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GEOTECHNICAL DATA REPORT

RAIL TUNNEL BENEATH HIGHWAY 401 BETWEEN ISLINGTON AVENUE AND KIPLING AVENUE, KITCHENER RAIL CORRIDOR TORONTO ONTARIO

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REPORT

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Stantec to provide geotechnical engineering services for the detailed design of the proposed rail tunnel beneath Highway 401 between Kipling Avenue and Islington Avenue along the Kitchener Rail Corridor in the City of Toronto, Ontario. This report was prepared on behalf of Metrolinx as the owner of the proposed rail tunnel project. The proposed tunnel will be constructed immediately beneath the interchange of Highways 401 and 409 that is managed by and any work associated with these highways are subject to review by MTO. The Highway 401 and 409 interchange is within sections of these highways that experience the most traffic in the Greater Toronto Area.

This report addresses the geotechnical explorations and testing carried out for the proposed rail tunnel and associated retaining walls along the rail corridor. The terms of reference for the project are presented in the Request to Qualify and Quote (RQQ) - RQQ-2012-CI-034, the scope of work is outlined in Golder's proposal P3-1111-0035, dated July 19, 2013 and subsequent change orders/amendments to the scope of work. The work was also carried out in general accordance with the requirements outlined in the "Guidelines For Foundation Engineering – Tunneling Specialty Provided by the Ministry of Transportation, Ontario (MTO)", dated April 3, 2008 and site-specific constraints.

This report should be read in conjunction with "Important Information and Limitations of This Report", following the text of this report. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

2.0 SITE AND PROJECT DESCRIPTION

2.1 Site Description

The rail tracks forming the Kitchener Rail Corridor extend under Islington Avenue, through the existing Highway 401/409 tunnel and over Kipling Avenue into the Etobicoke North GO Station located west of Kipling Avenue in the City of Toronto, Ontario. The Kitchener Rail Corridor is oriented in an east-west direction and it intersects Highway 401 between Kipling Avenue and Islington Avenue. Highway 401 is oriented in a south-west to north-east direction in the vicinity of the tunnel. The existing tunnel is approximately 170 m long beneath the 20 traffic lanes, shoulders, median and maintenance areas that compose the off-ramp from Highway 401 to Highway 409 westbound, Highway 401 eastbound and westbound express and collectors and on-ramp from Highway 409 eastbound. This rail tunnel consists of cast-in-place concrete walls and roof supported on spread footings that are founded at about Elevation 152.2 m and has an interior clearance of about 7 m between the underside of the concrete roof and the existing rail elevations. There is a nominal thickness of asphaltic concrete pavement above the roof of the tunnel; however, Highway 401 and 409 are essentially constructed on the concrete tunnel roof. The tunnel roof varies in thickness from about 1.2 m at the walls to about 0.6 m at the centre. The elevation of the highway from the west side of the tunnel to the east side varies from about Elevation 162.3 m to 161.9 m, respectively. At each end of the existing tunnel there are wing-walls to support the highway embankment. The existing Highway 401 embankment is as much as 8 m high with side slopes as steep as 2 horizontal to 1 vertical (2H:1V), though the slope on the east side, away from the immediate area of the tracks, is significantly flatter.

The initial lanes of Highway 401 were constructed in about 1950 and the original rail tunnel was constructed as part of the highway construction. In 1965 the collector lanes and Highway 409 were constructed. Based on the



1965 Contract Drawings for the existing Canadian National Railway (C.N.R.) Overhead structure, during part the Highway 401 widening and construction of Highway 409 the original concrete rigid frame structure that supported the east and westbound lanes of Highway 401 was removed and the existing structure was constructed in stages while highway traffic was diverted.

Along the rail lines east and west of the tunnel, the corridor has been constructed with slopes north and south of the rail line. A steel crib/bin retaining wall supports the southern slope at the west portal, and gabion walls support the slopes at the north slopes of the east and west portals.

2.2 Project Description

A new two track tunnel (approximately 176 m in length) will be located about 16 m north of the existing tunnel on a parallel alignment. The purpose of the additional tracks is to increase the capacity along the GO commuter rail service in the Georgetown South Rail Corridor as well as to accommodate the new Union-Pearson (UP) Express service. As part of this overall project the elevation of the existing rail lines will also be gradually lowered from Kipling Avenue by as much as 1 m below the original rail grade at the west tunnel portal and then from the east tunnel portal the grade will rise eastward to again meet the existing rail grade.

3.0 SUBSURFACE EXPLORATIONS

3.1 Previous Investigation by Others

As part of Highway 401 construction and expansion, construction of Highway 409 and subsequent development from Kipling Avenue to Islington Avenue in the mid 1960's, various subsurface explorations were carried out by, others for Ministry of Transportation, Ontario (MTO) and others. Subsurface information pertinent to this section of the Highway 401/409 interchange was obtained from reports included in the MTO GEOCRES library as listed below:

- **MTO GEOCRES No. 30M11-065:** Report titled "C.N.R. Overhead between Kipling Ave. and Islington Ave., Hwy. #401, District #6. W.J. 64-F-21, W.P. 239-60," by Department of Highways – Ontario, Materials and Research Division, Foundation Section, dated April 1964. Borehole 1 and 2 were drilled at the grade of Highway 401, through the backfill of the south side of the existing structure. Copies of these borehole reports are provided in Appendix A.
- **MTO GEOCRES No. 30M11-066:** Report titled "Foundation Investigation Report For Proposed Overhead Structures at the Intersection of C.N.R. and Hwy. 401, Twp. of Etobicoke, County of York, District No. 6, Toronto. W.J. 64-F-31, W.P. 239-60," by Department of Highways – Ontario, Materials and Research Division, Foundation Section, dated June 22, 1964. Boreholes 1 to 4 were drilled at the toe of the highway embankment on the east and west side of the location of the tunnel in 1964 and these borehole reports are provided in Appendix B.
- **Peto MacCallum LTD. (PML) Report No. 09TF014:** Report titled "Preliminary Geotechnical Investigation, Islington Avenue to Kipling Avenue (M10.3 to 11.3), GO Transit Weston Rail Corridor" under GO Transit Tender No. ITC-2009-GT-008, dated March 31, 2010. In total twelve (12) boreholes (Borehole IK-1 to IK-12



and IK-14) were completed from west of Kipling Avenue to east of Islington Avenue. Copies of these borehole reports are provided in Appendix C.

- **Thurber Engineering Ltd. (TEL), Two Reports, both No. 19-1605-138:** Reports titled “DRAFT Hydrogeology Assessment, Highway 401 & 409 Sewer Crossing, Georgetown South Project, Toronto, Ontario,” dated August 2, 2013 and “Foundation Investigation and Design Report, Rail Grade Lowering at Existing Tunnel Crossing Highways 401 and 409 Between Kipling Avenue and Islington Avenue, Toronto, Ontario,” dated February 11, 2013. In total four (4) boreholes (designated Boreholes 12-01, 12-02, 12-03, and 12-04) were drilled from track grade, within the existing tunnel, approximately 50 metres apart. Copies of these borehole reports are provided in Appendix D.

The locations of previous boreholes relevant to this project are shown on Drawings 1 3 and 4.

In addition to the previous subsurface explorations, the contract drawings for the 1965 construction of the Highway 401/409 interchange and reconstruction of the rail tunnel (Contract No. 65-263, W.P. No. 85-59-6) were reviewed in preparation of this report. These contract drawings provide some useful information related to the design expectations for backfilling of the reconstructed tunnel.

3.2 2013, 2014 and 2015 Field Explorations

3.2.1 Borehole Drilling

Field work for the rail tunnel subsurface investigation was carried out between December 18, 2013 and June 12, 2014, during which time a total of four sampled boreholes were advanced on Highway 401 in the vicinity of the existing tunnel structure, adjacent to the proposed rail tunnel alignment, to assess the extent and nature of fill materials and consistency of the native soils within the proposed tunnel alignment. Borehole 3A was offset from Borehole 3 and was advanced for the purpose of installing groundwater observation well. These boreholes were completed at the locations shown on Drawing 1. A total of ten boreholes (Boreholes 2014-R1 to R9 and R12) were also completed along the rail corridor between Kipling Avenue and Islington Avenue at the locations shown on Drawing 2. In March 2015 a total of three boreholes (Boreholes 2015-1, 2015-3 and 2105-4) were completed along the rail corridor. Borehole 2015-1 was advanced for the purpose of the proposed storm sewer west of Kipling Avenue. The factual information from Borehole 2015-1 is incorporated into Sections 4.2.3, 4.2.5 and 4.2.7 of this report. Boreholes 2015-3 and 2015-4 were advanced at a previously-proposed pedestrian bridge location east of Kipling Avenue and adjacent to the existing station. Since completion of these boreholes the location of the pedestrian bridge was revised. The factual information from these two boreholes is presented in a report titled, “Draft Geotechnical Investigation, Pedestrian Bridge, Etobicoke North GO Station, Kitchener Rail Corridor”, Report No. 13-1111-0035-3, dated January 2016. Record of Borehole sheets for the 2013, 2014 and 2015 explorations are presented in Appendix E.

Boreholes for the Highway 401 Rail Tunnel were located in the field by IBW Surveyors (a licensed Ontario Land Surveying company retained by Stantec) prior to advancing the boreholes and the as-drilled locations and ground surface elevations were surveyed by IBW. The location of the boreholes along the rail corridor were determined using a hand-held GPS unit considered to be accurate to within about ± 3 m. The borehole locations, in MTM NAD 83 northing and easting coordinates, and the ground surface elevations referenced to geodetic datum are summarized below and are shown on Drawings 1, 2, 3 and 4.



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Borehole	Location (MTM NAD 83)		Ground Surface Elevation (m)	Depth Drilled (m)
	Northing (m)	Easting (m)		
2013-1	4,840,299.5	616,274.4	163.4	21.5
2013-2	4,840,299.6	616,310.0	163.1	21.4
2013-3	4,840,302.5	616,335.4	162.4	21.5
2013-3A	4,840,313.9	616,346.5	162.1	17.3
2013-4	4,840,304.9	616,390.6	161.6	20.4

Borehole	Location (MTM NAD 83)		Ground Surface Elevation (m)	Depth Drilled (m)
	Northing (m)	Easting (m)		
2014-R1	4,840,261.0	615,755.0	158.5	4.4
2014-R2	4,840,341.3	615,728.1	158.0	4.4
2014-R3	4,840,277.9	616,029.0	156.8	4.4
2014-R4	4,840,269.8	616,163.0	156.9	4.4
2014-R5	4,840,284.3	616,224.3	155.1	4.4
2014-R6	4,840,285.5	616,530.8	152.3	4.4
2014-R7	4,840,301.9	616,558.0	151.5	4.4
2014-R8	4,840,304.7	616,659.7	151.1	4.4
2014-R9	4,840,289.2	616,679.3	151.2	4.4
2014-R12	4,840,304.5	616,999.6	147.4	4.4
2015-R1	4,840,267.6	615,565.8	158.8	4.4

Borehole drilling was carried out using track-mounted Bombardier D-52 and Diedrich D-54 drill rigs, supplied and operated by Walker Drilling Ltd. of Utopia, Ontario. The boreholes were drilled using 210 mm outside diameter hollow-stem, continuous flight augers. Soil samples were collected at 0.75 m depth intervals through the fill material and at 1.5 m depth intervals through native soil using a 50 mm outside diameter split-spoon sampler driven by an automatic hammer in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586-11)¹. In situ field vane shear testing, using MTO standard “N” sized vanes, was carried out in cohesive soils where encountered and when possible, to measure undrained shear strength (ASTM D2573-08)². The depths of the rail tunnel boreholes ranged from about 17.3 m to 21.5 m below existing ground surface and the boreholes advanced along the rail corridor were taken to a depth of 4.4 m below ground surface. The Relative Drilling Resistance (RDR) was recorded during the borehole investigation for the rail tunnel boreholes at the request of Stantec and in accordance with the definitions provided by Stantec to Golder.

The perceived RDR is relative to the type and capabilities of the drilling equipment and broadly and qualitatively describes the difficulty or ease of drilling through a particular subsurface material. For example, drilling “chatter” reflects aural and visual cues of intermittent drill bit and drill string binding in the borehole, grinding on possible

¹ ASTM D1586-11 – Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.

² ASTM D2573-08 – Standard Test Method for Field Vane Shear Test in Cohesive Soil.



obstructions, or otherwise obviously experiencing difficulty penetrating the ground. Such drilling behaviour can be indicative of the presence of very dense/hard ground, gravel, cobbles, boulders, the top surface of bedrock and/or other obstructions or unknown hard objects in the ground. The table below provides the general drilling behaviour criteria for each RDR number and corresponding term description.

RDR	Descriptive Drilling Resistance Term	Criteria
1	Very Easy	No “chatter”, very little resistance, very fast and steady drill advance rate.
2	Easy	No chatter, some resistance, fast and steady drill advance rate.
3	Moderate	Some chatter, firm drill resistance with moderate advance rate.
4	Hard	Frequent chatter and variable drill resistance, slow advance rate.
5	Very Hard	Constant chatter, variable and very slow drill advance, nearly refusal.

The assessed RDR values for each soil layer have been included on the Record of Borehole sheets following the text of this report; however, the RDR is not to be interpreted or construed as any precise or specific measure of subsurface material type, strength, location within the borehole or subsurface object size.

Groundwater conditions in the open boreholes were observed during and immediately following the drilling operations and one piezometer was installed in Borehole 2013-3A to allow observation of the water level at this location. A groundwater observation well (piezometer) was installed in two of the rail corridor boreholes to permit measuring of the water level at selected locations along the rail corridor. The installed piezometer consists of a 50 mm outside diameter PVC pipe with a 1.5 m slotted screen sealed within a filter sand pack. The borehole and annulus surrounding the piezometer pipe above the filter sand pack was backfilled to the ground surface with bentonite chips to create a seal against vertical groundwater movement within the borehole. Piezometer installation details and water level readings are described on the borehole record sheets presented following the text of the report. All rail tunnel boreholes in which standpipe piezometers were not installed were backfilled to ground surface with a bentonite and cement grout mixture. All rail corridor boreholes in which standpipe piezometers were not installed were backfilled to ground surface with bentonite grout. Where concrete was encountered below the asphaltic road surface the borehole was backfilled with concrete and then asphaltic “cold patch” to match the riding surface. The piezometers were constructed in accordance with Ontario Regulation 903 (as amended by Ontario Regulation 331/13). Excess soil cuttings were disposed of off-site.

The field work was observed by members of Golder’s engineering and technical staff, who located the boreholes, arranged for the clearance of underground services, obtained the MTO encroachment permit, coordinated traffic control setup, in accordance with Ontario Traffic Manual, Book 7 – Temporary Conditions, coordinated the drilling, sampling and in situ testing operations, logged the boreholes, and examined and cared for the soil samples. The samples were identified in the field, placed in appropriate containers, labelled and transported to Golder’s Mississauga geotechnical laboratory where the samples underwent further visual examination and laboratory testing. All of the laboratory tests were carried out to MTO and/or ASTM standards, as appropriate. Classification testing (water content, Atterberg limits and grain size distribution) was carried out on selected samples. The results of the geotechnical laboratory testing are included in Appendix F.



3.2.2 Test Pit Excavation

In order to further characterise the existing Highway 401/409 embankment fill materials four test pits were excavated. One test pit was excavated on each of the east and west sides of the highway embankment and two were excavated in the median (see Drawing 1 for location of test pits). The test pits on the east and west embankment slopes were excavated using a Caterpillar 312 Excavator and the median test pits were excavated using a Kubota KX121. Both excavators were supplied and operated by W.M. Petrie & Sons Contracting Ltd., located in Oakville, Ontario. The eastern and western test pits were excavated from near the toe of the excavation up along the face to about 4 m to 5 m above the toe of the embankment. The test pits were excavated to a depth of 3.5 m and 3.7 m below the face of the slope at the test pit location. Representative soil samples were collected from the excavation. Upon completion of excavation groundwater conditions in the test pit were observed and the test pits were backfilled with the excavated materials tamped in place using the backhoe bucket. The median test pits were excavated south of the existing rail tunnel for the purpose of assisting in identifying the boundary between the existing rail structure granular backfill and the larger mass of highway embankment fill. The test pits were excavated south of the existing tunnel to limit disturbance to the area immediately above the future tunnel and because of site and access constraints. The median test pits were excavated to depths of 1.8 m and 2.5 m below ground surface.

Field work was observed by members of Golder's engineering and technical staff, who located the test pits, arranged for the clearance of underground services, obtained an MTO encroachment permit, coordinated traffic control setup, in accordance with Ontario Traffic Manual, Book 7 – Temporary Conditions, monitored the excavating of the test pit, sampling operations, logged the test pits, and examined and cared for the soil samples. The samples were identified in the field, placed in appropriate containers, labelled and transported to Golder's Mississauga geotechnical laboratory where the samples underwent further visual examination and laboratory testing. All of the laboratory tests were carried out to MTO and/or ASTM standards, as appropriate. Classification testing (water content, Atterberg limits and grain size distribution) was carried out on selected samples. Records of the test pits and associated photographs are included in Appendix G. The results of the geotechnical laboratory testing from test pit samples are also included in Appendix F

3.2.3 Soil Geochemistry Testing

Selected soil samples collected from the rail tunnel and retaining wall boreholes were submitted under chain-of-custody protocol to an independent Canadian Association for Environmental Analytical Laboratories (CAEAL) accredited laboratory, Maxxam Analytics Inc. in Mississauga Ontario (Maxxam) for testing of the metals and inorganics parameters listed under Ontario Regulation 153 Table 1. Selected soil samples from the rail corridor boreholes were also submitted under chain-of-custody protocol to Maxxam for testing of benzene-toluene-ethylene-xylene suite (BTEX), and petroleum hydrocarbons (PHC) F1 to F4 listed under Ontario Regulation 153 Table 1. The results of the chemical testing on the soil are included in Appendix H, following the text of this report.

3.2.4 Groundwater Chemical Testing and Hydraulic Conductivity Testing

On April 12, 2015, a water sample was obtained from the groundwater observation well installed in Borehole 2013-3A, which was advanced through Highway 401 just east of the alignment for the proposed rail tunnel. In addition, a rising head permeability test was carried out in the well in order to assess the hydraulic conductivity of the sand



and silt glacial till material within which the well was screened. The well was bailed until the well was dry. The rising head test was carried out as the well recovered and at the end of the highway closure period a sample of the water was obtained and submitted for the parameters listed under the Toronto Sanitary and Combined Sewer Use By-Law. The water sample was submitted under chain-of-custody protocol to a Standards Council of Canada (SCC) accredited laboratory, Agat Laboratories in Mississauga Ontario (Agat).

The results of the chemical testing carried out on the water sample is included in Appendix H, following the text of this report. The estimated hydraulic conductivity of the sand and silt glacial till material is summarized in Section 4.2.8.

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

The proposed rail tunnel beneath Highway 401 between Kipling Avenue and Islington Avenue in the City of Toronto, Ontario is located within the physiographic region known as the Peel Plain, according to *The Physiography of Southern Ontario* (Chapman and Putnam, 1984)³. 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 silt to sand zones and is mapped in this area as the Halton Till. Shallow, localized deposits of loose silt and sand 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.

4.2 Subsurface Conditions

Subsurface soil and groundwater conditions described in this report represent a simplification of the actual conditions for design purposes. The stratigraphic boundaries shown on the borehole records are inferred from non-continuous sampling, observations of drilling progress and the results of uncorrected Standard Penetration Tests (SPT). These boundaries, therefore, represent transitions between soil types rather than exact planes of geological change. The simplified interpreted stratigraphy is shown on Drawings 1, 2, 3 and 4 for the proposed tunnel alignment and retaining walls along the lowered rail corridor. Variation in the stratigraphic boundaries between and beyond boreholes will exist and is to be expected.

In general, the subsurface conditions in the area of the proposed rail tunnel consist of asphaltic or Portland cement concrete underlain by granular and cohesive fills associated with the Highway 401 embankment. In Borehole 2013-4 the fill is underlain by a clayey silt deposit. The fill or clayey silt is underlain by native glacial till consisting primarily of clayey silt with sand. The clayey silt glacial till deposit then grades to a granular glacial material that varies in composition from sand and silt to silt with some sand. Along the rail corridor the subsurface conditions consist of granular and cohesive fill materials underlain by the clayey silt glacial till deposit within the depths explored during the 2013, 2014 and 2015 drilling. Boreholes in the rail corridor terminated within the clayey silt till

³ Chapman, L.J. and Putnam, 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.



deposit; however, the granular glacial till deposit is expected to exist beneath the borehole termination elevations. Each of these simplified soil strata are described below.

4.2.1 Pavements

A layer of asphaltic concrete pavement about 120 mm to 400 mm thick was encountered at the ground surface in all boreholes advanced at the highway level. A 430 mm thick layer of Portland cement concrete pavement was encountered in Borehole 2013-2 underlying the asphaltic pavement riding surface.

4.2.2 Topsoil

An approximately 100 mm thick layer of topsoil⁴ was encountered along the faces of the embankment slopes in Test Pits 1 and 2 and the ground surface in Test Pits 3A and 3B excavated in the Highway 401 median.

4.2.3 Sand and Gravel (Granular Road Base) Fill

All boreholes drilled through the highway encountered fill material consisting of sand and gravel immediately beneath the asphaltic concrete or Portland cement concrete. The sand and gravel fill material extended to depths of between 0.8 m to 1.2 m below ground surface (between Elevations 162.6 m to 160.8 m) and ranged in thickness from about 0.5 m to 0.7 m. The measured water content measured on one sample of the granular road base was 4 percent. The sand and gravel fill contained trace silt. A recorded SPT "N" value in the sand and gravel fill was 55 blows per 0.3 m of penetration, indicating a very dense state.

4.2.4 Highway Embankment Fill

Embankment fill was encountered underlying the granular road base fill material in all boreholes drilled for the proposed rail tunnel. In general, the embankment fill is comprised of granular materials overlying clayey silt with sand fill (cohesive). The characteristics of these two distinct fill types are described in more detail below.

In the boreholes, the surface of the granular fill was encountered at depths of between 0.8 m to 1.2 m below ground surface (between Elevations 162.6 m to 160.8 m). The thickness of the granular portion of the embankment fill material beneath the granular road base varies from 2.4 m to 5.5 m at the explored locations. The interface between the granular fill and cohesive fill was encountered at depths of between 3.5 m to 6.7 m below ground surface (between Elevations 159.6 m and 156.4 m) in the boreholes. The base of the cohesive fill material extended to depths of between 6.9 m and 9.0 m below ground surface (between Elevations 155.5 m and 154.1 m). The thickness of the cohesive portion of the embankment fill material varied from 2.3 m to 4.8 m in Boreholes 2013-1 to 2013-3 and was about 0.6 m thick in Borehole 2013-4.

⁴ Classification of materials identified in this report as topsoil was based solely on visual and textural evidence. Testing of organic content or other constituents or nutrients, or the topsoil's general suitability as a vegetal growth supporting medium, was not carried out. Therefore, the use of materials classified as topsoil in this report cannot be relied upon for supporting growth of landscaped vegetation (e.g. select grasses).



Two test pits were excavated in the median of Highway 401 (east of the eastbound express lanes), south of the existing rail tunnel, in order to gain insight to the fill material type transitions. The 1965 contract drawings for reconstruction of the rail tunnel indicated that the former highway embankment was to be cut to slopes of about 1.5 to 1 (horizontal to vertical) and then backfilled with “granular backfill.” In Test Pit 3A, excavated approximately 19.6 m south of the south side of the existing rail tunnel, fill material consisting of clayey silt with sand was encountered to the base of the test pit at a depth of 2.5 m below ground surface. The fill material contained some gravel, cobbles and construction debris (see Test Pit record in Appendix G). In Test Pit 3B, located about 11 m south of the south side of the rail tunnel, granular fill material consisting of silty sand to sand was encountered to the base of the test pit at a depth of 1.8 m below ground surface.

Test pits were also excavated into the east and west sides of the embankment. Fill material consisting of clayey silt with sand was encountered in both test pits. Cobbles, one boulder and minor construction debris were noted in Test Pit 1. Photographs of these conditions are provided in Appendix G.

Granular Embankment Fill

The granular fill is generally comprised of light grey to brown sand, trace to some gravel, trace to some clay, and trace to some silt, although a 0.6 m thick layer of clayey silt was encountered near the base of the granular fill in Borehole 2013-4. The results of grain size distribution tests completed on each granular fill sample are shown on Figures F1A to F1D. The measured water content of granular fill samples ranged from 5 percent to 13 percent. Grain size distribution tests completed on two samples of granular fill from the median test pit are shown on Figure F2. The measured water content measured on two samples of the granular fill material were 8 percent and 12 percent. The SPT “N” values measured within the granular fill deposit ranged from 6 to 40 blows per 0.3 m of penetration, indicating a loose to dense state. In general, higher SPT “N” values were recorded closer to the surface in each borehole. Qualitative relative drilling resistance values ranged from 2 to 4. A constant head laboratory fixed-wall permeability test (ASTM D 2434) was completed on a composite sample of the granular embankment fill. This test was carried out at a water content and density comparable to the in situ conditions and using three different values of hydraulic gradient. The measured permeability ranged from about 6×10^{-5} cm/s to 9×10^{-5} cm/s. Results of this test are provided on Figure F3, in Appendix F.

Cohesive Embankment Fill

The cohesive fill is generally comprised of brown to grey clayey silt with sand, trace to some gravel and all boreholes with the exception of Borehole 2013-2 contain organic matter. The results of grain size distribution tests completed on selected cohesive fill samples are shown on Figures F4A and F4B. Atterberg limit tests were carried out on select samples of the clayey silt with sand fill and measured liquid limits ranging from about 19 percent to 27 percent, plastic limits ranging from about 11 percent to 15 percent, and plasticity indices ranging from 7 percent to 13 percent. The results of the Atterberg limit tests are shown on a plasticity chart on Figures F5A (highway grade boreholes) and F5B (median test pits), and indicate that the cohesive fill material consists of clayey silt of low plasticity. Water contents measured on cohesive fill samples ranged from 7 percent to 19 percent. The SPT “N” values measured within the cohesive fill deposit range from 2 to 18 blows per 0.3 m of penetration. In situ field vane tests carried out within cohesive fill in Borehole 2013-3 measured undrained shear strengths of about 45 kPa



and 59 kPa, indicating a firm to very stiff consistency. Qualitative relative drilling resistance values ranged from 1 to 3.

4.2.5 Fill Along Rail Corridor

Data from boreholes previously drilled along the corridor by PML (Boreholes IK-1 to IK-6 and IK-14) and Thurber (Boreholes 12-01 to 12-04) were used to supplement Golder boreholes related to the proposed retaining structure along the corridor. Since the PML and Thurber boreholes were completed there have been grade changes along the rail corridor and, therefore, the information presented on the records of the PML and Thurber boreholes may not be reflective of current subsurface ground conditions. Where applicable, information from the PML and Thurber boreholes is summarized in this and subsequent sections of the report.

Boreholes 2014-R2, 2014-R3, 2014-R5, 2014-R7 and 2015-R1 were advanced within the track bed and encountered between 300 mm and 800 mm of ballast rock. Granular fill material was encountered in some of the boreholes along the rail corridor and the depth and elevation of the surface and base of the granular fill material are summarized in the table below.

Golder Borehole	Depth to Top of Granular Fill Material	Elevation of Top of Granular Fill Material	Depth to Base of Granular Fill Material	Elevation of Base of Granular Fill Material
2014-R5	0.5 m	155.1 m	1.4 m	153.7 m
2014-R6	At ground surface	152.3 m	0.3 m	152.0 m
2014-R8	At ground surface	151.1 m	0.3 m	150.8 m
2014-R9	At ground surface	151.2 m	0.8 m	150.4 m
2014-R12	At ground surface	147.4 m	0.8 m	146.6 m
2015-R1	At ground surface	158.8 m	0.6 m	158.2 m

The depth and elevation of the surface and base of the granular fill material encountered in the previous PML and Thurber boreholes are summarized in the table below:

Borehole	Depth to Top of Granular Fill Material	Elevation of Top of Granular Fill Material	Depth to Base of Granular Fill Material	Elevation of Base of Granular Fill Material
IK-1	At ground surface	150.1 m	0.5 m	149.3 m
IK-4	0.8 m	156.9 m	1.5 m	156.2 m
IK-5	0.1 m	157.3 m	0.7 m	156.7 m
IK-6	0.1 m	158.0 m	0.7 m	157.4 m
12-03	0.3 m	154.5 m	0.7 m	154.1 m
12-04	0.2 m	155.2 m	0.6 m	154.8 m



Cohesive fill material consisting of clayey silt with sand to clayey silt was encountered some boreholes along the rail corridor and the depth and elevation of the surface and base of the cohesive fill material are summarized in the table below.

Golder Borehole	Depth to Top of Cohesive Fill Material	Elevation of Top of Cohesive Fill Material	Depth to Base of Cohesive Fill Material	Elevation of Base of Cohesive Fill Material
2014-R1	At ground surface	158.5 m	0.8 m	157.7 m
2014-R4	At ground surface	156.9 m	0.8 m	156.1 m
2014-R6	0.3 m	152.0 m	0.8 m	151.5 m
2014-R8	0.3 m	150.8 m	1.0 m	150.1 m
2015-R1	0.6 m	158.2 m	1.5 m	157.3 m

The depth and elevation of the surface and base of the cohesive fill material encountered in the previous PML and Thurber boreholes are summarized in the table below:

Borehole	Depth to Top of Cohesive Fill Material	Elevation of Top of Cohesive Fill Material	Depth to Base of Cohesive Fill Material	Elevation of Base of Cohesive Fill Material
IK-2	0.4 m	151.2 m	2.3 m	149.3 m
IK-3	At ground surface	153.2 m	0.8 m	152.4 m
IK-4	0.1 m	157.6 m	2.3 m	155.4 m
12-02	0.3 m	153.9 m	1.0 m	153.2 m

The result of a grain size distribution test completed on one selected sample of the granular fill sample is shown on Figure F6. The measured water content measured on six granular fill samples ranged between 4 percent and 13 percent. Atterberg limit tests were carried out on one selected sample of the clayey silt and measured a liquid limit of about 23 percent, a plastic limit of about 13 percent, and a plasticity index of about 10 percent. The results of the Atterberg limit test is shown on a plasticity chart on Figure F7, and indicate that the material consists of clayey silt of low plasticity. The measured water content of two cohesive fill samples was 10 percent and 12 percent. In the boreholes completed by PML the SPT 'N' values within the granular fill material ranged from 10 to 18 blows per 0.3 m of penetration, indicating a compact state. The SPT "N" values in the cohesive fill material in the boreholes advanced by PML range from 3 to 18 blows per 0.3 m of penetration, indicating a soft to very stiff consistency.

4.2.6 Clayey Silt

Underlying the fill in Borehole 2013-4 a deposit of clayey silt was encountered at about a depth of 6.1 m below ground surface (Elevation 155.5 m) and extended to a depth of 6.9 m below ground surface (Elevation 154.7 m). Clayey silt was also encountered underlying the fill in Boreholes 2014-R1 and 2014-R3 and within the till deposit in Borehole 2014-R9. The table below summarizes the elevations and locations at which the clayey silt soils were encountered.



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Borehole	Depth to Surface of Clayey Silt	Elevation of Surface of Clayey Silt	Depth to Base of Clayey Silt	Elevation of Base of Clayey Silt
2014-R1	0.8 m	157.7 m	1.7 m	156.8 m
2014-R3	0.5 m	156.3 m	2.2 m	154.6 m
2014-R9	3.7 m	147.5 m	Borehole terminated in deposit at 4.4 m (Elevation 146.8 m)	
Test Pit No. 2	3.0 m	155.2 m	Test Pit terminated in deposit at 3.7 m (Elevation 154.5 m)	

The results of grain size distribution tests completed on two samples of the clayey silt with sand are shown on Figure F8. Atterberg limit tests were carried out on two selected samples of the clayey silt with sand and measured liquid limits of about 22 percent and 24 percent, plastic limits of about 13 percent and 14 percent, and plasticity indices of about 9 percent and 11 percent. The results of the Atterberg limit tests are shown on a plasticity chart on Figure F9, and indicate that the material consists of clayey silt of low plasticity. The measured water content ranged from 9 percent to 19 percent and SPT "N" values ranged from 21 to 44 blows per 0.3 m of penetration, suggesting a very stiff to hard consistency.

4.2.7 Clayey Silt with Sand to Sandy Clayey Silt Glacial Till

A glacial till deposit consisting primarily of clayey silt with sand was encountered in all boreholes. In the boreholes advanced at the highway grade the surface of the clayey silt with sand till was encountered at elevations ranging from 154.1 m to 155.0 m (depths of between about 6.9 m and 9.0 m below highway surface) and was about 3.6 m to 5.3 m thick.

In the boreholes advanced within the rail corridor the clayey silt with sand till deposit the surface of the deposit was encountered at the depths and elevations summarized in the table below.

Golder Borehole	Depth to Surface of Clayey Silt Till	Elevation of Surface of Clayey Silt Till
2014-R1	1.7	156.8
2014-R2	0.3	157.7
2014-R3	2.2	154.6
2014-R4	0.8 m	156.1 m
2014-R5	1.4 m	153.7 m
2014-R6	0.8 m	151.5 m
2014-R7	0.8 m	150.7 m
2014-R8	1.0 m	150.1 m
2014-R9	0.8 m	150.4 m
2014-R12	0.8 m	146.6 m
2015-R1	1.5 m	157.3 m



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The base of the till deposit in Boreholes 2014-R6 and 2014-R8 was encountered at depths of 3.0 m and 3.7 m (at Elevation 149.3 m and 147.4 m), respectively. The rest of the boreholes advanced in the rail corridor terminated within the clayey silt with sand till deposit at a depth of 4.4 m below ground surface (between Elevation 154.4 and 143.0 m). Within the till deposit in Borehole 2014-R7 a 0.3 m thick layer of gravelly sand was encountered at a depth of about 2.2 m below ground surface (Elevation 149.3 m) and in borehole 2014-R8 a 0.4 m thick layer of sand and silt was encountered at a depth of 1.8 m below ground surface (Elevation 149.3 m).

The depth and elevation of the surface and base of the cohesive till in the PML and Thurber boreholes are summarized in the table below.

Borehole	Depth to Surface of Clayey Silt Till	Elevation of Surface of Clayey Silt Till	Depth to Base of Clayey Silt Till	Elevation of Base of Clayey Silt Till
IK-1	0.8 m	149.3 m	11.0 m	139.1 m
IK-2	2.3 m	149.3 m	4.5 m	147.1 m
IK-3	0.8 m	152.4 m	2.3 m	150.9 m
IK-4	2.3 m	155.4 m	9.1 m	148.6 m
IK-5	0.7 m	156.7 m	Cohesive Till Not Penetrated – Borehole Terminated at 5.2 m depth (Elevation 152.2 m)	
IK-6	0.7 m	157.4 m	Cohesive Till Not Penetrated – Borehole Terminated at 5.2 m depth (Elevation 152.9 m)	
IK-14	0.4 m	154.5 m	10.2 m	145.0 m
12-01	0.2 m	153.4 m	3.7 m	149.9 m
12-02	1.0 m	153.2 m	4.4 m	149.8 m
12-03	0.7 m	154.1 m	6.1 m	148.7 m
12-04	0.6 m	154.8 m	6.1 m	149.3 m

The cohesive till deposit predominately consists of brown becoming grey clayey silt with sand and trace gravel; however at some borehole locations the till material is a sandy clayey silt. The results of the grain size distribution tests completed on selected samples of the clayey silt with sand till are shown on Figures F10A and F10B. The results of the grain size distribution tests completed on a sample of the gravelly sand in Borehole 2014-R7 is shown on Figure F11. Atterberg limit tests were carried out on selected samples and measured liquid limits ranging from 17 percent to 23 percent, plastic limits ranging from 11 percent to 15 percent, and plasticity indices ranging from 6 percent to 10 percent. The results of the Atterberg limit tests are shown on a plasticity chart on Figures F12A and F12B, and indicate that the cohesive till consists of clayey silt of low plasticity. The natural water content measured on select samples ranged from 5 percent to 15 percent. The SPT “N” values measured within the stiff to hard clayey silt till deposit ranged from 13 blows to more than 80 blows per 0.3 m of penetration, suggesting a stiff to hard consistency. Drilling RDR values recorded during the drilling operation ranged from 2 to 5.



4.2.8 Silt to Sand and Silt to Gravelly Silty Sand Glacial Till

Underlying the cohesive clayey silt glacial till a deposit of granular glacial till consisting primarily of gravelly silty sand to sand and silt to silt was encountered in all boreholes drilled from the highway level. In Boreholes 2013-3 and 2013-3A, sand layers were observed in the split-spoon samples at a depth of about 16.2 m below ground surface (Elevation 146.2 m). The surface of the granular till deposit was encountered at depths between about 12.2 m to 13.2 m below ground surface (between Elevations 150.5 m and 149.2 m) in the boreholes advanced at the highway grade. All boreholes advanced at the highway grade terminated within this deposit penetrating it to depths ranging from 20.4 m to 21.5 m below ground surface (between Elevations 141.9 and 140.9 m).

Of the boreholes advanced by Golder in the rail corridor granular till was encountered in Boreholes 2014-R6 and 2014-R8 at depths of 3 m and 4.3 m (Elevations 149.3 m and 147.4 m), respectively. Boreholes 2014-R6 and 2014-R8 terminated within the granular till deposit at a depth of 4.4 m below ground surface (Elevations 147.9 m and 146.7 m), respectively.

The depth and elevation of the surface and base of the granular till in the PML and Thurber boreholes are summarized in the table below.

Borehole	Depth to Surface of Sand and Silt Till	Elevation of Surface of Sand and Silt Till	Depth to Base of Sand and Silt Till	Elevation of Base of Sand and Silt Till
IK-1	11.0 m	139.1 m	15.3 m	134.8 m
IK-2	4.5 m	147.1 m	Sand and Silt Till Not Penetrated – Borehole Terminated at 4.9 m depth (Elevation 146.7 m)	
IK-3	2.3 m	150.9 m	Sand and Silt Till Not Penetrated – Borehole Terminated at 17.4 m depth (Elevation 135.8 m)	
IK-4	9.1 m	148.6 m	Sand and Silt Till Not Penetrated – Borehole Terminated at 21.6 m depth (Elevation 136.1 m)	
IK-14	11.2 m	144.0 m	Sand and Silt Till Not Penetrated – Borehole Terminated at 15.5 m depth (Elevation 139.7 m)	
12-01	3.7 m	149.9 m	Sand and Silt Till Not Penetrated – Borehole Terminated at 8.8 m depth (Elevation 144.8 m)	
12-02	4.4 m	149.8 m	Sand and Silt Till Not Penetrated – Borehole Terminated at 10.8 m depth (Elevation 143.4 m)	
12-03	6.1 m	148.7 m	9.3 m	145.5 m
12-04	6.1 m	149.3 m	9.2 m	146.2 m

The granular till deposit varied in composition from sand and silt to silt containing some sand. Some of the samples also included trace to some gravel and trace clay. In Borehole 2013-4 grinding of the augers was observed at about 14 m and 18 m depth below ground surface (at Elevations 147.6 m and 143.6 m). These observations are inferred to indicate the presence of cobbles and/or boulders within the till deposit. The results of the grain size distribution tests completed on selected samples are shown on Figure F13. The natural water content measured



on select samples ranges from 6 percent to 13 percent. The SPT “N” values measured within the very dense granular till deposit ranged from 50 to more than 154 blows per 0.3 m of penetration, indicating a very dense state. Drilling RDR values recorded during field work ranged from 3 to 4.

As discussed in Section 3.2.4, a rising head permeability field test was carried out on April 12, 2015 in the piezometer installed in Borehole 2013-3A. The results of the rising head tests are presented on Figure 1 and the calculated hydraulic conductivity of the sand and silt glacial till was 4.4×10^{-6} cm/sec. It is noted that the calculated hydraulic conductivity value is only representative of the general mass between the top and the bottom elevations of the sand pack around the piezometer screen and for a limited distance within the soil deposit. The calculated hydraulic conductivity values should only be considered as an indicator of the layer hydraulic properties in the immediate vicinity of the test and not a definitive measure of the overall formation behaviour.

4.2.9 Sand

In PML Borehole IK-3, located east of the proposed rail tunnel, a layer of sand is noted on the Record of Borehole sheet within the sandy silt till at a depth of about 7.0 m below ground surface (148.2 m). The layer of sand extended to a depth of about 11.0 m below ground surface (Elevation 142.2 m). The layer of sand is described as wet and contains trace gravel below a depth of about 9 m below ground surface (Elevation 144.2 m). The natural water content is reported to be between about 7 percent and 10 percent and no other geotechnical classification testing was reported as being carried out on any of the samples obtained from the sand layer. The SPT “N” values measured within the very dense sand layer ranged are reported as 21 and 128 per 0.3 m of penetration and 85 per 0.25 m of penetration, indicating a compact to very dense state.

4.2.10 Cobbles and Boulders

Difficulties drilling through and sampling the native soils are noted on the borehole records contained in Appendices B through E. No cores were retrieved from these obstructions. These conditions may represent obstructions such as cobbles that were disturbed or broken by the drilling equipment. The natural strata through which the proposed tunnel and retaining walls will be constructed are glacially derived, and therefore are likely to contain boulders and cobbles, even where obstructions or drilling difficulties were not encountered. In general, cobbles are defined as stones with a maximum dimension (in any of three orthogonal directions) greater than 75 mm and boulders are defined as stones having a maximum dimension of 300 mm or greater.

One boulder was encountered in Test Pit 1, excavated on the side slope of the existing embankment. This boulder, found within the cohesive fill, measured approximately 340 mm in maximum dimension. While boulders may be and were encountered within the fill soils it is anticipated that their number and size will not be representative of boulders encountered within the natural soils, even though most of the fill will consist of reworked native soils obtained from nearby sources.

Cobbles and boulders will be encountered in most of the native glacially-derived soils at the project site. The cobbles and boulders will have originated from the igneous and metamorphic rocks (gneiss and diorite) of the Canadian Shield, rather than the weaker sedimentary rock (limestone and shale) found locally. The unconfined compressive strength of the rock forming cobbles and boulders may range from about 120 to 200 MPa. Past experience within the Greater Toronto Area indicates that the combined total volume of individual boulders within



cohesive and granular tills (associated with the geologic Halton Till sheet) is highly variable and, on some projects, was on the order of 0.15 percent and 0.3 percent of the excavated volume. Cobbles should be expected to be a routine encounter within all native soil deposits at this site.

4.2.11 Shale Bedrock

In PML Borehole IK-1, located east of Islington Avenue shale bedrock was inferred in the borehole at a depth of about 19.8 m below ground surface (Elevation 130.3 m). The inferred bedrock was not cored and the borehole terminated at a depth of 20.8 m (Elevation 129.3 m).

4.2.12 Groundwater Conditions

Water levels in the boreholes were observed during and upon completion of drilling operations and ranged between about 5.2 m and 9.9 m depth below ground surface (between Elevations 157.9 m and 151.4 m). A standpipe piezometer was installed in the silt and sand till deposit in Borehole 2013-3A, 2014-R2 and 2014-R5 to permit observation of the groundwater level at these locations. The piezometers were destroyed by the regrading activities that were ongoing within the rail corridor, prior to obtaining a water level reading. Details of the piezometer installation are shown on the Record of Borehole sheets (Appendix E) and the groundwater level measured in the piezometer is summarised below.

Borehole No.	Ground Surface Elevation (m)	Stratum Sealed Into	Piezometer Tip Elevation (m)	Groundwater Elevation (m)	Date of Measurement
2013-3A	162.1	Silt to Sand and Silt Till	145.5	151.4	June 9, 2014 Upon completion of drilling
				151.7	April 12, 2015

During previous field explorations carried out by others, piezometers were installed into selected boreholes along the rail corridor. The table below provides a summary of the stratum into which the piezometer was installed, groundwater level elevation and date of measurement.

Borehole No.	Ground Surface Elevation (m)	Stratum Sealed Into	Piezometer Tip Elevation (m)	Groundwater Elevation (m)	Date of Measurement
IK-4	157.7	Sandy Silt Till	136.5	153.3	September 16, 2009
IK-7	158.7	Silty Sand	134.2	152.1	September 16, 2009

No free water was observed in any of the test pits. In general, groundwater levels should be expected to fluctuate seasonally in response to changes in precipitation and snow melt.



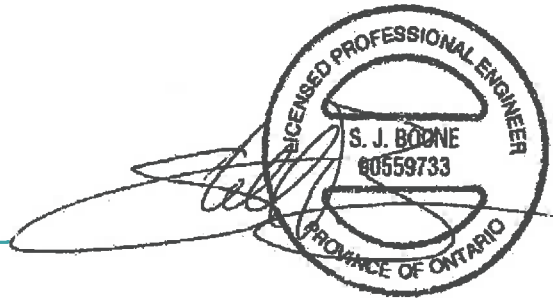
5.0 CLOSURE

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Soil, Rock and Ground water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.



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Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



**GEOTECHNICAL DATA REPORT RAIL TUNNEL BENEATH HIGHWAY 401
BETWEEN ISLINGTON AVENUE AND KIPLING AVENUE, KITCHENER RAIL
CORRIDOR**

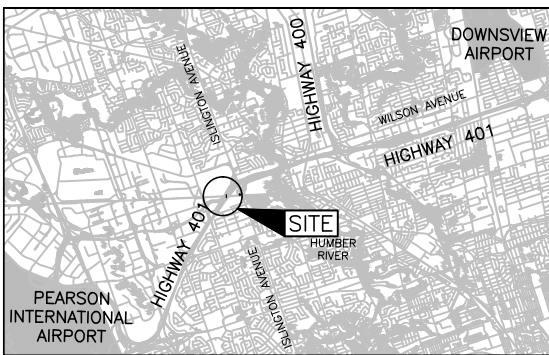
DRAWINGS

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

CONT No.,
WP No.,

KITCHENER RAIL CORRIDOR
HIGHWAY 401 RAIL TUNNEL
SOIL SRATA

SHEET



KEY PLAN
SCALE
1 0 1 2 km

LEGEND

- Borehole - Current Investigation
- Borehole - Geocres 30M11-65
- Test Pit Golder 2014 Investigation
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ▽ WL upon completion of drilling

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
1 (64-F-21)	162.5	4840277.0	616301.0
2 (64-F-21)	162.5	4840295.8	616317.1
BH 2013-2	163.1	4840299.6	616310.0
TP-3A	163.7	4840259.9	616323.1
TP-3B	163.3	4840268.3	616327.4

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.

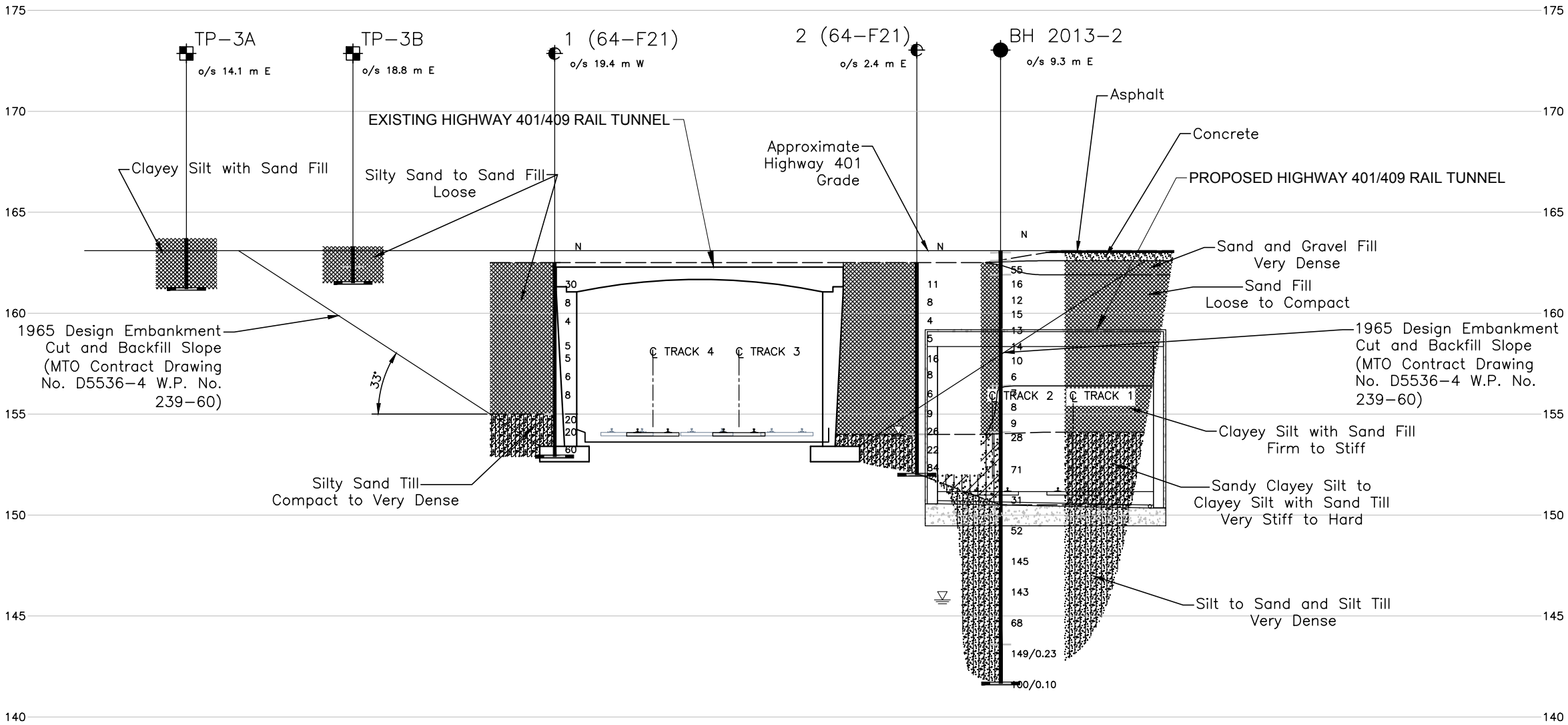
The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

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.

REFERENCE

Base plan and track locations provided in digital format by STANTEC, drawing file nos. dwg_10560_30sub_sta10750_export_20150319.dwg, received March 20, 2015, and dwg_10560_trackalignment_export_20151228.dwg, received January 5, 2016.

NO.	DATE	BY	REVISION	
Geocres No.,				
HWY. 401		PROJECT NO. 13-1111-0035		DIST. ,
SUBM'D. SMM	CHKD. BM/AV	DATE: 3/30/2015		SITE: .
DRAWN: JFC	CHKD. SMM	APPD. SJB		DWG. 2

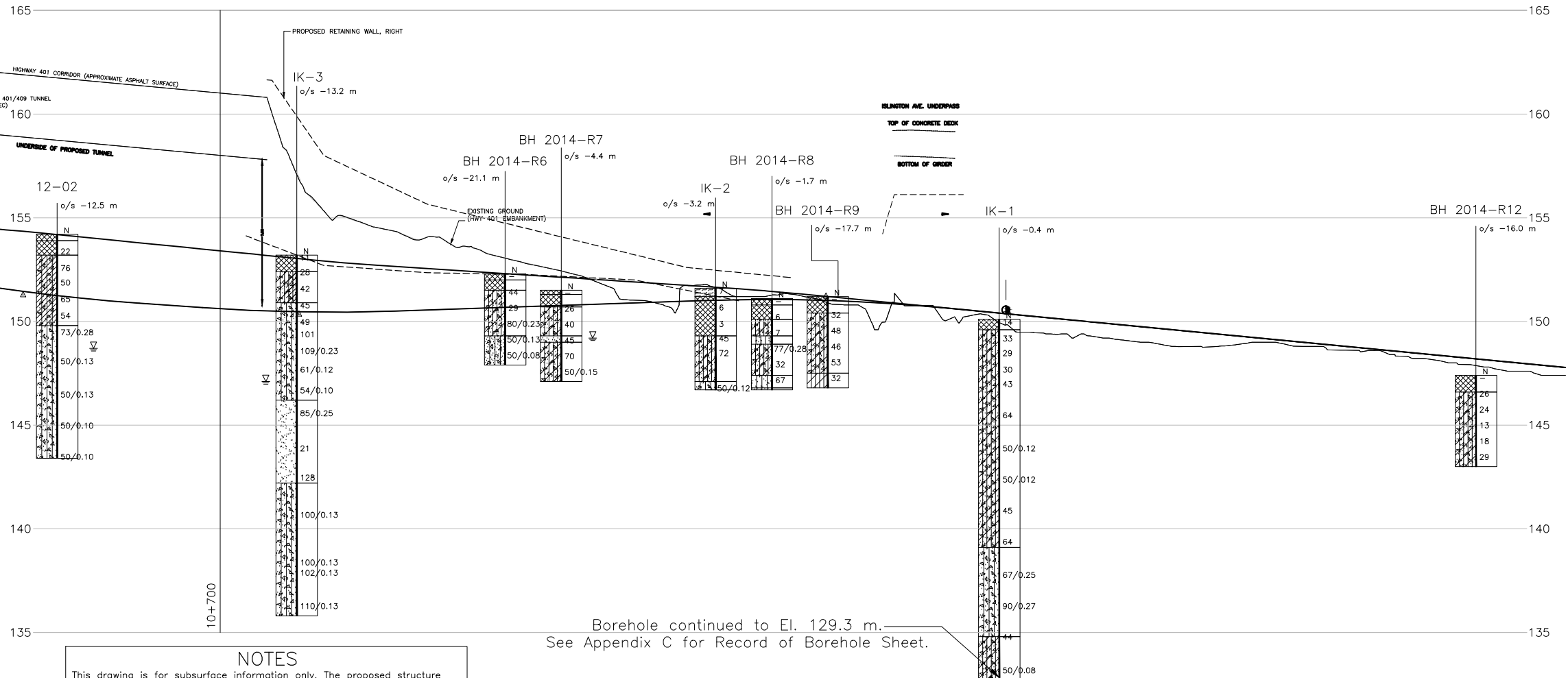
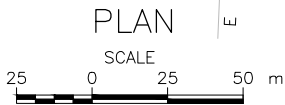
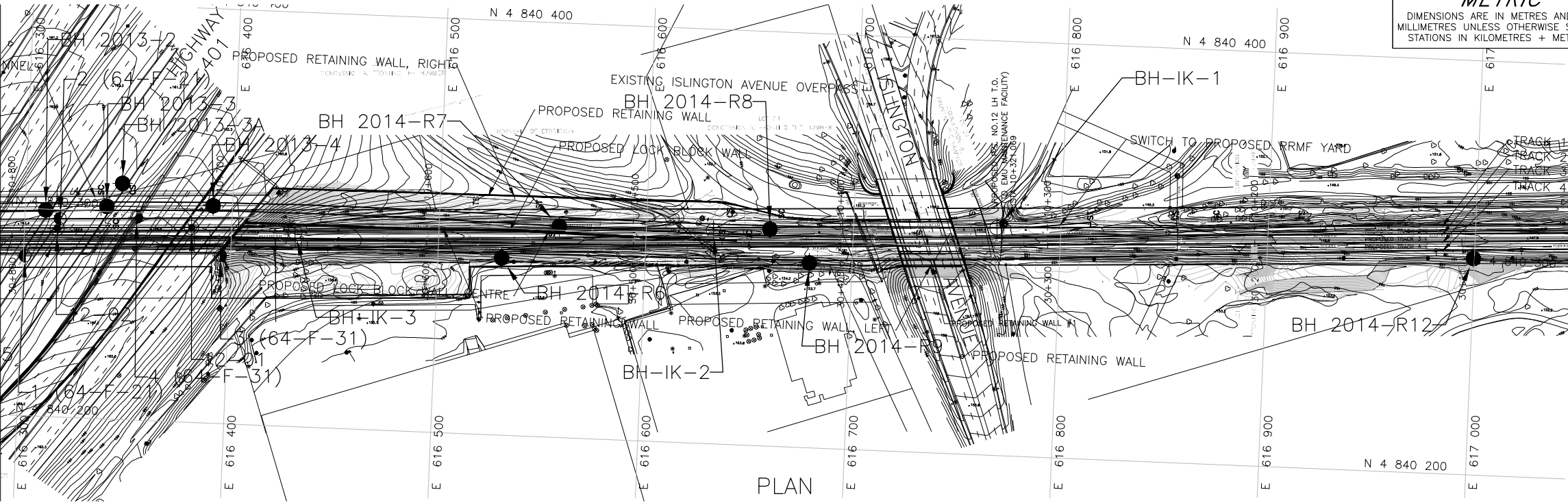


**CROSS SECTION RAIL TUNNEL
STATION 10+787**

SCALE
2.5 0 2.5 5 m
HORIZONTAL

SCALE
2.5 0 2.5 5 m
VERTICAL

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



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.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

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.



PART TRACK #1 PROFILE

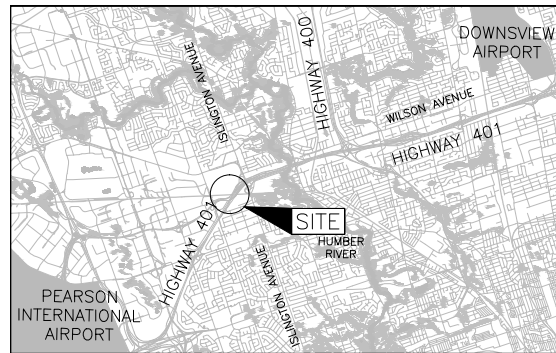


REFERENCE

Base plans provided in digital format by STANTEC, drawing file nos. 2009089-t1a-FEB04detail_1.dwg, received August 14, 2013, dwg_10560_mjb_alignment_export_20150409.dwg, received April 10, 2015, dwg_10560_trackalignment_export_20151228.dwg, received January 5, 2016 and Topo plan provided in digital format by IBW SURVEYORS, drawing file no. 5-10419-topo_r5.dwg, received March 13, 2015

CONT No.
WP No.

CN KITCHENER SUBDIVISION
HIGHWAY 401 RAIL TUNNEL
BOREHOLE LOCATIONS
AND SOIL STRATA



LEGEND

- Borehole - Current Investigation
- ⊕ Borehole - Peto MacCallum Limited Report No.09TF014
- ⊥ Seal
- ⊥ Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
12-02	154.2	4840291.0	616315.8
BH-1K-1	150.1	4840309.7	616769.2
BH-1K-2	151.6	4840302.9	616632.5
BH-1K-3	153.2	4840293.8	616430.6
BH 2014-R6	152.3	4840285.5	616530.8
BH 2014-R7	151.5	4840301.9	616558.0
BH 2014-R8	151.1	4840304.7	616659.7
BH 2014-R9	151.2	4840289.2	616679.3
BH 2014-R12	147.4	4840304.5	616999.6

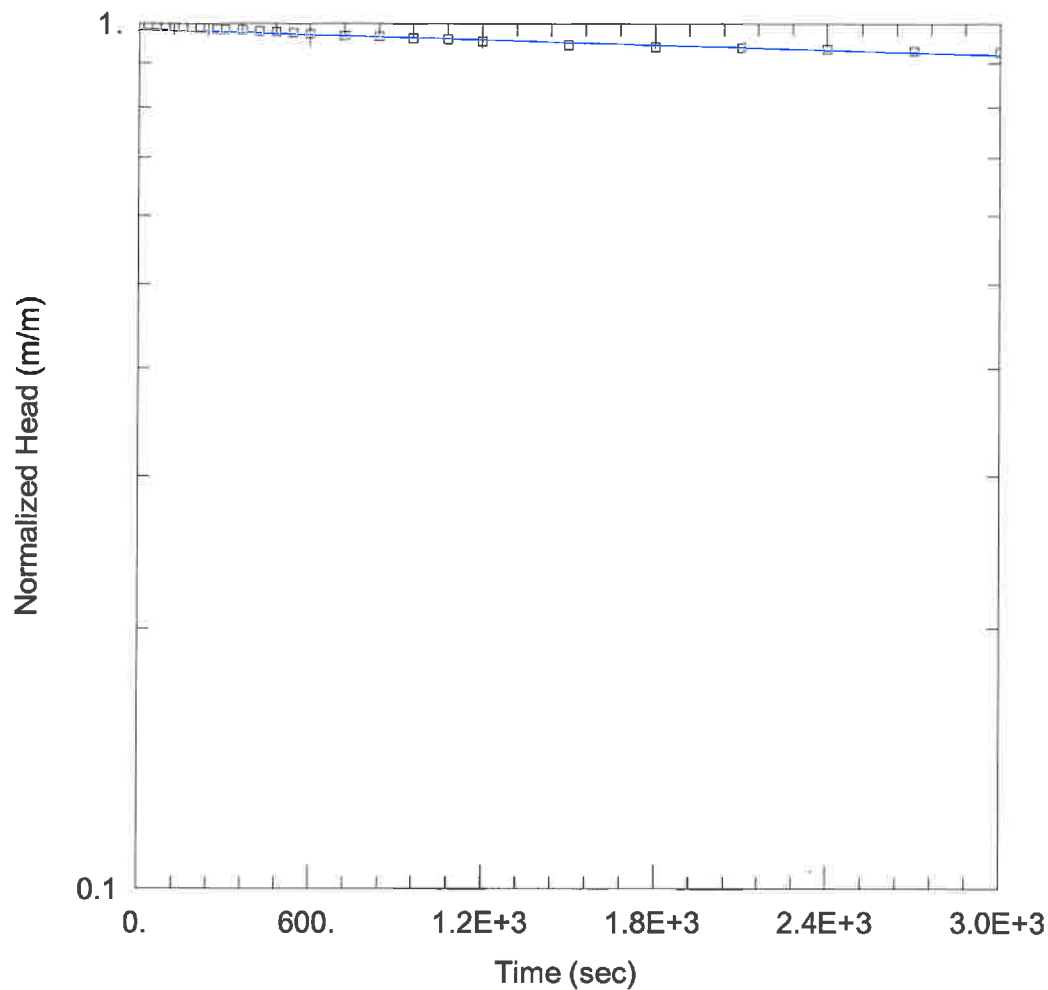
STRATIGRAPHY LEGEND

- Sand and Gravel Fill, Clayey Silt Fill
- Sand
- Sandy Silt to Sand and Silt
- Sandy Clayey Silt to Clayey Silt
- Sandy Clayey Silt to Clayey Silt with Sand Till
- Sand and Silt to Silt Till

NO.	DATE	BY	REVISION
Geocres No.			
HWY. 401	PROJECT NO. 13-1111-0035		DIST.
SUBM'D.	CHKD.	DATE: 4/10/2015	SITE:
DRAWN: JFC	CHKD.	APPD.	DWG. 4



FIGURES



WELL TEST ANALYSIS

Data Set: C:\...\13-1111-0035 AQT BH2013-3A.aqt

Date: 05/07/15

Time: 12:14:27

PROJECT INFORMATION

Company: Golder

Project: 13-1111-0035(1200)

Test Well: BH2013-3A

Test Date: April 11, 2015

AQUIFER DATA

Saturated Thickness: 6.49 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (BH2013-3A)

Initial Displacement: -6.24 m

Static Water Column Height: 6.49 m

Total Well Penetration Depth: 6.49 m

Screen Length: 2.6 m

Casing Radius: 0.06 m

Well Radius: 0.105 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 4.423E-8$ m/sec

$y_0 = -6.14$ m



APPENDIX A

Previous Geotechnical Investigation (MTO 30M11-65, dated April 1964)

Borehole Locations and Soil Strata
Abbreviations Used in Report
Records of Boreholes 1 to 4

Mr. S. McCombie,
Bridge Planning Engr.,
Bridge Division.

Foundation Section,
Materials & Research Div.,
Room 107, Lab. Bldg.

Attention: Mr. J. Curtis

April 28, 1964

C.N.R. Overhead between Kipling Ave. and
Islington Ave., Hwy. #401, District #6.
W.P. 239-60 -- W.J. 64-F-21

As requested by you in your memo dated March 24, 1964, we have carried out two borings at the above-mentioned site for the purpose of determining the nature and the condition of the backfill material behind the bridge abutment walls. The two log sheets are attached to this memo for your information.

Following is a summary of our findings at the site:

(1) At the east abutment, backfill consists of 28 ft. of well graded fine to coarse sand in a generally loose condition. This is underlain by a very dense deposit of glacial till consisting of a heterogeneous mixture of silt, sand and gravel.

(2) At the west abutment, conditions are similar to those at the east abutment except that the total depth of the backfill material is 24.5 ft.

(3) At the west abutment, no water was observed in the borehole which was carried out to a depth of 31.5 ft. (el. 501.5). At the east abutment, ground water was observed at a depth of 28.0 ft. (el. 505.0).

(4) For purposes of computing earth pressures, we would recommend that an angle of internal friction of 30° be assigned to the backfill material, together with a unit weight of 115 p.c.f. These values are indicated by the loose condition of the material.

The above information was given verbally to Mr. B. Richardson on April 2, 1964.

If we can be of any further assistance in this matter, please contact this Office.

KGS/MdeP
Attach. (2)
cc: Foundations Office
Gen. Files

K. G. Selby,
SENIOR FOUNDATION ENGR.
For:
A. G. Starnac,
PRINCIPAL FOUNDATION ENGR.

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT ——— WL	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	BLOWS / FOOT		
							SHEAR STRENGTH P.S.F.	WATER CONTENT ——— W		
								WP ——— W ——— WL 10 20 30		
								WATER CONTENT %		
533.0	Groundlevel									
0.0										
	Well graded sand with occasional gravel (loose)		1	SS	30	530				
			2	SS	8					
			3	SS	4					
			4	SS	5	520				
			5	SS	5					
			6	SS	6					
			7	SS	8	510				
508.5			8	SS	20					
24.5	Silty sand and gravel till		9	SS	20					
501.5			10	SS	60					
31.5	End of borehole.					500				
						490				

JOB 64-F-21 LOCATION Hwy. 401 & CNR (28' East of Bridge center on Hwy. 401 E ORIGINATED BY V.K.
W P 239-60 BORING DATE March 31, 1964. COMPILED BY V.K.
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY K.S.

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY POCF	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P S F		WATER CONTENT % 10 20 30				
533.0	Groundlevel											
0.0					530							
	Well graded sand with occasional gravel.	1	SS	11								Gr 4 Sa 87 Si } 9 Cl }
	(loose)	2	SS	8								
		3	SS	4								
		4	SS	5	520							
		5	SS	16								Gr 2 Sa 86 Si } 12 Cl }
		6	SS	8								
		7	SS	6	510							
		8	SS	9								Gr 5 Sa 84 Si } 11 Cl }
505.0	W.L.	9	SS	26								
28.0	Silty sand and gravel till	10	SS	22								
498.5		11	SS	84	500							
34.5	End of borehole.											
					490							



APPENDIX B

Previous Geotechnical Investigation (MTO 30M11-066, dated April 1964)

MTO Letter dated April 28, 1964
Records of Boreholes 1 and 2

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	DRAINED TRIAXIAL	S	SENSITIVITY

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma'}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma'}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_f	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

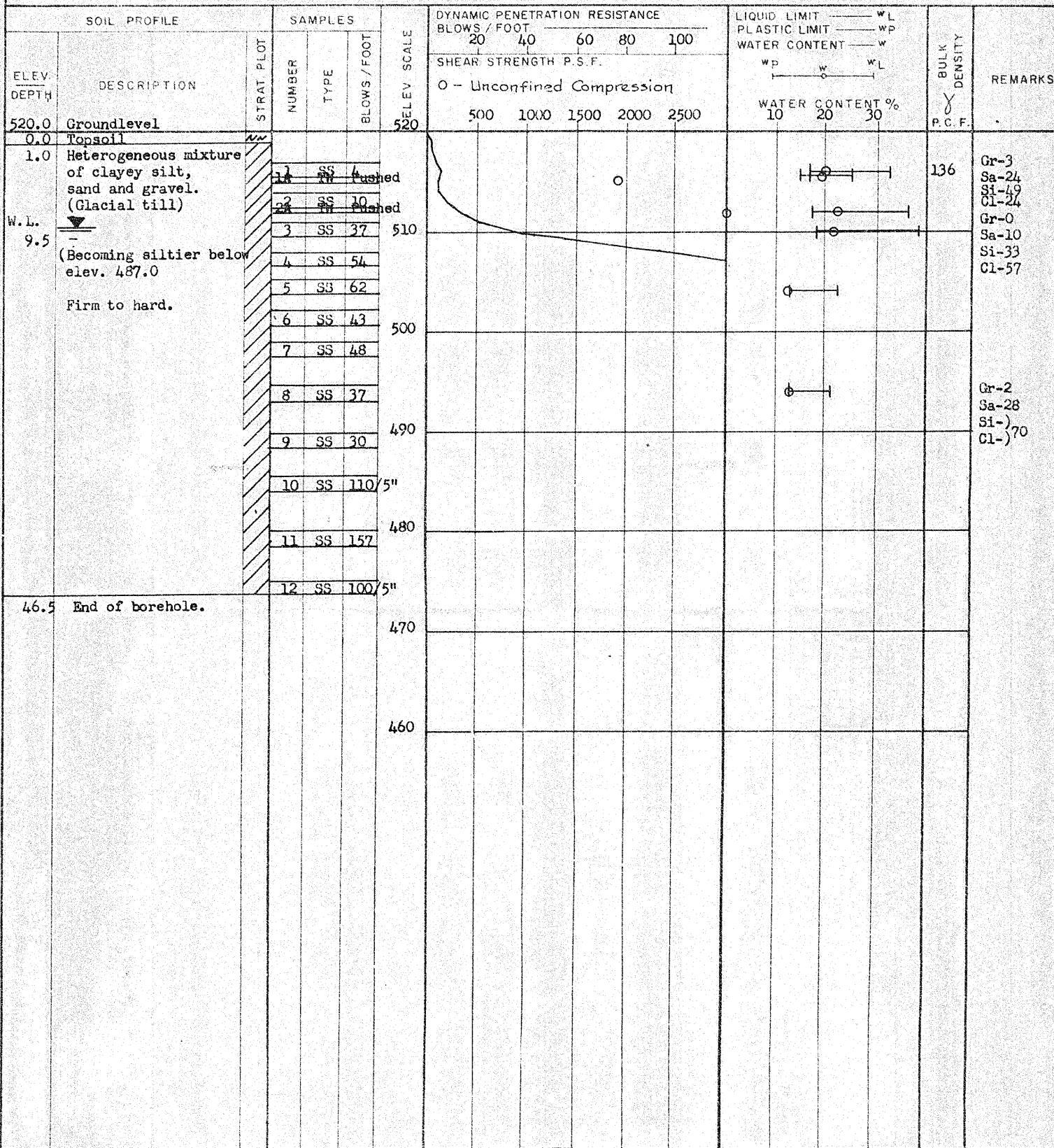
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

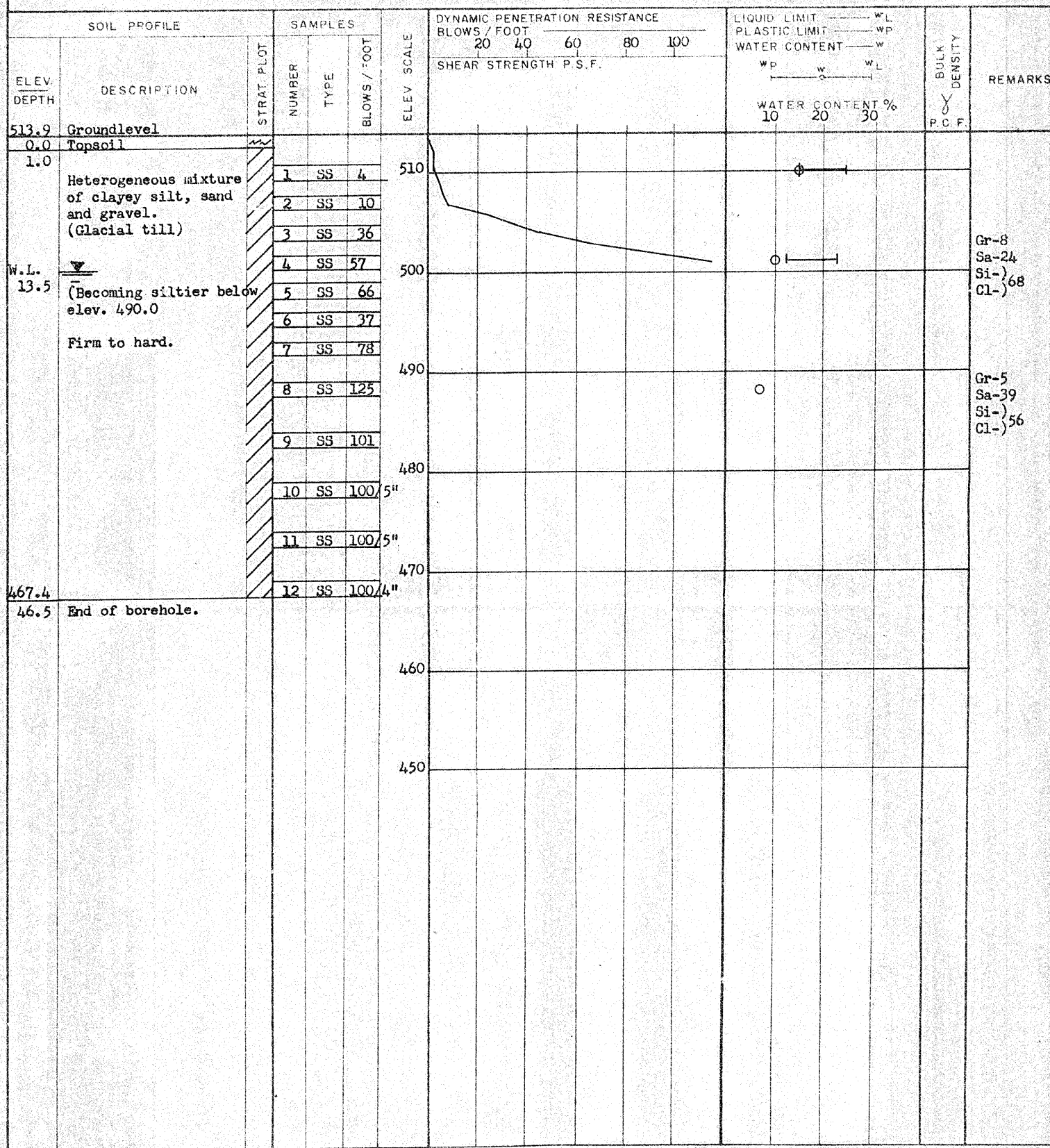
SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		PLASTIC LIMIT		WATER CONTENT		BULK DENSITY	REMARKS
ELEV	DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	20	40	60	80	100		
512.9	0.0	Groundlevel											
	0.0	Topsoil											
1.0	1.0	Heterogeneous mixture of clayey silt, sand and gravel. (Glacial till) Firm to hard.		1	SS	5							
3.5	3.5			2	SS	4							
				3	SS	4							
				4	SS	4							
				5	SS	59							
				6	SS	38							
		(Becoming siltier below elev. 491.0)		7	SS	46							
				8	SS	52							
				9	SS	56							
				10	SS	105/6"							
				11	SS	80/6"							
473.4	46.5	End of borehole.		12	SS	141							

JOB 64-F-31 LOCATION Hwy. 401 & C.N.R., 440/38, 117' to Rt. of E ORIGINATED BY V.K.
W.P. 239-60 BORING DATE April 30, 1964. COMPILED BY V.K.
DATUM Geodetic BOREHOLE TYPE Wash & Bore NX Casing. CHECKED BY M.D.



JOB 64-F-31
W.P. 239-60
DATUM GeodeticLOCATION Hwy. 401, C.N.R.; 437+77, 24.9' to Lt. of C
BORING DATE May 4, 1964.
BOREHOLE TYPE Wash & Bore NX Casing.ORIGINATED BY V.K.
COMPILED BY V.K.
CHECKED BY M.D.

108 64-F-31

LOCATION Hwy. 401 & C.N.R.; 437/88, 112' to Lt.

ORIGINATED BY V.K.

W. P. 239-60

BORING DATE May 6, 1964.

COMPILED BY _____ V.K.

DATUM Geodetic

BOREHOLE TYPE Wash & Bore NX Casing.

CHECKED BY _____ M.D.



APPENDIX C

Previous Geotechnical Investigation (Peto MacCallum Ltd., Report No. 09TF014, dated March, 2010)

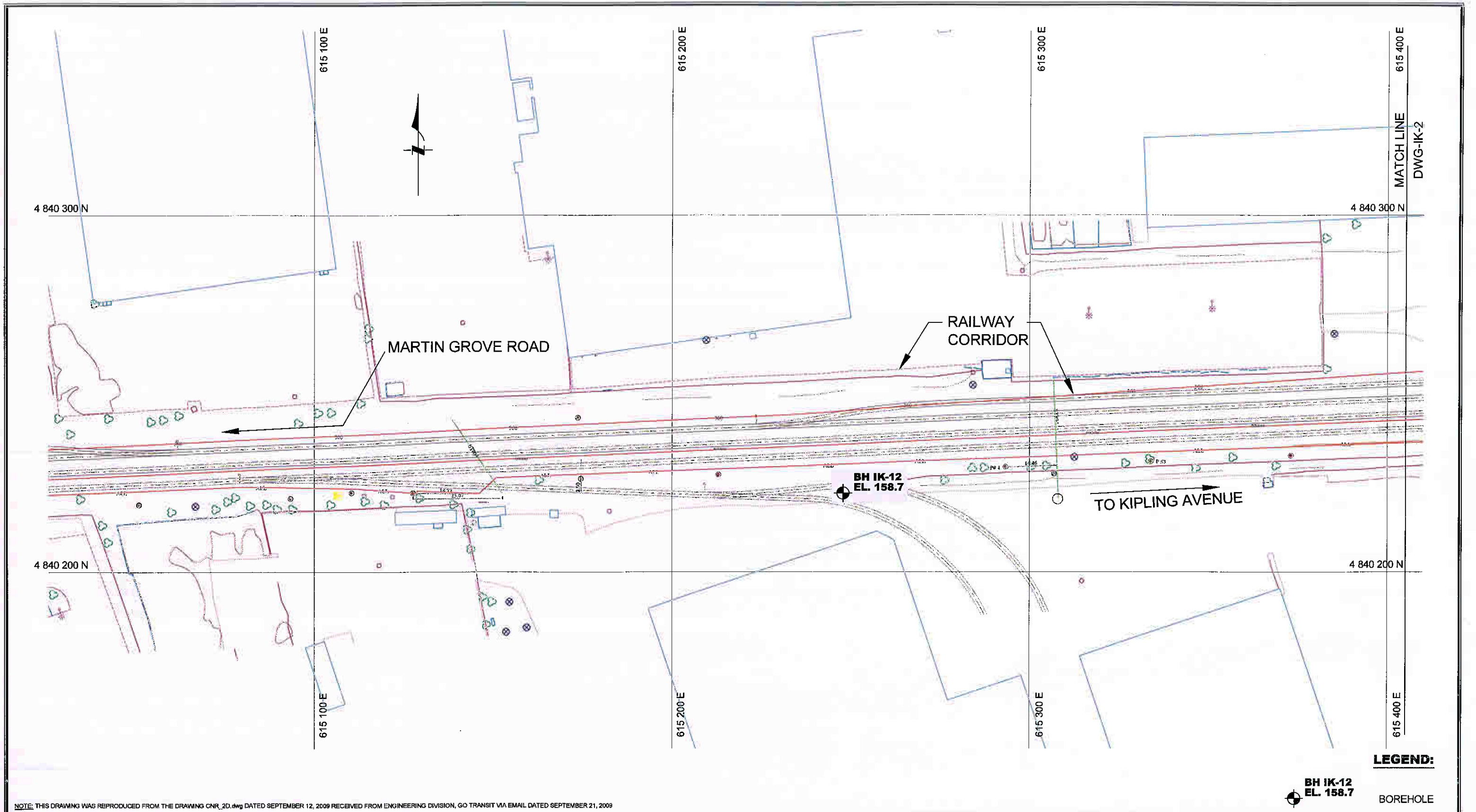
Drawings IK-1 to IK-5

List of Abbreviations

Records of Boreholes IK-1 to IK-12 and IK-14

Geotechnical Laboratory Results

Chemical Testing (Soil) Laboratory Results



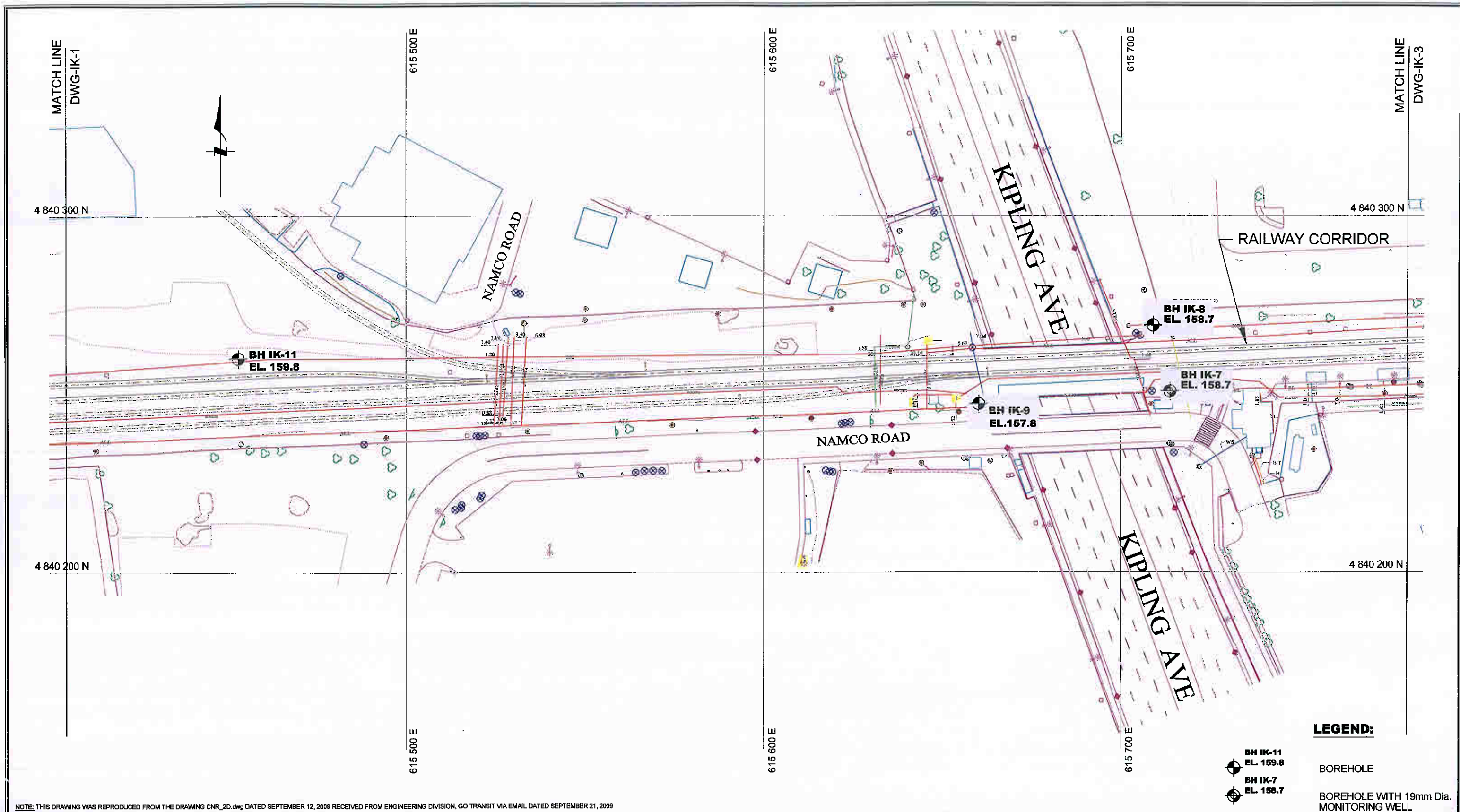
NOTE: THIS DRAWING WAS REPRODUCED FROM THE DRAWING CNR_20.dwg DATED SEPTEMBER 12, 2009 RECEIVED FROM ENGINEERING DIVISION, GO TRANSIT VIA EMAIL DATED SEPTEMBER 21, 2009

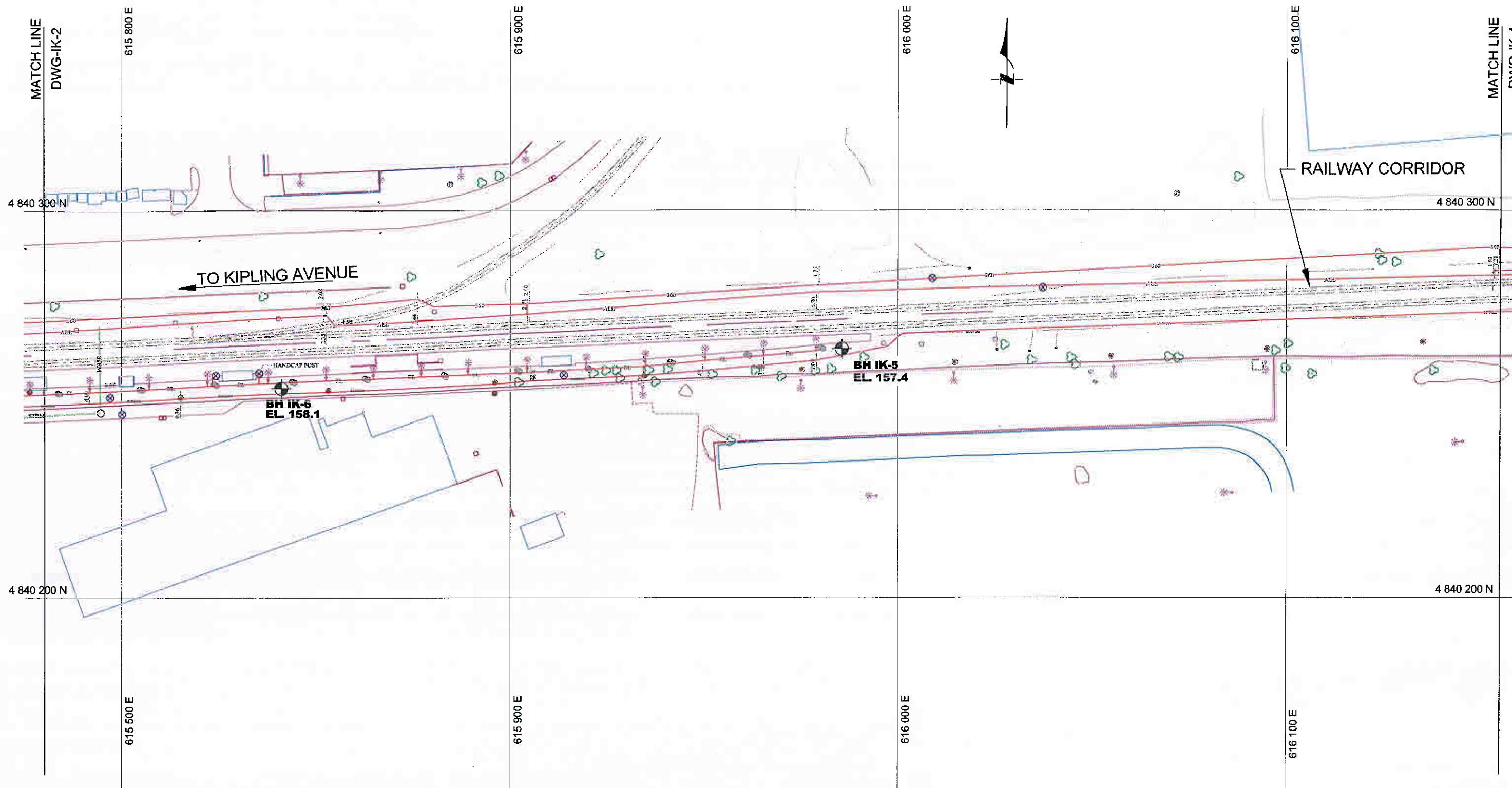


GO TRANSIT
WESTON RAIL CORRIDOR
ISLINGTON AVENUE TO KIPLING AVENUE
(Mile 10.3 to 11.3)

BOREHOLE
LOCATION PLAN

DATE: APRIL 2010	SCALE: 5m 0 10 20 25m
DRAWN BY: N.A.	PML REFERENCE NO: 09TF014
CHECK BY: T.X.	DRAWING NO: DWG-IK-1





NOTE: THIS DRAWING WAS REPRODUCED FROM THE DRAWING CNR_2D.dwg DATED SEPTEMBER 12, 2009 RECEIVED FROM ENGINEERING DIVISION, GO TRANSIT VIA EMAIL DATED SEPTEMBER 21, 2009

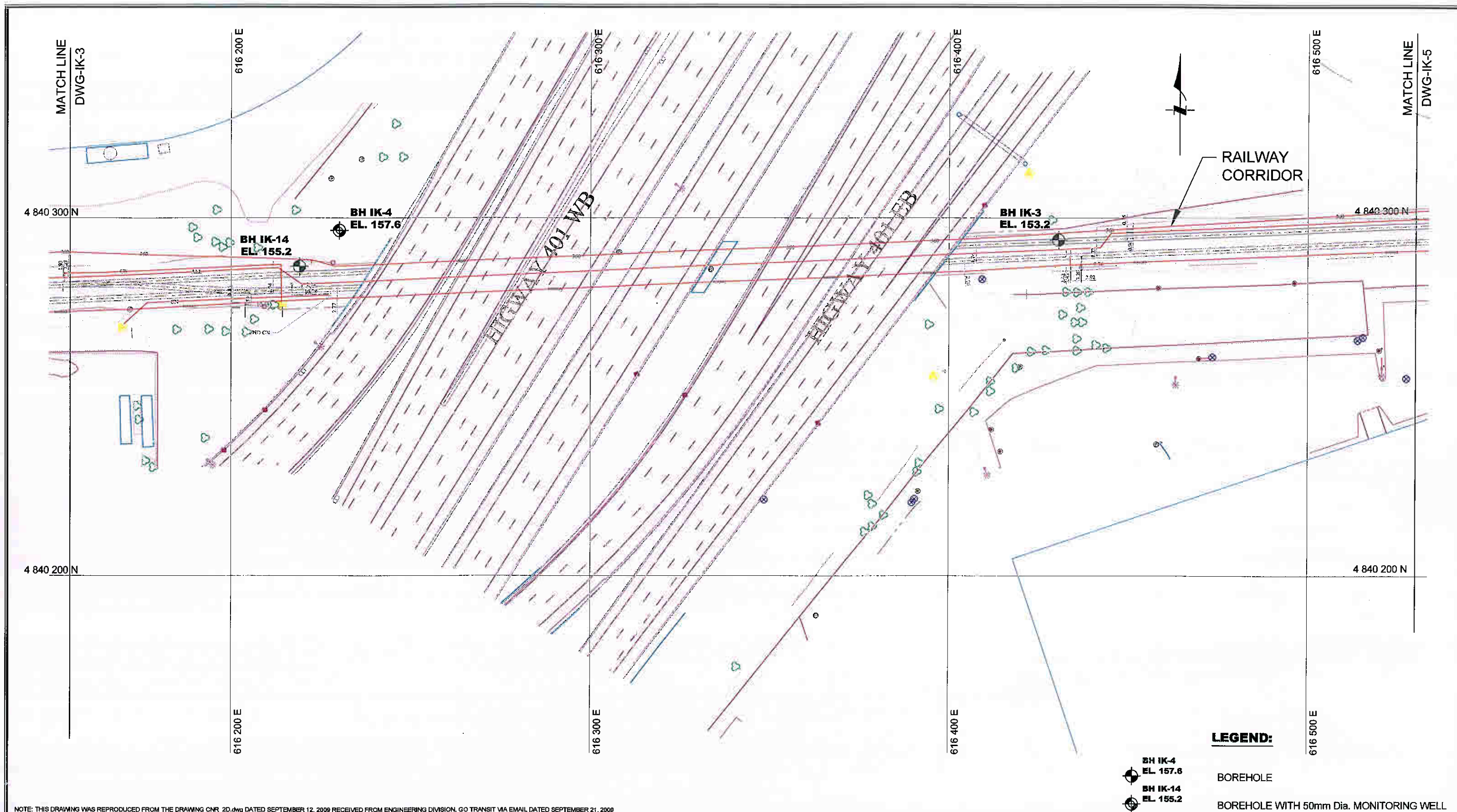
LEGEND:
 **BH IK-6**
EL. 159.1 BOREHOLE



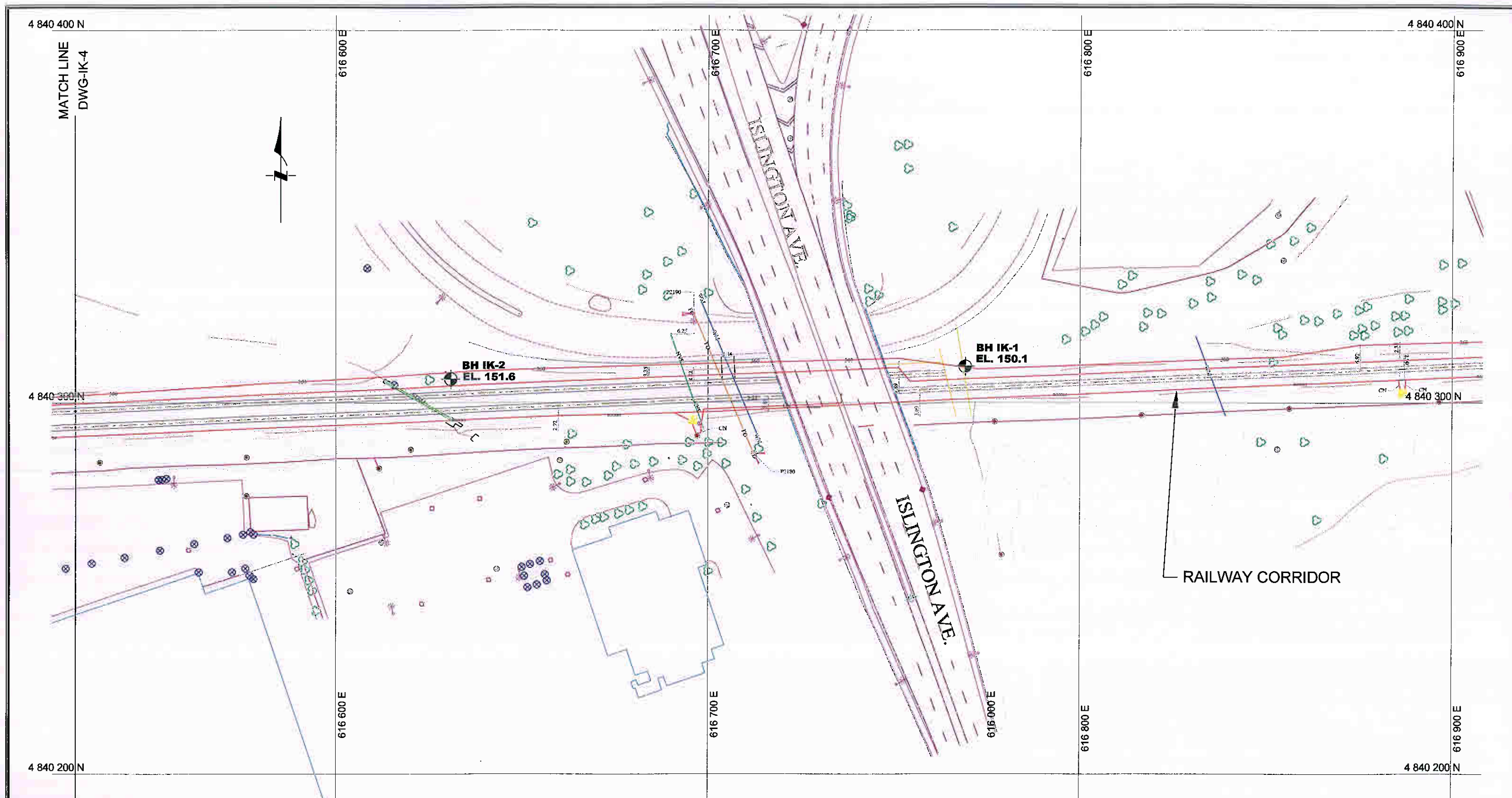
GO TRANSIT
 WESTON RAIL CORRIDOR
 ISLINGTON AVENUE TO KIPLING AVENUE
 (Mile 10.3 to 11.3)

BOREHOLE
 LOCATION PLAN

DATE: APRIL 2010	SCALE: 0 10 20 25m
DRAWN BY: N.A.	PML REFERENCE NO: 09TF014
CHECK BY: T.X.	DRAWING NO: DWG-IK-3




<p>Canada </p> <p></p>	<p>PML Peto MacCallum Ltd. CONSULTING ENGINEERS</p>	<p>GO TRANSIT WESTON RAIL CORRIDOR ISLINGTON AVENUE TO KIPLING AVENUE (Mile 10.3 to 11.3)</p>	<p>BOREHOLE LOCATION PLAN</p>	<p>DATE: APRIL 2010</p> <p>DRAWN BY: N.A.</p> <p>CHECK BY: T.X.</p>	<p>SCALE: </p> <p>PML REFERENCE NO: 09TF014</p> <p>DRAWING NO: DWG-IK-4</p>
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NOTE: THIS DRAWING WAS REPRODUCED FROM THE DRAWING CNR_2D.dwg DATED SEPTEMBER 12, 2009 RECEIVED FROM ENGINEERING DIVISION, GO TRANSIT VIA EMAIL DATED SEPTEMBER 21, 2009


LEGEND:

 **BH IK-2**
EL. 151.6 BOREHOLE



GO TRANSIT
WESTON RAIL CORRIDOR
ISLINGTON AVENUE TO KIPLING AVENUE
(Mile 10.3 to 11.3)

BOREHOLE
LOCATION PLAN

DATE: APRIL 2010	SCALE: 
DRAWN BY: N.A.	PML REFERENCE NO: 09TF014
CHECK BY: T.X.	DRAWING NO: DWG-IK-5

LIST OF ABBREVIATIONS



PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: - The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

<u>CONSISTENCY</u>	<u>N (blows/0.3 m)</u>	<u>c (kPa)</u>	<u>DENSENESS</u>	<u>N (blows/0.3 m)</u>
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		
WTPL	Wetter Than Plastic Limit			
APL	About Plastic Limit			
DTPL	Drier Than Plastic Limit			

TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oesterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample		
	PH	Sample Advanced Hydraulically	
	PM	Sample Advanced Manually	

SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

LOG OF BOREHOLE NO. 1K-1

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 309.7 N; 616 769.2 E

OUR PROJECT NO. 09TF014

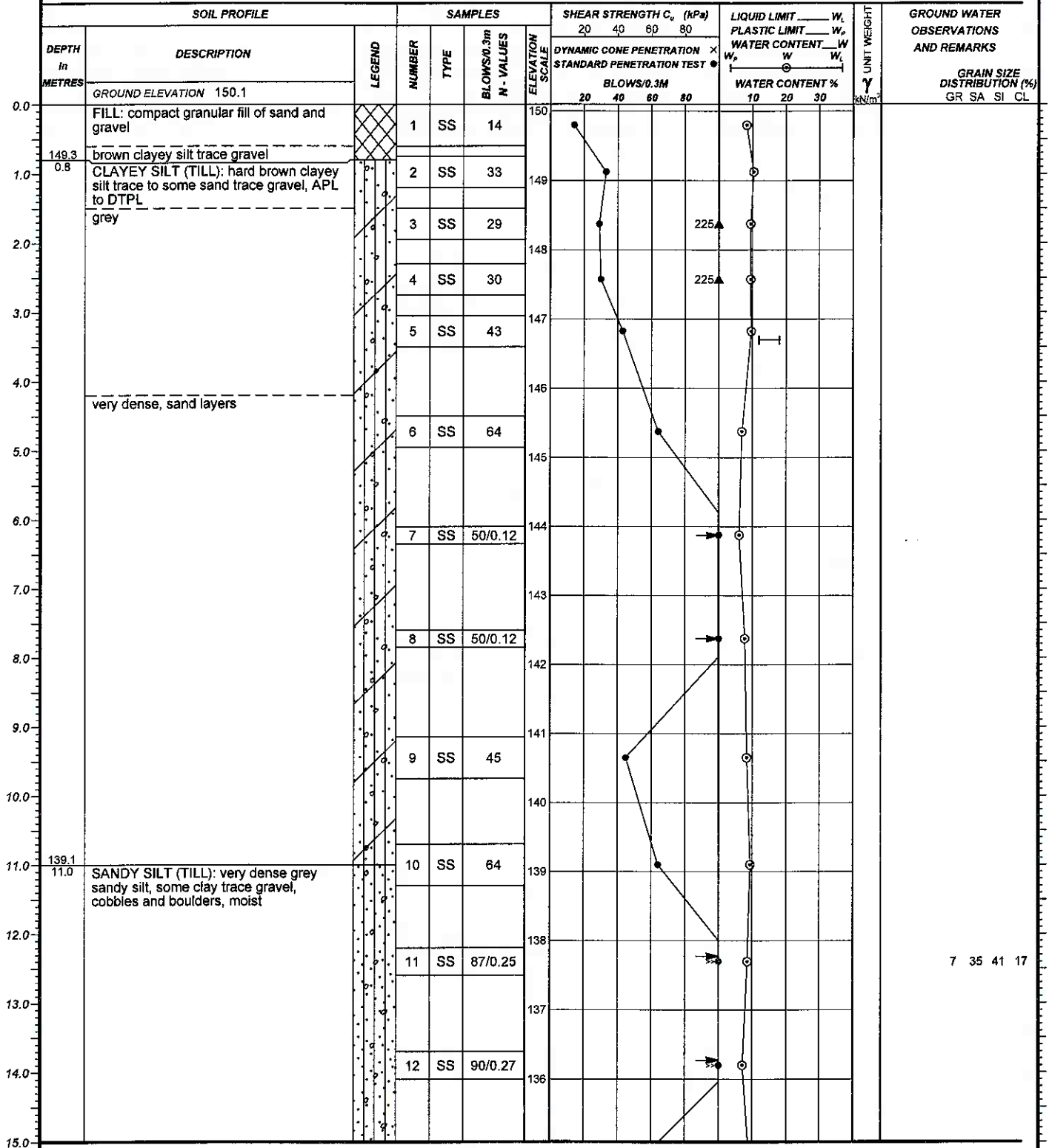
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers & Wash Boring

BORING DATE Jul. 31 & Aug. 4, 2009

TECHNICIAN M.M.



NOTES:

+ UNDISTURBED FIELD VANE
 ⊕ REMOLDED FIELD VANE
 △ LAB SHEAR TEST
 ◆ POCKET PENETROMETER
 CHECKED BY

LOG OF BOREHOLE NO. 1K-1

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 309.7 N; 616 769.2 E

OUR PROJECT NO. 09TF014

LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers & Wash Boring

BORING DATE Jul. 31 & Aug. 4, 2009

TECHNICIAN M.M.

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u (kPa)		LIQUID LIMIT W_L		UNIT WEIGHT γ kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS							
DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE	20 40 60 80		PLASTIC LIMIT W_P									
							DYNAMIC CONE PENETRATION \times		WATER CONTENT W									
							STANDARD PENETRATION TEST \bullet		W_P W W_L									
CONTINUED FROM PREVIOUS PAGE							BLOWS/0.3M		WATER CONTENT %									
							20 40 60 80		10 20 30									
134.8 15.3	CLAYEY SILT (TILL): hard grey clayey silt trace sand trace gravel, DTPL		13	SS	44	135												
16.0						134												
17.0			14	SS	50/0.08	133												
18.0	fragments of shale					132												
19.0			15	SS	80/0.05	131												
20.0						130												
130.3 19.8	SHALE: grey weathered shale with clay pockets		16	SS	103/0.05													
129.3 20.8	BOREHOLE TERMINATED AT 20.8 m		17	SS	103/0.05													
21.0																		
22.0												Upon completion of augering, no free water, no cave-in.						
23.0																		
24.0																		
25.0																		
26.0																		
27.0																		
28.0																		
29.0																		
30.0																		

NOTES:

- + UNDISTURBED FIELD VANE
- ⊕ REMOLDED FIELD VANE
- ⊗ LAB SHEAR TEST
- ▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. IK-2

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 306.3 N; 616 630.9 E **OUR PROJECT NO.** 09TF014

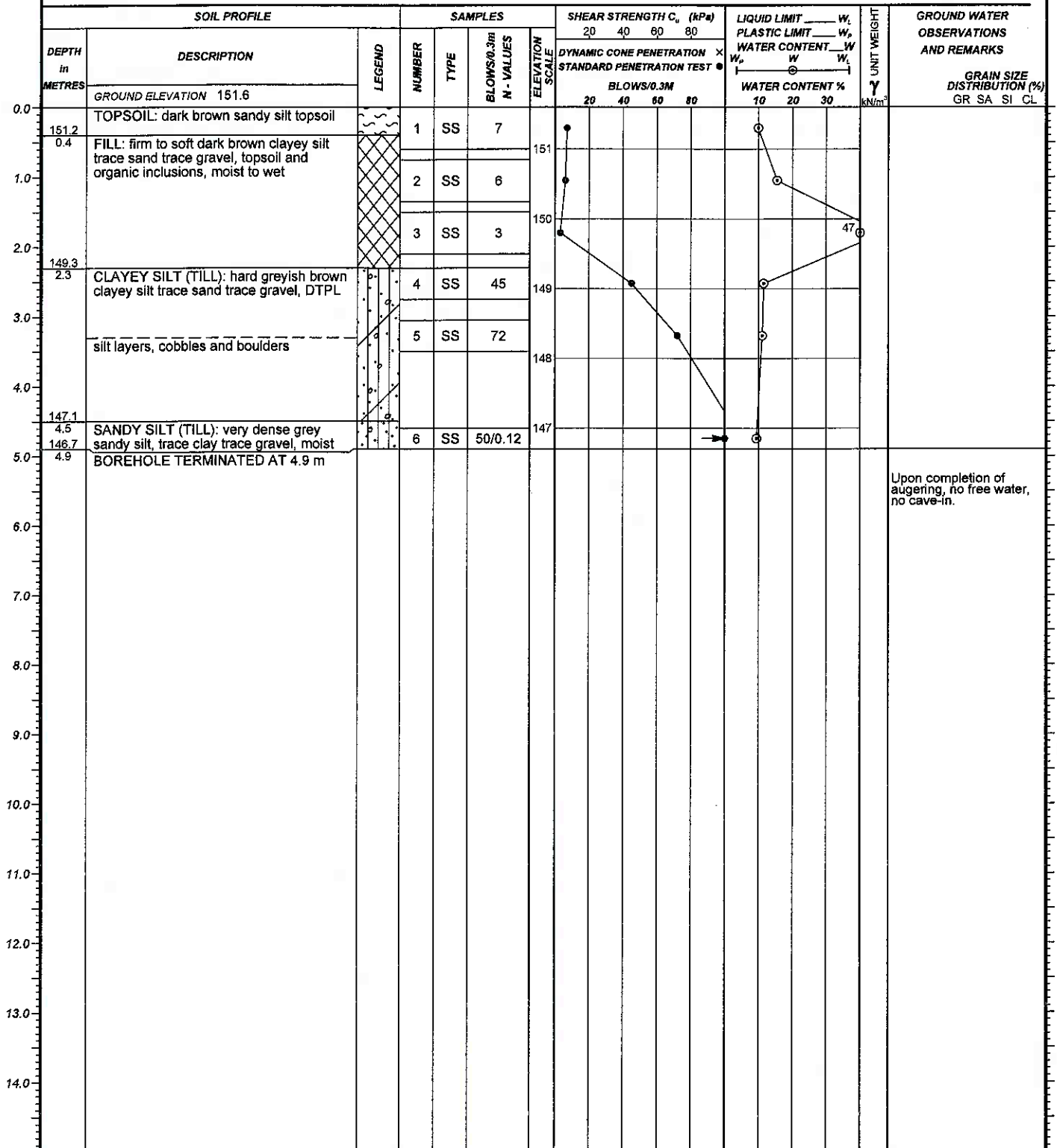
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE July 31, 2009

TECHNICIAN M.M.



NOTES:

+ UNDISTURBED FIELD VANE
 ⊕ REMOLDED FIELD VANE
 ⊗ LAB SHEAR TEST
 ▲ POCKET PENETROMETER
 CHECKED BY

LOG OF BOREHOLE NO. 1K-3

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 293.8 N; 616 430.6 E

OUR PROJECT NO. 09TF014

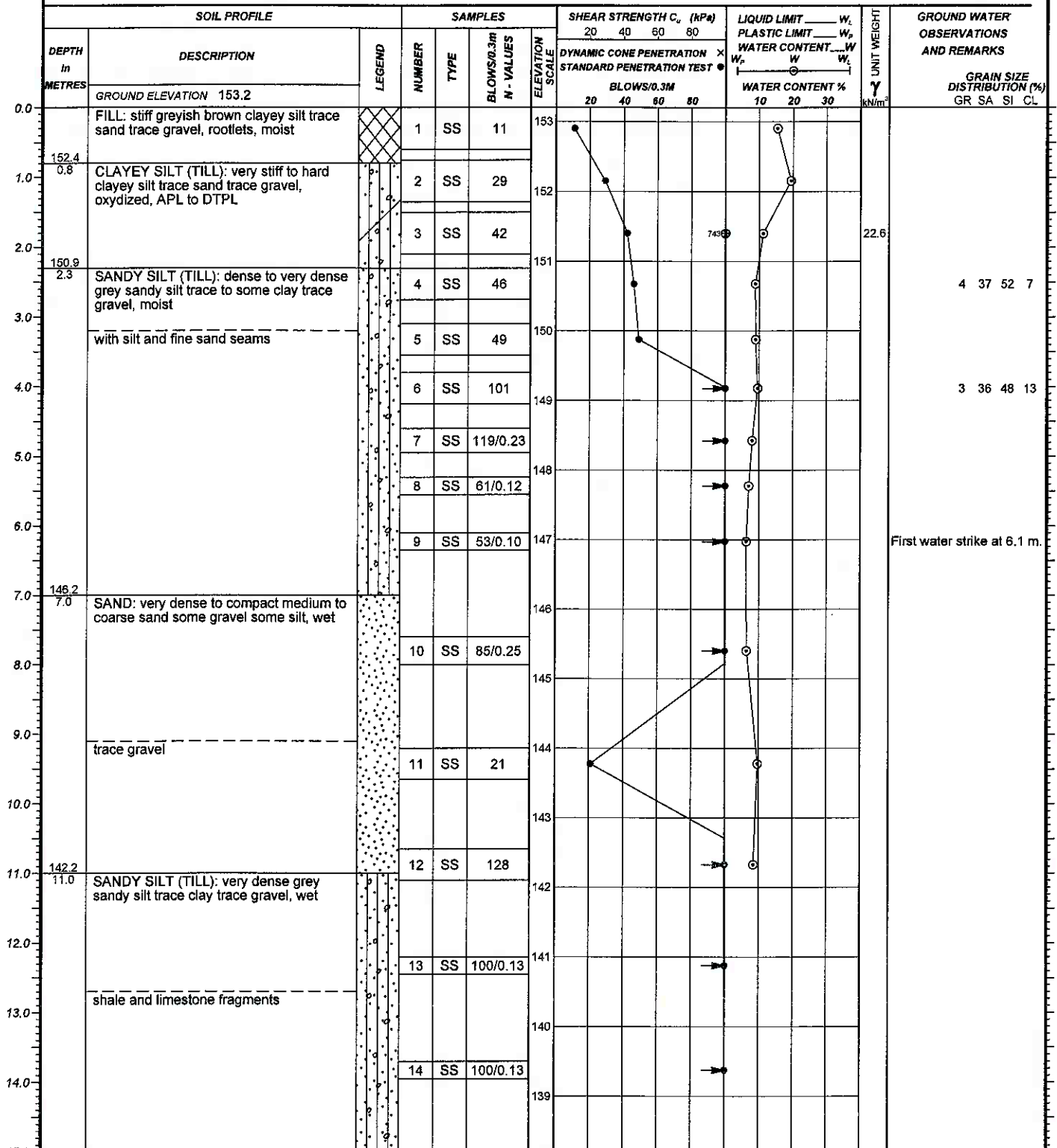
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE August 5 and 6, 2009

TECHNICIAN M.M.



NOTES:

+ UNDISTURBED FIELD VANE
 ⊕ REMOLDED FIELD VANE
 ⊗ LAB SHEAR TEST
 ▲ POCKET PENETROMETER
 CHECKED BY

LOG OF BOREHOLE NO. 1K-3

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 293.8 N; 616 430.6 E

OUR PROJECT NO. 09TF014

LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE August 5 and 6, 2009

TECHNICIAN M.M.

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u (kPa)				LIQUID LIMIT W_L				UNIT WEIGHT γ kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS		
DEPTH In METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE	20 40 60 80				PLASTIC LIMIT W_p						
							DYNAMIC CONE PENETRATION \times				WATER CONTENT W						
							STANDARD PENETRATION TEST \bullet				WATER CONTENT %						
							BLOWS/0.3M				10 20 30						
	CONTINUED FROM PREVIOUS PAGE																
16.0	SANDY SILT (TILL): very dense grey sandy silt trace clay trace gravel, wet (continued)		15	SS	102/0.13	138											
						137											
17.0			16	SS	110/0.13												
135.8 17.4	BOREHOLE TERMINATED AT 17.4 m					136											
18.0																	
19.0																	
20.0																	
21.0																	
22.0																	
23.0																	
24.0																	
25.0																	
26.0																	
27.0																	
28.0																	
29.0																	
30.0																	

NOTES:

+ UNDISTURBED FIELD VANE
 ⊕ REMOLDED FIELD VANE
 ⊗ LAB SHEAR TEST
 ▲ POCKET PENETROMETER
 CHECKED BY

LOG OF BOREHOLE NO. 1K-4

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 296.5 N; 616 230.0 E

OUR PROJECT NO. 09TF014

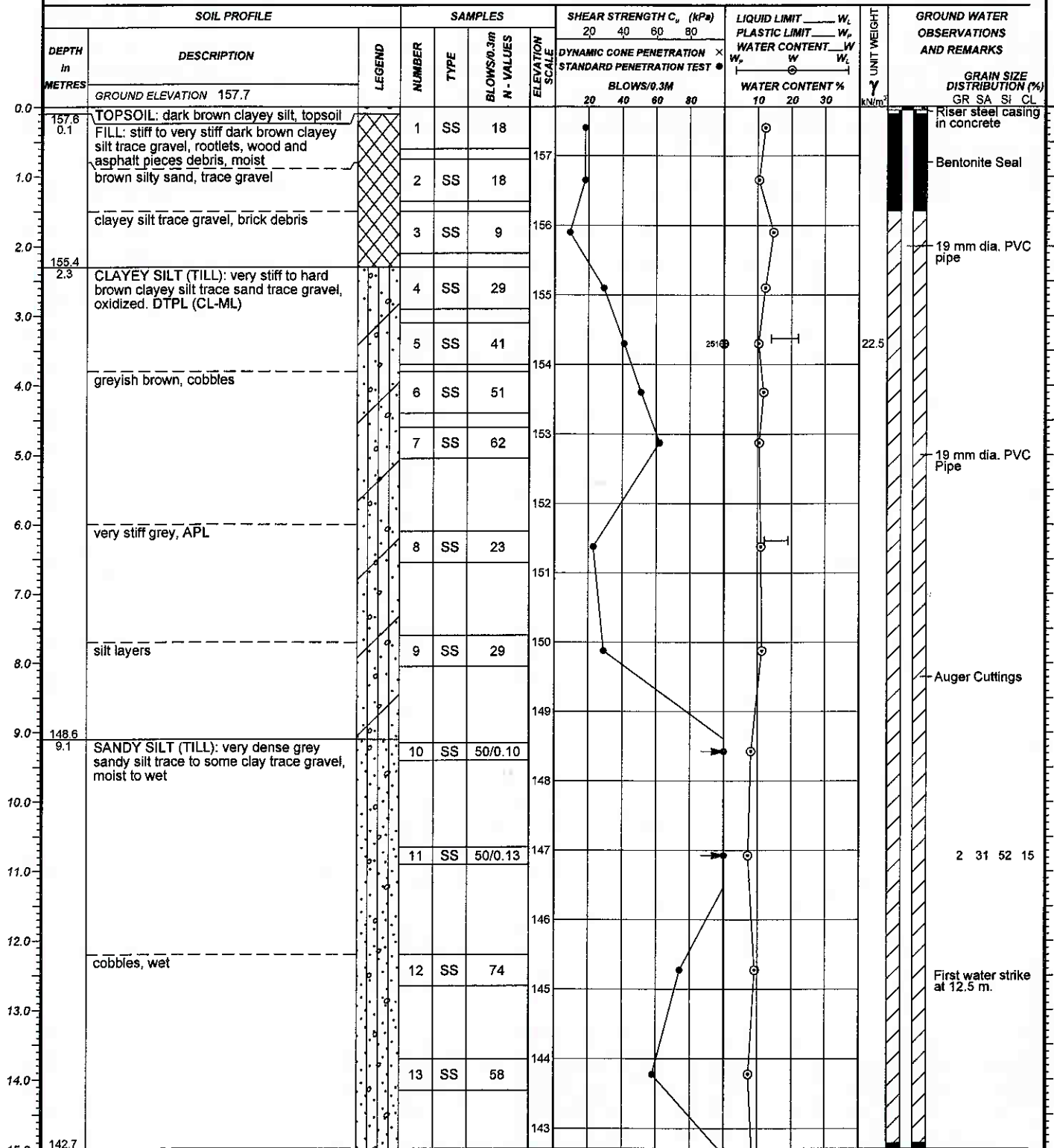
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE August 5 to 7, 2009

TECHNICIAN S.A.



NOTES:

+ UNDISTURBED FIELD VANE
 ⊕ REMOLDED FIELD VANE
 ⊗ LAB SHEAR TEST
 ▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. 1K-4

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 296.5 N; 616 230.0 E

OUR PROJECT NO. 09TF014

LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE August 5 to 7, 2009

TECHNICIAN S.A.

SOIL PROFILE		LEGEND	SAMPLES			SHEAR STRENGTH C_u (kPa)				LIQUID LIMIT W_L				UNIT WEIGHT γ kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS												
DEPTH in METRES	DESCRIPTION		NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE	20 40 60 80				PLASTIC LIMIT W_p																
							DYNAMIC CONE PENETRATION \times STANDARD PENETRATION TEST				WATER CONTENT W																
	CONTINUED FROM PREVIOUS PAGE						BLOWS/0.3M				WATER CONTENT %																
							20	40	60	80	10	20	30														
15.0	SANDY SILT (TILL): very dense grey sandy silt trace to some clay trace gravel, wet (Cont'd)		14	SS	50/0.13	142																					
16.0						141																					
17.0			15	SS	50/0.10	140																					
18.0						139																					
19.0			16	SS	50/0.08	138																					
20.0			17	SS	50/0.13	137																					
21.0																											
21.6			18	SS	50/0.13																						
21.6	BOREHOLE TERMINATED AT 21.6 m														<p>Upon completion of augering, no free water, no cave-in</p> <p><u>Water Level Readings</u></p> <table> <tr> <th>Date</th><th>Depth (m)</th><th>Elev.</th></tr> <tr> <td>21/08/09</td><td>4.8</td><td>152.9</td></tr> <tr> <td>02/09/09</td><td>4.2</td><td>153.5</td></tr> <tr> <td>16/09/09</td><td>4.4</td><td>153.3</td></tr> </table>	Date	Depth (m)	Elev.	21/08/09	4.8	152.9	02/09/09	4.2	153.5	16/09/09	4.4	153.3
Date	Depth (m)	Elev.																									
21/08/09	4.8	152.9																									
02/09/09	4.2	153.5																									
16/09/09	4.4	153.3																									

NOTES:

+ UNDISTURBED FIELD VANE
 ⊕ REMOLDED FIELD VANE
 ⊗ LAB SHEAR TEST
 ▲ POCKET PENETROMETER
 CHECKED BY

LOG OF BOREHOLE NO. 1K-5

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 264.3 N; 615 985.5 E

OUR PROJECT NO. 09TF014

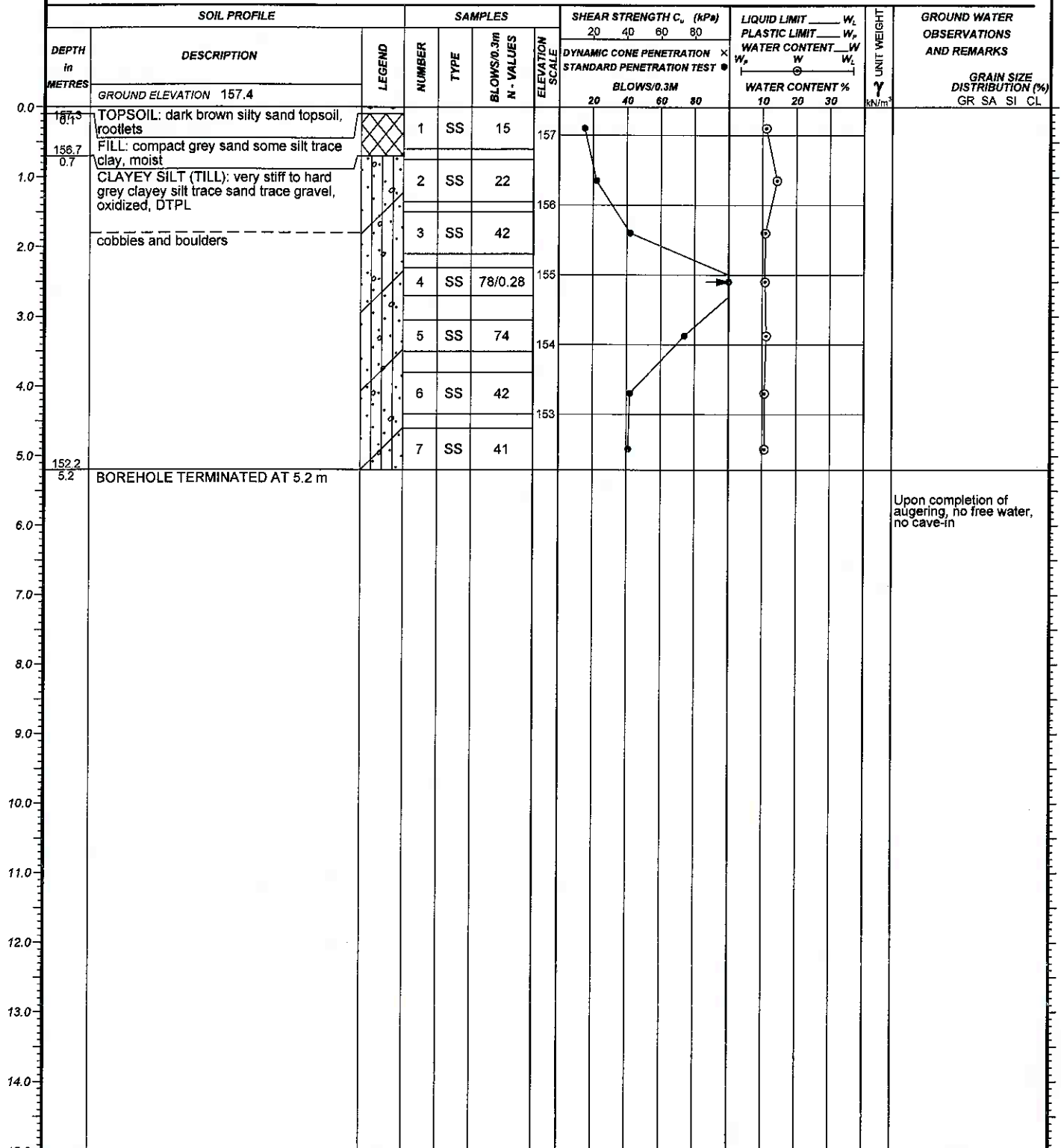
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE September 22, 2009

TECHNICIAN S.A.



NOTES:

+ UNDISTURBED FIELD VANE
⊕ REMOLDED FIELD VANE
⊗ LAB SHEAR TEST
▲ POCKET PENETROMETER
CHECKED BY

LOG OF BOREHOLE NO. 1K-6

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 254.0 N; 615 841.1 E

OUR PROJECT NO. 09TF014

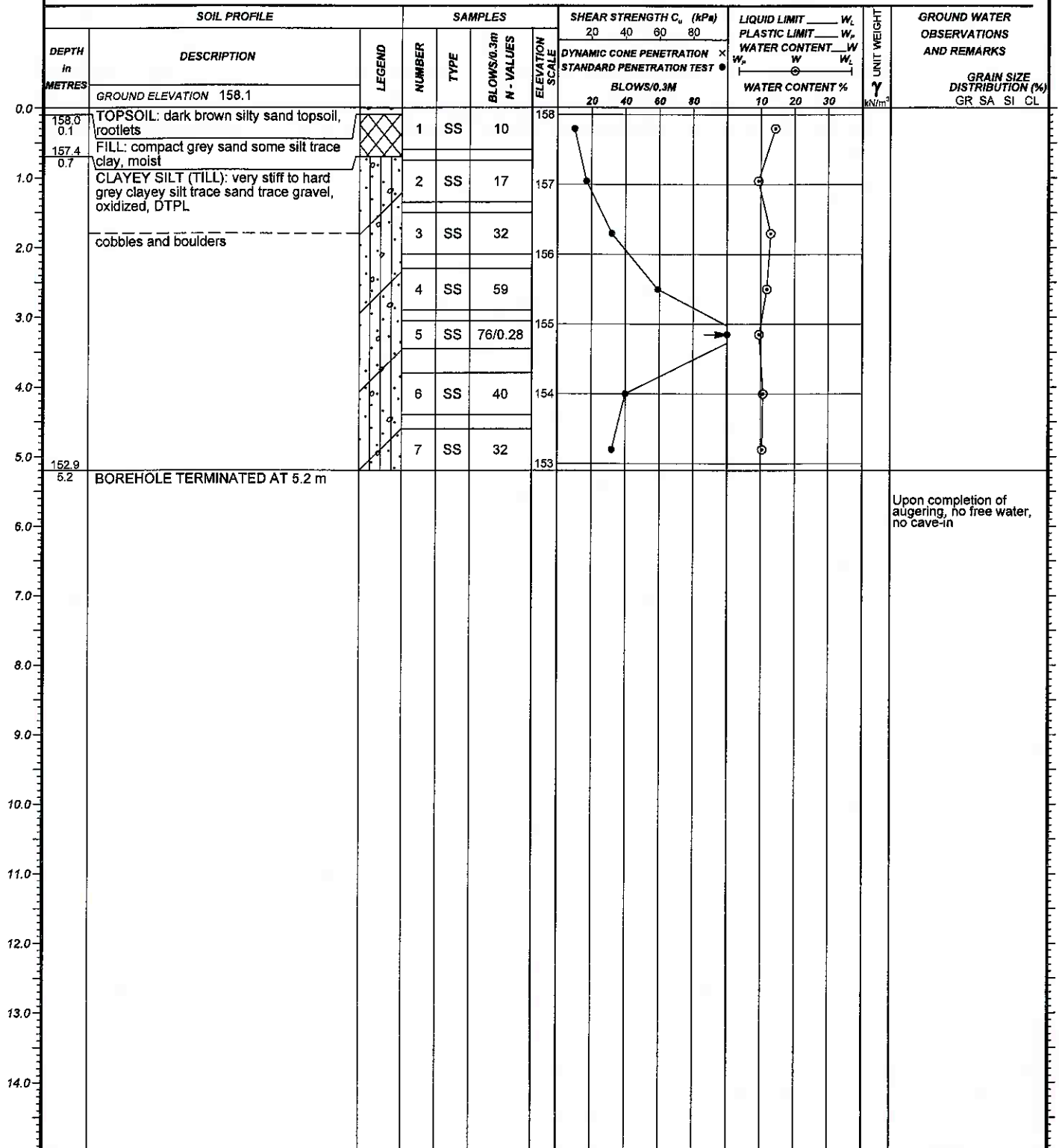
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE September 22, 2009

TECHNICIAN S.A.



NOTES:

+ UNDISTURBED FIELD VANE
 ⊕ REMOLDED FIELD VANE
 ⊗ LAB SHEAR TEST
 ▲ POCKET PENETROMETER
 CHECKED BY

LOG OF BOREHOLE NO. 1K-7

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 250.8 N; 615 713.8 E

OUR PROJECT NO. 09TF014

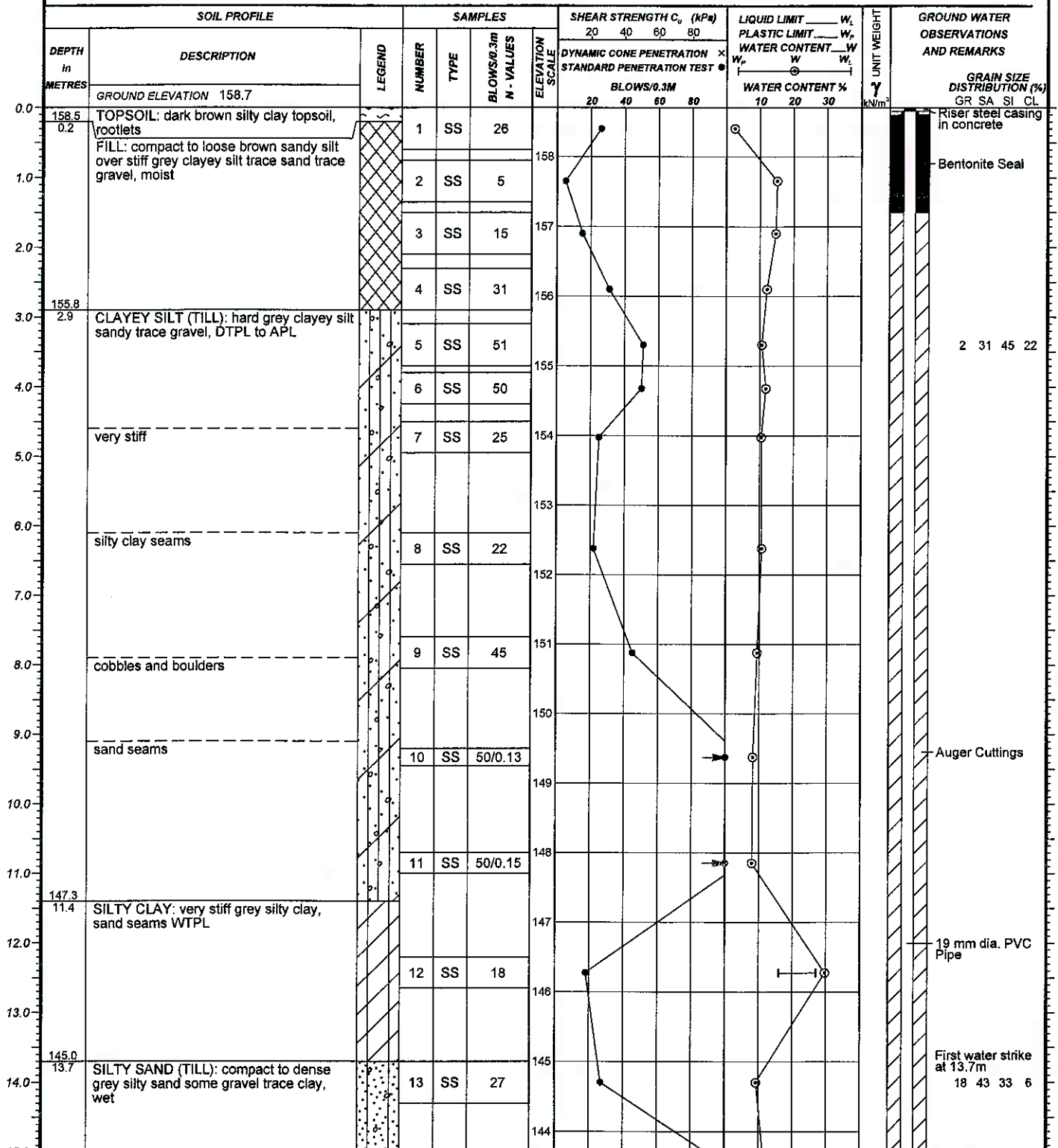
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE July 27 to 30, 2009

TECHNICIAN S.A.



LOG OF BOREHOLE NO. 1K-7

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 250.8 N; 615 713.8 E

OUR PROJECT NO. 09TF014

LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

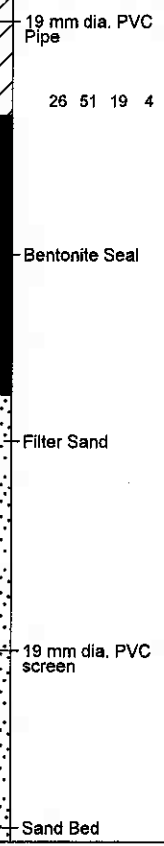
ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE July 27 to 30, 2009

TECHNICIAN S.A.

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u (kPa)		LIQUID LIMIT W_L		PLASTIC LIMIT W_P		WATER CONTENT W		UNIT WEIGHT γ (kN/m ³)	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3M N-VALUES	ELEVATION SCALE	20	40	60	80	W _L	W _P	W ₁		
	CONTINUED FROM PREVIOUS PAGE														
16.0	SILTY SAND (TILL): compact to dense grey silty sand some gravel trace clay, wet (continued)		14	SS	50/0.08	143									
17.0	very dense gravelly sand some silt trace clay, wet		15	SS	50/0.15	142									
18.0						141									
19.0			16	SS	50/0.08	140									
20.0						139									
21.0	137.8 20.9 SILTY SAND: very dense grey silty fine to medium sand trace gravel, wet		17	SS	50/0.03	138									
22.0						137									
23.0			18	SS	55/0.15	136									
24.0						135									
25.0	133.9 24.8 BOREHOLE TERMINATED AT 24.8 m		19	SS	78	134									
26.0															
27.0															
28.0															
29.0															
30.0															



Upon completion of augering, no free water, no cave-in

Water Level Readings

Date	Depth (m)	Elev.
21/08/09	7.1	151.6
02/09/09	6.4	152.3
16/09/09	6.6	152.1

NOTES:

- + UNDISTURBED FIELD VANE
- ⊕ REMOLDED FIELD VANE
- ⊗ LAB SHEAR TEST
- ▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. 1K-8

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 269.3 N; 615 709.0 E

OUR PROJECT NO. 09TF014

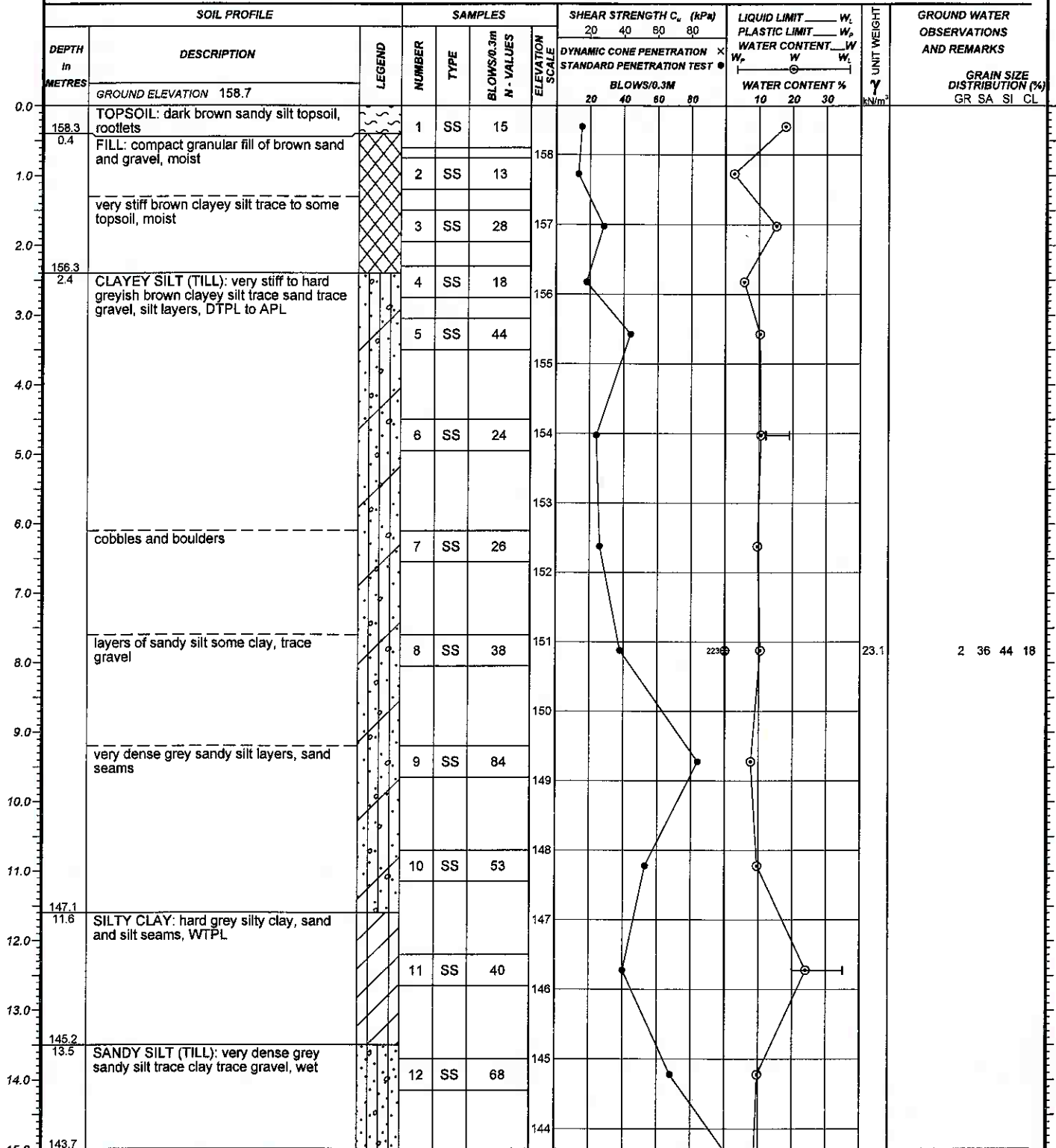
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE July 27 & 28, 2009

TECHNICIAN M.M.



NOTES:

+ UNDISTURBED FIELD VANE
⊕ REMOLDED FIELD VANE
⊗ LAB SHEAR TEST
▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. 1K-8

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 269.3 N; 615 709.0 E

OUR PROJECT NO. 09TF014

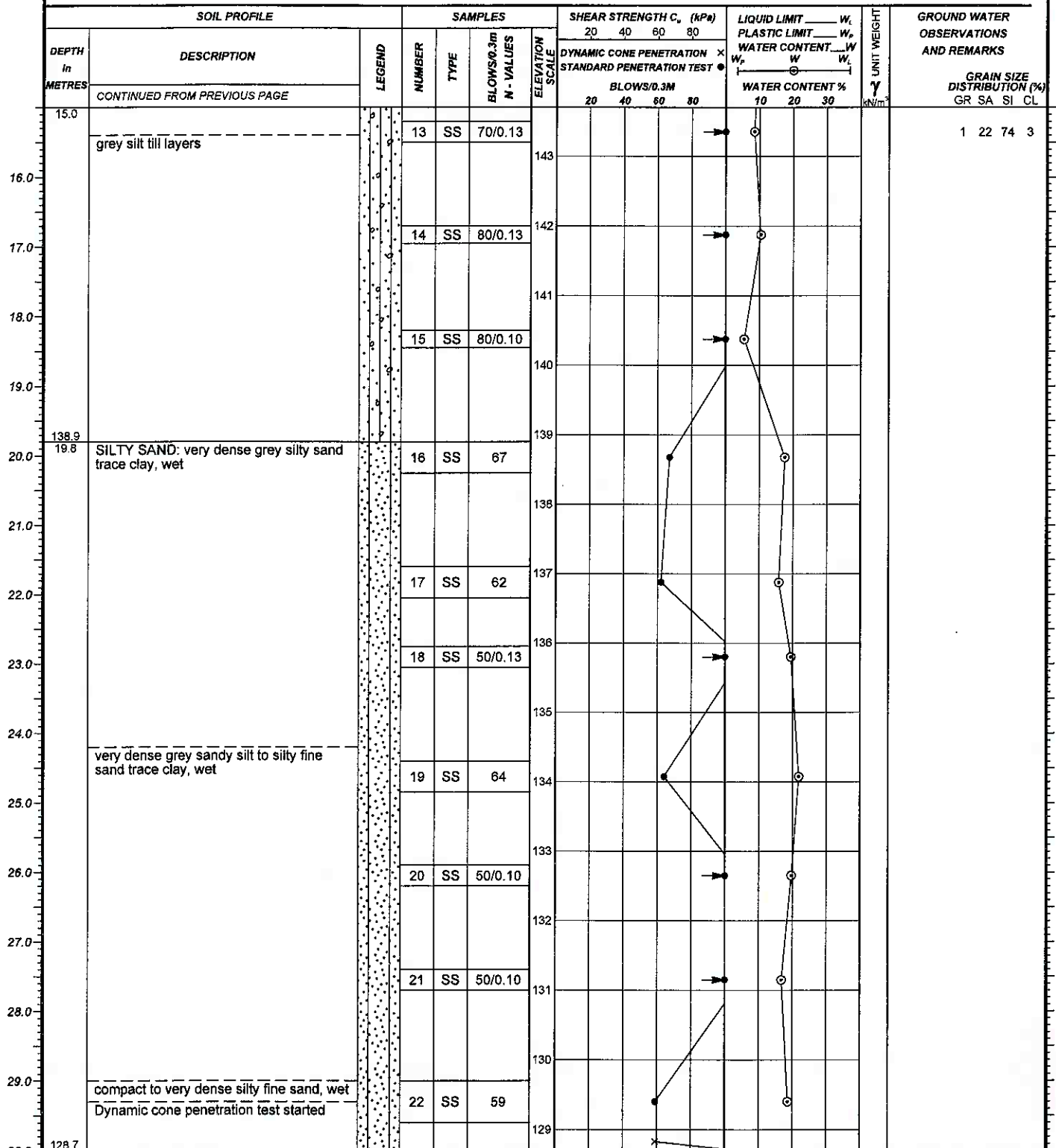
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE July 27 & 28, 2009

TECHNICIAN M.M.



NOTES:

+ UNDISTURBED FIELD VANE
 ⊕ REMOLDED FIELD VANE
 ⊗ LAB SHEAR TEST
 ▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. 1K-8

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 269.3 N; 615 709.0 E

OUR PROJECT NO. 09TF014

LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE July 27 & 28, 2009

TECHNICIAN M.M.

SOIL PROFILE		SAMPLES				SHEAR STRENGTH C_u (kPa)				LIQUID LIMIT W_L				UNIT WEIGHT γ kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS							
DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE	20 40 60 80				PLASTIC LIMIT W_p											
							DYNAMIC CONE PENETRATION \times				WATER CONTENT W											
							STANDARD PENETRATION TEST \bullet				W_p W W_L											
CONTINUED FROM PREVIOUS PAGE							BLOWS/0.3M				WATER CONTENT %											
							20	40	60	80	10	20	30									
30.0 128.4																						
30.3	BOREHOLE TERMINATED AT 30.3 m														Upon completion of augering, no free water, no cave-in							
31.0																						
32.0																						
33.0																						
34.0																						
35.0																						
36.0																						
37.0																						
38.0																						
39.0																						
40.0																						
41.0																						
42.0																						
43.0																						
44.0																						
45.0																						

NOTES:

- + UNDISTURBED FIELD VANE
- ⊕ REMOLDED FIELD VANE
- ⊗ LAB SHEAR TEST
- ▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. 1K-9

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 247.2 N; 615 660.3 E

OUR PROJECT NO. 09TF014

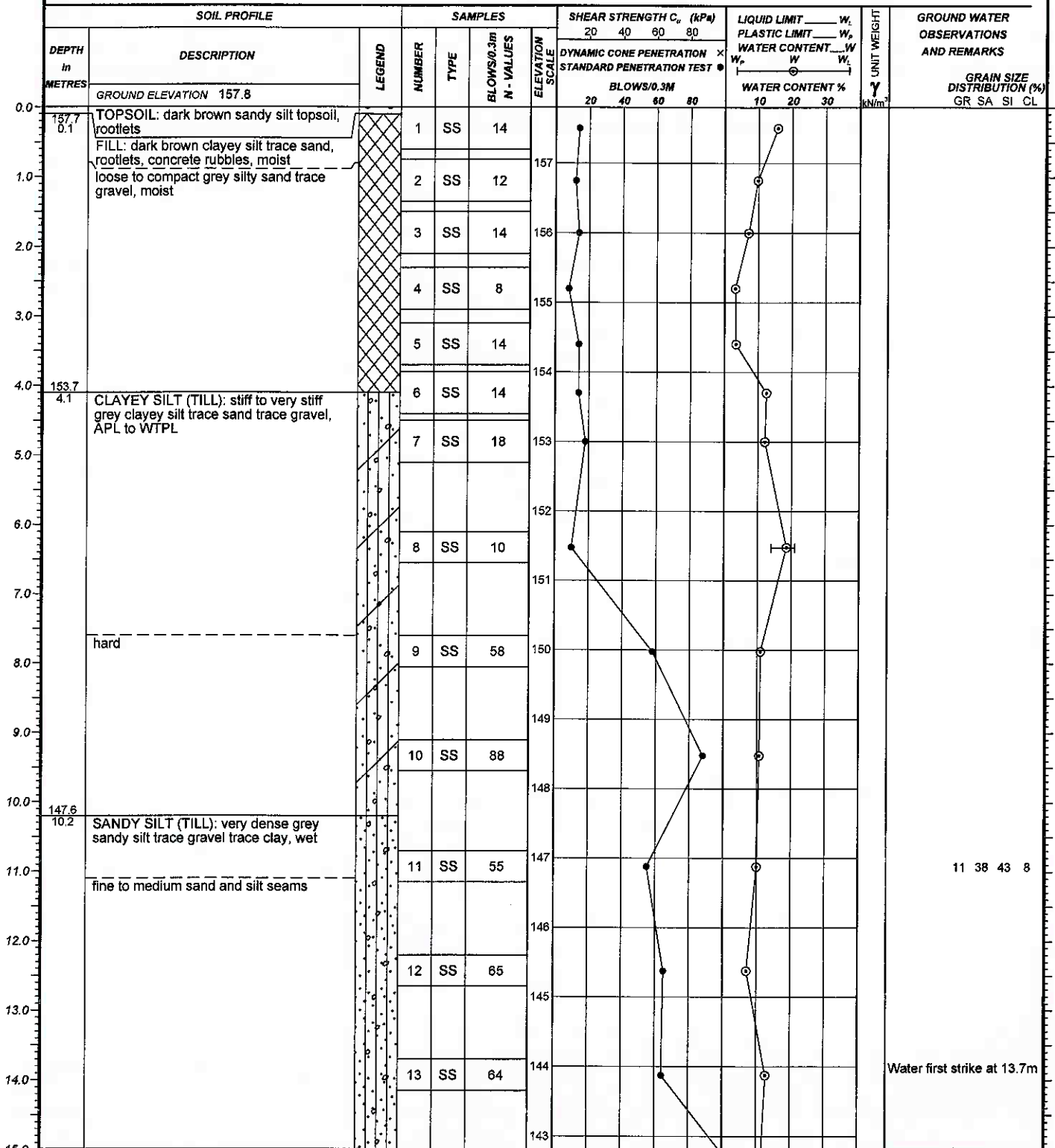
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE July 31 & Aug. 5, 2009

TECHNICIAN S.A.



NOTES: Borehole was extended by dynamic cone penetration test to 21.4 m and terminated in probable very dense sand deposit.

+ UNDISTURBED FIELD VANE
⊕ REMOLDED FIELD VANE
⊗ LAB SHEAR TEST
▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. 1K-9

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 247.2 N; 615 660.3 E

OUR PROJECT NO. 09TF014

LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE July 31 & Aug. 5, 2009

TECHNICIAN S.A.

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u (kPa)				LIQUID LIMIT W_L				UNIT WEIGHT γ (kN/m ³)	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N-VALUES	ELEVATION SCALE	20	40	60	80	PLASTIC LIMIT W_p	WATER CONTENT W	WATER CONTENT %		
	CONTINUED FROM PREVIOUS PAGE														
16.0	SANDY SILT (TILL): very dense grey sandy silt trace gravel trace clay, wet (continued) cobbles and boulders		14	SS	50/0.12	142									
17.0			15	SS	60/0.10	141									
18.0	very dense grey silt trace sand trace clay layers					140									
18.3	SILTY SAND: very dense grey silty fine sand trace clay, wet		16	SS	60/0.08	139									0 2 96 2
19.0			17	SS	88	138									
20.0	probable very dense silty fine sand					137									
21.0															
21.4	BOREHOLE TERMINATED AT 21.4 m														Upon completion of augering, free water at 17.7m, cave-in at 16.8m
22.0															
23.0															
24.0															
25.0															
26.0															
27.0															
28.0															
29.0															
30.0															

NOTES: Borehole was extended by dynamic cone penetration test to 21.4 m and terminated in probable very dense sand deposit.

+ UNDISTURBED FIELD VANE
 ⊕ REMOLDED FIELD VANE
 ⊗ LAB SHEAR TEST
 ▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. IK-11

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 280.0 N; 615 453.2 E

OUR PROJECT NO. 09TF014

LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE July 27, 2009

TECHNICIAN M.M.

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u (kPa)		LIQUID LIMIT W_L		UNIT WEIGHT γ (kN/m ³)	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION \times STANDARD PENETRATION TEST \bullet	BLOWS/0.3M	PLASTIC LIMIT W_P	WATER CONTENT W		
	GROUND ELEVATION 159.8										
0.0	FILL: compact granular fill of brown sand and gravel, moist		1	SS	20						
1.0	stiff brown clayey silt trace topsoil, moist to wet		2	SS	11						
158.2 1.8	CLAYEY SILT (TILL): very stiff to hard brown clayey silt trace sand trace gravel, DTPL		3	SS	21						
2.0			4	SS	41						
3.0			5	SS	70						
4.0			6	SS	38						
154.8 5.0	BOREHOLE TERMINATED AT 5.0 m										
6.0											Upon completion of augering, free water at 2.30m, no cave-in.
7.0											
8.0											
9.0											
10.0											
11.0											
12.0											
13.0											
14.0											
15.0											

NOTES:

- + UNDISTURBED FIELD VANE
- ⊕ REMOLDED FIELD VANE
- ⊗ LAB SHEAR TEST
- ▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. 1K-12

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 222.1 N; 615 247.8 E **OUR PROJECT NO.** 09TF014

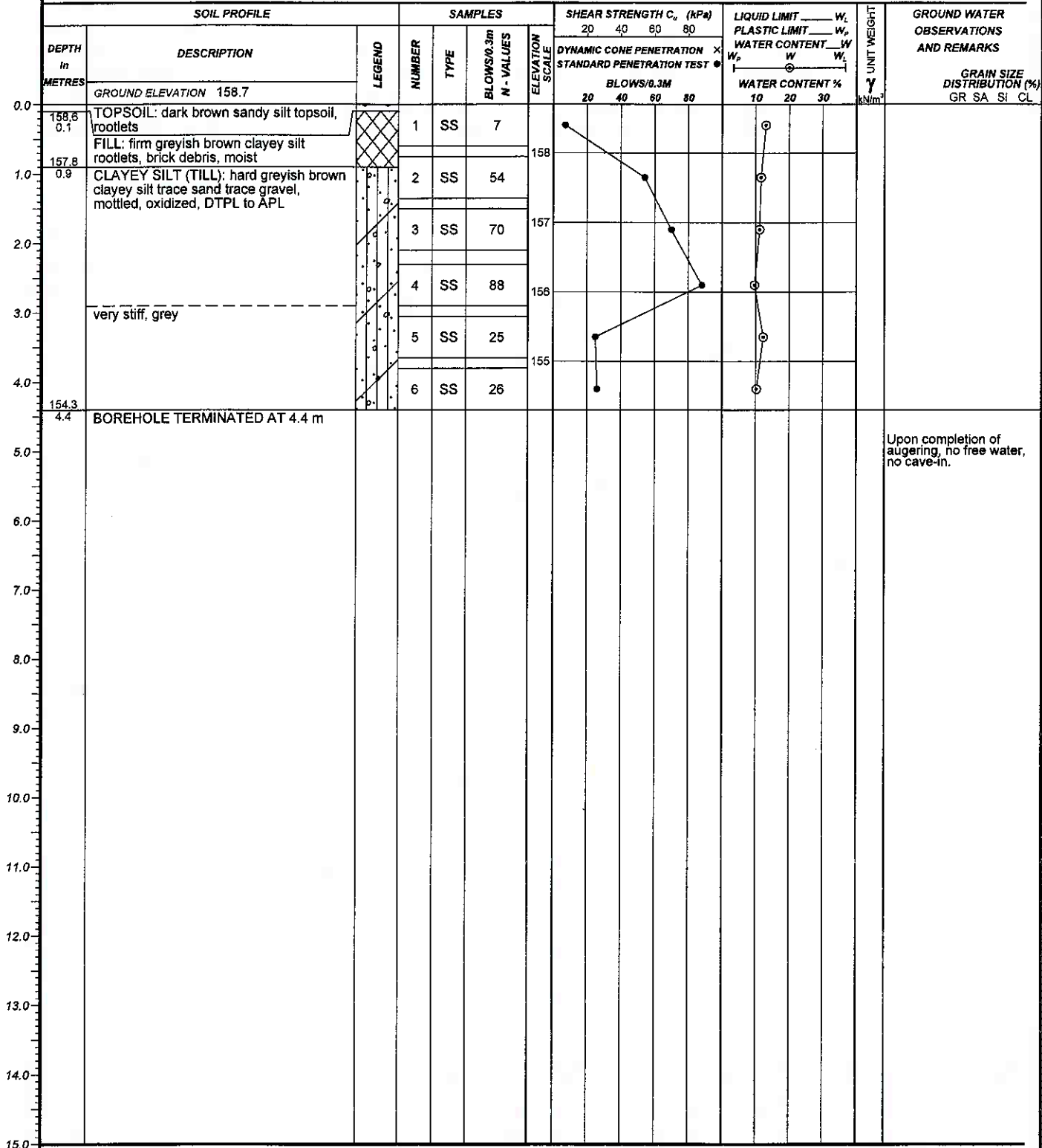
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE July 27, 2009

TECHNICIAN S.A.



Upon completion of augering, no free water, no cave-in.

NOTES:

- + UNDISTURBED FIELD VANE
- ⊕ REMOLDED FIELD VANE
- ⊗ LAB SHEAR TEST
- ▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. IK-14

PROJECT Go Transit Weston Rail Corridor

Coords: 4 840 286.4 N; 616 219.0 E

OUR PROJECT NO. 09TF014

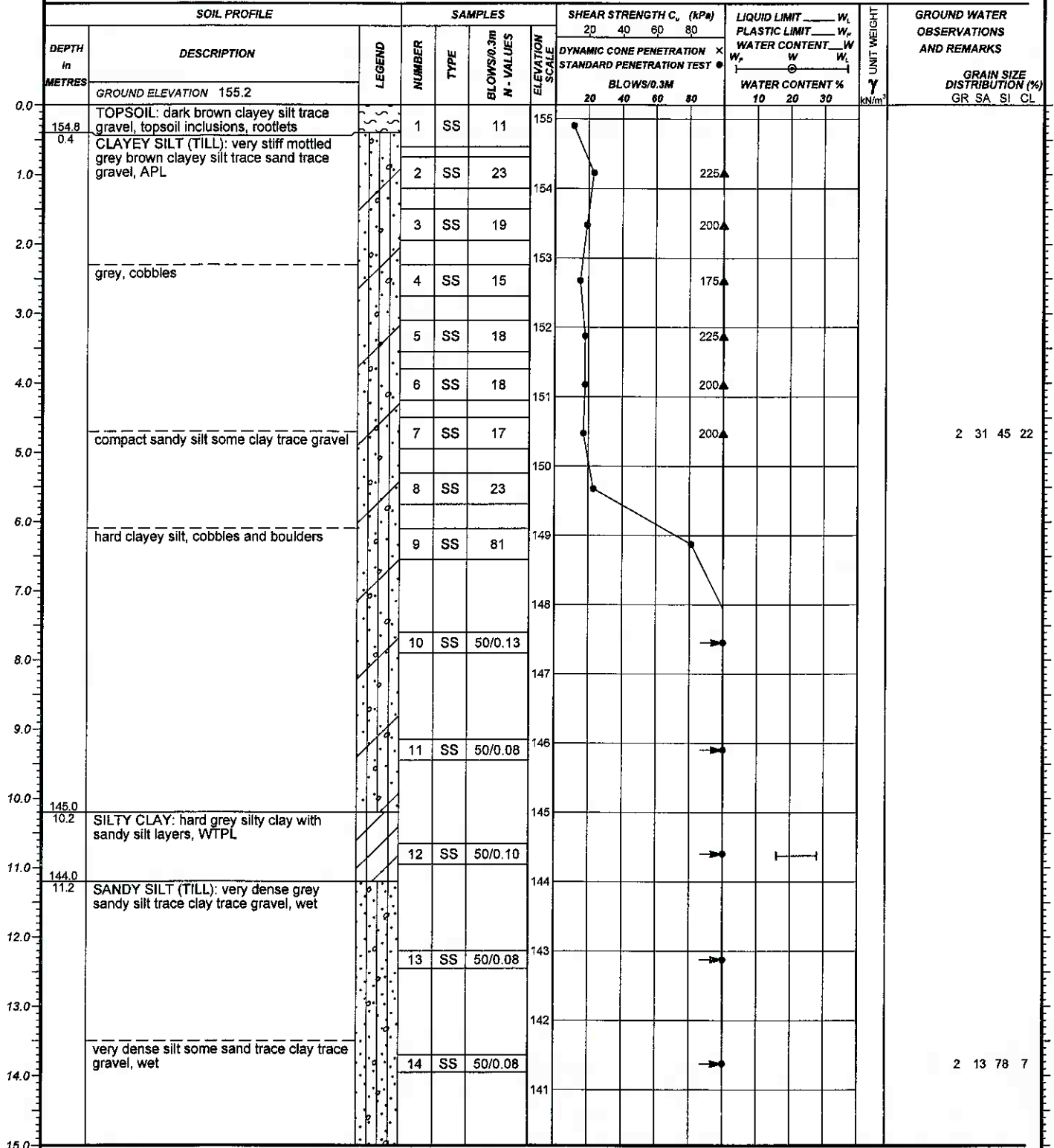
LOCATION Islington Avenue to Kipling Avenue (Mile 10.3 to 11.3) Toronto, Ontario

ENGINEER T.X.

BORING METHOD Continuous Flight Hollow Stem Augers & Wash Boring

BORING DATE August 7, 2009

TECHNICIAN M.M.



NOTES:

- + UNDISTURBED FIELD VANE
- ⊕ REMOLDED FIELD VANE
- ⊗ LAB SHEAR TEST
- ▲ POCKET PENETROMETER

CHECKED BY

LOG OF BOREHOLE NO. 1K-14

PROJECT Go Transit Weston Rail Corridor

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BORING METHOD Continuous Flight Hollow Stem Augers & Wash Boring

BORING DATE August 7, 2009

TECHNICIAN M.M.

SOIL PROFILE		SAMPLES				SHEAR STRENGTH C_u (kPa)				LIQUID LIMIT W_L				UNIT WEIGHT γ kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS		
DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE	20 40 60 80				PLASTIC LIMIT W_p						
							DYNAMIC CONE PENETRATION \times				WATER CONTENT W						
							STANDARD PENETRATION TEST \bullet				WATER CONTENT %						
							BLOWS/0.3M				10 20 30						
139.7 15.5	CONTINUED FROM PREVIOUS PAGE SANDY SILT (TILL): very dense grey sandy silt trace clay trace gravel, wet (continued) BOREHOLE TERMINATED AT 15.5 m		15	SS	50/0.08	140									Upon completion of augering, no free water, no cave-in		
16.0																	
17.0																	
18.0																	
19.0																	
20.0																	
21.0																	
22.0																	
23.0																	
24.0																	
25.0																	
26.0																	
27.0																	
28.0																	
29.0																	
30.0																	

NOTES:

- + UNDISTURBED FIELD VANE
- ⊕ REMOLDED FIELD VANE
- ⊗ LAB SHEAR TEST
- ▲ POCKET PENETROMETER

CHECKED BY

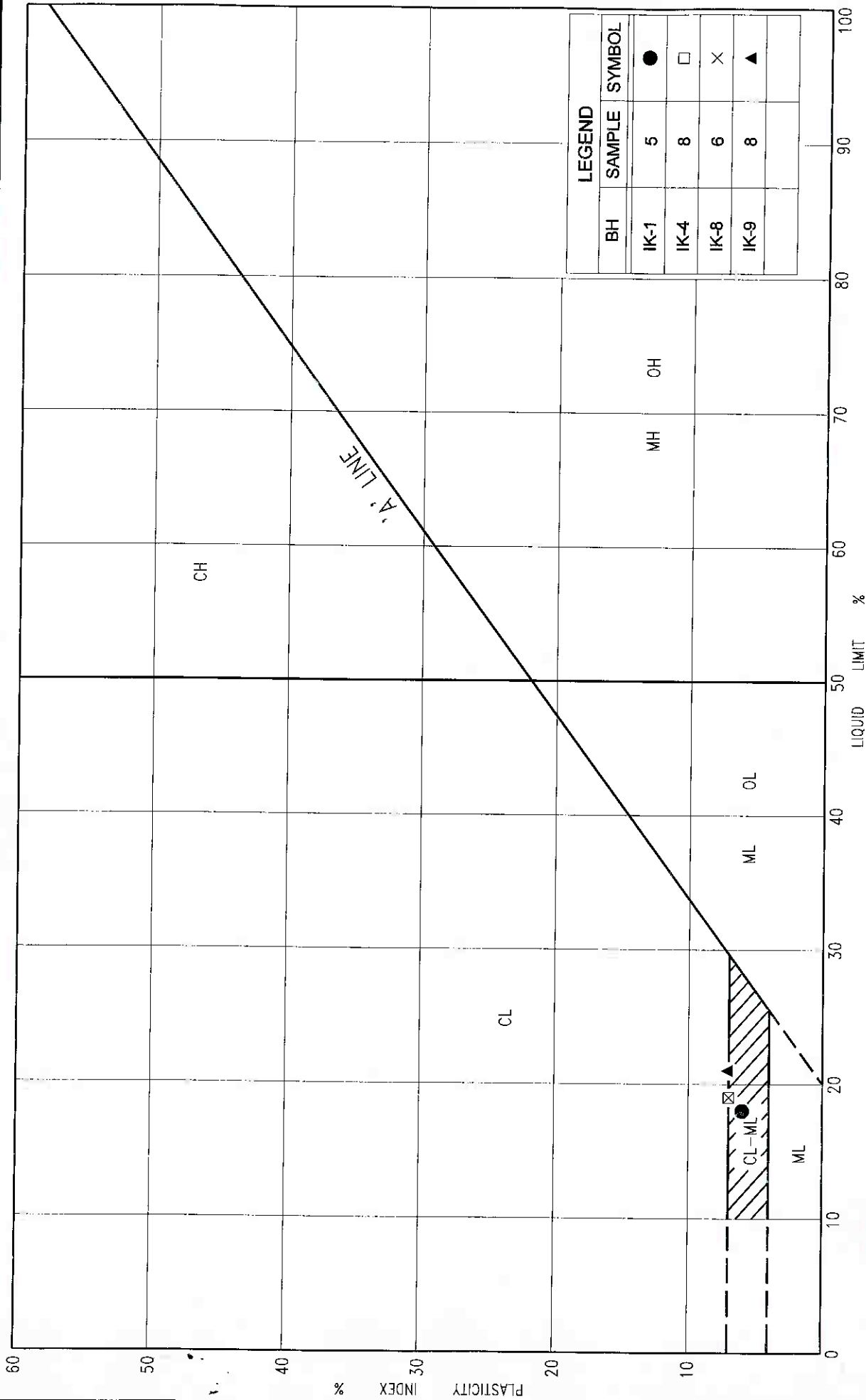
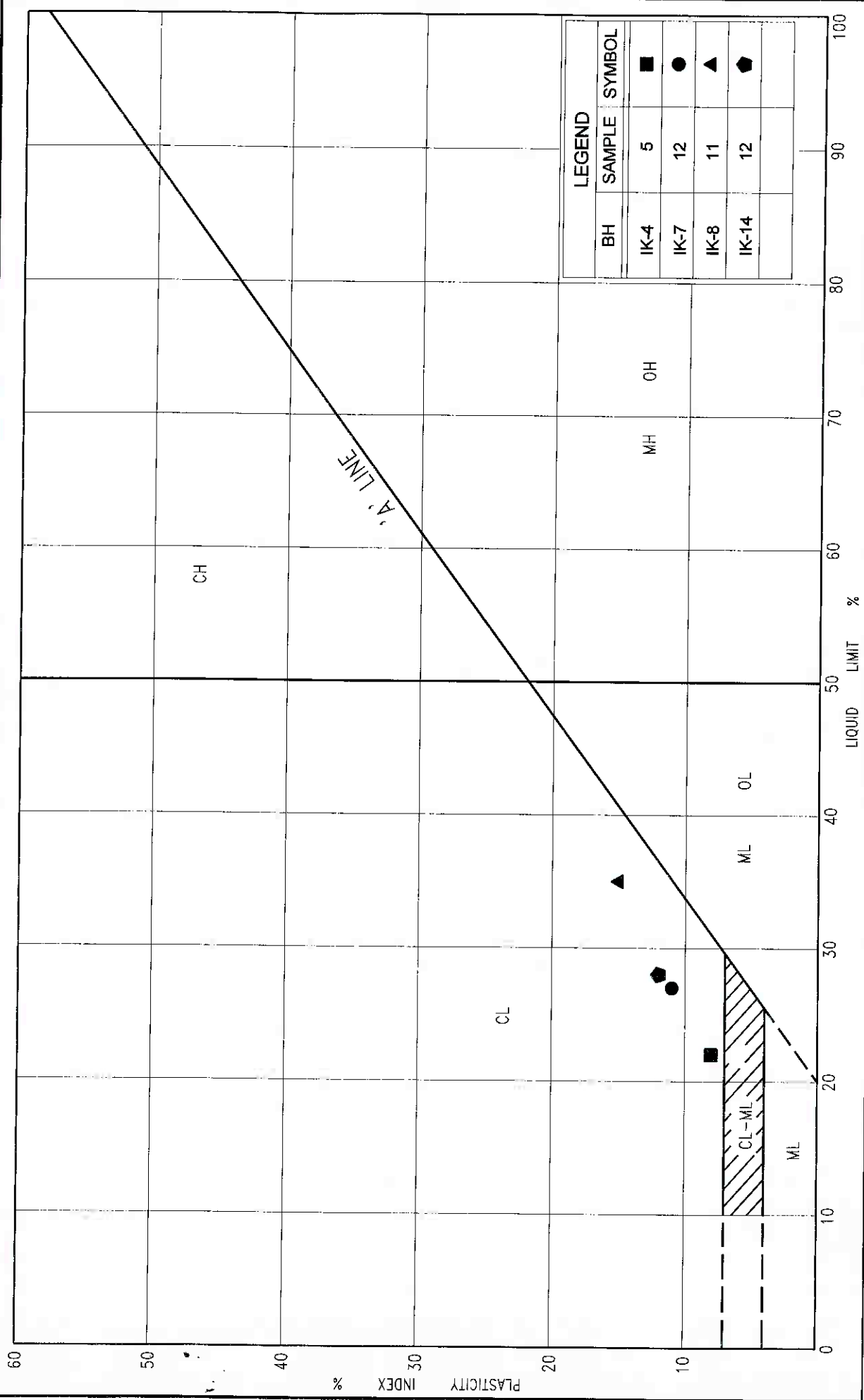




Figure No. IK-PC-1
Project No. 09TF014





Peto MacCallum Ltd.
CONSULTING ENGINEERS



PLASTICITY CHART

SILTY CLAY: silty clay, trace sand

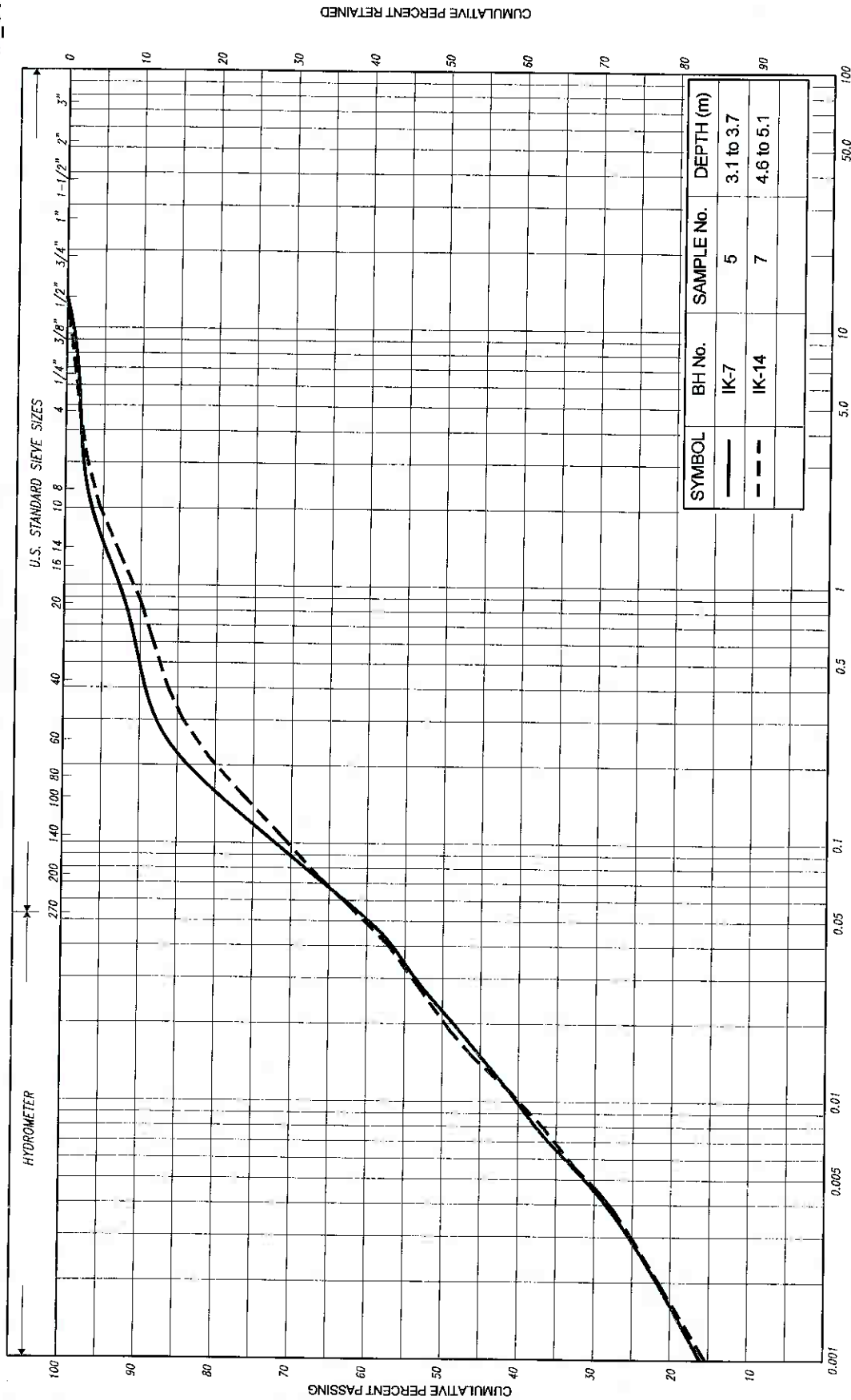
Figure No. **IK-PC-2**

Project No. **09TF014**



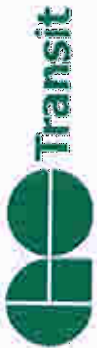
PROJECT NO. 09TF014
FIGURE NO. IK_GS-1

PARTICLE SIZE DISTRIBUTION CHART



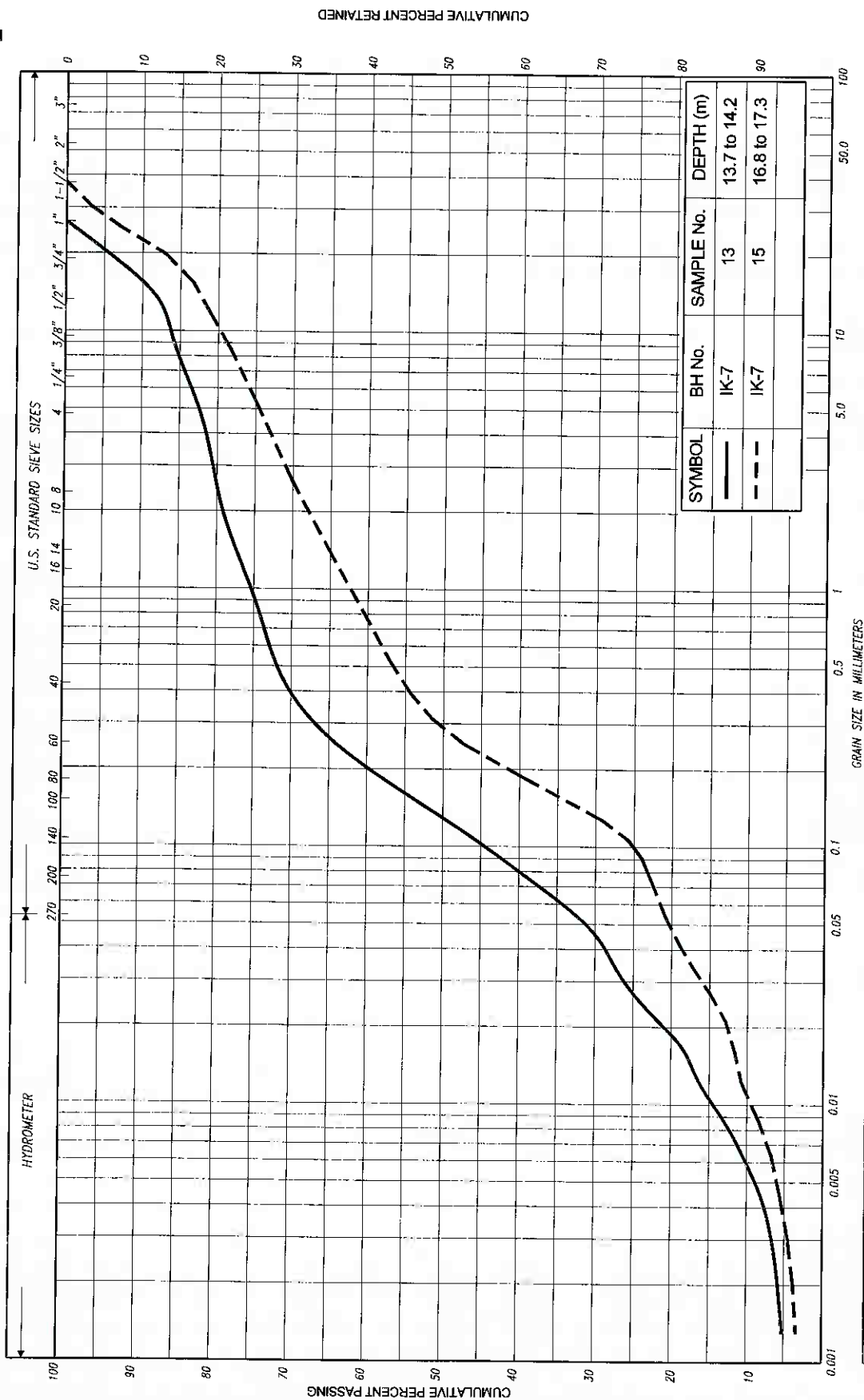
CLAY		FINE		COARSE		SILT & CLAY		FINE		MEDIUM		COARSE		GRAVEL		COBBLES		UNIFIED	
CLAY		FINE		COARSE		SILT		FINE		MEDIUM		COARSE		GRAVEL		COBBLES		M.I.T.	
CLAY		FINE		COARSE		SILT		FINE		MEDIUM		COARSE		GRAVEL		COBBLES		U.S. BUREAU	

REMARKS: CLAYEY SILT (TILL): Clayey silt sandy, trace gravel



PROJECT NO. 09TF014
FIGURE NO. IK_GS-3

PARTICLE SIZE DISTRIBUTION CHART

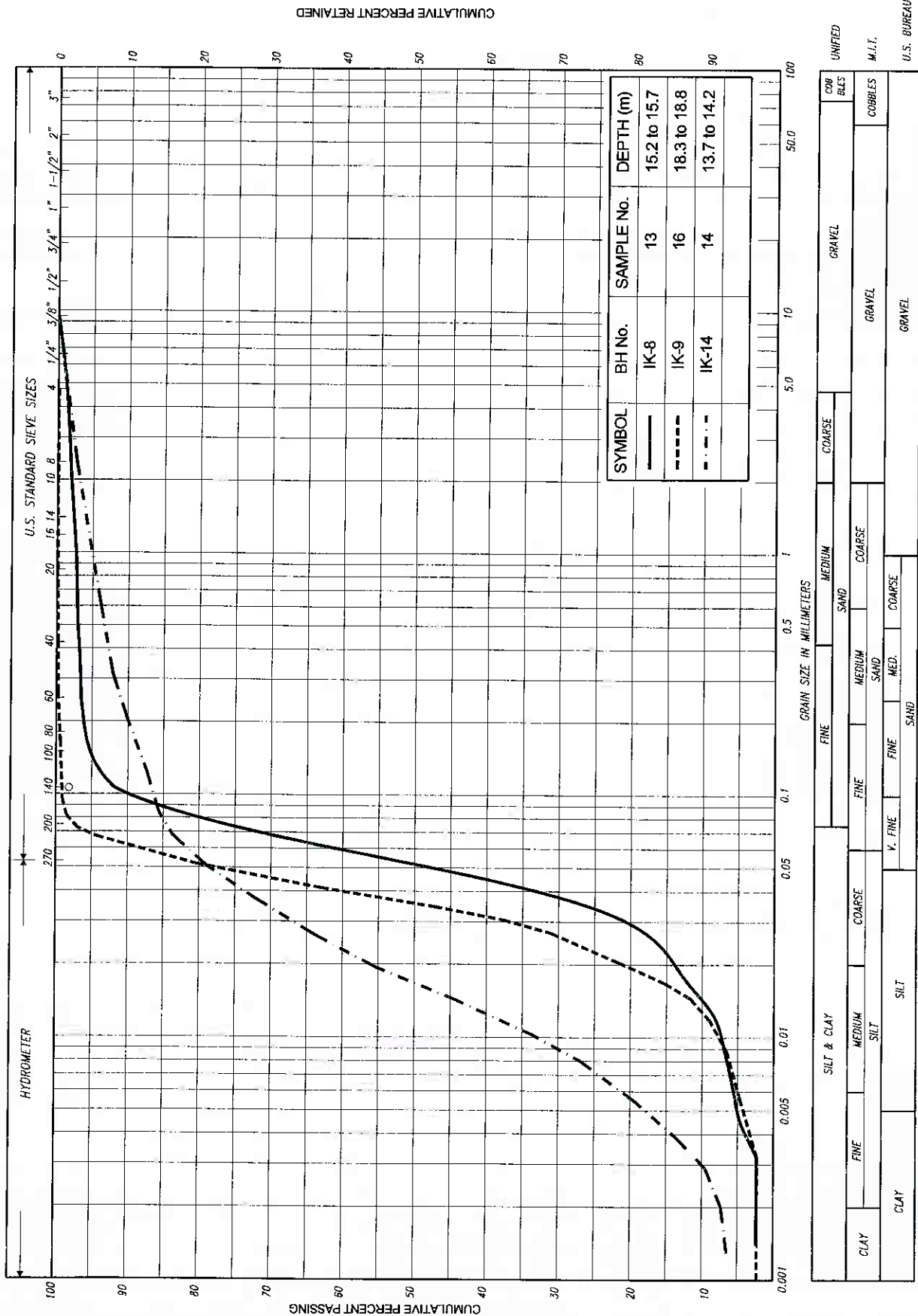


CLAY		SILT & CLAY		FINE		COARSE		MEDIUM SAND		COARSE		GRAVEL		COBBLES		UNIFIED	
CLAY		SILT		FINE		COARSE		FINE		MEDIUM		GRAVEL		COBBLES		U.I.T.	
CLAY		SILT		V. FINE		FINE		V. FINE		MEDIUM		GRAVEL		COBBLES		U.S. BUREAU	

REMARKS: SILTY SAND / GRAVELLY SAND (TILL):



PARTICLE SIZE DISTRIBUTION CHART



REMARKS: SILT (TILL): silt sandy to trace sand trace clay, trace gravel

UNCONFINED UNIAXIAL COMPRESSION TEST


CLIENT: Go Transit
PROJECT: Weston Rail Corridor
SAMPLE DESCRIPTION:

OUR REF.: 09TF014
DATE: 2009-08-17
TESTED BY: FP/BM
LAB. REF.: 37267E
DEPTH: 5.0-7.0'

SAMPLE IDENTIFICATION: BH: IK 3 SA: 3

CONDITION OF TEST SAMPLE: Recovery = 13 cm

SPECIMEN DIMENSIONS						CONSOLIDATION UNIT DETAILS		
DIAMETER	37.9	mm	AREA	1.131E-03	m ²	RING FACTOR		N/div
HEIGHT	118.7	mm	VOLUME	1.342E-04	m ³	RATE OF STRAIN	0.39	% /min
WEIGHT	310.2	gm	WET UNIT WEIGHT	2312	kg/m ³			

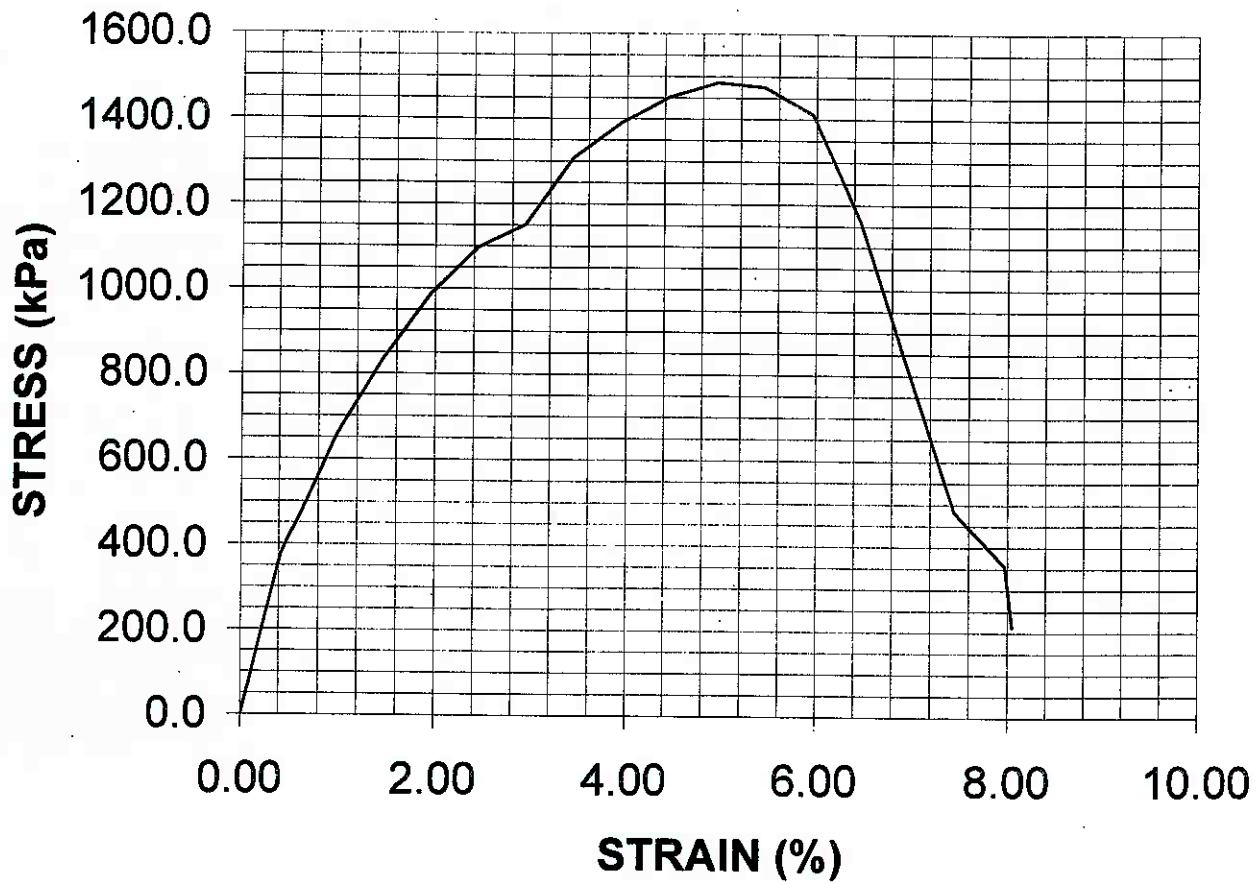
STRAIN DIAL RDG.	Time (sec)	STRAIN %	LOAD (N)	CORR'D AREA (m ²)	STRESS (kPa)	WATER CONTENT AND UNIT WEIGHT DETERMINATION		
0		0.00	0.0	1.131E-03	0.0		TRIMMINGS	SAMPLE AFTER TEST
N/A	90.0	0.42	427.0	1.138E-03	377.2			
N/A	180.0	0.99	751.0	1.145E-03	656.5	TARE NUMBER	DD	AB
N/A	255.1	1.47	960.0	1.150E-03	836.5	WT. TARE AND WET SOIL (gm)	76.04	424.6
N/A	330.2	1.95	1140.0	1.156E-03	986.5	WT. TARE AND WET SOIL (gm)	71.38	395.38
N/A	405.4	2.44	1274.0	1.162E-03	1096.4	WT. OF WATER (gm)	4.66	29.22
N/A	480.3	2.94	1345.0	1.168E-03	1151.5	WT. OF TARE (gm)	26.76	115.03
N/A	555.1	3.44	1538.0	1.174E-03	1308.8	WT. OF DRY SAMPLE (gm)	44.62	280.35
N/A	630.2	3.94	1610.0	1.180E-03	1390.6	WATER CONTENT (%)	10.4	10.4
N/A	705.4	4.45	1719.0	1.186E-03	1451.6	DRY UNIT WEIGHT OF SAMPLE	2094	kg/m ³
N/A	780.7	4.95	1769.0	1.192E-03	1485.4	FAILURE SKETCH	SAMPLE DESCRIPTION	
N/A	856.0	5.45	1774.0	1.199E-03	1475.0			
N/A	930.4	5.96	1704.0	1.205E-03	1411.4			
N/A	1005.7	6.47	1410.0	1.212E-03	1160.0			
N/A	1066.0	6.91	1049.0	1.218E-03	854.8			
N/A	1140.9	7.45	594.0	1.225E-03	482.7			
N/A	1215.8	7.97	439.0	1.232E-03	356.2			
N/A	1230.2	8.05	264.0	1.233E-03	213.4			
N/A	1230.2	8.05	264.0	1.233E-03	213.4			
						SPECIFIC GRAVITY	2.750	
						UNCON. COMP. STRENGTH	1485.4	kPa
						SHEAR STRESS	742.7	kPa
						STRAIN % AT FAILURE	5.45	
						SATURATION	91	%
						VOID RATIO	0.313	

UNCONFINED UNIAXIAL COMPRESSION TEST

CLIENT: Go Transit
PROJECT: Weston Rail Corridor

OUR REF.: 09TF014
DATE: 2009-08-17

SAMPLE IDENTIFICATION: BH: IK 3 SA: 3 **DEPTH:** 5.0-7.0'



UNCONFINED UNIAXIAL COMPRESSION TEST

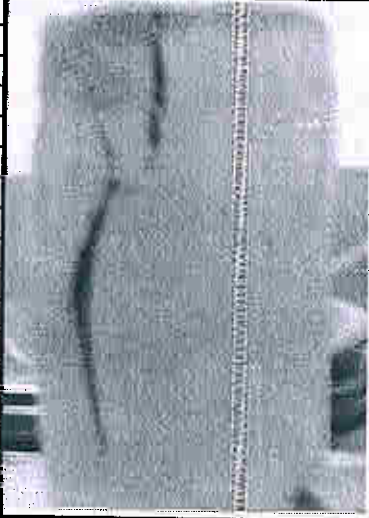
CLIENT: Go Transit
PROJECT: Weston Rail Corridor
SAMPLE DESCRIPTION:

OUR REF.: 09TF014
DATE: 2009-08-17
TESTED BY: FP/BM
LAB. REF.: 37283 A
DEPTH: 10.0-12.0'

SAMPLE IDENTIFICATION: BH: IK 4 SA: 5

CONDITION OF TEST SAMPLE: Recovery = 8 cm.

SPECIMEN DIMENSIONS						CONSOLIDATION UNIT DETAILS		
DIAMETER	35.5	mm	AREA	9.870E-04	m ²	RING FACTOR		N/div
HEIGHT	76.1	mm	VOLUME	7.507E-05	m ³	RATE OF STRAIN	0.36	%/min
WEIGHT	172.3	gm	WET UNIT WEIGHT	2295	kg/m ³			

STRAIN DIAL RDG.	Time (sec)	STRAIN %	LOAD (N)	CORR'D AREA (m ²)	STRESS (kPa)	WATER CONTENT AND UNIT WEIGHT DETERMINATION				
0		0.00	0.0	9.870E-04	0.0					
N/A	105.1	0.42	217.0	9.910E-04	219.6		TRIMMINGS	SAMPLE AFTER TEST		
N/A	195.0	0.93	298.0	9.960E-04	300.3	TARE NUMBER	11			
N/A	285.1	1.49	354.0	1.002E-03	353.7	WT. TARE AND WET SOIL (gm)	38.90	379.09		
N/A	360.1	1.95	389.0	1.007E-03	382.0	WT. TARE AND WET SOIL (gm)	37.15	363.62		
N/A	435.1	2.41	435.0	1.011E-03	429.5	WT. OF WATER (gm)	1.75	15.47		
N/A	525.1	2.97	469.0	1.017E-03	461.9	WT. OF TARE (gm)	16.53	207.13		
N/A	600.1	3.44	496.0	1.022E-03	484.8	WT. OF DRY SAMPLE (gm)	20.62	156.49		
N/A	675.2	3.92	515.0	1.027E-03	502.6	WATER CONTENT (%)	8.5	9.9		
N/A	765.3	4.47	517.0	1.033E-03	501.1	DRY UNIT WEIGHT OF SAMPLE	2115	kg/m ³		
N/A	841.0	4.96	507.0	1.038E-03	488.1	FAILURE SKETCH	SAMPLE DESCRIPTION			
N/A	915.2	5.43	494.0	1.044E-03	473.4					
N/A	990.4	5.91	489.0	1.049E-03	465.4					
N/A	1080.9	6.48	483.0	1.055E-03	456.9					
N/A	1155.1	6.95	471.0	1.061E-03	448.6					
N/A	1170.6	7.05	468.0	1.062E-03	440.2					
N/A	1170.6	7.05	468.0	1.062E-03	440.2					
						SPECIFIC GRAVITY	2.750			
						UNCON. COMP. STRENGTH	502.6	kPa		
						SHEAR STRESS	251.3	kPa		
						STRAIN % AT FAILURE	3.92			
						SATURATION	91	%		
						VOID RATIO	0.300			

UNCONFINED UNIAXIAL COMPRESSION TEST

CLIENT:
PROJECT:

Go Transit
Weston Rail Corridor

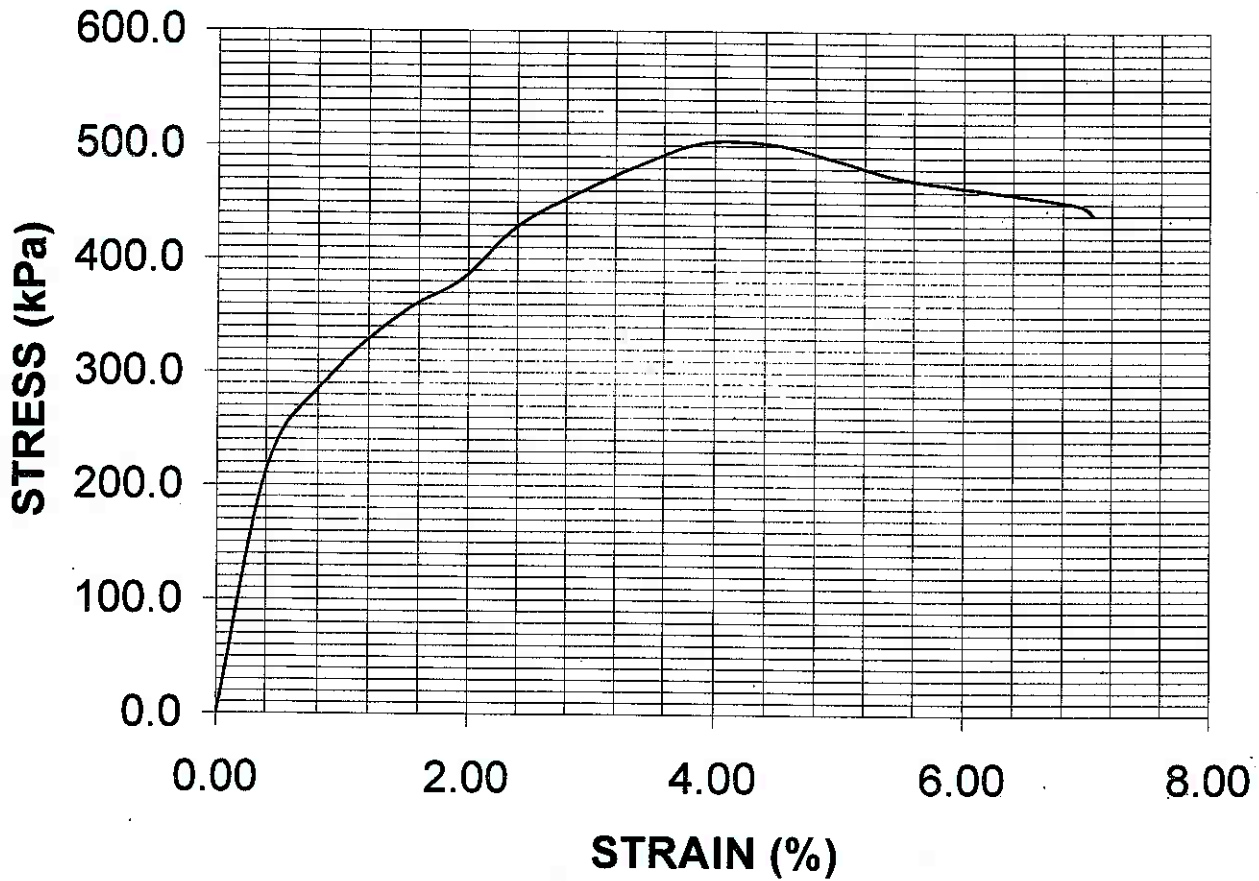
OUR REF.: 09TF014
DATE: 2009-08-17

SAMPLE IDENTIFICATION:

BH: IK 4

SA: 5

DEPTH: 10.0-12.0'



UNCONFINED UNIAXIAL COMPRESSION TEST


CLIENT: Go Transit
PROJECT: Weston Rail Corridor
SAMPLE DESCRIPTION:

OUR REF.: 09TF014
DATE: 2009-08-17
TESTED BY: FP/BM
LAB. REF.: 37284 F
DEPTH: 25.0-26.5'

SAMPLE IDENTIFICATION: BH: IK 8 SA: 8

CONDITION OF TEST SAMPLE: Recovery = 8.4 cm.

SPECIMEN DIMENSIONS						CONSOLIDATION UNIT DETAILS		
DIAMETER	37.2	mm	AREA	1.087E-03	m ²	RING FACTOR		N/div
HEIGHT	80.1	mm	VOLUME	8.707E-05	m ³	RATE OF STRAIN	0.36	%/min
WEIGHT	205.3	gm	WET UNIT WEIGHT	2358	kg/m ³			

STRAIN DIAL RDG.	Time (sec)	STRAIN %	LOAD (N)	CORR'D AREA (m ²)	STRESS (kPa)	WATER CONTENT AND UNIT WEIGHT DETERMINATION		
0		0.00	0.0	1.087E-03	0.0			
N/A	90.1	0.50	46.0	1.093E-03	41.8		TRIMMINGS	SAMPLE AFTER TEST
N/A	165.1	0.95	66.0	1.098E-03	60.4	TARE NUMBER	27	GEO62
N/A	255.1	1.50	92.0	1.104E-03	83.8	WT. TARE AND WET SOIL (gm)	44.22	312.97
N/A	330.1	1.96	115.0	1.109E-03	103.9	WT. TARE AND WET SOIL (gm)	42.01	294.9
N/A	420.1	2.50	144.0	1.115E-03	129.0	WT. OF WATER (gm)	2.21	18.07
N/A	495.0	2.95	168.0	1.120E-03	150.0	WT. OF TARE (gm)	16.68	107.92
N/A	585.1	3.48	196.0	1.127E-03	174.1	WT. OF DRY SAMPLE (gm)	25.33	186.98
N/A	660.1	3.93	219.0	1.132E-03	193.4	WATER CONTENT (%)	8.7	9.7
N/A	750.1	4.46	245.0	1.138E-03	214.8	DRY UNIT WEIGHT OF SAMPLE	2169	kg/m ³
N/A	840.8	5.00	270.0	1.145E-03	236.5	FAILURE SKETCH	SAMPLE DESCRIPTION	
N/A	915.0	5.44	291.0	1.150E-03	253.0			
N/A	1005.7	5.98	317.0	1.157E-03	273.7			
N/A	1080.0	6.43	335.0	1.162E-03	288.1			
N/A	1171.0	6.97	358.0	1.169E-03	305.9			
N/A	1260.9	7.50	381.0	1.176E-03	323.9			
N/A	1335.4	7.93	397.0	1.181E-03	336.5			
N/A	1425.8	8.47	414.0	1.188E-03	348.3			
N/A	1515.7	8.99	434.0	1.195E-03	362.4			
N/A	1590.9	9.44	449.0	1.201E-03	373.8			
N/A	1680.7	9.98	465.0	1.208E-03	385.5			
N/A	1756.0	10.43	478.0	1.214E-03	393.7			
N/A	1845.8	10.97	492.0	1.221E-03	402.6			
N/A	2010.7	11.97	513.0	1.235E-03	415.7			
N/A	2175.4	12.96	535.0	1.249E-03	428.4			
N/A	2355.0	14.00	563.0	1.264E-03	445.5			
N/A	2520.6	15.00	554.0	1.279E-03	433.0			
N/A	2670.8	15.92	500.0	1.293E-03	386.4			
						SPECIFIC GRAVITY	2.750	
						UNCON. COMP. ST RENGTH	445.5	kPa
						SHEAR STRESS	222.7	kPa
						STRAIN % AT FAILURE	14.00	
						SATURATION	99	%
						VOID RATIO	0.268	

UNCONFINED UNIAXIAL COMPRESSION TEST

CLIENT:
PROJECT:

Go Transit
Weston Rail Corridor

OUR REF.: 09TF014
DATE: 2009-08-17

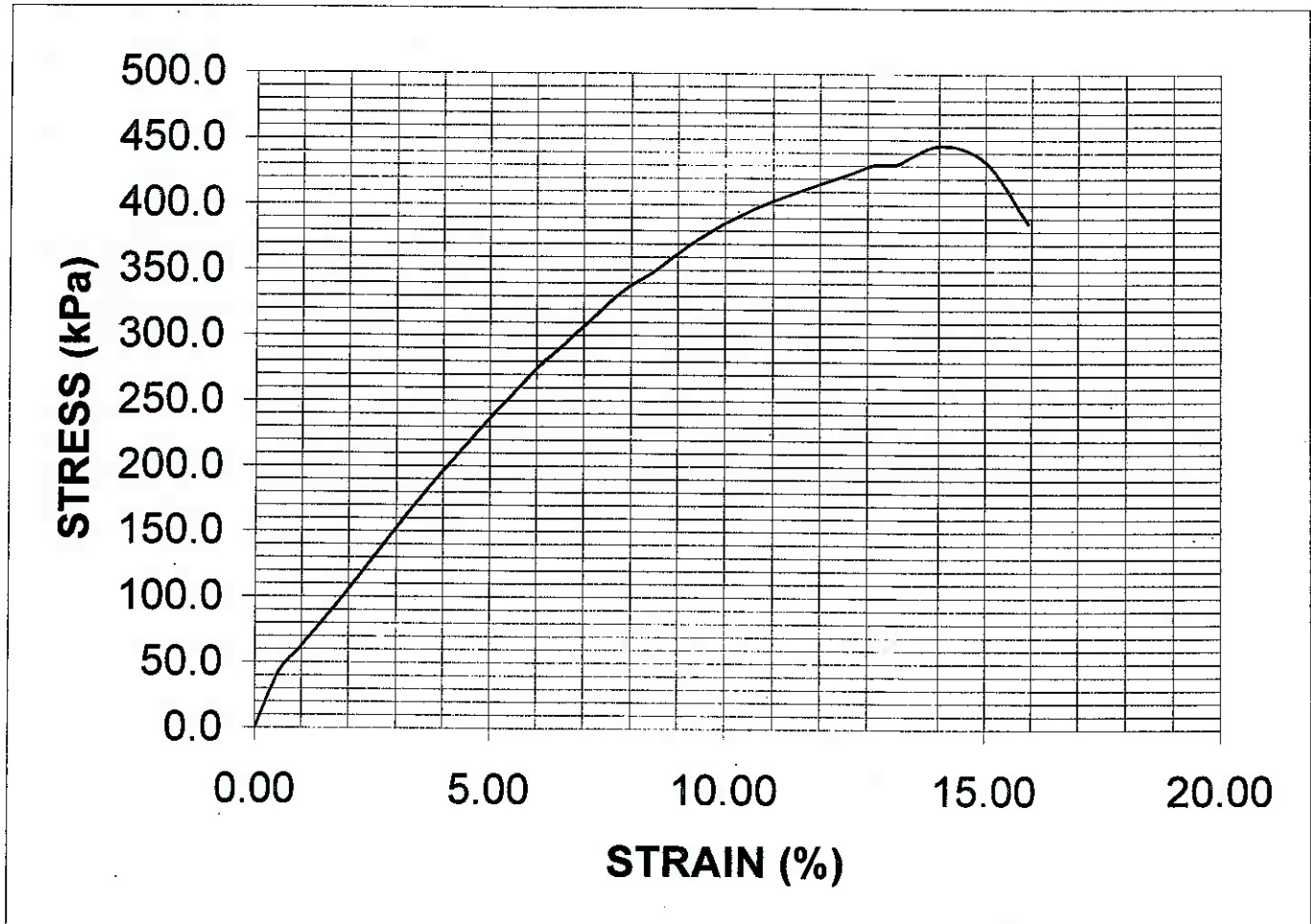
SAMPLE IDENTIFICATION:

BH: 1K 8

SA: 8

DEPTH: 25.0-26.5'

el





AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL 905-712-5100
FAX 905-712-5122
www.agatlabs.com

R E C E I V E D

AUG 27 2009

PETO MacCALLUM LTD.

**CLIENT NAME: PETO MACCALLUM LIMITED
165 CARTWRIGHT AVENUE
TORONTO, ON M6A1V5**

ATTENTION TO: Mahaboob Alam

PROJECT NO: 09TF014

AGAT WORK ORDER: 09T347610

**SOIL ANALYSIS REVIEWED BY: Elizabeth Polakowska, MSc (Animal Sci), PhD (Agri Sci), Inorganic Lab
Supervisor**

TRACE ORGANICS REVIEWED BY: Inga Kuzmina, Analytical Chemist

DATE REPORTED: Aug 11, 2009

PAGES (INCLUDING COVER): 12

Should you require any information regarding this analysis please contact your client services representative at (905) 712 5100, or at 1-800-856-6261

NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories (V1)

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of Alberta (APEGGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Page 1 of 12

Results relate only to the items tested



Certificate of Analysis

AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
L4Z 1Y2

TEL: (905) 712-5100
FAX: (905) 712-5122
www.agatlabs.com

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

O. Reg. 153 Metals & Inorganics in Soil									
DATE SAMPLED: Jul 31, 2009	DATE RECEIVED: Aug 04, 2009	DATE REPORTED: Aug 11, 2009	SAMPLE TYPE: Soil						
Parameter	Unit	G/S	RDL	BH 2 SS 2 1415625	BH 7 SS 2 1415627	BH 8 SS 2 1415639	BH 9 SS 2 1415640	BH 11 SS 2 1415643	BH 12 SS 2 1415645
Arsimony	µg/g	13	1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
Arsenic	µg/g	20	0.6	4.2	3.6	7.6	0.9	2.3	3.1
Barium	µg/g	750	0.3	147	62.9	23.1	11.1	157	65.5
Beryllium	µg/g	1.2	0.4	1.2	0.6	<0.4	<0.4	2.4	0.5
Boron (Hot Water Extractable)	µg/g	1.5	0.10	0.74	0.74	0.47	0.15	14.7	0.17
Cadmium	µg/g	12	0.4	0.5	<0.4	0.5	<0.4	0.5	<0.4
Chromium	µg/g	750	0.6	32.9	12.8	4.3	1.1	10.2	15.0
Cobalt	µg/g	40	0.3	10.6	7.5	3.9	1.7	3.9	9.3
Copper	µg/g	225	0.3	41.8	36.5	15.1	5.3	54.8	21.7
Lead	µg/g	200	0.5	18.3	14.6	62.5	3.0	16.6	8.9
Molybdenum	µg/g	40	0.5	<0.5	0.7	1.0	<0.5	<0.5	<0.5
Nickel	µg/g	150	0.6	32.8	19.7	13.5	5.3	12.9	22.3
Selenium	µg/g	10	0.8	<0.8	<0.8	<0.8	<0.8	1.3	<0.8
Silver	µg/g	20	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Thallium	µg/g	4.1	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Vanadium	µg/g	200	0.4	42.8	20.4	8.0	4.9	12.6	20.7
Zinc	µg/g	600	0.4	102	52.8	102	12.4	109	42.4
Chromium, Hexavalent	µg/g	8	0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Cyanide, Free	µg/g	100	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Mercury	µg/g	10	0.011	0.125	0.042	0.013	<0.011	0.011	0.014
Electrical Conductivity (2:1)	mS/cm	0.7	0.002	0.877	1.21	0.305	0.077	1.00	0.237
Sodium Adsorption Ratio (2:1)	N/A	5.0	N/A	6.08	11.0	0.413	0.178	0.546	0.184
pH, 2:1 CaCl2 Extraction	N/A		N/A	7.09	7.77	8.23	8.12	10.3	8.02

Comments: RDL - Reported Detection Limit; G/S - Guideline / Standard; Refers to T2(RPI)

1415625-1415645 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

Elizabeth Polakowska



Certificate of Analysis

AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
L4Z 1Y2

TEL: (905) 712-5100
FAX: (905) 712-5122
www.agatlabs.com

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

O. Reg. 153 - Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil

DATE SAMPLED: Jul 31, 2009	DATE RECEIVED: Aug 04, 2009	DATE REPORTED: Aug 11, 2009	SAMPLE TYPE: Soil			
Parameter	Unit	G / S	RDL	BH 2 SS 3 1415626	BH 7 SS 2 1415627	BH 9 SS 6 1415641
Benzene	µg/g	0.24	0.10	<0.10	<0.10	<0.10
Toluene	µg/g	2.1	0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	0.28	0.05	<0.05	<0.05	<0.05
Xylenes (Total)	µg/g	25	0.07	<0.07	<0.07	<0.07
C6 - C10 (F1)	µg/g		5	<5	<5	<5
C6 - C10 (F1 minus BTEX)	µg/g	30	5	<5	<5	<5
C>10 - C16 (F2)	µg/g	150	10	<10	<10	<10
C>16 - C34 (F3)	µg/g	400	50	<50	<50	<50
C>34 - C50 (F4)	µg/g	2800	50	<50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	2800	50	NA	NA	NA
Moisture Content	%		0.1	19.6	13.0	13.5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to T2(RPI)

1415626-1415641

Results are based on sample dry weight.

The C6-C10 fraction is calculated using toluene response factor.

The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.

Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.

Total C6 - C50 results are corrected for BTEX contributions.

This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.

nC6 and nC10 response factors are within 30% of Toluene response factor.

nC10, nC16 and nC34 response factors are within 10% of their average.

C50 response factor is within 70% of nC10 + nC16 + nC34 average.

Linearity is within 15%.

Extraction and holding times were met for this sample.

Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Quality Control Data is available upon request.

Certified By: 



AGAT[®] Laboratories

Certificate of Analysis

AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
L4Z 1Y2

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FAX: (905) 712-5122
www.agatlabs.com

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

O. Reg. 153 - Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil (PAHs Incl.)

DATE SAMPLED: Jul 31, 2009	DATE RECEIVED: Aug 04, 2009	DATE REPORTED: Aug 11, 2009	SAMPLE TYPE: Soil			
Parameter	Unit	G / S	RDL	BH 8 SS 2 1415639	BH 11 SS 2 1415643	BH 12 SS 2 1415645
Benzene	µg/g	0.24	0.10	<0.10	<0.10	<0.10
Toluene	µg/g	2.1	0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	0.28	0.05	<0.05	<0.05	<0.05
Xylenes (Total)	µg/g	25	0.07	<0.07	<0.07	<0.07
C6 - C10 (F1)	µg/g		5	<5	<5	<5
C6 - C10 (F1 minus BTEX)	µg/g	30	5	<5	<5	<5
C>10 - C16 (F2)	µg/g	150	10	<10	<10	<10
C>10 - C16 (F2 minus Naphthalene)	µg/g	150	10	<10	<10	<10
C>16 - C34 (F3)	µg/g	400	50	58	<50	<50
C>16 - C34 (F3 minus PAHs)	µg/g	400	50	58	<50	<50
C>34 - C50 (F4)	µg/g	2800	50	160	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	2800	50	NA	NA	NA
Moisture Content	%		0.1	3.2	16.2	11.0

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to T2(RPI)

1415639-1415645

Results are based on sample dry weight.

The C6-C10 fraction is calculated using toluene response factor.

The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.

Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.

Total C6 - C50 results are corrected for BTEX and PAH contributions.

This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.

nC6 and nC10 response factors are within 30% of Toluene response factor.

nC10, nC16 and nC34 response factors are within 10% of their average.

C50 response factor is within 70% of nC10 + nC16 + nC34 average.

Linearity is within 15%.

Extraction and holding times were met for this sample.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

O. Reg. 153 PAHs in Soil									
DATE SAMPLED: Jul 31, 2009	DATE RECEIVED: Aug 04, 2009	DATE REPORTED: Aug 11, 2009	SAMPLE TYPE: Soil						
Parameter	Unit	G/S	RDL	BH 2 SS 2 1415625	BH 7 SS 4 1415635	BH 8 SS 2 1415639	BH 9 SS 2 1415640	BH 11 SS 2 1415643	BH 12 SS 2 1415645
Naphthalene	µg/g	4.6	0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03
Acenaphthylene	µg/g	100	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	µg/g	15	0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Fluorene	µg/g	340	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Phenanthrene	µg/g	40	0.02	<0.02	<0.02	0.03	0.02	<0.02	<0.02
Anthracene	µg/g	28	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluoranthene	µg/g	40	0.02	<0.02	<0.02	0.04	0.03	<0.02	<0.02
Pyrene	µg/g	250	0.02	<0.02	<0.02	0.03	0.02	<0.02	<0.02
Benzo(a)anthracene	µg/g	6.6	0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
Chrysene	µg/g	12	0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
Benzo(b)fluoranthene	µg/g	12	0.02	<0.02	<0.02	0.03	0.03	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	12	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(a)pyrene	µg/g	1.2	0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
Indeno(1,2,3-cd)pyrene	µg/g	12	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dibenzo(a,h)anthracene	µg/g	1.2	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(g,h,i)perylene	µg/g	40	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

Certified By:



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AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

O. Reg. 153 PAHs in Soil

DATE SAMPLED: Jul 31, 2009	DATE RECEIVED: Aug 04, 2009	DATE REPORTED: Aug 11, 2009	SAMPLE TYPE: Soil
Comments:			
1415625	RDL - Reported Detection Limit: G / S - Guideline / Standard: Refers to T2(RPI)		
	Results are based on the dry weight of the soil.		
	Surrogate Recovery of Chrysene-d12: 85 %.		
	Percent moisture: 28.6%.		
1415635	Results are based on the dry weight of the soil.		
	Surrogate Recovery of Chrysene-d12: 81 %.		
	Percent moisture: 11.7 %.		
1415639	Results are based on the dry weight of the soil.		
	Surrogate Recovery of Chrysene-d12: 85 %.		
	Percent moisture: 3.2%.		
1415640	Results are based on the dry weight of the soil.		
	Surrogate Recovery of Chrysene-d12: 82%.		
	Percent moisture: 7.6%.		
1415643	Results are based on the dry weight of the soil.		
	Surrogate Recovery of Chrysene-d12: 86%.		
	Percent moisture: 16.2%.		
1415645	Results are based on the dry weight of the soil.		
	Surrogate Recovery of Chrysene-d12: 83%.		
	Percent moisture: 11.0%.		

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AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

PCBs (soil)

DATE SAMPLED: Jul 31, 2009	DATE RECEIVED: Aug 04, 2009	DATE REPORTED: Aug 11, 2009	SAMPLE TYPE: Soil
Parameter	Unit	G / S	
PCBs	µg/g	5.0	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to T2(RPI)

1415626 Results are based on the dry weight of soil extracted.
Decachlorobiphenyl surrogate recovery: 103 %.

1415635 Results are based on the dry weight of soil extracted.
Decachlorobiphenyl surrogate recovery: 104 %.
Percent moisture= 12 %.

1415639 Results are based on the dry weight of soil extracted.
Decachlorobiphenyl surrogate recovery: 103 %.

1415640 Results are based on the dry weight of soil extracted.
Decachlorobiphenyl surrogate recovery: 92 %.

1415643 Results are based on the dry weight of soil extracted.
Decachlorobiphenyl surrogate recovery: 91 %.

1415645 Results are based on the dry weight of soil extracted.
Decachlorobiphenyl surrogate recovery: 98 %.

DATE RECEIVED: Aug 04, 2009

DATE REPORTED: Aug 11, 2009

SAMPLE TYPE: Soil

BH 2 SS 3

BH 7 SS 4

BH 8 SS 2

BH 9 SS 2

BH 11 SS 2

BH 12 SS 2

1415626

1415635

1415639

1415640

1415643

<0.05

<0.05

<0.05

<0.05

<0.05

<0.05

<0.05

<0.05

<0.05

<0.05

Certified By:



Guideline Violation

AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

5835 COOPERS AVENUE
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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
1415625	BH 2 SS 2	T2(RPI)	O. Reg. 153 Metals & Inorganics in Soil	Electrical Conductivity (2:1)	0.7	0.877
1415625	BH 2 SS 2	T2(RPI)	O. Reg. 153 Metals & Inorganics in Soil	Sodium Adsorption Ratio (2:1)	5.0	6.08
1415627	BH 7 SS 2	T2(RPI)	O. Reg. 153 Metals & Inorganics in Soil	Electrical Conductivity (2:1)	0.7	1.21
1415627	BH 7 SS 2	T2(RPI)	O. Reg. 153 Metals & Inorganics in Soil	Sodium Adsorption Ratio (2:1)	5.0	11.0
1415643	BH 11 SS 2	T2(RPI)	O. Reg. 153 Metals & Inorganics in Soil	Beryllium	1.2	2.4
1415643	BH 11 SS 2	T2(RPI)	O. Reg. 153 Metals & Inorganics in Soil	Boron (Hot Water Extractable)	1.5	14.7
1415643	BH 11 SS 2	T2(RPI)	O. Reg. 153 Metals & Inorganics in Soil	Electrical Conductivity (2:1)	0.7	1.00



Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

ATTENTION TO: Mahaboob Alam

Soil Analysis

RPT Date: Aug 11, 2009

RPT Date: Aug 11, 2009			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE				
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measure d Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

O. Reg. 153 Metals & Inorganics in Soil

Antimony (µg/g)	1	1415640	< 1.6	< 1.6	0.0%	< 1.6	112%	80%	120%	92%	80%	120%	92%	70%	130%
Arsenic (µg/g)	1	1415640	0.9	0.9	0.0%	< 0.6	100%	90%	110%	104%	90%	110%	104%	70%	130%
Barium (µg/g)	1	1415640	11.1	10.0	10.4%	< 0.3	98%	90%	110%	100%	90%	110%	102%	70%	130%
Beryllium (µg/g)	1	1415640	< 0.4	< 0.4	0.0%	< 0.4	103%	90%	110%	103%	90%	110%	97%	70%	130%
Boron (Hot Water Extractable) (µg/g)	1	1415645	0.17	0.16	6.1%	< 0.10	100%	80%	110%	106%	90%	110%	109%	80%	120%
Cadmium (µg/g)	1	1415640	< 0.4	< 0.4	0.0%	< 0.4	108%	90%	110%	99%	90%	110%	90%	70%	130%
Chromium (µg/g)	1	1415640	1.1	1.1	0.0%	< 0.6	99%	90%	110%	106%	90%	110%	104%	70%	130%
Cobalt (µg/g)	1	1415640	1.7	1.8	5.7%	< 0.3	109%	90%	110%	104%	90%	110%	95%	70%	130%
Copper (µg/g)	1	1415640	5.3	5.9	10.7%	< 0.3	103%	90%	110%	115%	80%	120%	101%	70%	130%
Lead (µg/g)	1	1415640	3.0	3.0	0.0%	< 0.5	106%	90%	110%	103%	90%	110%	104%	70%	130%
Molybdenum (µg/g)	1	1415640	< 0.5	< 0.5	0.0%	< 0.5	94%	90%	110%	105%	90%	110%	110%	70%	130%
Nickel (µg/g)	1	1415640	5.3	5.5	3.7%	< 0.6	102%	90%	110%	104%	90%	110%	97%	70%	130%
Selenium (µg/g)	1	1415640	< 0.8	< 0.8	0.0%	< 0.8	102%	90%	110%	102%	90%	110%	99%	70%	130%
Silver (µg/g)	1	1415640	< 0.4	< 0.4	0.0%	< 0.4	108%	90%	110%	112%	80%	120%	111%	70%	130%
Thallium (µg/g)	1	1415640	< 0.4	< 0.4	0.0%	< 0.4	99%	90%	110%	94%	90%	110%	101%	70%	130%
Vanadium (µg/g)	1	1415640	4.9	4.8	2.1%	< 0.4	97%	90%	110%	110%	90%	110%	102%	70%	130%
Zinc (µg/g)	1	1415640	12.4	12.2	1.6%	< 0.4	99%	90%	110%	108%	80%	120%	100%	70%	130%
Chromium, Hexavalent (µg/g)	1		< 0.40	< 0.40	0.0%	< 0.40	97%	90%	110%	100%	90%	110%	99%	90%	110%
Cyanide, Free (µg/g)	1	1415625	< 1.0	< 1.0	0.0%	< 1.0	98%	90%	110%	100%	90%	110%	98%	90%	110%
Mercury (µg/g)	1	1415625	0.125	0.125	0.0%	< 0.011	100%	90%	110%	105%	90%	110%	102%	70%	130%
Electrical Conductivity (2:1) (mS/cm)	1	1415639	0.305	0.303	0.7%	< 0.002	98%	90%	110%						
Sodium Adsorption Ratio (2:1) (N/A)	1	1415639	0.413	0.401	2.9%	N/A									
pH, 2:1 CaCl2 Extraction (N/A)	1	1415645	8.02	8.04	0.2%	N/A	100%	90%	110%						

Certified By:

Elizabeth Polakowska

AGAT QUALITY ASSURANCE REPORT (V1)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Analytical Laboratories (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Analytical Laboratories (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.



Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

ATTENTION TO: Mahaboob Alam

Trace Organics Analysis

RPT Date: Aug 11, 2009			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measure d Value	Acceptable Limits	Recovery	Acceptable Limits	Recovery	Acceptable Limits
								Lower		Upper		Lower

O. Reg. 153 PAHs in Soil

Naphthalene (µg/g)	1		< 0.03	< 0.03	0.0%	< 0.03	98%	60%	140%	93%	60%	140%	89%	60%	140%
Acenaphthylene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	102%	60%	140%	88%	60%	140%	85%	60%	140%
Acenaphthene (µg/g)	1		< 0.03	< 0.03	0.0%	< 0.03	101%	60%	140%	92%	60%	140%	90%	60%	140%
Fluorene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	106%	60%	140%	94%	60%	140%	94%	60%	140%
Phenanthrene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	102%	60%	140%	90%	60%	140%	92%	60%	140%
Anthracene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	104%	60%	140%	90%	60%	140%	93%	60%	140%
Fluoranthene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	94%	60%	140%	79%	60%	140%	81%	60%	140%
Pyrene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	94%	60%	140%	80%	60%	140%	79%	60%	140%
Benzo(a)anthracene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	108%	60%	140%	82%	60%	140%	81%	60%	140%
Chrysene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	103%	60%	140%	77%	60%	140%	78%	60%	140%
Benzo(b)fluoranthene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	105%	60%	140%	84%	60%	140%	96%	60%	140%
Benzo(k)fluoranthene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	104%	60%	140%	84%	60%	140%	95%	60%	140%
Benzo(a)pyrene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	103%	60%	140%	89%	60%	140%	89%	60%	140%
Indeno(1,2,3-cd)pyrene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	101%	60%	140%	85%	60%	140%	77%	60%	140%
Dibenzo(a,h)anthracene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	98%	60%	140%	85%	60%	140%	93%	60%	140%
Benzo(g,h,i)perylene (µg/g)	1		< 0.02	< 0.02	0.0%	< 0.02	99%	60%	140%	89%	60%	140%	81%	60%	140%

O. Reg. 153 - Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil

Benzene (µg/g)	1	1415645	< 0.10	< 0.10	0.0%	< 0.10	108%	70%	140%	101%	70%	140%	94%	70%	140%
Toluene (µg/g)	1	1415645	< 0.08	< 0.08	0.0%	< 0.08	104%	70%	140%	96%	70%	140%	87%	70%	140%
Ethylbenzene (µg/g)	1	1415645	< 0.05	< 0.05	0.0%	< 0.05	103%	70%	140%	99%	70%	140%	92%	70%	140%
Xylenes (Total) (µg/g)	1	1415645	< 0.07	< 0.07	0.0%	< 0.07	104%	70%	140%	99%	70%	140%	93%	70%	140%
C6 - C10 (F1) (µg/g)	1	1415645	< 5	< 5	0.0%	< 5	75%	70%	140%	72%	70%	140%	71%	70%	140%
C>10 - C16 (F2) (µg/g)	1	1415645	< 10	< 10	0.0%	< 10	104%	70%	130%	97%	70%	130%	107%	70%	130%
C>16 - C34 (F3) (µg/g)	1	1415645	< 50	< 50	0.0%	< 50	103%	70%	130%	114%	70%	130%	104%	70%	130%
C>34 - C50 (F4) (µg/g)	1	1415645	< 50	< 50	0.0%	< 50	102%	70%	130%	97%	70%	130%	99%	70%	130%

PCBs (soil)

PCBs (µg/g)	1		< 0.05	< 0.05	0.0%	< 0.05	100%	60%	140%	103%	60%	140%	103%	60%	140%
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Certified By:

AGAT QUALITY ASSURANCE REPORT (V1)

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Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

ATTENTION TO: Mahaboob Alam

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Extractable)	MET 1004	EPA SW 846 6010C, MSA Part 3, Ch.21	ICP/OES
Cadmium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Chromium, Hexavalent	INOR 1029	SM 3500 B; MSA Part 3, Ch.25	SPECTROPHOTOMETER
Cyanide, Free	INOR 1052	MOE CN-3015 & E 3009 A; SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET 1001	EPA SW-846 7471A, 245.5	CVAAS
Electrical Conductivity (2:1)	INOR 1036	McKeague 4.12 & SM 2510 B	EC METER
Sodium Adsorption Ratio (2:1)	INOR 1007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR 93-6031	MSA part 3 & SM 4500-H+ B	pH METER



Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 09T347610

PROJECT NO: 09TF014

ATTENTION TO: Mahaboob Alam

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylenes (Total)	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
C6 - C10 (F1)	VOL - 5009	CCME Tier 1 Method	GC / FID
C6 - C10 (F1 minus BTEX)	VOL - 5009	CCME Tier 1 Method	GC / FID
C>10 - C16 (F2)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>16 - C34 (F3)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>34 - C50 (F4)	VOL - 5012	CCME Tier 1 Method	GC / FID
Gravimetric Heavy Hydrocarbons	VOL - 5012	CCME Tier 1 Method	GRAVIMETRIC ANALYSIS
Moisture Content	VOL - 5009	CCME Tier 1 Method	GRAVIMETRIC
Benzene	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylenes (Total)	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
C6 - C10 (F1)	VOL - 5009	CCME Tier 1 Method	GC / FID
C6 - C10 (F1 minus BTEX)	VOL - 5009	CCME Tier 1 Method	GC / FID
C>10 - C16 (F2)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>10 - C16 (F2 minus Naphthalene)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>16 - C34 (F3)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>16 - C34 (F3 minus PAHs)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>34 - C50 (F4)	VOL - 5012	CCME Tier 1 Method	GC / FID
Gravimetric Heavy Hydrocarbons	VOL - 5012	CCME Tier 1 Method	GRAVIMETRIC ANALYSIS
Moisture Content	VOL - 5009	CCME Tier 1 Method	GRAVIMETRIC
Naphthalene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Acenaphthylene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Acenaphthene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Fluorene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Phenanthrene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Anthracene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Fluoranthene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Pyrene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(a)anthracene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Chrysene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(b)fluoranthene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(k)fluoranthene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(a)pyrene	TO 0500	EPA SW-846 3540 & 8270	GC/MS
Indeno(1,2,3-cd)pyrene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Dibenzo(a,h)anthracene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(g,h,i)perylene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
PCBs	ORG 5009	EPA SW-846 3550 & 8081	GC/ECD

Client Information

Company: PETO MAX CALLUM LTD.
Contact: M. ALAM
Address: 165 CARTWRIGHT AVE
TORONTO, ONT.
Phone: 416-785-5110 Fax: 416-785-5120
Project: 09TF014 PO: 09-483
AGAT Quotation #: 09-483

Please note, if quotation number is not provided, client will be billed full price for analysis.

Invoice To Same as Above? Yes/No (circle)

Company: _____
Contact: _____
Address: _____
Phone: _____ Fax: _____

Report Information - reports to be sent to:

1. Name: _____
Email: _____
2. Name: _____
Email: _____

Regulatory Requirements

☒ Regulation 153 ☐ Sewer Use
☐ Indicate one ☐ Region
☐ Ind/Comm ☐ (Indicate one)
☐ Res/Parc ☐ Sanitary
☐ Agriculture ☐ Storm
☐ Soil Texture (check one)
☐ Coarse ☐ Medium ☐ Fine

☐ Prev. Water Quality Objectives (PWOQ)
☐ Drinking Water (check one) 170/243/252

Analysis includes water sample, ground water, and surface water (if applicable).
For the "What" column, please use the following Water Quality Objectives (PWOQ):

Turnaround Time (TAT) Required

Regular TAT: ☒ 5 to 7 Working Days

Rush TAT: (please provide prior notification)

Rush Surcharges Apply

☐ 3 to 5 Working Days

☐ 1 to 3 Working Days

☐ 1 Working Day

DATE REQUIRED (Rush surcharges may apply):

*TAT is exclusive of weekends and statutory holidays

Report Format

☐ Single Sample per page

☐ Multiple Samples per page

☐ Results by fax

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Site/ Sample Information	Comments	Metals and Inorganics	Metal Scan (except Pb, Cd, Cr)	GCME Fractions 1 to 4	VOCs	PAHs	PCBs	TCLP Metals/Inorganics	TCLP	Storm Sewer Use	Sanitary Sewer Use	LABORATORY USE ONLY	LAB SAMPLE ID
IK-1 SS-2	08/04	Soil	Soil	2			✓		✓		✓	✓					PH, Sulfate & N, butan-1-ol	
SS-3	08/04	Soil	Soil	1			✓		✓		✓	✓						
IK-3 SS-1	08/05	Soil	Soil	2			✓		✓		✓	✓						
SS-3	08/05	Soil	Soil	1			✓		✓		✓	✓						
IK-4 SS-1	08/05	Soil	Soil	2			✓		✓		✓	✓						
SS-3	08/05	Soil	Soil	2			✓		✓		✓	✓						
IK-14 SS-1	08/07	Soil	Soil	2			✓		✓		✓	✓						
SS-1	08/07	Soil	Soil	1			✓		✓		✓	✓						

Samples Relinquished By (print name & sign)

TAO XUE, Cao Xu

Date/Time

Aug 10, 2007

Samples Received By (print name & sign)

7.30. 3.2

Date/Time

Aug 10, 2007

Print Copy - Client

Yellow Copy - AGAT

PAGE

1 of 8

NO: 121521



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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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FAX 905-712-5122
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RECEIVED

SEP 2 2009

CLIENT NAME: PETO MACCALLUM LIMITED
165 CARTWRIGHT AVENUE
TORONTO, ON M6A1V5

ATTENTION TO: Mahaboob Alam

PROJECT NO: 09TF014

AGAT WORK ORDER: 09T348697

SOIL ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

TRACE ORGANICS REVIEWED BY: Timothy Sun, Senior Chemist

DATE REPORTED: Aug 24, 2009

PAGES (INCLUDING COVER): 11

Should you require any information regarding this analysis please contact your client services representative at (905) 712 5100, or at 1-800-856-6261

***NOTES**

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Analytical Laboratories (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Analytical Laboratories (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Page 1 of 11

Results relate only to the items tested



Certificate of Analysis

AGAT WORK ORDER: 09T348697

PROJECT NO: 09TF014

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

Carbonate, pH & Sulphate (Soil)									
DATE SAMPLED: Aug 04, 2009		DATE RECEIVED: Aug 10, 2009		DATE REPORTED: Aug 24, 2009		SAMPLE TYPE: Soil			
Parameter	Unit	G / S	RDL	IK - 1 SS - 3 1422216	IK - 3 SS - 3 1422219	IK - 4 SS - 3 1422226	IK - 14 SS - 2 1422229		
Calcium Carbonate Equivalence (as CaCO ₃)	%		0.1	26.5	29.4	20.6	29.4		
pH, 2:1 CaCl ₂ Extraction	N/A		N/A	7.87	7.90	7.66	7.88		
Sulphate (2:1)	µg/g		2.0	47.7	33.9	206	16.4		

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

M. Munir

Certified By:



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PROJECT NO: 09TF014

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

O. Reg. 153 Metals & Inorganics in Soil									
DATE SAMPLED: Aug 04, 2009	DATE RECEIVED: Aug 10, 2009	DATE REPORTED: Aug 24, 2009	SAMPLE TYPE: Soil						
Parameter	Unit	G/S	RDL	IK-1 SS-2 1422215	IK-3 SS-1 1422217	IK-4 SS-1 1422221	IK-14 SS-1 1422227		
Antimony	µg/g	13	1.6	<1.6	<1.6	<1.6	<1.6		
Arsenic	µg/g	20	0.6	2.9	3.5	3.3	3.7		
Barium	µg/g	750	0.3	49.4	63.6	64.1	62.1		
Beryllium	µg/g	1.2	0.4	0.5	0.6	0.6	0.5		
Boron (Hot Water Extractable)	µg/g	1.5	0.10	0.36	0.46	0.25	0.34		
Cadmium	µg/g	12	0.4	<0.4	<0.4	<0.4	0.5		
Chromium	µg/g	750	0.6	14.6	14.9	14.3	14.8		
Cobalt	µg/g	40	0.3	7.2	7.4	8.6	9.0		
Copper	µg/g	225	0.3	19.9	24.7	20.2	33.3		
Lead	µg/g	200	0.5	15.1	129	13.5	30.4		
Molybdenum	µg/g	40	0.5	<0.5	0.7	<0.5	0.6		
Nickel	µg/g	150	0.6	16.5	16.6	18.5	25.7		
Selenium	µg/g	10	0.8	<0.8	<0.8	<0.8	<0.8		
Silver	µg/g	20	0.4	<0.4	<0.4	<0.4	<0.4		
Thallium	µg/g	4.1	0.4	<0.4	<0.4	<0.4	<0.4		
Vanadium	µg/g	200	0.4	21.0	20.7	20.4	17.7		
Zinc	µg/g	600	0.4	38.0	89.5	47.4	94.4		
Chromium, Hexavalent	µg/g	8	0.40	<0.40	<0.40	<0.40	<0.40		
Cyanide, Free	µg/g	100	1.0	<1.0	<1.0	<1.0	<1.0		
Mercury	µg/g	10	0.011	0.015	0.029	0.022	0.038		
Electrical Conductivity (2:1)	mS/cm	0.7	0.002	0.545	0.615	0.188	0.268		
Sodium Adsorption Ratio (2:1)	N/A	5.0	N/A	2.81	5.21	0.572	1.97		
pH, 2:1 CaCl2 Extraction	N/A		N/A	7.88	7.81	7.69	7.79		

Comments: RDL - Reported Detection Limit; G/S - Guideline / Standard; Refers to T2(RPI)

1422215-1422227 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

Mohd. Munir



Certificate of Analysis

AGAT WORK ORDER: 09T348697

PROJECT NO: 09TF014

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

O. Reg. 153 - Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil (PAHs Incl.)

DATE SAMPLED: Aug 04, 2009	DATE RECEIVED: Aug 10, 2009	DATE REPORTED: Aug 24, 2009	SAMPLE TYPE: Soil				
Parameter	Unit	G/S	RDL	IK - 1 SS - 2 1422215	IK - 3 SS - 1 1422217	IK - 4 SS - 1 1422221	IK - 14 SS - 1 1422227
Benzene	µg/g	0.24	0.10	<0.10	<0.10	<0.10	<0.10
Toluene	µg/g	2.1	0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	0.28	0.05	<0.05	<0.05	<0.05	<0.05
Xylenes (Total)	µg/g	25	0.07	<0.07	<0.07	<0.07	<0.07
C6 - C10 (F1)	µg/g		5	<5	<5	<5	<5
C6 - C10 (F1 minus BTEX)	µg/g	30	5	<5	<5	<5	<5
C>10 - C16 (F2)	µg/g	150	10	<10	<10	<10	<10
C>10 - C16 (F2 minus Naphthalene)	µg/g	150	10	<10	<10	<10	<10
C>16 - C34 (F3)	µg/g	400	50	<50	<50	<50	<50
C>16 - C34 (F3 minus PAHs)	µg/g	400	50	<50	<50	<50	<50
C>34 - C50 (F4)	µg/g	2800	50	<50	<50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	2800	50	NA	NA	NA	NA
Moisture Content	%		0.1	10.0	12.1	12.0	12.4

Comments: RDL - Reported Detection Limit; G/S - Guideline / Standard; Refers to T2(RPI)

1422215-1422227

Results are based on sample dry weight.

The C6-C10 fraction is calculated using toluene response factor.

The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.

Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.

Total C6 - C50 results are corrected for BTEX and PAH contributions.

This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.

nC6 and nC10 response factors are within 30% of Toluene response factor.

nC10, nC16 and nC34 response factors are within 10% of their average.

C50 response factor is within 70% of nC10 + nC16 + nC34 average.

Linearity is within 15%.

Extraction and holding times were met for this sample.

Certified By:

Caribey



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AGAT WORK ORDER: 09T348697

PROJECT NO: 09TF014

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
L4Z 1Y2

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

O. Reg. 153 PAHs in Soil

DATE SAMPLED: Aug 04, 2009	DATE RECEIVED: Aug 10, 2009	DATE REPORTED: Aug 24, 2009	SAMPLE TYPE: Soil				
Parameter	Unit	G/S	RDL	IK-1 SS-2 1422215	IK-3 SS-1 1422217	IK-4 SS-3 1422226	IK-14 SS-1 1422227
Naphthalene	µg/g	4.6	0.03	<0.03	0.04	<0.03	0.04
Acenaphthylene	µg/g	100	0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	µg/g	15	0.03	<0.03	<0.03	<0.03	<0.03
Fluorene	µg/g	340	0.02	<0.02	<0.02	<0.02	<0.02
Phenanthrene	µg/g	40	0.02	<0.02	0.07	<0.02	<0.02
Anthracene	µg/g	28	0.02	<0.02	<0.02	<0.02	<0.02
Fluoranthene	µg/g	40	0.02	<0.02	0.03	<0.02	<0.02
Pyrene	µg/g	250	0.02	<0.02	0.03	<0.02	<0.02
Benzo(a)anthracene	µg/g	6.6	0.02	<0.02	0.02	<0.02	<0.02
Chrysene	µg/g	12	0.02	0.02	0.03	<0.02	<0.02
Benzo(b)fluoranthene	µg/g	12	0.02	<0.02	0.05	<0.02	<0.02
Benzo(k)fluoranthene	µg/g	12	0.02	<0.02	0.02	<0.02	<0.02
Benzo(a)pyrene	µg/g	1.2	0.02	<0.02	0.03	<0.02	<0.02
Indeno(1,2,3-cd)pyrene	µg/g	12	0.02	<0.02	<0.02	<0.02	<0.02
Dibenzo(a,h)anthracene	µg/g	1.2	0.02	<0.02	<0.02	<0.02	<0.02
Benzo(g,h,i)perylene	µg/g	40	0.02	<0.02	0.02	<0.02	<0.02

Comments: RDL - Reported Detection Limit; G/S - Guideline / Standard; Refers to T2(RPI)

1422215 Results are based on the dry weight of the soil.
Surrogate Recovery of Chrysene-d12: 92%.
Percent moisture: 10.0%.

1422217 Results are based on the dry weight of the soil.
Surrogate Recovery of Chrysene-d12: 92%.
Percent moisture: 12.1%.

1422226 Results are based on the dry weight of the soil.
Surrogate Recovery of Chrysene-d12: 84%.
Percent moisture: 12.8%.

1422227 Results are based on the dry weight of the soil.
Surrogate Recovery of Chrysene-d12: 82%.
Percent moisture: 12.4%.

Certified By:

Gambury



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AGAT WORK ORDER: 09T348697

PROJECT NO: 09TF014

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

PCBs (soil)

DATE SAMPLED: Aug 04, 2009	DATE RECEIVED: Aug 10, 2009				DATE REPORTED: Aug 24, 2009		SAMPLE TYPE: Soil
Parameter	Unit	G / S	RDL	IK - 1 SS - 2 1422215	IK - 3 SS - 1 1422217	IK - 4 SS - 3 1422226	IK - 14 SS - 1 1422227
PCBs	µg/g	5.0	0.05	0.11	0.06	<0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to T2(RPI)

1422215 Results are based on the dry weight of soil extracted.

Decachlorobiphenyl surrogate recovery: 100 %.

1422217 Results are based on the dry weight of soil extracted.

Decachlorobiphenyl surrogate recovery: 104 %.

1422226 Results are based on the dry weight of soil extracted.

Decachlorobiphenyl surrogate recovery: 108 %.

1422227 Results are based on the dry weight of soil extracted.

Decachlorobiphenyl surrogate recovery: 95 %.

Certified By:



Guideline Violation

AGAT WORK ORDER: 09T348697

PROJECT NO: 09TF014

5835 COOPERS AVENUE
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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Mahaboob Alam

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
1422217	IK - 3 SS - 1	T2(RPI) •	O. Reg. 153 Metals & Inorganics in Soil	Sodium Adsorption Ratio (2:1)	5.0	5.21



Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 09T348697

PROJECT NO: 09TF014

ATTENTION TO: Mahaboob Alam

Soil Analysis

RPT Date: Aug 24, 2009			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measure d Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153 Metals & Inorganics in Soil															
Antimony (µg/g)	1		< 1.6	< 1.6	0.0%	< 1.6	96%	90%	110%	80%	80%	120%	87%	70%	130%
Arsenic (µg/g)	1		1.9	1.6	17.1%	< 0.6	103%	90%	110%	103%	80%	120%	107%	70%	130%
Barium (µg/g)	1		56.5	52.6	7.1%	< 0.3	105%	80%	120%	110%	90%	110%	108%	70%	130%
Beryllium (µg/g)	1		< 0.4	< 0.4	0.0%	< 0.4	94%	80%	120%	115%	80%	120%	121%	70%	130%
Boron (Hot Water Extractable) (µg/g)	1	1422221	0.25	0.22	12.8%	< 0.10	109%	90%	110%	102%	90%	110%	102%	80%	120%
Cadmium (µg/g)	1		< 0.4	< 0.4	0.0%	< 0.4	108%	90%	110%	97%	90%	110%	76%	70%	130%
Chromium (µg/g)	1		15.0	13.8	8.3%	< 0.6	94%	90%	110%	100%	80%	120%	101%	70%	130%
Cobalt (µg/g)	1		4.1	3.8	7.6%	< 0.3	102%	80%	120%	107%	80%	120%	106%	70%	130%
Copper (µg/g)	1		28.3	25.1	12.0%	< 0.3	99%	90%	110%	103%	80%	120%	82%	70%	130%
Lead (µg/g)	1		28.9	22.9	23.2%	< 0.5	102%	90%	110%	96%	90%	110%	90%	70%	130%
Molybdenum (µg/g)	1		0.6	0.6	0.0%	< 0.5	102%	90%	110%	107%	80%	120%	115%	70%	130%
Nickel (µg/g)	1		9.3	8.8	5.5%	< 0.6	108%	90%	110%	102%	80%	120%	101%	70%	130%
Selenium (µg/g)	1		< 0.8	< 0.8	0.0%	< 0.8	99%	90%	110%	104%	90%	110%	105%	70%	130%
Silver (µg/g)	1		< 0.4	< 0.4	0.0%	< 0.4	106%	90%	110%	107%	80%	120%	107%	70%	130%
Thallium (µg/g)	1		< 0.4	< 0.4	0.0%	< 0.4	98%	90%	110%	105%	90%	110%	97%	70%	130%
Vanadium (µg/g)	1		13.5	12.1	10.9%	< 0.4	99%	90%	110%	107%	80%	120%	108%	70%	130%
Zinc (µg/g)	1		102	95.2	6.9%	< 0.4	113%	80%	120%	103%	70%	130%	106%	70%	130%
Chromium, Hexavalent (µg/g)	1	1422215	< 0.40	< 0.40	0.0%	< 0.40	93%	90%	110%	92%	90%	110%	101%	90%	110%
Cyanide, Free (µg/g)	1	1422215	< 1.0	< 1.0	0.0%	< 1.0	93%	90%	110%	97%	90%	110%	91%	90%	110%
Mercury (µg/g)	1	1422227	0.038	0.038	0.0%	< 0.011	103%	90%	110%	107%	90%	110%	106%	70%	130%
Electrical Conductivity (2:1) (mS/cm)	1		0.232	0.229	1.3%	< 0.002	99%	90%	110%						
pH, 2:1 CaCl2 Extraction (N/A)	1	1422227	7.79	7.80	0.1%	N/A	97%	90%	110%						
Carbonate, pH & Sulphate (Soil)															
Calcium Carbonate Equivalence (as CaCO3) (%)	1	1422216	26.5	25.5	3.8%	< 0.1	98%	85%	115%		0%	0%		85%	115%
Sulphate (2:1) (µg/g)	1		9.7	9.9	2.0%	< 2.0	82%	80%	120%	86%	80%	120%	92%	80%	120%

Certified By:

M. Mahaboob Alam

AGAT QUALITY ASSURANCE REPORT (V1)

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AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Analytical Laboratories (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Analytical Laboratories (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested



Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 09T348697

SUBJECT NO: 09TF014

ATTENTION TO: Mahaboob Alam

Trace Organics Analysis

Date: Aug 24, 2009			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measure d Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
g. 153 PAHs in Soil															
thalene (µg/g)	1					< 0.03	105%	60%	140%	77%	60%	140%	91%	60%	140%
aphthylene (µg/g)	1					< 0.02	97%	60%	140%	75%	60%	140%	90%	60%	140%
aphthene (µg/g)	1					< 0.03	100%	60%	140%	72%	60%	140%	97%	60%	140%
ene (µg/g)	1					< 0.02	98%	60%	140%	72%	60%	140%	99%	60%	140%
anthrene (µg/g)	1					< 0.02	100%	60%	140%	73%	60%	140%	103%	60%	140%
acene (µg/g)	1					< 0.02	96%	60%	140%	74%	60%	140%	98%	60%	140%
anthene (µg/g)	1					< 0.02	93%	60%	140%	83%	60%	140%	96%	60%	140%
e (µg/g)	1					< 0.02	92%	60%	140%	83%	60%	140%	94%	60%	140%
x(a)anthracene (µg/g)	1					< 0.02	91%	60%	140%	101%	60%	140%	85%	60%	140%
ene (µg/g)	1					< 0.02	100%	60%	140%	82%	60%	140%	95%	60%	140%
x(b)fluoranthene (µg/g)	1					< 0.02	91%	60%	140%	77%	60%	140%	92%	60%	140%
x(k)fluoranthene (µg/g)	1					< 0.02	115%	60%	140%	91%	60%	140%	110%	60%	140%
x(a)pyrene (µg/g)	1					< 0.02	100%	60%	140%	74%	60%	140%	92%	60%	140%
x(1,2,3-cd)pyrene (µg/g)	1					< 0.02	95%	60%	140%	85%	60%	140%	87%	60%	140%
zo(a,h)anthracene (µg/g)	1					< 0.02	91%	60%	140%	82%	60%	140%	77%	60%	140%
(g,h,i)perylene (µg/g)	1					< 0.02	102%	60%	140%	87%	60%	140%	100%	60%	140%
g. 153 - Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil (PAHs Incl.)															
ne (µg/g)	1		< 0.10	< 0.10	0.0%	< 0.10	121%	70%	130%	115%	70%	130%	100%	70%	130%
ie (µg/g)	1		< 0.08	< 0.08	0.0%	< 0.08	121%	70%	130%	120%	70%	130%	99%	70%	130%
enzene (µg/g)	1		< 0.05	< 0.05	0.0%	< 0.05	116%	70%	130%	119%	70%	130%	95%	70%	130%
s (Total) (µg/g)	1		< 0.07	< 0.07	0.0%	< 0.07	106%	70%	130%	119%	70%	130%	96%	70%	130%
10 (F1) (µg/g)	1		< 5	< 5	0.0%	< 5	87%	70%	130%	71%	70%	130%	73%	70%	130%
C16 (F2) (µg/g)	1		< 10	< 10	0.0%	< 10	98%	70%	130%	95%	70%	130%	91%	70%	130%
C34 (F3) (µg/g)	1		< 50	< 50	0.0%	< 50	101%	70%	130%	98%	70%	130%	109%	70%	130%
C50 (F4) (µg/g)	1		< 50	< 50	0.0%	< 50	106%	70%	130%	112%	70%	130%	104%	70%	130%
soil)															
µg/g)	1		< 0.05	< 0.05	0.0%	< 0.05	106%	60%	140%	98%	60%	140%	97%	60%	140%

Certified By:

AGAT QUALITY ASSURANCE REPORT (V1)

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Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 09T348697

PROJECT NO: 09TF014

ATTENTION TO: Mahaboob Alam

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Calcium Carbonate Equivalence (as CaCO ₃)			TITRATION
pH, 2:1 CaCl ₂ Extraction	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Sulphate (2:1)	INOR 1005	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
Antimony	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Extractable)	MET 1004	EPA SW 846 6010C, MSA Part 3, Ch.21	ICP/OES
Cadmium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET 1003	EPA SW-846 3050B & 6020A	ICP-MS
Chromium, Hexavalent	INOR 1029	SM 3500 B; MSA Part 3, Ch.25	SPECTROPHOTOMETER
Cyanide, Free	INOR 1052	MOE CN-3015 & E 3009 A; SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET 1001	EPA SW-846 7471A, 245.5	CVAAS
Electrical Conductivity (2:1)	INOR 1036	McKeague 4.12 & SM 2510 B	EC METER
Sodium Adsorption Ratio (2:1)	INOR 1007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl ₂ Extraction	INOR 93-6031	MSA part 3 & SM 4500-H+ B	pH METER



Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 09T348697

PROJECT NO: 09TF014

ATTENTION TO: Mahaboob Alam

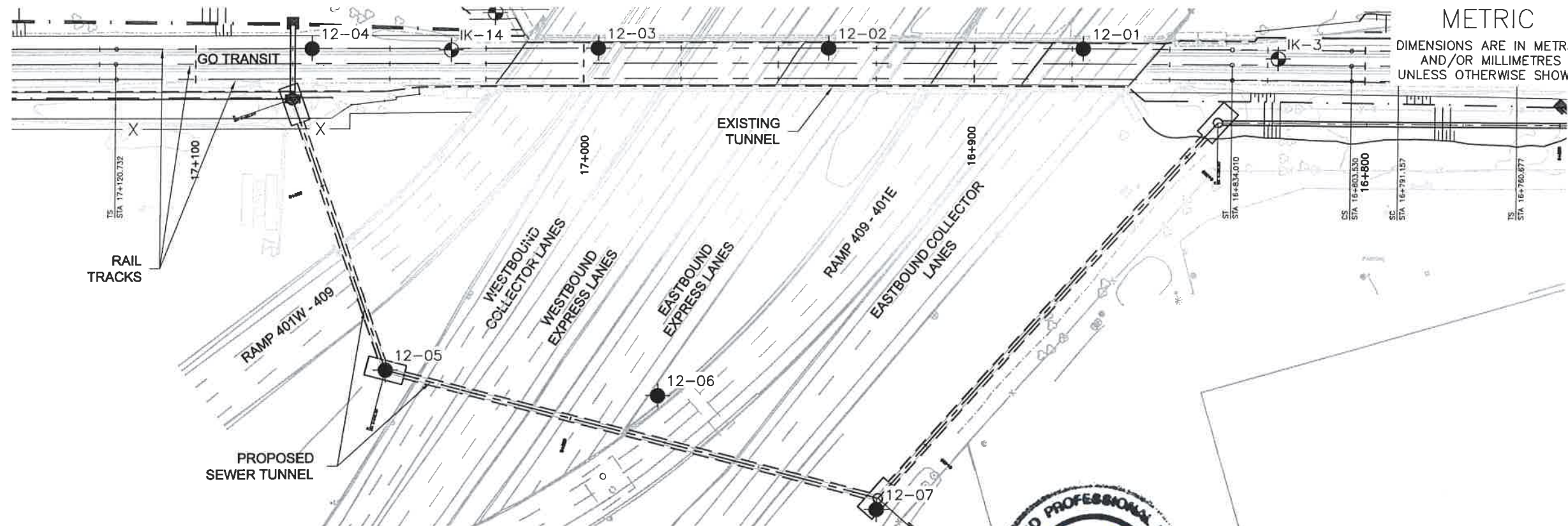
PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylenes (Total)	VOL 5009	EPA SW-846 5035 & 8260	P & T GC/MS
C6 - C10 (F1)	VOL - 5009	CCME Tier 1 Method	GC / FID
C6 - C10 (F1 minus BTEX)	VOL - 5009	CCME Tier 1 Method	GC / FID
C>10 - C16 (F2)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>10 - C16 (F2 minus Naphthalene)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>16 - C34 (F3)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>16 - C34 (F3 minus PAHs)	VOL - 5012	CCME Tier 1 Method	GC / FID
C>34 - C50 (F4)	VOL - 5012	CCME Tier 1 Method	GC / FID
Gravimetric Heavy Hydrocarbons	VOL - 5012	CCME Tier 1 Method	GRAVIMETRIC ANALYSIS
Moisture Content	VOL - 5009	CCME Tier 1 Method	GRAVIMETRIC
Naphthalene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Acenaphthylene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Acenaphthene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Fluorene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Phenanthrene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Anthracene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Fluoranthene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Pyrene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(a)anthracene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Chrysene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(b)fluoranthene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(k)fluoranthene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(a)pyrene	TO 0500	EPA SW-846 3540 & 8270	GC/MS
Indeno(1,2,3-cd)pyrene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Dibenzo(a,h)anthracene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
Benzo(g,h,i)perylene	Org 5506	EPA SW-846 3540 & 8270	GC/MS
PCBs	ORG 5009	EPA SW-846 3550 & 8081	GC/ECD



APPENDIX D

Previous Geotechnical Investigation (Thurber Engineering Ltd., Report No. 19-1605-138, dated February, 2013)

Symbols, Abbreviations and Terms Used on Record of Boreholes
Borehole Locations and Soil Strata
Record of Boreholes 12-01 to 12-04
Geotechnical Laboratory Results



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



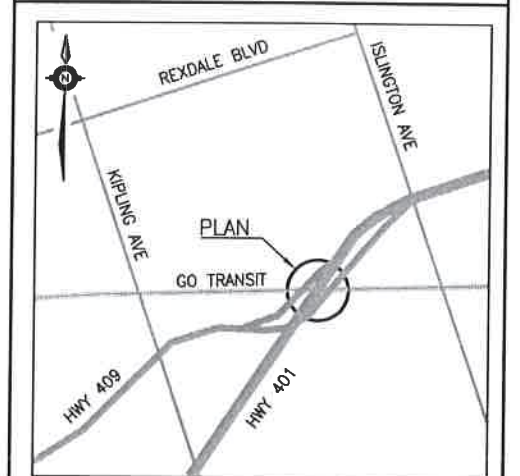
—NOTE—
Borehole locations have not been surveyed.
Coordinates and elevations are approximate.

CONT No

HIGHWAY 401 & 409
RAILWAY GRADE LOWERING
BOREHOLE LOCATIONS AND SOIL STRATA

Hatch Mott MacDonald

THURBER ENGINEERING LTD.



KEYPLAN

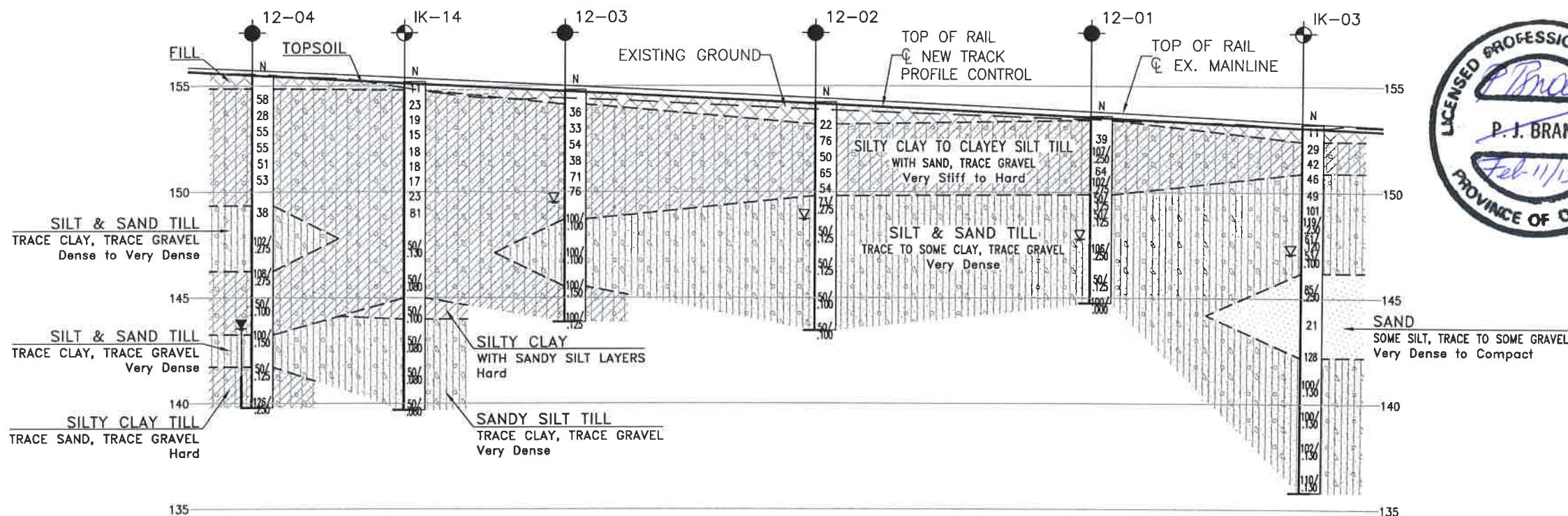
LEGEND

◆	Current Borehole by Thurber
◊	Previous Borehole by PML
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
≡	Water Level
≡	Head Artesian Water
≡	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

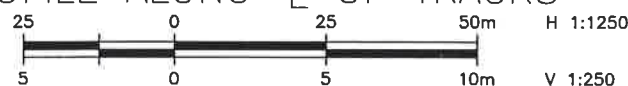
NO	ELEVATION	NORTHING	EASTING
12-01	153.6	4 840 293.9	616 380.7
12-02	154.2	4 840 291.0	616 315.8
12-03	154.8	4 840 288.4	616 256.7
12-04	155.4	4 840 285.2	616 183.1
12-05	163.3	4 840 202.6	616 205.9
12-06	163.0	4 840 199.1	616 276.4
12-07	158.0	4 840 172.3	616 334.0
IK-3	153.2	4 840 293.8	616 430.6
IK-4	157.7	4 840 296.5	616 230.0
IK-14	155.2	4 840 286.4	616 219.0

—NOTES—

- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.



PROFILE ALONG ϕ OF TRACKS



REVISIONS	DATE	BY	DESCRIPTION
DESIGN	MTB	CHK PJB	CODE
DRAWN	MFA	CHK MTB	SITE
			LOAD
			STRUCT
			DWG 1
			DATE FEB. 2013

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT ⁽¹⁾ 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

- 1) Laboratory Triaxial Testing
- 2) Field Insitu Vane Testing
- 3) Laboratory Vane Testing
- 4) SPT value
- 5) Pocket Penetrometer



4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample		TP Thin Wall Piston Sample
	PH Sampler Advanced by Hydraulic Pressure		PM Sampler Advanced by Manual Pressure
	WH Sampler Advanced by Self Static Weight		RC Rock Core
			SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$

 Water Level
 Shear Strength Determination by Pocket Penetrometer

- (1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS $W_L < 50\%$	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. ($W_L < 30\%$).
		CI	Inorganic clays of medium plasticity, silty clays. ($30\% < W_L < 50\%$).
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
	HIGHLY ORGANIC SOILS		Pt
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

RECORD OF BOREHOLE No 12-01

1 OF 1

METRIC

W.P. 19-1605-138 LOCATION N 4 840 293.9 E 616 380.7 ORIGINATED BY ES
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2012.08.16 - 2012.08.16 CHECKED BY MTB

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 (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)					
								○ UNCONFINED	+ FIELD VANE		● QUICK TRIAXIAL	x LAB VANE				
								20 40 60 80 100			20 40 60					
153.6																
0.0	BALLAST: (200mm)															
0.2	Silty CLAY, with sand, trace gravel Hard Brown (TILL)															
	Occasional oxide staining		1	SS	39											
			2	SS	107/ 0.250											
	Becoming grey		3	SS	64										1 35 39 26	
			4	SS	102/ 0.275											
149.9																
3.7	SILT and SAND, trace gravel, trace clay Very Dense Grey Moist (TILL)		5	SS	50/ 0.125											
			6	SS	50/ 0.125											
			7	SS	106/ 0.250										9 42 40 9	
			8	SS	50/ 0.125											
144.8																
8.8	END OF BOREHOLE AT 8.8m ON PROBABLE BOULDER. WATER LEVEL AT 5.8m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.		9	SS	100/ 0.0											

+³, X³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 12-02

1 OF 2

METRIC

W.P. 19-1605-138 LOCATION N 4 840 291.0 E 616 315.8 ORIGINATED BY ES
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2012.08.16 - 2012.08.16 CHECKED BY MTB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
154.2												
0.0	BALLAST: (325mm)						154					
153.9												
0.3	Clayey SILT, some gravel Brown Moist (FILL)											
153.2												
1.0	Silty CLAY, with sand, trace gravel Very Stiff to Hard Brown (TILL)		1	SS	22		153					
			2	SS	76							
							152					
			3	SS	50							
							151					
			4	SS	65							
			5	SS	54		150					
149.8												
4.4	SILT and SAND, trace gravel, trace to some clay Very Dense Grey Moist (TILL)		6	SS	73/ 0.275		149					
							148					
			7	SS	50/ 0.125							
							147					
			8	SS	50/ 0.125		146					
							145					
			9	SS	50/ 0.100							

Continued Next Page

+ ³ , × ³ : Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 12-02

2 OF 2

METRIC

W.P. 19-1605-138 LOCATION N 4 840 291.0 E 616 315.8 ORIGINATED BY ES
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2012.08.16 - 2012.08.16 CHECKED BY MTB

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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		WATER CONTENT (%) w _p w w _L				
	Continued From Previous Page							20 40 60 80 100						
143.4	SILT and SAND, trace gravel, trace clay Very Dense Grey Moist (TILL)		10	SS	50/		144							
10.8	END OF BOREHOLE AT 10.8m. WATER LEVEL AT 5.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.				0 100									

+ 3, x 3: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 12-03

1 OF 2

METRIC

W.P. 19-1605-138 LOCATION N 4 840 288.4 E 616 256.7 ORIGINATED BY ES
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2012.08.14 - 2012.08.14 CHECKED BY MTB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
154.8												
0.0												
154.5	BALLAST: (250mm)											
0.3	Gravelly SAND, mixed with clayey silt											
154.1	Brown											
0.7	Moist (FILL)											
	Silty CLAY, with sand, trace gravel, oxide staining		1	SS	36		154					
	Hard Brown (TILL) Becoming grey		2	SS	33		153					
			3	SS	54		152					1 31 42 26
			4	SS	38							
			5	SS	71		151					
			6	SS	76		150					
							149					
148.7	SILT and SAND, some clay, trace gravel		7	SS	100/							
6.1	Very Dense Grey Moist (TILL)				0.100		148					
			8	SS	100/		147					2 39 42 17
					0.100							
							146					
145.5	Silty CLAY, some sand, trace gravel		9	SS	100/							0 7 66 27
9.3	Hard Grey (TILL)				0.150		145					

Continued Next Page

+ 3, x 3: Numbers refer to Sensitivity 20 15 10 6 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 12-03

2 OF 2

METRIC

W.P. 19-1605-138 LOCATION N 4 840 288.4 E 616 256.7 ORIGINATED BY ES
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2012.08.14 - 2012.08.14 CHECKED BY MTB

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			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE		WATER CONTENT (%) w _p w w _L				
	Continued From Previous Page													
143.9			10	SS	100/		144							
10.9	END OF BOREHOLE AT 10.9m. WATER LEVEL AT 5.3m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.				0.125									

RECORD OF BOREHOLE No 12-04

1 OF 2

METRIC

W.P. 19-1605-138 LOCATION N 4 840 285.2 E 616 183.1 ORIGINATED BY ES
HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2012.08.15 - 2012.08.15 CHECKED BY MTB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT (%)					
155.4														
0.0	BALLAST: (200mm)													
0.2	SAND, some gravel, some silt, trace clay													
154.8	Brown													
0.6	Moist (FILL)													
	Silty CLAY, with sand, trace gravel, oxide staining		1	SS	58									
	Hard Brown (TILL)		2	SS	28									0 28 49 23
	Becoming Grey		3	SS	55									
			4	SS	55									
			5	SS	51									
	Fine sand seams		6	SS	53									
149.3														
6.1	SILT and SAND, trace clay, trace gravel		7	SS	38									
	Dense to Very Dense Grey Moist (TILL)		8	SS	102/ 0.275									
146.2														
9.2	Silty CLAY, with sand, trace gravel		9	SS	108/ 0.275									1 26 48 25
	Hard Grey (TILL)													

Continued Next Page

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

RECORD OF BOREHOLE No 12-04

2 OF 2

METRIC

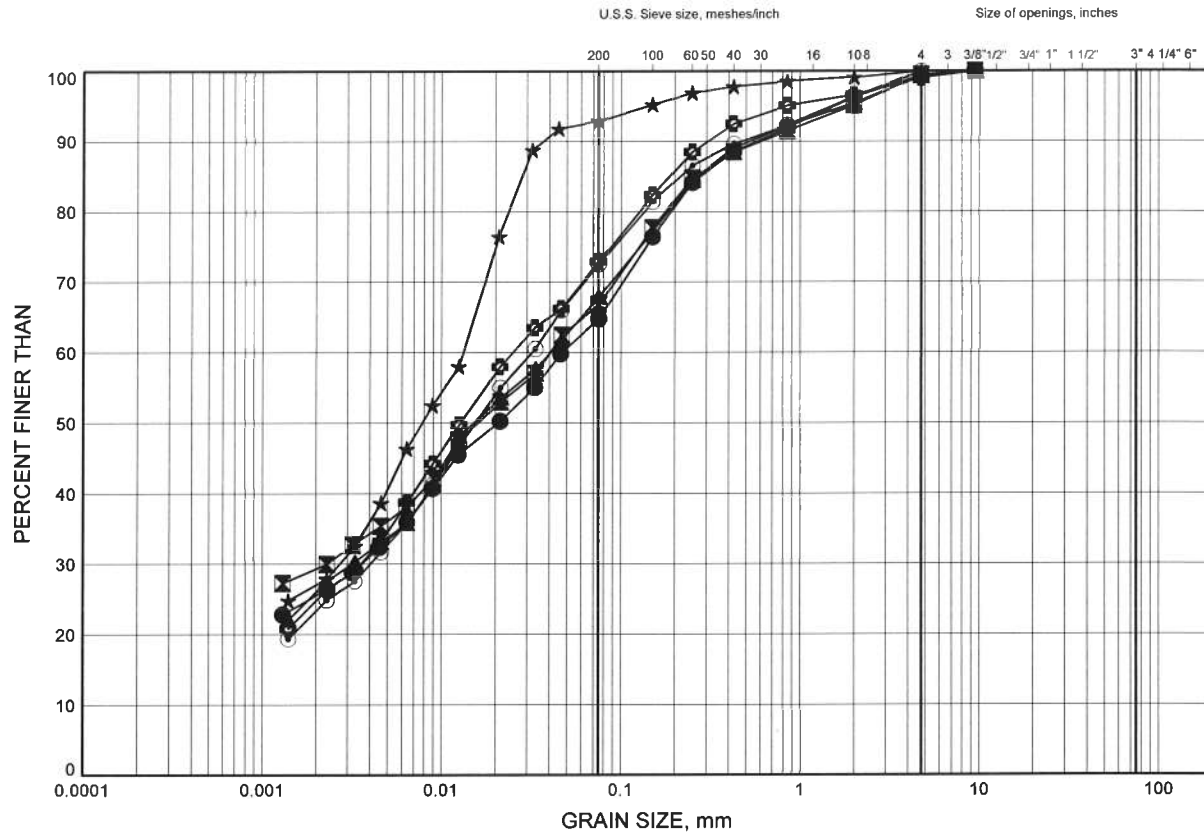
W.P. 19-1605-138 LOCATION N 4 840 285.2 E 616 183.1 ORIGINATED BY ES
HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2012.08.15 - 2012.08.15 CHECKED BY MTB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
	Continued From Previous Page													
143.2			10	SS	50/ 0.100		145							
12.2	SILT and SAND, trace clay, trace gravel Very Dense Grey Moist (TILL)		11	SS	100/ 0.150		143							
141.7			12	SS	50/ 0.125		142							
13.7	Silty CLAY, trace sand, trace gravel Hard Grey Moist (TILL)		13	SS	126/ 0.250		141							
139.8							140							
15.6	END OF BOREHOLE AT 15.6m. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Aug. 16/12 11.9 143.5													

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

GRAIN SIZE DISTRIBUTION

SILTY CLAY TILL



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

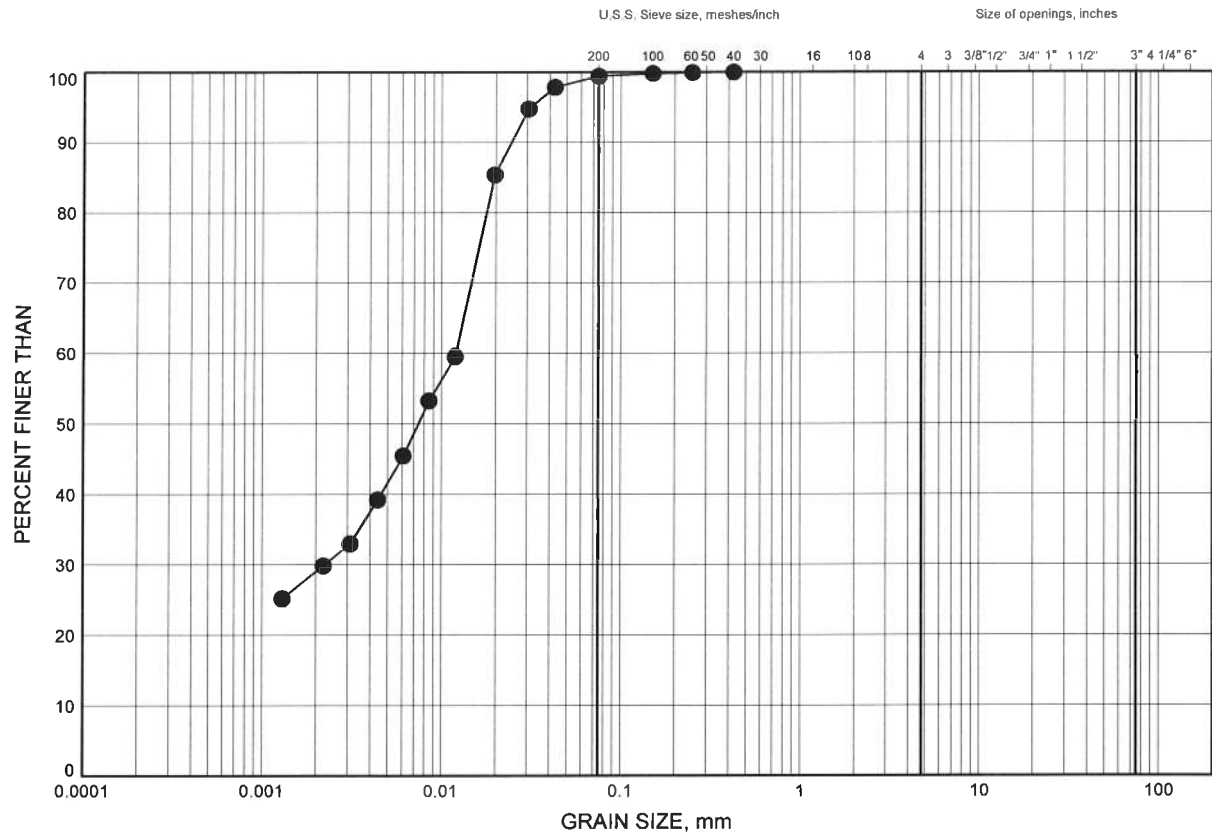
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	12-01	2.59	151.01
⊠	12-02	3.35	150.85
▲	12-03	2.59	152.21
★	12-03	9.30	145.50
⊙	12-04	1.83	153.57
⊕	12-04	9.37	146.03

Date October 2012W.P.# 19-1605-138Prep'd ANChkd. MTB

GRAIN SIZE DISTRIBUTION

SILTY CLAY TILL



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

LEGEND

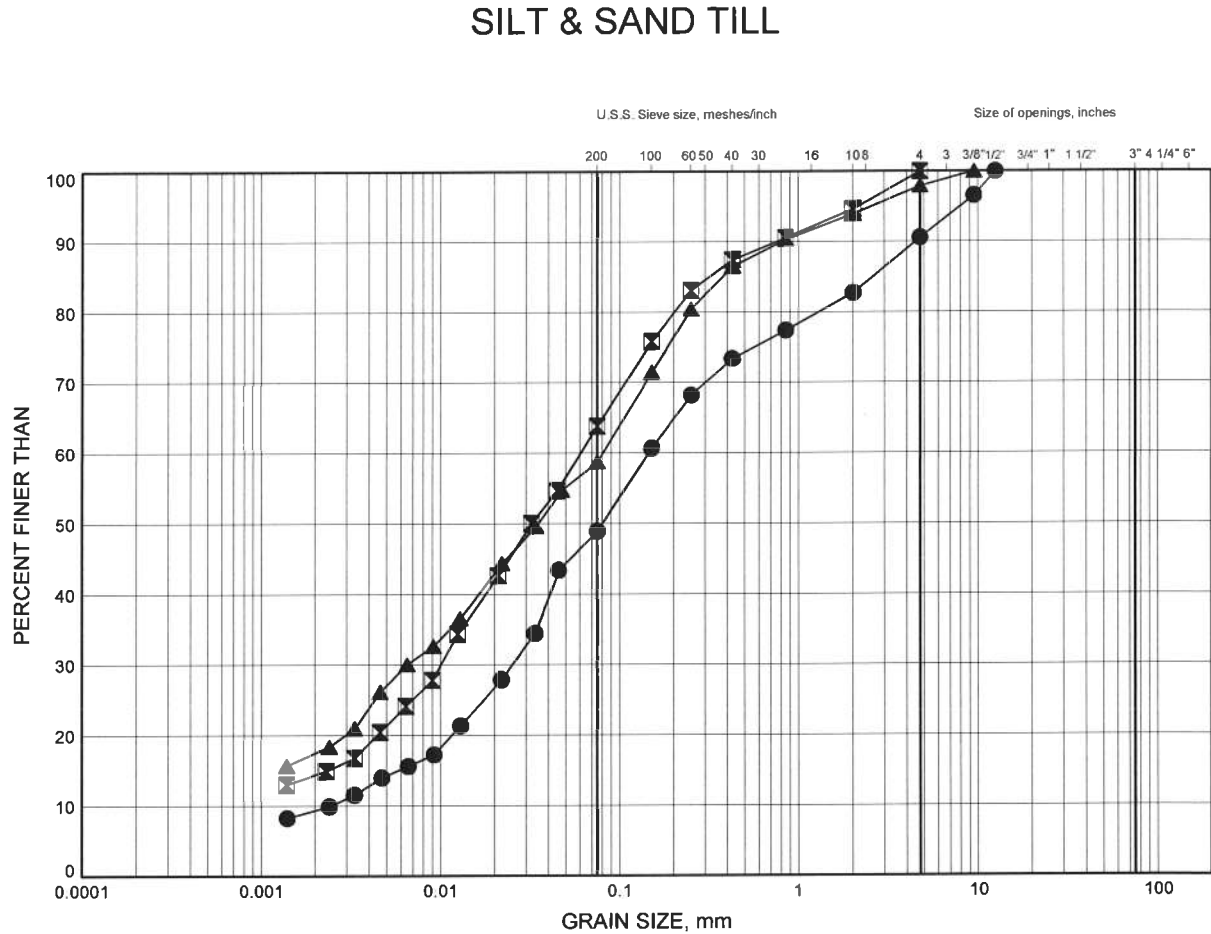
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	12-04	13.85	141.55

Date October 2012W.P.# 19-1605-138Prep'd ANChkd. MTB

Sewer Crossing and Railway Grade Lowering at Hwy 401&409

GRAIN SIZE DISTRIBUTION

FIGURE B3



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	12-01	6.30	147.30
■	12-02	4.80	149.40
▲	12-03	7.75	147.05

Date October 2012
W.P.# 19-1605-138

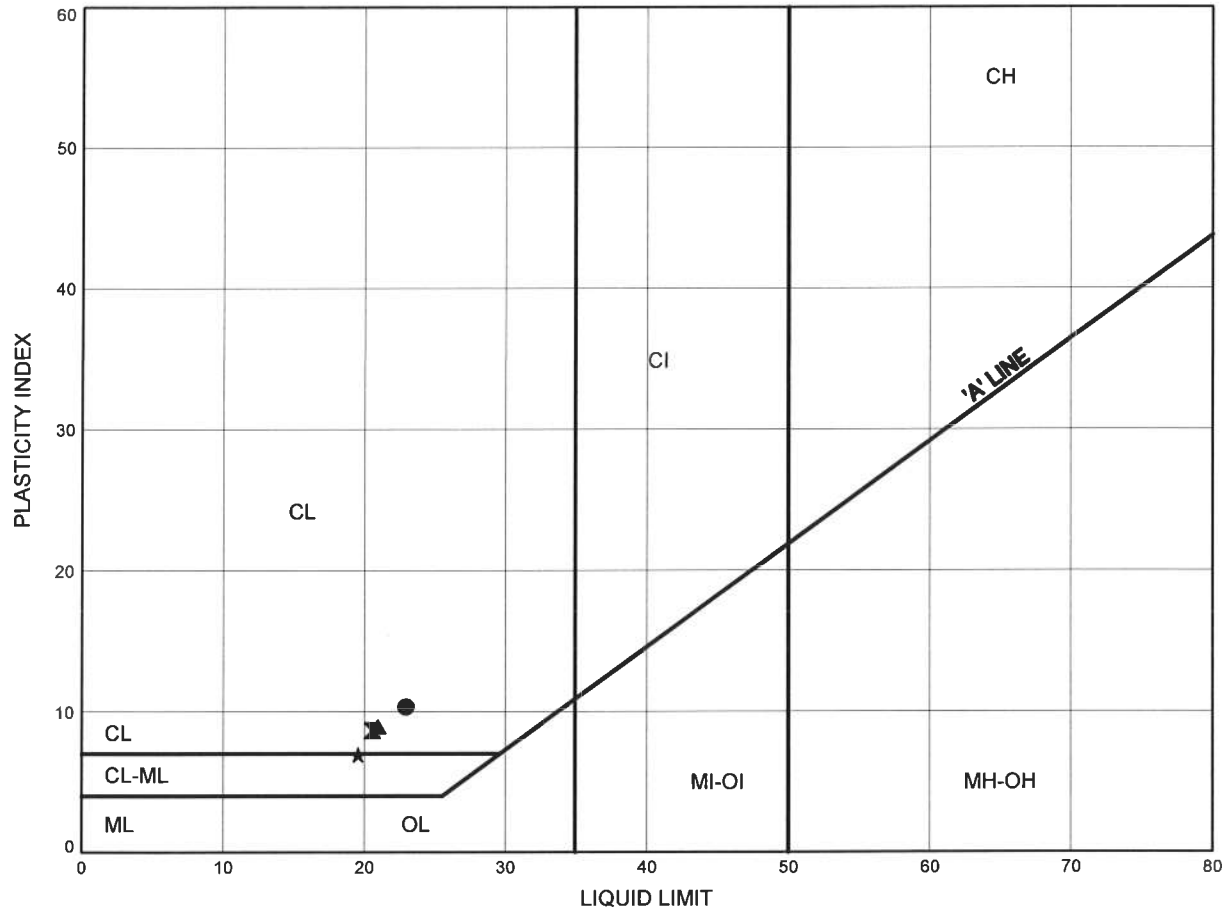


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Sewer Crossing and Railway Grade Lowering at Hwy 401&409
ATTERBERG LIMITS TEST RESULTS

FIGURE B4

SILTY CLAY TILL with SAND



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	12-01	2.59	151.01
◻	12-02	3.35	150.85
▲	12-03	2.59	152.21
★	12-04	1.83	153.57

Date October 2012
W.P.# 19-1605-138



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APPENDIX E

Record of Borehole Sheets (2013 - 2015)



LIST OF SYMBOLS

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

I. GENERAL

π	3.1416
$\ln x$,	natural logarithm of x
\log_{10}	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time
FoS	factor of safety

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta \sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
ν	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

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

(a) Index Properties (continued)

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

(b) Hydraulic Properties

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

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
C_v	coefficient of consolidation (vertical direction)
C_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = $\tan \delta$
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

* Density symbol is ρ . Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

Notes: 1
2

$$\tau = c' + \sigma' \tan \phi'$$
$$\text{shear strength} = (\text{compressive strength})/2$$



LIST OF ABBREVIATIONS

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

I. SAMPLE TYPE

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

II. PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

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

Dynamic Cone Penetration Resistance; N_d :

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

PH: Sampler advanced by hydraulic pressure

PM: Sampler advanced by manual pressure

WH: Sampler advanced by static weight of hammer

WR: Sampler advanced by weight of sampler and rod

Piezo-Cone Penetration Test (CPT)

A electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

III. SOIL DESCRIPTION

(a) Non-Cohesive (Cohesionless) Soils

Density Index	N
Relative Density	Blows/300 mm or Blows/ft
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) Cohesive Soils Consistency

	C_u, S_u	
	kPa	psf
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very stiff	100 to 200	2,000 to 4,000
Hard	over 200	over 4,000

IV. SOIL TESTS

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


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

V. MINOR SOIL CONSTITUENTS

Per cent by Weight	Modifier	Example
0 to 5	Trace	Trace sand
5 to 12	Trace to Some (or Little)	Trace to some sand
12 to 20	Some	Some sand
20 to 30	(ey) or (y)	Sandy
over 30	And (non-cohesive (cohesionless)) or With (cohesive)	Sand and Gravel Silty Clay with sand / Clayey Silt with sand

GTA-MTO 001 T:\PROJECTS\2013-1111-0035 (METROLINX, TORONTO)\LOG\13-1111-0035.GPJ GAL-GTA.GDT 01/21/16

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

PROJECT <u>13-1111-0035</u>			RECORD OF BOREHOLE No BH 2013-1 SHEET 2 OF 2				METRIC								
W.P. _____			LOCATION <u>N 4840299.5 ; E 616274.4</u>				ORIGINATED BY <u>OS</u>								
DIST _____ HWY <u>401</u>			BOREHOLE TYPE <u>210 mm O.D. Hollow Stem Augers</u>				COMPILED BY <u>TWB/BM</u>								
DATUM <u>Geodetic</u>			DATE <u>May 7 and 8, 2014</u>				CHECKED BY <u>SMM</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							
	--- CONTINUED FROM PREVIOUS PAGE ---							20 40 60 80 100							
	Sandy SILT, trace to some clay, trace gravel (TILL) Very dense Grey Moist RDR = 3		16	SS	100/0.13		148								
							147								
			17	SS	100/0.13		146								
							145								
			18	SS	111		144								
							143								
			19	SS	79		142								
141.9 21.5	END OF BOREHOLE		20	SS	52										
	NOTE: 1. Open borehole dry upon completion of drilling.														

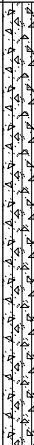
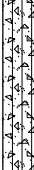
GTA-MTO 001 T:\PROJECTS\2013\13-1111-0035 (METROLINX, TORONTO)\LOG\13-1111-0035.GPJ GAL-GTA.GDT 01/21/16

PROJECT		RECORD OF BOREHOLE No BH 2013-2 SHEET 1 OF 2					METRIC							
W.P.		LOCATION					ORIGINATED BY							
DIST		BOREHOLE TYPE					COMPILED BY							
DATUM		DATE					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 kPa
163.1	GROUND SURFACE													
0.0	ASPHALT (120 mm)						163							
162.6	CONCRETE (430 mm)													
0.5	Gravelly sand, some fines (FILL) Very dense Brown Moist		1	SS	55		162						27 59 (14)	
161.9	RDR = 4 Sand, trace gravel, trace to some fines (FILL) Loose to compact Brown Moist		2	SS	16								2 89 (9)	
1.2	RDR = 2,3		3	SS	12		161						2 86 (12)	
			4	SS	15		160						2 87 (11)	
			5	SS	13		159						1 90 (9)	
			6	SS	14		158						2 91 (7)	
			7	SS	10								2 89 (9)	
			8	SS	6		157						2 91 (7)	
156.4	Clayey silt with sand, trace to some gravel (POSSIBLE FILL) Firm to stiff Brown to grey Moist		9	SS	7		156						1 30 48 21	
6.7	RDR = 2,3		10	SS	8		155							
			11	SS	9								9 26 45 20	
154.1	CLAYEY SILT with SAND, trace gravel (TILL) Very stiff to hard Brown Wet		12	SS	28		154							
9.0	RDR = 5 at a depth of 10.7 m below ground surface		13	SS	71		153						2 37 46 15	
			14	SS	31		152							
150.5	SAND and SILT, trace gravel, trace clay (TILL) Very dense Grey Moist to wet		15	SS	52		151							
12.6	RDR = 3						150							
							149							

Continued Next Page

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

GTA-MTO 001 T:\PROJECTS\2013\13-1111-0035 (METROLINX, TORONTO)\LOG\13-1111-0035.GPJ GAL-GTA.GDT 01/21/16

PROJECT 13-1111-0035			RECORD OF BOREHOLE No BH 2013-2 SHEET 2 OF 2				METRIC							
W.P. _____			LOCATION N 4840299.6 ; E 616310.0				ORIGINATED BY AMW/OS							
DIST _____ HWY 401			BOREHOLE TYPE 210 mm O.D. Hollow Stem Augers				COMPILED BY AV							
DATUM Geodetic			DATE Dec. 18, 2013 and May 5-6, 2014				CHECKED BY SMM							
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						
	--- CONTINUED FROM PREVIOUS PAGE ---						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	20 40 60 80 100 WATER CONTENT (%)						
143.6	SAND and SILT, trace gravel, trace clay (TILL) Very dense Grey Moist to wet RDR = 3		16	SS	145	▽	148							
19.5							147							
							146							
							145							
							144							
141.7	SILT, trace to some gravel, some sand, trace to some clay (TILL) Very dense Grey Moist to wet RDR = 3		19	SS	149/0.23	▽	143							6 19 66 9
21.4							142							
21.4	END OF BOREHOLE		20	SS	100/0.10									
	NOTE: 1. Water level measured in open borehole at a depth of 17.3 m below ground surface (Elev. 145.8 m), upon completion of drilling.													


GTA-MTO 001 T:\PROJECTS\2013\13-1111-0035 (METROLINX, TORONTO)\LOG\13-1111-0035.GPJ GAL-GTA.GDT 01/21/16

PROJECT 13-1111-0035		RECORD OF BOREHOLE No BH 2013-3 SHEET 1 OF 2										METRIC					
W.P.		LOCATION N 4840302.5 ; E 616339.4										ORIGINATED BY OS					
DIST HWY 401		BOREHOLE TYPE 210 mm O.D. Hollow Stem Augers										COMPILED BY AV					
DATUM Geodetic		DATE May 9 and 12, 2014										CHECKED BY SMM					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					W _p			W	W _L
162.4	GROUND SURFACE						20	40	60	80	100					GR SA SI CL	
0.0	ASPHALT																
162.0																	
0.4	Sand and gravel, trace silt (FILL) Dense Light grey to brown Moist						162										
161.3			1A	SS	40												
1.1	RDR = 3		1B														
	Sand, trace to some gravel, trace to some clay, trace to some silt (FILL) Loose to dense Brown Moist		2	SS	30		161										
	RDR = 3		3	SS	18		160										
			4A	SS	8												
158.9			4B				159										
3.5	Clayey silt with sand, trace to some gravel (FILL) Firm to stiff Brown to grey Wet		5	SS	3												
	RDR = 1,2		6	SS	2		158										
			7	SS	7		157										
			8	SS	9												
	Containing organics below a depth of 7.6 m below ground surface		9	SS	8		156										
154.1																	
8.3	Sandy CLAYEY SILT, trace gravel (TILL) Very stiff to hard Grey Wet		10	SS	30		154										
	RDR = 4		11	SS	52		153										
	Split-spoon sampler bouncing at a depth of 10.7 m below ground surface		12	SS	40		152										
			13	SS	24		151										
149.2							150										
13.2	SAND and SILT, trace to some gravel, trace clay (TILL) Very dense Grey Moist		14	SS	141		149										
	RDR = 4						148										

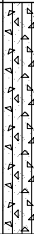
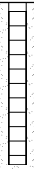
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+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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PROJECT 13-1111-0035		RECORD OF BOREHOLE No BH 2013-3 SHEET 2 OF 2				METRIC							
W.P. _____		LOCATION N 4840302.5 ; E 616339.4				ORIGINATED BY OS							
DIST _____ HWY 401		BOREHOLE TYPE 210 mm O.D. Hollow Stem Augers				COMPILED BY AV							
DATUM Geodetic		DATE May 9 and 12, 2014				CHECKED BY SMM							
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					
--- CONTINUED FROM PREVIOUS PAGE ---							20 40 60 80 100						
	SAND and SILT, trace to some gravel, trace clay (TILL) Very dense Grey Moist RDR = 4 Containing sand lenses at a depth of 16.2 m below ground surface		15	SS	54/0.23	147							
			16	SS	26/0.20	146							
	Split-spoon sampler bouncing at a depth of 18.5 m below ground surface		17	SS	100/0.10	144							
	Split-spoon sampler bouncing at a depth of 20.0 m below ground surface		18	SS	50/0.05	142							
140.9 21.5	END OF BOREHOLE		19	SS	100/0.13	141							
NOTES: 1. Water level measured in borehole at a depth of 12.2 m below ground surface (Elev. 150.2 m) on May 12, 2014. 2. Water level measured in borehole at a depth of 9.9 m below ground surface (Elev. 152.5 m) on June 2, 2014.													

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


PROJECT <u>13-1111-0035</u>										RECORD OF BOREHOLE No BH 2013-3A SHEET 2 OF 2										METRIC			
W.P. _____										LOCATION <u>N 4840313.9 ; E 616346.5</u>										ORIGINATED BY <u>PS</u>			
DIST _____ HWY <u>401</u>										BOREHOLE TYPE <u>210 mm O.D. Hollow Stem Augers</u>										COMPILED BY <u>JIL</u>			
DATUM <u>Geodetic</u>										DATE <u>June 8 and 9, 2014</u>										CHECKED BY <u>SMM</u>			
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			20	40	60	80	100	W _p	W	W _L								
	--- CONTINUED FROM PREVIOUS PAGE ---																						
144.8	Gravelly SILTY SAND, trace clay (TILL) Very dense Grey Moist to wet occasional sand seams RDR = 4		2	SS	100/70/10		147										27 41 28 4						
							146																
145			3	SS	69		145																
17.3	END OF BOREHOLE NOTES: 1. Water level measured in monitoring well at a depth of 10.7 m below ground surface (Elev. 151.4 m) on June 9, 2014, upon completion of installation. 2. Water level measured in monitoring well at a depth of 10.4 m below ground surface (Elev. 151.7 m) on April 12, 2015.																						

PROJECT 13-1111-0035		RECORD OF BOREHOLE No BH 2013-4 SHEET 1 OF 2				METRIC						
W.P. _____		LOCATION N 4840304.9 ; E 616390.6		ORIGINATED BY PKS								
DIST _____ HWY 401		BOREHOLE TYPE 210 mm O.D. Hollow Stem Augers		COMPILED BY AV								
DATUM Geodetic		DATE June 10 and 12, 2014		CHECKED BY SMM								
SOIL PROFILE			SAMPLES			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	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	W _p W W _L			WATER CONTENT (%)
161.6	GROUND SURFACE											
0.0	ASPHALT											
161.3												
0.3	Sand and gravel, trace silt (FILL)											
160.8												
0.8	Sand, trace to some gravel, trace to some silt, trace clay (FILL) Compact Brown Moist RDR = 2		1	SS	20		161					1 85 11 3
			2	SS	14		160					4 84 10 2
			3	SS	23		159					15 72 10 3
			4	SS	15		158					9 79 9 3
157.9			5	SS	15		157					6 72 10 12
3.7	Sand, trace to some gravel, trace to some silt, trace to some clay (FILL) Compact Brown Moist RDR = 2		6	SS	18		156					1 30 45 24
157.0			7	SS	18		155					11 63 18 8
4.6	Clayey silt with sand, trace gravel, trace organics, containing rootlets (FILL) Very stiff Grey Moist RDR = 2		8	SS	13		154					9 33 45 13
156.4			9	SS	17		153					
5.2	CLAYEY SILT, trace to some sand, trace gravel, containing rootlets and organics Stiff Dark grey Moist RDR = 3		10	SS	27		152					
155.5			11	SS	52		151					5 35 46 14
6.1	CLAYEY SILT with SAND, trace to some gravel (TILL) Very stiff to hard Brown becoming grey at 8.2 m depth below ground surface Moist RDR = 2,3		12	SS	51		150					
154.7			13	SS	26		149					
6.9	SAND and SILT, some gravel, trace clay (TILL) Very dense Grey Wet RDR = 4		14	SS	129		148					
			15	SS	100/0.013		147					
149.4												
12.2	Auger grinding between depths of 14 m and 18 m below ground surface											

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

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PROJECT <u>13-1111-0035</u>		RECORD OF BOREHOLE No BH 2013-4				SHEET 2 OF 2		METRIC										
W.P. _____		LOCATION <u>N 4840304.9 ; E 616390.6</u>				ORIGINATED BY <u>PKS</u>												
DIST _____ HWY <u>401</u>		BOREHOLE TYPE <u>210 mm O.D. Hollow Stem Augers</u>				COMPILED BY <u>AV</u>												
DATUM <u>Geodetic</u>		DATE <u>June 10 and 12, 2014</u>				CHECKED BY <u>SMM</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										
--- CONTINUED FROM PREVIOUS PAGE ---																		
	SAND and SILT, some gravel, trace clay (TILL) Very dense Grey Wet RDR = 4		16	SS	106/0.23													
			17	SS	85/0.15													
			18	SS	115													
141.2 20.4	END OF BOREHOLE																	
	NOTE: 1. Water level measured in borehole at a depth of 7.7 m below ground surface (Elev. 153.9 m) on June 12, 2014, when borehole was drilled to a depth of 13.7 m below ground surface.																	

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PROJECT		RECORD OF BOREHOLE					No BH 2014-R1		SHEET 1 OF 1		METRIC					
W.P. _____		LOCATION					N 4840261.0 ; E 615755.0		ORIGINATED BY		JL					
DIST _____ HWY 401		BOREHOLE TYPE					130 mm O.D. Solid Stem Augers		COMPILED BY		MP					
DATUM Geodetic		DATE					July 18, 2014		CHECKED BY		SMM					
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								
158.5	GROUND SURFACE															
0.0	Clayey silt, some sand, some gravel (FILL) Brown Dry to moist		1	AS	-											
157.7			2	SS	21											
0.8	Sandy CLAYEY SILT, trace to some gravel, containing oxidation staining Very stiff Brown															
157.1			3A	SS	20											
156.8			3B													
1.7	CLAYEY SILT, trace to some gravel, containing silty sand seams Very stiff Brown to grey Wet		4	SS	72											
	CLAYEY SILT, trace to some gravel, containing oxidation staining (samples 4 and 5) (TILL) Very stiff to hard Brown to grey Moist to wet spoon bouncing at 2.7 m and at 3.5 m		5	SS	57											
			6	SS	28											
154.1	END OF BOREHOLE															
4.4	NOTE: 1. Water level in open borehole at a depth of 1.5 m (Elev. 157.0 m) upon completion of drilling.															

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PROJECT		RECORD OF BOREHOLE					No BH 2014-R2		SHEET 1 OF 1		METRIC						
W.P. _____		LOCATION					N 4840279.0 ; E 615900.8		ORIGINATED BY		JL						
DIST _____ HWY 401		BOREHOLE TYPE					130 mm O.D. Solid Stem Augers		COMPILED BY		MP						
DATUM Geodetic		DATE					July 21, 2014		CHECKED BY		SMM						
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									
158.0	GROUND SURFACE							20	40	60	80	100					
0.0	Sand and gravel (FILL)																
157.7	Grey																
0.3	Dry to moist		1	AS	-												
	Sandy CLAYEY SILT, trace gravel, containing oxidation staining (TILL) Very stiff to hard Brown Moist		2	SS	22												
			3	SS	30												
	Becoming grey at a depth of 3.7 m		4	SS	38												
			5	SS	47												
			6	SS	42												
153.6	END OF BOREHOLE																
4.4	NOTE: 1. Open borehole dry upon completion of drilling. 2. Piezometer destroyed prior to being monitored.																

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PROJECT		RECORD OF BOREHOLE					No BH 2014-R3 SHEET 1 OF 1					METRIC					
W.P. _____		LOCATION					N 4840277.9 ; E 616029.0					ORIGINATED BY					
DIST _____ HWY 401		BOREHOLE TYPE					130 mm O.D. Solid Stem Augers					COMPILED BY					
DATUM Geodetic		DATE					July 17, 2014					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 kPa									
156.8	GROUND SURFACE																
0.0	Ballast (200mm) (FILL)																
156.3	Sub-ballast (300mm) (FILL)		1	AS	-												
0.5	CLAYEY SILT, some sand to sandy, trace to some gravel, containing oxidation staining Hard Brown Moist		2	SS	34												
			3	SS	44												
154.6	split spoon bouncing at 2.1 m																
2.2	CLAYEY SILT with SAND, trace to some gravel (TILL) Hard Grey Moist		4	SS	45												
			5	SS	37												
			6	SS	35												
152.4	END OF BOREHOLE																
4.4	NOTE: 1. Open borehole dry upon completion of drilling.																

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PROJECT <u>13-1111-0035</u>		RECORD OF BOREHOLE No BH 2014-R4 SHEET 1 OF 1				METRIC	
W.P. _____		LOCATION <u>N 4840269.8 ; E 616163.0</u>				ORIGINATED BY <u>JL</u>	
DIST _____ HWY <u>401</u>		BOREHOLE TYPE <u>130 mm O.D. Solid Stem Augers</u>				COMPILED BY <u>MP</u>	
DATUM <u>Geodetic</u>		DATE <u>July 17, 2014</u>				CHECKED BY <u>SMM</u>	

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 (%)				
								20	40	60	80	100	W _p	W	W _L		
156.9 0.0	GROUND SURFACE Sandy clayey silt (FILL) Brown to black Moist		1	AS	-												
156.1 0.8	CLAYEY SILT some gravel, some sand, containing oxidation staining (TILL) Very stiff Brown to grey Moist		2	SS	25												
			3	SS	41												
			4	SS	35												
			5	SS	30												
			6	SS	28												
152.5 4.4	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.																

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PROJECT <u>13-1111-0035</u>		RECORD OF BOREHOLE No BH 2014-R5 SHEET 1 OF 1				METRIC	
W.P. _____		LOCATION <u>N 4840284.3 ; E 616224.3</u>				ORIGINATED BY <u>JL</u>	
DIST _____ HWY <u>401</u>		BOREHOLE TYPE <u>130 mm O.D. Solid Stem Augers</u>				COMPILED BY <u>MP</u>	
DATUM <u>Geodetic</u>		DATE <u>July 21, 2014</u>				CHECKED BY <u>SMM</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	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					WATER CONTENT (%)						
						20	40	60	80	100	10	20	30				
155.1	GROUND SURFACE																
0.0	Ballast (150mm) (FILL)																
154.6	Sand and gravel (FILL)		1	AS	-												
0.5	Grey Dry to moist																
	Gravelly silty sand, trace to some clay (FILL)		2	SS	8												
153.7	Loose Brown to grey Moist																
1.4	Sandy CLAYEY SILT, trace to some gravel, oxidation staining (TILL)		3	SS	17												
	Firm to very stiff Brown to grey Moist		4	SS	19												
			5	SS	13												
			6	SS	21												
150.7	END OF BOREHOLE																
4.4	NOTE: 1. Open borehole dry upon completion of drilling. 2. Piezometer destroyed prior to being monitored.																

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PROJECT <u>13-1111-0035</u>		RECORD OF BOREHOLE No BH 2014-R6 SHEET 1 OF 1				METRIC	
W.P. _____		LOCATION <u>N 4840285.5 ; E 616530.8</u>				ORIGINATED BY <u>JL</u>	
DIST _____ HWY <u>401</u>		BOREHOLE TYPE <u>130 mm O.D. Solid Stem Augers</u>				COMPILED BY <u>MP</u>	
DATUM <u>Geodetic</u>		DATE <u>July 18, 2014</u>				CHECKED BY <u>SMM</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	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					WATER CONTENT (%)						
						20	40	60	80	100	10	20	30				
152.3	GROUND SURFACE																
0.0	Sand and gravel (FILL)																
0.3	Clayey silt, trace to some gravel, (FILL)		1	AS	-												
151.5	Brown Moist																
0.8	CLAYEY SILT with SAND, trace to some gravel (TILL) Very stiff to hard Grey Wet		2	SS	44												
			3	SS	29												
	Sand seams at 2.4 m, probable cobbles, spoon bouncing at 2.0 m-2.3 m and at 2.6 m and 2.7 m		4	SS	80/0.23												
149.3																	
3.0	SILT, some sand to sandy, trace to some gravel, trace clay (TILL) Very dense Grey Moist Spoon bouncing at 3.2 m, 3.3 m and at 3.9 m		5	SS	50/0.13												
			6	SS	50/0.08												
147.9																	
4.4	END OF BOREHOLE																
	NOTE: 1. Open borehole dry upon completion of drilling.																

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PROJECT 13-1111-0035				RECORD OF BOREHOLE No BH 2014-R7 SHEET 1 OF 1				METRIC									
W.P. _____				LOCATION N 4840301.9 ; E 616558.0				ORIGINATED BY JL									
DIST _____ HWY 401				BOREHOLE TYPE 130 mm O.D. Solid Stem Augers				COMPILED BY MP									
DATUM Geodetic				DATE July 18, 2014				CHECKED BY SMM									
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									
151.5	GROUND SURFACE																
0.0	Ballast (FILL)																
0.2	Sand and gravel (FILL)		1	AS	-												
150.7	Grey to brown Dry to moist																
0.8	CLAYEY SILT with SAND, some gravel (TILL) Very stiff to hard Brown Moist		2	SS	26												
			3	SS	40												
149.3																	
149.0	Gravelly SAND, some silt, trace to some clay Dense Brown Wet		4A	SS	45												
2.5			4B	SS													
	CLAYEY SILT, sandy to with sand, containing oxidation staining (TILL) Hard Brown to grey Moist		5	SS	70												
			6	SS	50/0.15												
147.1																	
4.4	END OF BOREHOLE																
NOTE: 1. Water level in open borehole at a depth of 2.3 m (Elev. 149.2 m) upon completion of drilling.																	

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PROJECT 13-1111-0035				RECORD OF BOREHOLE No BH 2014-R8 SHEET 1 OF 1				METRIC									
W.P. _____				LOCATION N 4840304.7 ; E 616659.7				ORIGINATED BY JL									
DIST _____ HWY 401				BOREHOLE TYPE 130 mm O.D. Solid Stem Augers				COMPILED BY MP									
DATUM Geodetic				DATE July 22, 2014				CHECKED BY SMM									
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									
151.1	GROUND SURFACE							20	40	60	80	100					
150.8	Sand and gravel (FILL) Grey Dry		1	AS	-		151										
150.3	Clayey silt, some sand, containing rootlets and organic (FILL)		2A	SS	6		150										
150.1	Brown to black Moist		2B														
149.3	CLAYEY SILT, trace to some gravel (TILL)		3A	SS	7		149										
148.9	Firm Mottled brown to grey Moist		3B														
148.9	SAND and SILT, trace to some clay Loose Brown to grey Wet		4	SS	77/0.28		148										
147.4	CLAYEY SILT with SAND, trace to some gravel (TILL)		5	SS	32												
147.4	Hard Brown to grey Wet		6A														
146.8	Sandy SILT, trace to some gravel Very dense Grey Moist		6B	SS	67		147										
146.8	SILT, some clay, trace to some gravel (TILL) Very dense Grey Moist																
4.4	END OF BOREHOLE																
NOTE: 1. Samples of sand and silt were wet.																	

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PROJECT		RECORD OF BOREHOLE					No BH 2014-R9		SHEET 1 OF 1		METRIC						
W.P.		LOCATION					N 4840289.2 ; E 616679.3		ORIGINATED BY		JL						
DIST		HWY					401		BOREHOLE TYPE		130 mm O.D. Solid Stem Augers						
COMPILED BY		MP					DATE		July 21, 2014		CHECKED BY						
SMM																	
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									
151.2	GROUND SURFACE																
0.0	Silty Sand with clayey silt, trace to some gravel, trace asphalt fragment (FILL) Brown Moist		1	AS	-												
150.4	CLAYEY SILT with SAND, trace gravel, containing oxidation staining (TILL) Hard Brown to grey Moist		2	SS	32												
0.8			3	SS	48												
			4	SS	46												
			5	SS	53												
147.5	SILT to CLAYEY SILT, some sand, some gravel Hard Grey Moist		6	SS	32												
3.7																	
146.8	END OF BOREHOLE																
4.4	NOTE: 1. Open borehole dry upon completion of drilling.																

GTA-MTO 001 T:\PROJECTS\2013\13-1111-0035 (METROLINX, TORONTO)\LOG\13-1111-0035.GPJ GAL-GTA.GDT 01/21/16

PROJECT 13-1111-0035		RECORD OF BOREHOLE No BH 2014-R12					SHEET 1 OF 1		METRIC								
W.P. _____		LOCATION N 4840304.5 ; E 616999.6					ORIGINATED BY JL										
DIST _____ HWY 401		BOREHOLE TYPE 130 mm O.D. Solid Stem Augers					COMPILED BY MP										
DATUM Geodetic		DATE July 22, 2014					CHECKED BY SMM										
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									
147.4	GROUND SURFACE																
0.0	Sand and gravel (FILL) Grey Dry		1	AS	-												
146.6			2	SS	26												
0.8	CLAYEY SILT, some sand, trace gravel (TILL) Very stiff to stiff Grey Moist		3	SS	24												
			4	SS	13												
			5	SS	18												
			6	SS	29												
143.0	END OF BOREHOLE																
4.4	NOTE: 1. Open borehole dry upon completion of drilling.																

GTA-MTO 001 T:\PROJECTS\2013\13-1111-0035 (METROLINX, TORONTO)\LOG\13-1111-0035.GPJ GAL-GTA.GDT 01/21/16

PROJECT		RECORD OF BOREHOLE				No BH 2015-R1		SHEET 1 OF 1		METRIC					
W.P. _____		LOCATION				N 4840267.6 ; E 615565.8		ORIGINATED BY				JL			
DIST _____ HWY 401		BOREHOLE TYPE				108 mm O.D. Continuous Flight Solid Stem Augers		COMPILED BY				MP			
DATUM Geodetic		DATE				March 25, 2015		CHECKED BY				SMM			
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 (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100			W _p
158.8	GROUND SURFACE														
0.0	Sandy gravel, trace silt and clay (FILL)		1	SS	36										
158.2	Dense Grey Moist														
0.6	Clayey silt, some gravel, containing oxidation staining (FILL)		2	SS	28										
157.3	Very stiff Brown to grey Moist														
1.5	Sandy CLAYEY SILT, trace to some gravel, containing oxidation staining (TILL)		3	SS	26										
	Very stiff to hard Brown Moist		4	SS	55										
	- Becoming grey at a depth of 3.8 m.		5	SS	75*										
			6	SS	24										
154.4	END OF BOREHOLE														
4.4	NOTES: 1. Open borehole dry upon completion of drilling. 2. Water level measured in piezometer at a depth of 0.3 m below ground surface (Elev. 158.5 m) on April 16, 2015 * Split-spoon sampler bouncing at a depth of 3.4 m														

GTA-MTO 001 T:\PROJECTS\2013\13-1111-0035 (METROLINX, TORONTO)\LOG\13-1111-0035.GPJ GAL-GTA.GDT 01/21/16

PROJECT 13-1111-0035		RECORD OF BOREHOLE No BH 2015-R3 SHEET 1 OF 1				METRIC							
W.P. _____		LOCATION N 4840278.9 ; E 615899.8		ORIGINATED BY JL									
DIST _____ HWY 401		BOREHOLE TYPE 210 mm O.D. Continuous Flight Hollow Stem Augers		COMPILED BY MP									
DATUM Geodetic		DATE March 27, 2015		CHECKED BY SMM									
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					
158.2	GROUND SURFACE						20 40 60 80 100	20 40 60 80 100	10 20 30				
0.0	Clayey silt, some gravel, some sand (FILL)		1A	SS	22								
157.9	Very stiff		1B										
0.3	Brown Moist												
	Sandy gravel, trace to some silt, trace clay (FILL)		2	SS	8								70 23 6 1
156.8	Loose to compact												
1.4	Grey Moist		3	SS	18								
	CLAYEY SILT with SAND, trace gravel (TILL)												
	Very stiff to hard		4	SS	45								4 31 51 14
	Brown to grey Moist												
	- Becoming grey at a depth of 3.8 m.		5	SS	54								
			6	SS	30								
	- Oxidation staining to a depth of 4.6 m.		7	SS	26								
			8	SS	20								5 37 45 13
			9	SS	40								
			10	SS	33								
148.4	END OF BOREHOLE												
9.8	NOTES:												
	1. Open borehole dry upon completion of drilling												
	2. Water level measured in piezometer at a depth of 3.3 m below ground surface (Elev. 154.9) on April. 16, 2015.												

GTA-MTO 001 T:\PROJECTS\2013\13-1111-0035 (METROLINX, TORONTO)\LOG\13-1111-0035.GPJ GAL-GTA.GDT 01/21/16

PROJECT		RECORD OF BOREHOLE No BH 2015-R4 SHEET 1 OF 1				METRIC							
W.P. _____		LOCATION N 4840246.0 ; E 615905.7				ORIGINATED BY JL							
DIST _____ HWY 401		BOREHOLE TYPE 108 mm O.D. Continuous Flight Augers				COMPILED BY MP							
DATUM Geodetic		DATE March 27, 2015				CHECKED BY SMM							
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					
157.9	GROUND SURFACE						20 40 60 80 100						
0.0	ASPHALT (200 mm)		1A	SS	10								
0.4	Sand and gravel (FILL)		1B										
0.4	Compact Brown Wet												
157.0	Clayey silt, some gravel, trace to some sand, containing brick fragments, hydrocarbon odour (FILL)		2	SS	19								
0.9	Stiff Black Moist		3	SS	24								
	CLAYEY SILT with SAND, trace to some gravel, containing oxidation staining to a depth of 3.4 m (TILL)		4	SS	41								
	Very stiff to hard Brown to grey Moist		5	SS	42								
	Becoming grey at a depth of 3.4 m		6	SS	17								
	Sandy silt seams at a depth of 3.4 m		7	SS	23								
			8	SS	22								
			9	SS	58								
			10	SS	32								
			11	SS	44								
146.6	END OF BOREHOLE												
11.3	NOTE: 1. Open borehole dry upon completion of drilling												



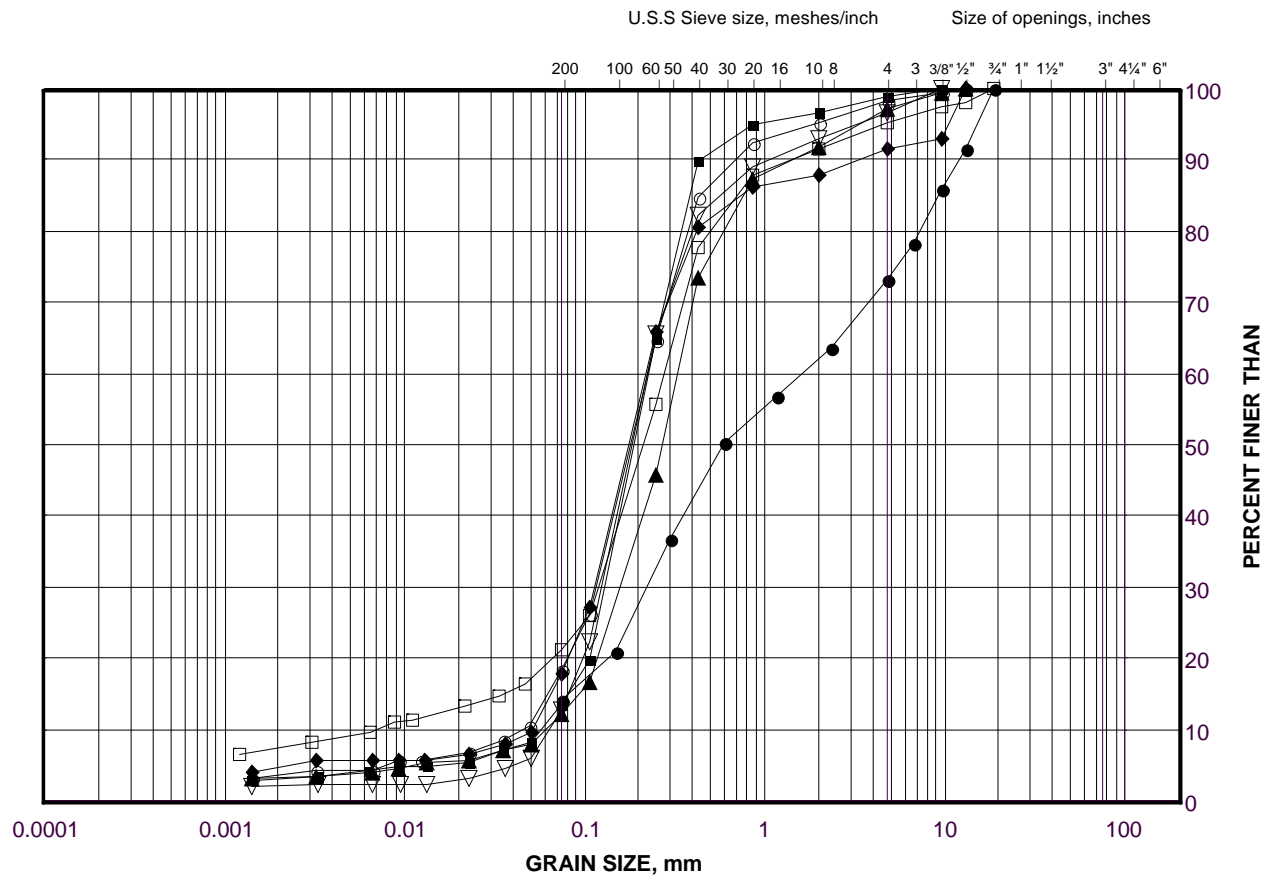
APPENDIX F

Laboratory Testing (2013 - 2015)

GRAIN SIZE DISTRIBUTION

Sand Fill
(Highway Embankment)

FIGURE F1A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	2013-2	1	162.1
■	2013-4	1	160.5
◆	2013-1	1	162.2
▲	2013-3	1B	161.1
▽	2013-4	2	159.7
○	2013-1	2	161.5
□	2013-3	2	160.6

Project Number: 13-1111-0035

Checked By: SMM

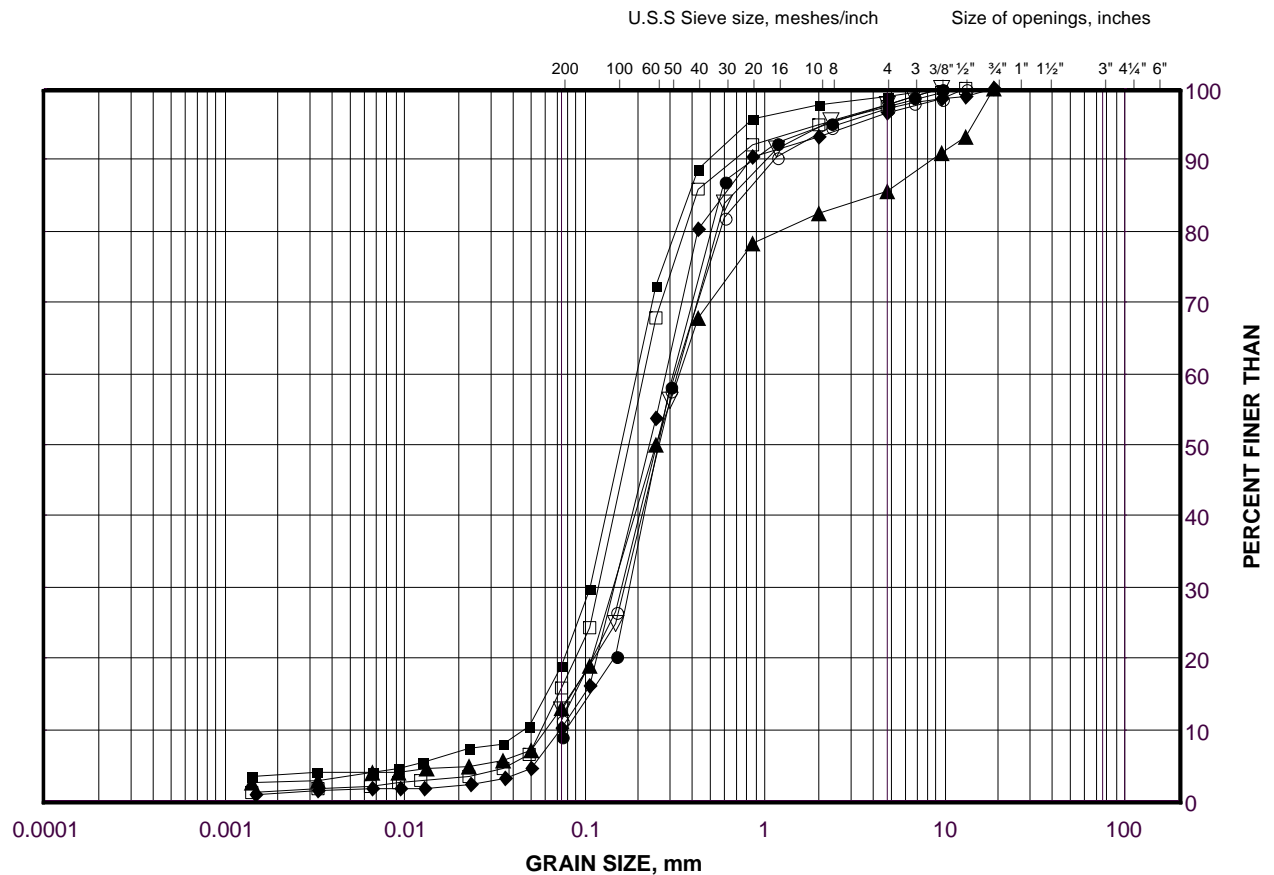
Golder Associates

Date: 15-Sep-14

GRAIN SIZE DISTRIBUTION

Sand Fill
(Highway Embankment)

FIGURE F1B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	2013-2	2	161.3
■	2013-1	3	160.7
◆	2013-3	3	159.7
▲	2013-4	3	159.0
▽	2013-2	3	160.6
○	2013-2	4	159.8
□	2013-1	4	160.0

Project Number: 13-1111-0035

Checked By: SMM

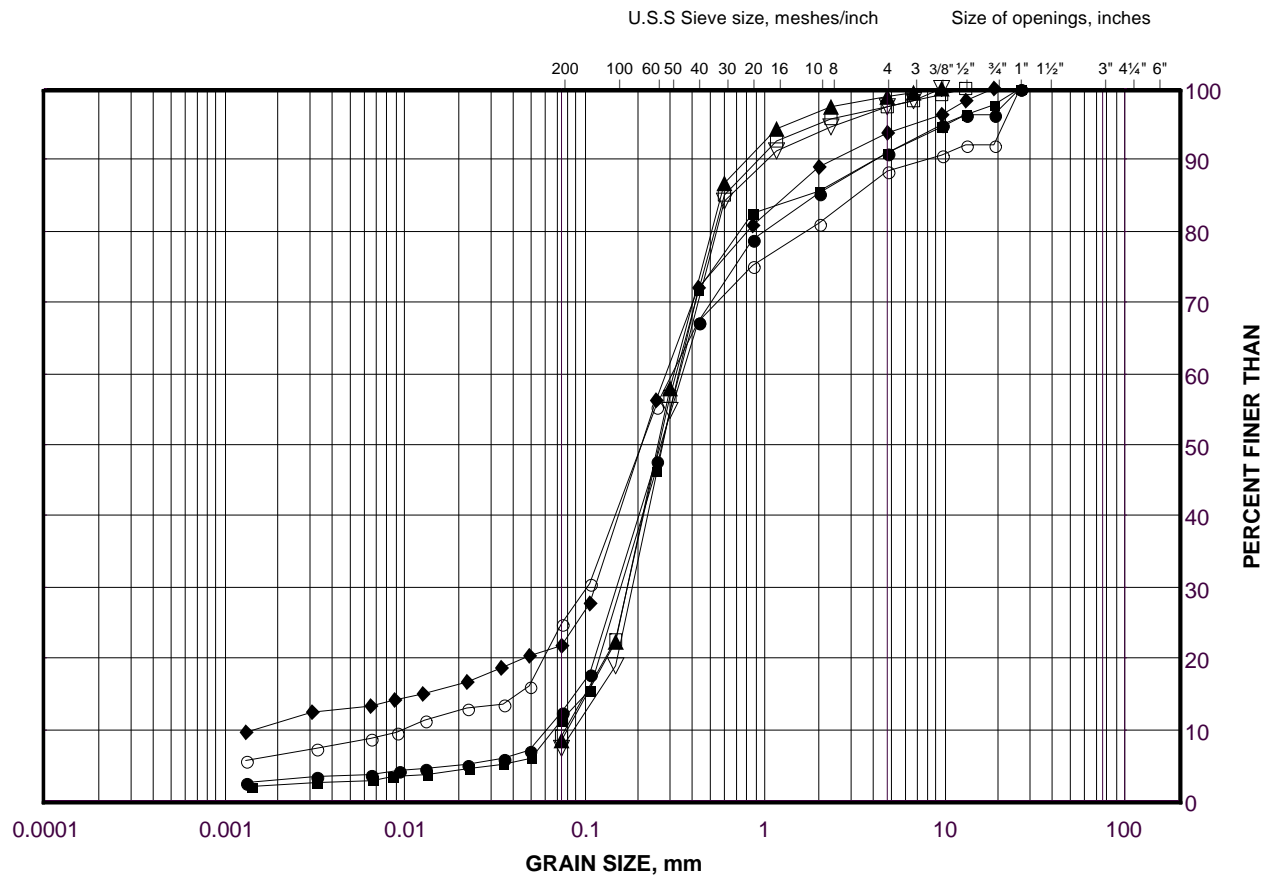
Golder Associates

Date: 15-Sep-14

GRAIN SIZE DISTRIBUTION

Sand Fill
(Highway Embankment)

FIGURE F1C



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	2013-4	4	158.3
■	2013-3	4A	159.2
◆	2013-4	5	157.5
▲	2013-2	5	159.0
▽	2013-2	6	158.3
○	2013-4	7	156.0
□	2013-2	7	157.6

Project Number: 13-1111-0035

Checked By: SMM

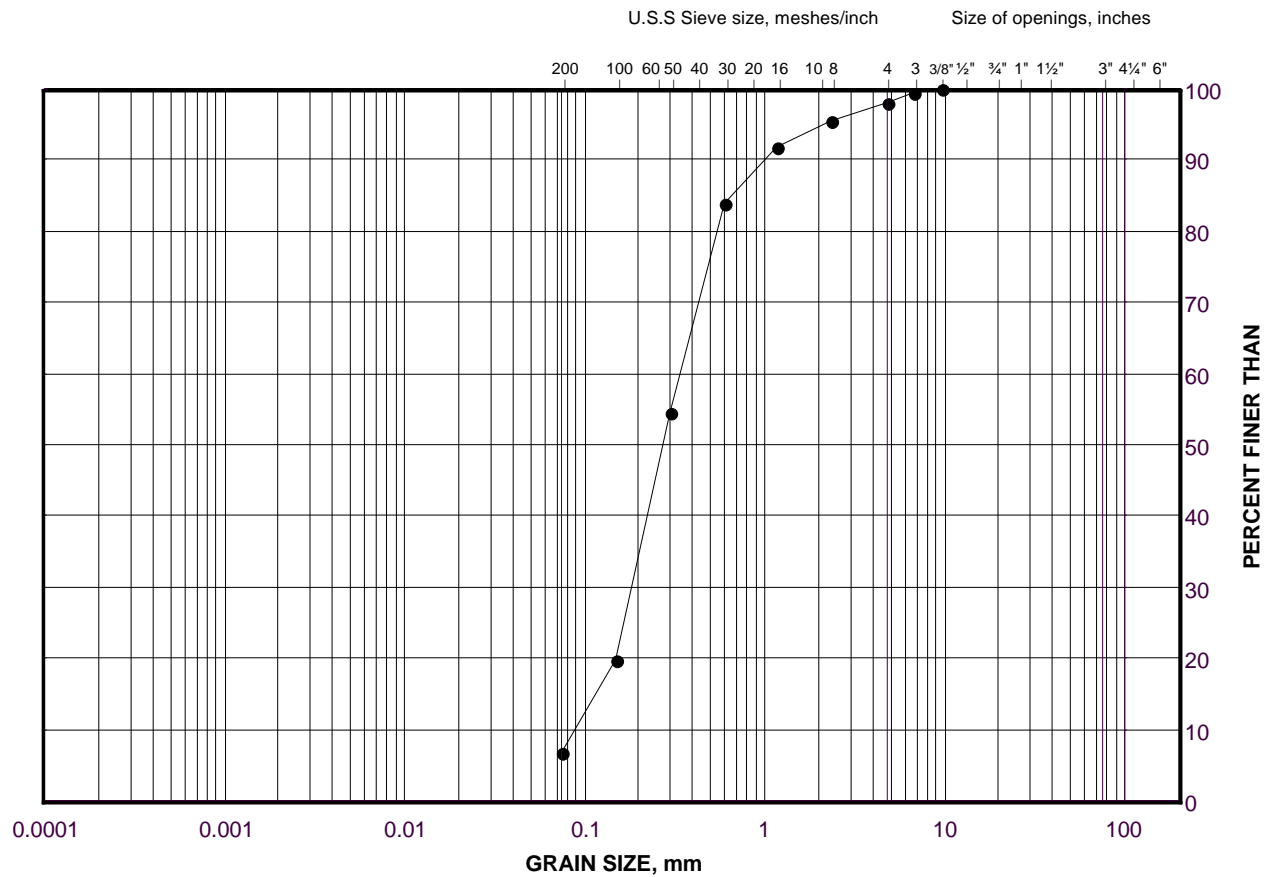
Golder Associates

Date: 15-Sep-14

GRAIN SIZE DISTRIBUTION

Sand Fill
(Highway Embankment)

FIGURE F1D



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	2013-2	8	156.7

Project Number: 13-1111-0035

Checked By: SMM

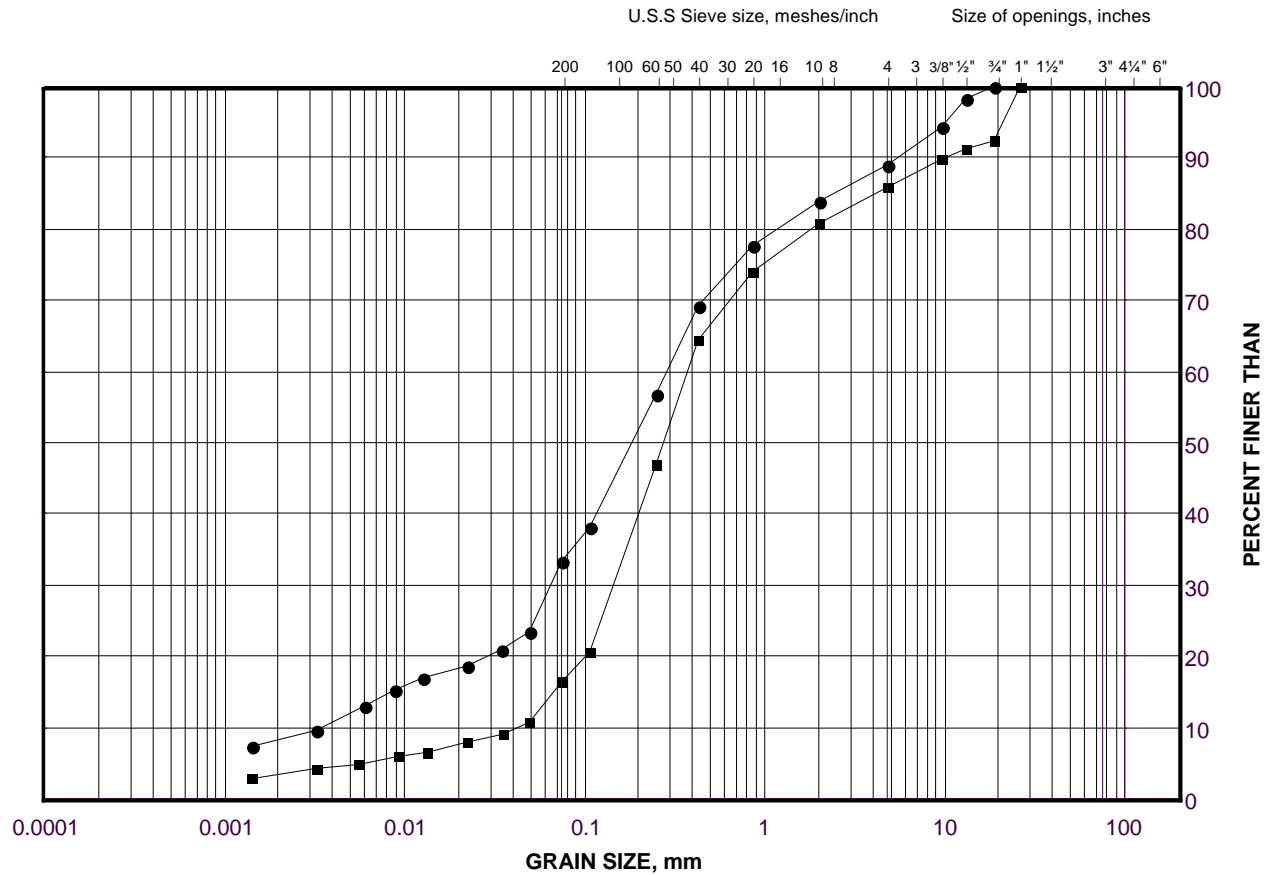
Golder Associates

Date: 15-Sep-14

GRAIN SIZE DISTRIBUTION

Sand to Silty Sand Fill
(Median Test Pit)

FIGURE F2



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

LEGEND

SYMBOL	TEST PIT	SAMPLE	ELEVATION(m)
●	3B	2	162.1
■	3B	3	161.5

Project Number: 13-1111-0035

Checked By: SMM

Golder Associates

Date: 13-Mar-15

PERMEABILITY OF GRANULAR SOILS
ASTM D 2434 (CONSTANT HEAD)
SAMPLE IDENTIFICATION

PROJECT NUMBER	13-1111-0035	SAMPLE	Combined Sample
PROJECT TITLE	STANTEC/METROLINX HWY 401/TORONTO	SAMPLE DEPTH, m	-
BOREHOLE NUMBER	-	DATE	1/29/2016

TESTS
TEST 1

WATER CONTENT, initial, %	6.30	WATER CONTENT, final, %	-
UNIT WEIGHT, initial, kN/m ³	21.09	UNIT WEIGHT, final, kN/m ³	-
DRY UNIT WEIGHT, initial, kN/m ³	19.84	DRY UNIT WEIGHT, final, kN/m ³	19.84
HEAD PRESSURE, kPa	0.77	DURATION, min	224.0
HYDRAULIC GRADIENT, i_1	0.7	PERMEANT FLUID:	Tap Water
COEFFICIENT OF PERMEABILITY AT STANDARD TEMPERATURE, k_{20} , cm/s			5.97E-05

TEST 2

WATER CONTENT, initial, %	6.30	WATER CONTENT, final, %	-
UNIT WEIGHT, initial, kN/m ³	21.09	UNIT WEIGHT, final, kN/m ³	-
DRY UNIT WEIGHT, initial, kN/m ³	19.84	DRY UNIT WEIGHT, final, kN/m ³	19.84
HEAD PRESSURE, kPa	1.51	DURATION, min	960.0
HYDRAULIC GRADIENT, i_2	1.4	PERMEANT FLUID:	Tap Water
COEFFICIENT OF PERMEABILITY AT STANDARD TEMPERATURE, k_{20} , cm/s			7.79E-05

TEST 3

WATER CONTENT, initial, %	6.30	WATER CONTENT, final, %	-
UNIT WEIGHT, initial, kN/m ³	21.09	UNIT WEIGHT, final, kN/m ³	-
DRY UNIT WEIGHT, initial, kN/m ³	19.84	DRY UNIT WEIGHT, final, kN/m ³	19.84
HEAD PRESSURE, kPa	2.10	DURATION, min	185.0
HYDRAULIC GRADIENT, i_3	1.9	PERMEANT FLUID:	Tap Water
COEFFICIENT OF PERMEABILITY AT STANDARD TEMPERATURE, k_{20} , cm/s			9.15E-05

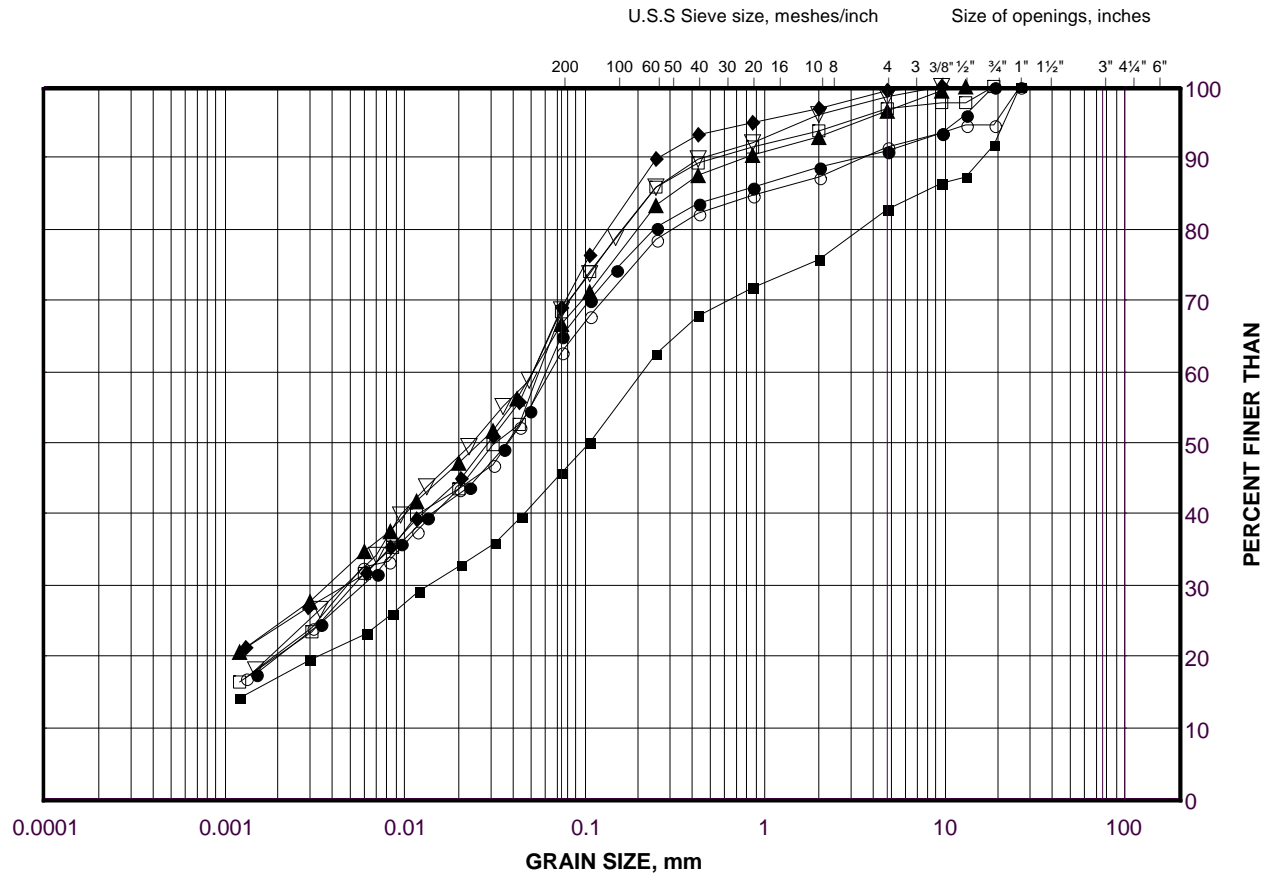
TEST RESULTS

AVERAGE COEFFICIENT OF PERMEABILITY AT STANDARD TEMPERATURE, k_{20} , cm/s	7.63E-05
--	-----------------

GRAIN SIZE DISTRIBUTION

Clayey Silt with Sand Fill
(Highway Embankment)

FIGURE F4A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	2013-2	11	154.5
■	2013-3	5	158.3
◆	2013-4	6	156.7
▲	2013-1	6	158.6
▽	2013-2	9	156.0
○	2013-1	9	156.2
□	2013-3	9	154.5

Project Number: 13-1111-0035

Checked By: SMM

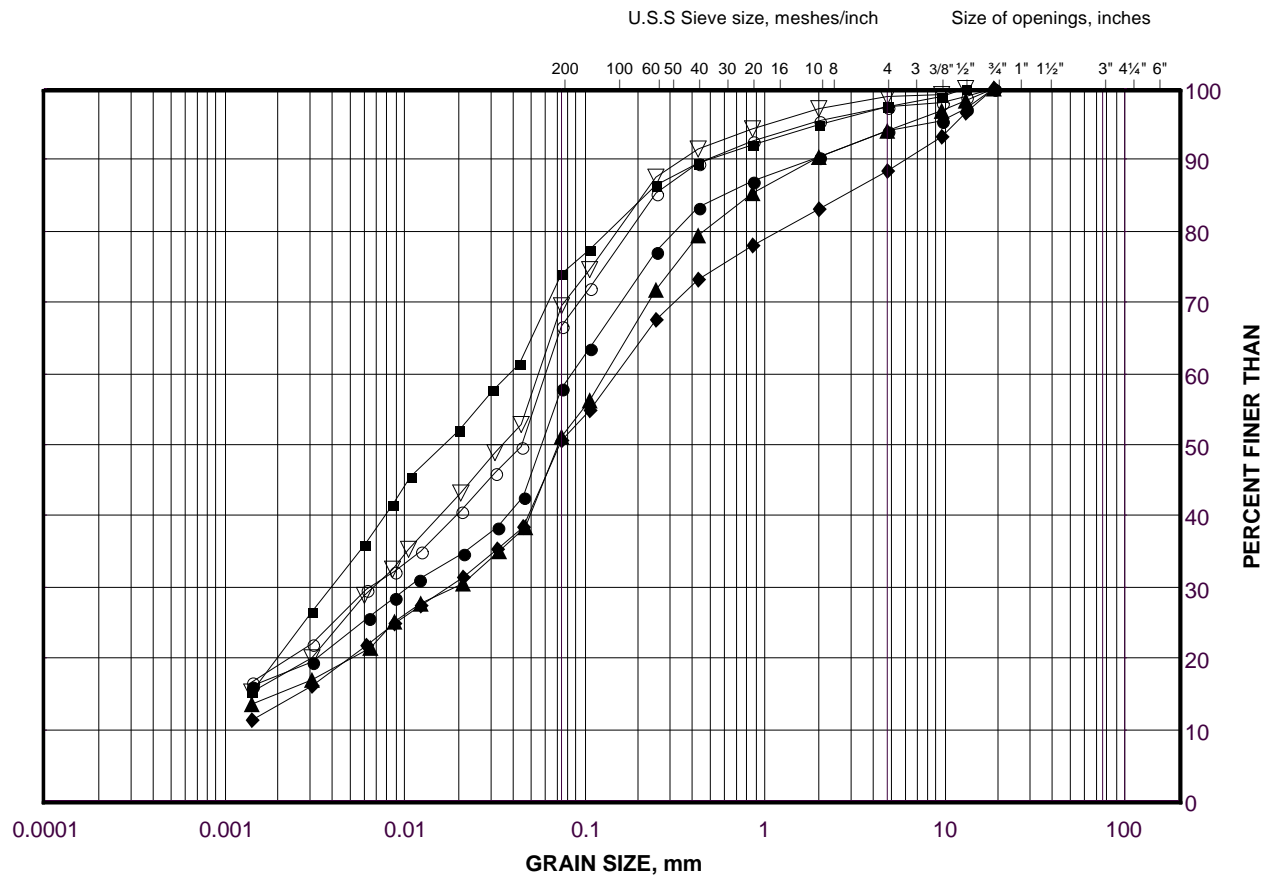
Golder Associates

Date: 15-Sep-14

GRAIN SIZE DISTRIBUTION

Clayey Silt with Sand Fill
(Highway Embankment)

FIGURE F4B



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

LEGEND

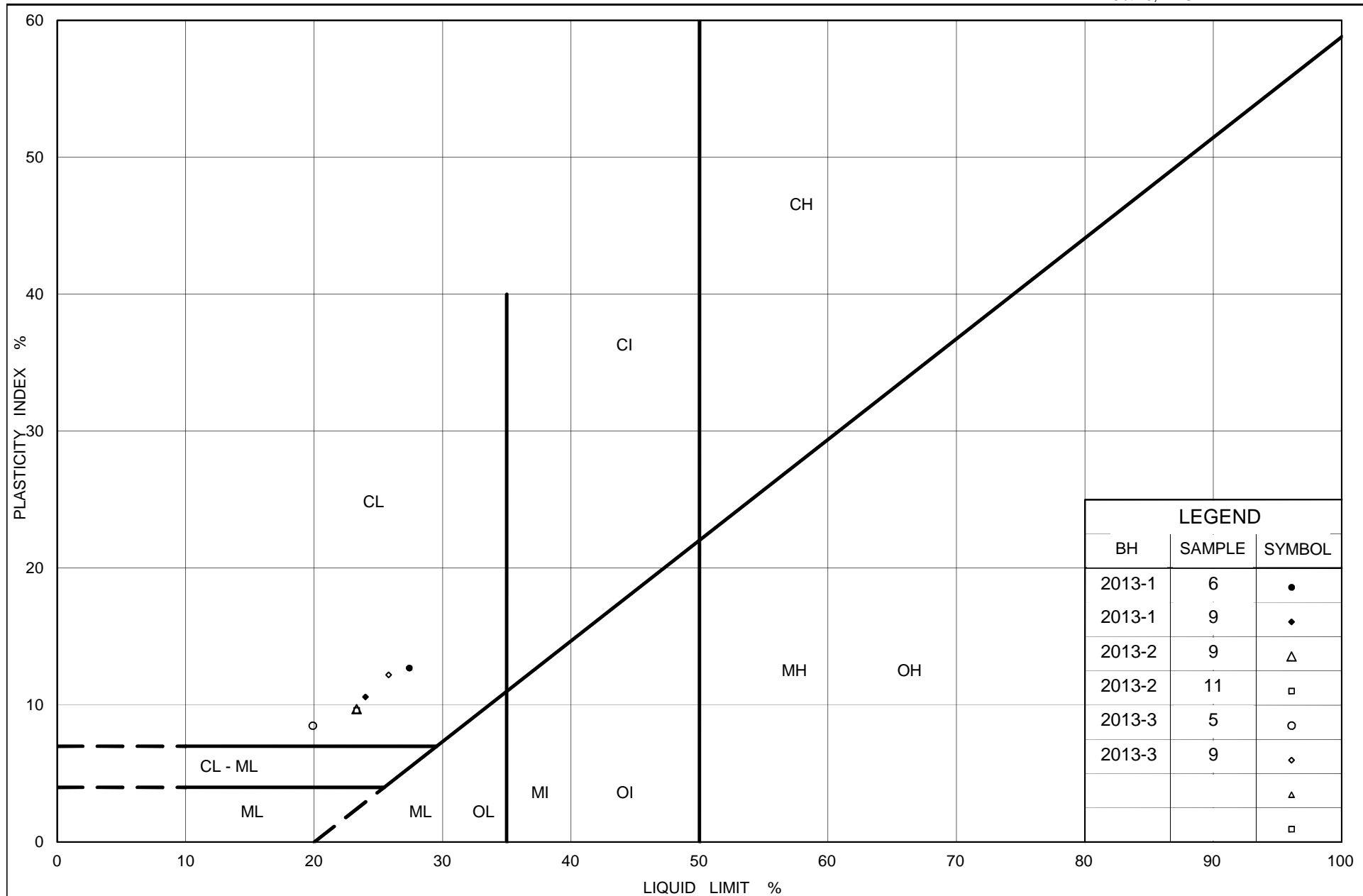
SYMBOL	TEST PIT	SAMPLE	ELEVATION(m)
●	3A	2	162.7
■	2	2	157.2
◆	1	3	157.2
▲	3A	4	161.2
▽	2	4	155.5
○	1	6	154.7

Project Number: 13-1111-0035

Checked By: SMM

Golder Associates

Date: 01-Apr-15



Ministry of Transportation

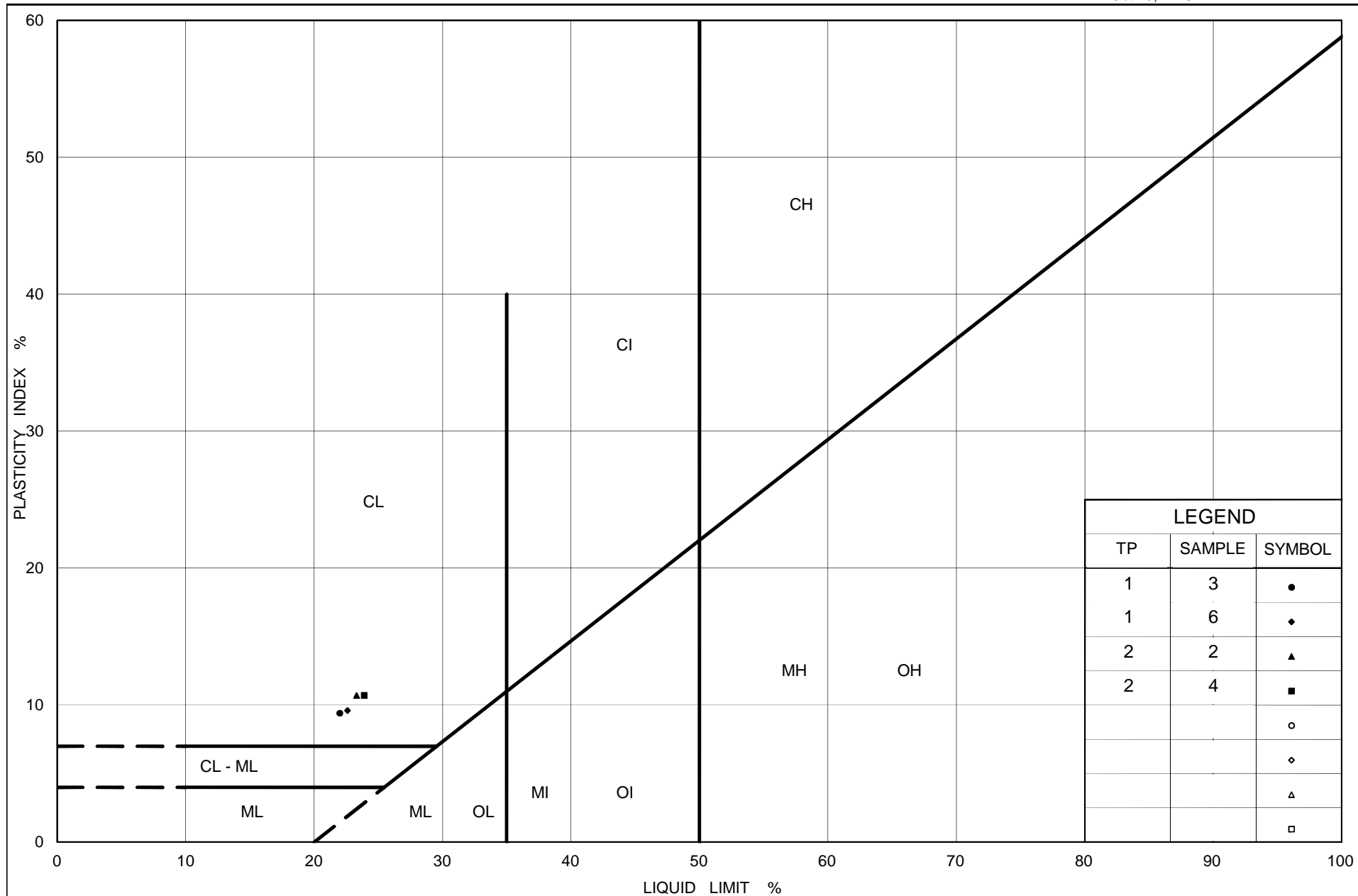
Ontario

PLASTICITY CHART Clayey Silt with Sand Fill (Highway Embankment)

Figure No. F5A

Project No. 13-1111-0035

Checked By: SMM



Ministry of Transportation

Ontario

PLASTICITY CHART Clayey Silt with Sand Fill (Highway Embankment)

Figure No. F5B

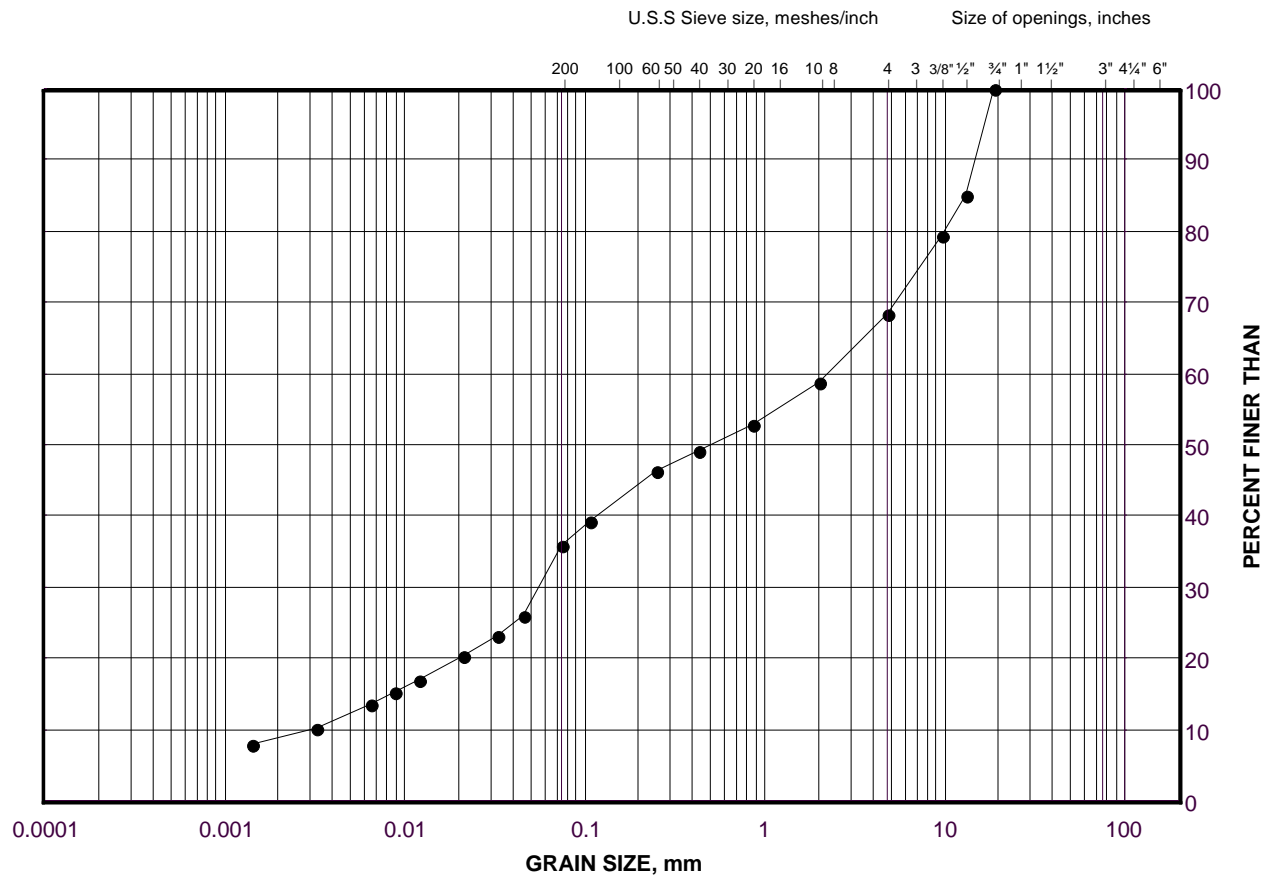
Project No. 13-1111-0035

Checked By: SMM

GRAIN SIZE DISTRIBUTION

Gravelly Silty Sand Fill
(Rail Corridor)

FIGURE F6



LEGEND

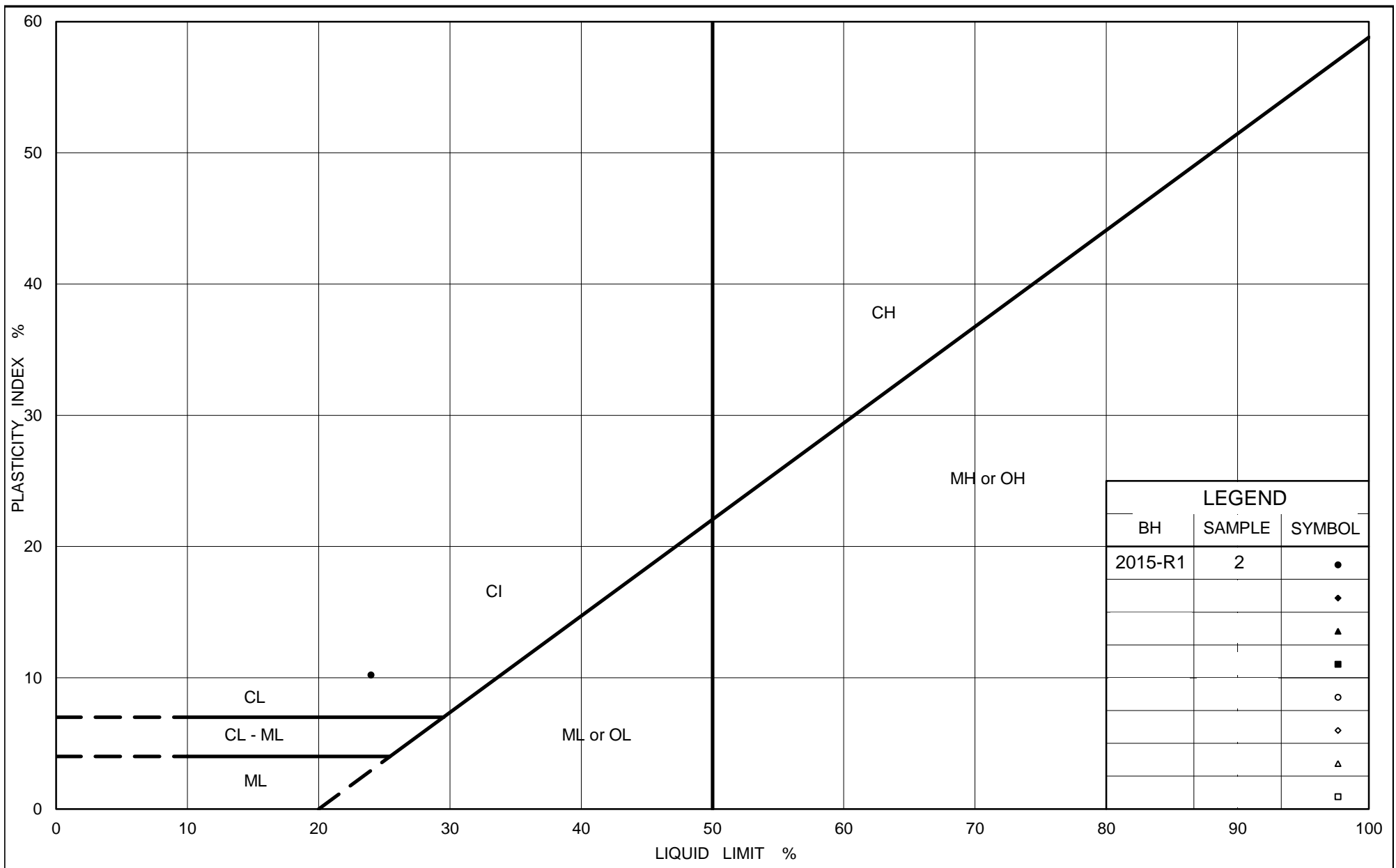
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	2014-R5	2	154.1

Project Number: 13-1111-0035

Checked By: SMM

Golder Associates

Date: 01-Apr-15



PLASTICITY CHART Clayey Silt Fill (Rail Corridor)

Figure No. F7

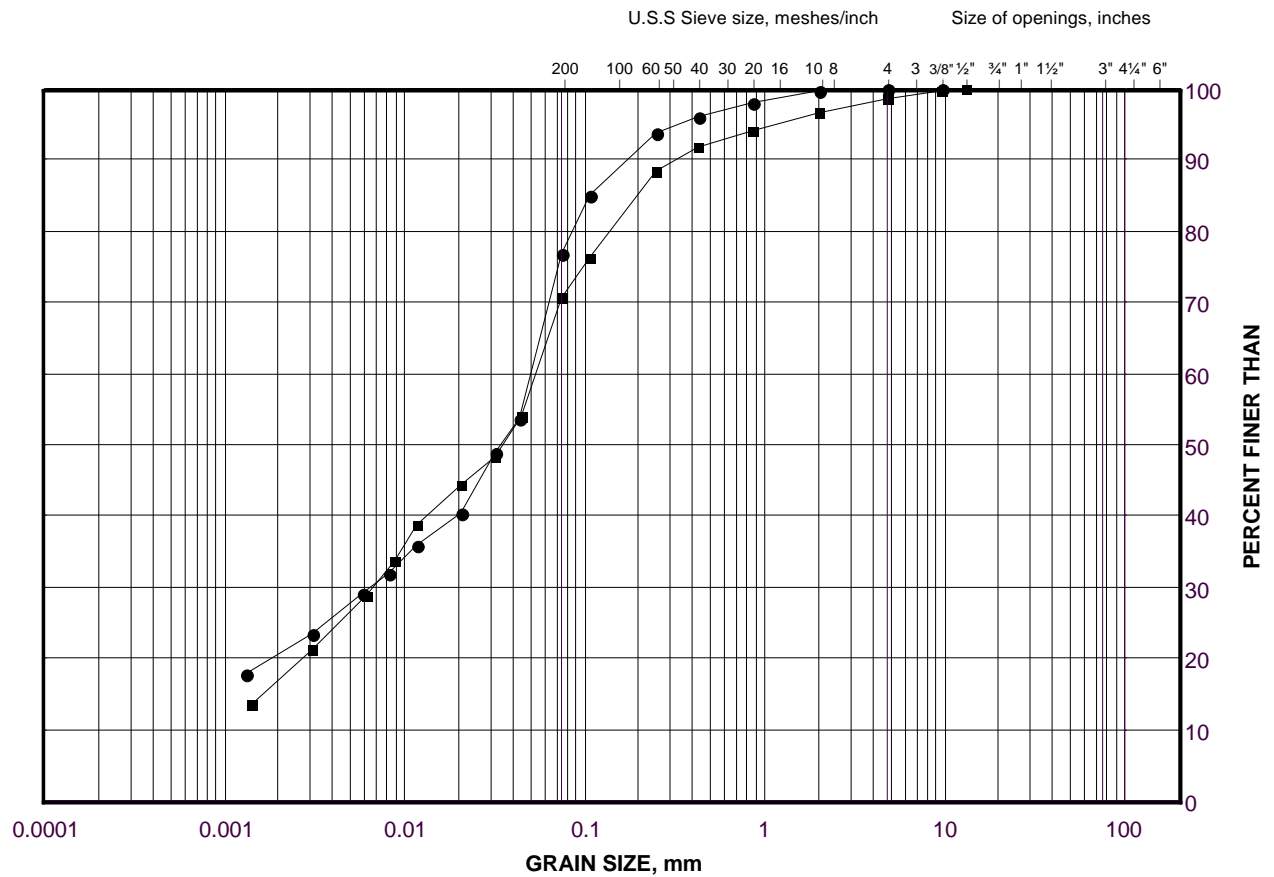
Project No. 13-1111-0035

Checked By: SMM

GRAIN SIZE DISTRIBUTION

Clayey Silt with Sand

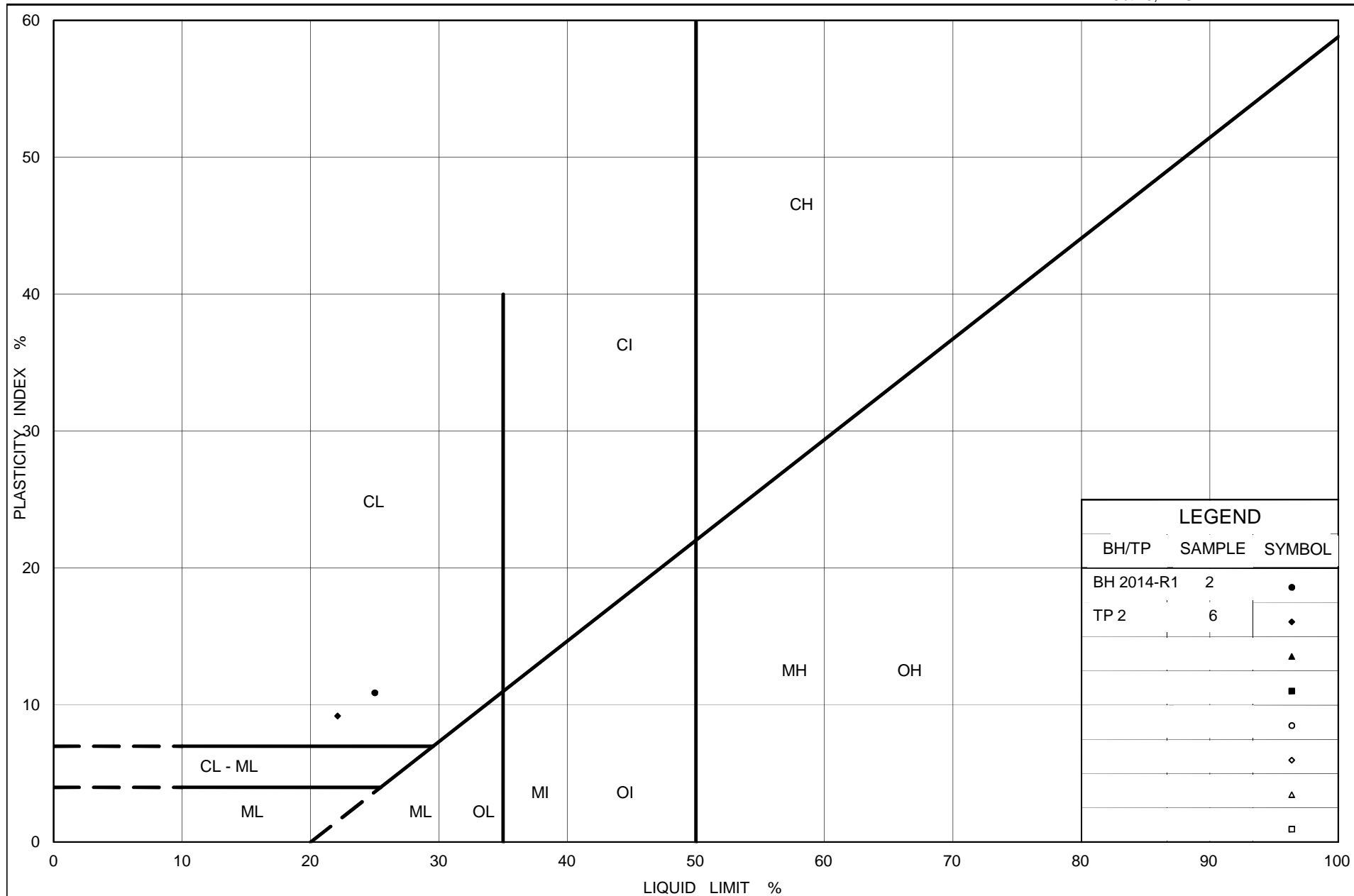
FIGURE F8



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

LEGEND

SYMBOL	BOREHOLE / TEST PIT	SAMPLE	ELEVATION(m)
●	BH 2014-R1	2	157.4
■	TP 2	6	154.5



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PLASTICITY CHART Clayey Silt with Sand

Figure No. F9

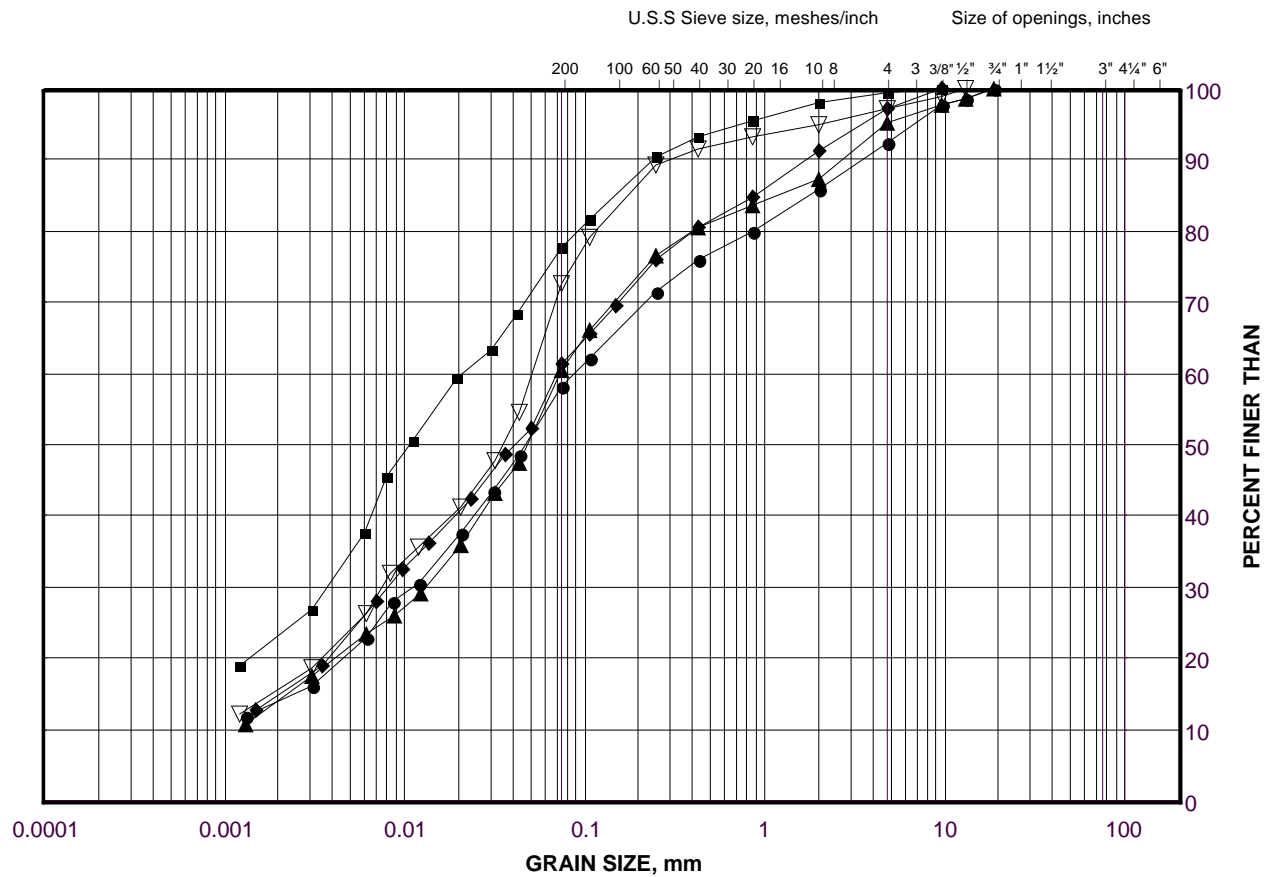
Project No. 13-1111-0035

Checked By: SMM

GRAIN SIZE DISTRIBUTION

Clayey Silt with Sand Till

FIGURE F10A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	2013-4	10	153.7
■	2013-1	12	154.0
◆	2013-2	13	152.2
▲	2013-4	13	150.7
▽	2013-3	13	150.0

Project Number: 13-1111-0035

Checked By: SMM

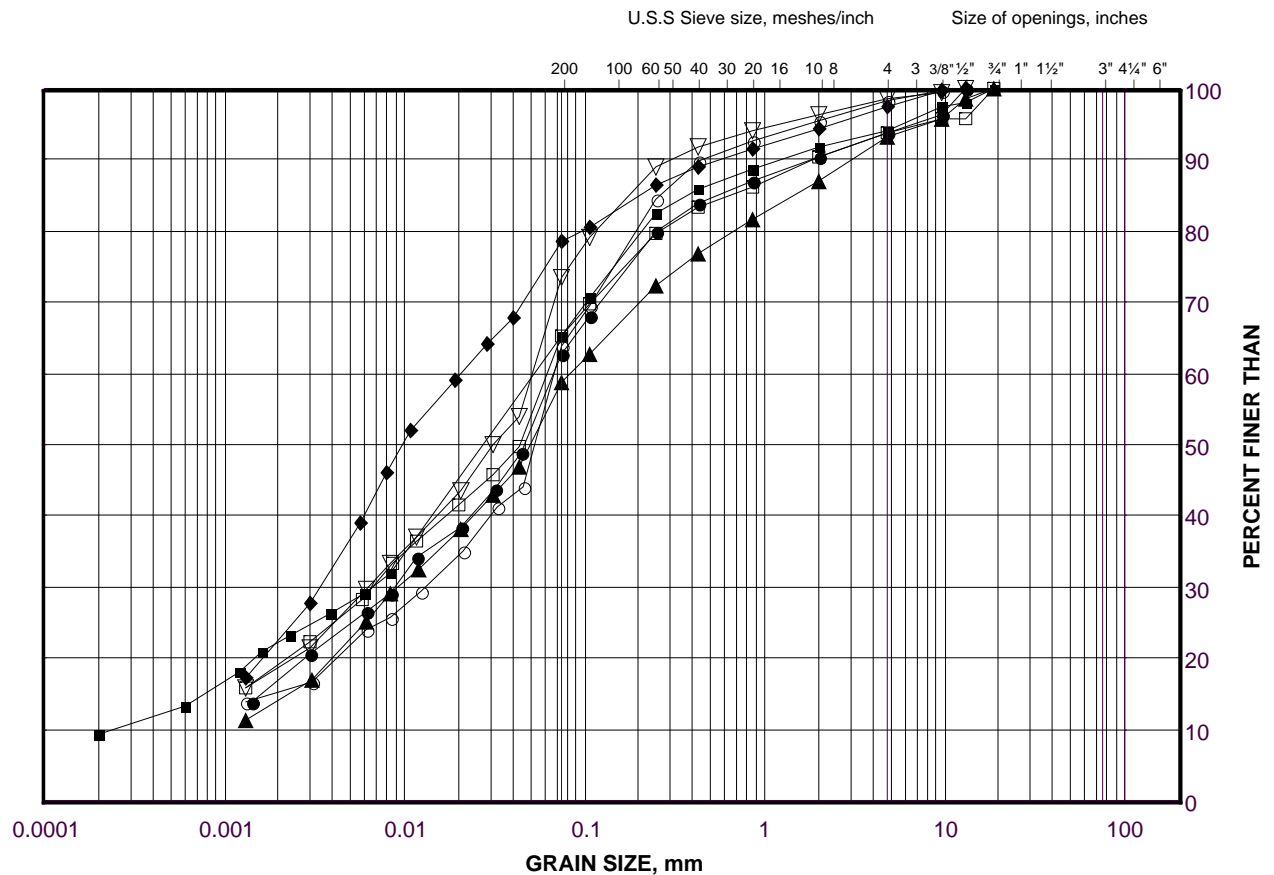
Golder Associates

Date: 16-Sep-14

GRAIN SIZE DISTRIBUTION

Clayey Silt with Sand Till

FIGURE F10B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	2014-R6	3	150.5
■	2015-R1	4	156.2
◆	2014-R12	4	144.8
▲	2014-R3	4	154.2
▽	2014-R2	4	155.4
○	2014-R9	5	147.9
□	2014-R5	6	151.0

Project Number: 13-1111-0035

Checked By: SMM

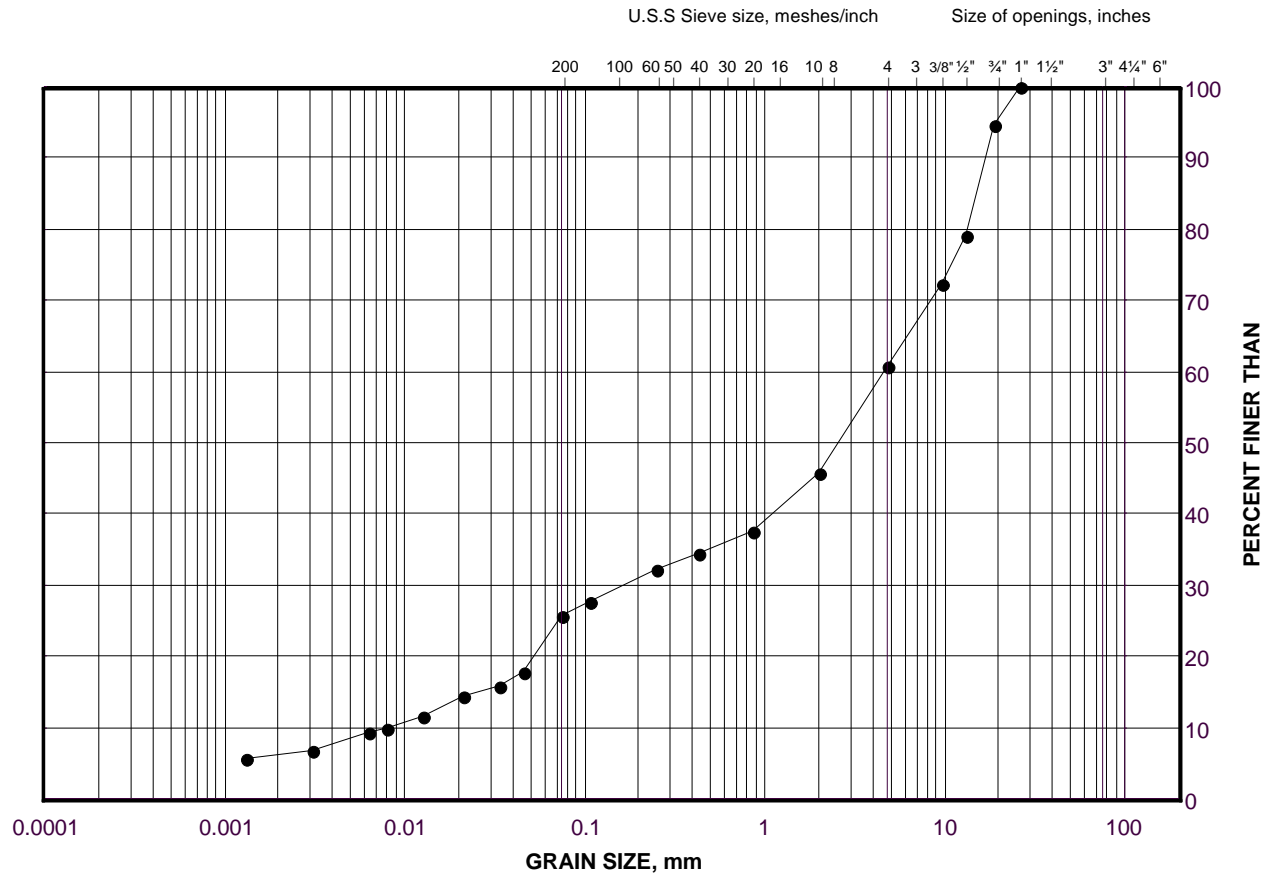
Golder Associates

Date: 22-Dec-15

GRAIN SIZE DISTRIBUTION

Gravelly Sand

FIGURE F11



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

LEGEND

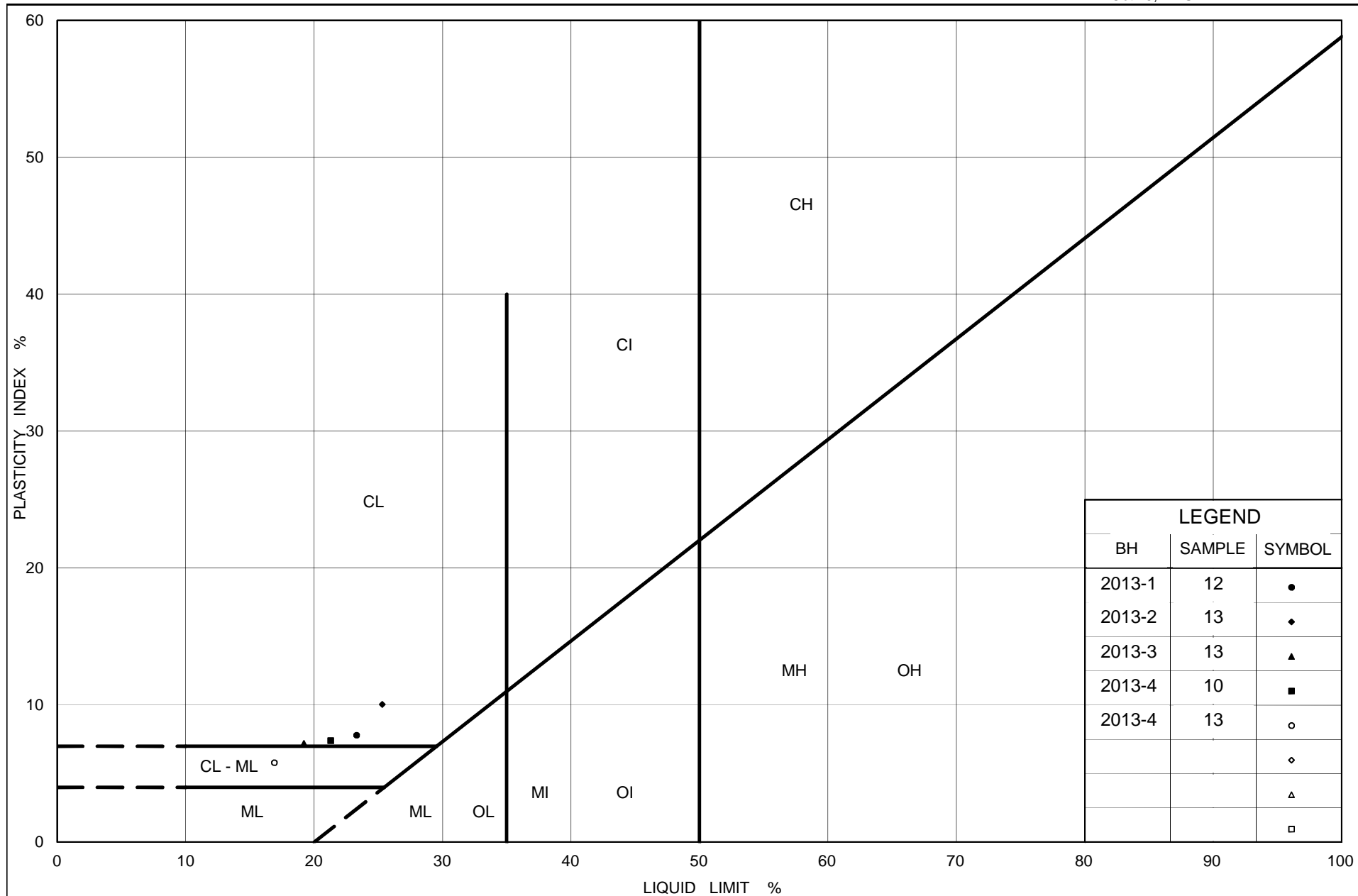
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	2014-R7	4A	149.1

Project Number: 13-1111-0035

Checked By: SMM

Golder Associates

Date: 01-Apr-15



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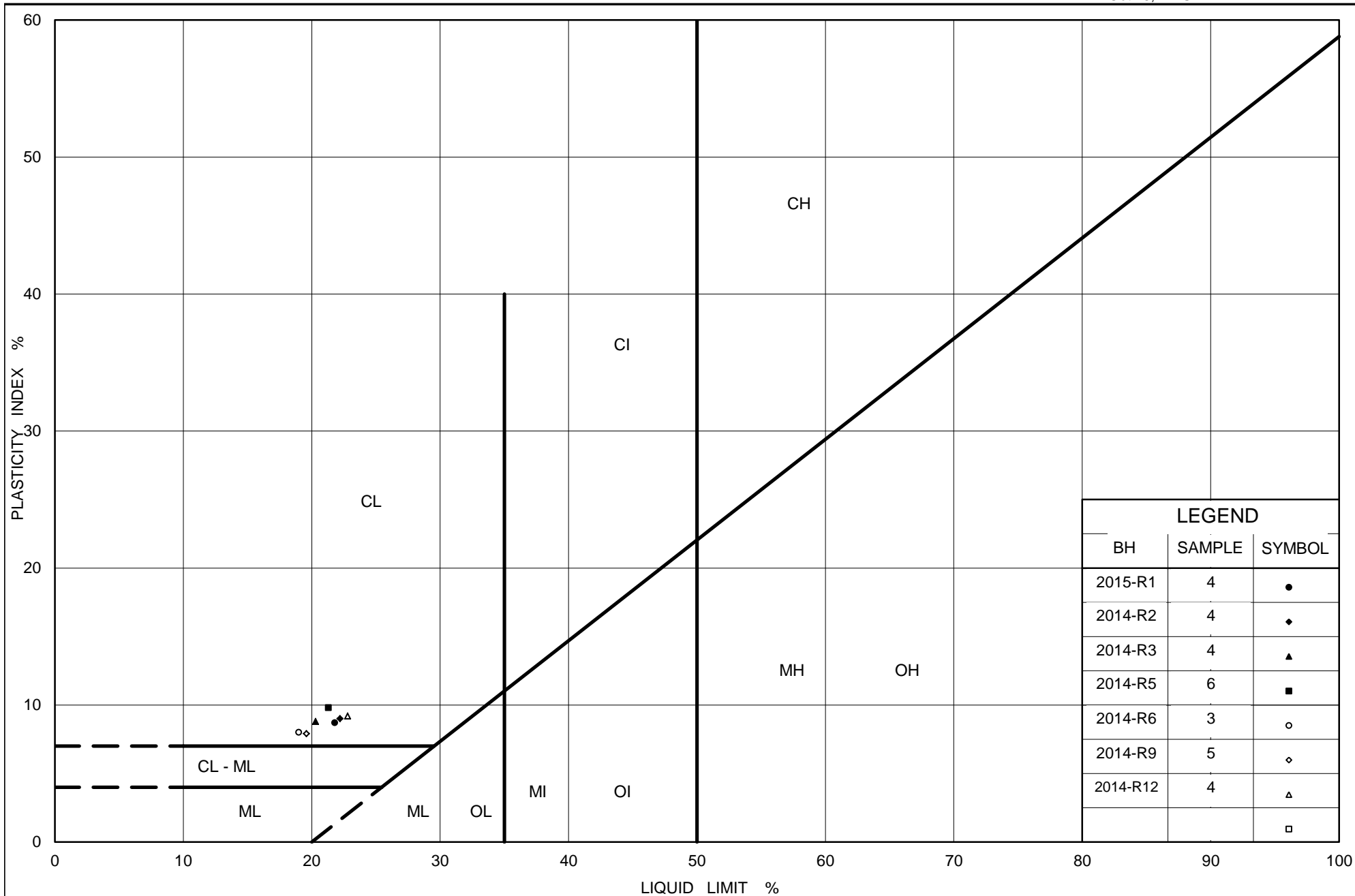
Ontario

PLASTICITY CHART Clayey Silt with Sand Till

Figure No. F12A

Project No. 13-1111-0035

Checked By: SMM



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Ontario

PLASTICITY CHART Clayey Silt with Sand Till

Figure No. F12B

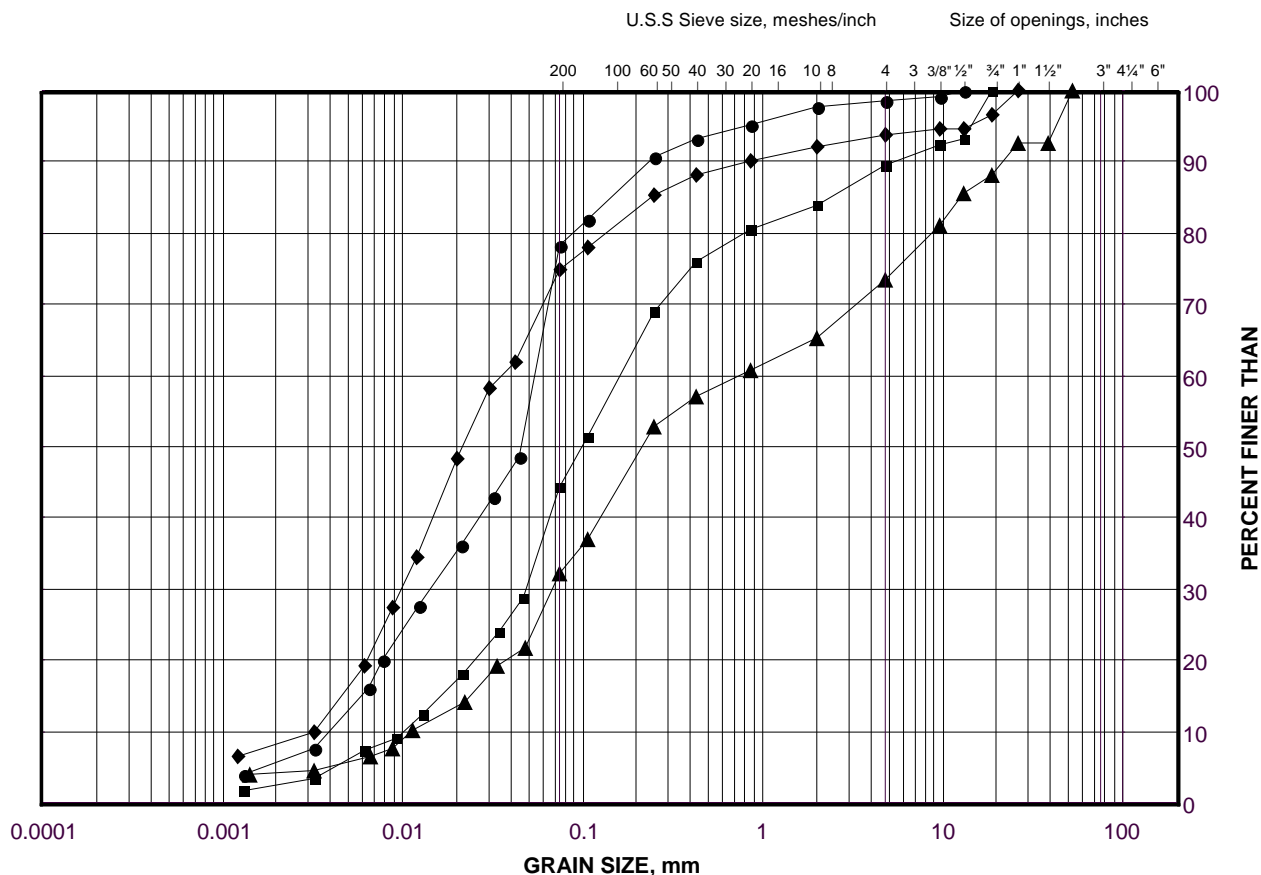
Project No. 13-1111-0035

Checked By: SMM

GRAIN SIZE DISTRIBUTION

Gravelly Silty Sand to Sand and Silt to Silt Till

FIGURE F13



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	2013-1	16	148.0
■	2013-3	18	142.5
◆	2013-2	19	143.1
▲	2013-3A	2	146.8



APPENDIX G

Record of Test Pits Sheets and Photographs (2014)

RECORD OF TEST PIT 1

Project Number: 13-1111-0035

Project Name: Metrolinx Highway 401 Tunnel

Test Pit Number: 1

Test Pit Location: East Side of Highway Embankment (see Drawing 1)

Date: October 7, 2014

Logged by: BM

Approximate Test Pit Ground Elevation: 158.2 m **Test Pit Size:** 3 m W x 5 m H x 3.5 m D

Depth		Soil Description	Sample No.	Sample Depth (m)	Classification Testing			
From (m)	To (m)				Grain Size Distribution			
					Gravel	Sand	Silt	Clay
0	0.1	Topsoil						
			1	0.1				
		FILL - Clayey silt, with sand, trace to some gravel, brown, moist, containing cobbles and boulders, containing construction debris (pieces of plastic pipe approximately 25 mm to 75 mm in size) and pockets of silty sand	2	0.5				
			3	1.0	12%	38%	36%	14%
0.1	3.5		4	1.5				
			5	2.5				
			6	3.5	2%	31%	48%	19%
	3.5	End of Test Pit						

Notes:

1. Test pit dry upon completion.
2. Test pit backfilled upon completion.
3. Atterberg Limit testing carried out on Samples 3 and 6, see Figure G4B for results.


Checked: SMM



Photograph G1: Test Pit 1 during excavation. Cobbles and boulders were encountered in the excavation.



Photograph G2: Completed Test Pit 1

PROJECT		Metrolinx Highway 401 Tunnel Toronto, Ontario		
TITLE		Test Pit 1 – East Side of Highway 401		
	PROJECT No.:	13-1111-0035	FILE No.	----
	DESIGN	--	SCALE	AS SHOWN
	CADD	--	REV.	
	CHECK		Photographs G1 & G2	
	REVIEW	SMM		
		MARCH 2015		




Photograph G3: Boulder found during the excavation of Test Pit 1

PROJECT

Metrolinx Highway 401 Tunnel
Toronto, Ontario

TITLE

Test Pit 1 – East Side of Highway 401



PROJECT No.: 13-1111-0035

FILE No. ----

DESIGN

--

SCALE AS SHOWN

REV.

CADD

--

CHECK

REVIEW

SMM

MARCH 2015

Photograph
G3

RECORD OF TEST PIT 2

Project Number: 13-1111-0035

Project Name: Metrolinx Highway 401 Tunnel

Test Pit Number: 2

Test Pit Location: West Side of Highway Embankment (see Drawing 1)

Date: October 7, 2014

Logged by: BM

Approximate Test Pit Ground Elevation: 158.2 m **Test Pit Size:** 3 m W x 4 m H x 3.7 m D

Depth		Soil Description	Sample No.	Sample Depth (m)	Classification Testing			
From (m)	To (m)				Gran Size Distribution			
					Gravel	Sand	Silt	Clay
0	0.1	Topsoil						
			1	0.1				
0.1	3.0	FILL – Sandy clayey silt, trace gravel, brown to grey, moist, containing cobbles.	2	1.0	2%	25%	53%	20%
			3	1.8				
			4	2.7	1%	29%	53%	17%
			5	1.5-1.8*				
3.0	3.7	Sandy CLAYEY SILT, trace gravel, brown, moist (TILL)	6	3.7	1%	28%	54%	17%
3.7		End of Test Pit						

* Sidewall sample

Notes:

1. Test pit dry upon completion.
2. Test pit backfilled upon completion.
3. Atterberg Limit testing carried out on Samples 2, 4 and 6, see Figures G4B and G7 for results.


Checked: SMM



Photograph G4: Test Pit 2



Photograph G5: Material from the excavation of Test Pit 2

PROJECT		Metrolinx Highway 401 Tunnel Toronto, Ontario			
TITLE		Test Pit 2 – West Side of Highway 401 Embankment			
	PROJECT No.: 13-1111-0035		FILE No. ----		
	DESIGN	--		SCALE AS SHOWN	REV.
	CADD	--		Photographs G4 & G5	
	CHECK				
	REVIEW	SMM	MARCH 2015		

RECORD OF TEST PIT 3A

Project Number: 13-1111-0035

Project Name: Metrolinx Highway 401 Tunnel

Test Pit Number: 3A

Test Pit Location: Highway 401 Median
(See Drawing 1)

Date: October 10, 2014

Logged by: BM

Approximate Test Pit Ground Elev (m): 163.7 m **Test Pit Size:** 1.5 m W x 3 m H x 2.5 m D

Depth		Soil Description	Sample No.	Sample Depth (m)	Classification Testing			
From (m)	To (m)				Grain Size Distribution			
					Gravel	Sand	Silt	Clay
0	0.1	Topsoil						
0.1	2.5	FILL – Clayey silt with sand, trace to some gravel, brown, moist, containing cobbles and construction debris (pieces of plastic pipe approximately 25 mm to 75 mm in size)	1	0.3	6%	36%	41%	17%
			2	1.2	6%	43%	35%	16%
			3	2.0				
			4	2.5				
	2.5	End of Test Pit						

Notes:

1. Test pit dry upon completion.
2. Test pit backfilled upon completion.


Checked: SMM



Photograph G6: Test Pit 3A



Photograph G7: Variable fill within the excavation of Test Pit 3A


PROJECT		Metrolinx Highway 401 Tunnel Toronto, Ontario			
TITLE		Test Pit 3A – Highway 401 Median			
	PROJECT No.: 13-1111-0035		FILE No. ----		
	DESIGN	--	SCALE AS SHOWN	REV.	
	CADD	--			
	CHECK				
	REVIEW	SMM			
		MARCH 2015		Photographs G6 & G7	



Photograph G8: Test Pit 3B



Photograph G9: Material from the excavation of Test Pit 3B

PROJECT		Metrolinx Highway 401 Tunnel Toronto, Ontario			
TITLE		Test Pit 3B – Highway 401 Median			
	PROJECT No.: 13-1111-0035		FILE No. ----		
	DESIGN	--	SCALE AS SHOWN		REV.
	CADD	--	Photographs G8 & G9		
	CHECK				
	REVIEW	SMM	MARCH 2015		

RECORD OF TEST PIT 3B

Project Number: 13-1111-0035

Project Name: Metrolinx Highway 401 Tunnel

Test Pit Number: 3B

Test Pit Location: Highway 401 Median
(See Drawing 1)

Date: October 10, 2014

Logged by: BM

Approximate Test Pit Ground Elev (m): 163.3 m **Test Pit Size:** 1.5 m W x 3 m H x 1.8 m D

Depth		Soil Description	Sample No.	Sample Depth (m)	Classification Testing			
From (m)	To (m)				Grain Size Distribution			
					Gravel	Sand	Silt	Clay
0	0.1	Topsoil						
0.1	1.0	FILL - Silty sand, trace to some clay, some gravel, brown, moist, containing cobbles and construction debris (pieces of plastic pipe approximately 25 mm to 75 mm in size).	1	0.3				
			2	0.9	11%	56%	25%	8%
1.0	1.8	FILL – Sand, some gravel, some silt, trace clay, brown to grey, moist, containing pockets of sandy silt fill	3	1.8	14%	69%	14%	3%
	1.8	End of Test Pit						


Notes:

1. Test pit dry upon completion.
2. Test pit backfilled upon completion.

Checked: SMM




Photograph G10: Completed Test Pit 3B

PROJECT					Metrolinx Highway 401 Tunnel Toronto, Ontario				
TITLE					Test Pit G3 – Highway 401 Median				
					PROJECT No.: 13-1111-0035		FILE No. ----		
					DESIGN	--		SCALE	AS SHOWN
					CADD	--			REV.
					CHECK			Photograph G10	
					REVIEW	SMM	MARCH 2015		



Photograph G10: Completed Test Pit 3B

PROJECT					Metrolinx Highway 401 Tunnel Toronto, Ontario				
TITLE					Test Pit G3 – Highway 401 Median				
					PROJECT No.: 13-1111-0035		FILE No. ----		
					DESIGN	--		SCALE	AS SHOWN
					CADD	--		REV.	
					CHECK			Photograph G10	
					REVIEW	SMM	MARCH 2015		



APPENDIX H

Chemical Analytical Test Results

Your Project #: 13-1111-0035
 Site#: 13-1111-0035
 Site Location: METROLINX
 Your C.O.C. #: 27511

Attention: Sandra McGaghran

Golder Associates Ltd
 6925 Century Ave
 Suite 100
 Mississauga, ON
 L5N 7K2

Report Date: 2013/12/30

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B3M0114

Received: 2013/12/20, 09:55

Sample Matrix: Soil
 # Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Hot Water Extractable Boron	2	2013/12/30	2013/12/30	CAM SOP-00408	R153 Ana. Prot. 2011
Free (WAD) Cyanide	1	N/A	2013/12/24	CAM SOP-00457	Ontario MOE CN-E3015
Free (WAD) Cyanide	1	N/A	2013/12/27	CAM SOP-00457	Ontario MOE CN-E3015
Conductivity	2	N/A	2013/12/30	CAM SOP-00414	MOE LSB E3138 v2
Hexavalent Chromium in Soil by IC (1)	2	2013/12/30	2013/12/30	CAM SOP-00436	EPA SW846-3060/7199
Acid Extr. Metals (aqua regia) by ICPMS	2	2013/12/30	2013/12/30	CAM SOP-00447	EPA 6020
Moisture	2	N/A	2013/12/23	CAM SOP-00445	R.Carter,1993
pH CaCl2 EXTRACT	2	2013/12/24	2013/12/24	CAM SOP-00413	SM 4500H+ B
Sodium Adsorption Ratio (SAR)	2	2013/12/20	2013/12/30	CAM SOP-00102	EPA 6010

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

* Results relate only to the items tested.

(1) Soils are reported on a dry weight basis unless otherwise specified.

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

-2-

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Antonella Brasil, Project Manager
Email: ABrasil@maxxam.ca
Phone# (905) 817-5817

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 2

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

O'REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		UJ0192	UJ0192		UJ0193		
Sampling Date		2013/12/18 12:30	2013/12/18 12:30		2013/12/18 09:30		
	Units	2013-2-4	2013-2-4 Lab-Dup	QC Batch	2013-2-12	RDL	QC Batch
Calculated Parameters							
Sodium Adsorption Ratio	N/A	17		3464451	0.48		3464451
Inorganics							
Chromium (VI)	ug/g	<0.2		3469622	<0.2	0.2	3469622
Conductivity	mS/cm	0.51	0.51	3469672	0.36	0.002	3469672
Free Cyanide	ug/g	<0.01		3466497	<0.01	0.01	3466404
Moisture	%	5.4		3466845	11	1.0	3466845
Available (CaCl ₂) pH	pH	8.62		3467502	7.64		3467502
Metals							
Hot Water Ext. Boron (B)	ug/g	<0.050		3469663	<0.050	0.050	3469663
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	3469631	<0.20	0.20	3469631
Acid Extractable Arsenic (As)	ug/g	1.2	1.0	3469631	4.9	1.0	3469631
Acid Extractable Barium (Ba)	ug/g	8.4	8.7	3469631	51	0.50	3469631
Acid Extractable Beryllium (Be)	ug/g	<0.20	<0.20	3469631	0.46	0.20	3469631
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	3469631	<5.0	5.0	3469631
Acid Extractable Cadmium (Cd)	ug/g	<0.10	<0.10	3469631	0.10	0.10	3469631
Acid Extractable Chromium (Cr)	ug/g	4.1	3.7	3469631	18	1.0	3469631
Acid Extractable Cobalt (Co)	ug/g	2.0	1.9	3469631	13	0.10	3469631
Acid Extractable Copper (Cu)	ug/g	4.2	4.4	3469631	28	0.50	3469631
Acid Extractable Lead (Pb)	ug/g	2.7	2.8	3469631	13	1.0	3469631
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	3469631	<0.50	0.50	3469631
Acid Extractable Nickel (Ni)	ug/g	3.9	3.6	3469631	27	0.50	3469631
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	3469631	<0.50	0.50	3469631
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	3469631	<0.20	0.20	3469631
Acid Extractable Thallium (Tl)	ug/g	<0.050	<0.050	3469631	0.15	0.050	3469631
Acid Extractable Uranium (U)	ug/g	0.41	0.17	3469631	0.56	0.050	3469631
Acid Extractable Vanadium (V)	ug/g	11	8.4	3469631	23	5.0	3469631
Acid Extractable Zinc (Zn)	ug/g	13	12	3469631	59	5.0	3469631
Acid Extractable Mercury (Hg)	ug/g	<0.050	<0.050	3469631	<0.050	0.050	3469631

N/A = Not Applicable

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

Test Summary

Maxxam ID UJ0192
Sample ID 2013-2-4
Matrix Soil

Collected 2013/12/18
Shipped
Received 2013/12/20

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3469663	2013/12/30	2013/12/30	Archana Patel
Free (WAD) Cyanide	TECH	3466497	N/A	2013/12/27	Louise Harding
Conductivity	COND	3469672	N/A	2013/12/30	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3469622	2013/12/30	2013/12/30	Lang Le
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3469631	2013/12/30	2013/12/30	Viviana Canzonieri
Moisture	BAL	3466845	N/A	2013/12/23	Anita Cheema
pH CaCl ₂ EXTRACT		3467502	2013/12/24	2013/12/24	Surinder Rai
Sodium Adsorption Ratio (SAR)	CALC/MET	3464451	2013/12/30	2013/12/30	Automated Statchk

Maxxam ID UJ0192 Dup
Sample ID 2013-2-4
Matrix Soil

Collected 2013/12/18
Shipped
Received 2013/12/20

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Conductivity	COND	3469672	N/A	2013/12/30	Yogesh Patel
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3469631	2013/12/30	2013/12/30	Viviana Canzonieri

Maxxam ID UJ0193
Sample ID 2013-2-12
Matrix Soil

Collected 2013/12/18
Shipped
Received 2013/12/20

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3469663	2013/12/30	2013/12/30	Archana Patel
Free (WAD) Cyanide	TECH	3466404	N/A	2013/12/24	Louise Harding
Conductivity	COND	3469672	N/A	2013/12/30	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3469622	2013/12/30	2013/12/30	Lang Le
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3469631	2013/12/30	2013/12/30	Viviana Canzonieri
Moisture	BAL	3466845	N/A	2013/12/23	Anita Cheema
pH CaCl ₂ EXTRACT		3467502	2013/12/24	2013/12/24	Surinder Rai
Sodium Adsorption Ratio (SAR)	CALC/MET	3464451	2013/12/30	2013/12/30	Automated Statchk

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

Package 1	6.3°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

O'REG 153 METALS & INORGANICS PKG (SOIL)

Hexavalent Chromium in Soil by IC: matrix spike failed possible due to matrix interference.

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3466404	Free Cyanide	2013/12/24	103	75 - 125	108	80 - 120	<0.01	ug/g	NC	35		
3466497	Free Cyanide	2013/12/27	104	75 - 125	100	80 - 120	<0.01	ug/g	NC	35		
3466845	Moisture	2013/12/23							4.3	20		
3469622	Chromium (VI)	2013/12/30	55 ⁽¹⁾	75 - 125	102	80 - 120	<0.2	ug/g	NC	35	109	75 - 125
3469631	Acid Extractable Antimony (Sb)	2013/12/30	98 ⁽²⁾	75 - 125	103	80 - 120	<0.20	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Arsenic (As)	2013/12/30	99 ⁽²⁾	75 - 125	101	80 - 120	<1.0	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Barium (Ba)	2013/12/30	95 ⁽²⁾	75 - 125	102	80 - 120	<0.50	ug/g	2.5 ⁽³⁾	30		
3469631	Acid Extractable Beryllium (Be)	2013/12/30	101 ⁽²⁾	75 - 125	100	80 - 120	<0.20	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Boron (B)	2013/12/30	97 ⁽²⁾	75 - 125	95	80 - 120	<5.0	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Cadmium (Cd)	2013/12/30	99 ⁽²⁾	75 - 125	101	80 - 120	<0.10	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Chromium (Cr)	2013/12/30	102 ⁽²⁾	75 - 125	104	80 - 120	<1.0	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Cobalt (Co)	2013/12/30	103 ⁽²⁾	75 - 125	104	80 - 120	<0.10	ug/g	6.2 ⁽³⁾	30		
3469631	Acid Extractable Copper (Cu)	2013/12/30	100 ⁽²⁾	75 - 125	103	80 - 120	<0.50	ug/g	4.1 ⁽³⁾	30		
3469631	Acid Extractable Lead (Pb)	2013/12/30	101 ⁽²⁾	75 - 125	105	80 - 120	<1.0	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Molybdenum (Mo)	2013/12/30	99 ⁽²⁾	75 - 125	101	80 - 120	<0.50	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Nickel (Ni)	2013/12/30	100 ⁽²⁾	75 - 125	103	80 - 120	<0.50	ug/g	6.1 ⁽³⁾	30		
3469631	Acid Extractable Selenium (Se)	2013/12/30	102 ⁽²⁾	75 - 125	104	80 - 120	<0.50	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Silver (Ag)	2013/12/30	99 ⁽²⁾	75 - 125	102	80 - 120	<0.20	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Thallium (Tl)	2013/12/30	87 ⁽²⁾	75 - 125	98	80 - 120	<0.050	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Uranium (U)	2013/12/30	98 ⁽²⁾	75 - 125	102	80 - 120	<0.050	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Vanadium (V)	2013/12/30	97 ⁽²⁾	75 - 125	101	80 - 120	<5.0	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Zinc (Zn)	2013/12/30	100 ⁽²⁾	75 - 125	106	80 - 120	<5.0	ug/g	NC ⁽³⁾	30		
3469631	Acid Extractable Mercury (Hg)	2013/12/30	110 ⁽²⁾	75 - 125	90	80 - 120	<0.050	ug/g	NC ⁽³⁾	30		
3469663	Hot Water Ext. Boron (B)	2013/12/30	96	75 - 125	101	75 - 125	<0.050	ug/g	22.3	35		
3469672	Conductivity	2013/12/30			98	90 - 110	<0.002	mS/cm	0.6 ⁽³⁾	10		

N/A = Not Applicable

RPD = Relative Percent Difference

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(2) - Matrix Spike Parent ID [UJ0192-01]

(3) - Duplicate Parent ID [UJ0192-01]

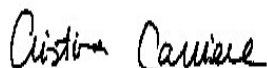
Validation Signature Page

Maxxam Job #: B3M0114

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, Scientific Specialist



Cristina Carriere, Scientific Services

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Page ____ of ____

INVOICE INFORMATION		REPORT INFORMATION (if differs from invoice)		PROJECT INFORMATION		TURNAROUND TIME (TAT) REQUIRED	
Company Name: <u>Golder Associates</u>	Company Name: _____	Quotation #: _____	<input type="checkbox"/> Regular TAT (5-7 days)		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS		
Contact Name: <u>Sandra McGaghran</u>	Contact Name: _____	P.O. #: _____					
Address: <u>Mississauga Office</u>	Address: _____	Project #: <u>2013-1111-0035</u>	Rush TAT (Applicable Surcharge)				
Phone: _____ Fax: _____	Phone: _____ Fax: _____	Site Location: <u>Metrolinx</u>	<input type="checkbox"/> 1 Day (100%)				
Email: <u>Sandra-mcgaghran@golder.com</u>	Email: _____	Site #: _____	<input type="checkbox"/> 2 Days (50%)				
		Sampled By: <u>AMW</u>	<input type="checkbox"/> 3-4 Days (25%)				
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY				ANALYSIS REQUESTED		Rush Confirmation #:	
REGULATION 153 (2011) <input checked="" type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other <input type="checkbox"/> Table _____ FOR RSC (PLEASE CIRCLE) YES / NO		OTHER REGULATIONS <input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw <input type="checkbox"/> MISA <input type="checkbox"/> Storm Sewer Bylaw <input type="checkbox"/> PWQO Municipality: _____ <input type="checkbox"/> Other (Specify): _____ <input type="checkbox"/> REG 558 (MINIMUM 3 DAY TAT REQUIRED)		FIELD FILTERED (PLEASE CIRCLE) Metals / Hg / CrVI <u>Metals & Inorganics</u>		Date Required: _____ LABORATORY USE ONLY CUSTODY SEAL (Y/N) <input checked="" type="checkbox"/> Temperature (°C) on Receipt Present: _____ Intact: _____ COOLING MEDIA PRESENT (Y/N) <input checked="" type="checkbox"/> <u>6/6/7°C</u>	
Include Criteria on Certificate of Analysis (Y/N)? _____							
SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM							
SAMPLE IDENTIFICATION		DATE SAMPLED	TIME SAMPLED	MATRIX	# OF CONT.	COMMENTS / TAT COMMENTS	
1	<u>2013-2-4</u>	<u>12/18/13</u>	<u>12:30</u>	<u>S</u>			
2	<u>2013-2-12</u>	<u>12/18/13</u>	<u>01:30 AM</u>	<u>S</u>			
3							
4							
5							
6							
7							
8							
9							
10							
RELINQUISHED BY: (Signature/Print)		DATE: (YYYY/MM/DD)	TIME:	RECEIVED BY: (Signature/Print)		DATE: (YYYY/MM/DD)	TIME:
<u>Aussie</u>		<u>2013/12/20</u>		<u>AMW</u>		<u>2013/12/20</u>	<u>9:55</u>

REC'D IN LONDON

20-Dec-13 09:55

Antonella Brasil



B3M0114

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Page ____ of ____

INVOICE INFORMATION	REPORT INFORMATION (if differs from invoice)	PROJECT INFORMATION	TURNAROUND TIME (TAT) REQUIRED
Company Name: <u>Golder Associates</u>	Company Name:	Quotation #:	<input type="checkbox"/> Regular TAT (5-7 days)
Contact Name: <u>Sandra McGaghran</u>	Contact Name:	P.O. #:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: <u>Mississauga Office</u>	Address:	Project #: <u>2013-1111-0035</u>	
Phone:	Phone:	Site Location: <u>Metrolinx</u>	Rush TAT (Applicable Surcharge)
Fax:	Fax:	Site #:	<input type="checkbox"/> 1 Day (100%)
Email: <u>Sandra-mcgaghran@golder.com</u>	Email:	Sampled By: <u>AMW</u>	<input type="checkbox"/> 2 Days (50%)
			<input type="checkbox"/> 3-4 Days (25%)

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY		ANALYSIS REQUESTED	Rush Confirmation #:
REGULATION 153 (2011) <input checked="" type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other <input type="checkbox"/> Table _____ FOR RSC (PLEASE CIRCLE) YES / NO	OTHER REGULATIONS <input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw <input type="checkbox"/> MISA <input type="checkbox"/> Storm Sewer Bylaw <input type="checkbox"/> PWQO Municipality: _____ <input type="checkbox"/> Other (Specify): _____ <input type="checkbox"/> REG 558 (MINIMUM 3 DAY TAT REQUIRED)	ANALYSIS REQUESTED FIELD FILTERED (PLEASE CIRCLE) Metals / Hg / CrVI <u>Metals & Inorganics</u>	Date Required: LABORATORY USE ONLY CUSTODY SEAL (Y/N) <input checked="" type="checkbox"/> Temperature (°C) on Receipt Present <u>6/6/7°C</u> Intact COOLING MEDIA PRESENT (Y/N) <input checked="" type="checkbox"/> <u>2/3/4°C</u>
Include Criteria on Certificate of Analysis (Y/N)? _____			
SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM			

SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX	# OF CONT.	FIELD FILTERED (PLEASE CIRCLE) Metals / Hg / CrVI	ANALYSIS REQUESTED	COMMENTS / TAT COMMENTS
1 <u>2013-2-4</u>	<u>12/18/13</u>	<u>12:30</u>	<u>S</u>		<u>X</u>		
2 <u>2013-2-12</u>	<u>12/18/13</u>	<u>10:30 AM</u>	<u>S</u>		<u>X</u>		
3							
4							
5							
6							
7							
8							
9							
10							

REC'D IN LONDON

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME:	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME:	# JARS USED AND NOT SUBMITTED
<u>Aussie</u>	<u>2013/12/20</u>		<u>Antonella Brasil</u>	<u>2013/12/20</u>	<u>9:55</u>	
			<u>CHRISTINA KAWA</u>	<u>2013/12/20</u>	<u>17:44</u>	

20-Dec-13 09:55

Antonella Brasil



B3M0114

Your Project #: 13-1111-0035
 Site#: 13-1111-0035
 Site Location: METROLINX
 Your C.O.C. #: 27511

Attention: Sandra McGaghran

Golder Associates Ltd
 6925 Century Ave
 Suite 100
 Mississauga, ON
 L5N 7K2

Report Date: 2013/12/30

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B3M0114

Received: 2013/12/20, 09:55

Sample Matrix: Soil
 # Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Hot Water Extractable Boron	2	2013/12/30	2013/12/30	CAM SOP-00408	R153 Ana. Prot. 2011
Free (WAD) Cyanide	1	N/A	2013/12/24	CAM SOP-00457	Ontario MOE CN-E3015
Free (WAD) Cyanide	1	N/A	2013/12/27	CAM SOP-00457	Ontario MOE CN-E3015
Conductivity	2	N/A	2013/12/30	CAM SOP-00414	MOE LSB E3138 v2
Hexavalent Chromium in Soil by IC (1)	2	2013/12/30	2013/12/30	CAM SOP-00436	EPA SW846-3060/7199
Acid Extr. Metals (aqua regia) by ICPMS	2	2013/12/30	2013/12/30	CAM SOP-00447	EPA 6020
Moisture	2	N/A	2013/12/23	CAM SOP-00445	R.Carter, 1993
pH CaCl2 EXTRACT	2	2013/12/24	2013/12/24	CAM SOP-00413	SM 4500H+ B
Sodium Adsorption Ratio (SAR)	2	2013/12/20	2013/12/30	CAM SOP-00102	EPA 6010

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Soils are reported on a dry weight basis unless otherwise specified.

Your Project #: 13-1111-0035
Site#: 13-1111-0035
Site Location: METROLINX
Your C.O.C. #: 27511

Attention:Sandra McGaghran

Golder Associates Ltd
6925 Century Ave
Suite 100
Mississauga, ON
L5N 7K2

Report Date: 2013/12/30

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B3M0114
Received: 2013/12/20, 09:55

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Antonella Brasil, Project Manager
Email: ABrasil@maxxam.ca
Phone# (905)817-5817

=====

This report has been generated and distributed using a secure automated process.

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

O'REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		UJ0192	UJ0192		UJ0193		
Sampling Date		2013/12/18 12:30	2013/12/18 12:30		2013/12/18 09:30		
COC Number		27511	27511		27511		
	Units	2013-2-4	2013-2-4 Lab-Dup	QC Batch	2013-2-12	RDL	QC Batch

Calculated Parameters							
Sodium Adsorption Ratio	N/A	17		3464451	0.48		3464451
Inorganics							
Chromium (VI)	ug/g	<0.2		3469622	<0.2	0.2	3469622
Conductivity	mS/cm	0.51	0.51	3469672	0.36	0.002	3469672
Free Cyanide	ug/g	<0.01		3466497	<0.01	0.01	3466404
Moisture	%	5.4		3466845	11	1.0	3466845
Available (CaCl2) pH	pH	8.62		3467502	7.64	N/A	3467502
Metals							
Hot Water Ext. Boron (B)	ug/g	<0.050		3469663	<0.050	0.050	3469663
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	3469631	<0.20	0.20	3469631
Acid Extractable Arsenic (As)	ug/g	1.2	1.0	3469631	4.9	1.0	3469631
Acid Extractable Barium (Ba)	ug/g	8.4	8.7	3469631	51	0.50	3469631
Acid Extractable Beryllium (Be)	ug/g	<0.20	<0.20	3469631	0.46	0.20	3469631
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	3469631	<5.0	5.0	3469631
Acid Extractable Cadmium (Cd)	ug/g	<0.10	<0.10	3469631	0.10	0.10	3469631
Acid Extractable Chromium (Cr)	ug/g	4.1	3.7	3469631	18	1.0	3469631
Acid Extractable Cobalt (Co)	ug/g	2.0	1.9	3469631	13	0.10	3469631
Acid Extractable Copper (Cu)	ug/g	4.2	4.4	3469631	28	0.50	3469631
Acid Extractable Lead (Pb)	ug/g	2.7	2.8	3469631	13	1.0	3469631
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	3469631	<0.50	0.50	3469631
Acid Extractable Nickel (Ni)	ug/g	3.9	3.6	3469631	27	0.50	3469631
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	3469631	<0.50	0.50	3469631
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	3469631	<0.20	0.20	3469631
Acid Extractable Thallium (Tl)	ug/g	<0.050	<0.050	3469631	0.15	0.050	3469631
Acid Extractable Uranium (U)	ug/g	0.41	0.17	3469631	0.56	0.050	3469631
Acid Extractable Vanadium (V)	ug/g	11	8.4	3469631	23	5.0	3469631
Acid Extractable Zinc (Zn)	ug/g	13	12	3469631	59	5.0	3469631
Acid Extractable Mercury (Hg)	ug/g	<0.050	<0.050	3469631	<0.050	0.050	3469631
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable							

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

TEST SUMMARY

Maxxam ID: UJ0192
Sample ID: 2013-2-4
Matrix: Soil

Collected: 2013/12/18
Shipped:
Received: 2013/12/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3469663	2013/12/30	2013/12/30	Archana Patel
Free (WAD) Cyanide	TECH	3466497	N/A	2013/12/27	Louise Harding
Conductivity	COND	3469672	N/A	2013/12/30	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3469622	2013/12/30	2013/12/30	Lang Le
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3469631	2013/12/30	2013/12/30	Viviana Canzonieri
Moisture	BAL	3466845	N/A	2013/12/23	Anita Cheema
pH CaCl2 EXTRACT		3467502	2013/12/24	2013/12/24	Surinder Rai
Sodium Adsorption Ratio (SAR)	CALC/MET	3464451	2013/12/30	2013/12/30	Automated Statchk

Maxxam ID: UJ0192 Dup
Sample ID: 2013-2-4
Matrix: Soil

Collected: 2013/12/18
Shipped:
Received: 2013/12/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity	COND	3469672	N/A	2013/12/30	Yogesh Patel
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3469631	2013/12/30	2013/12/30	Viviana Canzonieri

Maxxam ID: UJ0193
Sample ID: 2013-2-12
Matrix: Soil

Collected: 2013/12/18
Shipped:
Received: 2013/12/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3469663	2013/12/30	2013/12/30	Archana Patel
Free (WAD) Cyanide	TECH	3466404	N/A	2013/12/24	Louise Harding
Conductivity	COND	3469672	N/A	2013/12/30	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3469622	2013/12/30	2013/12/30	Lang Le
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3469631	2013/12/30	2013/12/30	Viviana Canzonieri
Moisture	BAL	3466845	N/A	2013/12/23	Anita Cheema
pH CaCl2 EXTRACT		3467502	2013/12/24	2013/12/24	Surinder Rai
Sodium Adsorption Ratio (SAR)	CALC/MET	3464451	2013/12/30	2013/12/30	Automated Statchk

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.3°C
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O'REG 153 METALS & INORGANICS PKG (SOIL)

Hexavalent Chromium in Soil by IC: matrix spike failed possible due to matrix interference.

Results relate only to the items tested.

Maxxam Job #: B3M0114

Report Date: 2013/12/30

Golder Associates Ltd

Client Project #: 13-1111-0035

Site Location: METROLINX

Sampler Initials: AMW

QUALITY ASSURANCE REPORT

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
	3466404	LHA	Matrix Spike	Free Cyanide	2013/12/24		103	%	75 - 125
	3466404	LHA	Spiked Blank	Free Cyanide	2013/12/24		108	%	80 - 120
	3466404	LHA	Method Blank	Free Cyanide	2013/12/24	<0.01		ug/g	
	3466404	LHA	RPD	Free Cyanide	2013/12/24	NC		%	35
	3466497	LHA	Matrix Spike	Free Cyanide	2013/12/27		104	%	75 - 125
	3466497	LHA	Spiked Blank	Free Cyanide	2013/12/27		100	%	80 - 120
	3466497	LHA	Method Blank	Free Cyanide	2013/12/27	<0.01		ug/g	
	3466497	LHA	RPD	Free Cyanide	2013/12/27	NC		%	35
	3466845	JK1	RPD	Moisture	2013/12/23	4.3		%	20
	3469622	LLE	Matrix Spike	Chromium (VI)	2013/12/30		55 (1)	%	75 - 125
	3469622	LLE	QC Standard	Chromium (VI)	2013/12/30		109	%	75 - 125
	3469622	LLE	Spiked Blank	Chromium (VI)	2013/12/30		102	%	80 - 120
	3469622	LLE	Method Blank	Chromium (VI)	2013/12/30	<0.2		ug/g	
	3469622	LLE	RPD	Chromium (VI)	2013/12/30	NC		%	35
	3469631	VIV	Matrix Spike [UJ0192-01]	Acid Extractable Antimony (Sb)	2013/12/30		98	%	75 - 125
				Acid Extractable Arsenic (As)	2013/12/30		99	%	75 - 125
				Acid Extractable Barium (Ba)	2013/12/30		95	%	75 - 125
				Acid Extractable Beryllium (Be)	2013/12/30		101	%	75 - 125
				Acid Extractable Boron (B)	2013/12/30		97	%	75 - 125
				Acid Extractable Cadmium (Cd)	2013/12/30		99	%	75 - 125
				Acid Extractable Chromium (Cr)	2013/12/30		102	%	75 - 125
				Acid Extractable Cobalt (Co)	2013/12/30		103	%	75 - 125
				Acid Extractable Copper (Cu)	2013/12/30		100	%	75 - 125
				Acid Extractable Lead (Pb)	2013/12/30		101	%	75 - 125
				Acid Extractable Molybdenum (Mo)	2013/12/30		99	%	75 - 125
				Acid Extractable Nickel (Ni)	2013/12/30		100	%	75 - 125
				Acid Extractable Selenium (Se)	2013/12/30		102	%	75 - 125
				Acid Extractable Silver (Ag)	2013/12/30		99	%	75 - 125
				Acid Extractable Thallium (Tl)	2013/12/30		87	%	75 - 125
				Acid Extractable Uranium (U)	2013/12/30		98	%	75 - 125
				Acid Extractable Vanadium (V)	2013/12/30		97	%	75 - 125
				Acid Extractable Zinc (Zn)	2013/12/30		100	%	75 - 125
	3469631	VIV	Spiked Blank	Acid Extractable Mercury (Hg)	2013/12/30		110	%	75 - 125
				Acid Extractable Antimony (Sb)	2013/12/30		103	%	80 - 120
				Acid Extractable Arsenic (As)	2013/12/30		101	%	80 - 120
				Acid Extractable Barium (Ba)	2013/12/30		102	%	80 - 120
				Acid Extractable Beryllium (Be)	2013/12/30		100	%	80 - 120
				Acid Extractable Boron (B)	2013/12/30		95	%	80 - 120
				Acid Extractable Cadmium (Cd)	2013/12/30		101	%	80 - 120
				Acid Extractable Chromium (Cr)	2013/12/30		104	%	80 - 120
				Acid Extractable Cobalt (Co)	2013/12/30		104	%	80 - 120
				Acid Extractable Copper (Cu)	2013/12/30		103	%	80 - 120
				Acid Extractable Lead (Pb)	2013/12/30		105	%	80 - 120
				Acid Extractable Molybdenum (Mo)	2013/12/30		101	%	80 - 120
				Acid Extractable Nickel (Ni)	2013/12/30		103	%	80 - 120
				Acid Extractable Selenium (Se)	2013/12/30		104	%	80 - 120
				Acid Extractable Silver (Ag)	2013/12/30		102	%	80 - 120
				Acid Extractable Thallium (Tl)	2013/12/30		98	%	80 - 120
				Acid Extractable Uranium (U)	2013/12/30		102	%	80 - 120
				Acid Extractable Vanadium (V)	2013/12/30		101	%	80 - 120
				Acid Extractable Zinc (Zn)	2013/12/30		106	%	80 - 120
	3469631	VIV	Method Blank	Acid Extractable Mercury (Hg)	2013/12/30		90	%	80 - 120
				Acid Extractable Antimony (Sb)	2013/12/30	<0.20		ug/g	
				Acid Extractable Arsenic (As)	2013/12/30	<1.0		ug/g	
				Acid Extractable Barium (Ba)	2013/12/30	<0.50		ug/g	
				Acid Extractable Beryllium (Be)	2013/12/30	<0.20		ug/g	
				Acid Extractable Boron (B)	2013/12/30	<5.0		ug/g	
				Acid Extractable Cadmium (Cd)	2013/12/30	<0.10		ug/g	
				Acid Extractable Chromium (Cr)	2013/12/30	<1.0		ug/g	
				Acid Extractable Cobalt (Co)	2013/12/30	<0.10		ug/g	
				Acid Extractable Copper (Cu)	2013/12/30	<0.50		ug/g	
				Acid Extractable Lead (Pb)	2013/12/30	<1.0		ug/g	

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
3469631	VIV	RPD [UJ0192-01]	Acid Extractable Molybdenum (Mo)	2013/12/30	<0.50		ug/g	
			Acid Extractable Nickel (Ni)	2013/12/30	<0.50		ug/g	
			Acid Extractable Selenium (Se)	2013/12/30	<0.50		ug/g	
			Acid Extractable Silver (Ag)	2013/12/30	<0.20		ug/g	
			Acid Extractable Thallium (Tl)	2013/12/30	<0.050		ug/g	
			Acid Extractable Uranium (U)	2013/12/30	<0.050		ug/g	
			Acid Extractable Vanadium (V)	2013/12/30	<5.0		ug/g	
			Acid Extractable Zinc (Zn)	2013/12/30	<5.0		ug/g	
			Acid Extractable Mercury (Hg)	2013/12/30	<0.050		ug/g	
			Acid Extractable Antimony (Sb)	2013/12/30	NC		%	30
			Acid Extractable Arsenic (As)	2013/12/30	NC		%	30
			Acid Extractable Barium (Ba)	2013/12/30	2.5		%	30
			Acid Extractable Beryllium (Be)	2013/12/30	NC		%	30
			Acid Extractable Boron (B)	2013/12/30	NC		%	30
			Acid Extractable Cadmium (Cd)	2013/12/30	NC		%	30
			Acid Extractable Chromium (Cr)	2013/12/30	NC		%	30
			Acid Extractable Cobalt (Co)	2013/12/30	6.2		%	30
			Acid Extractable Copper (Cu)	2013/12/30	4.1		%	30
			Acid Extractable Lead (Pb)	2013/12/30	NC		%	30
			Acid Extractable Molybdenum (Mo)	2013/12/30	NC		%	30
			Acid Extractable Nickel (Ni)	2013/12/30	6.1		%	30
			Acid Extractable Selenium (Se)	2013/12/30	NC		%	30
			Acid Extractable Silver (Ag)	2013/12/30	NC		%	30
			Acid Extractable Thallium (Tl)	2013/12/30	NC		%	30
			Acid Extractable Uranium (U)	2013/12/30	NC		%	30
			Acid Extractable Vanadium (V)	2013/12/30	NC		%	30
			Acid Extractable Zinc (Zn)	2013/12/30	NC		%	30
			Acid Extractable Mercury (Hg)	2013/12/30	NC		%	30
3469663	APT	Matrix Spike	Hot Water Ext. Boron (B)	2013/12/30		96	%	75 - 125
3469663	APT	Spiked Blank	Hot Water Ext. Boron (B)	2013/12/30		101	%	75 - 125
3469663	APT	Method Blank	Hot Water Ext. Boron (B)	2013/12/30	<0.050		ug/g	
3469663	APT	RPD	Hot Water Ext. Boron (B)	2013/12/30	22.3		%	35
3469672	YPA	Spiked Blank	Conductivity	2013/12/30		98	%	90 - 110
3469672	YPA	Method Blank	Conductivity	2013/12/30	<0.002		mS/cm	
3469672	YPA	RPD [UJ0192-01]	Conductivity	2013/12/30	0.6		%	10

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

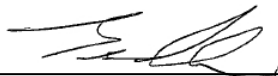
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Job #: B3M0114
Report Date: 2013/12/30

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: AMW

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

A handwritten signature in black ink, appearing to read "Brad Newman", written over a horizontal line.

Brad Newman, Scientific Specialist

A handwritten signature in black ink, appearing to read "Cristina Carriere", written over a horizontal line.

Cristina Carriere, Scientific Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Your Project #: 13-1111-0035
 Site#: 13-1111-0035
 Site Location: METROLINX HWY 401
 Your C.O.C. #: 14854

Attention: Sandra McGaghran

Golder Associates Ltd
 6925 Century Ave
 Suite 100
 Mississauga, ON
 L5N 7K2

Report Date: 2014/06/18
Report #: R3062583
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B4A0292
Received: 2014/06/12, 15:10

Sample Matrix: Soil
 # Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Hot Water Extractable Boron	4	2014/06/16	2014/06/16	CAM SOP-00408	R153 Ana. Prot. 2011
Free (WAD) Cyanide	4	N/A	2014/06/16	CAM SOP-00457	Ontario MOE CN-E3015
Conductivity	4	N/A	2014/06/17	CAM SOP-00414	MOE LSB E3138 v2
Hexavalent Chromium in Soil by IC (1)	4	2014/06/17	2014/06/17	CAM SOP-00436	EPA SW846-3060/7199
Strong Acid Leachable Metals by ICPMS	4	2014/06/16	2014/06/17	CAM SOP-00447	EPA 6020
Moisture	4	N/A	2014/06/13	CAM SOP-00445	R.Carter,1993
pH CaCl2 EXTRACT	4	2014/06/17	2014/06/17	CAM SOP-00413	EPA 9045D
Sodium Adsorption Ratio (SAR)	4	2014/06/12	2014/06/18	CAM SOP-00102	EPA 6010

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

- * RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
- * Results relate only to the items tested.

(1) Soils are reported on a dry weight basis unless otherwise specified.

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

-2-

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Antonella Brasil, Senior Project Manager
Email: ABrasil@maxxam.ca
Phone# (905) 817-5817

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 2

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

O.REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		WH2479	WH2480	WH2481	WH2482		
Sampling Date		2014/06/11 01:40	2014/06/11 02:10	2014/06/11 02:40	2014/06/11 03:20		
	Units	2013-04-3	2013-04-5	2013-04-7	2013-04-9	RDL	QC Batch
Calculated Parameters							
Sodium Adsorption Ratio	N/A	15	18	0.94	4.5		3639539
Inorganics							
Chromium (VI)	ug/g	<0.2	<0.2	<0.2	<0.2	0.2	3644084
Conductivity	mS/cm	0.83	0.88	0.53	0.76	0.002	3642850
Free Cyanide	ug/g	<0.01	<0.01	0.01	<0.01	0.01	3641201
Moisture	%	7.4	10	8.7	18	1.0	3641004
Available (CaCl ₂) pH	pH	7.99	7.99	7.57	7.44		3642985
Metals							
Hot Water Ext. Boron (B)	ug/g	0.064	0.057	0.19	0.067	0.050	3642481
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	<0.20	<0.20	0.20	3642486
Acid Extractable Arsenic (As)	ug/g	<1.0	<1.0	2.1	4.9	1.0	3642486
Acid Extractable Barium (Ba)	ug/g	8.9	7.2	34	49	0.50	3642486
Acid Extractable Beryllium (Be)	ug/g	<0.20	<0.20	0.30	0.61	0.20	3642486
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	<5.0	5.8	5.0	3642486
Acid Extractable Cadmium (Cd)	ug/g	<0.10	<0.10	<0.10	0.11	0.10	3642486
Acid Extractable Chromium (Cr)	ug/g	4.6	5.1	11	19	1.0	3642486
Acid Extractable Cobalt (Co)	ug/g	1.9	2.1	4.6	10	0.10	3642486
Acid Extractable Copper (Cu)	ug/g	4.3	3.9	12	28	0.50	3642486
Acid Extractable Lead (Pb)	ug/g	2.4	2.4	5.5	12	1.0	3642486
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	<0.50	<0.50	0.50	3642486
Acid Extractable Nickel (Ni)	ug/g	3.8	3.7	11	24	0.50	3642486
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	<0.50	<0.50	0.50	3642486
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	<0.20	<0.20	0.20	3642486
Acid Extractable Thallium (Tl)	ug/g	<0.050	<0.050	0.075	0.16	0.050	3642486
Acid Extractable Uranium (U)	ug/g	0.22	0.26	0.46	0.50	0.050	3642486
Acid Extractable Vanadium (V)	ug/g	11	13	18	27	5.0	3642486
Acid Extractable Zinc (Zn)	ug/g	12	12	31	51	5.0	3642486
Acid Extractable Mercury (Hg)	ug/g	<0.050	<0.050	<0.050	<0.050	0.050	3642486

N/A = Not Applicable

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

Test Summary

Maxxam ID WH2479
Sample ID 2013-04-3
Matrix Soil

Collected 2014/06/11
Shipped
Received 2014/06/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3642481	2014/06/16	2014/06/16	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3641201	N/A	2014/06/16	Xuanhong Qiu
Conductivity	COND	3642850	N/A	2014/06/17	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3644084	2014/06/17	2014/06/17	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3642486	2014/06/16	2014/06/17	Viviana Canzonieri
Moisture	BAL	3641004	N/A	2014/06/13	Chun Yan
pH CaCl2 EXTRACT		3642985	2014/06/17	2014/06/17	Yogesh Patel
Sodium Adsorption Ratio (SAR)	CALC/MET	3639539	2014/06/18	2014/06/18	Automated Statchk

Maxxam ID WH2480
Sample ID 2013-04-5
Matrix Soil

Collected 2014/06/11
Shipped
Received 2014/06/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3642481	2014/06/16	2014/06/16	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3641201	N/A	2014/06/16	Xuanhong Qiu
Conductivity	COND	3642850	N/A	2014/06/17	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3644084	2014/06/17	2014/06/17	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3642486	2014/06/16	2014/06/17	Viviana Canzonieri
Moisture	BAL	3641004	N/A	2014/06/13	Chun Yan
pH CaCl2 EXTRACT		3642985	2014/06/17	2014/06/17	Yogesh Patel
Sodium Adsorption Ratio (SAR)	CALC/MET	3639539	2014/06/18	2014/06/18	Automated Statchk

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

Test Summary

Maxxam ID WH2481
Sample ID 2013-04-7
Matrix Soil

Collected 2014/06/11
Shipped
Received 2014/06/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3642481	2014/06/16	2014/06/16	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3641201	N/A	2014/06/16	Xuanhong Qiu
Conductivity	COND	3642850	N/A	2014/06/17	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3644084	2014/06/17	2014/06/17	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3642486	2014/06/16	2014/06/17	Viviana Canzonieri
Moisture	BAL	3641004	N/A	2014/06/13	Chun Yan
pH CaCl2 EXTRACT		3642985	2014/06/17	2014/06/17	Yogesh Patel
Sodium Adsorption Ratio (SAR)	CALC/MET	3639539	2014/06/18	2014/06/18	Automated Statchk

Maxxam ID WH2482
Sample ID 2013-04-9
Matrix Soil

Collected 2014/06/11
Shipped
Received 2014/06/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3642481	2014/06/16	2014/06/16	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3641201	N/A	2014/06/16	Xuanhong Qiu
Conductivity	COND	3642850	N/A	2014/06/17	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3644084	2014/06/17	2014/06/17	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3642486	2014/06/16	2014/06/17	Viviana Canzonieri
Moisture	BAL	3641004	N/A	2014/06/13	Chun Yan
pH CaCl2 EXTRACT		3642985	2014/06/17	2014/06/17	Yogesh Patel
Sodium Adsorption Ratio (SAR)	CALC/MET	3639539	2014/06/18	2014/06/18	Automated Statchk

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

Package 1	12.0°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Samples received with temperature >10 C and analyses conducted with client's consent.

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3641004	Moisture	2014/06/13							2.6	20		
3641201	Free Cyanide	2014/06/16	95	75 - 125	103	80 - 120	<0.01	ug/g	NC	35		
3642481	Hot Water Ext. Boron (B)	2014/06/16	94	75 - 125	106	75 - 125	<0.050	ug/g	5.1	40		
3642486	Acid Extractable Antimony (Sb)	2014/06/17	109	75 - 125	109	80 - 120	<0.20	ug/g	NC	30		
3642486	Acid Extractable Arsenic (As)	2014/06/17	102	75 - 125	101	80 - 120	<1.0	ug/g	NC	30		
3642486	Acid Extractable Barium (Ba)	2014/06/17	97	75 - 125	102	80 - 120	<0.50	ug/g	7.4	30		
3642486	Acid Extractable Beryllium (Be)	2014/06/17	108	75 - 125	104	80 - 120	<0.20	ug/g	NC	30		
3642486	Acid Extractable Boron (B)	2014/06/17	105	75 - 125	104	80 - 120	<5.0	ug/g	NC	30		
3642486	Acid Extractable Cadmium (Cd)	2014/06/17	107	75 - 125	105	80 - 120	<0.10	ug/g	NC	30		
3642486	Acid Extractable Chromium (Cr)	2014/06/17	105	75 - 125	106	80 - 120	<1.0	ug/g	NC	30		
3642486	Acid Extractable Cobalt (Co)	2014/06/17	102	75 - 125	104	80 - 120	<0.10	ug/g	0.3	30		
3642486	Acid Extractable Copper (Cu)	2014/06/17	101	75 - 125	105	80 - 120	<0.50	ug/g	2.9	30		
3642486	Acid Extractable Lead (Pb)	2014/06/17	101	75 - 125	105	80 - 120	<1.0	ug/g	0.06	30		
3642486	Acid Extractable Molybdenum (Mo)	2014/06/17	108	75 - 125	106	80 - 120	<0.50	ug/g	NC	30		
3642486	Acid Extractable Nickel (Ni)	2014/06/17	101	75 - 125	105	80 - 120	<0.50	ug/g	0.1	30		
3642486	Acid Extractable Selenium (Se)	2014/06/17	103	75 - 125	104	80 - 120	<0.50	ug/g	NC	30		
3642486	Acid Extractable Silver (Ag)	2014/06/17	106	75 - 125	106	80 - 120	<0.20	ug/g	NC	30		
3642486	Acid Extractable Thallium (Tl)	2014/06/17	97	75 - 125	98	80 - 120	<0.050	ug/g	NC	30		
3642486	Acid Extractable Uranium (U)	2014/06/17	101	75 - 125	102	80 - 120	<0.050	ug/g	3.8	30		
3642486	Acid Extractable Vanadium (V)	2014/06/17	107	75 - 125	106	80 - 120	<5.0	ug/g	NC	30		
3642486	Acid Extractable Zinc (Zn)	2014/06/17	NC	75 - 125	105	80 - 120	<5.0	ug/g	1.6	30		
3642486	Acid Extractable Mercury (Hg)	2014/06/17	109	75 - 125	113	80 - 120	<0.050	ug/g				
3642850	Conductivity	2014/06/17			100	90 - 110	<0.002	mS/cm	1.7	10		
3644084	Chromium (VI)	2014/06/17	61 ^(1, 2)	80 - 120	103	80 - 120	<0.2	ug/g	NC	35	93	80 - 120

N/A = Not Applicable

RPD = Relative Percent Difference

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



(2) -

The recovery of chromium VI in the matrix spike was below the acceptance criteria. The sample was reanalyzed with the same results

Validation Signature Page

Maxxam Job #: B4A0292

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

=====

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12-Jun-14 15:10

Antonella Brasil



B4A0292

FW

ENV-061

CHAIN OF CUSTODY RECORD

14854

Page ____ of ____

INVOICE INFORMATION		REPORT INFORMATION		PROJECT INFORMATION		MAXXAM JOB NUMBER	
Company Name: <u>GOLDER ASSOCIATES</u>		Company Name: _____		P.O. #: _____		MAXXAM JOB NUMBER	
Contact Name: <u>SANDRA MCGAGHRAN</u>		Contact Name: _____		Project #: <u>13-1111-0035</u>		CHAIN OF CUSTODY #	
Address: <u>MISSISSAUGA OFFICE</u>		Address: _____		Site Location: <u>METROLINK Hwy 401</u>		00	
Phone: <u>905-567-4444</u> Fax: _____		Phone: _____ Fax: _____		Site #: _____			
Email: <u>Sandra.mcgaghran@golder.com</u>		Email: _____		Sampled By: <u>(PKS) PAT SPEARS</u>			

Note: For MOE Regulated Drinking Water samples, please use the Drinking Water CoC.

Regulation 153 (2011)				Other Regulations				ANALYSIS REQUESTED (Please be specific)												TURNAROUND TIME (TAT) REQUIRED	
<input checked="" type="checkbox"/> Table 1	Res/Park	Med/Fine	CCME	<input type="checkbox"/> Sanitary Sewer Bylaw													PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS.				
<input type="checkbox"/> Table 2	Ind/Comm	Coarse	Reg. 558	<input type="checkbox"/> Storm Sewer Bylaw													Regular (Standard) TAT: <input type="checkbox"/> (5-7 working days for most tests)				
<input type="checkbox"/> Table 3	Agri/Other	For RSC	MISA	Municipality: _____													Rush TAT: ***Samples must be received by 3pm to guarantee your TAT***				
<input type="checkbox"/> Table _____		Yes	PWQO	Other (specify): _____													Rush Confirmation #: PN <input type="checkbox"/> 1 day <input type="checkbox"/> 2 days <input type="checkbox"/> 3 days				
				No													Date Req'd: _____				
Include Criteria on Certificate of Analysis (Y/N)?																TATs for certain tests are > 5 days. Please contact your Project Manager for details.					
SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.																# of Cont. COMMENTS / TAT COMMENTS					
1	2013-04-3	2014/6/11	1:40 AM	S	MOE Regulated Drinking Water? (Y/N)	Metals Field Filtered? (Y/N)															
2	2013-04-5	2014/6/11	2:10 PM	S																	
3	2013-04-7	2014/6/11	2:40 AM	S																	
4	2013-04-9	2014/6/11	3:20 AM	S																	
5																					
6																					
7																					
8																					
9																					
10																					

RELINQUISHED BY (Signature/Print) PAT SPEARS Date (YYYY/MM/DD) 2014/06/12 Time: 15:10 RECEIVED BY: (Signature/Print) ANTONELLA BRASIL Date (YYYY/MM/DD) 2014/06/12 Time: 15:10 #JARS USED AND NOT SUBMITTED _____

Laboratory Use Only		
Custody Seal	Yes	No
Present	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Intact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Temperature (°C) on Receipt <u>11/11/14°C</u>		

*MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

Your Project #: 13-1111-0035
 Site#: 13-1111-0035
 Site Location: METROLINX HWY 401
 Your C.O.C. #: 14854

Attention: Sandra McGaghran

Golder Associates Ltd
 6925 Century Ave
 Suite 100
 Mississauga, ON
 L5N 7K2

Report Date: 2014/06/18
 Report #: R3062583
 Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B4A0292

Received: 2014/06/12, 15:10

Sample Matrix: Soil
 # Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Hot Water Extractable Boron	4	2014/06/16	2014/06/16	CAM SOP-00408	R153 Ana. Prot. 2011
Free (WAD) Cyanide	4	N/A	2014/06/16	CAM SOP-00457	Ontario MOE CN-E3015
Conductivity	4	N/A	2014/06/17	CAM SOP-00414	MOE LSB E3138 v2
Hexavalent Chromium in Soil by IC (1)	4	2014/06/17	2014/06/17	CAM SOP-00436	EPA SW846-3060/7199
Strong Acid Leachable Metals by ICPMS	4	2014/06/16	2014/06/17	CAM SOP-00447	EPA 6020
Moisture	4	N/A	2014/06/13	CAM SOP-00445	R.Carter,1993
pH CaCl2 EXTRACT	4	2014/06/17	2014/06/17	CAM SOP-00413	EPA 9045D
Sodium Adsorption Ratio (SAR)	4	2014/06/12	2014/06/18	CAM SOP-00102	EPA 6010

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Soils are reported on a dry weight basis unless otherwise specified.

Attention:Sandra McGaghran

Golder Associates Ltd
6925 Century Ave
Suite 100
Mississauga, ON
L5N 7K2

Your Project #: 13-1111-0035
Site#: 13-1111-0035
Site Location: METROLINX HWY 401
Your C.O.C. #: 14854

Report Date: 2014/06/18
Report #: R3062583
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B4A0292

Received: 2014/06/12, 15:10

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Antonella Brasil, Senior Project Manager
Email: ABrasil@maxxam.ca
Phone# (905)817-5817

=====

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Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

O.REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		WH2479	WH2480	WH2481	WH2482		
Sampling Date		2014/06/11 01:40	2014/06/11 02:10	2014/06/11 02:40	2014/06/11 03:20		
COC Number		14854	14854	14854	14854		
	Units	2013-04-3	2013-04-5	2013-04-7	2013-04-9	RDL	QC Batch
Calculated Parameters							
Sodium Adsorption Ratio	N/A	15	18	0.94	4.5		3639539
Inorganics							
Chromium (VI)	ug/g	<0.2	<0.2	<0.2	<0.2	0.2	3644084
Conductivity	mS/cm	0.83	0.88	0.53	0.76	0.002	3642850
Free Cyanide	ug/g	<0.01	<0.01	0.01	<0.01	0.01	3641201
Moisture	%	7.4	10	8.7	18	1.0	3641004
Available (CaCl2) pH	pH	7.99	7.99	7.57	7.44	N/A	3642985
Metals							
Hot Water Ext. Boron (B)	ug/g	0.064	0.057	0.19	0.067	0.050	3642481
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	<0.20	<0.20	0.20	3642486
Acid Extractable Arsenic (As)	ug/g	<1.0	<1.0	2.1	4.9	1.0	3642486
Acid Extractable Barium (Ba)	ug/g	8.9	7.2	34	49	0.50	3642486
Acid Extractable Beryllium (Be)	ug/g	<0.20	<0.20	0.30	0.61	0.20	3642486
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	<5.0	5.8	5.0	3642486
Acid Extractable Cadmium (Cd)	ug/g	<0.10	<0.10	<0.10	0.11	0.10	3642486
Acid Extractable Chromium (Cr)	ug/g	4.6	5.1	11	19	1.0	3642486
Acid Extractable Cobalt (Co)	ug/g	1.9	2.1	4.6	10	0.10	3642486
Acid Extractable Copper (Cu)	ug/g	4.3	3.9	12	28	0.50	3642486
Acid Extractable Lead (Pb)	ug/g	2.4	2.4	5.5	12	1.0	3642486
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	<0.50	<0.50	0.50	3642486
Acid Extractable Nickel (Ni)	ug/g	3.8	3.7	11	24	0.50	3642486
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	<0.50	<0.50	0.50	3642486
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	<0.20	<0.20	0.20	3642486
Acid Extractable Thallium (Tl)	ug/g	<0.050	<0.050	0.075	0.16	0.050	3642486
Acid Extractable Uranium (U)	ug/g	0.22	0.26	0.46	0.50	0.050	3642486
Acid Extractable Vanadium (V)	ug/g	11	13	18	27	5.0	3642486
Acid Extractable Zinc (Zn)	ug/g	12	12	31	51	5.0	3642486
Acid Extractable Mercury (Hg)	ug/g	<0.050	<0.050	<0.050	<0.050	0.050	3642486
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable							

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: WH2479
Sample ID: 2013-04-3
Matrix: Soil

Collected: 2014/06/11
Shipped:
Received: 2014/06/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3642481	2014/06/16	2014/06/16	Suban Kanapathippalai
Free (WAD) Cyanide	TECH	3641201	N/A	2014/06/16	Xuanhong Qiu
Conductivity	COND	3642850	N/A	2014/06/17	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3644084	2014/06/17	2014/06/17	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3642486	2014/06/16	2014/06/17	Viviana Canzonieri
Moisture	BAL	3641004	N/A	2014/06/13	Chun Yan
pH CaCl2 EXTRACT		3642985	2014/06/17	2014/06/17	Yogesh Patel
Sodium Adsorption Ratio (SAR)	CALC/MET	3639539	2014/06/18	2014/06/18	Automated Statchk

Maxxam ID: WH2480
Sample ID: 2013-04-5
Matrix: Soil

Collected: 2014/06/11
Shipped:
Received: 2014/06/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3642481	2014/06/16	2014/06/16	Suban Kanapathippalai
Free (WAD) Cyanide	TECH	3641201	N/A	2014/06/16	Xuanhong Qiu
Conductivity	COND	3642850	N/A	2014/06/17	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3644084	2014/06/17	2014/06/17	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3642486	2014/06/16	2014/06/17	Viviana Canzonieri
Moisture	BAL	3641004	N/A	2014/06/13	Chun Yan
pH CaCl2 EXTRACT		3642985	2014/06/17	2014/06/17	Yogesh Patel
Sodium Adsorption Ratio (SAR)	CALC/MET	3639539	2014/06/18	2014/06/18	Automated Statchk

Maxxam ID: WH2481
Sample ID: 2013-04-7
Matrix: Soil

Collected: 2014/06/11
Shipped:
Received: 2014/06/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3642481	2014/06/16	2014/06/16	Suban Kanapathippalai
Free (WAD) Cyanide	TECH	3641201	N/A	2014/06/16	Xuanhong Qiu
Conductivity	COND	3642850	N/A	2014/06/17	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3644084	2014/06/17	2014/06/17	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3642486	2014/06/16	2014/06/17	Viviana Canzonieri
Moisture	BAL	3641004	N/A	2014/06/13	Chun Yan
pH CaCl2 EXTRACT		3642985	2014/06/17	2014/06/17	Yogesh Patel
Sodium Adsorption Ratio (SAR)	CALC/MET	3639539	2014/06/18	2014/06/18	Automated Statchk

Maxxam ID: WH2482
Sample ID: 2013-04-9
Matrix: Soil

Collected: 2014/06/11
Shipped:
Received: 2014/06/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3642481	2014/06/16	2014/06/16	Suban Kanapathippalai
Free (WAD) Cyanide	TECH	3641201	N/A	2014/06/16	Xuanhong Qiu

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: WH2482
Sample ID: 2013-04-9
Matrix: Soil

Collected: 2014/06/11
Shipped:
Received: 2014/06/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity	COND	3642850	N/A	2014/06/17	Yogesh Patel
Hexavalent Chromium in Soil by IC	IC/SPEC	3644084	2014/06/17	2014/06/17	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3642486	2014/06/16	2014/06/17	Viviana Canzonieri
Moisture	BAL	3641004	N/A	2014/06/13	Chun Yan
pH CaCl2 EXTRACT		3642985	2014/06/17	2014/06/17	Yogesh Patel
Sodium Adsorption Ratio (SAR)	CALC/MET	3639539	2014/06/18	2014/06/18	Automated Statchk

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	12.0°C
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Samples received with temperature >10 C and analyses conducted with client's consent.

Results relate only to the items tested.

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
3641201	XQI	Matrix Spike	Free Cyanide	2014/06/16		95	%	75 - 125
3641201	XQI	Spiked Blank	Free Cyanide	2014/06/16		103	%	80 - 120
3641201	XQI	Method Blank	Free Cyanide	2014/06/16	<0.01		ug/g	
3642481	SUK	Matrix Spike	Hot Water Ext. Boron (B)	2014/06/16		94	%	75 - 125
3642481	SUK	Spiked Blank	Hot Water Ext. Boron (B)	2014/06/16		106	%	75 - 125
3642481	SUK	Method Blank	Hot Water Ext. Boron (B)	2014/06/16	<0.050		ug/g	
3642486	VIV	Matrix Spike	Acid Extractable Antimony (Sb)	2014/06/17		109	%	75 - 125
			Acid Extractable Arsenic (As)	2014/06/17		102	%	75 - 125
			Acid Extractable Barium (Ba)	2014/06/17		97	%	75 - 125
			Acid Extractable Beryllium (Be)	2014/06/17		108	%	75 - 125
			Acid Extractable Boron (B)	2014/06/17		105	%	75 - 125
			Acid Extractable Cadmium (Cd)	2014/06/17		107	%	75 - 125
			Acid Extractable Chromium (Cr)	2014/06/17		105	%	75 - 125
			Acid Extractable Cobalt (Co)	2014/06/17		102	%	75 - 125
			Acid Extractable Copper (Cu)	2014/06/17		101	%	75 - 125
			Acid Extractable Lead (Pb)	2014/06/17		101	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2014/06/17		108	%	75 - 125
			Acid Extractable Nickel (Ni)	2014/06/17		101	%	75 - 125
			Acid Extractable Selenium (Se)	2014/06/17		103	%	75 - 125
			Acid Extractable Silver (Ag)	2014/06/17		106	%	75 - 125
			Acid Extractable Thallium (Tl)	2014/06/17		97	%	75 - 125
			Acid Extractable Uranium (U)	2014/06/17		101	%	75 - 125
			Acid Extractable Vanadium (V)	2014/06/17		107	%	75 - 125
			Acid Extractable Zinc (Zn)	2014/06/17		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2014/06/17		109	%	75 - 125
3642486	VIV	Spiked Blank	Acid Extractable Antimony (Sb)	2014/06/17		109	%	80 - 120
			Acid Extractable Arsenic (As)	2014/06/17		101	%	80 - 120
			Acid Extractable Barium (Ba)	2014/06/17		102	%	80 - 120
			Acid Extractable Beryllium (Be)	2014/06/17		104	%	80 - 120
			Acid Extractable Boron (B)	2014/06/17		104	%	80 - 120
			Acid Extractable Cadmium (Cd)	2014/06/17		105	%	80 - 120
			Acid Extractable Chromium (Cr)	2014/06/17		106	%	80 - 120
			Acid Extractable Cobalt (Co)	2014/06/17		104	%	80 - 120
			Acid Extractable Copper (Cu)	2014/06/17		105	%	80 - 120
			Acid Extractable Lead (Pb)	2014/06/17		105	%	80 - 120
			Acid Extractable Molybdenum (Mo)	2014/06/17		106	%	80 - 120
			Acid Extractable Nickel (Ni)	2014/06/17		105	%	80 - 120
			Acid Extractable Selenium (Se)	2014/06/17		104	%	80 - 120
			Acid Extractable Silver (Ag)	2014/06/17		106	%	80 - 120
			Acid Extractable Thallium (Tl)	2014/06/17		98	%	80 - 120
			Acid Extractable Uranium (U)	2014/06/17		102	%	80 - 120
			Acid Extractable Vanadium (V)	2014/06/17		106	%	80 - 120
			Acid Extractable Zinc (Zn)	2014/06/17		105	%	80 - 120
			Acid Extractable Mercury (Hg)	2014/06/17		113	%	80 - 120
3642486	VIV	Method Blank	Acid Extractable Antimony (Sb)	2014/06/17	<0.20		ug/g	
			Acid Extractable Arsenic (As)	2014/06/17	<1.0		ug/g	
			Acid Extractable Barium (Ba)	2014/06/17	<0.50		ug/g	
			Acid Extractable Beryllium (Be)	2014/06/17	<0.20		ug/g	
			Acid Extractable Boron (B)	2014/06/17	<5.0		ug/g	
			Acid Extractable Cadmium (Cd)	2014/06/17	<0.10		ug/g	
			Acid Extractable Chromium (Cr)	2014/06/17	<1.0		ug/g	
			Acid Extractable Cobalt (Co)	2014/06/17	<0.10		ug/g	

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Acid Extractable Copper (Cu)	2014/06/17	<0.50		ug/g	
			Acid Extractable Lead (Pb)	2014/06/17	<1.0		ug/g	
			Acid Extractable Molybdenum (Mo)	2014/06/17	<0.50		ug/g	
			Acid Extractable Nickel (Ni)	2014/06/17	<0.50		ug/g	
			Acid Extractable Selenium (Se)	2014/06/17	<0.50		ug/g	
			Acid Extractable Silver (Ag)	2014/06/17	<0.20		ug/g	
			Acid Extractable Thallium (Tl)	2014/06/17	<0.050		ug/g	
			Acid Extractable Uranium (U)	2014/06/17	<0.050		ug/g	
			Acid Extractable Vanadium (V)	2014/06/17	<5.0		ug/g	
			Acid Extractable Zinc (Zn)	2014/06/17	<5.0		ug/g	
			Acid Extractable Mercury (Hg)	2014/06/17	<0.050		ug/g	
3642850	YPA	Spiked Blank	Conductivity	2014/06/17		100	%	90 - 110
3642850	YPA	Method Blank	Conductivity	2014/06/17	<0.002		mS/cm	
3644084	SAC	Matrix Spike	Chromium (VI)	2014/06/17		61 (1)	%	80 - 120
3644084	SAC	QC Standard	Chromium (VI)	2014/06/17		93	%	80 - 120
3644084	SAC	Spiked Blank	Chromium (VI)	2014/06/17		103	%	80 - 120
3644084	SAC	Method Blank	Chromium (VI)	2014/06/17	<0.2		ug/g	

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

(1) The recovery of chromium VI in the matrix spike was below the acceptance criteria. The sample was reanalyzed with the same results

Maxxam Job #: B4A0292
Report Date: 2014/06/18

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX HWY 401
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Your Project #: 13-1111-0035
Site#: 13-1111-0035
Site Location: METROLINX
Your C.O.C. #: 30772

Attention: Sandra McGaghran

Golder Associates Ltd
6925 Century Ave
Suite 100
Mississauga, ON
L5N 7K2

Report Date: 2014/05/16
Report #: R3031100
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B478113

Received: 2014/05/12, 13:49

Sample Matrix: Soil
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Hot Water Extractable Boron	6	2014/05/14	2014/05/15	CAM SOP-00408	R153 Ana. Prot. 2011
Free (WAD) Cyanide	6	N/A	2014/05/14	CAM SOP-00457	Ontario MOE CN-E3015
Conductivity	6	N/A	2014/05/15	CAM SOP-00414	MOE LSB E3138 v2
Hexavalent Chromium in Soil by IC (1)	6	2014/05/14	2014/05/14	CAM SOP-00436	EPA SW846-3060/7199
Acid Extr. Metals (aqua regia) by ICPMS	6	2014/05/14	2014/05/14	CAM SOP-00447	EPA 6020
Moisture	6	N/A	2014/05/13	CAM SOP-00445	R.Carter,1993
pH CaCl2 EXTRACT	6	2014/05/14	2014/05/14	CAM SOP-00413	SM 4500H+ B
Sodium Adsorption Ratio (SAR)	6	2014/05/13	2014/05/16	CAM SOP-00102	EPA 6010

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

- * RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
- * Results relate only to the items tested.

(1) Soils are reported on a dry weight basis unless otherwise specified.

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

-2-

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Antonella Brasil, Senior Project Manager
Email: ABrasil@maxxam.ca
Phone# (905) 817-5817

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 2

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

O.REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		VW6113	VW6114	VW6115	VW6116	VW6116	VW6117	VW6118		
Sampling Date		2014/05/09 01:30	2014/05/09 02:30	2014/05/09 03:30	2014/05/12 02:00	2014/05/12 02:00	2014/05/08 02:00	2014/05/07 02:00		
	Units	2013-3-3	2013-3-7	2013-3-11	2013-3-16	2013-3-16 Lab-Dup	2013-1-20	2013-1-6	RDL	QC Batch
Calculated Parameters										
Sodium Adsorption Ratio	N/A	13	3.7	0.56	0.33		0.33	1.7		3603909
Inorganics										
Chromium (VI)	ug/g	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	0.2	3605427
Conductivity	mS/cm	0.76	0.73	0.45	0.14		0.14	0.88	0.002	3606683
Free Cyanide	ug/g	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	0.01	3604925
Moisture	%	5.7	12	9.5	8.1		7.3	11	1.0	3604954
Available (CaCl2) pH	pH	7.94	7.70	7.66	8.15		8.15	7.69		3605236
Metals										
Hot Water Ext. Boron (B)	ug/g	0.089	0.12	0.089	0.12		0.18	0.19	0.050	3605476
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	3605559
Acid Extractable Arsenic (As)	ug/g	1.1	3.0	4.0	2.1	2.1	1.8	3.7	1.0	3605559
Acid Extractable Barium (Ba)	ug/g	9.2	55	52	29	28	33	59	0.50	3605559
Acid Extractable Beryllium (Be)	ug/g	<0.20	0.39	0.47	<0.20	<0.20	<0.20	0.52	0.20	3605559
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	3605559
Acid Extractable Cadmium (Cd)	ug/g	<0.10	<0.10	<0.10	0.17	<0.10	<0.10	<0.10	0.10	3605559
Acid Extractable Chromium (Cr)	ug/g	4.2	15	17	8.7	8.1	7.6	17	1.0	3605559
Acid Extractable Cobalt (Co)	ug/g	1.9	7.1	11	3.3	3.3	3.2	9.1	0.10	3605559
Acid Extractable Copper (Cu)	ug/g	3.9	17	26	12	15	9.8	20	0.50	3605559
Acid Extractable Lead (Pb)	ug/g	2.7	20	11	3.5	3.6	3.7	12	1.0	3605559
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	3605559
Acid Extractable Nickel (Ni)	ug/g	3.5	16	22	6.5	6.8	6.8	20	0.50	3605559
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	3605559
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	3605559
Acid Extractable Thallium (Tl)	ug/g	<0.050	0.099	0.13	<0.050	0.052	<0.050	0.12	0.050	3605559
Acid Extractable Vanadium (V)	ug/g	11	19	22	14	14	14	23	5.0	3605559
Acid Extractable Zinc (Zn)	ug/g	11	41	54	29	22	19	47	5.0	3605559
Acid Extractable Mercury (Hg)	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	3605559

N/A = Not Applicable

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

Test Summary

Maxxam ID VW6113
Sample ID 2013-3-3
Matrix Soil

Collected 2014/05/09
Shipped
Received 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl ₂ EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam ID VW6114
Sample ID 2013-3-7
Matrix Soil

Collected 2014/05/09
Shipped
Received 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl ₂ EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

Test Summary

Maxxam ID VW6115
Sample ID 2013-3-11
Matrix Soil

Collected 2014/05/09
Shipped
Received 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl ₂ EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam ID VW6116
Sample ID 2013-3-16
Matrix Soil

Collected 2014/05/12
Shipped
Received 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl ₂ EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

Test Summary

Maxxam ID VW6116 Dup
Sample ID 2013-3-16
Matrix Soil

Collected 2014/05/12
Shipped
Received 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri

Maxxam ID VW6117
Sample ID 2013-1-20
Matrix Soil

Collected 2014/05/08
Shipped
Received 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl2 EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam ID VW6118
Sample ID 2013-1-6
Matrix Soil

Collected 2014/05/07
Shipped
Received 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathippillai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl2 EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

Package 1	17.3°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Sample VW6116-01: SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Sample VW6117-01: SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3604925	Free Cyanide	2014/05/14	98	75 - 125	99	80 - 120	<0.01	ug/g	NC	35		
3604954	Moisture	2014/05/13							0.6	20		
3605427	Chromium (VI)	2014/05/14	90	80 - 120	103	80 - 120	<0.2	ug/g	NC	35	110	80 - 120
3605476	Hot Water Ext. Boron (B)	2014/05/15	101	75 - 125	101	75 - 125	<0.050	ug/g	1.2	40		
3605559	Acid Extractable Antimony (Sb)	2014/05/14	103 ⁽¹⁾	75 - 125	100	80 - 120	<0.20	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Arsenic (As)	2014/05/14	100 ⁽¹⁾	75 - 125	100	80 - 120	<1.0	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Barium (Ba)	2014/05/14	NC ⁽¹⁾	75 - 125	98	80 - 120	<0.50	ug/g	3.6 ⁽²⁾	30		
3605559	Acid Extractable Beryllium (Be)	2014/05/14	107 ⁽¹⁾	75 - 125	104	80 - 120	<0.20	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Boron (B)	2014/05/14	105 ⁽¹⁾	75 - 125	101	80 - 120	<5.0	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Cadmium (Cd)	2014/05/14	102 ⁽¹⁾	75 - 125	100	80 - 120	<0.10	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Chromium (Cr)	2014/05/14	102 ⁽¹⁾	75 - 125	99	80 - 120	<1.0	ug/g	6.4 ⁽²⁾	30		
3605559	Acid Extractable Cobalt (Co)	2014/05/14	99 ⁽¹⁾	75 - 125	101	80 - 120	<0.10	ug/g	0.5 ⁽²⁾	30		
3605559	Acid Extractable Copper (Cu)	2014/05/14	104 ⁽¹⁾	75 - 125	101	80 - 120	<0.50	ug/g	28.1 ⁽²⁾	30		
3605559	Acid Extractable Lead (Pb)	2014/05/14	101 ⁽¹⁾	75 - 125	100	80 - 120	<1.0	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Molybdenum (Mo)	2014/05/14	103 ⁽¹⁾	75 - 125	99	80 - 120	<0.50	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Nickel (Ni)	2014/05/14	99 ⁽¹⁾	75 - 125	100	80 - 120	<0.50	ug/g	4.0 ⁽²⁾	30		
3605559	Acid Extractable Selenium (Se)	2014/05/14	102 ⁽¹⁾	75 - 125	102	80 - 120	<0.50	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Silver (Ag)	2014/05/14	102 ⁽¹⁾	75 - 125	102	80 - 120	<0.20	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Thallium (Tl)	2014/05/14	96 ⁽¹⁾	75 - 125	95	80 - 120	<0.050	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Vanadium (V)	2014/05/14	104 ⁽¹⁾	75 - 125	100	80 - 120	<5.0	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Zinc (Zn)	2014/05/14	NC ⁽¹⁾	75 - 125	113	80 - 120	<5.0	ug/g	NC ⁽²⁾	30		
3605559	Acid Extractable Mercury (Hg)	2014/05/14	99 ⁽¹⁾	75 - 125	107	80 - 120	<0.050	ug/g	NC ⁽²⁾	30		
3606683	Conductivity	2014/05/15			99	90 - 110	<0.002	mS/cm	6.9	10		

N/A = Not Applicable

RPD = Relative Percent Difference

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) - Matrix Spike Parent ID [VW6116-01]

(2) - Duplicate Parent ID [VW6116-01]

Validation Signature Page

Maxxam Job #: B478113

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

A handwritten signature in black ink, appearing to read "Cristina Carriere", is written over a horizontal line.

Cristina Carriere, Scientific Services

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



6740 Campbell Road, Mississauga, Ontario L5N 2L8 www.maxxam.ca

Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266

CHAIN OF CUSTODY RECORD

30772

Page ____ of ____

INVOICE INFORMATION	REPORT INFORMATION (if differs from invoice)	PROJECT INFORMATION	TURNAROUND TIME (TAT) REQUIRED
Company Name: <u>Golder Associates</u>	Company Name: _____	Quotation #: _____	<input type="checkbox"/> Regular TAT (5-7 days)
Contact Name: <u>Sandra McGaghran</u>	Contact Name: _____	P.O. #: _____	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: <u>Mississauga office</u>	Address: _____	Project #: <u>13-1111-0035</u>	Rush TAT (Applicable Surcharge)
<u>905 567 6100 x 1235</u>	Phone: _____ Fax: _____	Site Location: <u>Metrolix</u>	<input type="checkbox"/> 1 Day (100%)
Phone: _____ Fax: _____	Site #: _____	Site #: _____	<input type="checkbox"/> 2 Days (50%)
Email: <u>Sandra-mcgaghran@golder.com</u>	Sampled By: <u>Oleg Skorik (OS)</u>	Sampled By: _____	<input type="checkbox"/> 3-4 Days (25%)

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION
MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

REGULATION 153 (2011)	OTHER REGULATIONS
Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/Fine	<input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw
Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse	<input type="checkbox"/> MISA <input type="checkbox"/> Storm Sewer Bylaw
Table 3 <input type="checkbox"/> Agri/Other	PWQO Municipality: _____
Table _____	Other (Specify): _____
FOR RSC (PLEASE CIRCLE) YES / NO	<input type="checkbox"/> REG 558 (MINIMUM 3 DAY TAT REQUIRED)

Include Criteria on Certificate of Analysis (Y/N)? _____

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX	# OF CONT.	FIELD FILTERED (PLEASE CIRCLE) Metals / Hg / CrVI	ANALYSIS REQUESTED	Rush Confirmation #:
1 2013-3-3	May 9, 2014	1:30 p.m.	S		X		
2 2013-3-7	May 9, 2014	2:30 a.m.	S		X		
3 2013-3-11	May 9, 2014	3:30 a.m.	S		X		
4 2013-3-16	May 12, 2014	2:00 a.m.	S		X		
5 2013-10-20	May 8, 2014	4:00 a.m.	S		X		
6 2013-1-6	May 7, 2014	2:00 a.m.	S		X		
7							
8							
9							
10							

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME:	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME:	# JARS U AND N SUBMIT
			<u>NAME FERRAZ</u>	2014/05/12	13:49	

12-May-14 13:49

Antonella Brasil



B478113

RDV

ENV-039

Your Project #: 13-1111-0035
 Site#: 13-1111-0035
 Site Location: METROLINX
 Your C.O.C. #: 30772

Attention: Sandra McGaghran

Golder Associates Ltd
 6925 Century Ave
 Suite 100
 Mississauga, ON
 L5N 7K2

Report Date: 2014/05/16
 Report #: R3031100
 Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B478113

Received: 2014/05/12, 13:49

Sample Matrix: Soil
 # Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Hot Water Extractable Boron	6	2014/05/14	2014/05/15	CAM SOP-00408	R153 Ana. Prot. 2011
Free (WAD) Cyanide	6	N/A	2014/05/14	CAM SOP-00457	Ontario MOE CN-E3015
Conductivity	6	N/A	2014/05/15	CAM SOP-00414	MOE LSB E3138 v2
Hexavalent Chromium in Soil by IC (1)	6	2014/05/14	2014/05/14	CAM SOP-00436	EPA SW846-3060/7199
Acid Extr. Metals (aqua regia) by ICPMS	6	2014/05/14	2014/05/14	CAM SOP-00447	EPA 6020
Moisture	6	N/A	2014/05/13	CAM SOP-00445	R.Carter,1993
pH CaCl2 EXTRACT	6	2014/05/14	2014/05/14	CAM SOP-00413	SM 4500H+ B
Sodium Adsorption Ratio (SAR)	6	2014/05/13	2014/05/16	CAM SOP-00102	EPA 6010

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Soils are reported on a dry weight basis unless otherwise specified.

Your Project #: 13-1111-0035
Site#: 13-1111-0035
Site Location: METROLINX
Your C.O.C. #: 30772

Attention:Sandra McGaghran

Golder Associates Ltd
6925 Century Ave
Suite 100
Mississauga, ON
L5N 7K2

Report Date: 2014/05/16
Report #: R3031100
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B478113
Received: 2014/05/12, 13:49

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Antonella Brasil, Senior Project Manager
Email: ABrasil@maxxam.ca
Phone# (905)817-5817

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

O.REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		VW6113	VW6114	VW6115	VW6116	VW6116	VW6117		
Sampling Date		2014/05/09 01:30	2014/05/09 02:30	2014/05/09 03:30	2014/05/12 02:00	2014/05/12 02:00	2014/05/08 02:00		
COC Number		30772	30772	30772	30772	30772	30772		
	Units	2013-3-3	2013-3-7	2013-3-11	2013-3-16	2013-3-16 Lab-Dup	2013-1-20	RDL	QC Batch

Calculated Parameters									
Sodium Adsorption Ratio	N/A	13	3.7	0.56	0.33		0.33		3603909
Inorganics									
Chromium (VI)	ug/g	<0.2	<0.2	<0.2	<0.2		<0.2	0.2	3605427
Conductivity	mS/cm	0.76	0.73	0.45	0.14		0.14	0.002	3606683
Free Cyanide	ug/g	<0.01	<0.01	<0.01	<0.01		<0.01	0.01	3604925
Moisture	%	5.7	12	9.5	8.1		7.3	1.0	3604954
Available (CaCl2) pH	pH	7.94	7.70	7.66	8.15		8.15	N/A	3605236
Metals									
Hot Water Ext. Boron (B)	ug/g	0.089	0.12	0.089	0.12		0.18	0.050	3605476
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	3605559
Acid Extractable Arsenic (As)	ug/g	1.1	3.0	4.0	2.1	2.1	1.8	1.0	3605559
Acid Extractable Barium (Ba)	ug/g	9.2	55	52	29	28	33	0.50	3605559
Acid Extractable Beryllium (Be)	ug/g	<0.20	0.39	0.47	<0.20	<0.20	<0.20	0.20	3605559
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	3605559
Acid Extractable Cadmium (Cd)	ug/g	<0.10	<0.10	<0.10	0.17	<0.10	<0.10	0.10	3605559
Acid Extractable Chromium (Cr)	ug/g	4.2	15	17	8.7	8.1	7.6	1.0	3605559
Acid Extractable Cobalt (Co)	ug/g	1.9	7.1	11	3.3	3.3	3.2	0.10	3605559
Acid Extractable Copper (Cu)	ug/g	3.9	17	26	12	15	9.8	0.50	3605559
Acid Extractable Lead (Pb)	ug/g	2.7	20	11	3.5	3.6	3.7	1.0	3605559
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	3605559
Acid Extractable Nickel (Ni)	ug/g	3.5	16	22	6.5	6.8	6.8	0.50	3605559
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	3605559
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	3605559
Acid Extractable Thallium (Tl)	ug/g	<0.050	0.099	0.13	<0.050	0.052	<0.050	0.050	3605559
Acid Extractable Vanadium (V)	ug/g	11	19	22	14	14	14	5.0	3605559
Acid Extractable Zinc (Zn)	ug/g	11	41	54	29	22	19	5.0	3605559
Acid Extractable Mercury (Hg)	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	3605559
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									
Lab-Dup = Laboratory Initiated Duplicate									
N/A = Not Applicable									

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

O.REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		VW6118		
Sampling Date		2014/05/07 02:00		
COC Number		30772		
	Units	2013-1-6	RDL	QC Batch
Calculated Parameters				
Sodium Adsorption Ratio	N/A	1.7		3603909
Inorganics				
Chromium (VI)	ug/g	<0.2	0.2	3605427
Conductivity	mS/cm	0.88	0.002	3606683
Free Cyanide	ug/g	<0.01	0.01	3604925
Moisture	%	11	1.0	3604954
Available (CaCl ₂) pH	pH	7.69	N/A	3605236
Metals				
Hot Water Ext. Boron (B)	ug/g	0.19	0.050	3605476
Acid Extractable Antimony (Sb)	ug/g	<0.20	0.20	3605559
Acid Extractable Arsenic (As)	ug/g	3.7	1.0	3605559
Acid Extractable Barium (Ba)	ug/g	59	0.50	3605559
Acid Extractable Beryllium (Be)	ug/g	0.52	0.20	3605559
Acid Extractable Boron (B)	ug/g	<5.0	5.0	3605559
Acid Extractable Cadmium (Cd)	ug/g	<0.10	0.10	3605559
Acid Extractable Chromium (Cr)	ug/g	17	1.0	3605559
Acid Extractable Cobalt (Co)	ug/g	9.1	0.10	3605559
Acid Extractable Copper (Cu)	ug/g	20	0.50	3605559
Acid Extractable Lead (Pb)	ug/g	12	1.0	3605559
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	0.50	3605559
Acid Extractable Nickel (Ni)	ug/g	20	0.50	3605559
Acid Extractable Selenium (Se)	ug/g	<0.50	0.50	3605559
Acid Extractable Silver (Ag)	ug/g	<0.20	0.20	3605559
Acid Extractable Thallium (Tl)	ug/g	0.12	0.050	3605559
Acid Extractable Vanadium (V)	ug/g	23	5.0	3605559
Acid Extractable Zinc (Zn)	ug/g	47	5.0	3605559
Acid Extractable Mercury (Hg)	ug/g	<0.050	0.050	3605559
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				
N/A = Not Applicable				

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

TEST SUMMARY

Maxxam ID: VW6113
Sample ID: 2013-3-3
Matrix: Soil

Collected: 2014/05/09
Shipped:
Received: 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathipplai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl2 EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam ID: VW6114
Sample ID: 2013-3-7
Matrix: Soil

Collected: 2014/05/09
Shipped:
Received: 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathipplai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl2 EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam ID: VW6115
Sample ID: 2013-3-11
Matrix: Soil

Collected: 2014/05/09
Shipped:
Received: 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathipplai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl2 EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam ID: VW6116
Sample ID: 2013-3-16
Matrix: Soil

Collected: 2014/05/12
Shipped:
Received: 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathipplai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

TEST SUMMARY

Maxxam ID: VW6116
Sample ID: 2013-3-16
Matrix: Soil

Collected: 2014/05/12
Shipped:
Received: 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl2 EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam ID: VW6116 Dup
Sample ID: 2013-3-16
Matrix: Soil

Collected: 2014/05/12
Shipped:
Received: 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri

Maxxam ID: VW6117
Sample ID: 2013-1-20
Matrix: Soil

Collected: 2014/05/08
Shipped:
Received: 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathipillai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl2 EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam ID: VW6118
Sample ID: 2013-1-6
Matrix: Soil

Collected: 2014/05/07
Shipped:
Received: 2014/05/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3605476	2014/05/14	2014/05/15	Suban Kanapathipillai
Free (WAD) Cyanide	TECH	3604925	N/A	2014/05/14	Louise Harding
Conductivity	COND	3606683	N/A	2014/05/15	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3605427	2014/05/14	2014/05/14	Manoj Gera
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	3605559	2014/05/14	2014/05/14	Viviana Canzonieri
Moisture	BAL	3604954	N/A	2014/05/13	Shivani Desai
pH CaCl2 EXTRACT		3605236	2014/05/14	2014/05/14	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3603909	2014/05/16	2014/05/16	Cristina Carriere

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	17.3°C
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Sample VW6116-01 : SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Sample VW6117-01 : SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Results relate only to the items tested.

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
3604925	LHA	Matrix Spike	Free Cyanide	2014/05/14		98	%	75 - 125
3604925	LHA	Spiked Blank	Free Cyanide	2014/05/14		99	%	80 - 120
3604925	LHA	Method Blank	Free Cyanide	2014/05/14	<0.01		ug/g	
3604925	LHA	RPD	Free Cyanide	2014/05/14	NC		%	35
3604954	BOP	RPD	Moisture	2014/05/13	0.6		%	20
3605427	MGE	Matrix Spike	Chromium (VI)	2014/05/14		90	%	80 - 120
3605427	MGE	QC Standard	Chromium (VI)	2014/05/14		110	%	80 - 120
3605427	MGE	Spiked Blank	Chromium (VI)	2014/05/14		103	%	80 - 120
3605427	MGE	Method Blank	Chromium (VI)	2014/05/14	<0.2		ug/g	
3605427	MGE	RPD	Chromium (VI)	2014/05/14	NC		%	35
3605476	SUK	Matrix Spike	Hot Water Ext. Boron (B)	2014/05/15		101	%	75 - 125
3605476	SUK	Spiked Blank	Hot Water Ext. Boron (B)	2014/05/15		101	%	75 - 125
3605476	SUK	Method Blank	Hot Water Ext. Boron (B)	2014/05/15	<0.050		ug/g	
3605476	SUK	RPD	Hot Water Ext. Boron (B)	2014/05/15	1.2		%	40
3605559	VIV	Matrix Spike	Acid Extractable Antimony (Sb)	2014/05/14		103	%	75 - 125
		[VW6116-01]	Acid Extractable Arsenic (As)	2014/05/14		100	%	75 - 125
			Acid Extractable Barium (Ba)	2014/05/14		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2014/05/14		107	%	75 - 125
			Acid Extractable Boron (B)	2014/05/14		105	%	75 - 125
			Acid Extractable Cadmium (Cd)	2014/05/14		102	%	75 - 125
			Acid Extractable Chromium (Cr)	2014/05/14		102	%	75 - 125
			Acid Extractable Cobalt (Co)	2014/05/14		99	%	75 - 125
			Acid Extractable Copper (Cu)	2014/05/14		104	%	75 - 125
			Acid Extractable Lead (Pb)	2014/05/14		101	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2014/05/14		103	%	75 - 125
			Acid Extractable Nickel (Ni)	2014/05/14		99	%	75 - 125
			Acid Extractable Selenium (Se)	2014/05/14		102	%	75 - 125
			Acid Extractable Silver (Ag)	2014/05/14		102	%	75 - 125
			Acid Extractable Thallium (Tl)	2014/05/14		96	%	75 - 125
			Acid Extractable Vanadium (V)	2014/05/14		104	%	75 - 125
			Acid Extractable Zinc (Zn)	2014/05/14		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2014/05/14		99	%	75 - 125
3605559	VIV	Spiked Blank	Acid Extractable Antimony (Sb)	2014/05/14		100	%	80 - 120
			Acid Extractable Arsenic (As)	2014/05/14		100	%	80 - 120
			Acid Extractable Barium (Ba)	2014/05/14		98	%	80 - 120
			Acid Extractable Beryllium (Be)	2014/05/14		104	%	80 - 120
			Acid Extractable Boron (B)	2014/05/14		101	%	80 - 120
			Acid Extractable Cadmium (Cd)	2014/05/14		100	%	80 - 120
			Acid Extractable Chromium (Cr)	2014/05/14		99	%	80 - 120
			Acid Extractable Cobalt (Co)	2014/05/14		101	%	80 - 120
			Acid Extractable Copper (Cu)	2014/05/14		101	%	80 - 120
			Acid Extractable Lead (Pb)	2014/05/14		100	%	80 - 120
			Acid Extractable Molybdenum (Mo)	2014/05/14		99	%	80 - 120
			Acid Extractable Nickel (Ni)	2014/05/14		100	%	80 - 120
			Acid Extractable Selenium (Se)	2014/05/14		102	%	80 - 120
			Acid Extractable Silver (Ag)	2014/05/14		102	%	80 - 120
			Acid Extractable Thallium (Tl)	2014/05/14		95	%	80 - 120
			Acid Extractable Vanadium (V)	2014/05/14		100	%	80 - 120
			Acid Extractable Zinc (Zn)	2014/05/14		113	%	80 - 120
			Acid Extractable Mercury (Hg)	2014/05/14		107	%	80 - 120
3605559	VIV	Method Blank	Acid Extractable Antimony (Sb)	2014/05/14	<0.20		ug/g	

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
3605559	VIV	RPD [VW6116-01]	Acid Extractable Arsenic (As)	2014/05/14	<1.0		ug/g	
			Acid Extractable Barium (Ba)	2014/05/14	<0.50		ug/g	
			Acid Extractable Beryllium (Be)	2014/05/14	<0.20		ug/g	
			Acid Extractable Boron (B)	2014/05/14	<5.0		ug/g	
			Acid Extractable Cadmium (Cd)	2014/05/14	<0.10		ug/g	
			Acid Extractable Chromium (Cr)	2014/05/14	<1.0		ug/g	
			Acid Extractable Cobalt (Co)	2014/05/14	<0.10		ug/g	
			Acid Extractable Copper (Cu)	2014/05/14	<0.50		ug/g	
			Acid Extractable Lead (Pb)	2014/05/14	<1.0		ug/g	
			Acid Extractable Molybdenum (Mo)	2014/05/14	<0.50		ug/g	
			Acid Extractable Nickel (Ni)	2014/05/14	<0.50		ug/g	
			Acid Extractable Selenium (Se)	2014/05/14	<0.50		ug/g	
			Acid Extractable Silver (Ag)	2014/05/14	<0.20		ug/g	
			Acid Extractable Thallium (Tl)	2014/05/14	<0.050		ug/g	
			Acid Extractable Vanadium (V)	2014/05/14	<5.0		ug/g	
			Acid Extractable Zinc (Zn)	2014/05/14	<5.0		ug/g	
			Acid Extractable Mercury (Hg)	2014/05/14	<0.050		ug/g	
			Acid Extractable Antimony (Sb)	2014/05/14	NC		%	30
			Acid Extractable Arsenic (As)	2014/05/14	NC		%	30
			Acid Extractable Barium (Ba)	2014/05/14	3.6		%	30
			Acid Extractable Beryllium (Be)	2014/05/14	NC		%	30
			Acid Extractable Boron (B)	2014/05/14	NC		%	30
			Acid Extractable Cadmium (Cd)	2014/05/14	NC		%	30
			Acid Extractable Chromium (Cr)	2014/05/14	6.4		%	30
			Acid Extractable Cobalt (Co)	2014/05/14	0.5		%	30
			Acid Extractable Copper (Cu)	2014/05/14	28.1		%	30
			Acid Extractable Lead (Pb)	2014/05/14	NC		%	30
			Acid Extractable Molybdenum (Mo)	2014/05/14	NC		%	30
			Acid Extractable Nickel (Ni)	2014/05/14	4.0		%	30
			Acid Extractable Selenium (Se)	2014/05/14	NC		%	30
			Acid Extractable Silver (Ag)	2014/05/14	NC		%	30
			Acid Extractable Thallium (Tl)	2014/05/14	NC		%	30
			Acid Extractable Vanadium (V)	2014/05/14	NC		%	30
			Acid Extractable Zinc (Zn)	2014/05/14	NC		%	30
			Acid Extractable Mercury (Hg)	2014/05/14	NC		%	30
3606683	L_A	Spiked Blank	Conductivity	2014/05/15		99	%	90 - 110
3606683	L_A	Method Blank	Conductivity	2014/05/15	<0.002		mS/cm	
3606683	L_A	RPD	Conductivity	2014/05/15	6.9		%	10

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Job #: B478113
Report Date: 2014/05/16

Golder Associates Ltd
Client Project #: 13-1111-0035
Site Location: METROLINX
Sampler Initials: OS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

A handwritten signature in black ink, reading "Cristina Carriere", is positioned above a horizontal line.

Cristina Carriere, Scientific Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

CLIENT NAME: GOLDER ASSOCIATES LTD.
6925 CENTURY AVE, SUITE#100
MISSISSAUGA, ON L5N7K2
(905) 567-4444

ATTENTION TO: Sandra McGaghran

PROJECT: 13-111-0035

AGAT WORK ORDER: 14T866175

SOIL ANALYSIS REVIEWED BY: Elizabeth Polakowska, MSc (Animal Sci), PhD (Agri Sci), Inorganic Lab
Supervisor

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Aug 06, 2014

PAGES (INCLUDING COVER): 17

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: GOLDER ASSOCIATES LTD.

SAMPLING SITE:

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

Ignitability in Soil

DATE RECEIVED: 2014-07-21

DATE REPORTED: 2014-08-06

SAMPLE DESCRIPTION: COMPOSITE

SAMPLE TYPE: Soil

DATE SAMPLED: 7/21/2014

Parameter

Unit

G / S

RDL

5617326

Ignitability

N

Comments: 5617326 RDL - Reported Detection Limit; N = Non-Flammable Solid
Wet soil sample with pebbles. G / S - Guideline / Standard

Certified By:

Elizabeth Polakowska



Certificate of Analysis

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

5835 COOPERS AVENUE
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<http://www.agatlabs.com>

CLIENT NAME: GOLDER ASSOCIATES LTD.

SAMPLING SITE:

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2014-07-21

DATE REPORTED: 2014-08-06

		SAMPLE DESCRIPTION:		2014R2-SS3	2014R5-SS5	2014R9-SS4
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		7/21/2014	7/21/2014	7/21/2014
Parameter	Unit	G / S	RDL	5599907	5599918	5599925
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	4	2
Barium	µg/g	220	2	61	61	54
Beryllium	µg/g	2.5	0.5	<0.5	<0.5	<0.5
Boron	µg/g	36	5	8	9	7
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.22	0.28	0.12
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	2	16	16	15
Cobalt	µg/g	21	0.5	8.3	7.7	5.7
Copper	µg/g	92	1	19	17	15
Lead	µg/g	120	1	10	7	6
Molybdenum	µg/g	2	0.5	<0.5	<0.5	<0.5
Nickel	µg/g	82	1	19	20	15
Selenium	µg/g	1.5	0.4	<0.4	<0.4	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.7	0.6	<0.5
Vanadium	µg/g	86	1	21	23	21
Zinc	µg/g	290	5	42	42	32
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	0.57	0.005	0.203	0.186	0.444
Sodium Adsorption Ratio (2:1)	NA	2.4	NA	1.94	0.271	4.32
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.70	7.92	7.81

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(ALL) - Current
5599907-5599925 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

Elizabeth Polakowska



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

5835 COOPERS AVENUE
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FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: GOLDER ASSOCIATES LTD.

SAMPLING SITE:

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2014-07-21

DATE REPORTED: 2014-08-06

		SAMPLE DESCRIPTION:		COMPOSITE
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		7/21/2014
Parameter	Unit	G / S	RDL	5617326
Arsenic Leachate	mg/L	2.5	0.010	<0.010
Barium Leachate	mg/L	100	0.100	0.824
Boron Leachate	mg/L	500	0.050	<0.050
Cadmium Leachate	mg/L	0.5	0.010	<0.010
Chromium Leachate	mg/L	5.0	0.010	<0.010
Lead Leachate	mg/L	5.0	0.010	<0.010
Mercury Leachate	mg/L	0.1	0.01	<0.01
Selenium Leachate	mg/L	1.0	0.010	<0.010
Silver Leachate	mg/L	5.0	0.010	<0.010
Uranium Leachate	mg/L	10.0	0.050	<0.050
Fluoride Leachate	mg/L	150	0.05	0.31
Cyanide Leachate	mg/L	20.0	0.05	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L	1000	0.70	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Regulation 558

Certified By:

Elizabeth Polakowska



Certificate of Analysis

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

5835 COOPERS AVENUE
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<http://www.agatlabs.com>

CLIENT NAME: GOLDER ASSOCIATES LTD.

SAMPLING SITE:

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

O. Reg. 153(511) - PAHs (Soil)						
DATE RECEIVED: 2014-07-21			DATE REPORTED: 2014-08-06			
		SAMPLE DESCRIPTION:		2014R2-SS3	2014R5-SS5	2014R9-SS4
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		7/21/2014	7/21/2014	7/21/2014
Parameter	Unit	G / S	RDL	5599907	5599918	5599925
Naphthalene	µg/g	0.09	0.05	<0.05	<0.05	<0.05
Acenaphthylene	µg/g	0.093	0.05	<0.05	<0.05	<0.05
Acenaphthene	µg/g	0.072	0.05	<0.05	<0.05	<0.05
Fluorene	µg/g	0.12	0.05	<0.05	<0.05	<0.05
Phenanthrene	µg/g	0.69	0.05	<0.05	<0.05	<0.05
Anthracene	µg/g	0.16	0.05	<0.05	<0.05	<0.05
Fluoranthene	µg/g	0.56	0.05	<0.05	<0.05	<0.05
Pyrene	µg/g	1	0.05	<0.05	<0.05	<0.05
Benz(a)anthracene	µg/g	0.36	0.05	<0.05	<0.05	<0.05
Chrysene	µg/g	2.8	0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	µg/g	0.47	0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	µg/g	0.48	0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	µg/g	0.3	0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-cd)pyrene	µg/g	0.23	0.05	<0.05	<0.05	<0.05
Dibenz(a,h)anthracene	µg/g	0.1	0.05	<0.05	<0.05	<0.05
Benzo(g,h,i)perylene	µg/g	0.68	0.05	<0.05	<0.05	<0.05
2-and 1-methyl Naphthalene	µg/g	0.59	0.05	<0.05	<0.05	<0.05
Moisture Content	%		0.1	10.6	9.5	9.3
wet weight	g		NA	10.14	10.18	10.44
Surrogate	Unit	Acceptable Limits				
Chrysene-d12	%	50-140		61	70	70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(ALL) - Current

5599907-5599925 Results are based on the dry weight of the soil.

Note: The result for Benzo(b)Fluoranthene is the total of the Benzo(b)&(j)Fluoranthene isomers because the isomers co-elute on the GC column.

Certified By:

N Popmukolof



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

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CLIENT NAME: GOLDER ASSOCIATES LTD.

SAMPLING SITE:

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2014-07-21

DATE REPORTED: 2014-08-06

		SAMPLE DESCRIPTION:		2014R2-SS3	2014R5-SS5	2014R9-SS4
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		7/21/2014	7/21/2014	7/21/2014
Parameter	Unit	G / S	RDL	5599907	5599918	5599925
Dichlorodifluoromethane	µg/g	0.05	0.05	<0.05	<0.05	<0.05
Vinyl Chloride	ug/g	0.02	0.02	<0.02	<0.02	<0.02
Bromomethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Trichlorofluoromethane	ug/g	0.25	0.05	<0.05	<0.05	<0.05
Acetone	ug/g	0.5	0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Methylene Chloride	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Methyl tert-butyl Ether	ug/g	0.05	0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	ug/g	0.05	0.02	<0.02	<0.02	<0.02
Methyl Ethyl Ketone	ug/g	0.5	0.50	<0.50	<0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g	0.05	0.02	<0.02	<0.02	<0.02
Chloroform	ug/g	0.05	0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	ug/g	0.05	0.03	<0.03	<0.03	<0.03
1,1,1-Trichloroethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Benzene	ug/g	0.02	0.02	<0.02	<0.02	<0.02
1,2-Dichloropropane	ug/g	0.05	0.03	<0.03	<0.03	<0.03
Trichloroethylene	ug/g	0.05	0.03	<0.03	<0.03	<0.03
Bromodichloromethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Methyl Isobutyl Ketone	ug/g	0.5	0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/g	0.05	0.04	<0.04	<0.04	<0.04
Toluene	ug/g	0.2	0.05	<0.05	<0.05	<0.05
Dibromochloromethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Ethylene Dibromide	ug/g	0.05	0.04	<0.04	<0.04	<0.04
Tetrachloroethylene	ug/g	0.05	0.05	<0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g	0.05	0.04	<0.04	<0.04	<0.04
Chlorobenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Ethylbenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05
m & p-Xylene	ug/g		0.05	<0.05	<0.05	<0.05

Certified By:

N Popmukolof



Certificate of Analysis

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

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CLIENT NAME: GOLDER ASSOCIATES LTD.

SAMPLING SITE:

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

O. Reg. 153(511) - VOCs (Soil)						
DATE RECEIVED: 2014-07-21			DATE REPORTED: 2014-08-06			
		SAMPLE DESCRIPTION:		2014R2-SS3	2014R5-SS5	2014R9-SS4
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		7/21/2014	7/21/2014	7/21/2014
Parameter	Unit	G / S	RDL	5599907	5599918	5599925
Bromoform	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Styrene	ug/g	0.05	0.05	<0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g	0.05	0.05	<0.05	<0.05	<0.05
o-Xylene	ug/g		0.05	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05
1,4-Dichlorobenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	ug/g	0.05	0.05	<0.05	<0.05	<0.05
Xylene Mixture	ug/g	0.05	0.05	<0.05	<0.05	<0.05
1,3-Dichloropropene	µg/g	0.05	0.04	<0.04	<0.04	<0.04
n-Hexane	µg/g	0.05	0.05	<0.05	<0.05	<0.05
Moisture Content	%		0.1	10.6	9.5	9.3
Surrogate	Unit	Acceptable Limits				
Toluene-d8	% Recovery	50-140		106	106	107
4-Bromofluorobenzene	% Recovery	50-140		97	99	97

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(ALL) - Current

5599907-5599925 The sample was analysed using the high level technique. The sample was

extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed.

Results are based on the dry weight of the soil.

Certified By:

N Popmukolof



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

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CLIENT NAME: GOLDER ASSOCIATES LTD.

SAMPLING SITE:

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

ON Regulation 558 Benzo(a) pyrene

DATE RECEIVED: 2014-07-21

DATE REPORTED: 2014-08-06

SAMPLE DESCRIPTION: COMPOSITE

SAMPLE TYPE: Soil

DATE SAMPLED: 7/21/2014

Parameter	Unit	G / S	RDL	5617326
Benzo(a)pyrene	mg/L	0.001	0.001	<0.001

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Regulation 558
5617326 The sample was leached according to Regulation 558 protocol. Analysis was performed on the leachate.

Certified By:



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Certificate of Analysis

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

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CLIENT NAME: GOLDER ASSOCIATES LTD.

SAMPLING SITE:

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

ON Regulation 558 PCBs

DATE RECEIVED: 2014-07-21

DATE REPORTED: 2014-08-06

		SAMPLE DESCRIPTION: COMPOSITE		
		SAMPLE TYPE: Soil		
		DATE SAMPLED: 7/21/2014		
Parameter	Unit	G / S	RDL	5617326
Polychlorinated Biphenyls	mg/L	0.3	0.005	<0.005
Surrogate	Unit	Acceptable Limits		
Decachlorobiphenyl	%	60-130	90	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Regulation 558
5617326 The soil sample was leached using the Regulation 558 procedure. Analysis was performed on the leachate.

Certified By:



AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

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CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Sandra McGaghran

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
5599925	2014R9-SS4	T1(ALL) - Current	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio (2:1)	2.4	4.32

Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

PROJECT: 13-111-0035

SAMPLING SITE:

AGAT WORK ORDER: 14T866175

ATTENTION TO: Sandra McGaghnan

SAMPLED BY: Jeremy Lebow

Soil Analysis

RPT Date: Aug 06, 2014			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE				
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

O. Reg. 558 Metals and Inorganics

Arsenic Leachate	1		< 0.010	< 0.010	0.0%	< 0.010	98%	90%	110%	95%	80%	120%	103%	70%	130%
Barium Leachate	1		0.292	0.318	8.5%	< 0.100	97%	90%	110%	92%	80%	120%	103%	70%	130%
Boron Leachate	1		0.056	0.061	8.5%	< 0.050	99%	90%	110%	92%	80%	120%	90%	70%	130%
Cadmium Leachate	1		< 0.010	< 0.010	0.0%	< 0.010	100%	90%	110%	109%	80%	120%	114%	70%	130%
Chromium Leachate	1		< 0.010	< 0.010	0.0%	< 0.010	96%	90%	110%	92%	80%	120%	94%	70%	130%
Lead Leachate	1		< 0.010	< 0.010	0.0%	< 0.010	95%	90%	110%	89%	80%	120%	83%	70%	130%
Mercury Leachate	1		< 0.01	< 0.01	0.0%	< 0.01	96%	90%	110%	93%	80%	120%	91%	70%	130%
Selenium Leachate	1		< 0.010	< 0.010	0.0%	< 0.010	99%	90%	110%	94%	80%	120%	95%	70%	130%
Silver Leachate	1		< 0.010	< 0.010	0.0%	< 0.010	104%	90%	110%	103%	80%	120%	99%	70%	130%
Uranium Leachate	1		< 0.050	< 0.050	0.0%	< 0.050	105%	90%	110%	97%	80%	120%	93%	70%	130%
Fluoride Leachate	1		0.22	0.24	8.7%	< 0.05	100%	90%	110%	108%	90%	110%	99%	70%	130%
Cyanide Leachate	5622033		<0.05	<0.05	0.0%	< 0.05	98%	90%	110%	109%	90%	110%	115%	70%	130%
(Nitrate + Nitrite) as N Leachate	5622033		<0.70	<0.70	0.0%	< 0.70	92%	80%	120%	94%	80%	120%	90%	70%	130%

O. Reg. 153(511) - Metals & Inorganics (Soil)

Antimony	1		< 0.8	< 0.8	0.0%	< 0.8	104%	70%	130%	91%	80%	120%	86%	70%	130%
Arsenic	1		2	2	0.0%	< 1	95%	70%	130%	95%	80%	120%	91%	70%	130%
Barium	1		63	66	4.7%	< 2	100%	70%	130%	91%	80%	120%	98%	70%	130%
Beryllium	1		< 0.5	< 0.5	0.0%	< 0.5	90%	70%	130%	94%	80%	120%	86%	70%	130%
Boron	1		6	6	0.0%	< 5	77%	70%	130%	93%	80%	120%	80%	70%	130%
Boron (Hot Water Soluble)	1		0.24	0.24	0.0%	< 0.10	103%	60%	140%	102%	70%	130%	99%	60%	140%
Cadmium	1		< 0.5	< 0.5	0.0%	< 0.5	108%	70%	130%	113%	80%	120%	97%	70%	130%
Chromium	1		15	15	0.0%	< 2	100%	70%	130%	93%	80%	120%	86%	70%	130%
Cobalt	1		5.7	5.9	3.4%	< 0.5	97%	70%	130%	93%	80%	120%	82%	70%	130%
Copper	1		12	12	0.0%	< 1	99%	70%	130%	97%	80%	120%	90%	70%	130%
Lead	1		7	7	0.0%	< 1	101%	70%	130%	95%	80%	120%	85%	70%	130%
Molybdenum	1		< 0.5	< 0.5	0.0%	< 0.5	110%	70%	130%	99%	80%	120%	100%	70%	130%
Nickel	1		13	14	7.4%	< 1	108%	70%	130%	102%	80%	120%	87%	70%	130%
Selenium	1		< 0.4	< 0.4	0.0%	< 0.4	101%	70%	130%	95%	80%	120%	93%	70%	130%
Silver	1		< 0.2	< 0.2	0.0%	< 0.2	91%	70%	130%	100%	80%	120%	94%	70%	130%
Thallium	1		< 0.4	< 0.4	0.0%	< 0.4	97%	70%	130%	97%	80%	120%	92%	70%	130%
Uranium	1		< 0.5	< 0.5	0.0%	< 0.5	101%	70%	130%	92%	80%	120%	93%	70%	130%
Vanadium	1		22	24	8.7%	< 1	92%	70%	130%	88%	80%	120%	79%	70%	130%
Zinc	1		32	35	9.0%	< 5	102%	70%	130%	97%	80%	120%	85%	70%	130%
Chromium VI	1		< 0.2	< 0.2	0.0%	< 0.2	98%	70%	130%	99%	80%	120%	103%	70%	130%
Cyanide	5605446		<0.040	<0.040	0.0%	< 0.040	95%	70%	130%	99%	80%	120%	110%	70%	130%
Mercury	1		< 0.10	< 0.10	0.0%	< 0.10	119%	70%	130%	99%	80%	120%	98%	70%	130%
Electrical Conductivity (2:1)	1		0.157	0.158	0.6%	< 0.005	99%	90%	110%	NA			NA		
Sodium Adsorption Ratio (2:1)	1		0.322	0.332	3.1%	NA	NA			NA			NA		



Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

PROJECT: 13-111-0035

SAMPLING SITE:

AGAT WORK ORDER: 14T866175

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

Soil Analysis (Continued)

RPT Date: Aug 06, 2014			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
pH, 2:1 CaCl2 Extraction	1	5599925	7.81	7.85	0.5%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.

Certified By:

Elizabeth Polakowska

Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

PROJECT: 13-111-0035

SAMPLING SITE:

AGAT WORK ORDER: 14T866175

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

Trace Organics Analysis

RPT Date: Aug 06, 2014			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
ON Regulation 558 PCBs															
Polychlorinated Biphenyls	1		< 0.005	< 0.005	0.0%	< 0.005	96%	60%	130%	121%	60%	130%	NA	60%	130%
ON Regulation 558 Benzo(a) pyrene															
Benzo(a)pyrene	1		< 0.001	< 0.001	0.0%	< 0.001	115%	70%	130%	77%	70%	130%	NA	70%	130%
O. Reg. 153(511) - PAHs (Soil)															
Naphthalene	1		< 0.05	< 0.05	0.0%	< 0.05	93%	50%	140%	64%	50%	140%	72%	50%	140%
Acenaphthylene	1		< 0.05	< 0.05	0.0%	< 0.05	92%	50%	140%	62%	50%	140%	59%	50%	140%
Acenaphthene	1		< 0.05	< 0.05	0.0%	< 0.05	92%	50%	140%	64%	50%	140%	71%	50%	140%
Fluorene	1		< 0.05	< 0.05	0.0%	< 0.05	91%	50%	140%	62%	50%	140%	69%	50%	140%
Phenanthrene	1		< 0.05	< 0.05	0.0%	< 0.05	85%	50%	140%	59%	50%	140%	66%	50%	140%
Anthracene	1		< 0.05	< 0.05	0.0%	< 0.05	91%	50%	140%	51%	50%	140%	60%	50%	140%
Fluoranthene	1		< 0.05	< 0.05	0.0%	< 0.05	87%	50%	140%	62%	50%	140%	72%	50%	140%
Pyrene	1		< 0.05	< 0.05	0.0%	< 0.05	88%	50%	140%	62%	50%	140%	71%	50%	140%
Benzo(a)anthracene	1		< 0.05	< 0.05	0.0%	< 0.05	81%	50%	140%	63%	50%	140%	67%	50%	140%
Chrysene	1		< 0.05	< 0.05	0.0%	< 0.05	85%	50%	140%	65%	50%	140%	71%	50%	140%
Benzo(b)fluoranthene	1		< 0.05	< 0.05	0.0%	< 0.05	105%	50%	140%	59%	50%	140%	65%	50%	140%
Benzo(k)fluoranthene	1		< 0.05	< 0.05	0.0%	< 0.05	110%	50%	140%	66%	50%	140%	70%	50%	140%
Benzo(a)pyrene	1		< 0.05	< 0.05	0.0%	< 0.05	104%	50%	140%	62%	50%	140%	63%	50%	140%
Indeno(1,2,3-cd)pyrene	1		< 0.05	< 0.05	0.0%	< 0.05	99%	50%	140%	60%	50%	140%	61%	50%	140%
Dibenz(a,h)anthracene	1		< 0.05	< 0.05	0.0%	< 0.05	99%	50%	140%	61%	50%	140%	61%	50%	140%
Benzo(g,h,i)perylene	1		< 0.05	< 0.05	0.0%	< 0.05	115%	50%	140%	67%	50%	140%	66%	50%	140%
2-and 1-methyl Naphthalene	1		< 0.05	< 0.05	0.0%	< 0.05	96%	50%	140%	62%	50%	140%	72%	50%	140%
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	1		< 0.05	< 0.05	0.0%	< 0.05	111%	50%	140%	120%	50%	140%	97%	50%	140%
Vinyl Chloride	1		< 0.02	< 0.02	0.0%	< 0.02	114%	50%	140%	119%	50%	140%	104%	50%	140%
Bromomethane	1		< 0.05	< 0.05	0.0%	< 0.05	93%	50%	140%	111%	50%	140%	105%	50%	140%
Trichlorofluoromethane	1		< 0.05	< 0.05	0.0%	< 0.05	117%	50%	140%	115%	50%	140%	98%	50%	140%
Acetone	1		< 0.50	< 0.50	0.0%	< 0.50	87%	50%	140%	90%	50%	140%	94%	50%	140%
1,1-Dichloroethylene	1		< 0.05	< 0.05	0.0%	< 0.05	97%	50%	140%	80%	60%	130%	94%	50%	140%
Methylene Chloride	1		< 0.05	< 0.05	0.0%	< 0.05	101%	50%	140%	94%	60%	130%	93%	50%	140%
Trans- 1,2-Dichloroethylene	1		< 0.05	< 0.05	0.0%	< 0.05	109%	50%	140%	73%	60%	130%	76%	50%	140%
Methyl tert-butyl Ether	1		< 0.05	< 0.05	0.0%	< 0.05	77%	50%	140%	77%	60%	130%	76%	50%	140%
1,1-Dichloroethane	1		< 0.02	< 0.02	0.0%	< 0.02	117%	50%	140%	107%	60%	130%	92%	50%	140%
Methyl Ethyl Ketone	1		< 0.50	< 0.50	0.0%	< 0.50	89%	50%	140%	84%	50%	140%	91%	50%	140%
Cis- 1,2-Dichloroethylene	1		< 0.02	< 0.02	0.0%	< 0.02	98%	50%	140%	77%	60%	130%	75%	50%	140%
Chloroform	1		< 0.04	< 0.04	0.0%	< 0.04	95%	50%	140%	75%	60%	130%	76%	50%	140%
1,2-Dichloroethane	1		< 0.03	< 0.03	0.0%	< 0.03	105%	50%	140%	88%	60%	130%	88%	50%	140%
1,1,1-Trichloroethane	1		< 0.05	< 0.05	0.0%	< 0.05	96%	50%	140%	76%	60%	130%	78%	50%	140%

Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

PROJECT: 13-111-0035

SAMPLING SITE:

AGAT WORK ORDER: 14T866175

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

Trace Organics Analysis (Continued)

RPT Date: Aug 06, 2014			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Carbon Tetrachloride	1		< 0.05	< 0.05	0.0%	< 0.05	90%	50%	140%	72%	60%	130%	71%	50%	140%
Benzene	1		< 0.02	< 0.02	0.0%	< 0.02	103%	50%	140%	79%	60%	130%	91%	50%	140%
1,2-Dichloropropane	1		< 0.03	< 0.03	0.0%	< 0.03	105%	50%	140%	85%	60%	130%	80%	50%	140%
Trichloroethylene	1		< 0.03	< 0.03	0.0%	< 0.03	105%	50%	140%	84%	60%	130%	76%	50%	140%
Bromodichloromethane	1		< 0.05	< 0.05	0.0%	< 0.05	88%	50%	140%	116%	60%	130%	72%	50%	140%
Methyl Isobutyl Ketone	1		< 0.50	< 0.50	0.0%	< 0.50	89%	50%	140%	81%	50%	140%	83%	50%	140%
1,1,2-Trichloroethane	1		< 0.04	< 0.04	0.0%	< 0.04	113%	50%	140%	104%	60%	130%	103%	50%	140%
Toluene	1		< 0.05	< 0.05	0.0%	< 0.05	98%	50%	140%	106%	60%	130%	104%	50%	140%
Dibromochloromethane	1		< 0.05	< 0.05	0.0%	< 0.05	87%	50%	140%	78%	60%	130%	79%	50%	140%
Ethylene Dibromide	1		< 0.04	< 0.04	0.0%	< 0.04	93%	50%	140%	83%	60%	130%	80%	50%	140%
Tetrachloroethylene	1		< 0.05	< 0.05	0.0%	< 0.05	101%	50%	140%	103%	60%	130%	100%	50%	140%
1,1,1,2-Tetrachloroethane	1		< 0.04	< 0.04	0.0%	< 0.04	93%	50%	140%	86%	60%	130%	85%	50%	140%
Chlorobenzene	1		< 0.05	< 0.05	0.0%	< 0.05	108%	50%	140%	105%	60%	130%	103%	50%	140%
Ethylbenzene	1		< 0.05	< 0.05	0.0%	< 0.05	101%	50%	140%	93%	60%	130%	89%	50%	140%
m & p-Xylene	1		< 0.05	< 0.05	0.0%	< 0.05	103%	50%	140%	97%	60%	130%	92%	50%	140%
Bromoform	1		< 0.05	< 0.05	0.0%	< 0.05	93%	50%	140%	88%	60%	130%	92%	50%	140%
Styrene	1		< 0.05	< 0.05	0.0%	< 0.05	97%	50%	140%	104%	60%	130%	99%	50%	140%
1,1,2,2-Tetrachloroethane	1		< 0.05	< 0.05	0.0%	< 0.05	104%	50%	140%	106%	60%	130%	109%	50%	140%
o-Xylene	1		< 0.05	< 0.05	0.0%	< 0.05	103%	50%	140%	100%	60%	130%	96%	50%	140%
1,3-Dichlorobenzene	1		< 0.05	< 0.05	0.0%	< 0.05	112%	50%	140%	108%	60%	130%	103%	50%	140%
1,4-Dichlorobenzene	1		< 0.05	< 0.05	0.0%	< 0.05	105%	50%	140%	103%	60%	130%	103%	50%	140%
1,2-Dichlorobenzene	1		< 0.05	< 0.05	0.0%	< 0.05	106%	50%	140%	100%	60%	130%	101%	50%	140%
1,3-Dichloropropene	1		< 0.04	< 0.04	0.0%	< 0.04	105%	50%	140%	95%	60%	130%	107%	50%	140%
n-Hexane	1		< 0.05	< 0.05	0.0%	< 0.05	106%	50%	140%	74%	60%	130%	85%	50%	140%

Certified By:



Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

PROJECT: 13-111-0035

SAMPLING SITE:

AGAT WORK ORDER: 14T866175

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Ignitability		EPA SW-846 1030	BURN MOLD
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A; SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio (2:1)	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl ₂ Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Arsenic Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Barium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Boron Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Cadmium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Chromium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Lead Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Mercury Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Selenium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Silver Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Uranium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA SW-846-1311 & SM4500-F- C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA SW-846-1311 & MOE 3015 & SM 4500 CN- I	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA SW 846-1311 & SM 4500 - NO ₃ - I	LACHAT FIA

Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 14T866175

PROJECT: 13-111-0035

ATTENTION TO: Sandra McGaghran

SAMPLING SITE:

SAMPLED BY: Jeremy Lebow

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Naphthalene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Acenaphthylene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Acenaphthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Fluorene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Phenanthrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benz(a)anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Chrysene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(b)fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(k)fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(a)pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Indeno(1,2,3-cd)pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Dibenz(a,h)anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(g,h,i)perylene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
2-and 1-methyl Naphthalene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Moisture Content	ORG-91-5106	EPA SW-846 3541 & 8270	BALANCE
Chrysene-d12	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
wet weight	ORG-91-5106	EPA SW-846 3541 & 8270	BALANCE
Dichlorodifluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromomethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Acetone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chloroform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Benzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Toluene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS

Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

PROJECT: 13-111-0035

SAMPLING SITE:

AGAT WORK ORDER: 14T866175

ATTENTION TO: Sandra McGaghran

SAMPLED BY: Jeremy Lebow

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
m & p-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromoform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Styrene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
o-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Xylene Mixture	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,3-Dichloropropene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
n-Hexane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Toluene-d8	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Moisture Content	VOL-91-5002	MOE E3139	BALANCE
Benzo(a)pyrene	ORG-91-5114	EPA SW846 3540 & 8270	GC/MS
Polychlorinated Biphenyls	ORG-91-5112	Regulation 558, EPA SW846 3510C/8082	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW846 3510C/8082	GC/ECD



AGAT

Laboratories

5835 Coopers Avenue
Mississauga, ON
L4Z 1Y2
www.agatlabs.com • webeath.agatlabs.com

Chain of Custody Record

P: 905.712.5100 • F: 905.712.5122

Client Information

Company: Golder Associates Ltd.
Contact: Sandra McLaughlin
Address: 6925 Century Avenue
Suite 100
Phone: 905-567-4444 Fax: 905-567-6561
Project: 13-111-0035 PO: _____
AGAT Quotation #: _____
Please note, if quotation number is not provided,
client will be billed full price for analysis.

Regulatory Requirements

☒ Regulation 153/04
(reg. 511 Amend)
Table 1 Indicate one
☒ Ind/Com
☒ Res/Park
☒ Agriculture
Soil Texture (check one)
☐ Coarse ☒ Fine
☐ Sewer Use
Region _____ Indicate one
☐ CCME
☐ Other (specify) _____
☐ Sanitary
☐ Storm
☐ Prov. Water Quality
Objectives (PWQO)
☐ None

Invoice To

Same: Yes ☒ No ☐
Company: _____
Contact: _____
Address: _____

Report Information - reports to be sent to:

1. Name: Sandra McLaughlin
Email: Sandra-McLaughlin@golder.com
2. Name: Jeremy Lebow
Email: Jeremy-Lebow@golder.com

Is this a drinking water sampler?
(potable water intended for human consumption)
☐ Yes ☐ No
If "Yes", please use the
Drinking Water Chain of Custody Form

Is this submission for a Record of Site Condition?

☐ Yes ☒ No

*TAT is exclusive of weekends and statutory holidays

Laboratory Use Only

Arrival Temperature: 14T 866175
AGAT WO #: _____
Lab Temperature: 15.6 (note)
Notes: _____

Turnaround Time Required (TAT) Required*

Regular TAT
☒ 5 to 7 Working Days
Rush TAT (please provide prior notification)
Rush Surcharges Apply
☐ 3 Working Days
☐ 2 Working Days
☐ 1 Working Day
OR
Date Required (Rush surcharges may apply): _____

Legend Matrix

GW Ground Water O Oil
SW Surface Water P Paint
SD Sediment S Soil

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Site/Sample Information	Comments	Metals and Inorganics -	Metals Scan	Hydride Forming Metals	Client Custom Metals	ORPs: <input type="checkbox"/> B-HWS <input type="checkbox"/> Cl- <input type="checkbox"/> CN- <input type="checkbox"/> EC <input type="checkbox"/> FOC <input type="checkbox"/> Cr+6 <input type="checkbox"/> SAR <input type="checkbox"/> NO ₃ /NO ₂ <input type="checkbox"/> N- Total <input type="checkbox"/> Hg <input type="checkbox"/> pH	Nutrients: <input type="checkbox"/> TP <input type="checkbox"/> NH ₃ <input type="checkbox"/> TKN <input type="checkbox"/> NO ₃ <input checked="" type="checkbox"/> NO ₂ <input type="checkbox"/> NO ₃ /NO ₂	VOC: <input type="checkbox"/> VOC <input type="checkbox"/> THM <input checked="" type="checkbox"/> BTEX	CCME Fractions 1 to 4*	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use
2-3	July 21/14	10:30am	S	2	BH 2-553																
5-5	July 21/14	12:05pm	S	2	BH 5-555																
9-4	July 21/14	1:35pm	S	2	BH 9-554																
2-3-1		10:30am	S	1	BH 2-553																
2-3-2		10:30am	S	1																	
2-3-3		10:30am	S	1																	
9-4-1		1:35pm	S	1	BH 9-554																
9-4-2		1:35pm	S	1																	
9-4-3		1:35pm	S	1																	
5-5-1		12:05pm	S	1	BH 5-555																
5-5-2		12:05pm	S	1																	
5-5-3		12:05pm	S	1																	

Samples Relinquished By (Print Name and Sign): Jeremy Lebow July 21/14 4:45 pm
Samples Relinquished By (Print Name and Sign): Jeremy Lebow July 21/14 4:45 pm
Samples Received By (Print Name and Sign): Jeremy Lebow July 21/14 4:45 pm
Samples Received By (Print Name and Sign): Jeremy Lebow July 21/14 4:45 pm

Pink Copy - Client
Yellow Copy - AGAT
White Copy - AGAT
Page 1 of 1
N#: 44698

Your Project #: 13-1111-0035
Site#: 13-1111-0035
Your C.O.C. #: 51328

Attention: Sandra McGaghran

Golder Associates Ltd
Mississauga - Standing Offer
6925 Century Ave
Suite 100
Mississauga, ON
CANADA L5N 7K2

Report Date: 2015/04/06
Report #: R3382175
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B554950
Received: 2015/03/30, 09:35

Sample Matrix: Soil
Samples Received: 4

Analyses	Date		Date Analyzed	Laboratory Method	Reference
	Quantity	Extracted			
Methylnaphthalene Sum	2	N/A	2015/04/01	CAM SOP-00301	EPA 8270D m
Hot Water Extractable Boron	4	2015/04/01	2015/04/01	CAM SOP-00408	R153 Ana. Prot. 2011
Free (WAD) Cyanide	3	2015/03/31	2015/04/02	CAM SOP-00457	OMOE E3015 m
Free (WAD) Cyanide	1	2015/04/01	2015/04/02	CAM SOP-00457	OMOE E3015 m
Conductivity	4	N/A	2015/04/02	CAM SOP-00414	OMOE E3138 v2 m
Hexavalent Chromium in Soil by IC (1)	4	2015/04/01	2015/04/02	CAM SOP-00436	EPA 3060/7199 m
Petroleum Hydro. CCME F1 & BTEX in Soil	2	2015/03/31	2015/04/02	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Soil	2	2015/04/01	2015/04/02	CAM SOP-00316	CCME CWS m
F4G (CCME Hydrocarbons Gravimetric)	1	2015/04/06	2015/04/06	CAM SOP-00316	CCME PHC-CWS m
Strong Acid Leachable Metals by ICPMS	4	2015/04/02	2015/04/02	CAM SOP-00447	EPA 6020A m
Moisture	4	N/A	2015/03/31	CAM SOP-00445	Carter 2nd ed 51.2 m
PAH Compounds in Soil by GC/MS (SIM)	2	2015/03/31	2015/04/01	CAM SOP-00318	EPA 8270D m
pH CaCl2 EXTRACT	4	2015/04/01	2015/04/01	CAM SOP-00413	EPA 9045 D m
Sodium Adsorption Ratio (SAR)	4	2015/03/31	2015/04/02	CAM SOP-00102	EPA 6010

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Your Project #: 13-1111-0035
Site#: 13-1111-0035
Your C.O.C. #: 51328

Attention: Sandra McGaghran

Golder Associates Ltd
Mississauga - Standing Offer
6925 Century Ave
Suite 100
Mississauga, ON
CANADA L5N 7K2

Report Date: 2015/04/06
Report #: R3382175
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B554950

Received: 2015/03/30, 09:35

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Soils are reported on a dry weight basis unless otherwise specified.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Antonella Brasil, Senior Project Manager

Email: ABrasil@maxxam.ca

Phone# (905)817-5817

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B554950
Report Date: 2015/04/06

Golder Associates Ltd
Client Project #: 13-1111-0035
Sampler Initials: JL

O.REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		AAL060	AAL061		AAL062		
Sampling Date		2015/03/27 09:45	2015/03/25 12:00		2015/03/25 11:40		
COC Number		51328	51328		51328		
	Units	BH2015-R4 SS1B	BH2015-R1 SS4	QC Batch	BH2015-R1 SS2	RDL	QC Batch
Calculated Parameters							
Sodium Adsorption Ratio	N/A	17	0.31	3966371	0.89		3966371
Inorganics							
Chromium (VI)	ug/g	0.9	<0.2	3968315	<0.2	0.2	3968315
Conductivity	mS/cm	0.99	0.16	3969239	0.22	0.002	3969239
Free Cyanide	ug/g	0.01	<0.01	3967436	<0.01	0.01	3967732
Moisture	%	12	9.9	3967359	11	1.0	3967359
Available (CaCl2) pH	pH	7.67	7.69	3967896	7.73	N/A	3967896
Metals							
Hot Water Ext. Boron (B)	ug/g	0.86	0.087	3968122	0.078	0.050	3968122
Acid Extractable Antimony (Sb)	ug/g	0.47	<0.20	3969485	<0.20	0.20	3969485
Acid Extractable Arsenic (As)	ug/g	3.2	3.2	3969485	3.4	1.0	3969485
Acid Extractable Barium (Ba)	ug/g	84	72	3969485	59	0.50	3969485
Acid Extractable Beryllium (Be)	ug/g	0.41	0.53	3969485	0.54	0.20	3969485
Acid Extractable Boron (B)	ug/g	7.1	8.3	3969485	7.9	5.0	3969485
Acid Extractable Cadmium (Cd)	ug/g	0.66	0.12	3969485	0.11	0.10	3969485
Acid Extractable Chromium (Cr)	ug/g	23	18	3969485	19	1.0	3969485
Acid Extractable Cobalt (Co)	ug/g	6.5	12	3969485	9.9	0.10	3969485
Acid Extractable Copper (Cu)	ug/g	28	21	3969485	24	0.50	3969485
Acid Extractable Lead (Pb)	ug/g	140	11	3969485	21	1.0	3969485
Acid Extractable Molybdenum (Mo)	ug/g	0.90	<0.50	3969485	<0.50	0.50	3969485
Acid Extractable Nickel (Ni)	ug/g	16	22	3969485	21	0.50	3969485
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	3969485	<0.50	0.50	3969485
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	3969485	<0.20	0.20	3969485
Acid Extractable Thallium (Tl)	ug/g	0.11	0.14	3969485	0.14	0.050	3969485
Acid Extractable Uranium (U)	ug/g	0.53	0.67	3969485	0.62	0.050	3969485
Acid Extractable Vanadium (V)	ug/g	25	25	3969485	25	5.0	3969485
Acid Extractable Zinc (Zn)	ug/g	130	48	3969485	58	5.0	3969485
Acid Extractable Mercury (Hg)	ug/g	0.065	<0.050	3969485	<0.050	0.050	3969485
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable							

Maxxam Job #: B554950
Report Date: 2015/04/06

Golder Associates Ltd
Client Project #: 13-1111-0035
Sampler Initials: JL

O.REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		AAL063		
Sampling Date		2015/03/25 11:40		
COC Number		51328		
	Units	BH2015-R4 SS3B	RDL	QC Batch

Calculated Parameters				
Sodium Adsorption Ratio	N/A	38		3966371
Inorganics				
Chromium (VI)	ug/g	<0.2	0.2	3968315
Conductivity	mS/cm	0.74	0.002	3969239
Free Cyanide	ug/g	<0.01	0.01	3967436
Moisture	%	12	1.0	3967359
Available (CaCl2) pH	pH	7.83	N/A	3967896
Metals				
Hot Water Ext. Boron (B)	ug/g	0.054	0.050	3968122
Acid Extractable Antimony (Sb)	ug/g	<0.20	0.20	3969485
Acid Extractable Arsenic (As)	ug/g	3.5	1.0	3969485
Acid Extractable Barium (Ba)	ug/g	80	0.50	3969485
Acid Extractable Beryllium (Be)	ug/g	0.53	0.20	3969485
Acid Extractable Boron (B)	ug/g	7.9	5.0	3969485
Acid Extractable Cadmium (Cd)	ug/g	<0.10	0.10	3969485
Acid Extractable Chromium (Cr)	ug/g	18	1.0	3969485
Acid Extractable Cobalt (Co)	ug/g	12	0.10	3969485
Acid Extractable Copper (Cu)	ug/g	22	0.50	3969485
Acid Extractable Lead (Pb)	ug/g	20	1.0	3969485
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	0.50	3969485
Acid Extractable Nickel (Ni)	ug/g	24	0.50	3969485
Acid Extractable Selenium (Se)	ug/g	<0.50	0.50	3969485
Acid Extractable Silver (Ag)	ug/g	<0.20	0.20	3969485
Acid Extractable Thallium (Tl)	ug/g	0.16	0.050	3969485
Acid Extractable Uranium (U)	ug/g	0.70	0.050	3969485
Acid Extractable Vanadium (V)	ug/g	26	5.0	3969485
Acid Extractable Zinc (Zn)	ug/g	53	5.0	3969485
Acid Extractable Mercury (Hg)	ug/g	<0.050	0.050	3969485
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				
N/A = Not Applicable				

Maxxam Job #: B554950
Report Date: 2015/04/06

Golder Associates Ltd
Client Project #: 13-1111-0035
Sampler Initials: JL

O.REG 153 PAHS (SOIL)

Maxxam ID		AAL060		AAL062		
Sampling Date		2015/03/27 09:45		2015/03/25 11:40		
COC Number		51328		51328		
	Units	BH2015-R4 SS1B	RDL	BH2015-R1 SS2	RDL	QC Batch
Calculated Parameters						
Methylnaphthalene, 2-(1-)	ug/g	0.46	0.028	<0.0071	0.0071	3966372
Polyaromatic Hydrocarbons						
Acenaphthene	ug/g	0.23	0.020	<0.0050	0.0050	3967523
Acenaphthylene	ug/g	0.073	0.020	<0.0050	0.0050	3967523
Anthracene	ug/g	0.26	0.020	<0.0050	0.0050	3967523
Benzo(a)anthracene	ug/g	0.48	0.020	<0.0050	0.0050	3967523
Benzo(a)pyrene	ug/g	0.51	0.020	<0.0050	0.0050	3967523
Benzo(b/j)fluoranthene	ug/g	0.69	0.020	<0.0050	0.0050	3967523
Benzo(g,h,i)perylene	ug/g	0.48	0.020	<0.0050	0.0050	3967523
Benzo(k)fluoranthene	ug/g	0.23	0.020	<0.0050	0.0050	3967523
Chrysene	ug/g	0.42	0.020	<0.0050	0.0050	3967523
Dibenz(a,h)anthracene	ug/g	0.073	0.020	<0.0050	0.0050	3967523
Fluoranthene	ug/g	1.3	0.020	<0.0050	0.0050	3967523
Fluorene	ug/g	0.27	0.020	<0.0050	0.0050	3967523
Indeno(1,2,3-cd)pyrene	ug/g	0.43	0.020	<0.0050	0.0050	3967523
1-Methylnaphthalene	ug/g	0.28	0.020	<0.0050	0.0050	3967523
2-Methylnaphthalene	ug/g	0.19	0.020	<0.0050	0.0050	3967523
Naphthalene	ug/g	<0.50 (1)	0.50	<0.0050	0.0050	3967523
Phenanthrene	ug/g	1.1	0.020	<0.0050	0.0050	3967523
Pyrene	ug/g	1.3	0.020	<0.0050	0.0050	3967523
Surrogate Recovery (%)						
D10-Anthracene	%	120		108		3967523
D14-Terphenyl (FS)	%	94		93		3967523
D8-Acenaphthylene	%	87		86		3967523
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						
(1) DL was raised due to matrix interference.						

Maxxam Job #: B554950
Report Date: 2015/04/06

Golder Associates Ltd
Client Project #: 13-1111-0035
Sampler Initials: JL

O.REG 153 PETROLEUM HYDROCARBONS (SOIL)

Maxxam ID		AAL060	AAL062		
Sampling Date		2015/03/27 09:45	2015/03/25 11:40		
COC Number		51328	51328		
	Units	BH2015-R4 SS1B	BH2015-R1 SS2	RDL	QC Batch
BTEX & F1 Hydrocarbons					
Benzene	ug/g	<0.020	<0.020	0.020	3968574
Toluene	ug/g	0.025	<0.020	0.020	3968574
Ethylbenzene	ug/g	0.052	<0.020	0.020	3968574
o-Xylene	ug/g	0.062	<0.020	0.020	3968574
p+m-Xylene	ug/g	0.066	<0.040	0.040	3968574
Total Xylenes	ug/g	0.13	<0.040	0.040	3968574
F1 (C6-C10)	ug/g	64	<10	10	3968574
F1 (C6-C10) - BTEX	ug/g	63	<10	10	3968574
F2-F4 Hydrocarbons					
F2 (C10-C16 Hydrocarbons)	ug/g	690	<10	10	3968535
F3 (C16-C34 Hydrocarbons)	ug/g	2800	<50	50	3968535
F4 (C34-C50 Hydrocarbons)	ug/g	1400	<50	50	3968535
Reached Baseline at C50	ug/g	No	Yes		3968535
Surrogate Recovery (%)					
1,4-Difluorobenzene	%	100	108		3968574
4-Bromofluorobenzene	%	108	102		3968574
D10-Ethylbenzene	%	90	97		3968574
D4-1,2-Dichloroethane	%	93	99		3968574
o-Terphenyl	%	105	96		3968535
RDL = Reportable Detection Limit					
QC Batch = Quality Control Batch					

Maxxam Job #: B554950
Report Date: 2015/04/06

Golder Associates Ltd
Client Project #: 13-1111-0035
Sampler Initials: JL

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		AAL060		
Sampling Date		2015/03/27 09:45		
COC Number		51328		
	Units	BH2015-R4 SS1B	RDL	QC Batch
F2-F4 Hydrocarbons				
F4G-sg (Grav. Heavy Hydrocarbons)	ug/g	4400	100	3971853
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

Maxxam Job #: B554950
Report Date: 2015/04/06

Golder Associates Ltd
Client Project #: 13-1111-0035
Sampler Initials: JL

TEST SUMMARY

Maxxam ID: AAL060
Sample ID: BH2015-R4 SS1B
Matrix: Soil

Collected: 2015/03/27
Shipped:
Received: 2015/03/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	3966372	N/A	2015/04/01	Automated Statchk
Hot Water Extractable Boron	ICP	3968122	2015/04/01	2015/04/01	Jolly John
Free (WAD) Cyanide	TECH	3967436	2015/03/31	2015/04/02	Xuanhong Qiu
Conductivity	AT	3969239	N/A	2015/04/02	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3968315	2015/04/01	2015/04/02	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	3968574	2015/03/31	2015/04/02	Yang Yu
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	3968535	2015/04/01	2015/04/02	Jolanta Kawzowicz
F4G (CCME Hydrocarbons Gravimetric)	BAL	3971853	2015/04/06	2015/04/06	Raheela Usmani
Strong Acid Leachable Metals by ICPMS	ICP/MS	3969485	2015/04/02	2015/04/02	Grace Bu
Moisture	BAL	3967359	N/A	2015/03/31	Valentina Kaftani
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	3967523	2015/03/31	2015/04/01	Darryl Tiller
pH CaCl2 EXTRACT	AT	3967896	2015/04/01	2015/04/01	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3966371	2015/04/02	2015/04/02	Automated Statchk

Maxxam ID: AAL061
Sample ID: BH2015-R1 SS4
Matrix: Soil

Collected: 2015/03/25
Shipped:
Received: 2015/03/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3968122	2015/04/01	2015/04/01	Jolly John
Free (WAD) Cyanide	TECH	3967436	2015/03/31	2015/04/02	Xuanhong Qiu
Conductivity	AT	3969239	N/A	2015/04/02	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3968315	2015/04/01	2015/04/02	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3969485	2015/04/02	2015/04/02	Grace Bu
Moisture	BAL	3967359	N/A	2015/03/31	Valentina Kaftani
pH CaCl2 EXTRACT	AT	3967896	2015/04/01	2015/04/01	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3966371	2015/04/02	2015/04/02	Automated Statchk

Maxxam ID: AAL062
Sample ID: BH2015-R1 SS2
Matrix: Soil

Collected: 2015/03/25
Shipped:
Received: 2015/03/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	3966372	N/A	2015/04/01	Automated Statchk
Hot Water Extractable Boron	ICP	3968122	2015/04/01	2015/04/01	Jolly John
Free (WAD) Cyanide	TECH	3967732	2015/04/01	2015/04/02	Xuanhong Qiu
Conductivity	AT	3969239	N/A	2015/04/02	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3968315	2015/04/01	2015/04/02	Sally Coughlin
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	3968574	2015/03/31	2015/04/02	Yang Yu
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	3968535	2015/04/01	2015/04/02	Jolanta Kawzowicz
Strong Acid Leachable Metals by ICPMS	ICP/MS	3969485	2015/04/02	2015/04/02	Grace Bu
Moisture	BAL	3967359	N/A	2015/03/31	Valentina Kaftani
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	3967523	2015/03/31	2015/04/01	Darryl Tiller
pH CaCl2 EXTRACT	AT	3967896	2015/04/01	2015/04/01	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3966371	2015/04/02	2015/04/02	Automated Statchk

Maxxam Job #: B554950
Report Date: 2015/04/06

Golder Associates Ltd
Client Project #: 13-1111-0035
Sampler Initials: JL

TEST SUMMARY

Maxxam ID: AAL063
Sample ID: BH2015-R4 SS3B
Matrix: Soil

Collected: 2015/03/25
Shipped:
Received: 2015/03/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	3968122	2015/04/01	2015/04/01	Jolly John
Free (WAD) Cyanide	TECH	3967436	2015/03/31	2015/04/02	Xuanhong Qiu
Conductivity	AT	3969239	N/A	2015/04/02	Lemeneh Addis
Hexavalent Chromium in Soil by IC	IC/SPEC	3968315	2015/04/01	2015/04/02	Sally Coughlin
Strong Acid Leachable Metals by ICPMS	ICP/MS	3969485	2015/04/02	2015/04/02	Grace Bu
Moisture	BAL	3967359	N/A	2015/03/31	Valentina Kaftani
pH CaCl ₂ EXTRACT	AT	3967896	2015/04/01	2015/04/01	Neil Dassanayake
Sodium Adsorption Ratio (SAR)	CALC/MET	3966371	2015/04/02	2015/04/02	Automated Statchk

Maxxam Job #: B554950
Report Date: 2015/04/06

Golder Associates Ltd
Client Project #: 13-1111-0035
Sampler Initials: JL

GENERAL COMMENTS

Sample AAL060-01 : PAH analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Sample AAL061-01 : SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Results relate only to the items tested.

Maxxam Job #: B554950
Report Date: 2015/04/06

QUALITY ASSURANCE REPORT

Golder Associates Ltd
Client Project #: 13-1111-0035
Sampler Initials: JL

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3967523	D10-Anthracene	2015/04/01	102	50 - 130	104	50 - 130	108	%				
3967523	D14-Terphenyl (FS)	2015/04/01	91	50 - 130	88	50 - 130	91	%				
3967523	D8-Acenaphthylene	2015/04/01	83	50 - 130	83	50 - 130	85	%				
3968535	o-Terphenyl	2015/04/01	94	60 - 130	89	60 - 130	93	%				
3968574	1,4-Difluorobenzene	2015/04/02	103	60 - 140	102	60 - 140	104	%				
3968574	4-Bromofluorobenzene	2015/04/02	102	60 - 140	103	60 - 140	100	%				
3968574	D10-Ethylbenzene	2015/04/02	90	60 - 140	84	60 - 140	82	%				
3968574	D4-1,2-Dichloroethane	2015/04/02	93	60 - 140	96	60 - 140	99	%				
3967359	Moisture	2015/03/31							1.1	20		
3967436	Free Cyanide	2015/04/02	94	75 - 125	98	80 - 120	<0.01	ug/g	NC	35		
3967523	1-Methylnaphthalene	2015/04/01	97	50 - 130	97	50 - 130	<0.0050	ug/g	NC	40		
3967523	2-Methylnaphthalene	2015/04/01	93	50 - 130	93	50 - 130	<0.0050	ug/g	NC	40		
3967523	Acenaphthene	2015/04/01	88	50 - 130	89	50 - 130	<0.0050	ug/g	NC	40		
3967523	Acenaphthylene	2015/04/01	85	50 - 130	86	50 - 130	<0.0050	ug/g	NC	40		
3967523	Anthracene	2015/04/01	93	50 - 130	94	50 - 130	<0.0050	ug/g	NC	40		
3967523	Benzo(a)anthracene	2015/04/01	96	50 - 130	89	50 - 130	<0.0050	ug/g	NC	40		
3967523	Benzo(a)pyrene	2015/04/01	93	50 - 130	91	50 - 130	<0.0050	ug/g	NC	40		
3967523	Benzo(b,j)fluoranthene	2015/04/01	91	50 - 130	89	50 - 130	<0.0050	ug/g	NC	40		
3967523	Benzo(g,h,i)perylene	2015/04/01	89	50 - 130	88	50 - 130	<0.0050	ug/g	NC	40		
3967523	Benzo(k)fluoranthene	2015/04/01	86	50 - 130	87	50 - 130	<0.0050	ug/g	NC	40		
3967523	Chrysene	2015/04/01	94	50 - 130	95	50 - 130	<0.0050	ug/g	NC	40		
3967523	Dibenz(a,h)anthracene	2015/04/01	87	50 - 130	83	50 - 130	<0.0050	ug/g	NC	40		
3967523	Fluoranthene	2015/04/01	99	50 - 130	97	50 - 130	<0.0050	ug/g	NC	40		
3967523	Fluorene	2015/04/01	86	50 - 130	86	50 - 130	<0.0050	ug/g	NC	40		
3967523	Indeno(1,2,3-cd)pyrene	2015/04/01	100	50 - 130	100	50 - 130	<0.0050	ug/g	NC	40		
3967523	Naphthalene	2015/04/01	85	50 - 130	86	50 - 130	<0.0050	ug/g	NC	40		
3967523	Phenanthrene	2015/04/01	86	50 - 130	88	50 - 130	<0.0050	ug/g	NC	40		
3967523	Pyrene	2015/04/01	101	50 - 130	98	50 - 130	<0.0050	ug/g	NC	40		
3967732	Free Cyanide	2015/04/02	105	75 - 125	102	80 - 120	<0.01	ug/g	NC	35		
3967896	Available (CaCl2) pH	2015/04/01			100	97 - 103			0.73	N/A		
3968122	Hot Water Ext. Boron (B)	2015/04/01	104	75 - 125	105	75 - 125	<0.050	ug/g	NC	40		
3968315	Chromium (VI)	2015/04/02	0 (1)	75 - 125	103	80 - 120	<0.2	ug/g	NC	35	106	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

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QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3968535	F2 (C10-C16 Hydrocarbons)	2015/04/02	93	50 - 130	89	80 - 120	<10	ug/g	NC	30		
3968535	F3 (C16-C34 Hydrocarbons)	2015/04/02	96	50 - 130	93	80 - 120	<50	ug/g	NC	30		
3968535	F4 (C34-C50 Hydrocarbons)	2015/04/02	93	50 - 130	89	80 - 120	<50	ug/g	NC	30		
3968574	Benzene	2015/04/02	97	60 - 140	102	60 - 140	<0.020	ug/g	NC	50		
3968574	Ethylbenzene	2015/04/02	110	60 - 140	119	60 - 140	<0.020	ug/g	NC	50		
3968574	F1 (C6-C10) - BTEX	2015/04/02					<10	ug/g	NC	30		
3968574	F1 (C6-C10)	2015/04/02	101	60 - 140	103	80 - 120	<10	ug/g	NC	30		
3968574	o-Xylene	2015/04/02	111	60 - 140	120	60 - 140	<0.020	ug/g	NC	50		
3968574	p+m-Xylene	2015/04/02	90	60 - 140	99	60 - 140	<0.040	ug/g	NC	50		
3968574	Toluene	2015/04/02	91	60 - 140	98	60 - 140	<0.020	ug/g	NC	50		
3968574	Total Xylenes	2015/04/02					<0.040	ug/g	NC	50		
3969239	Conductivity	2015/04/02			100	90 - 110	<0.002	mS/cm	0	10		
3969485	Acid Extractable Antimony (Sb)	2015/04/02	87	75 - 125	102	80 - 120	<0.20	ug/g	NC	30		
3969485	Acid Extractable Arsenic (As)	2015/04/02	94	75 - 125	104	80 - 120	<1.0	ug/g	NC	30		
3969485	Acid Extractable Barium (Ba)	2015/04/02	NC	75 - 125	101	80 - 120	<0.50	ug/g	0.046	30		
3969485	Acid Extractable Beryllium (Be)	2015/04/02	96	75 - 125	101	80 - 120	<0.20	ug/g	NC	30		
3969485	Acid Extractable Boron (B)	2015/04/02	92	75 - 125	103	80 - 120	<5.0	ug/g	NC	30		
3969485	Acid Extractable Cadmium (Cd)	2015/04/02	99	75 - 125	101	80 - 120	<0.10	ug/g	NC	30		
3969485	Acid Extractable Chromium (Cr)	2015/04/02	NC	75 - 125	105	80 - 120	<1.0	ug/g	0.88	30		
3969485	Acid Extractable Cobalt (Co)	2015/04/02	100	75 - 125	106	80 - 120	<0.10	ug/g	2.2	30		
3969485	Acid Extractable Copper (Cu)	2015/04/02	NC	75 - 125	104	80 - 120	<0.50	ug/g	0.94	30		
3969485	Acid Extractable Lead (Pb)	2015/04/02	97	75 - 125	104	80 - 120	<1.0	ug/g	2.6	30		
3969485	Acid Extractable Mercury (Hg)	2015/04/02	107	75 - 125	117	80 - 120	<0.050	ug/g	NC	30		
3969485	Acid Extractable Molybdenum (Mo)	2015/04/02	97	75 - 125	106	80 - 120	<0.50	ug/g	NC	30		
3969485	Acid Extractable Nickel (Ni)	2015/04/02	NC	75 - 125	104	80 - 120	<0.50	ug/g	1.3	30		
3969485	Acid Extractable Selenium (Se)	2015/04/02	99	75 - 125	105	80 - 120	<0.50	ug/g	NC	30		
3969485	Acid Extractable Silver (Ag)	2015/04/02	99	75 - 125	103	80 - 120	<0.20	ug/g	NC	30		
3969485	Acid Extractable Thallium (Tl)	2015/04/02	96	75 - 125	101	80 - 120	<0.050	ug/g	NC	30		
3969485	Acid Extractable Uranium (U)	2015/04/02	99	75 - 125	104	80 - 120	<0.050	ug/g	4.9	30		
3969485	Acid Extractable Vanadium (V)	2015/04/02	NC	75 - 125	105	80 - 120	<5.0	ug/g	2.3	30		
3969485	Acid Extractable Zinc (Zn)	2015/04/02	NC	75 - 125	104	80 - 120	<5.0	ug/g	3.8	30		

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QUALITY ASSURANCE REPORT(CONT'D)

Golder Associates Ltd
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QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
3971853	F4G-sg (Grav. Heavy Hydrocarbons)	2015/04/06	105	65 - 135	104	65 - 135	<100	ug/g	9.5	50		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) The matrix spike recovery was below the lower control limit. This may be due in part to the reducing environment of the sample. The matrix spike was reanalyzed to confirm result.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, Scientific Specialist

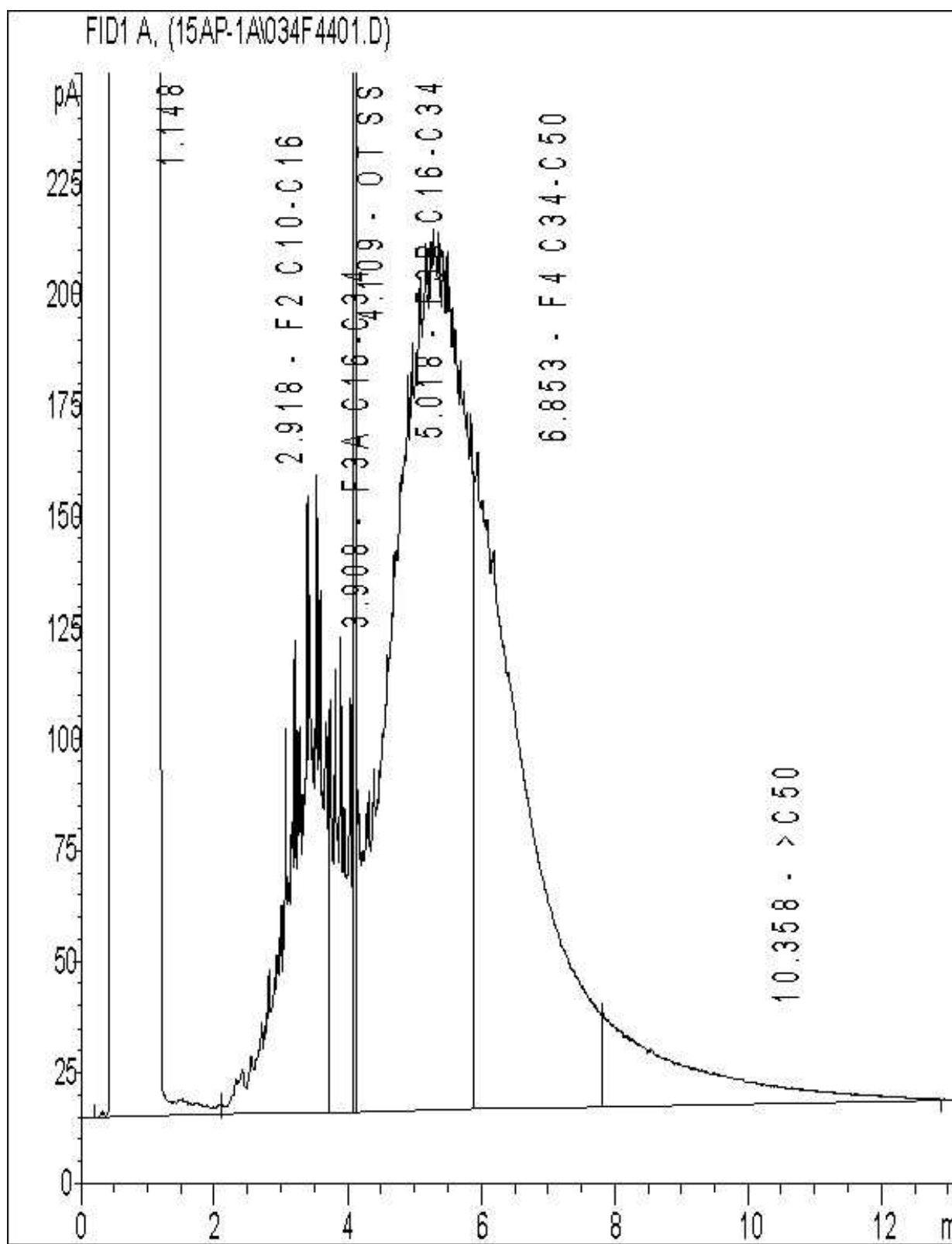


Cristina Carriere, Scientific Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

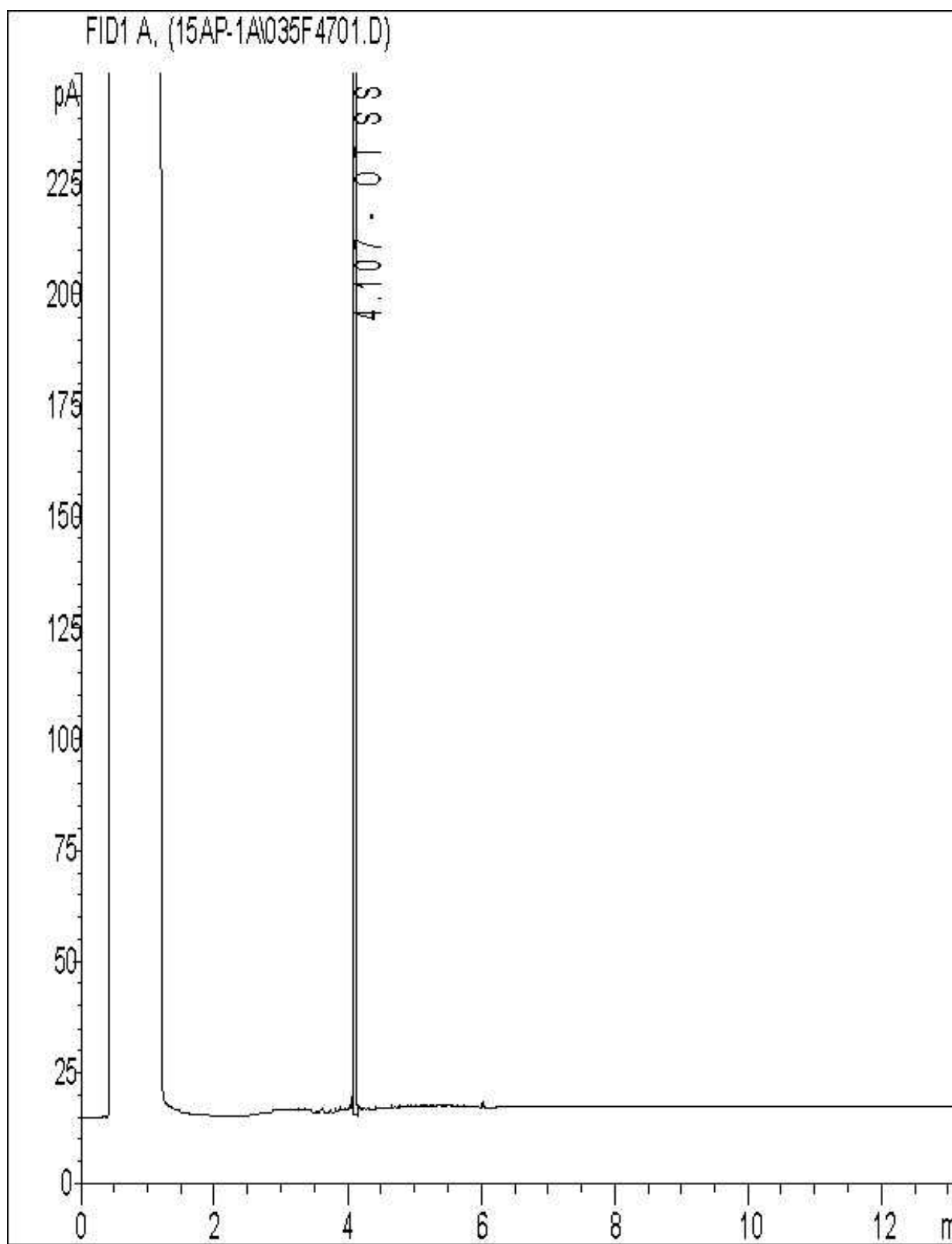
ENV-1079

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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