of 4.8 m (Elevation 179.1 m), 7.5 m (Elevation 176.1 m) and 4.1 m (Elevation 179.7 m) below ground surface on May 5, 1962 (about one week after completion of the boreholes) in Boreholes 80-5, 80-6 and 8-15 respectively. The groundwater level has likely changed over the past 50 years and will be subject to seasonal variations, and will tend to be higher during wet periods of the year.

5.2.3 *Contract 1 - OHS#5 - Station 19+378*

The proposed OHS #5 is located approximately 400 m east of Bathurst Street at about Station 19+378. The existing Highway 401 EBC pavement grade at the proposed sign location is approximately Elevation 184.5 m.

Based on the available geotechnical information from Boreholes 80-8 and 80-13, the subsoil conditions near OHS #5 consist a layer of topsoil underlain by silty till fill. The fill is underlain by a deposit of silt till, which is in turn underlain by a deposit of silty clay. A more detailed description of the subsurface conditions in the boreholes located in the vicinity of the proposed OHS #5 location is provided below.

5.2.3.1 *Inferred Embankment Fill*

The current ground surface at the location of OHS #5 is at Elevation 184.5 m based on the topographic plan provided by URS. The ground surface at the borehole locations advanced during the previous geotechnical investigation was at Elevation 181.7 m and 181.1 m in Boreholes 80-8 and 80-13. Therefore, it is inferred that embankment fill was placed above the previous ground surface as part of the construction of the Highway 401,



however, no geotechnical data for the embankment fill is available. Based on the existing topographic plan, it is estimated the embankment fill is up to about 3.4 m thick at the proposed OHS #5 location.

5.2.3.2 Topsoil and Silt Fill

An approximately 0.2 to 0.3 m thick layer of topsoil was present in Boreholes 80-8 and 80-13 at the time of the 1962 investigation. Underlying the topsoil, a layer of silt fill was encountered, about 1.1 m thick in both boreholes.

Dynamic Cone Penetration Test (DCPT) values ranging between about 2 blows and 10 blows per 0.3 m of penetration were measured in the fill as shown on the borehole records.

5.2.3.3 Silt Till

A deposit of silt till was encountered underlying the fill layer in both boreholes. The top of the silt till deposit was encountered at depths of 1.2 m and 1.4 m below ground surface (Elevations 180.5 m and 179.7 m) and the deposit is 4.3 m and 4.4 m thick in Boreholes 80-8 and 80-13, respectively.

The measured SPT 'N'-values within the silt till deposit range from 22 blows to 84 blows per 0.3 m of penetration, indicating the deposit is compact to very dense.

The result of an unconfined compressive test performed on a sample of the silt till deposit measured a compressive strength of 325 kPa, suggesting an undrained shear strength of about 163 kPa.

The natural water content measured on a sample of the silt till is about 12 per cent.

5.2.3.4 Silty Clay

A deposit of silty clay was encountered underlying the silt till deposit. Boreholes 80-8 and 80-13 were terminated within this deposit at depths of 6.2 m and 6.3 m below ground surface (Elevation 175.4 m and 174.8 m) after penetrating about 0.8 m and 0.5 m, respectively into the deposit.

Two SPT 'N'-values measured within the silty clay deposit are 53 blows and 82 blows per 0.3 m of penetration, suggesting a hard consistency.

The result of a quick undrained triaxial test performed on a sample of the silty clay measured a compressive strength of 795 kPa, suggesting an undrained shear strength of about 398 kPa.

An Atterberg limits test performed on a sample of the silty clay measured a liquid limit of 41 per cent, plastic limit of 19 per cent, and corresponding plasticity index of 22 per cent. The natural water content measured on two samples of the silty clay is 16 and 19 per cent.

5.2.3.5 Groundwater Conditions

A standpipe piezometer was installed in each borehole and the water level was recorded at a depth of 1.7 m (Elevation 180.0 m) and 1.2 m (Elevation 179.9 m) on May 5, 1962 (about 4 days after completion of the boreholes) in Boreholes 80-8 and 8-13, respectively. The groundwater level has likely changed over the past 50 years and will be subject to seasonal variations, and will tend to be higher during wet periods of the year.



5.2.4 Contract 1 - OHS#6 - Station 19+701

The proposed OHS #6 is located approximately 300 m west of Avenue Road at about Station 19+701. The existing Highway 401 EBC pavement grade at the proposed sign location is approximately Elevation 180.5 m.

Based on the available geotechnical information from Boreholes 80-10 and 80-11, the subsoil conditions near OHS #6 consist of a layer of topsoil / fill underlain by a silt till deposit, which is underlain by a silty clay deposit. A more detailed description of the subsurface conditions in the boreholes located in the vicinity of the proposed OHS #6 site is provided below.

5.2.4.1 Topsoil / Fill

A 0.15 m thick layer of topsoil was encountered in Borehole 80-11 at the time of the 1962 investigation. A 1.5 m thick and a 1.1 m thick layer of sand fill was present at the ground surface in Borehole 80-10 and below the topsoil in 80-11.

One SPT 'N'-value measured within the sand fill is 45 blows per 0.3 m of penetration, indicating the fill deposit is dense. Dynamic Cone Penetration Test (DCPT) values ranging between 2 blows and 32 blows per 0.3 m of penetration were measured within the fill deposit.

5.2.4.2 Silt Till

A deposit of silt till was encountered underlying the fill layer in both boreholes. The top of the silt till deposit was encountered at depths of 1.8 m and 1.2 m below ground surface (Elevations 179.1 m and 180.3 m) and the thickness of the deposit is 3.7 m and 4.3 m in 80-10 and 80-11, respectively.

The measured SPT 'N'-values within the silt till deposit range from 25 blows to 56 blows per 0.3 m of penetration, indicating the deposit is compact to very dense.

An Atterberg Limits test performed on a sample of the silt till measured a liquid limit of 25 per cent, a plastic limit of 14 per cent, and a corresponding plasticity index of 11 per cent indicating the till is a clayey silt of low plasticity. The natural water content measured on a sample of the silt till was about 10 per cent.

A grain size distribution test performed on a sample of the silt till measured 22 per cent clay, 38 per cent silt, 35 per cent sand and 5 per cent gravel indicating the till is comprised predominantly of clayey silt and sand.

5.2.4.3 Silty Clay

A deposit of silty clay was encountered underlying the silt till deposit. Boreholes 80-10 and 80-11 were terminated within this deposit at depths of 7.5 m and 7.6 m below ground surface (Elevation 171.9 m and 173.9 m) after penetrating about 2.0 m and 2.1 m, respectively into the silty clay.

SPT 'N'-values measured within the silty clay deposit range from 46 blows to 74 blows per 0.3 m of penetration, with one "N" value greater than 100 blows per 0.3 m of penetration, suggesting a hard consistency.

An Atterberg limits test performed on a sample of the silty clay measured a liquid limit of 47 per cent, a plastic limit of 22 per cent, and a corresponding plasticity index of 25 per cent, indicating that the material consists of silty clay of intermediate plasticity. The natural water content measured on a sample of the silty clay is about 18 per cent.



5.2.4.4 Groundwater Conditions

A standpipe piezometer was installed in each borehole and the water level was recorded at a depth of 2.2 m and 1.7 m below ground surface (Elevation 178.7 m Elevation 179.9 m) on May 5, 1962 (about 5 days after completion of the boreholes) in Boreholes 80-10 and 8-11, respectively. The groundwater level has likely changed over the past 50 years and will be subject to seasonal variations, and will tend to be higher during wet periods of the year.

5.2.5 Contract 1- OHS#7 - Station 19+951

The proposed OHS #7 is located about 50 m west of the Highway 401 / Avenue Road underpass at about Station 19+951. The existing Highway 401 EBC pavement grade near the proposed sign location is approximately Elevation 178.5 m.

Based on the available geotechnical information from Boreholes 73-4 to 73-6, the subsoil conditions near OHS #7 generally consist of sandy clayey silt underlain by silty sand to sandy silt, which is underlain by a sand deposit. A silty clay layer was present within the silty sand to sandy silt deposit in Borehole 73-6. A more detailed description of the subsurface conditions in the boreholes located near the proposed OHS #7 site is provided below.

5.2.5.1 Sand with Organics

A 1.3 m thick deposit of sand containing organic matter was encountered at the ground surface in Borehole 73-4 at the time of the 1961 investigation.

The deposit is described as having a loose relative density.

5.2.5.2 Sandy Clayey Silt

An approximately 3.0 m to 4.2 m thick deposit of sandy clayey silt was encountered underlying the deposit of sand with organics in Borehole 73-4 and at the ground surface in Borehole 73-5.

The measured SPT 'N'-values within the sandy clayey silt deposit ranged from 10 blows to 150 blows per 0.3 m of penetration, suggesting a stiff to hard consistency.

The natural water content measured on four samples of the sandy clayey silt ranged from 8 to 16 per cent.

5.2.5.3 Sandy Silt to Silty Sand

A deposit of sandy silt to silty sand was encountered immediately at the ground surface in Borehole 73-6 and underlying the sandy clayey silt deposit in Boreholes 73-4 and 73-5. The top of the deposit was encountered at a depth of 4.3 m below ground surface in Boreholes 73-4 and 73-5 corresponding to Elevation 179.8 m and 176.0 m respectively. Boreholes 73-4 and 73-5 terminated within this deposit at depths of 7.9 m and 9.3 m below ground surface (Elevation 176.2 m and 170.9 m), penetrating the deposit for a thickness of 3.6 m and 5.0 m, respectively. The deposit is 6.7 m thick in Borehole 73-6, with the bottom of the deposit extending to Elevation 171.7 m.

The measured SPT 'N'-values within the sandy silt to silty sand range from 30 blows per 0.15 m of penetration to 100 blows per 0.05 m of penetration but typically greater than 100 blows per 0.3 m of penetration, indicating a very dense relative density.



The natural water content measured on samples of the sandy silt to silty sand ranged from 4 to 19 per cent.

5.2.5.4 Silty Clay

A 1.8 m thick stratum of silty clay was encountered below the sandy silt to silty sand deposit at a depth of 6.7 m (Elevation 171.7 m) in Borehole 73-6.

One SPT 'N'-value measured within the silty clay is 154 blows per 0.25 m of penetration, suggesting a hard consistency.

5.2.5.5 Sand

A 0.6 m thick deposit of sand was encountered underlying the silty clay layer in Borehole 73-6. The borehole terminated within the sand deposit at a depth of 9.1 m (Elevation 169.3).

The deposit is described as very dense on the borehole record.

5.2.5.6 Groundwater Conditions

The borehole records indicate a groundwater level at depths of about 5.9 m and 4.6 m below ground surface (Elevation 174.3 m and 173.8 m) in Boreholes 73-5 and 73-6, respectively. The water level may not represent stabilized groundwater conditions and has likely changed since the year 1961 (i.e. the time of this investigation). The groundwater level will be subject to seasonal variations, and will tend to be higher during wet periods of the year.

5.2.6 Contract 1 - OHS#8 - Station 20+391

The proposed OHS #8 is located approximately 380 m east of Avenue Road at about Station 20+391. The existing Highway 401 EBC pavement grade near the proposed sign location is at about Elevation 174.9 m.

Based on the available geotechnical information from Boreholes 75-2 and 75-3, the subsoil conditions near OHS #8 consist of a surficial layer of topsoil underlain by sandy clayey silt till underlain by silt and sand deposits. A more detailed description of the subsurface conditions in the boreholes located near the OHS #8 site is provided below.

5.2.6.1 Topsoil

A layer of topsoil about 0.3 m and 0.5 m thick was present in Boreholes 75-2 and 75-3 at the time of the 1962 investigation. The ground surface was at Elevation 178.6 m and 175.9 m in Boreholes 75-2 and 75-3 respectively.

5.2.6.2 Sandy Clayey Silt Till

Below the topsoil, a deposit of sandy clayey silt till was encountered at a depth of about 0.3 m and 0.5 m below ground surface in Boreholes 75-2 and 75-3, respectively. The sandy clayey silt till deposit is 2.4 m and 2.3 m thick in Borehole 75-2 and 75-3 respectively, and the deposit contains clay layers in Borehole 75-3. In Borehole 75-2, a 0.5 m thick layer of clayey silt till was encountered within the granular deposit described below at a depth of 8.2 m below ground surface (Elevation 170.4 m).



Two measured SPT 'N'-values within the sandy clayey silt till deposit are 6 blows and 69 blows per 0.3 m of penetration, suggesting a firm to hard consistency. The lower 'N'-value within the till deposit in Borehole 75-3 is attributed to the clay layers present.

5.2.6.3 Sand, Silty Sand and Silt

A deposit of sand, silty sand and silt was encountered immediately below the sandy clayey silt till in Borehole 75-2 and 75-3. The top of the sand and silt deposit was encountered at a depth of 2.7 m below ground surface, corresponding to Elevation 175.9 m and 173.2 m, and extends to the bottom of both boreholes which terminated at a depth of 9 m and 9.1 m below ground surface (Elevation 169.6 m and 166.8 m) in Boreholes 75-2 and 75-3, respectively. Interlayers and pockets of sand and gravel and clayey silt till as noted above were encountered within the sand and the silt strata. A boulder was encountered within the sand stratum at a depth of about 5.5 m below ground surface (about Elevation 173.1 m).

The measured SPT 'N'-values within the sand, silty sand and sand deposit are greater than 100 blows per 0.3 m of penetration indicating the deposit is very dense.

5.2.6.4 Gravel

A 1.2 m thick layer of gravel was encountered within the sand and silty sand deposit at a depth of 7 m below ground surface (Elevation 171.6 m) in Borehole 75-2. Boulders were reportedly encountered within the gravel deposit during borehole advancement.

A measured SPT 'N'-value within the gravel layer is greater than 100 blows per 0.3 m of penetration indicating the material is very dense.

5.2.6.5 Groundwater Conditions

Groundwater levels were measured at the time of drilling at a depth of about 7.6 m and 8.4 m below ground surface (Elevation 171 m and 167.5 m) in Boreholes 75-2 and 75-3 respectively.

The water level may not represent stabilized groundwater conditions and has likely changed since 1962 (i.e. the time of this investigation). The groundwater level will be subject to seasonal variations, and will tend to be higher during wet periods of the year.

5.2.7 Contract 2 - OHS#1 - Station 16+248

The proposed Contract 2 OHS #1 is located approximately 430 m west of the Dufferin Street exit ramp at about Station 16+248. The existing Highway 401 EBC pavement grade at the proposed sign location is at about Elevation 189.4 m.

Based on the available geotechnical information from Boreholes 243-11 and 81-4A, the subsoil conditions near OHS #1 for this contract consist of clayey silt embankment fill underlain by clayey silt to silty clay till, which is underlain by a silt deposit. A more detailed description of the subsurface conditions in the boreholes closest to the OHS #1 drilled in 2011 and 1963 is provided below.



5.2.7.1 Clayey Silt Fill

A 0.2 m thick layer of asphalt underlain by a 3.5 m thick fill deposit consisting of clayey silt with sand was encountered in Borehole 243-11. In Borehole 81-4A a 0.2 m thick layer of topsoil was encountered at ground surface.

The measured SPT 'N'-values within the fill range from 12 blows to 19 blows per 0.3 m of penetration suggesting a stiff to very stiff consistency.

Atterberg limits testing carried out on one sample of the fill measured a plastic limit of 15 per cent, a liquid limit of 30 per cent, and a corresponding plasticity index of 15 per cent indicating the deposit is a clayey silt of low plasticity. A grain size distribution test performed on a sample of the clayey silt fill measured 25 per cent clay, 52 per cent silt and 23 per cent sand.

The natural water content measured on two selected samples of the fill is 14 and 16 per cent.

5.2.7.2 Clayey Silt to Silty Clay Till

A deposit of clayey silt to silty clay till was encountered below the topsoil in Borehole 81-4A and below the clayey silt fill in Borehole 243-11. Borehole 243-11 terminated within the till deposit at a depth of 12.8 m below ground surface (Elevation 179.7 m), penetrating it for a thickness of 9.1 m. The thickness of the till deposit in Borehole 81-4A is 11.9 m.

The measured SPT 'N'-values within the clayey silt to silty clay till deposit range from 19 blows to 62 blows per 0.3 m of penetration, suggesting a very stiff to hard consistency.

Atterberg limits testing was carried out on three selected samples of the till deposit and measured plastic limits between 10 per cent and 11 per cent, liquid limits between 17 per cent and 26 per cent, and plastic indices between 8 per cent and 14 per cent indicating that the material is a clayey silt of low plasticity. Two grain size distribution tests performed on samples of the clayey silt till measured 17 per cent to 19 per cent clay; 47 per cent to 48 per cent silt; 32 per cent to 34 per cent sand; and 0 to 2 per cent gravel.

The natural water content measured on selected samples of the till ranges from 8 per cent to 14 per cent.

5.2.7.3 Silt / Clayey Silt

A silt to clayey silt deposit was encountered underlying the clayey silt to silty clay till deposit in Borehole 81-4A at a depth of 12.2 m below ground surface (Elevation 178.8 m). The borehole terminated within this deposit at a depth of 13.8 m below ground surface (Elevation 177.1 m), penetrating it for a thickness of 1.6 m.

The measured SPT 'N'-values within the silt to clayey silt deposit are greater than 100 blows per 0.3 m of penetration, suggesting a very dense / hard consistency.

5.2.7.4 Groundwater Conditions

The groundwater level in Borehole 81-4A was measured at a depth of approximately 3.4 m below ground surface (Elevation 187.6 m), while Borehole 243-11 was dry on completion of drilling. The water level may not represent stabilized groundwater conditions, will be subject to seasonal variations, and will tend to be higher during wet periods of the year.



FOUNDATION REPORT - SIGN SUPPORT STRUCTURES

5.2.8 Contract 2 - OHS#2 - Station 10+468

The proposed Contract 2 OHS #2 is located on the Highway 401W–Yorkdale E/W Ramp at about Station 10+468. The existing pavement grade at the proposed sign location is at approximately Elevation 189.8 m.

Based on the available geotechnical information from Borehole 81-3B, the subsoil conditions near OHS #2 for this contract consist of topsoil underlain by clayey silt to silty clay till. A more detailed description of the subsurface conditions encountered in Borehole 81-3B (located about 100 m from the proposed OHS #2 site), drilled in 1963 is provided below.

5.2.8.1 Topsoil

An approximately 0.2 m thick deposit of topsoil was encountered at ground surface in Borehole 81-3B.

5.2.8.2 Clayey Silt to Silty Clay Till

Underlying the topsoil, a 6.4 m thick deposit of clayey silt to silty clay till was encountered in Borehole 81-3B to the bottom of the borehole which was terminated at a depth of 6.6 m below ground surface (Elevation 182.4 m). The till deposit contains trace sand and trace gravel, and organic matter was present to about 1.2 m below ground surface (Elevation 187.8 m).

The measured SPT 'N'-values within the clayey silt to silty clay till deposit range from 16 blows to 59 blows per 0.3 m of penetration, suggesting a very stiff to hard consistency.

5.2.8.3 Groundwater Conditions

The groundwater level was measured in the open borehole at a depth of 4.5 m below ground surface (Elevation 184.5 m) in Borehole 81-3B. The water level may not represent stabilized groundwater conditions and has likely changed since the year 1963 (i.e. the time of this investigation). The groundwater level will be subject to seasonal variations, and will tend to be higher during wet periods of the year.

6.0 CLOSURE

This Foundation Investigation Report was prepared by Ms. Nikol Kochmanová, P.Eng., and reviewed by Mr. Kevin Bentley, P.Eng., an Associate and Senior Geotechnical Engineer at Golder. Mr. Jorge Costa, P.Eng., a Designated MTO Contact and Principal with Golder, conducted an independent review and quality control audit of this report.

GOLDER ASSOCIATES LTD.



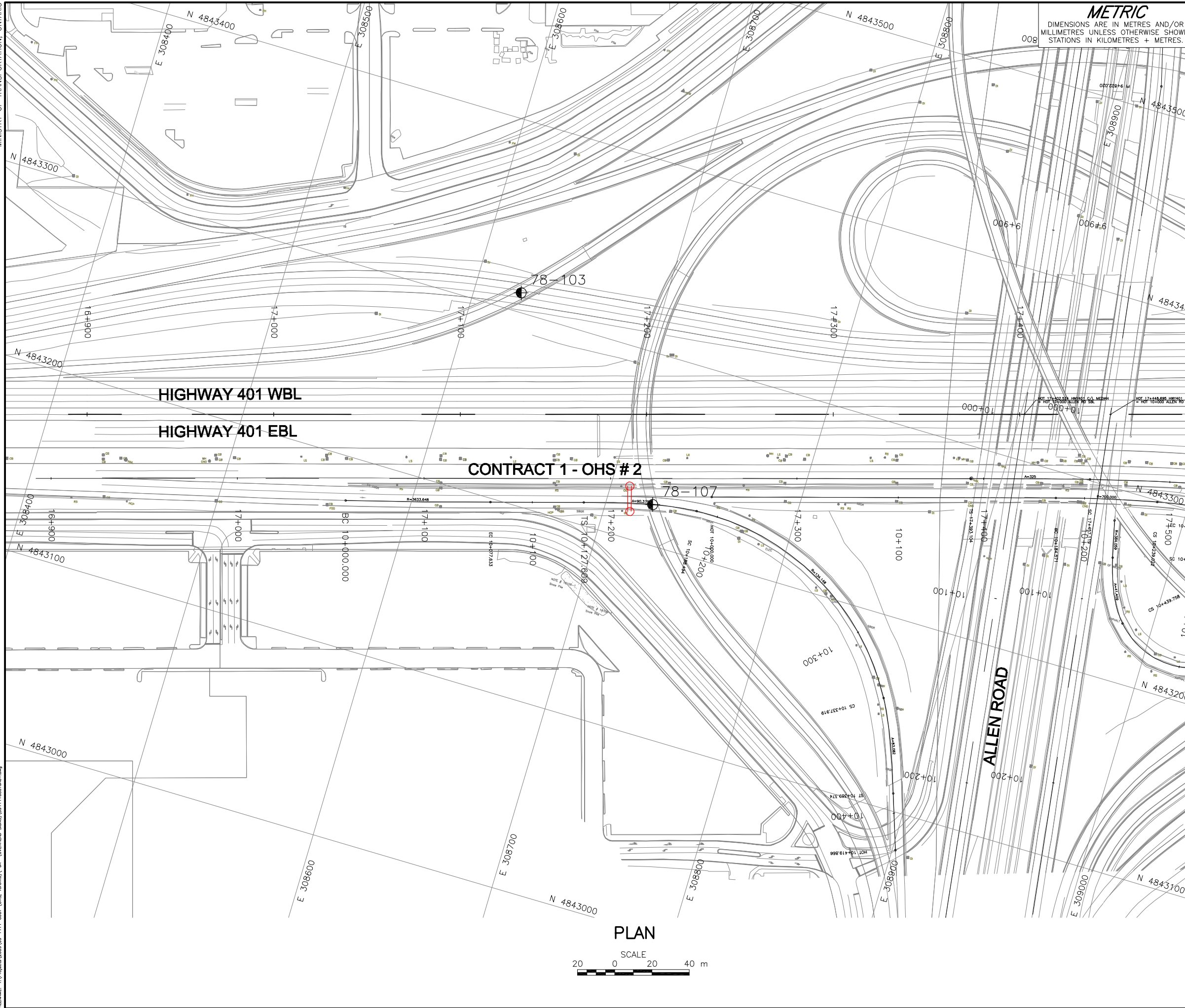
Kevin J. Bentley, P.Eng.
Geotechnical Engineer, Associate



Jorge M.A. Costa, P.Eng.
Designated MTO Contact, Principal

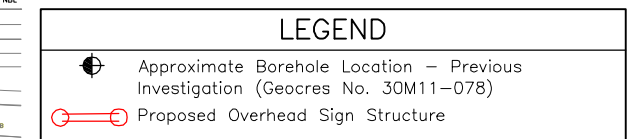
NK/KJB/JMAC/jl

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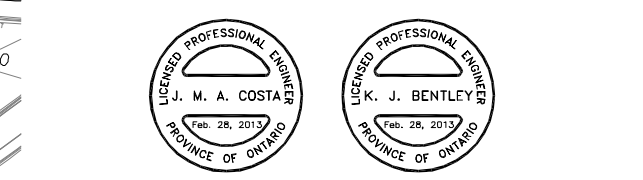


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BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
78-103	188.5	4843310.3	308624.7
78-107	188.5	4843221.4	308724.5



NOTES

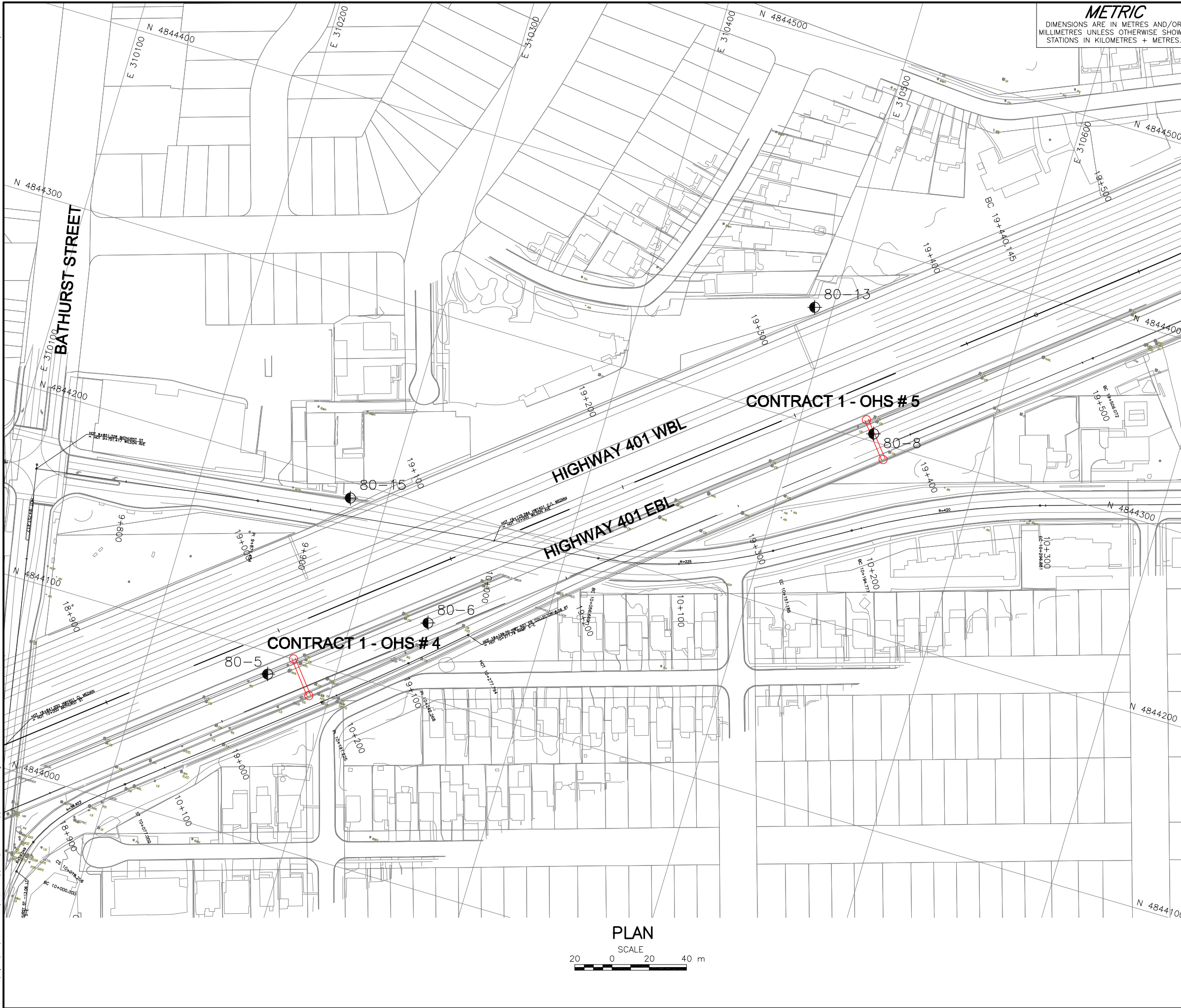
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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REFERENCE

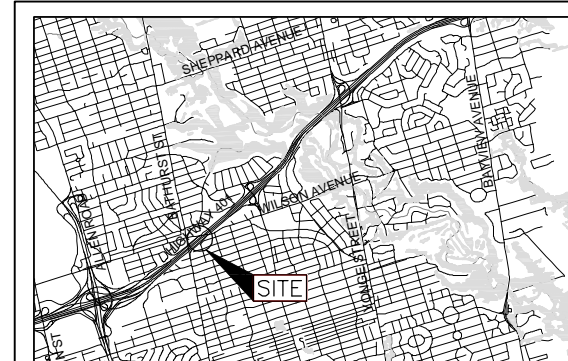
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 August 3, 2011 and August 10, 2011.

NO.	DATE	BY	REVISION		
Geocres No. 30M11-247					
HWY. 401			PROJECT NO. 09-1111-6007		DIST. Central
SUBM'D. NK		CHKD. KJB	DATE: Feb.28, 2013		SITE:
DRAWN: JFC		CHKD. NK	APPD. JMAG		DWG. 1



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MILLIMETRES UNLESS OTHERWISE SHOWN
STATIONS IN KILOMETRES + METRES.



SHEET



KEY PLAN

SCALE
1 0 1 2 km

LEGEND

-  Approximate Borehole Location – Previous Investigation (Geocres No. 30M11-080)
 Proposed Overhead Sign Structure

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
80-5	183.9	4844088.5	310264.9
80-6	183.6	4844139.1	310339.6
80-8	181.7	4844304.1	310540.2
80-13	181.1	4844360.3	310490.6
80-15	183.8	4844191.6	310280.7



NOTES

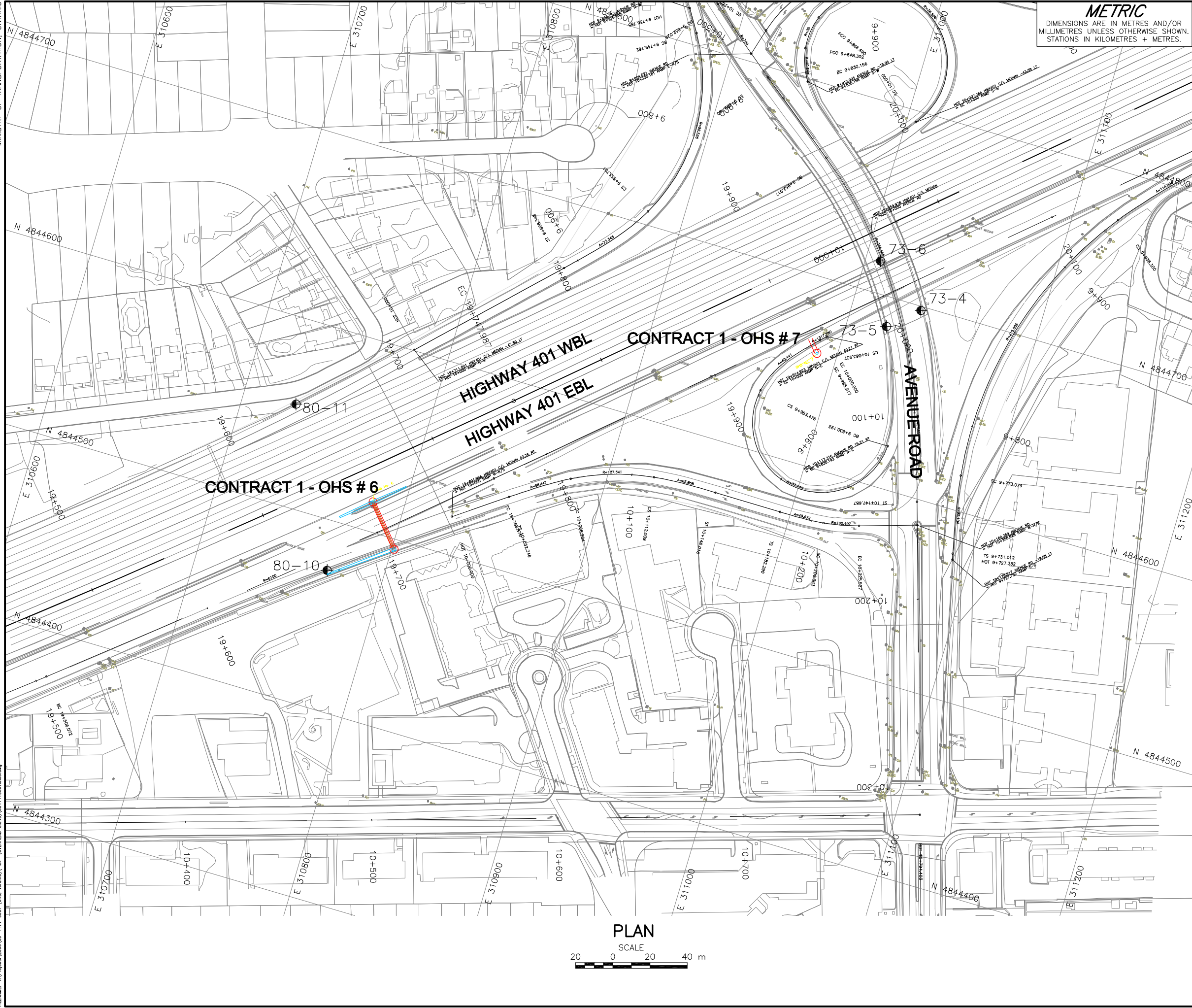
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August 3, 2011 and August 10, 2011.

NO.	DATE	BY	REVISION		
Geocres No. 30M11-247					
HWY. 401			PROJECT NO. 09-1111-6007		DIST. Centra
SUBM'D. NK		CHKD. KJB	DATE: Feb.28, 2013		SITE:
DRAWN: JFC		CHKD. NK	APPD. JMCA		DWG. 2



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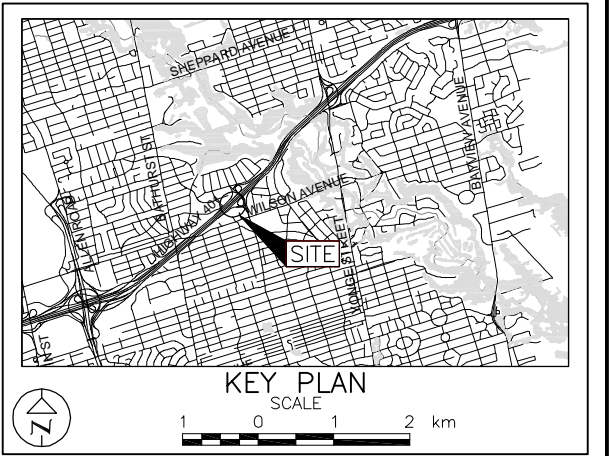
CONT No.
GWP No. 2131-01-00

HIGHWAY 401 EBC REHABILITATION
CONTRACT 1 - OHS #6 AND #7
BOREHOLE LOCATIONS

SHEET

Golder Associates

Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

Approximate Borehole Location - Previous Investigation (Geocres No. 30M11-073 and 30M11-080)

Proposed Overhead Sign Structure

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
73-4	184.1	4844697.8	311036.3
73-5	180.2	4844684.3	311021.0
73-6	178.4	4844717.1	311008.0
80-10	179.4	4844473.6	310769.9
80-11	181.5	4844554.4	310728.6

LICENSED PROFESSIONAL ENGINEER
J. M. A. COSTA
Feb. 28, 2013
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
K. J. BENTLEY
Feb. 28, 2013
PROVINCE OF ONTARIO

NOTES

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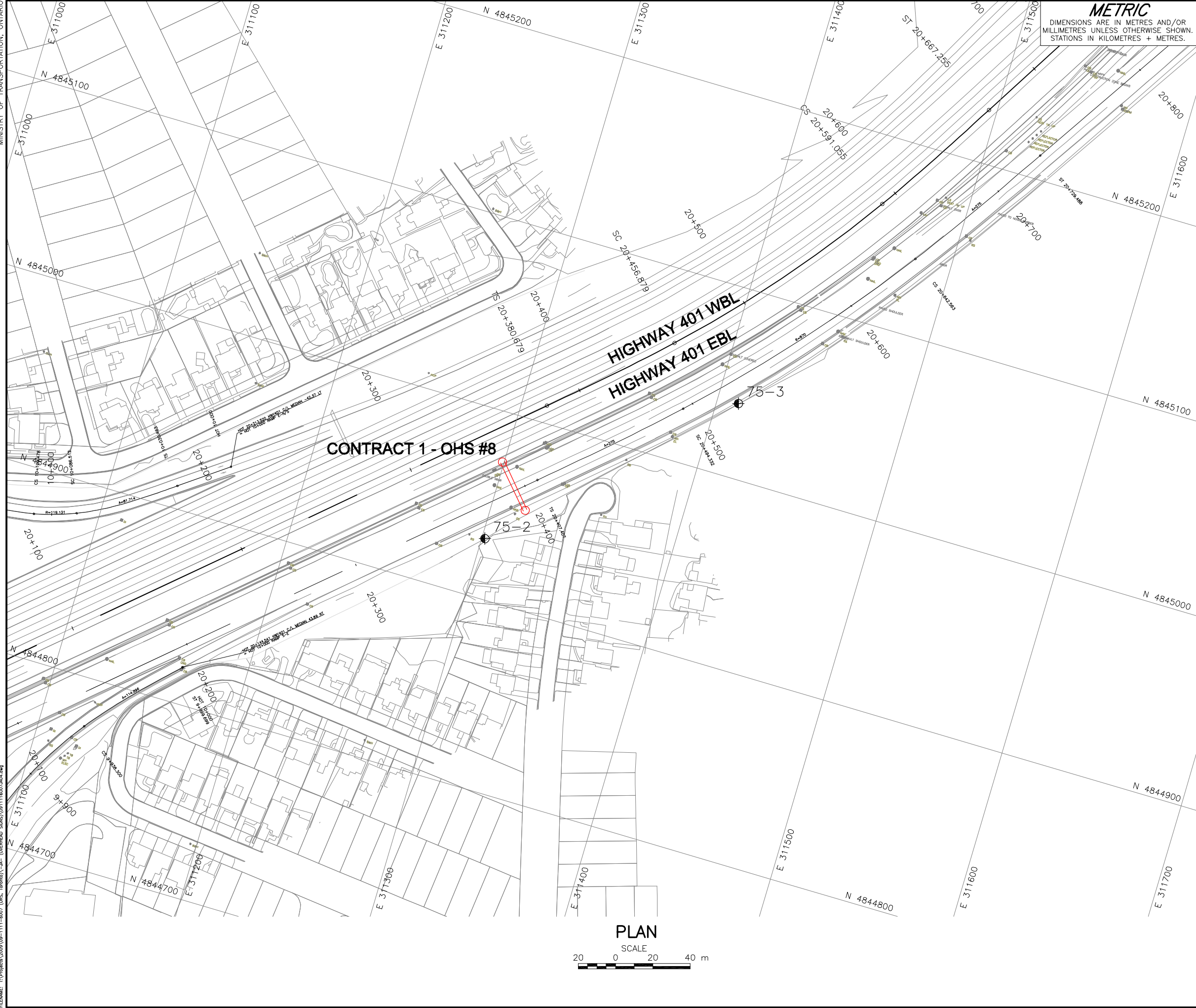
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

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NO.	DATE	BY	REVISION
Geocres No. 30M11-247			
HWY. 401		PROJECT NO. 09-1111-6007	
SUBM'D. NK		DATE: Feb.28, 2013	
DRAWN: JFC		SITE:	
		DIST. Central	
		DWG. 3	





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STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 2131-01-00

HIGHWAY 401 EBC REHABILITATION
CONTRACT 1 - OHS #8
BOREHOLE LOCATIONS



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LEGEND

Approximate Borehole Location - Previous Investigation (Geocres No. 30M11-075)

Proposed Overhead Sign Structure

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
75-2	178.6	4844931.6	311301.7
75-3	175.9	4845039.5	311411.5



NOTES

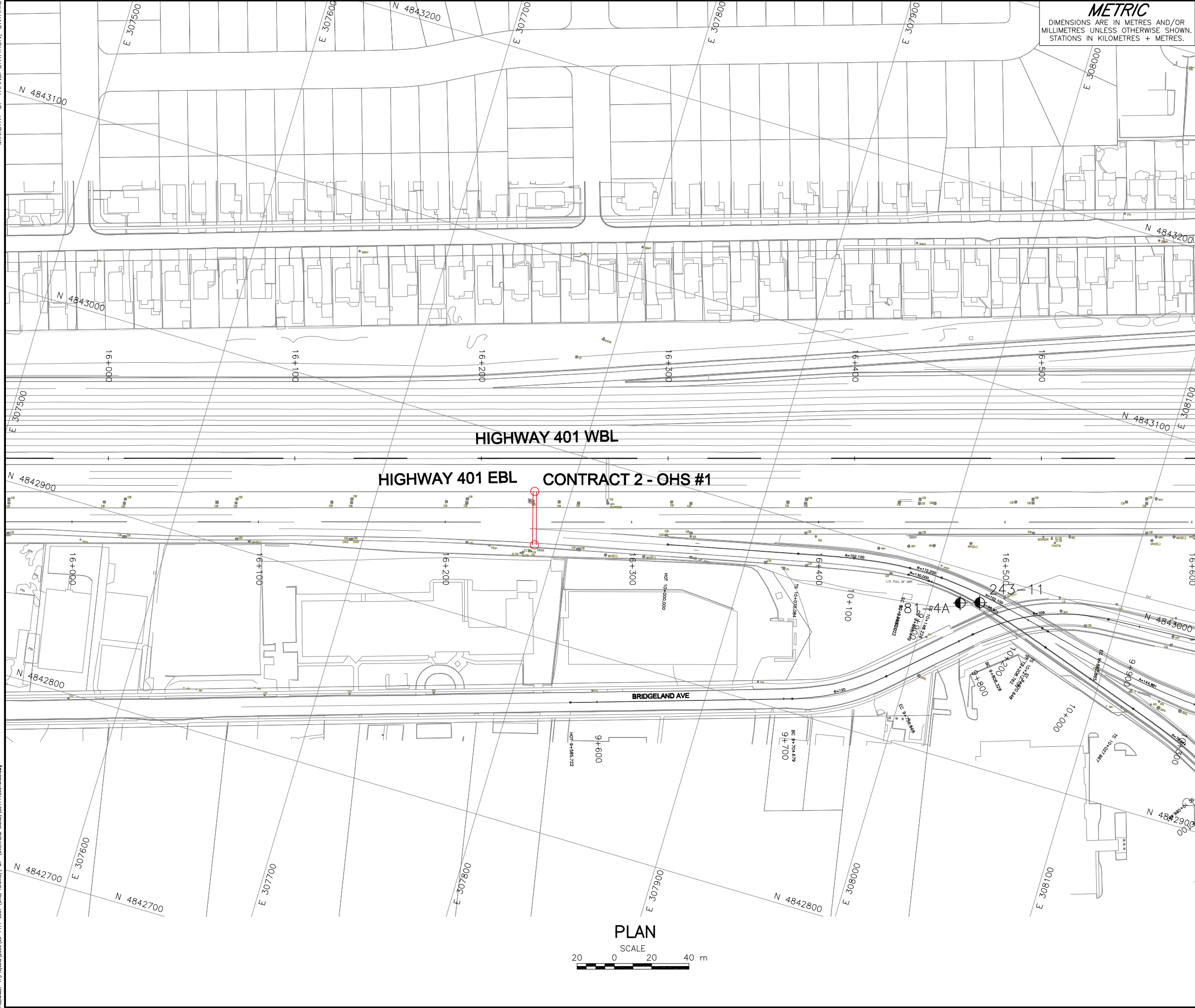
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NO.	DATE	BY	REVISION
Geocres No. 30M11-247			
HWY. 401	PROJECT NO. 09-1111-6007		DIST. Central
SUBM'D. NK	CHKD. KJB	DATE: Feb.28, 2013	SITE:
DRAWN: JFC	CHKD. NK	APPD. JMAC	DWG. 4



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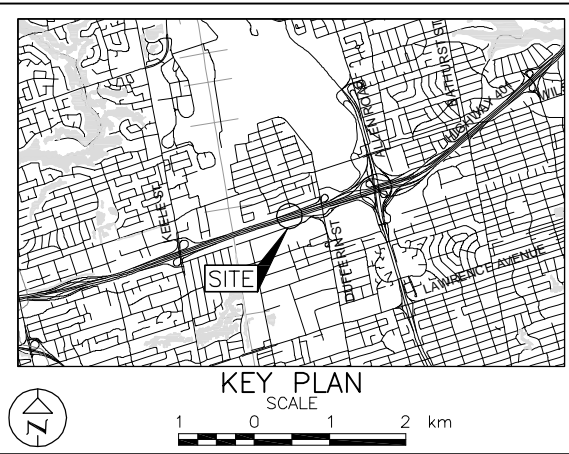
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GWP No. 2131-01-00

HIGHWAY 401 EBC REHABILITATION
CONTRACT 2 - OHS #1
BOREHOLE LOCATIONS

SHEET



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MISSISSAUGA, ONTARIO, CANADA



LEGEND

Approximate Borehole Location - Previous Investigation (Geocres No.'s 30M11-081 and 30M11-243)

Proposed Overhead Sign Structure

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
81-4A	191.0	4842981.9	308016.6
243-11	192.5	4842985.1	308026.6



NOTES

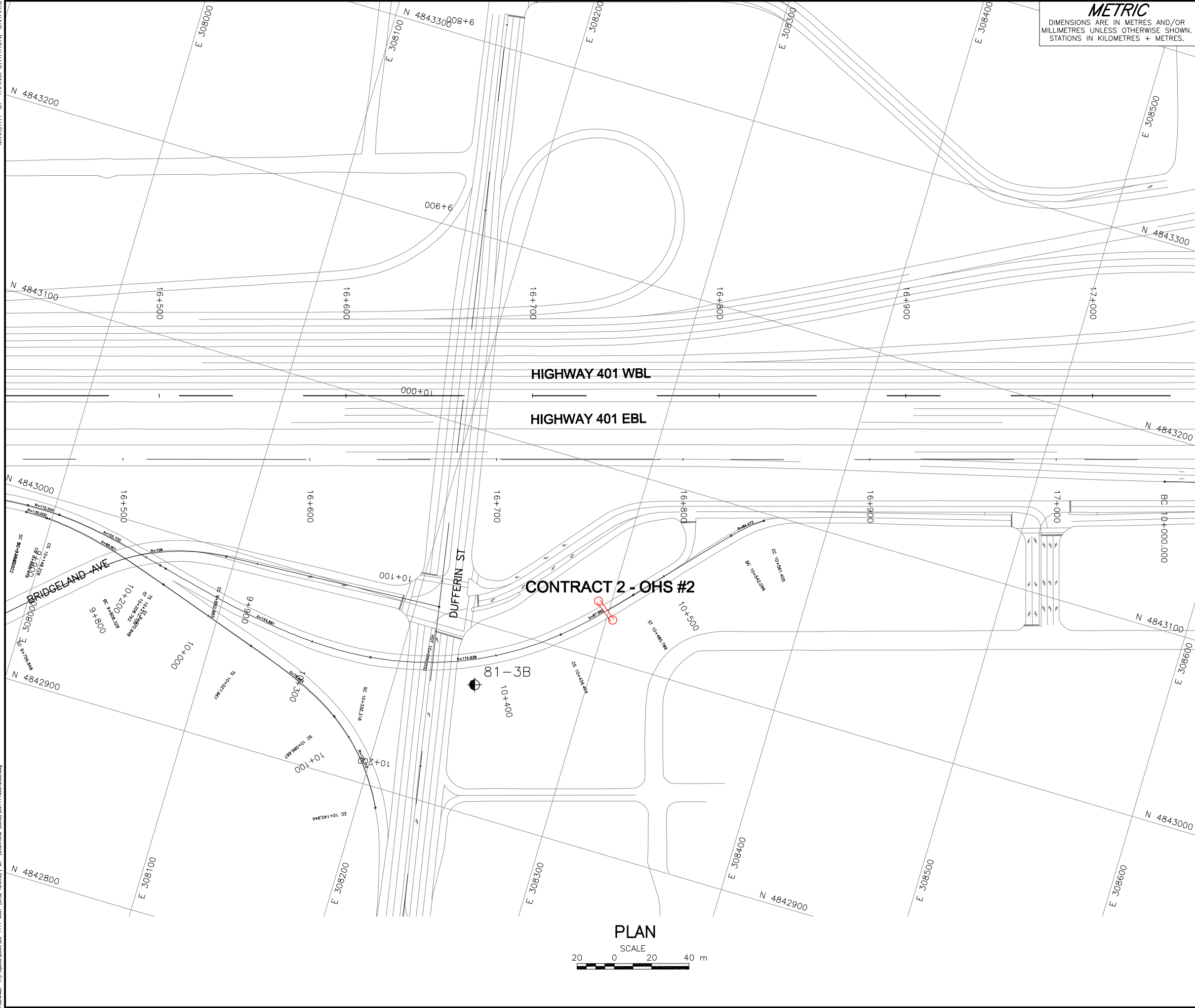
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REFERENCE

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NO.	DATE	BY	REVISION
Geocres No. 30M11-247			
HWY. 401		PROJECT NO. 09-1111-6007	
SUBM'D. NK		CHKD. KJB	DATE: Feb.28, 2013
DRAWN: JFC		CHKD. NK	APPD. JMAC
		DIST. Central	
		SITE:	
		DWG. 5	



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CONT No.
GWP No. 2131-01-00

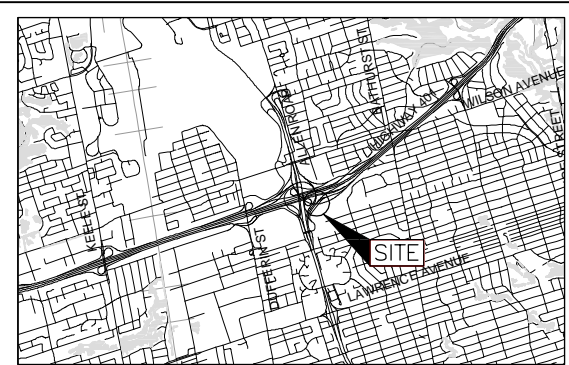
HIGHWAY 401 EBC REHABILITATION
CONTRACT 2 - OHS #2
BOREHOLE LOCATIONS



SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

- Approximate Borehole Location - Previous Investigation (Geocres No. 30M11-081)
- Proposed Overhead Sign Structure

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
81-3B	189.0	4842967.8	308242.2



NOTES

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REFERENCE

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NO.	DATE	BY	REVISION
Geocres No. 30M11-247			
HWY. 401		PROJECT NO. 09-1111-6007	
SUBM'D. NK		DATE: Feb.28, 2013	
DRAWN: JFC		SITE:	
CHKD. NK		APPD. JMAC	
DIST. Central		DWG. 6	



APPENDIX A

Record of Boreholes from Previous Investigations



CONTRACT 1 – OHS#2 SIGN STRUCTURE

EXPLANATION OF THE FORM "OFFICE REPORT ON SOIL EXPLORATION"

The object of this form is to enable a comprehensive study of the soil to be made by combining on one sheet all of the information obtained from the boring. An explanation of the various columns of the report follows.

ELEVATION AND DEPTH

This column gives the elevation and depth of boundaries between the various soil strata. The elevation is referred to the datum shown in the general heading.

WATER CONDITIONS

In this column the water level in the casing at the time of boring or the water table in the ground, determined by a series of observations in a piezometer or standpipe, is indicated to scale by a horizontal line with the symbol W.L. or W.T. above the line. A notation of any complicated groundwater conditions will be made in this column.

DESCRIPTION

A description of the soil, using standard terminology, is contained in this column. The consistency of cohesive soils and the relative density of non-cohesive soils are described by the following terms:

Consistency	U-Strength Tons/sq. ft.	Relative Density	Standard Penetration Resistance, Blows/ft.
Very soft	0.03 to 0.25	Very loose	0 to 4
Soft	0.25 to 0.5	Loose	4 to 10
Firm	0.5 to 1.0	Compact	10 to 30
Stiff	1.0 to 2.0	Dense	30 to 50
Very stiff	2.0 to 4.0	Very dense	over 50
Hard	over 4.0		

STRATIGRAPHIC PLOT

The stratigraphic plot follows the standard symbols of the National Research Council, Canada.

ELEVATION SCALE

The information in all columns is plotted to a true elevation scale which is shown in this column.

GRAPHS

The main body of the report forms a graph which is used to plot to correct elevation the important soil properties which are obtained through field and laboratory tests. The scales and symbols for the plotting are shown at the head of the column.

OTHER TESTS

In this column are shown, by symbol, the other field or laboratory tests which have been performed on the soil and in which the results have not been plotted on the above graph.

SAMPLES

The first three columns describe the condition, type and number of each sample obtained from the boring. The location and extent of each sample is plotted to scale.

In the last column is shown the penetration resistance in blows of 4200 inch-pounds required to drive one foot of the sampler into the ground. When a 2 inch Drive Sampler is used the result obtained is termed the "Standard Penetration Resistance".

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

SAMPLE CONDITION

SAMPLE TYPES

ABBREVIATIONS

<input type="checkbox"/>	DISTURBED
<input type="checkbox"/>	FAIR
<input type="checkbox"/>	GOOD
<input type="checkbox"/>	LOST

A.S. - AUGER SAMPLE
ST - SLOTTED TUBE
W.S. - WASHED SAMPLE
D.O. - DRIVE-OPEN
D.F. - DRIVE-FOOT VALVE
C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
S.O. - SLEEVE-OPEN
S.F. - SLEEVE-FOOT VALVE
T.O. - THIN WALLED OPEN
R.C. - ROCK CORE

V - IN-SITU VANE TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
QC - TRIAXIAL CONSOLIDATED QUICK
Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW

γ - WET UNIT WEIG./IT
 K - PERMEABILITY
 C - CONSOLIDATION

WL - WATER LEVEL IN CASING
WT - WATER TABLE IN SOIL

SOIL PROFILE					COMPRESSION STRENGTH TONS/FT ²			SAMPLES				
ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE	WATER CONTENT W%			OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
					20	40	60					
					DYNAMIC PENETRATION TEST BLOWS PER FOOT							
					BH #103							
610.3		GROUND LEVEL		620	0-5 TOPSOIL			78-103				
		VERY DENSE BROWN SILTY TILL		610								
				600								
		VERY DENSE GREY SILTY TILL		590								
				580								
		VERY DENSE BROWN STRATIFIED SILT AND SAND		570								
		END OF HOLE		560								
					BH #104							
621.3		GROUND LEVEL		620	0-5 TOPSOIL							
		COMPACT TO VERY DENSE BROWN SILTY TILL		610								
				600								
		DENSE TO VERY DENSE GREY SILTY TILL		590								
				580								
		VERY DENSE BROWN SILTY SAND TRACE OF GRAVEL		570								
				560								
		END OF HOLE		550								

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT S 7423 BORING # 107 AND 108 DATUM GEODETIC CASING
 BORING DATE AUG. 30, 31, 1962 REPORT DATE AUG. 31, 1962 COMPILED BY AEL CHECKED BY F. J. H.
 SAMPLER HAMMER WT. 14.0 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

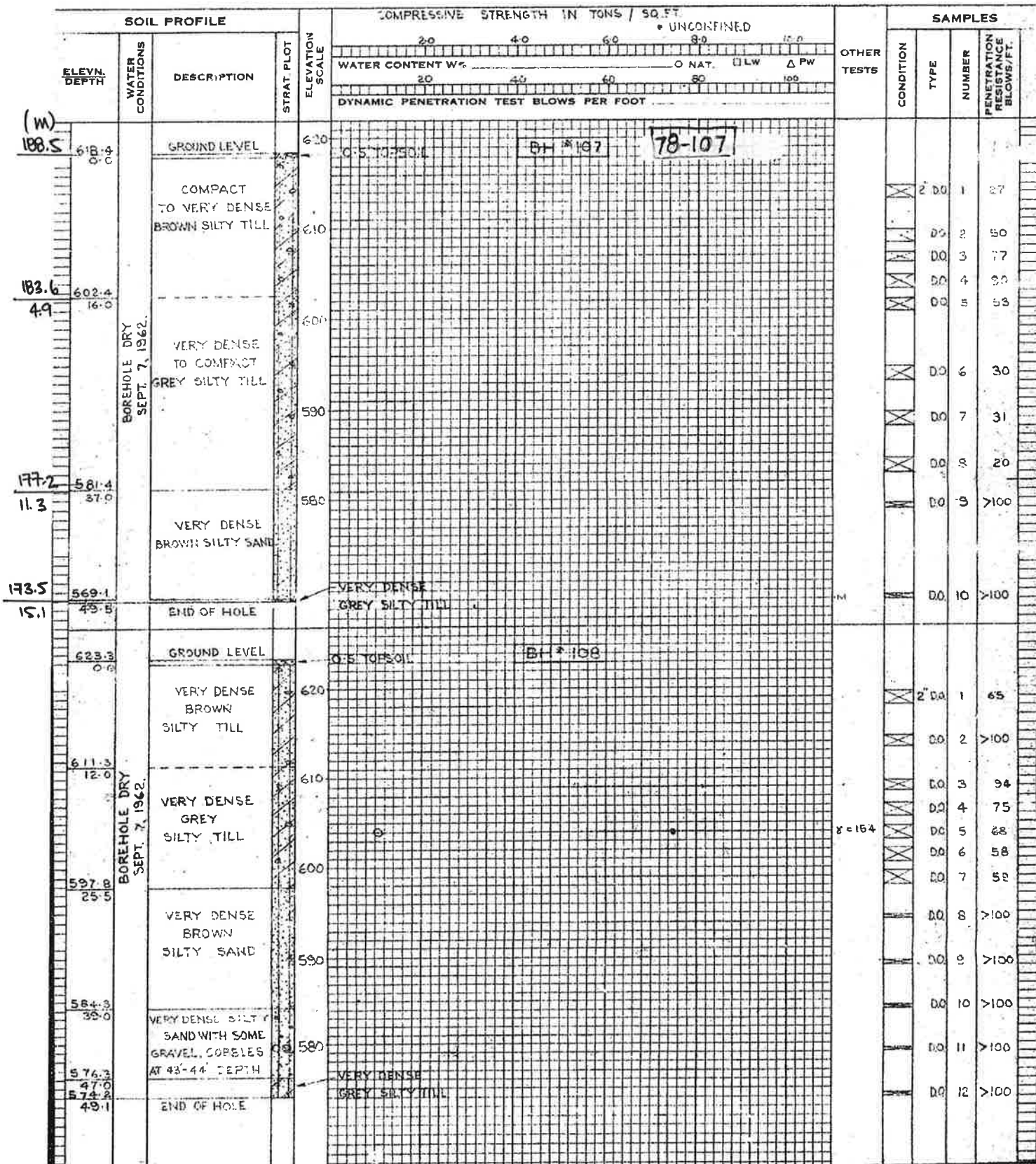
F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 Qc - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW

γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION

WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL





CONTRACT 1 – OHS#4 SIGN STRUCTURE

OFFICE REPORT ON SOIL EXPLORATION

SAMPLE CONDITION

SAMPLE TYPES

ABBREVIATIONS

A.S. - AUGER SAMPLE
S.T. - SLOTTED TUBE
W.S. - WASHED SAMPLE
D.O. - DRIVE-OPEN
D.F. - DRIVE-FOOT VALVE
C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
S.O. - SLEEVE-OPEN
S.F. - SLEEVE-FOOT VALVE
T.O. - THIN WALLED OPEN
R.C. - ROCK CORE

V - IN-SITU VANE TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
QC - TRIAXIAL CONSOLIDATED QUICK
Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW

γ - WET UNIT WEIGHT PCF
K - PERMEABILITY
C - CONSOLIDATION

WL - WATER LEVEL IN CASING
WT - WATER TABLE IN SOIL

SOIL PROFILE					COMPREHENSIVE STRENGTH TONS PER SQ. FT.		OTHER TESTS	SAMPLES			
ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLT.	ELEVATION SCALE	UNCONFINED			CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
					WATER CONTENT W%	O NAT. □ LW Δ Pw					
					DYNAMIC PENETRATION TEST BLOWS PER FOOT						
					20	40	60	80	100		
					X=131						

OFFICE REPORT ON SOIL EXPLORATION

SAMPLE CONDITION

SAMPLE TYPES

ABBREVIATIONS

DISTURBED
FAIR
GOOD
LOST

A.S. AUGER SAMPLE
S.T. SLOTTED TUBE
W.S. WASHED SAMPLE
D.O. DRIVE-OPEN
D.F. DRIVE-FOOT VALVE
C.S. CHUNK SAMPLE

F.S. - FOIL SAMPLE
S.O. - SLEEVE-OPEN
S.F. - SLEEVE-FOOT VALVE
T.O. - THIN WALLED OPEN
R.C. - ROCK CORE

- V - IN-SITU VANE TEST
- M - MECHANICAL ANALYSIS
- U - UNCONFINED COMPRESSION
- QC - TRIAXIAL CONSOLIDATED QUICK
- Q - TRIAXIAL QUICK
- S - TRIAXIAL SLOW

γ - WET UNIT WEIGHT PCF
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

[illegible]



CONTRACT 1 – OHS#5 SIGN STRUCTURE

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT S7358 BORING # 7-1-3 DATUM GEODETIC CASING
 BORING DATE MAY 1 1962 REPORT DATE APRIL 30 1962 COMPILED BY ALL CHECKED BY D.B.D.
 SAMPLER HAMMER WT. 145 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION



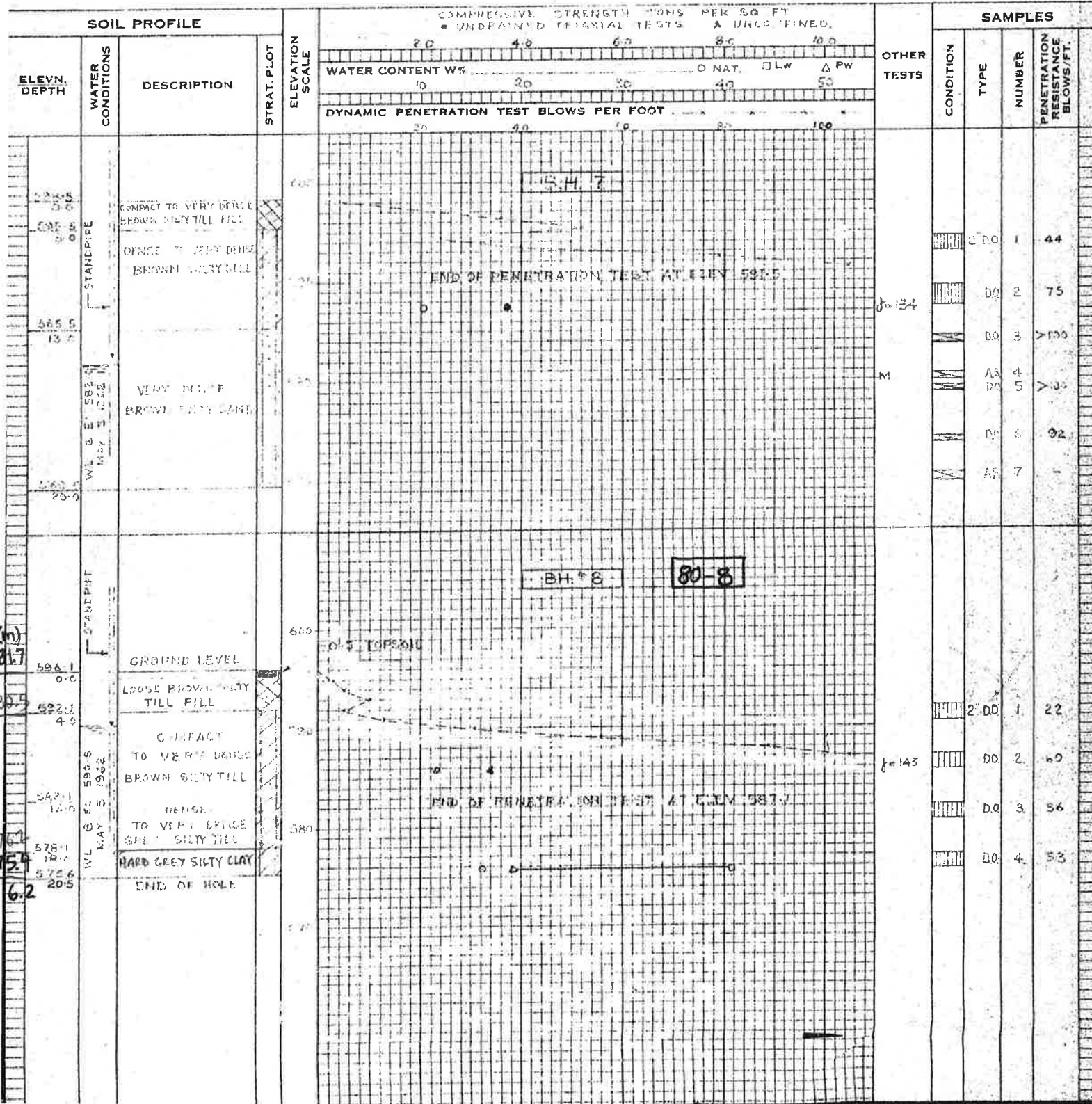
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW
 γ - WET UNIT WEIGHT PCF
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 57282 BORING # 13 & 14 DATUM GEODLTG CASING
 BORING DATE APRIL 27, 1962 REPORT DATE MAY 1, 1962 COMPILED BY AEL CHECKED BY D.B.O
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW
 γ - WET UNIT WEIGHT PCF
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

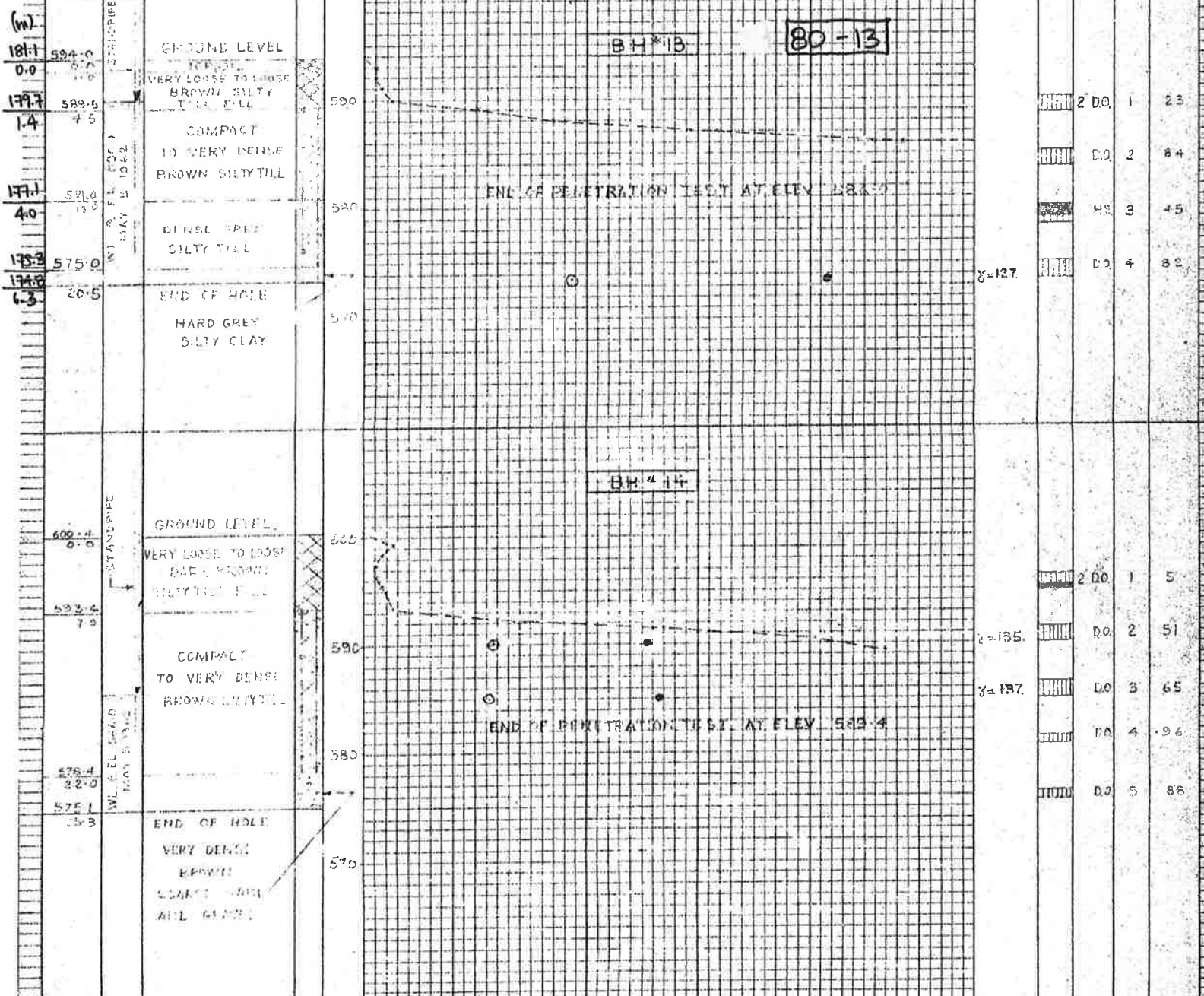
SOIL PROFILE

COMPRESSIVE STRENGTH TONS PER SQ FT
 • UNDRAINED TRIAXIAL TESTS

WATER CONTENT W% 0 NAT. □ LW Δ PW
 DYNAMIC PENETRATION TEST BLOWS PER FOOT

SAMPLES

OTHER TESTS
 CONDITION
 TYPE
 NUMBER
 PENETRATION RESISTANCE BLOWS/FT.





CONTRACT 1 – OHS#6 SIGN STRUCTURE

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 57358 BORING # 9 10 DATUM GEODETIC CASING
 BORING DATE APRIL 24 1962 REPORT DATE APRIL 30 1962 COMPILED BY AEL CHECKED BY DBO
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW
 7 - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

SOIL PROFILE

COMPRESSION STRENGTH TONS PER SQ. FT.

UNCONFINED

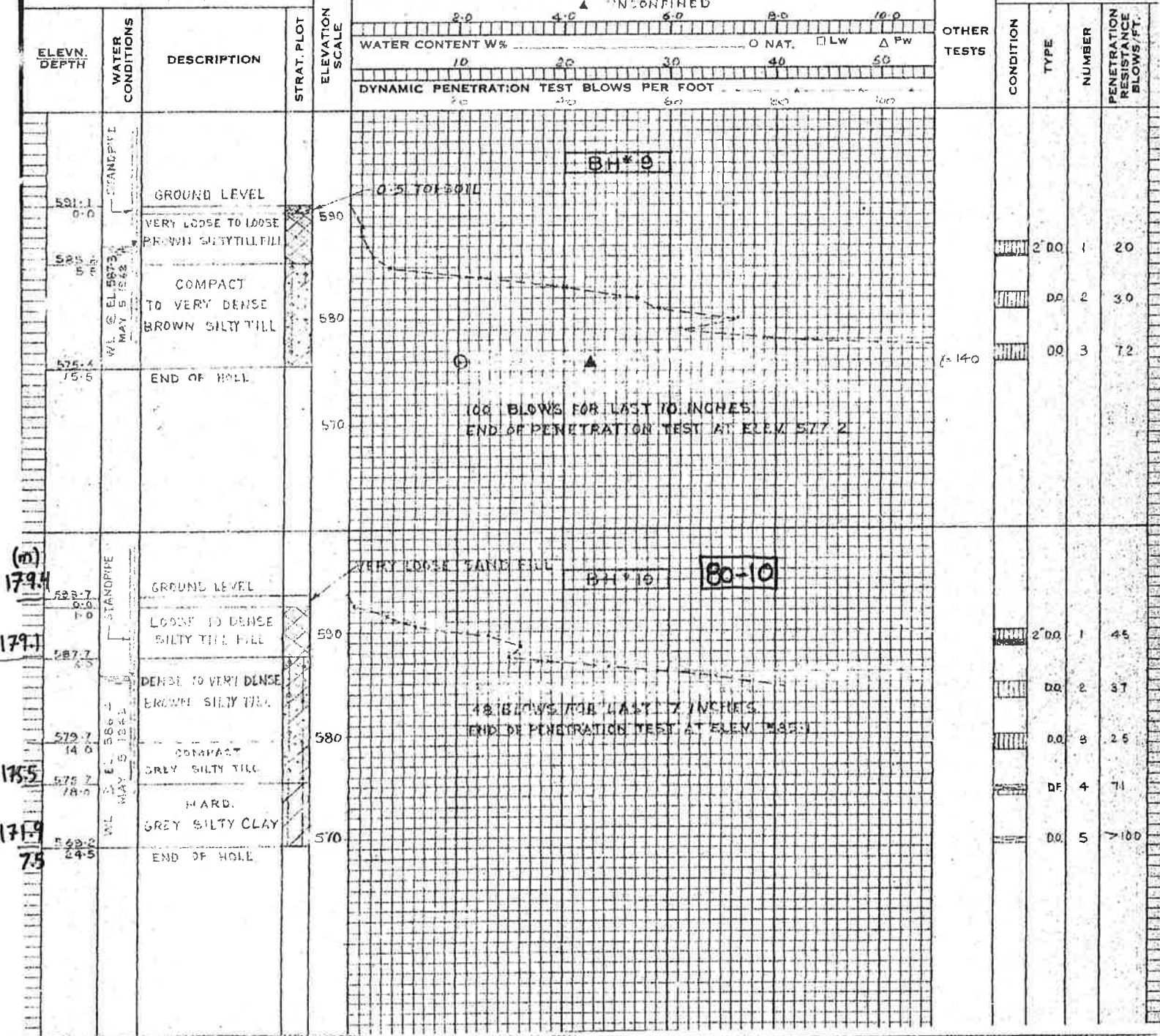
WATER CONTENT W%

NAT. LW PW

DYNAMIC PENETRATION TEST BLOWS PER FOOT

SAMPLES

OTHER TESTS
 CONDITION
 TYPE
 NUMBER
 PENETRATION RESISTANCE BLOWS/FT.



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 57358 BORING # 11 & 12 DATUM GEODETIC CASING
 BORING DATE APRIL 25 1962 REPORT DATE APRIL 30 1962 COMPILED BY ACL CHECKED BY D B O
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

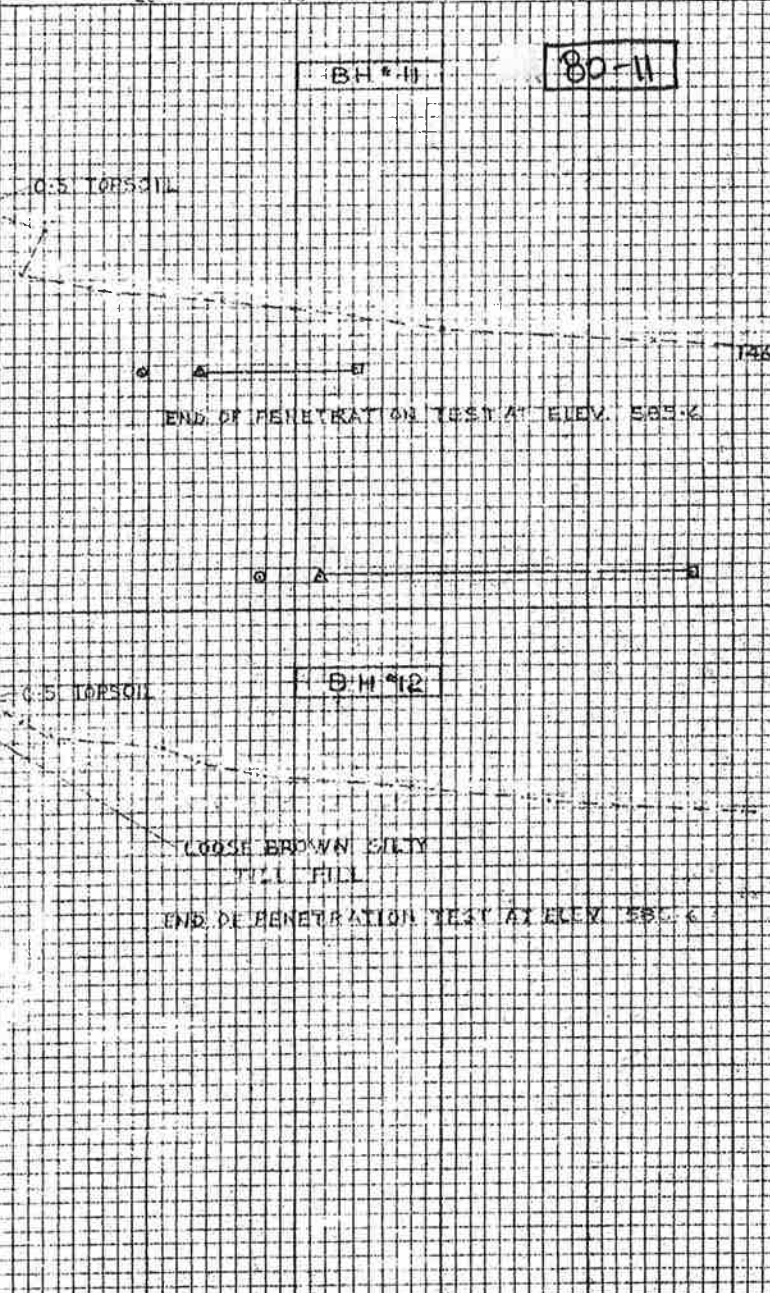
ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW
 γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASIN
 WT - WATER TABLE IN SOIL

SOIL PROFILE

ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE
181.5 6.0	592.6 0.0	GROUND LEVEL		600
180.3 1.2	591.6 4.0	LOOSE BROWN SILTY TILL FILL		590
179.6 2.9	592.6 13.0	COMPACT TO VERY DENSE BROWN SILTY TILL		580
176.1 5.4	577.4 18.0	DENSE GREY SILTY TILL		570
173.9 7.6	570.6 25.0	HARD GREY SILTY CLAY		560
		END OF HOLE		550

WATER CONTENT W% 10 20 30 40 50 60 70 80 90 100
 DYNAMIC PENETRATION TEST BLOWS PER FOOT 20 40 60 80 100



OTHER TESTS

SAMPLES

CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
		1	26
		2	56
		3	41
		4	46
		5	74



CONTRACT 1 – OHS#7 SIGN STRUCTURE

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 193-58 BORE HOLE NO. 2 73-5

JOB 61-F-91 STATION 8+55 (32' L.E.)

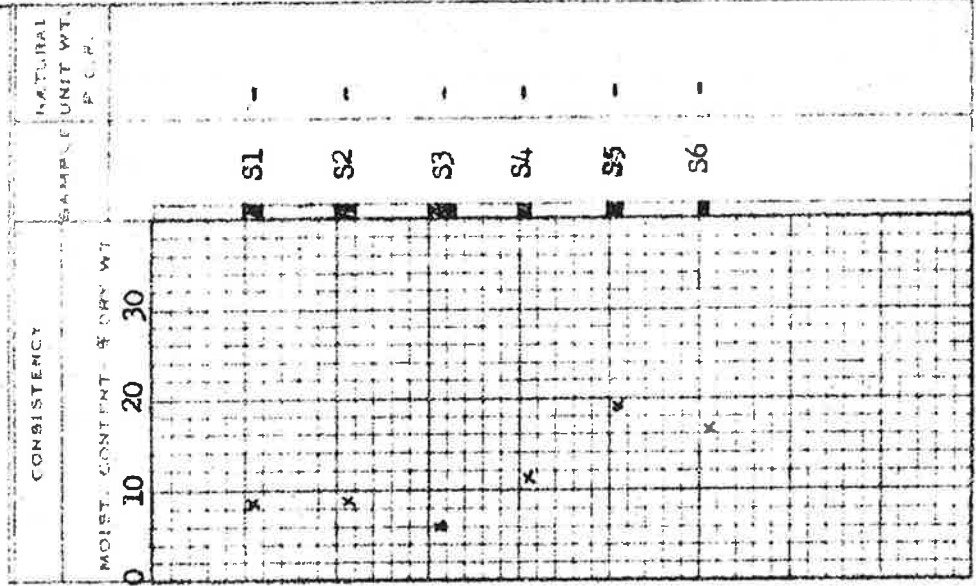
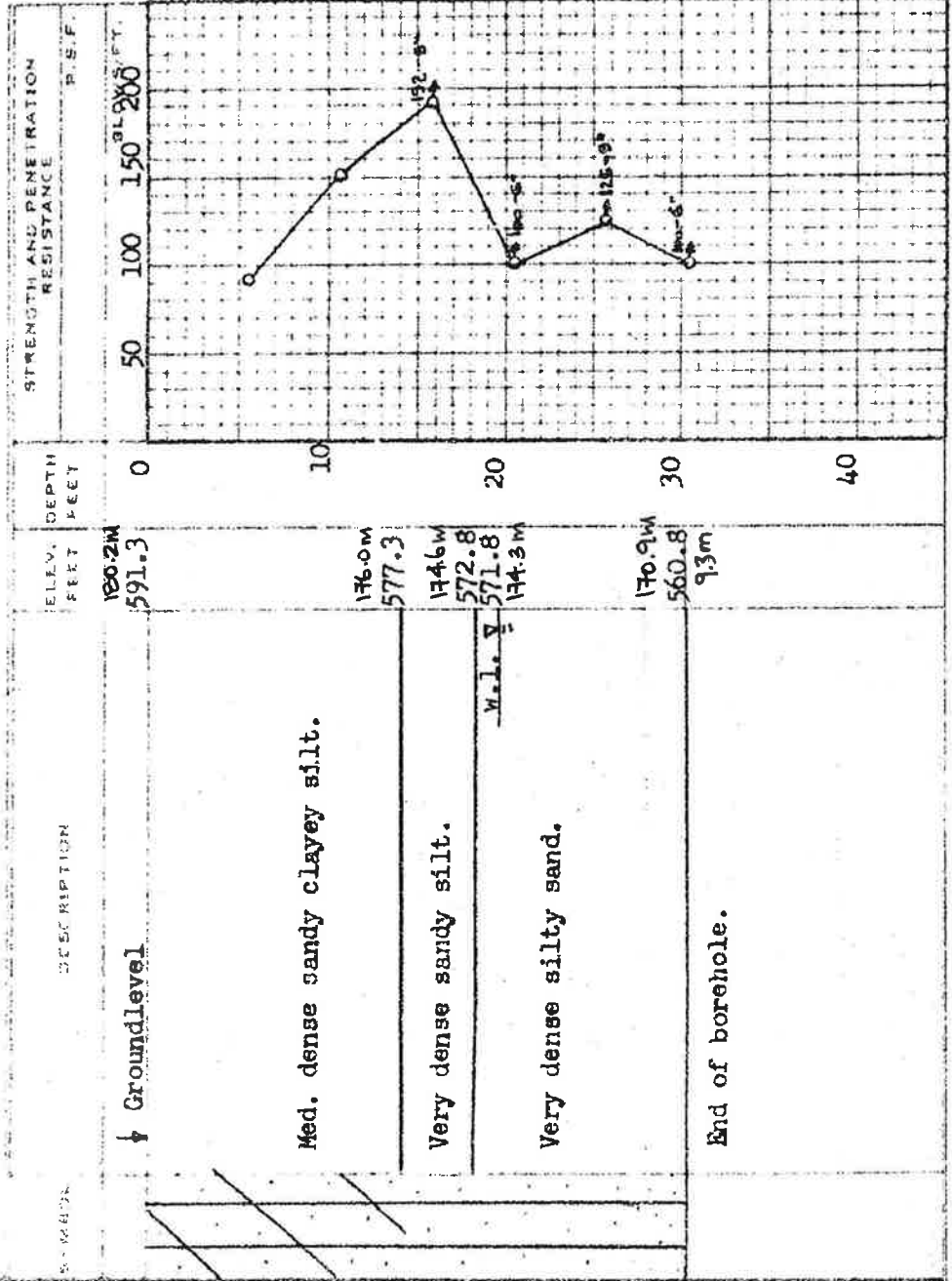
DAYUM 591.3' COMPILED BY B.K.

BORING DATE Sept. 8/61. CHECKED BY W.W.K.

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) --- O
VANE TEST (C) AND SENSITIVITY (S) --- +
NATURAL MOISTURE AND LIQUIDITY INDEX --- X
LIQUID LIMIT --- -
PLASTIC LIMIT --- -

2" DIA SPLIT TUBE --- 8
2" SHELBY TUBE --- 8
2" SPLIT TUBE --- O
2" DIA CONE --- O
2" SHELBY CASING --- X



OFFICE REPORT ON SOIL EXPLORATION

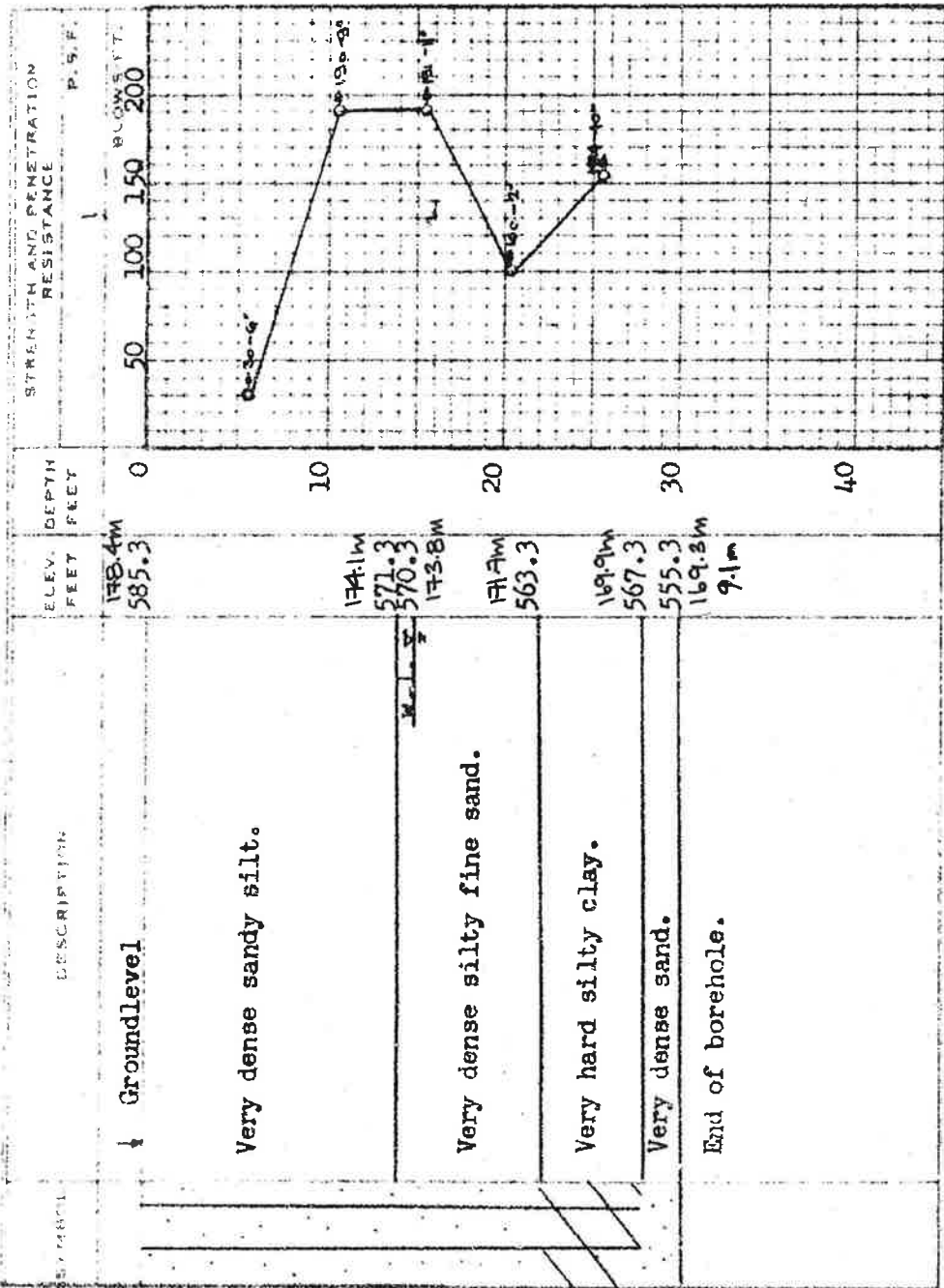
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 193-58 BORE HOLE NO. 6 73-6
 JOB 61-P-91 STATION 9+65 E
 DATUM 585.3' COMPILED BY B.K.
 BORING DATE Sept. 11/61. CHECKED BY W.W.K.

LEGEND

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 2" SHELBY
 CASING

1/2 UNCONFINED COMPRESSION (Qu)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT





CONTRACT 1 – OHS#8 SIGN STRUCTURE

LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

SOIL COMPONENTS AND GROUND WATER CONDITIONS.

BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	ORGANICS	BEDROCK	GROUND WATER LEVEL	DEPTH OF CAVE-IN
		COARSE	FINE	COARSE	MEDIUM	FINE						
Ø	> 8"	3"	3/4"	4.76mm	2.0	0.42	0.074	0.002	>	NO SIZE LIMIT		
U.S. Standard Sieve Size :				No.4	No.10	No.40	No.200					

SAMPLE TYPES.

AS Auger sample
CS Sample from casing
ChS Chunk sample

RC Rock core
% Recovery
SS Split spoon sample

TP Piston, thin walled tube sample
TW Open, thin walled tube sample
WS Wash sample

SAMPLER ADVANCED BY static weight : w
" pressure : p
" tapping : f

OBSERVATIONS
MADE WHILE
CORING

Steady pressure
 No pressure
 Intermittent pressure

Washwater returns
 Washwater lost

PENETRATION RESISTANCES.

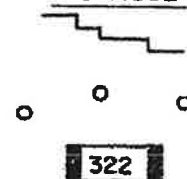
DYNAMIC PENETRATION RESISTANCE : to drive a 2" ϕ , 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot.

STANDARD PENETRATION RESISTANCE, -N- : to drive a 2" outside dia, split spoon sampler 1 foot into the ground, expressed in blows per foot.

EXTRAPOLATED -N- VALUE

The energy for the penetration resistances is supplied by a 140 lb. hammer falling 30 inches

SYMBOL :



SOIL PROPERTIES.

W% Water content
LL% Liquid limit
PL% Plastic limit
PI% Plasticity index
LI Liquidity index

γ^* Natural bulk density (unit weight)
e Void ratio
RD Relative density
Cv Coeff. of consolidation
mv Coeff. of volume compressibility

k Coeff. of permeability
C Shear strength
 ϕ Angle of int. friction
C' Cohesion
 ϕ' Angle of int. friction

In terms of total stress
In terms of effective stress

UNDRAINED SHEAR STRENGTH.

— DERIVED FROM —

TRIAXIAL COMPRESSION TEST



UNCONFINED TEST



LABORATORY

VANE TEST



FIELD



POCKET PENETROMETER TEST



Strain at failure is represented by direction of stem

20%
15% + 5%
10%

St : sensitivity = $\frac{\text{shear strength in undisturbed state}}{\text{shear strength in remoulded state}}$

SOIL DESCRIPTION.

COHESIONLESS SOILS :

RD :

Very loose 0 - 15 %
Loose 15 - 35 %
Compact 35 - 65 %
Dense 65 - 85 %
Very dense 85 - 100 %

COHESIVE SOILS :

C lbs/sq.ft.

Very soft less than 250
Soft 250 - 500
Firm 500 - 1000
Stiff 1000 - 2000
Very stiff 2000 - 4000
Hard over 4000

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 2 75-2

OUR REFERENCE NO. 2-10-6

 CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: RETAINING WALL (RAMP "D")
 LOCATION: AVENUE ROAD, TORONTO
 DATUM ELEVATION: 586.0

 METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 6"
 DATE: OCT. 4, 1962

ENCLOSURE NO. 4

(m)
 178.6
 175.9
 171.6
 170.4
 169.9
 169.6

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	2- or Adjustment of sampler	0	20	40	60	80	100	PI	W	
							SPT-60 5127NG111 lbs/sq ft								
586.0	0	TOPSOIL													
	5	BROWN DAMP HARD SANDY CLAYEY SILT TILL		1	SS	69									
580.0															
	10	coarse sand and gravel		2	SS	166									
575.0															
	15	BROWN DAMP VERY DENSE FINE SAND		3	SS	168									
570.0															
	20	boulder		4	SS	106									
565.0															
	23			5	SS	400									
	25	COARSE VERY DENSE SUBANGULAR GRAVEL													
560.0															
	27														
	28	BROWN MOIST HARD SANDY CLAYEY SILT TILL													
	30	BROWN SATURATED VERY DENSE SILTY FINE SAND		6	SS	360									
555.0															

DETAILS OF
EXTRAPOLATED
- N - VALUES:

SA #	BLOWS:
2	31/6" - 69/5"
3	30/6" - 70/5"
4	47/6" - 53/6"
5	100/3"
6	70/6" - 30/1"

 DETAILS OF
 EXTRAPOLATED
 - N - VALUES:

SA #	BLOWS:
2	31/6" - 69/5"
3	30/6" - 70/5"
4	47/6" - 53/6"
5	100/3"
6	70/6" - 30/1"

OUR REFERENCE NO. 2-10-6

GEOTECHNICAL DATA SHEET FOR BOREHOLE 3

75-3

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: RETAINING WALL (RAMP "D")
 LOCATION: AVENUE ROAD, TORONTO
 DATUM ELEVATION: 577.2

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 6"
 DATE: OCT. 4, 1962

ENCLOSURE NO. 5

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot 0 20 40 60 80 100 SHEAR STRENGTH lbs. sq. ft.	CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	-N- or Advancement of Sampler			
577.2	0	TOPSOIL							
575.0	1.5								
	5	BROWN MOIST <i>red clay layers</i> FIRM SANDY CLAYEY SILT		1	SS	6	0		
570.0	7								
	10			2	SS	236		0	
565.0									
	15	BROWN VERY DENSE SILT		3	SS	300		0	
560.0		WITH							
	20	SAND POCKETS		4	SS	300		0	
555.0									
	25			5	SS	1200		0	
550.0	27								
	30	BROWN VERY DENSE SILTY FINE SAND		6	SS	300		0	
545.0									

DETAILS OF
EXTRAPOLATED
-N- VALUES:

SA**	BLOWS:
2	41/6" - 59/3"
3	75/6" - 25/1"
4	100/4"
5	100/1"
6	100/4"

DETAILS OF
EXTRAPOLATED
- N - VALUES:

SA#	BLOWS:
2	41/6" - 59/3"
3	75/6" - 25/1"
4	100/4"
5	100/1"
6	100/4"

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: V.H. CH'D: L.S.R.



CONTRACT 2 – OHS#1 SIGN STRUCTURE

81-4A

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4A

FOUNDATION SECTION

JOB 63-F-24

LOCATION 213/00 302nd Rt.

ORIGINATED BY B.H.G.

W.P. 233-61-2-1

BORING DATE March 18, 1963.

COMPILED BY

DATUM Geodetic

BOREHOLE TYPE Pennsylvania Auger - 4 1/2" Ø

CHECKED BY

SOIL PROFILE

SAMPLES

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.LIQUID LIMIT --- WL
PLASTIC LIMIT --- WP
WATER CONTENT --- W
W D W L
WATER CONTENT %BULK
DENSITY
P.C.F.

REMARKS

ELEV.
DEPTH

DESCRIPTION

STRAT. PLOT

NUMBER

TYPE

BLOWS / FOOT

ELEV. SCALE

(m)

191.0

190.7

0.3

626.5' Groundlevel
Topsoil

0'-9"

Clayey silt and silty
clay with trace of
sand and fine
gravel.
(Glacial Till)

Very stiff to hard.

Brown changing to
grey at El. 611.

1 SS 23

2 SS 24

3 SS 43

4 SS 57

5 SS 42

6 SS 62

7 SS 59

8 SS 50

9 SS >100

10 SS >100

625

620

615

610

605

600

595

590

585

580

▽ El. 615.5
187.6m

178.8

12.2

177.1

13.9

586.5
40.0 Silt, clayey silt
with trace of fine
gravel.
V. dense
Grey581.2
45.4 End of borehole.

BH 243-11

RECORD OF BOREHOLE No 11

1 OF 1 **METRIC**

PROJECT 09-1111-6007 (8000) LOCATION N 4842985.1 E 308026.6
 G.W.P. 2225-10-00 ORIGINATED BY MS
 DIST HWY 401 BOREHOLE TYPE CME-75 Truck Mount, 70 mm Inner Diameter Hollow Stem Augers COMPILED BY NK
 DATUM Geodetic DATE October 23, 2011 CHECKED BY KJB

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	20 40 60 80 100					
192.5	GROUND SURFACE													
0.0	ASPHALT													
0.2	Clayey silt with sand, trace gravel (FILL) Stiff to very stiff Brown Moist		1	SS	13		192				o			
			2	SS	12		191							
			3	SS	16		190				o			0 23 52 25
			4	SS	19		189							
188.8			5	SS	19		188				o			
3.7	CLAYEY SILT with sand, trace gravel (TILL) Very stiff to hard Brown becoming grey below a depth of 5.6 m Moist		6	SS	41		187							
			7	SS	39		186				o			1 34 48 17
			8	SS	31		185							
			9	SS	32		184							
			10	SS	38		183							
			11	SS	38		182							
							181							
							180							2 32 47 19
179.7	END OF BOREHOLE													
12.8	NOTE: 1. Borehole dry on completion of drilling.													

GTA-MTO 001 09-1111-6007.GPJ GAL-MISS.GDT 4/11/12 CD



CONTRACT 2 – OHS#2 SIGN STRUCTURE

B1-3B

DEPARTMENT OF HIGHWAYS - ILLINOIS
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 3B

FOUNDATION SECTION

JOB 63-F-24 LOCATION 218+95 470' Rt. ORIGINATED BY B.M.G.
W.P. 233-61-2-2 BORING DATE March 21, 1963. COMPILED BY B.M.G.
DATUM Geodetic BOREHOLE TYPE Pennsylvania Auger - 4 1/2" Ø CHECKED BY K.G.S.

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— % PLASTIC LIMIT ——— % WATER CONTENT ——— % wp ——— w ——— wl		BULK DENSITY P C F	REMARKS												
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER TYPE	BLOWS / FOOT	ELEV SCALE	20	40			60	80	100									
189.0 620	Topsoil																				
0.2 610.6	Clayey silt and silty clay with trace of sand and fine gravel. (Glacial Till) Trace of organics to El. 616 V. stiff to hard. Brown changing to grey at El. 609'		1	SS	16																
			2	SS	34	615															
				3	SS	58	610														
				4	SS	59	605														
				5	SS	32															
182.4 598.5			6	SS	41	600															
6.6 21.6	End of borehole.					595															
							</														

VEL. 605.2
184.5m

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