



March 4, 2016

FOUNDATION INVESTIGATION REPORT

High Fill Embankments and Deep Cut, Highway 400 Widening
from North of King Road to South Canal Bank Road, Regional
Municipality of York
G.W.P. 2835-02-00

Submitted to:

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REPORT

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1.0 INTRODUCTION

Golder Associated Ltd. (Golder) has been retained by AECOM on behalf of the Ministry of Transportation, Ontario (MTO) to provide detailed foundation engineering services for the widening of Highway 400 from north of King Road to South Canal Road in the Region Municipality of York, Ontario. This project includes: the replacement of bridges at Lloydtown-Aurora Road, 16th Side Road, Highway 9 and at South Canal Road; culvert extensions and replacements; retaining walls; and the widening of high fill embankments and deep cuts, high mast lights and overhead signs.

The Terms of Reference for the foundation engineering services are outlined in the Terms of Reference of MTO's Request for Proposal, dated May 2008 that form part of the Consultant's Agreement (Number 2007 E 0002) for this project. The work has been carried out in accordance with Golder's Supplementary Specialty Plan for this project, dated October 2010.

This report addresses the foundation investigation carried out for the high fill embankments and deep cut components of the Highway 400 widening from north of King Road to Highway 9. The purpose of this investigation is to establish the subsurface conditions within the proposed widened embankment and deep cut areas, by borehole drilling and laboratory testing on selected samples. For the purposes of this foundation investigation, the locations that require high fill embankment and deep cut widening have been grouped into eight (8) separate areas; seven areas for high fill embankment widening and one area for a deep cut. The approximate limits of the high fill embankments and deep cut that require widening are summarized below (referenced to the Highway 400 chainage and to the lane (NBL and SBL) of the Highway along which they are located).

High Fill Embankment / Deep Cut Area	Station Limits of High Fill Embankment/ Deep Cut Widening	
	Along the SBL side	Along the NBL side
High Fill Embankment Area 1	15+050 to 15+500	15+050 to 15+500
High Fill Embankment Area 2	15+850 to 16+350	16+000 to 16+350
Deep Cut Area	16+400 to 17+000	16+400 to 17+000
High Fill Embankment Area 3	17+100 to 18+100	17+350 to 17+800
High Fill Embankment Area 4	18+500 to 19+000	18+200 to 18+900
High Fill Embankment Area 5	22+350 to 22+900	22+350 to 22+900
High Fill Embankment Area 6	23+450 to 23+750	23+450 to 23+650
High Fill Embankment Area 7	23+925 to 24+100	23+950 to 24+100

2.0 SITE DESCRIPTION

The high fill embankments and deep cut are located along Highway 400 between King Road and Highway 9 in the Region Municipality of York, Ontario (refer to Drawings 1A, 1B, and 1C). In general, the topography in the area of the overall project site consists of rolling terrain including agricultural fields and densely treed areas, with commercial facilities located adjacent to the Highway 400 corridor.



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The Highway 400 embankments and cut slopes addressed in this report vary in height from approximately 5 m to 11 m relative to the natural ground surface adjacent to the toes of the existing embankments. The slopes are generally inclined at about 2 horizontal to 1 vertical (2H:1V), with the slope faces generally well vegetated. No evidence of embankment or pavement settlement or slope instability was observed within the deep cut and high fill embankment areas at the time of the borehole investigation. A brief description of each of the high fill embankments and deep cut sites is summarized below:

High Fill Embankment/ Deep Cut Area	Site Description
High Fill Embankment Area 1 Station 15+050 to 15+500	This high fill embankment is about 450 m long on the NBL and SBL sides and is located between 15 th Sideroad and 16 th Sideroad. The existing embankment is up to 10 m high. Culvert 29 and Retaining Wall No. 1 are located within this area. At the location of the retaining wall, the embankment is about 11 m high and immediately beyond the toe of the NBL/SBL embankments, there is a swamp. The ground surface at the toe of the slope ranges from about Elevations 299 m to 308 and the road surface rises from Elevations 306 m to 314 m at the northern end of the fill.
High Fill Embankment Area 2 Station 15+850 to 16+350	This high fill embankment is approximately 350 m long on the NBL side and 450 m long on the SBL side and is located to the north and south of 16 th Sideroad. The existing embankment is up to 7 m high. Culvert 32 and the 16 th Sideroad overpass are located within this area. The ground surface at the toe of the slope ranges from about Elevations 325 m to 337 and the road surface rises from Elevations 329 m to 340 m at the northern end of the fill.
Deep Cut Area Station 16+400 to 17+000	The deep cut is about 600 m long on the NBL and SBL side and is located north of High Fill Embankment 2, between 16 th Sideroad and 17 th Sideroad. The existing deep cut is up to 6 m deep. The slopes and crests of the cut are characterized by dense tree cover. The ground surface at the crest of the slope ranges from about Elevations 348 m to 360 and the road surface rises from Elevations 344 m to 352 m at the northern end of the cut.
High Fill Embankment Area 3 Station 17+100 to 18+100	This high fill embankment is approximately 400 m long on the NBL side and 950 m long on the SBL side and is located north of the Deep Cut, between 16 th Sideroad and 17 th Sideroad. The existing embankment is up to 5 m high. Culverts 33 and 34 are located within this area. The ground surface at the toe of the slopes ranges from about Elevations 317 m to 347 and the road surface falls from Elevations 345 m to 322 m at the northern end of the fill area.
High Fill Embankment Area 4 Station 18+200 to 19+000	This high fill embankment is approximately 750 m long on the NBL side and 450 m long on the SBL side and is located north of 17 th Sideroad. The existing embankment is up to 7 m high. Culverts 35 and 36 are located within this area. The ground surface at the toe of the slope ranges from about Elevations 311 m to 318 m and the road surface is between Elevations 316 m and 318 m.
High Fill Embankment Area 5 Station 22+350 to 22+900	This high fill embankment is approximately 550 m long on the NBL and SBL sides and is located north of 19 th Sideroad. The existing embankment is up to 7 m high. Culvert 41 is located within this area. The ground surface at the toe of the slope ranges from about Elevations 270 m to 279 m and the road surface falls from Elevations 280 m to 272 m at the northern end of the fill area.
High Fill Embankment Area 6 Station 23+450 to 23+750	This high fill embankment is approximately 200 m long on the NBL side and 300 m long on the SBL side and is located between 19 th Sideroad and Highway 9. The existing embankment is up to 6 m high. Culvert 42 is located within this area. The



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High Fill Embankment/ Deep Cut Area	Site Description
	ground surface at the toe of the slope ranges from about Elevations 253 m to 256 and the road surface falls from Elevations 256 m to 252 m at the northern end of the fill area.
High Fill Embankment Area 7 Station 23+925 to 24+100	This high fill embankment is approximately 175 m long on the NBL and SBL sides and is located south of Highway 9 and includes the embankments of the SBL on-ramp and NBL off-ramp immediately adjacent to Highway 400. The existing embankment is up to 5 m high. Culvert 43 is located within this area.

3.0 INVESTIGATION PROCEDURES

The field work for the foundation investigation was carried out between November 4, 2010 and November 2, 2015 during which time a total of 140 boreholes (DC-1 to DC-26, F1-1 to F1-12, F2-1 to F2-12, F3-1 to F3-7, F3-9 to F2-26, F4-1 to F4-23, F5-1 to F5-21, F6-1 to F6-6, F6-8, F6-9, F7-1 to F7-6) were advanced. In addition, thirty-seven (37) boreholes drilled for the culvert investigation, retaining wall investigation, and for the 16th Sideroad overpass investigations (Boreholes C29-1 to C29-4, C32-1 to C32-4, C33-1 to C33-4, C34-1 to C34-4, C35-3, C36-1 to C36-4, C41-1 to C41-4, C42-1 to C42-4, C43-1 to C43-4, and 5 to 8) are also used supplementing the subsurface stratigraphy. An additional investigation was also completed in May and June, 2012 and October 2015 to delineate the extent of organic/weak clayey soils adjacent to the toe of the NBL embankment in High Fill Embankment Area 1. The additional investigation included the drilling of five boreholes (Boreholes F1-5C, F1-5D, F1-5E, F1-5F and F1-5G). In general, the boreholes are configured to be spaced at about 50 m apart along the fill section, including boreholes advanced through the existing highway embankment. The locations of these boreholes are shown on Drawings A1 to H2.

The field investigations were carried out using truck-mounted Diedrich D-90 drill rigs and track-mounted Diedrich D-50, Diedrich D-25, Geoprobe, CME-55 and Mobile B-57 drill rigs supplied and operated by Walker Drilling Ltd. of Utopia, Ontario and DBW Drilling of Vaughan, Ontario. A Marl Mini Mole drill rig was supplied by Kodiak Drilling of Oakville, Ontario. The boreholes were advanced using either 108 mm inner diameter continuous hollow stem augers, 108 mm outer diameter continuous hollow stem augers or 108 mm outer diameter continuous solid stem augers. Soil samples were obtained at about 0.75 m and 1.5 m intervals of depth, using 50 mm outside diameter split-spoon samplers driven by either automatic or manual hammers, in accordance with the Standard Penetration Test (SPT) procedure (ASTM D1586). In situ field vane testing was conducted using standard MTO "N"-sized vanes (ASTM D25731) where soft to stiff cohesive soils were encountered, to measure the undrained shear strength of the clayey silt to clay deposits at these locations.

The groundwater conditions in the open boreholes were observed during the drilling operations and eleven piezometers were installed, one in each of Boreholes C29-1, C32-1, C33-1, C34-4, C36-4, C41-4, F1-5B, F4-2, RW1-3, -5, -7 and -12 to permit monitoring of the water level at these locations. The piezometers consist of 25 mm diameter PVC pipe, with a slotted screen sealed at a select depth within the borehole. The borehole and annulus surrounding the piezometer pipe above the screen sand pack were backfilled to the ground surface with bentonite pellets/grout. Piezometer installation details and water level readings are described on the Record of Borehole sheets presented in Appendices A to G. All boreholes in which standpipe piezometers were not



installed were backfilled with bentonite upon completion in accordance with Ontario Regulation 903 (as amended by Ontario Regulation 372).

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, observed 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 our 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, organic content, Atterberg limits and grain size distribution) was carried out on selected samples. In addition, one-dimensional consolidation (oedometer) tests were carried out on two (2) samples of the cohesive deposits. The results of the laboratory testing are included in Appendices A to H.

The locations of the boreholes advanced specifically for the deep cuts and high fill embankments were measured by Golder personnel relative to the survey staking along the alignment and to site features, and the ground surface elevations at the borehole locations were determined from the digital terrain model for this project. The borehole locations and the ground surface elevation of those boreholes advanced for the culvert, retaining wall and bridge investigations were surveyed by Callon Dietz, a professional surveying company retained by AECOM. The borehole locations, referenced to MTM NAD 83 northing and easting coordinates and the ground surface elevations referenced to Geodetic datum, are summarized on Drawings A1 to H1, in the respective appendices.

4.0 SUBSURFACE CONDITIONS

4.1 Regional Geology

This 23 km section of Highway 400 included in the overall project site traverses, in a south – north direction, the physiographic regions known as South Slope, Oak Ridges Moraine and Simcoe Lowland, according to The Physiography of Southern Ontario (Chapman and Putman, 1984)¹. Along Highway 400, the South Slope is present south of King Road, the Oak Ridge Moraines extends from north of King Road to south of Highway 9 and the Simcoe Lowlands occupy a 4 km wide strip extending from south of Highway 9 to Holland River. The Lloydtown-Aurora Road / Highway 400 Interchange is located within the Oak Ridges Moraine physiographic region.

The surficial soils of the South Slope region are generally cohesive tills. The Oak Ridges Moraine predominately consists of sand and gravel, although in the King Township area these soils are often overlain by till. It is understood that during grading for the initial construction of Highway 400 in this area, deep cuts exposed up to about 10 m of till overlying the sands and gravels.

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



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The Holland River valley, which crosses Highway 400 in the vicinity of Highway 9 and South Canal Road, is located within the Simcoe Lowlands region. This valley extends south west from Cook Bay, at the south end of Lake Simcoe, and was once a shallow extension of the lake. The floor of the valley consists of peat, soft clays and loose sands. It is understood that during initial construction of Highway 400, a layer of peat about 2 m to 3 m thick was removed in order to construct the road upon the underlying sand and clay.

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

4.2 Subsurface Conditions

The subsurface investigations for the High Fill Embankments and Deep Cut included the drilling of 140 boreholes within the proposed deep cut and high fill embankment widening areas and supplemented with thirty-seven (37) other boreholes drilled for different aspects of the overall assignment such as retaining walls, overpass and culverts. The borehole locations and ground surface elevations at each of the cut and fill locations are shown on Drawings A1 to H2 and the boreholes drilled at each of the deep cut and high fill areas are summarized below.

High Fill Embankment / Deep Cut Area	Boreholes for Respective Area	Reference Drawings (Plan and Profiles)	Reference Appendix
High Fill Embankment Area 1	F1-1 to F1-12, C29-1 to C29-4, F1-5A to F1-5G	A1, A2, A3	A
Highway Fill Embankment Area 2	F2-1 to F2-12, C32-1 to C32-4, 5 to 8	B1, B2	B
Deep Cut Area	DC-1 to DC-26	C1, C2	C
High Fill Embankment Area 3	F3-1 to F3-7, F3-9 to F3-26, C33-1 to C33-4, C34-1 to C34-4	D1 to D4	D
Highway Fill Embankment Area 4	F4-1 to F4-23, C35-3, C36-1 to C36-4	E1, E2	E
High Fill Embankment Area 5	F5-1 to F5-21, C41-1 to C41-4	F1, F2	F
Highway Fill Embankment Area 6	F6-1 to F6-6, F6-8, F6-9, C42-1 to C42-4	G1, G2	G
High Fill Embankment Area 7	F7-1 to F7-6, C43-1 to C43-4	G1, G2	H

The detailed subsurface soil and groundwater conditions encountered in the boreholes advanced for the detail foundation investigation together with results of the laboratory tests carried out on selected soil samples are provided on the Record of Borehole sheets in Appendix A to H, following the text of this report. The results of the in situ field tests (i.e. SPT "N" values and vane undrained shear strengths) as presented on the Record of Borehole Sheets and in Section 4 are uncorrected. The stratigraphic boundaries shown on the Record of



Borehole sheets are inferred from non-continuous sampling, observations of drilling progress and the results of Standard Penetration Tests. These boundaries, therefore, represent transitions between soil types rather than exact planes of geological change. The interpreted stratigraphy in profile within each high fill or deep cut section along Highway 400 is shown on Drawings A2 to H2 and is a simplification of the subsurface conditions. Variation in the stratigraphic boundaries between and beyond boreholes will exist and is to be expected.

4.3 High Fill Embankment Area 1 (Station 15+050 to 15+500 NBL and SBL)

Boreholes F1-1 to F1-12 and C29-1 to C29-4 were advanced within the limits of this embankment, at the locations shown on Drawing A1, in Appendix A. Additional boreholes (Boreholes F1-5A to F1-5G) were advanced to further investigate the organic clayey soils present on the east side of the existing embankment in the vicinity of Station 15+300. The detailed subsurface soil and groundwater conditions encountered in the boreholes advanced for these investigations and the results of in situ tests and laboratory tests carried out on selected soil samples are provided in Appendix A. The inferred soil stratigraphy as encountered in the boreholes is shown in profile on Drawings A1, A2 and A3 in Appendix A.

It should be noted that the section of embankment along the SBL from about Stations 15+350 to 15+460 has been addressed in the retaining wall report (Golder 2015, GEOCRETS No. 30M 13-213) as the foundation investigation for the retaining wall is an integral component of the embankment widening in this area. This section of embankment widening is not duplicated in this report.

In summary, the subsurface conditions encountered in the boreholes in this area consist of topsoil or asphalt and/or fill, underlain by a deposit of clayey silt till in places interlayered with pockets of silt till, clayey silt or sand. A thick deposit of peat and organic clayey silt to silty clay was encountered in Boreholes F1-5B, F1-5C, F1-5D and F1-5G and a thinner organic deposit as encountered in Boreholes F1-5E and RW1-1 in the retaining wall section. A more detailed description of the subsurface conditions is provided in the following subsections.

4.3.1 Topsoil

An approximately 100 mm to 700 mm thick layer of topsoil was encountered immediately below the existing ground surface in Boreholes C29-1, F1-2 to F1-4, F1-5A, F1-5B, F1-5C, F1-5E, F1-7, F1-8 and F1-11, which were advanced at the toe of the existing embankment.

4.3.2 Asphalt

Boreholes C29-2, C29-3, F1-1, F1-5F, F1-6, F1-9 and F1-12, which were advanced on the Highway 400 road surface, encountered approximately 200 mm to 500 mm of asphalt.

4.3.3 Fill

Underlying the asphalt and topsoil layers or at ground surface, eleven boreholes encountered a layer of fill from the road surface and through the Highway 400 embankment and fill that had been placed at the toe of the embankment. The elevation of the surface and base of the fill deposit and the deposit thickness as encountered in the boreholes are summarized below:



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Borehole No.	Depth to Surface of Fill (m)	Fill Surface Elevation (m)	Fill Thickness (m)	Fill Base Elevation (m)
C29-2	0.5	308.1	11.2	296.9
C29-3	0.2	307.9	8.5	299.4
F1-1	0.2	305.3	2.0	303.3
F1-2	0.2	303.8	0.5	303.3
F1-3	0.3	300.8	1.9	298.9
F1-4	0.4	299.1	1.1	298.0
F1-5F	0.2	309.8	8.7	301.1
F1-6	0.2	311.4	5.9	305.5
F1-7	0.2	307.6	0.5	307.1
F1-9	0.3	306.0	3.4	302.6
F1-12	0.2	314.2	7.0	307.2

The existing embankment consists mainly of non-cohesive soil but the composition of the fill varies from sandy silt to sand and gravel to clayey silt. Rootlets and/or organics were noted in upper portions of the fill in Boreholes F1-3, F1-4 and F1-7 and organics were noted below a depth of 8.7 m in Borehole C29-2.

The measured Standard Penetration Test (SPT) "N" values within the deposit range between 2 blows and 56 blows per 0.3 m of penetration, with SPT "N" values typically higher in the section of embankment below the highway. Within the non-cohesive portions of the fill, the SPT "N" values range between 9 blows and 56 blows per 0.3 m of penetration, indicating a loose to very dense relative density. Within the cohesive portions of the fill the SPT "N" values range between 2 blows and 17 blows per 0.3 m of penetration, suggesting a very soft to very stiff consistency.

The grain size distributions of eleven (11) samples of the silt and sand to silty sand and clayey silt fill are shown on Figures A1A and A1B.

Atterberg limits tests were carried out on four (4) samples of the cohesive portion of the fill, and measured plastic limits between 14 per cent and 20 per cent, liquid limits between 28 per cent and 31 per cent, and plasticity indices between 8 per cent and 14 per cent. These test results, which are plotted on a plasticity chart on Figure A2, indicates that this material is a clayey silt of low plasticity.

The measured water contents of samples of the fill range between 6 per cent and 23 per cent.

4.3.4 Upper Clayey Silt

A stratum of clayey silt was encountered at ground surface or underlying the topsoil in Boreholes C29-4, F1-5A, F1-5B and F1-11, below the fill layer in Borehole F1-4 and below a surface deposit of silty sand in Borehole F1-5G. The elevation of the surface and base of the deposit and the deposit thickness as encountered in the boreholes are summarized below.



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Borehole No.	Depth to Surface (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C29-4	0.0	299.5	2.2	297.3
F1-4	1.5	298.0	0.7	297.3
F1-5A	0.2	299.3	2.8	296.5
F1-5B	0.1	298.8	0.6	298.2
F1-5F	13.3	296.7	0.7	296.0
F1-5G	0.8	298.1	2.4	295.7
F1-11	0.1	302.6	1.3	301.3

The deposit varies in composition from clayey silt to sandy clayey silt, containing trace gravel. Rootlets and/or organics were noted in upper portions of the deposit in all of the boreholes that encountered this layer except Borehole F1-5F. An interlayer of sand was noted between depths of 0.7 m and 1.0 m in Borehole C29-4.

The measured SPT "N" values within the deposit range between 1 blow and 14 blows per 0.3 m of penetration, suggesting a very soft to stiff consistency.

The grain size distributions of three (3) samples of the clayey silt deposit are shown on Figure A3.

Atterberg limits tests were carried out on four (4) samples of the cohesive deposit, and measured plastic limits between 14 per cent and 20 per cent, liquid limits between 23 per cent and 30 per cent, and plasticity indices between 8 per cent and 10 per cent. These test results, which are plotted on a plasticity chart on Figure A4, indicates that this material is a clayey silt of low plasticity.

The measured water contents of samples of the upper clayey silt range between 16 per cent and 31 per cent.

4.3.5 Silt to Sand

A silt to sand deposit was encountered below the clayey silt to sandy clayey silt deposit in Boreholes C29-3, C29-4, F1-4, and F1-5B, below the fill in Borehole F1-6 and F1-5F, below the topsoil in Borehole C29-1, F1-5C and F1-5E and at ground surface in Borehole F1-5G. This layer was also encountered as an interlayer in the cohesive till deposit in Borehole F1-11. The elevation of the surface and base of the non-cohesive deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C29-1	0.7	296.9	0.8	296.1
C29-3	8.7	299.5	3.0	296.5
C29-4	2.2	295.3	3.4	291.9
F1-4	2.2	297.3	0.5	296.8
F1-5B	0.7	298.4	1.1	297.3



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Borehole No.	Depth to Surface (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
F1-5C	0.1	298.5	2.2	296.3
F1-5E	0.1	300.4	2.1	298.3
F1-5F	8.9	301.1	>11.5	<289.6
F1-5G	0.0	298.9	0.8	298.1
F1-6	8.0	303.6	0.7	302.9
F1-11	5.6	301.5	>1.1	<300.4

The deposit varies in composition from silt to sand, some silt, trace to some gravel and clay. Rootlets and organics were noted in Boreholes C29-1, F1-4, F1-5B, F1-5C, F1-5E, F1-5G and F1-6. In Borehole F1-5B and F1-5F this deposit contains shell fragments. A 0.3 m thick interlayer of clayey silt was encountered in Borehole C29-3 and sand layers and clayey silt zones were noted in Borehole F1-6.

The measured SPT "N" values within the deposit range from 3 blows to 46 blows per 0.3 m of penetration, but typically range between 7 blows and 27 blows per 0.3 m of penetration, indicative of a loose to compact relative density.

The grain size distributions of eight (8) samples of the non-cohesive deposit are shown on Figures A5A and A5B.

The measured water contents of samples of the sand to silt range between 16 per cent and 31 per cent.

4.3.6 Clayey Silt Till

A clayey silt till deposit was encountered in all of the boreholes except Boreholes F1-5A and F1-5B, underlying the fill layer in Boreholes C29-2, F1-1 to F1-3, F1-7, F1-9 and F1-12, beneath the sand to silt layer in Boreholes C29-1, C29-3, C29-4, F1-4 and F1-6, beneath the clayey silt in Borehole F1-11 and at ground surface or beneath the topsoil in Boreholes F1-8 and F1-10. All of the boreholes were terminated within this layer except Boreholes C29-2, C29-3 and F1-11. The elevation of the surface and base of the deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C29-1	1.5	296.1	>9.8	Below 286.3
C29-2	11.7	296.9	6.1	290.8
C29-3	11.7	296.5	6.1	290.4
C29-4	5.6	291.9	>5.7	Below 286.2
F1-1	2.2	303.3	>9.1	Below 294.2
F1-2	0.7	303.3	>7.5	Below 295.8
F1-3	2.2	298.9	>4.5	Below 294.4



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Borehole No.	Depth to Surface (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
F1-4	2.7	296.8	>4.0	Below 292.8
F1-6	5.9	305.7	>5.4	Below 300.3
F1-7	0.7	307.1	>6.0	Below 301.1
F1-8	0.1	302.7	>6.6	Below 296.1
F1-9	3.7	302.6	>9.1	Below 293.5
F1-10	0	306.5	>6.7	Below 299.8
F1-11	2.1	305.0	3.5	301.5
F1-12	7.2	307.2	>5.6	Below 301.6

The till deposit consists of clayey silt, trace sand to sandy and trace gravel. The upper portion of this deposit contains trace rootlets in Borehole F1-8. Pockets and/or seams of sand or silt were encountered within the deposit in Boreholes C29-1, F1-1 to F1-3 and F1-8. It is also noted that the augers were grinding during drilling operations in Boreholes F1-7 and F1-10 at depths of 1.7 m and 1.5 m, respectively, inferred on cobbles and/or boulders.

The measured SPT "N" values within the deposit range from 7 blows to 68 blows per 0.3 m of penetration, but are typically between 12 blows and 49 blows per 0.3 m of penetration, and generally increased with depth. These results suggest a firm to hard consistency.

The results of grain size distribution tests completed on twenty-six (26) selected samples of this deposit are shown on Figures A6A to A6D.

Atterberg limits testing was carried out on thirty-six (36) samples of the clayey silt till deposit, and measured plastic limits between 12 per cent and 19 per cent, liquid limits between 21 per cent and 34 per cent, and plasticity indices between 7 per cent and 16 per cent. The test results, which are plotted on a plasticity chart on Figures A7A to A7D, indicate that this material is classified as a clayey silt of low plasticity.

The measured water contents of samples of the clayey silt till range from 9 per cent to 19 per cent.

4.3.7 Lower Clayey Silt to Silty Clay

A layer of clayey silt to silty clay was encountered in Boreholes C29-1 to C29-3 underlying the clayey silt till. Borehole C29-1 penetrated through the 1.5 m and Boreholes C29-2 and C29-3 were terminated within this layer penetrating into it for 0.9 m and 5.1 m, respectively. The surface of the layer was encountered at depths between 7.2 m and 17.8 m below ground surface, between Elevations 299.0 m and 289.0 m.

The measured SPT "N" values within the deposit range from 15 blows to 55 blows per 0.3 m of penetration, suggesting a very stiff to hard consistency.

Grain size distributions of two (2) selected samples of this deposit are shown on Figure A8.



Atterberg limits tests were carried out on two (2) samples of the deposit measured plastic limits between 15 per cent and 18 per cent, liquid limits of about 27 per cent and 38 per cent, and plasticity indices of about 20 per cent and 22 per cent. These test results, which are plotted on a plasticity chart on Figure A9, indicate that this material is a clayey silt of slight to medium plasticity.

The measured water contents of samples of the lower clayey silt to silty clay range from 19 per cent to 25 per cent.

4.3.8 Peat / Organic Silty Clay

Between approximately Stations 15+300 and 15+350 on the east side of the embankment of the NBL of Highway 400, Boreholes F1-5A to F1-5E and F1-5G encountered various layers of organic materials below the fill, clayey silt with sand to sandy clayey silt and silty sand deposits. The overall organic deposit consists of various layers ranging in thickness from about 0.2 m to 8.1 m and may be summarized as follows:

- Organic silt underlain by peat in Borehole F1-5A;
- Organic silty clay underlain by layers of organic silty sand to organic sandy silt, silty clay, trace organics and organic silt in Borehole F1-5B;
- Organic silt to peat underlain by layers of organic clayey silt to silt in Borehole F1-5C;
- Organic clayey silt underlain by organic silt to silty peat and organic clayey silt to silty clay in Borehole F1-5D;
- Silty clay trace organics overlying silty peat underlain by organic silt in Borehole F1-5E;
- Silty sandy peat, Organic clayey silt, and silty clay, trace organics in Borehole F1-5G.

The organic deposit was encountered at depths ranging from about 0.8 m to 3.7 m below ground surface, between about Elevations 298.3 m and 295.6 m and was fully penetrated to depths between 4.5 m (Elevation 296.0 m) and 13.4 m (Elevation 285.7 m).

The measured SPT "N" values within the deposit range from 0 blow (weight of hammer) to 7 blows per 0.3 m of penetration, suggesting a very soft to firm consistency. One in-situ field vane test in the silty clay, trace organics deposit measured an undrained shear strength of about 29 kPa and five tests within the organic silt to organic clayey silt portion of the deposit measured undrained shear strengths ranging between 38 kPa and greater than 96 kPa. The sensitivity of these portions of the deposit range between 2 and 4. The field vane test results together with the SPT 'N'-values indicate that the organic clayey silt to organic silt and silty clay, trace organics deposits have a very soft to firm consistency.

The organic content of two (2) samples of the organic silty sand is about 68 per cent and 54 per cent, and that of a two samples of the silty clay, trace organics is about 4 per cent. The organic content of three (3) samples of the peat ranged from about 18 per cent to 76 per cent. The organic content of a sample of organic clayey silt to silty clay was about 8 per cent.

Grain size distributions of six (6) selected sample of the organic silt, organic sandy silt / silty sand, organic clayey silt to silty clay, and silty clay trace organics are shown of Figures A10A to A10D in Appendix A.



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Atterberg limits tests were carried out on seventeen (17) samples of the organic deposits and measured plastic limits ranging from 22 per cent to 77 per cent, liquid limits ranging from 37 per cent to 83 per cent, and plasticity indices ranging from 12 per cent to 35 per cent. These test results, which are plotted on plasticity charts on Figures A11A to A11C, indicate that the material of five (5) samples are classified as silty clay of intermediate (Figure A11D) and the material represented by twelve (12) samples are classified as organic silt / organic clayey silt of intermediate to high plasticity with one sample indicating an organic clay of high plasticity (Figures A11A and A11C).

A laboratory one-dimensional consolidation (oedometer) test was carried out on one specimen of the silty clay and one specimen of organic clay obtained from Shelby tube samples in Boreholes F1-5B and F1-5D, respectively. A pre-consolidation pressure of about 40 kPa and 30 kPa were estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot for the respective samples. A bulk unit weight of about 17kN/m³ and 18 kN/m³ and a specific gravity of about 2.7 to 2.8 were measured on the consolidation test specimen. Details of the test results are shown on sheets 1 to 4 of Figures A12 and A13, and are summarized below.

BOREHOLE SAMPLE NO.	Sample Depth / Elevation	σ_{vo}' (kPa)	σ_p' (kPa)	$\sigma_p' - \sigma_{vo}'$ (kPa)	OCR	C_c	C_r	e_o	c_v^* (cm ² /s)
Borehole F1-5B Sample 12	8.4 m / 290.7 m	40.0	40.0	0.0	1.00	0.35	0.036	1.20	2.6×10^{-3}
Borehole F1-5D Sample 8	6.5 m / 292.0	35.0	35.0	0.0	1.00	0.28	0.034	1.18	5.2×10^{-4}

Note: * For stress range of $150 \text{ kPa} \leq \sigma_v' \leq 300 \text{ kPa}$
 where: σ_{vo}' is the effective overburden pressure in kPa
 σ_p' is the preconsolidation pressure in kPa
 OCR is overconsolidation ratio
 e_o is initial void ratio
 C_c is the compression index
 C_r is the recompression index
 c_v is the coefficient of consolidation in cm²/s

4.3.9 Silty Sand to Sand and Gravel

A deposit of silty sand to sand and gravel, comprised of various layers of silt and sand, silty sand, sand and sand and gravel was encountered below the peat in Borehole F1-5A and below the organic silt / silty peat to organic clayey silt to silty clay / silty clay, trace organics in Boreholes F1-5B to F1-5E and F1-5G. The various layers of the deposit contain trace to some amounts of gravel, silt and clay. The deposit was encountered at depths ranging from 4.3 m to 13.4 m below ground surface (Elevation 296.2 m to 285.7 m). Boreholes F1-5A to F1-5C, F1-5D and F1-5G were terminated within this deposit at a depths ranging from 6.7 m to 14.3 m below ground surface (Elevations 288.3 m to 284.6 m) and a Dynamic Cone Penetration Test was advanced from the base of Borehole F1-5B to a depth of 16.5 m (Elevation 282.6 m).



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The measured SPT “N” values within the overall deposit range from 3 blows to 47 blows per 0.3 m of penetration, indicative of a very loose to dense relative density.

Grain size distributions of six (6) samples of the silty sand to sand and gravel deposit are shown on Figure A14.

The measured water contents of samples of the silty sand to sand and gravel range from 11 per cent to 20 per cent.

4.3.10 Groundwater Conditions

The observed/recorded water levels in the open boreholes following completion of drilling and in the standpipe piezometer installed in Boreholes F1-5B and C29-1 are shown on the Record of Borehole sheets and are summarized as follows:

Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F1-1	305.5	3.8	301.7	Nov. 8, 2010	Open Borehole
F1-2	301.6	6.5	295.1	Nov. 4, 2010	Open Borehole
F1-3	299.6	3.6	296.0	Nov. 5, 2010	Open Borehole
F1-4	299.5	1.2	298.3	Nov. 5, 2010	Open Borehole
F1-5A	299.5	0.4	299.1	Nov. 9, 2010	Open Borehole
F1-5B	299.1	1.5	297.6	Nov. 9, 2010	Open Borehole
		5.2	293.9	Oct. 10, 2011	Piezometer
		2.3	296.8	Nov. 11, 2011	Piezometer
F1-5C	298.6	0.9	297.7	May 16, 2012	Open Borehole
F1-5D	298.5	-	-	Oct. 30, 2015	Not Recorded
F1-5E	300.5	2.5	298.0	May 17, 2012	Open Borehole
F1-5F	310.0	11.3	298.7	June 4, 2012	Open Borehole
F1-5G	298.9	-	-	Nov. 2, 2015	Not Recorded
F1-6	311.6	10.1	301.5	Nov. 9, 2010	Open Borehole
F1-7	307.8	5.8	302.0	Nov. 10, 2010	Open Borehole
F1-8	302.8	1.2	301.6	Dec. 16, 2010	Open Borehole
F1-9	306.3	Dry	-	Nov. 24, 2010	Open Borehole
F1-10	301.4	3.5	297.9	Dec. 15, 2010	Open Borehole
F1-11	302.7	6.7	296.0	Dec. 17, 2010	Open Borehole
F1-12	314.4	Dry	-	Nov. 21, 2010	Open Borehole
C29-1	297.6	1.3	296.3	Dec. 18, 2010	Open Borehole
		0.5	297.1	Jan. 2, 2011	Piezometer
		0.1	297.5	July, 4, 2011	Piezometer



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Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
C29-2	308.2	Dry	-	Nov. 22, 2010	Open Borehole
C29-3	308.2	5.8	302.4	Nov. 9, 2010	Open Borehole
C29-4	297.5	0.2	297.3	Nov. 5, 2010	Open Borehole

The water levels observed in the open boreholes on completion of drilling and in the piezometer may not represent long-term stabilized groundwater levels. It is noted that while advancing Boreholes F1-5A and F1-5C, blowing sands were encountered in the silty sand to sand and gravel deposit; it is therefore inferred that the groundwater in this layer is under pressure. The water level at the site is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during the spring and periods of precipitation.

4.4 High Fill Embankment Area 2 (Station 16+000 to 16+350 NBL and Station 15+850 to 16+350 SBL)

Boreholes F2-1 to F2-12, C32-1 to C32-4 and 5 to 8 were advanced within the limits of this embankment, at the locations shown on Drawing B1 in Appendix B. The inferred soil stratigraphy as encountered in the boreholes is shown in profile on Drawings B1 and B2 in Appendix B. The detailed subsurface soil and groundwater conditions encountered in the boreholes advanced for this investigation and the results of in situ and laboratory tests carried out on selected soil samples are provided in Appendix B.

In summary, the subsoils encountered in the boreholes in this area consist of a layer of topsoil or asphalt, underlain by fill and thin deposits of clayey silt and sand to silt and sand. These deposits are underlain by a deposit of clayey silt till in places interlayered with or underlain by deposits of silt and sand and clayey silt and silt. A more detailed description of the subsurface conditions is provided in the following subsections.

4.4.1 Topsoil and Asphalt

An approximately 100 mm to 700 mm thick layer of topsoil was encountered immediately below the existing ground surface in Boreholes C32-1, F2-1, F2-3, F2-6, F2-8, F2-10, 6 and 7, which were advanced at the toe of the existing embankment. A 200 mm thick layer of topsoil and a 100 mm thick layer of peat were also encountered underlying the fill deposit in Borehole F2-5 and Borehole 6, respectively.

An approximately 200 mm to 300 mm thick layer of asphalt was encountered in Boreholes C32-3, F2-7, F2-9 and F2-11 which were advanced through the roadway.



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4.4.2 Fill

Fill was encountered below the asphalt and topsoil layers or at ground surface at the crest of the embankment (shoulder) in all of the boreholes except Boreholes F2-8 and F2-10. The elevation of the surface and base of the fill deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C32-1	0.1	324.0	1.4	322.6
C32-2	0.2	330.9	7.0	323.9
C32-3	0.0	332.1	10.2	321.9
C32-4	0.0	327.7	3.0	324.7
F2-1	0.2	327.8	1.3	326.5
F2-2	0.0	333.5	8.7	329.2
F2-3	0.2	328.2	1.5	326.9
F2-4	0.0	337.6	5.0	332.6
F2-5	0.0	339.6	3.0	336.6
F2-6	0.1	324.5	1.4	323.0
F2-7	0.2	328.6	4.3	324.2
F2-9	0.2	332.0	7.0	325.0
F2-11	0.3	337.9	6.9	331.0
F2-12	0.0	337.5	2.2	335.3
5	0.0	328.8	2.2	326.6
6	0.1	328.8	2.0	326.8
7	0.1	329.7	0.6	329.1
8	0.0	329.6	0.7	328.9

Boreholes C32-2, C32-3, F2-2, F2-4, F2-5, F2-7, F2-9 and F2-11 were advanced from the road surface or shoulder and penetrated through the entire existing Highway 400 high fill embankment, whereas the remaining boreholes were advanced through fill that had been placed at the toe of the slope.

The embankment fill consists primarily of non-cohesive soil but varies in composition from sand and gravel under the layer of asphalt and gravelly sand to sand and silt to clayey silt within the embankment. Zones and layers of clayey silt were encountered interlayered within the non-cohesive fill. Rootlets and/or organics were noted in upper portions of the fill in Boreholes C32-3, C32-4, F2-1, F2-3, F2-5, F2-6, F2-12, 7 and 8 and organics were noted between depths of 7.2 m and 7.7 m in Borehole C32-3.

The measured SPT "N" values within the fill deposit range from 2 blows to 65 blows per 0.3 m of penetration, however, typically ranging from 21 blows to 41 blows per 0.3 m of penetration in the sections of the fill embankment below the highway, indicating a loose to dense and typically compact to dense relative density within the non-cohesive portions of the fill and firm to stiff consistency within the cohesive fill.



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The measured water contents of samples of the cohesive fill range from 15 per cent to 19 per cent. The measured water contents of samples of the non-cohesive fill range from 5 per cent to 22 per cent.

The grain size distributions of twenty (20) samples of the granular fill are shown on Figures B1A to B1C.

Atterberg limits tests were carried out on three (3) samples of the cohesive portion of the fill, and measured plastic limits ranging between 13 per cent and 25 per cent, liquid limits ranging between 16 per cent and 26 per cent, and plasticity indices ranging between 4 per cent and 11 per cent. The test results, which are plotted on a plasticity chart on Figure B2, indicate that this portion of the fill material is silt of slight plasticity or clayey silt of low plasticity.

4.4.3 Clayey Silt to Silty Clay

A deposit of clayey silt to silty clay was encountered at ground surface or beneath the topsoil in Borehole F2-8, beneath the fill layer in Boreholes C32-1, C32-2, C32-4, F2-3, F2-10 and 7 and beneath the silty sand to sandy silt layer in Boreholes F2-2 and F2-5. The elevation of the surface of the deposit and the deposit thickness as encountered in the boreholes are summarized below:

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C32-1	1.5	322.6	1.6	321.0
C32-2	7.2	323.9	1.5	322.4
C32-4	3.0	324.7	1.5	323.2
F2-2	5.6	327.9	3.1	324.8
F2-3	1.5	326.9	0.7	326.2
F2-5	4.6	335.0	1.2	333.8
F2-8	0.7	324.3	0.8	323.5
F2-10	0.1	331.4	5.5	325.9
7	0.7	329.1	0.4	328.7

The deposit varies in composition from clayey silt to silty clay, trace to some sand and gravel. Rootlets and/or organics were noted in Boreholes C32-1, C32-2, F2-3 and F2-10 and an organic content test carried out on a sample of clayey silt from the upper portion of the deposit measured an organic content of 4 per cent. Sand pockets or seams were encountered in Borehole C32-2.

The measured SPT "N" values within the deposit range from 5 blows to 33 blows per 0.3 m of penetration suggesting a soft to hard consistency for the overall deposit, but are typically between 6 blows and 12 blows per 0.3 m of penetration, suggesting a firm to stiff consistency.

The measured water contents of samples of the clayey silt range from 8 per cent to 27 per cent. The measured water content of a sample of sand pocket/seam was 18 per cent.

The grain size distributions of four (4) samples of the clayey silt to silty clay deposit are shown on Figure B3.



Atterberg limits tests were carried out on nine (9) samples clayey silt to silty clay deposit, and measured plastic limits ranging between 13 per cent and 19 per cent, liquid limits ranging between 16 per cent and 36 per cent and plasticity indices ranging between 4 per cent and 18 per cent. These test results, which are plotted on a plasticity chart on Figures B4A and B4B, indicates that this material is a clayey silt of low plasticity to silty clay of intermediate plasticity.

4.4.4 Silt and Sand to Sand

Deposits of silt and sand to sand were encountered below the fill in Boreholes F2-2, F2-4, and F2-12, below the clayey silt deposit in Borehole C32-2 and F2-5 and beneath a peat/topsoil layer encountered below the fill in Boreholes F2-5, 5 and 6. The elevation of the surface of the deposit and the deposit thickness as encountered in the boreholes are summarized below:

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposits Base Elevation (m)
C32-2	8.7	322.4	1.5	320.9
F2-2	4.3	329.2	1.3	327.9
F2-4	5.0	332.6	5.2	327.4
F2-5	3.2	336.4	1.4	335.0
	5.8	333.8	>2.4	Below 331.4
F2-12	2.2	335.3	3.6	331.7
5	2.2	326.6	0.5	326.1
6	2.2	326.7	0.8	325.9

The deposit ranges in gradation silt to silt and sand to sand with trace gravel and trace to some clay.

The measured SPT “N” values within the deposit range from 7 blows to 53 blows per 0.3 m of penetration, indicating a loose to very dense relative density.

The measured water contents of samples of the silt and sand to sand range from 3 per cent to 18 per cent.

The grain size distributions of six (6) samples of the silt and sand to sand deposits are shown on Figure B5.

4.4.5 Clayey Silt Till

A deposit of clayey silt till was encountered in all of the boreholes except Boreholes F2-5 and F2-12. This layer was encountered beneath the fill layer in Boreholes C32-3, F2-1, F2-6, F2-7, F2-9, F2-11 and 8, beneath the clayey silt to silty clay in Boreholes C32-1, C32-4, F2-2, F2-3, F2-8, F2-10 and 7 and beneath the sand to sand and silt layer in Boreholes C32-2, F2-4, 5 and 6. All of the boreholes were terminated within this layer except Boreholes C32-3, F2-4, F2-11, 5 and 7. The elevation of the surface and base of the till deposit and the deposit thickness as encountered in the boreholes are summarized below:



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Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C32-1	3.1	321.0	3.3	317.7
	8.7	315.4	>2.6	Below 312.8
C32-2	10.2	320.9	>7.2	Below 313.7
C32-3	10.2	321.9	5.1	316.8
C32-4	4.5	323.2	>6.8	Below 316.4
F2-1	1.5	326.5	>5.2	Below 321.3
F2-2	8.7	324.8	>2.6	Below 322.2
F2-3	2.2	326.2	>4.5	Below 321.7
F2-4	10.2	327.4	0.9	326.5
F2-6	1.5	323.0	>5.2	Below 317.8
F2-7	4.6	324.2	>8.2	Below 316.0
F2-8	1.5	323.5	>5.2	Below 318.3
F2-9	7.2	325.0	>5.6	Below 319.4
F2-10	5.6	325.9	>1.1	Below 324.8
F2-11	7.2	331.0	1.5	329.5
5	2.7	326.1	10.6	315.5
6	3.0	325.9	>3.7	Below 322.2
7	1.1	328.7	>9.9	Below 318.8
8	0.7	328.9	>6.0	Below 322.9

The till deposit consists of clayey silt, trace to some sand and trace gravel. Pockets, interlayers and/or seams of sand or silt were encountered in Boreholes F2-1, F2-6, F2-8, 5, 6, 7 and 8. A 0.8 m thick interlayer of clayey silt to silt was found in Borehole C32-1 at a depth of 5.6, Elevation 318.5 m. In addition, Boreholes C32-1, F2-1 and F2-8 encountered interlayered layers of sand to sandy silt that are between 0.5 m and 2.3 m thick, at depths between 2.8 m and 6.4 m, below ground surface (Elevation 323.9 m and 316.1 m).

The measured SPT "N" values within the clayey silt till deposit range from 6 blows to 84 blows per 0.3 m of penetration, but are typically between 12 blows and 42 blows per 0.3 m of penetration, and generally increase with depth. These SPT "N" values suggest that the till deposit has a firm to hard consistency.

The measured water contents of samples of the clayey silt till range from 7 per cent to 23 per cent. The measured water content of samples of the sand interlayers range from 13 per cent to 51 per cent.

The results of grain size distribution tests completed on twenty-five (25) selected samples of this deposit are shown on Figures B6A to B6C, and the grain size distribution test completed on three (3) selected samples from the sand interlayers are shown on Figure B7.



Atterberg limits tests were carried out on thirty-three (33) samples of the clayey silt till deposit, and measured plastic limits ranging between 13 per cent and 20 per cent, liquid limits ranging between 18 per cent and 34 per cent and plasticity indices ranging between 4 per cent and 15 per cent. These test results, which are plotted on plasticity charts on Figures B8A to B8E, indicate that this material is a clayey silt of low plasticity.

4.4.6 Lower Clayey Silt

A deposit of clayey silt was encountered underlying the cohesive till deposit in Borehole 5. The surface of the clayey silt deposit was encountered at a depth of 13.3 m, corresponding to Elevation 315.5 m and the thickness of the deposit is about 3.2 m.

The clayey silt deposit contains some sand, as well as seams of sand and silt. Grinding of the augers occurred between about Elevation 313.7 m and 312.6 m, and this is inferred to represent the presence of cobbles and/or boulders within this deposit.

The SPT “N” value measured within the clayey silt are 62 blows and 112 blows per 0.3 m of penetration and 75 blows per 0.02 m of penetration, suggesting a hard consistency.

The measured water content of samples of the lower clayey silt were 14 per cent and 20 per cent.

The grain size distribution of one (1) sample from the clayey silt deposit is shown on Figure 9.

An Atterberg limits test was carried out on one (1) specimen of the clayey silt deposit and measured a liquid limit of about 25 per cent, a plastic limit of about 16 per cent and a plasticity index of about 9 per cent. The result of the Atterberg limits test is shown on a plasticity chart on Figure B10 and indicates that this material is a clayey silt of low plasticity.

4.4.7 Silt and Sand Till

A deposit of gravelly silt and sand till was encountered underlying the sand deposit in Borehole F2-12. The surface of the till deposit was encountered at a depth of 5.8 m, corresponding to Elevation 331.7 m, and the borehole was terminated in this layer at Elevation 330.8 m, penetrating 0.9 m into it.

The SPT “N” value measured within the till deposit is 34 blows per 0.3 m of penetration, indicating a dense relative density.

The measured water content of a sample of the silt and sand till was 10 per cent.

A grain size distribution of one (1) sample of the silt and sand till deposit is shown on Figure B11.

4.4.8 Lower Silt to Sand

A lower deposit of silt to sand was encountered underlying the clayey silt till in Boreholes C32-3, F2-4, F2-11 and 7 and below the clayey silt deposit in Borehole 5. The elevation of the surface of the deposit and the deposit thickness as encountered in the boreholes are summarized below:



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Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C32-3	15.3	316.8	>0.6	Below 316.2
F2-4	11.1	326.5	>0.2	Below 326.3
F2-11	8.7	329.5	>4.1	Below 325.4
5	16.5	312.3	>4.5	Below 307.8
7	11.0	318.8	>10.8	Below 308.0

The non-cohesive deposit is comprised of various layers/strata varying in composition from sand some silt trace gravel, to silt, some sand to sand and silt, all containing trace to some clay and clayey silt seams. In Borehole 5 the augers were grinding during the drilling operations between the depths of 15.2 m and 16.2 m, inferred to be on a boulder.

The SPT "N" values measured within the non-cohesive deposit range from 16 blows to 65 blows per 0.3 m of penetration and up to 100 blows per 0.20 m of penetration, indicating a compact to very dense relative density.

The measured water contents of samples of the lower silt to sand range from 2 per cent to 18 per cent.

Grain size distributions of six (6) samples of the non-cohesive deposit are shown on Figure B12.

An Atterberg limits test was carried out on one (1) sample of the silt portion of this deposit and yielded a liquid limit of about 17 per cent, a plastic limit of about 13 per cent and a plasticity index of about 4 per cent. The results of the Atterberg limits test are shown on the plasticity chart on Figure B13 and indicate that the material is a silt of slight plasticity.

4.4.9 Groundwater Conditions

The observed/recorded water levels in the open boreholes following completion of drilling and in the standpipe piezometer installed in Boreholes C32-1, 5 and 7 are shown on the Record of Borehole sheets and are summarized as follows:

Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F2-1	328.0	3.6	324.4	Nov. 11, 2010	Open Borehole
F2-2	333.5	2.1	331.4	Nov. 11, 2010	Open Borehole
F2-3	328.4	2.6	325.8	Nov. 11, 2010	Open Borehole
F2-4	337.6	Dry	-	Nov. 12, 2010	Open Borehole
F2-5	339.6	Dry	-	Nov. 12, 2010	Open Borehole
F2-6	324.5	Dry	-	Nov. 15, 2010	Open Borehole



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Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F2-7	328.8	7.3	321.5	Nov. 17, 2010	Open Borehole
F2-8	325.0	6.4	318.6	Nov. 15, 2010	Open Borehole
F2-9	332.2	Dry	-	Nov. 15, 2010	Open Borehole
F2-10	331.5	Dry	-	Nov. 12, 2010	Open Borehole
F2-11	338.2	Dry	-	Nov. 14, 2010	Open Borehole
F2-12	337.5	Dry	-	Nov. 12, 2010	Open Borehole
C32-1	324.1	2.1	322.0	Nov. 16, 2010	Open Borehole
		0.9	323.2	Dec. 22, 2010	Piezometer
		0.9	323.2	Feb. 1, 2011	Piezometer
		0.2	323.9	Apr. 7, 2011	Piezometer
C32-2	331.1	13.1	318.0	Nov. 16, 2010	Open Borehole
C32-3	332.1	6.7	325.4	Nov. 10, 2010	Open Borehole
C32-4	327.7	0.1	327.6	Oct. 29, 2010	Open Borehole
5	328.8	11.3	317.5	Mar. 31, 2011	Open Borehole
		2.8	326.0	Apr. 1, 2011	Piezometer
		3.1	325.7	Apr. 7, 2011	Piezometer
6	328.9	0.9	328.0	Mar. 31, 2011	Open Borehole
7	329.8	Dry	-	Apr. 1, 2011	Open Borehole
		Dry	-	Apr. 1, 2011	Piezometer
		5.1	324.7	Apr. 7, 2011	Piezometer
8	329.6	-	-	-	Not Recorded

The water levels observed in the open boreholes on completion of drilling and in the piezometer may not represent long-term stabilized groundwater levels. The water level at the site is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during the spring and periods of precipitation.

4.5 Deep Cut Area (Station 16+400 to 17+000 NBL and SBL)

Boreholes DC-1 to DC-26 were advanced within the limits of a cut along the crest of the existing slopes on both sides of the existing highway alignment and along the shoulder of the highway, at the locations shown on Drawing C1 in Appendix C. The inferred soil stratigraphy as encountered in the boreholes is shown in profile on Drawings C1 and C2, in Appendix C. The detailed subsurface soil and groundwater conditions encountered in the boreholes advanced for this investigation and the results of in situ and laboratory tests carried out on selected soil samples are provided in Appendix C.



In summary, the subsoils encountered in the cut areas consist of a surficial layer of topsoil in the boreholes drilled at the crest of the existing slopes and a layer of asphalt and granular fill in most places in the boreholes drilled through the shoulders of the widening section of the roadway, underlain by a deposit of generally compact to very dense silt to silt and sand to sand. At the northern end of the cut sections, till deposits comprised of clayey silt or silt and sand were encountered in places overlying or within the non-cohesive deposit. A more detailed description of the subsurface conditions is provided in the following subsections.

4.5.1 Topsoil and Asphalt

An approximately 100 mm to 200 mm thick layer topsoil was at the ground surface in all boreholes advanced at the crest of the slope, except Boreholes DC-5 and DC-9.

Approximately 200 mm thick layer of asphalt was encountered at the ground surface in all of the boreholes advanced through the roadway shoulder near the toe of the existing deep cut section.

4.5.2 Fill

Fill was encountered below the asphalt in all of the boreholes drilled through the SBL shoulder of the roadway and one borehole drilled through the NBL shoulder. The elevation of the surface and base of the fill deposit and the thickness of the deposit as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
DC-12	0.2	350.9	0.6	350.3
DC-15		343.9		343.3
DC-17		346.9		346.3
DC-19		349.7		349.1
DC-21		351.4		350.8
DC-23		351.8		351.2
DC-26		350.4		349.8

The fill deposit consists of silt and sand to silty sand to sand, trace gravel and is inferred to constitute the granular layer of the pavement structure.

4.5.3 Clayey Silt

In Borehole DC-26, a 0.7 m thick layer of clayey silt was encountered underlying the granular subbase at Elevation 349.8 m. The measured SPT "N" value within the cohesive deposit is 7 blows per 0.3 m of penetration, suggesting a firm consistency.

4.5.4 Silt and Sand Till

A till deposit comprised of silt and sand, trace to some clay, trace gravel, trace organics and rootlets in places was encountered underlying the topsoil, at ground surface or underlying a portion of the silt and sand layer described in Section 4.5.6, in Boreholes DC-5, DC-9, DC-24 and DC-25. These boreholes were advanced at the



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northern end of the deep cut site and at the crest of the slope. The elevation of the surface and base of the till deposit and the deposit thickness as encountered in the borehole is summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
DC-5	1.5	355.9	2.2	353.7
DC-9	0	358.9	0.7	358.2
DC-24	0.7	359.3	3.0	356.3
DC-25	0.2	358.3	3.5	354.8

A sand interlayer was found in Borehole DC-5 and a cobble was recovered at the tip of the split-spoon sampler at a depth of 2.6 m below ground surface (Elevation 355.9 m) precluding recovery of a full sample. The measured SPT "N" values within the till deposit range from 10 blows to 29 blows per 0.3 m of penetration, indicating a compact relative density.

The measured water contents of samples of the silt and sand till ranged from 11 per cent to 14 per cent.

The grain size distributions of four (4) samples of the non-cohesive till deposit are shown on Figure C1.

Atterberg limits testing was carried out on three (3) samples of the silt and sand till deposit and measured plastic limits ranging between 12 per cent and 13 per cent, a liquid limit of 15 per cent and plasticity indices of 2 per cent and 3 per cent. These test results, which are plotted on a plasticity chart on Figure C2, indicate that the till material is a silt and sand of slight plasticity.

4.5.5 Clayey Silt Till

A deposit of clayey silt till was encountered underlying the silt and sand till deposit, and below the silt and sand layer in places, in Boreholes DC-9, DC-11, DC-13, DC-22, DC-24 and DC-25 which were advanced at the crest of the existing deep cut slope. The clayey silt till deposit was also encountered beneath the fill or clayey silt layer in Boreholes DC-12, DC-23 and DC-26, which were advanced at the base of the cut. Generally, the clayey silt till deposit was encountered in boreholes that were advanced at the northern end of the site. The elevation of the surface and base of the till deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
DC-9	0.7	358.2	6.5	351.7
DC-11	1.5	357.4	3.4	354.0
DC-12	0.8	350.3	2.9	347.4
DC-13	1.5	353.5	> 6.7	Below 346.8
DC-22	1.5	358.5	5.1	353.4
DC-23	0.8	351.2	1.4	349.8
DC-24	4.5	355.5	1.1	354.4
	7.2	352.8	3.0	349.8



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Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
DC-25	3.7	354.8	> 6.1	Below 348.7
DC-26	1.5	349.1	2.2	346.9

The deposit consists of clayey silt, containing various amounts of sand and gravel. Rootlets and/or organics were noted in upper portions of Boreholes DC-9 and sand to silt and sand seams, interlayers and pockets were found in Boreholes DC-9, DC-12, DC-24 and DC-25. In Borehole DC-9, cobbles or a boulder prevented the split-spoon sample from being advanced below a depth of 3.3 m below ground surface.

The measured SPT "N" values within the deposit range from 5 blows to 50 blows per 0.3 m of penetration, but are typically between 12 blows and 36 blows per 0.3 m of penetration, suggesting a firm, but generally stiff to hard consistency.

The measured water contents of samples of the clayey silt till ranged from 6 per cent to 16 per cent.

Grain size distributions of eight (8) samples of the clayey silt till deposit are shown on Figures C3A and C3B.

Atterberg limits tests were carried out on eighteen (18) samples of the clayey silt till deposit, and measured plastic limits ranging between 10 per cent and 15 per cent, liquid limits ranging between 16 per cent and 22 per cent and plasticity indices ranging between 4 per cent and 9 per cent. These test results, which are plotted on plasticity charts on Figures C4A to C4C, indicate that this material is a clayey silt of low plasticity.

4.5.6 Silt to Sand

An interlayered deposit of silt to silt and sand to sand was encountered in all of the boreholes except Borehole DC-25, which was advanced at the northern end of the site. This deposit was encountered at ground surface or beneath the topsoil or asphalt and granular layer in all of the boreholes except Boreholes DC-9, DC-12, DC-23 and DC-24 to DC-26 where it was encountered beneath the clayey silt till and silt and sand till deposits. In Boreholes DC-5, DC-11, DC-13, DC-22 and DC-24, portions of the silt and sand deposit were found overlying and/or below the till deposits.

This deposit contains trace to some gravel and clay, and in Borehole DC-14, the bottom 0.3 m thickness of the deposit grades to sandy gravel. The upper portions of this deposit in Borehole DC-7 contain trace organics and/or rootlets. In Boreholes DC-1, DC-2, DC-16, DC-24 clayey silt to silt lenses/seams and or pockets were encountered at various depths and in Borehole DC-22 rock fragments were recovered in the split-spoon samples. Some portions of this deposit contain zones of oxidation staining. The augers were noted to grind in Borehole DC-9 at a depth of 10.0 m below ground surface (Elevation 348.9 m) inferred to be on a cobble or a boulder.

All of the boreholes were terminated within this non-cohesive deposit except Borehole DC-13, which was terminated within the clayey silt till deposit described above. The non-cohesive deposit is between 1.3 m and 15.9 m thick and the surface of the deposit was encountered at depths ranging between ground surface and 7.2 m below ground surface, between Elevations 359.9 m and 343.3 m. The boreholes were terminated at depths ranging between 5.0 m and 15.9 m below ground surface, between Elevations 348.7 m and 336.2 m.



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The portions of this deposit that were encountered above the clayey silt and sand and silt tills are between 0.8 m and 1.3 m thick.

The measured SPT “N” values within the deposit range from 5 blows to greater than 105 blows per 0.3 m of penetration and two SPT “N” values of 100 blows per 0.23 m and 0.28 m of penetration, but are typically between 10 blows and 45 blows per 0.3 m of penetration and generally increased with depth. These SPT results indicate that the overall deposit has a very loose to very dense relative density, but generally a compact to dense relative density.

The measured water contents of samples of the silt to sand deposit ranged from 2 per cent to 18 per cent.

Grain size distributions of sixty-two (62) samples of the non-cohesive deposit are shown on Figures C5A to C5I, inclusive.

Atterberg limits testing was carried out on three (3) samples of the silt to sand deposit and one test indicates that the material is non-plastic and two tests measured plastic limits of 13 per cent and 15 per cent, liquid limits of 17 per cent and 18 per cent and plasticity indices of 3 per cent and 4 per cent. These two test results, which are plotted on a plasticity chart on Figure C6, indicate that this material is non-plastic silt to sandy silt to silt of slight plasticity.

4.5.7 Groundwater Conditions

The observed/recorded water levels in the open boreholes following completion of drilling are shown on the Record of Borehole sheets and are summarized as follows:

Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
DC-1	349.8	Dry	-	Dec. 16, 2010	Open Borehole
DC-2	344.9	Dry	-	Dec. 23, 2010	Open Borehole
DC-3	354.0	Dry	-	Dec. 17, 2010	Open Borehole
DC-4	347.8	Dry	-	Dec. 23, 2010	Open Borehole
DC-5	357.4	Dry	-	Dec. 20, 2010	Open Borehole
DC-6	350.4	Dry	-	Dec. 23, 2010	Open Borehole
DC-7	354.0	Dry	-	Dec. 20, 2010	Open Borehole
DC-8	351.6	Dry	-	Dec. 24, 2010	Open Borehole
DC-9	358.9	Dry	-	Dec. 20, 2010	Open Borehole
DC-10	352.1	Dry	-	Dec. 24, 2010	Open Borehole
DC-11	358.9	Dry	-	Dec. 21, 2010	Open Borehole
DC-12	351.1	Dry	-	Dec. 24, 2010	Open Borehole
DC-13	355.0	Dry	-	Dec. 22, 2010	Open Borehole



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Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
DC-14	347.5	Dry	-	Jan. 13, 2011	Open Borehole
DC-15	344.1	Dry	-	Dec. 22, 2010	Open Borehole
DC-16	354.5	Dry	-	Jan. 14, 2011	Open Borehole
DC-17	347.1	Dry	-	Dec. 22, 2010	Open Borehole
DC-18	353.8	Dry	-	Jan. 13, 2010	Open Borehole
DC-19	349.9	Dry	-	Dec. 22, 2010	Open Borehole
DC-20	352.5	Dry	-	Dec. 23, 2010	Open Borehole
DC-21	351.6	Dry	-	Dec. 21, 2010	Open Borehole
DC-22	360.0	Dry	-	Dec. 23, 2010	Open Borehole
DC-23	352.0	Dry	-	Dec. 21, 2010	Open Borehole
DC-24	360.0	6.7	353.3	Dec. 22, 2010	Open Borehole
DC-25	358.5	5.5	353.0	Dec. 22, 2010	Open Borehole
DC-26	350.6	Dry	-	Dec. 21, 2010	Open Borehole

The water levels observed in the open boreholes on completion of drilling and in the piezometer may not represent long-term stabilized groundwater levels. The water level at the site is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during the spring and periods of precipitation.

4.6 High Fill Embankment Area 3 (Station 17+350 to 17+800 NBL and Station 17+100 to 18+100 SBL)

Boreholes F3-1 to F3-7, F3-9 to F2-26, C33-1 to C33-4 and C34-1 to C34-4 were advanced within the limits of this embankment, at the locations shown on Drawing D1, in Appendix D. The inferred soil stratigraphy as encountered in the boreholes is shown in profile on Drawings D2 to D4, in Appendix D. The detailed subsurface soil and groundwater conditions encountered in the boreholes advanced for this investigation and the results of in situ and laboratory tests carried out on selected soil samples are provided in Appendix D.

In summary, the subsoils encountered in the boreholes in this area consist of a layer of asphalt along the roadway shoulder and topsoil along the toes of the embankment, underlain by fill and/or thin deposits of clayey silt and sand to sandy silt. These deposits are underlain by interlayered deposits of silt and sand till and clayey silt till in places, and deposits of silt and sand. A more detailed description of the subsurface conditions is provided in the following subsections.



4.6.1 Topsoil and Asphalt

Approximately 100 mm to 200 mm of topsoil was encountered immediately below the existing ground surface in all of the boreholes that were advanced at the toe of the existing high fill embankment, except Boreholes C33-1, F3-20 and F2-23. Boreholes C33-2, C33-3, C34-2, C34-3, F3-1, F3-5, F3-11, F3-14, F3-22 and F3-24, which were advanced on the Highway 400 paved shoulder, encountered between approximately 100 mm and 300 mm of asphalt.

4.6.2 Fill

Fill was encountered at ground surface or below the asphalt or topsoil layers in all of the boreholes that were advanced from the road surface and in the majority of the boreholes advanced at the toe of the slope. The elevation of the surface and the base of the fill deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C33-2	0.2	335.8	5.4	330.4
C33-3	0.2	335.4	5.4	330.0
C34-1	0.2	321.5	0.8	320.7
C34-2	0.2	326.0	4.3	321.7
C34-3	0.2	327.0	2.8	324.0
F3-1	0.2	338.9	5.4	333.5
F3-5	0.2	330.8	3.5	327.3
F3-11	0.2	344.9	0.6	3244.3
F3-14	0.2	339.6	4.3	335.3
F3-17	0.1	331.8	0.6	331.2
F3-18	0.2	331.9	0.5	331.4
F3-22	0.1	324.4	3.8	320.6
F3-23	0	319.9	1.3	318.6
F3-24	0.3	321.3	4.2	317.1
F3-25	0.1	317.4	0.6	316.8
F3-26	0.1	316.9	0.6	316.3

The fill comprising the roadway embankment consists mainly of non-cohesive soil but varies in composition from sand and gravel immediately below the roadway to silty sand to clayey silt. Zones and layers of clayey silt were encountered within the non-cohesive fill in Boreholes F3-5, C33-2 and C34-2. Rootlets and/or organics were noted in upper portions of the fill in Boreholes F3-17, F3-23, F3-25 and F3-26 and organics were noted at depth in Borehole C33-2 and C33-3.

The measured SPT "N" values within the non-cohesive fill range from 3 blows to 49 blows per 0.3 m of penetration, indicating a compact to dense relative density and the SPT "N" values in the portions of cohesive fill range from 19 blows to 47 blows per 0.3 m of penetration, suggesting a very stiff to hard consistency. The



measured SPT “N” values are typically greater in the sections of the embankment below the highway, where they typically ranged from 18 blows to 36 blows per 0.3 m of penetration.

The measured water contents of samples of the fill ranged from 6 per cent to 21 per cent.

The grain size distributions of eight (8) samples of the silty sand to sand fill and the clayey silt fill are shown on Figures D1A and D1B.

Atterberg limits testing was carried out on five (5) samples of the cohesive portion of the fill and measured plastic limits ranging between 11 per cent and 14 per cent, liquid limits ranging between 17 per cent and 18 per cent and plasticity indices ranging between 4 per cent and 6 per cent. These test results, which are plotted on a plasticity chart on Figure D2, indicate that this material is a clayey silt of low plasticity.

4.6.3 Upper Clayey Silt

An upper deposit of clayey silt was encountered beneath the fill in Borehole F3-1 and beneath the topsoil in Boreholes F3-2, F3-10 and F3-15. The elevation of the surface and base of the clayey silt deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
F3-1	5.6	333.5	4.8	328.7
F3-2	0.1	332.4	1.3	331.1
F3-10	0.1	344.9	0.6	344.3
F3-15	0.1	334.3	0.6	333.7

The deposit also contains trace to some sand to with sand and trace gravel. Rootlets and organics were noted in upper portions of Boreholes F3-2 and F3-10, lenses of silty sand and silty clay and organics were found in Boreholes F3-1 and F3-2, respectively.

The measured SPT “N” values within the deposit range from 4 blows to 27 blows per 0.3 m of penetration, suggesting a firm to very stiff consistency.

The measured water contents of samples of the upper clayey silt ranged from 9 per cent to 19 per cent.

The grain size distribution of one (1) sample of the upper clayey silt deposit is shown on Figure D3.

Atterberg limits testing was carried out on four (4) samples of the upper clayey silt deposit and measured plastic limits of 11 per cent and 14 per cent, liquid limits between 17 per cent and 20 per cent and plasticity indices between 5 per cent and 8 per cent. These test results, which are plotted on a plasticity chart on Figure D4, indicate that this material is a clayey silt of low plasticity.

4.6.4 Upper Sandy Silt to Sand

An upper deposit of sandy silt to sand was encountered beneath the upper clayey silt deposit in Borehole F3-1, F3-2 and F3-15, beneath the topsoil/ground surface in Boreholes C33-1 to C33-4, F3-6, F3-7, F3-13 and F3-16, and beneath the fill in Boreholes C33-2, C33-3 and F3-14. The elevation of the surface and base of the deposit and the deposit thickness as encountered in the boreholes are summarized below.



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Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C33-1	0.0	331.4	0.7	330.7
C33-2	5.6	330.4	3.1	327.3
C33-3	5.6	330.0	1.6	328.4
C33-4	0.1	330.0	0.7	329.3
F3-2	1.4	331.1	2.3	328.8
F3-7	0.1	324.4	2.9	321.5
F3-13	0.2	338.8	2.0	336.8
F3-14	4.5	335.3	2.7	332.6
F3-15	0.7	333.7	2.3	331.4
F3-16	0.2	330.8	0.5	330.3
F3-26	0.7	316.3	2.3	314.0

This deposit varies in composition from sandy silt to sand and silt to silty sand to sand, containing trace to some gravel and clay. The upper portions of this deposit also contain trace organics and/or rootlets in Borehole C33-1, C33-4 and F3-16. In Borehole C33-3 lenses of clayey silt were encountered within the non-cohesive deposit and in Borehole F3-13 a 700 mm thick interlayer of sand and gravel was encountered at a depth of 1.5 m (Elevation 337.5 m).

The measured SPT "N" values within the deposit range from 1 blow to 28 blows per 0.3 m of penetration, indicating a very loose to compact relative density.

The measured water contents of samples of the upper sandy silt to sand ranged from 1 per cent to 22 per cent.

Grain size distributions of nine (9) samples of the non-cohesive deposit are shown on Figures D5A and D5B.

4.6.5 Lower Clayey Silt

A lower deposit of clayey silt, trace to some sand, trace gravel was encountered beneath the silt and sand to silty sand deposit in Boreholes C33-2, C33-3, C33-4, F3-2 and F3-7. Interlayers of silty sand and silt and sand, 0.3 m and 1.2 m thick, were noted in Boreholes F3-2 and F3-7. The elevation of the surface and base of the deposit and the deposit thickness as encountered in the borehole is summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C33-2	8.7	327.3	1.5	325.8
C33-3	7.2	328.4	1.5	326.9
C33-4	0.8	329.3	1.2	328.1
F3-2	3.7	328.8	>2.7	Below 326.1
F3-7	3.0	321.5	0.7	318.9
	4.9	319.6	0.7	318.9



The measured SPT “N” values within the lower clayey silt deposit range from 4 blows to 40 blows per 0.3 m of penetration, suggesting a firm to hard consistency.

The measured water contents of samples of the lower clayey silt ranged from 10 per cent to 22 per cent.

The grain size distribution of a sample of the clayey silt deposit is shown on Figure D6, and the grain size distribution of two (2) samples of the silt and sand to silty sand interlayer within the clayey silt deposit are shown on Figure D7.

Atterberg limits testing was carried out on six (6) samples of the lower clayey silt and measured plastic limits ranging between 11 per cent and 14 per cent, liquid limits ranging between 17 per cent and 22 per cent and plasticity indices ranging between 5 per cent and 9 per cent. These test results, which are plotted on a plasticity chart on Figure D8, indicate that this material is a clayey silt of low plasticity.

4.6.6 Clayey Silt Till and Silt and Sand Till

Deposits of clayey silt till and silt and sand till were encountered in boreholes that were advanced at the southern end of the site on the west (SBL) side of the Highway and beneath the topsoil/ground surface in Boreholes F3-9 and F3-12, beneath the fill layer in Borehole F3-11, beneath the sand and silt deposits in Boreholes C33-1, F3-13, F3-14, F3-15, F3-16 and F3-26 and beneath the upper deposit of clayey silt in Borehole F3-10. The elevation of the surface of the till deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Classification of Till
C33-1	0.7	330.7	2.6	Sand and Silt
F3-9	0.1	346.9	4.1	Sand and Silt
F3-10	0.7 2.2	344.3 342.8	1.5 3.4	Sand and Silt/ Clayey Silt
F3-11	0.8	344.3	6.4	Clayey Silt
F3-12	0.2 3.7	341.3 337.8	3.5 1.3	Sand and Silt/ Clayey Silt
F3-13	2.2 3.7	336.8 335.3	1.5 1.9	Sand and Silt/ Clayey Silt
F3-14	7.2	332.6	1.5	Clayey Silt
F3-15	3.0	331.4	3.6	Clayey Silt
F3-16	0.7	330.3	1.5	Sand and Silt
F3-26	3.0	314.0	1.4	Clayey Silt

The till deposit varies in consistency and gradation from clayey silt to clayey silt with sand to silt and sand, trace to some gravel. Rootlets and/or organics were noted in upper portions of Boreholes F3-9, F3-10 and F3-16 and silty sand/sand/silt lenses were found in Boreholes C33-1, F3-13 and F3-26. Interlayers of silty sand to sand



between 0.1 m and 0.5 m thick were noted in Boreholes F3-12 and F3-13. In Borehole F3-10 the augers were noted to be grinding at a depth of 5.2 m (Elevation 339.8 m) inferred on cobbles and/or boulders within this layer.

The measured SPT “N” values within the clayey silt till deposit range from 7 blows to 67 blows per 0.3 m of penetration, suggesting a firm to hard consistency. The measured SPT “N” values within the silt and sand till deposit range from 4 blows to 44 blows per 0.3 m of penetration, indicating a loose to dense relative density.

The measured water contents of samples of the till deposits ranged from 10 per cent to 21 per cent.

The grain size distributions of eleven (11) samples of the till deposits are shown on Figures D9A and D9B, and a grain size distribution of a sample of the silty sand interlayer within the sand and silt till is shown on Figure D10.

Atterberg limits testing was carried out on sixteen (16) samples of the clayey silt till and sand and silt till deposits, and measured plastic limits ranging between 11 per cent and 16 per cent, liquid limits ranging between 14 per cent and 24 per cent and plasticity indices ranging between 2 per cent and 9 per cent. The test results, which are plotted on a plasticity chart on Figures D11A and D11B, indicate that the cohesive till deposit may be classified as clayey silt of low plasticity the non-cohesive till may be classified as silt and sand with fines of slight plasticity.

4.6.7 Lower Silt and Sand

A lower deposit of silt and sand was encountered in all of the boreholes except Borehole F3-2. This layer was encountered beneath the topsoil, asphalt, fill or ground surface in almost all of the boreholes, except in Boreholes C33-1, C33-2 and F3-9 to F3-15 where it was encountered beneath the clayey silt till to sand and silt till deposits and in Boreholes C33-3, C33-4, F3-1, F3-7, F3-16 and F3-17 where it was encountered beneath the lower clayey silt deposit.

This deposit varies in composition from silt to sand and silt to sand, trace to some of gravel and clay. The upper portions of this deposit contain trace organics and/or rootlets in Borehole C34-4, F3-20 and F3-21. In Boreholes C33-1, C33-3, C34-2 to C34-4, F3-3 to F3-5, F3-9, F3-16 to F3-19, F3-23 and F3-26 clayey silt to silt interlayers, seams, lenses and/or pockets were encountered at various depths. In Borehole F3-26 clayey silt till interlayer, 1.4 m thick, was encountered at a depth of 3.0 m (Elevation 314.0 m).

All of the boreholes where the deposit was encountered were terminated within this deposit. The thickness of this non-cohesive deposit is between at least 1.1 m and 12.9 m and the surface of the deposit was encountered at depths between ground surface and 10.4 m, between Elevations 347.0 m and 316.3 m. The boreholes were terminated at depths between 6.7 m and 17.4 m below ground surface, between Elevations 340.8 m and 308.8 m.

The measured SPT “N” values within the deposit range from 5 blows to greater than 100 blows per 0.3 m of penetration, but are typically between 19 blows and 40 blows per 0.3 m of penetration, and increased with depth. These results indicate a loose to very dense relative density and typically a compact to dense relative density.

The measured water contents of samples of the silt and sand ranged from 2 per cent to 25 per cent.

Grain size distributions of seventy (70) samples of the non-cohesive deposit are shown on Figures D12A to D12L. Grain size distributions of two (2) samples of the clayey silt interlayers are shown on Figure D12M.



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Atterberg limits testing was carried out on one (1) sample of the lower silt and sand and measured a plastic limit of 17 per cent, a liquid limit of 16 per cent and a plasticity index of about 1 per cent. These test results, which are plotted on a plasticity chart on Figure D13A, indicate that this material is a silt of slight plasticity.

Atterberg limits testing was carried out on two (2) samples of the of the clayey silt interlayer and measured plastic limits of 14 per cent, liquid limits of 24 per cent and 21 per cent and plasticity indices of 10 per cent and 7 per cent. These test results, which are plotted on a plasticity chart on Figure D13B, indicates that the interlayers are clayey silt of low plasticity.

4.6.8 Groundwater Conditions

The observed/recorded water levels in the open boreholes following completion of drilling and in the standpipe piezometer installed in Boreholes C33-1 and C34-4 are shown on the Record of Borehole sheets and are summarized as follows:

Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F3-1	339.1	Dry	-	Dec. 11, 2010	Open Borehole
F3-2	332.5	4.9	327.6	Nov. 18, 2010	Open Borehole
F3-3	330.0	Dry	-	Nov. 18, 2010	Open Borehole
F3-4	327.5	Dry	-	Nov. 22, 2010	Open Borehole
F3-5	331.0	Dry	-	Jan. 6, 2011	Open Borehole
F3-6	325.2	Dry	-	Nov. 22, 2010	Open Borehole
F3-7	324.5	Dry	-	Nov. 22, 2010	Open Borehole
F3-9	347.0	Dry	-	Nov. 29, 2010	Open Borehole
F3-10	345.0	Dry	-	Nov. 29, 2010	Open Borehole
F3-11	345.1	Dry	-	Dec. 10, 2010	Open Borehole
F3-12	341.5	Dry	-	Nov. 29, 2010	Open Borehole
F3-13	339.0	Dry	-	Nov. 30, 2010	Open Borehole
F3-14	339.8	Dry	-	Dec. 10, 2010	Open Borehole
F3-15	334.4	Dry	-	Nov. 30, 2010	Open Borehole
F3-16	331.0	2.7	328.3	Dec. 2, 2010	Open Borehole
F3-17	331.9	Dry	-	Dec. 1, 2010	Open Borehole
F3-18	332.1	Dry	-	Dec. 1, 2010	Open Borehole
F3-19	330.0	Dry	-	Dec. 1, 2010	Open Borehole
F3-20	326.8	Dry	-	Dec. 1, 2010	Open Borehole
F3-21	323.5	Dry	-	Dec. 1, 2010	Open Borehole
F3-22	324.5	Dry	-	Mar. 29, 2011	Open Borehole



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Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F3-23	319.9	Dry	-	Nov. 30, 2010	Open Borehole
F3-24	321.6	Dry	-	Nov. 24, 2010	Open Borehole
F3-25	317.5	Dry	-	Nov. 29, 2010	Open Borehole
F3-26	317.0	6.1	310.9	Nov. 29, 2010	Open Borehole
C33-1	331.4	Dry	-	Nov. 30, 2010	Open Borehole
		8.7	322.7	Dec. 22, 2010	Piezometer
		8.2	323.2	Feb. 1, 2011	Piezometer
C33-2	336.0	10.4	325.6	Dec. 9, 2010	Open Borehole
C33-3	335.6	Dry	-	Jan. 5, 2011	Open Borehole
C33-4	330.1	Dry	-	Dec. 19, 2010	Open Borehole
C34-1	321.7	1.1	320.6	Dec. 1, 2010	Open Borehole
C34-2	326.2	15.3	310.9	Nov. 30, 2010	Open Borehole
C34-3	327.2	Dry	-	Jan. 7, 2011	Open Borehole
C34-4	323.8	Dry	-	Nov. 22, 2010	Open Borehole
		Dry	-	Dec. 16, 2010	Piezometer
		Dry	-	Feb. 1, 2011	Piezometer

The water levels observed in the open boreholes on completion of drilling and in the piezometer may not represent long-term stabilized groundwater levels. The water level at the site is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during the spring and periods of precipitation.

4.7 High Fill Embankment Area 4 (Station 18+200 to 19+000 NBL and Station 18+500 to 19+000 SBL)

Boreholes F4-1 to F4-23, C35-3, C36-1 to C36-4 were advanced within the limits of this embankment, at the locations shown on Drawing E1, in Appendix E. The detailed subsurface soil and groundwater conditions encountered in the boreholes advanced for this investigation and the results of in situ and laboratory tests carried out on selected soil samples are provided in Appendix E. Stratigraphic profiles along the roadway and along the toes of the embankment showing the interpreted subsurface conditions are presented on Drawings E1 and E2, in Appendix E.

In summary, the subsoils encountered in the boreholes in this area consist of a surficial topsoil or asphalt underlain by fill and thin deposits of clayey silt and sandy silt to sand. These layers are underlain by a clayey silt



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till deposit and a non-cohesive deposit comprised of pockets/interlayers of silt and sand, clayey silt, sandy silt, and/or sand and silt to silty sand, in places underlain by a deposit of sandy silt to silt and sand till. A more detailed description of the subsurface conditions is provided in the following subsections.

4.7.1 Topsoil and Asphalt

An approximately 100 mm to 300 mm thick layer of topsoil was encountered at the ground surface in Boreholes C36-1, C36-4, F4-1, F4-2, F4-4, F4-8, F4-9, F4-10, F4-13, F4-15 to F4-21 and F4-23.

An approximately 200 mm to 500 mm thick layer of asphalt was encountered at the ground surface in Boreholes C35-3, C36-2, C36-3, F4-3, F4-5, F4-7, F4-14 and F4-22, which were advanced through the roadway shoulder.

4.7.2 Fill

Fill was encountered below the asphalt in all of the boreholes that were advanced from the road surface, and below the topsoil layer in Boreholes C36-1, C36-4, F4-4, F4-13, F4-1 and F4-18. The elevation of the surface and base of the fill deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C35-3	0.2	317.3	2.8	314.5
C36-1	0.1	310.4	0.2	310.2
C36-2	0.2	317.4	8.5	308.9
C36-3	0.2	317.4	8.5	308.9
C36-4	0.1	309.9	1.4	308.5
F4-3	0.5	316.7	3.2	313.5
F4-4	0.1	314.5	0.4	314.1
F4-5	0.2	316.8	3.5	313.3
F4-7	0.2	316.1	4.3	311.8
F4-13	0.1	313.4	1.4	312.0
F4-14	0.3	318.0	1.9	316.1
F4-15	0.3	314.7	0.9	313.8
F4-18	0.2	316.3	1.3	315.0
F4-22	0.2	317.8	3.5	314.3

The existing embankment fill consists mainly of non-cohesive soil, but varies in composition from sand and gravel to clayey silt to organic silty sand. Layers of clayey silt were encountered in the non-cohesive portions of the fill in Boreholes C36-2, C36-3, F4-7, F4-13 and F4-18 and zones of silty sand were noted in the cohesive portion of the fill in Borehole F4-7. Rootlets and/or organics were noted in the upper portions of the fill in Boreholes C36-4, F4-4, F4-13 and F4-15.

The measured SPT "N" values within the deposit range between 1 blow and 29 blows per 0.3 m of penetration, with one SPT "N" value of 61 blows per 0.3 m of penetration in a borehole through the embankment below the



highway. Within the non-cohesive portions of the fill the SPT “N” values typically range between 5 blows and 29 blows per 0.3 m of penetration, indicating a loose to compact relative density. Within the cohesive portions of the fill the SPT “N” values range between 8 blows and 26 blows per 0.3 m of penetration, suggesting a stiff to very stiff consistency.

The measured water contents of samples of the fill ranged from 3 per cent to 22 per cent.

The grain size distributions of nine (9) samples of the sandy silt to sand fill and the clayey silt fill are shown on Figures E1A and E1B.

Atterberg limits testing was carried out on six (6) samples from the cohesive portion of the fill, and measured plastic limits between about 11 per cent and 16 per cent, liquid limits between about 21 per cent and 25 per cent, and plasticity indices between about 5 per cent and 12 per cent. The test results, which are plotted on a plasticity chart on Figure E2, indicate that the cohesive till material is a clayey silt of low plasticity.

Testing carried out on two (2) samples of silty sand fill containing organics measured about 6 per cent and 10 per cent organic content within the layer.

4.7.3 Clayey Silt

A clayey silt deposit was encountered at depths between 0.1 m and 1.5 m below ground surface in C36-1, F4-4 and F4-16 to F4-20. The elevation of the surface and base of the clayey silt deposit and the deposit thickness as encountered in the boreholes are summarized below:

Borehole No.	Depth to Surface of Layer (m)	Layer Surface Elevation (m)	Layer Thickness (m)	Layer Base Elevation (m)
C36-1	0.3	310.2	0.8	309.4
C36-2	8.7	308.9	3.0	305.9
F4-4	0.5	314.1	1.7	312.4
F4-16	0.1	314.9	1.2	313.7
F4-17	0.7	313.9	0.8	313.1
F4-18	1.5	315.0	1.3	313.7
F4-19	0.1	313.9	0.4	313.5
F4-20	0.1	312.4	0.2	312.2

The deposit consists of clayey silt, trace to some sand and gravel. Rootlets and/or organics were noted in Boreholes C36-1, F4-16, F4-19 and F4-20 and the upper 1.1 m thick portion of the deposit in Borehole F4-4 is described as clayey silt to organic silt.

The measured SPT “N” values within the deposit range from 2 blows to 35 blows per 0.3 m of penetration, but are typically between 10 blows and 18 blows per 0.3 m of penetration, suggesting a very soft to hard consistency, but typically stiff to very stiff.

The measured water contents of samples of the clayey silt ranged from 15 per cent to 25 per cent.



The grain size distribution of one (1) sample of the clayey silt is shown on Figure E3.

Atterberg limits tests were carried out on four (4) samples of the cohesive deposit and measured plastic limits between about 14 per cent and 21 per cent, liquid limits between about 20 per cent and 26 per cent, and plasticity indices between about 4 per cent and 11 per cent. The test results, which are plotted on a plasticity chart on Figure E4, indicate that this material is a clayey silt of low plasticity with one of the samples tested indicating potentially an organic silt of slight plasticity.

4.7.4 Sandy Silt to Sand

A deposit comprised of various layers/seams and pockets of non-cohesive soil ranging in composition from silt to sandy silt to sand and silt to silty sand to sand was encountered in fifteen boreholes at this site. The elevation of the surface and base of the deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C35-3	3.0	314.5	4.2	310.3
F4-1	0.2	314.8	6.5	308.3
F4-2	0.2	314.3	2.0	312.3
F4-3	3.7	313.5	>9.1	Below 304.4
F4-4	3.0	311.6	0.7	310.9
F4-4	5.6	309.0	>1.1	Below 307.9
F4-6	0.0	314.5	4.3	310.2
F4-11	0.0	311.0	2.6	308.4
F4-13	4.5	309.0	1.1	307.9
F4-14	7.2	311.1	3.0	308.1
F4-17	0.2	314.4	0.5	313.9
F4-18	2.8	313.7	1.7	312.0
F4-19	0.5	313.5	2.1	311.4
F4-20	0.3	312.2	1.9	310.3
F4-22	5.6	312.4	>7.1	Below 305.3

The various layers/lenses or pockets of the non-cohesive deposit contain trace to some clay and gravel. Rootlets and organics were noted in upper portions in Boreholes F4-1, F4-2, F4-3, and F4-20, a gravelly sand interlayer was found in Borehole F4-11 and a clayey silt interlayer was noted in Borehole F4-4. Boreholes F4-3, F4-4 and F4-22 were terminated within this deposit.

The measured SPT "N" values within the deposit range from 1 blow to 41 blows per 0.3 m of penetration, indicating a loose to dense relative density.



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The measured water contents of samples of the sandy silt to sand ranged from 8 per cent to 28 per cent.

The grain size distributions of fifteen (15) samples from these deposits are shown on Figures E5A to E5C.

4.7.5 Clayey Silt to Sand and Silt

A deposit of non-cohesive soil comprised primarily of silt but ranging in composition from silt to silt and sand was encountered in all boreholes at this site except Boreholes F4-1 and F4-3. In three boreholes (Boreholes F4-4, F4-5 and F4-6), a portion of the deposit is described as clayey silt. The elevation of the surface and base of the deposits and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C35-3	7.2	310.3	>8.7	Below 301.6
C36-1	1.1	309.4	1.1	308.3
C36-3	8.7	308.9	3.0	305.9
C36-4	1.5	308.5	2.2	306.3
F4-2	2.2	312.3	>9.1	Below 303.2
F4-4	2.2	312.4	0.8	311.6
F4-4	3.7	310.9	1.9	309.0
F4-5	3.7	313.3	>9.1	Below 304.2
F4-6	4.3	310.2	>2.4	Below 307.8
F4-7	4.5	311.8	>8.3	Below 303.5
F4-8	0.1	313.9	>6.5	Below 307.4
F4-9	0.1	313.9	>6.6	Below 307.3
F4-10	0.1	314.4	>6.6	Below 307.8
F4-11	2.6	308.4	>4.1	Below 304.3
F4-12	0.0	311.5	3.7	307.8
F4-13	1.5	312.0	4.1	307.9
F4-14	2.2	316.1	5.0	311.1
F4-15	1.2	313.8	>5.5	Below 308.3
F4-16	1.5	313.5	>5.2	Below 308.3
F4-17	1.5	313.1	>5.2	Below 307.9
F4-18	4.5	312.0	>6.8	Below 305.2
F4-19	2.6	311.4	>3.9	Below 307.5
F4-20	2.2	310.3	4.4	305.9
F4-21	0.2	312.8	5.4	307.4
F4-22	3.7	314.3	1.9	312.4
F4-23	0.2	317.3	3.2	314.1



The silt and clayey silt layers/seams of the deposit, containing trace sand and trace gravel, and sand to silty sand pockets and seams were noted within the silt layer in Boreholes F4-13 and F4-15 and within the clayey silt layer in Borehole F4-4.

The measured SPT "N" values within the deposit range between 4 blows per 0.3 m of penetration and 107 blows per 0.25 m of penetration. Within the non-cohesive portions of the deposit the SPT "N" values typically range between 7 blows and 52 blows per 0.3 m of penetration, indicating a loose to very dense relative density. Within the cohesive portions of the fill the SPT "N" values range between 4 blows per 0.3 m of penetration and 107 blows per 0.25 m of penetration, suggesting a firm to hard consistency.

The measured water contents of samples of the clayey silt to sand and silt ranged from 9 per cent to 27 per cent.

Grain size distributions of three (3) samples of the cohesive portions of this deposit are shown on Figure E6.

Grain size distributions of forty-five (45) samples of the non-cohesive silt to silt and sand layers/seams of this deposit are shown on Figures E7A to E7G.

Atterberg limits testing was carried out on nineteen (19) samples of the of the clayey silt and silt layers of the deposit and 19 tests measured plastic limits between 10 per cent and 19 per cent, liquid limits between 18 per cent and 23 per cent, and plasticity indices between 2 per cent and 10 per cent; and one sample is non-plastic. The test results, which are plotted on a plasticity chart on Figures E8A and E8C, indicate that the deposit is classified as non-plastic silt to silt of slight plasticity and three samples indicate clayey silt of low plasticity.

4.7.6 Sandy Silt to Silty Sand Till

A non-cohesive till deposit comprised of sandy silt to silt and sand to silty sand, trace clay and gravel was encountered beneath the clayey silt to silt deposit in Boreholes C36-1, C36-2, C36-3, C36-4, F4-12 to F4-14, F4-20, F4-21 and F4-23. The elevation of the surface and base of the till deposit and the deposit thickness as encountered in the borehole is summarized below.

Borehole No.	Depth to Surface (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C36-1	2.2	308.3	4.4	303.9
C36-2	11.7	305.9	>3.7	<302.2
C36-3	11.7	305.9	5.2	300.7
C36-4	3.7	306.3	4.2	302.1
F4-12	3.7	307.8	3.0	304.8
F4-13	5.6	307.9	1.1	306.8
F4-14	10.2	308.1	2.1	306.0
F4-20	6.6	305.9	0.1	305.8
F4-21	5.6	307.4	1.1	306.3
F4-23	3.4	314.1	3.3	310.8



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The measured SPT “N” values within the deposit range from 10 blows per 0.3 m of penetration to 105 blows per 0.1 m of penetration, but are typically between 20 blows and greater than 100 blows per 0.3 m of penetration, indicating a compact to very dense relative density.

The measured water contents of samples of the sandy silt to silty sand till ranged from 7 per cent to 25 per cent.

The grain size distributions of thirteen (13) samples of the till are shown on Figures E9A and E9B.

Atterberg limits tests were carried out on two (2) samples of the sandy silt to silty sand till and one test indicating that the material is non-plastic and the other test as plotted on a plasticity chart on Figure E10, measured a plastic limit of 13 per cent, a liquid limit of 15 per cent and a plasticity index of about 2 per cent. The test results indicate that the sandy silt to silty sand till is non-plastic or of slight plasticity.

4.7.7 Groundwater Conditions

The observed/recorded water levels in the open boreholes following completion of drilling and in the standpipe piezometer installed in Boreholes F4-2 and C36-4 are shown on the Record of Borehole sheets and are summarized as follows:

Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F4-1	315.0	2.7	312.3	Nov. 23, 2010	Open Borehole
F4-2	314.5	2.1 2.2	312.4 312.3	Dec. 16, 2010 Feb. 1, 2011	Piezometer Piezometer
F4-3	317.2	7.3	309.9	Jan. 11, 2011	Open Borehole
F4-4	314.6	2.5	312.1	Jan. 12, 2011	Open Borehole
F4-5	317.0	5.8	311.2	Jan. 13, 2011	Open Borehole
F4-6	314.5	0.0	314.5	Jan. 10, 2011	Open Borehole
F4-7	316.3	10.0	306.3	Jan. 13, 2011	Open Borehole
F4-8	314.0	3.0	311.0	Jan. 10, 2011	Open Borehole
F4-9	314.0	5.2	308.8	Jan. 11, 2011	Open Borehole
F4-10	314.5	2.3	312.2	Jan. 11, 2011	Open Borehole
F4-11	311.0	0.9	310.1	Jan. 11, 2011	Open Borehole
F4-12	311.5	2.4	309.1	Nov. 25, 2010	Open Borehole
F4-13	313.5	4.0	309.5	Nov. 24, 2010	Open Borehole
F4-14	318.3	Dry	-	Jan. 15, 2011	Open Borehole
F4-15	315.0	5.9	309.1	Nov. 29, 2010	Open Borehole
F4-16	315.0	Dry	-	Nov. 26, 2010	Open Borehole
F4-17	314.6	-	-	-	Not Recorded
F4-18	316.5	2.4	314.1	Nov. 26, 2010	Open Borehole



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Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F4-19	314.0	Dry	-	Nov. 25, 2010	Open Borehole
F4-20	312.5	1.8	310.7	Nov. 25, 2010	Open Borehole
F4-21	313.0	Dry	-	Nov. 25, 2010	Open Borehole
F4-22	318.0	Dry	-	Nov. 26, 2010	Open Borehole
F4-23	317.5	Dry	-	Nov. 24, 2010	Open Borehole
C35-3	317.5	11.6	305.9	Jan. 10, 2011	Open Borehole
C36-1	310.5	2.1	308.4	Nov. 25, 2010	Open Borehole
C36-3	317.6	9.8	307.8	Jan. 14, 2011	Open Borehole
C36-4	310.0	0.6	309.4	Nov. 24, 2010	Open Borehole
		0.6	309.4	Dec. 16, 2010	Piezometer
		0.9	309.1	Feb. 1, 2011	Piezometer

The water level observed in the open boreholes on completion of drilling and in the piezometers may not represent a long-term stabilized groundwater level. The water level at the site is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during the spring and periods of precipitation.

4.8 High Fill Embankment Area 5 (Station 22+350 to 22+900 NBL and SBL)

Boreholes F5-1 to F5-21 and C41-1 to C41-4 were advanced within the limits of this embankment widening, at the locations shown on Drawing F1, in Appendix F. The detailed subsurface soil and groundwater conditions encountered in the boreholes advanced for this investigation and the results of in situ and laboratory tests carried out on selected soil samples are provided in Appendix F. Stratigraphic profiles along the roadway and along the toes of the embankment showing the interpreted subsurface conditions are shown on Drawings F1 and F2, in Appendix F.

In summary, the subsoils encountered in the boreholes in this area consist of surficial topsoil or asphalt underlain by a fill deposit at most borehole locations and surficial and near-surface deposits of clayey silt and sandy silt to sand. These deposits are underlain by a clayey silt till deposit in places overlain or underlain by pockets/layers of clayey silt, silt, sandy silt to silt and sand, and a sandy silt to silt and till deposit at the southern end of the site. A more detailed description of the subsurface conditions is provided in the following subsections.



4.8.1 Topsoil

An approximately 100 mm to 200 mm thick layer of topsoil was encountered at the ground surface in Boreholes C41-1, C41-4, F5-1, F5-3 to F5-5, F5-7, F5-8, F5-11 to F5-13, F5-15 to F5-17, F5-19 and F5-21.

4.8.2 Asphalt

An approximately 200 mm to 300 mm thick layer of asphalt was encountered at the ground surface in Boreholes C41-2, C41-3, F5-2, F5-6, F5-9, F5-14, F5-18 and F5-20, which were advanced from road surface.

4.8.3 Fill

Fill was encountered below the asphalt in all of the boreholes that were advanced from the road surface and below the topsoil layer in Boreholes C41-1, C41-4, F5-3 to F5-5, F5-7 and F5-11. The elevation of the surface and base of the fill deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C41-1	0.2	280.4	0.5	279.9
C41-2	0.2	284.2	5.4	278.8
C41-3	0.2	284.6	7.0	277.6
C41-4	0.2	279.4	0.7	278.7
F5-2	0.2	281.9	5.4	276.5
F5-3	0.1	272.8	1.4	271.4
F5-4	0.1	273.0	2.1	270.9
F5-5	0.2	272.8	1.8	271.0
F5-6	0.2	277.3	4.3	273.0
F5-7	0.2	271.6	0.6	271.0
F5-9	0.3	274.1	2.7	271.4
F5-11	0.3	278.7	1.2	277.5
F5-14	0.2	280.0	5.4	274.6
F5-18	0.2	275.0	5.4	269.5
F5-20	0.2	272.6	3.5	269.1

The existing embankment is comprised mainly of non-cohesive soil, with gradation varying from sand and silt to sand to sand and gravel to clayey silt. Pockets of clayey silt were encountered in the non-cohesive portions of the fill in Borehole C41-2 and zones/layers of silty sand were noted in the cohesive portions of the fill in Boreholes C41-1, F5-5 and F5-7. Rootlets and/or organics were noted in the fill in Boreholes C41-1, C41-4, F5-3, F5-4, F5-5 and F5-11. In general, the sand and gravel layer underlies the asphalt pavement, in turn underlain by silt and sand to silty sand fill, with the clayey silt fill underlying the non-cohesive materials.

The measured SPT "N" values within the deposit range between 3 blows and 33 blows per 0.3 m of penetration, however, recorded SPT "N" values were typically higher in the sections of the embankment below the highway. Within the non-cohesive portions of the fill the SPT "N" values typically range between 4 blows and 24 blows per



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0.3 m of penetration, indicating a loose to compact relative density. Within the cohesive portions of the fill the SPT “N” values range between 4 blows and 21 blows per 0.3 m of penetration, suggesting a firm to very stiff consistency.

The grain size distributions of nine (9) samples of the silt and sand fill are shown on Figures F1A and F1B.

Atterberg limits testing was carried out on four (4) samples from the cohesive portion of the fill, and measured plastic limits between about 12 per cent and 16 per cent, liquid limits between about 19 per cent and 27 per cent, and plasticity indices between about 6 per cent and 12 per cent. The test results, which are plotted on a plasticity chart on Figure F2, indicate that this material is a clayey silt of low plasticity.

4.8.4 Clayey Silt

A deposit of clayey silt, trace to some sand and gravel, was encountered beneath the topsoil layer in Boreholes F5-8, F5-15 to F5-17, F5-19 and F5-21, beneath the fill in Boreholes F5-3, F5-6, F5-7, F5-9 and F5-11 and at ground surface in Borehole F5-10. The elevation of the surface and base of the till deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
F5-3	1.5	271.4	0.7	270.7
F5-6	4.5	273.0	1.1	271.9
F5-7	0.9	270.9	0.6	270.3
F5-8	0.1	271.4	1.1	270.3
F5-9	3.1	271.4	2.6	268.8
F5-10	0.0	270.5	1.5	269.0
F5-11	1.5	277.5	1.5	276.0
F5-15	0.2	274.9	1.4	273.5
F5-16	0.1	273.8	0.5	273.3
F5-17	0.1	272.7	1.4	271.3
F5-19	0.1	271.4	0.6	270.8
F5-21	0.2	269.3	0.5	268.8

Rootlets and/or organics were noted in Boreholes F5-3, F5-6, F5-9, F5-16, F5-17 and F5-19 and zones of silty sand were noted in Borehole F5-8. The upper 0.8 m thick layer of the clayey silt deposit in Borehole F5-10 is described as organic silty clay, trace to some sand.

The measured SPT “N” values within the deposit range from 4 blows to 46 blows per 0.3 m of penetration, indicating a soft to hard consistency.

An organic content test carried out on one sample of clayey silt containing organics measured about 1 per cent organic content.

The grain size distributions of two (2) samples of the clayey silt are shown on Figure F3.



Atterberg limits tests were carried out on five (5) samples of the clayey silt deposit, and measured plastic limits between about 12 per cent and 18 per cent, liquid limits between about 18 per cent and 34 per cent and plasticity indices between about 4 per cent and 16 per cent. The test results, which are plotted on a plasticity chart on Figure F4, indicate that this material is generally a clayey silt of low plasticity with zones of silt of slight plasticity.

4.8.5 Silt to Silty Sand

Layers or pockets of silt, sandy silt, silt and sand, and silty sand were encountered beneath the topsoil layer in Boreholes F5-1, F5-12 and F5-13, beneath the fill in Boreholes C41-1, C41-3, F5-2 and F5-5 and beneath the clayey silt deposit in Borehole F5-3 and F5-15. The elevation of the surface and base of the deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C41-1	0.7	279.9	0.8	279.1
C41-3	7.2	277.6	1.5	276.1
F5-1	0.1	277.0	0.7	276.3
F5-2	5.6	276.5	1.6	274.9
F5-3	2.2	270.7	0.8	269.9
F5-5	2.0	271.0	0.4	270.6
F5-12	0.1	277.5	1.4	276.1
F5-13	0.1	276.4	0.6	275.8
F5-15	1.5/3.0	273.5/272.0	0.7/0.7	272.8/271.3
F5-21*	2.2	267.3	0.8 m interlayer	266.5

* Discussed in Section 4.8.7

The silt to silty sand layers/pockets also contains trace to some clay and trace gravel. Rootlets and organics were noted in upper portions in Boreholes F5-2 and F5-13, and a clayey silt layer and a sand pocket were noted in Borehole F5-12. In Borehole F5-15, a 0.8 m thick interlayer of clayey silt is present within the sandy silt layer

The measured SPT “N” values within the deposit range from 3 blows to 113 blows per 0.3 m of penetration, indicating of a very loose to very dense relative density.

The grain size distributions of four (4) samples of the silt to silt and sand layers/pockets are shown on Figure F5.

An Atterberg limits test was carried out on a sample of silt and sand layer, and measured a plastic limit of about 14 per cent, a liquid limit of about 17 per cent, and plasticity index of about 3 per cent. The test result, which is plotted on a plasticity chart on Figure F6, indicates that the interlayer/pocket is a silt of slight plasticity.

4.8.6 Sandy Silt to Silt and Sand Till

A till deposit comprised of sandy silt to silt and sand, trace clay, trace to some gravel, was encountered at the southern end of the site beneath the silty sand to silt layer in Borehole C41-1, beneath the fill in Boreholes C41-2 and C41-4, and beneath the clayey silt layer in Borehole F5-11. Sand pockets were noted in Boreholes C41-1



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and F5-11. The elevation of the surface and base of the deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C41-1	1.5	279.1	4.8	274.3
C41-2	5.6	278.8	3.1	275.7
C41-4	0.9	278.7	1.3	277.3
F5-11	3	276.0	3.6	272.4

The measured SPT "N" values within the deposit range from 21 blows to greater than 100 blows per 0.3 m of penetration, indicating a compact to very dense relative density.

The grain size distributions of five (5) samples of the till deposit are shown on Figure F7.

Two Atterberg limits tests were carried out on samples of the till deposit, and the material is non-plastic.

4.8.7 Clayey Silt Till

A clayey silt till deposit was encountered beneath the fill, clayey silt, sandy silt to sand interlayers/pockets and below the sandy silt to sand and silt till in all of the boreholes except Boreholes C41-3 and F5-11. The elevation of the surface and base of the till deposit and the deposit thickness as encountered in the boreholes are summarized below.

Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
C41-2	8.7	275.7	2.3	273.4
C41-3	8.7	276.1	5.3	270.8
C41-4	2.2	277.3	8.9	268.5
F5-1	0.8	276.3	5.9	270.4
F5-2	7.2	274.9	5.6	276.5
F5-3	3	269.9	4.2	268.7
F5-4	2.2	270.9	4.5	268.6
F5-5	2.4	270.6	4.3	268.7
F5-6	5.6	271.9	7.2	270.3
F5-7	1.5	270.3	5.2	266.6
F5-8	1.2	270.3	5.5	266.0
F5-9	5.6	268.8	7.2	267.2
F5-10	1.5	269.0	5.2	265.3
F5-12	1.5	276.1	5.2	272.4
F5-13	0.7	275.8	6.0	270.5
F5-14	5.6	274.6	7.2	273.0



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Borehole No.	Depth to Surface of Deposit (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
F5-15	2.2	272.8	4.5	270.5
F5-16	0.7	273.3	4.2	269.8
F5-17	1.5	271.3	5.2	267.6
F5-18	5.6	274.4	7.2	272.8
F5-19	0.7	270.8	6.0	265.5
F5-20	3.7	269.1	9.1	263.7
F5-21	0.7	268.8	6.0*	263.5

* Including a 0.8 m thick and 0.5 m thick interlayer of silt and silt and sand till.

The cohesive till deposit also containing trace to some sand and trace to some gravel. Rootlets and/or organics were noted in upper portions of Boreholes F5-13 and sand pockets/seams were found in Boreholes C41-4, F5-1, F5-4, F5-5, F5-12, F5-13, F5-16, F5-17, F5-19, F5-20 and F5-21. Interlayers of sandy silt to silty sand were noted in Boreholes F5-1, F5-15 and F5-21. These interlayers are between 0.5 m and 1.2 m thick and are found at depths between 3.0 m and 3.7 m below ground surface.

The measured SPT "N" values within the deposit range from 4 blows to 67 blows per 0.3 m of penetration, but are typically between 15 blows and 37 blows per 0.3 m of penetration, suggesting of a soft to hard consistency and typically a stiff to hard consistency.

The grain size distributions of thirty-seven (37) samples of the clayey silt till deposit are shown on Figures F8A to F8F.

Atterberg limits tests were carried out on forty-one (41) samples of the clayey silt till deposit and measured plastic limits between about 10 per cent and 15 per cent, liquid limits between about 15 per cent and 25 per cent, and plasticity indices between about 4 per cent and 11 per cent. The test results, which are plotted on a plasticity chart on Figures F9A to F9F, indicate that the till material is a clayey silt of low plasticity, with inclusions of silt of slight plasticity.

The grain size distribution of one sample of a silt interlayer within the clayey silt till is shown on Figure F10.

An Atterberg limits test was carried out a sample of the silt and sand till interlayer, and measured a plastic limit of about 13 per cent a liquid limit of about 15 per cent, and plasticity index of about 2 per cent. The test result, which is plotted on a plasticity chart on Figure F11, indicates that this material is a silt and sand of slight plasticity.

4.8.8 Lower Clayey Silt

A deposit of clayey silt was encountered underlying the clayey silt till layer in Boreholes F5-3 and F5-16. The elevation of the surface and base of the till deposit and the deposit thickness as encountered in the boreholes are summarized below.



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Borehole No.	Depth to Surface (m)	Deposit Surface Elevation (m)	Deposit Thickness (m)	Deposit Base Elevation (m)
F5-3	7.2	265.7	1.0	264.7
F5-16	4.9	269.1	1.8	267.3

The deposit consists of clayey silt, trace to some sand, trace gravel. Sand seams were noted in Borehole F5-16.

The measured SPT "N" values within the deposit are 22 blows and 35 blows per 0.3 m of penetration, suggesting a very stiff to hard consistency.

The grain size distribution of one sample of the lower clayey silt is shown on Figure F12.

Atterberg limits testing was carried out on two (2) samples of the lower clayey silt deposit, and measured plastic limits of about 7 per cent and 8 per cent, liquid limits of about 19 per cent and 26 per cent, and plasticity indices of 12 per cent and 18 per cent. These test results, which are plotted on a plasticity chart on Figure F13, indicate that this material is a clayey silt of low plasticity.

4.8.9 Groundwater Conditions

The observed/recorded water levels in the open boreholes following completion of drilling and in the standpipe piezometer installed in Boreholes C41-4 are shown on the Record of Borehole sheets and are summarized as follows:

Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F5-1	277.1	0.6	276.5	Dec. 25, 2010	Open Borehole
F5-2	282.1	10.7	271.4	Mar. 25, 2011	Open Borehole
F5-3	272.9	2.0	270.9	Dec. 13, 2010	Open Borehole
F5-4	273.1	5.5	267.6	Dec. 2, 2010	Open Borehole
F5-5	273.0	2.9	270.1	Dec. 2, 2010	Open Borehole
F5-6	277.5	9.1	268.4	Mar. 26, 2011	Open Borehole
F5-7	271.8	3.5	268.3	Dec. 2, 2010	Open Borehole
F5-8	271.5	5.6	265.9	Dec. 2, 2010	Open Borehole
F5-9	274.4	8.8	265.6	Mar. 26, 2011	Open Borehole
F5-10	270.5	4.5	266.0	Dec. 2, 2010	Open Borehole
F5-11	279.0	3.8	275.2	Dec. 7, 2010	Open Borehole
F5-12	277.6	3.0	274.6	Dec. 3, 2010	Open Borehole
F5-13	276.5	0.6	275.9	Dec. 3, 2010	Open Borehole



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Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F5-14	280.2	Dry	-	Dec. 3, 2010	Open Borehole
F5-15	275.0	4.6	270.4	Dec. 3, 2010	Open Borehole
F5-16	274.0	2.3	271.7	Dec. 2, 2010	Open Borehole
F5-17	272.8	2.1	270.7	Dec. 2, 2010	Open Borehole
F5-18	275.2	5.5	266.7	Dec. 3, 2010	Open Borehole
F5-19	271.5	3.0	268.5	Dec. 2, 2010	Open Borehole
F5-20	272.8	0.6	272.2	Dec. 3, 2010	Open Borehole
F5-21	269.5	1.5	268.0	Dec. 2, 2010	Open Borehole
C41-1	280.6	4.6	276.0	Dec. 7, 2010	Open Borehole
C41-2	284.4	7.6	276.8	Dec. 17, 2010	Open Borehole
C41-3	284.8	6.4	278.4	Mar. 25, 2011	Open Borehole
C41-4	279.6	1.3	278.3	Dec. 10, 2010	Open Borehole
		0.8	278.8	Dec. 22, 2010	Piezometer
		1.0	278.6	Feb. 1, 2011	Piezometer

The water levels observed in the open boreholes on completion of drilling and in the piezometer may not represent long-term stabilized groundwater levels. The water level at the site is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during the spring and periods of precipitation.

4.9 High Fill Embankment Area 6 (Station 23+450 to 23+650 NBL and Station 23+450 to 23+750 SBL)

Boreholes F6-1 to F6-6, F6-8, F6-9 and C42-1 to C42-4 were advanced within the limits of this embankment, at the locations shown on Drawing G1, in Appendix G. The detailed subsurface soil and groundwater conditions encountered in the boreholes advanced for this investigation and the results of in situ and laboratory tests carried out on selected soil samples are provided in Appendix G. Stratigraphic profiles along the roadway and along the toes of the embankment showing the interpreted subsurface conditions are shown on Drawing G1, in Appendix G.

In summary, the subsoils encountered in the boreholes in this area consist of a surficial layer of topsoil or asphalt in the roadway boreholes, underlain by fill, deposits of sand to sand and gravel and clayey silt. The fill deposit is underlain by successive deposits of clayey silt, clayey silt till, and silt and sand and till. A more detailed description of the subsurface conditions is provided in the following subsections.



4.9.1 Topsoil and Asphalt

An approximately 200 mm thick layer of topsoil was encountered immediately below the existing ground surface in Boreholes F6-1, F6-3, F6-4 and F6-6 which were advanced at or near the toe of the existing high fill embankment.

An approximately 200 mm thick layer of asphalt was encountered beneath the road surface in Borehole F6-2, F6-5, F6-9, C42-2 and C42-3 which were advanced at the crest of the high fill embankment on the Highway 400 shoulders.

4.9.2 Fill

Fill consisting of silty sand and gravel, silt and sand to sand, and clayey silt was encountered in Boreholes F6-2 to F6-6, F6-8, F6-9, and C42-1 to C42-4. The non-cohesive layer of fill was encountered at ground surface to 0.2 m below ground surface and the thickness of the layer ranges from 0.4 m to 3.5 m.

A lower layer of silty sand fill was encountered below clayey silt fill in Borehole C42-1 and C42-2 at depths of 1.4 m and 5.6 m below ground surface and the thickness of these layers is 0.8 m and 1.0 m, at the respective boreholes. The silty sand fill in Borehole F6-4 is described as organic.

The measured SPT “N” values within the silty sand to sand fill range from 7 blows to 59 blows per 0.3 m of penetration, indicating a loose to very dense relative density.

The results of grain size distribution tests performed on two (2) samples of silt and sand to sand fill are shown on Figure G1.

The cohesive fill was encountered at depths ranging from ground surface to 2.2 m below ground surface, typically underlying the non-cohesive fill, and the thickness of the layer ranges from 0.5 m to 5.7 m. The clayey silt fill in Borehole F6-3 is described as organic.

The measured SPT “N” values within the clayey silt fill range from 4 blows to 29 blows per 0.3 m of penetration, suggesting a firm to very stiff consistency.

The results of grain size distribution tests performed on four (4) samples of the clayey silt fill are shown on Figure G2.

Atterberg limits testing carried out on five (5) samples of the cohesive fill measured liquid limits ranging from about 17 per cent to 31 per cent, plastic limits ranging from about 11 per cent to 17 per cent and plasticity indices ranging from about 6 per cent to 14 per cent. The test results, which are plotted on a plasticity chart of Figure G3, indicate that the material is a clayey silt of low plasticity.

4.9.3 Organic Clayey Silt

A 0.7 m thick layer of organic clayey silt was encountered below the sand and silt to silty sand fill in Boreholes F6-5 and C42-4 at depths of 3.0 m to 0.7 m, respectively, below ground surface. The organic clayey silt typically contains trace to some sand and rootlets.

The measured SPT “N” values within the organic clayey silt layer are 5 blows and 15 blows per 0.3 m of penetration, suggesting a firm to stiff consistency.



Organic content testing carried out on two (2) samples of the clayey silt measured about 6 per cent organic content. Atterberg limits testing carried out on a sample of the organic clayey silt measured a liquid limit of 31 per cent, a plastic limit of 20 per cent and a plasticity index of 11 per cent. The test result, which is plotted on a plasticity chart on Figure G4, together with the organic content of the sample tested, suggests that the material is an organic clayey silt of low plasticity.

4.9.4 Sandy Silt to Silty Sand and Gravel

A layer of sandy silt to silty sand and gravel was encountered below the topsoil in Borehole F6-1, below the clayey silt fill in Borehole C42-3, below the upper clayey silt deposit in Borehole C42-2 and below the organic clayey silt deposit in Borehole C42-4, at depths ranging from 0.2 to 7.2 m below ground surface and is 0.5 m to 1.5 m thick. The sandy silt to silty sand and gravel layer typically contains trace clay, and organics were noted to be present within the layer in Borehole F6-1.

The measured SPT “N” values within the sandy silt to silty sand and gravel layer range from 8 blows to 30 blows per 0.3 m of penetration, indicating a loose to compact relative density.

The result of a grain size distribution test performed on one sample of the gravelly sand is shown on Figure G5.

4.9.5 Upper Clayey Silt

An upper deposit of clayey silt was encountered below the clayey silt fill layers in Boreholes C42-4, F6-2, F6-3, F6-6, F6-8 and F6-9 at depths ranging from 0.7 m to 6.6 m below ground surface (Elevation 251.6 m to 244.6 m) and is 0.6 m to 3.4 m thick. The clayey silt deposit typically contains trace sand and trace gravel. Organics and rootlets were noted to be present within the deposit in Boreholes F6-3 and F6-6.

The measured SPT “N” values within the upper clayey silt deposit range from 8 blows to 32 blows per 0.3 m of penetration, suggesting a stiff to hard consistency.

The results of one grain size distribution test performed on a sample of the upper clayey silt are shown on Figure G6.

Atterberg limits testing carried out on five (5) samples of the upper deposit of clayey silt measured liquid limits ranging from about 30 per cent to 33 per cent, plastic limits ranging from about 14 per cent to 19 per cent and plasticity indices ranging from about 13 per cent to 16 per cent. The test results, which are plotted on a plasticity chart on Figure G7, indicate that the material is a clayey silt of low plasticity. Organic content testing carried out on a sample of the upper clayey silt deposit measured about 5 per cent organics in the material.

4.9.6 Clayey Silt Till

A deposit of clayey silt was encountered below the sandy silt in Borehole F6-1, below the upper clayey silt deposit in Boreholes F6-2, F6-3, F6-6, F6-8 and F6-9, below the organic clayey silt in Borehole F6-5, below the silty sand fill in Borehole C42-1 and below the silty sand to silty sand and gravel in Boreholes C42-2, C42-3 and C42-4 at depths ranging from 0.7 m to 8.7 m below ground surface (Elevation 253.9 m to 242.3 m) and is 1.6 m to 4.6 m thick where fully penetrated. The clayey silt till deposit was also encountered below silt and sand till interlayer in Boreholes C42-1, C42-3 and C42-4 at depths ranging between 7.1 m and 13.3 m below ground surface (Elevation 241.5 m to 240.4 m). Boreholes F6-1, F6-8, C42-1, C42-3 and C42-4 were terminated within the clayey silt till deposit at depths ranging from 6.3 m to 15.9 m below ground surface (Elevation 247.9 m to



237.8 m) after penetrating 0.9 m to 6.0 m into the deposit. The clayey silt till deposit typically contains trace to some sand and trace gravel.

The measured SPT “N” values within the clayey silt till deposit range from 13 blows to 119 blows per 0.3 m of penetration, and 100 blows per 0.1 m of penetration, suggesting a stiff to hard consistency.

The results of grain size distribution tests performed on nine (9) samples of the clayey silt till are shown on Figures G8A and G8B.

Atterberg limits testing carried out on twelve (12) samples of the clayey silt till measured liquid limits ranging from about 18 per cent to 31 per cent, plastic limits ranging from about 11 per cent to 15 per cent and plasticity indices ranging from about 5 per cent to 16 per cent. The test results, which are plotted on a plasticity chart on Figures G9A and G9B, indicate that the material is a clayey silt of low plasticity.

4.9.7 Silt and Sand to Gravelly Sand Till

A deposit of silt and sand to gravelly sand till was encountered below the clayey silt fill in Borehole F6-4 and below the clayey silt till in Boreholes F6-2, F6-3, F6-5, F6-6, F6-9 and C42-2 at depths ranging from 2.2 m to 11.6 m below ground surface (Elevation 252.4 m to 242.6 m) and is 1.4 m to 3.1 m thick where fully penetrated. The silt and sand to gravelly sand till deposit was encountered interlayered with the clayey silt till deposit in Boreholes C42-1, C42-3 and C42-4 at depths ranging from 5.6 m to 11.7 m below ground surface (Elevation 243.5 m to 242.9 m) and is 1.5 m to 3.1 m thick. Boreholes F6-2, F6-4, F6-5, F6-9 and C42-2 were terminated in the silt and sand to gravelly sand till at depths ranging from 6.2 m to 13.9 m below ground surface (Elevation 249.3 m to 240.3 m) after penetrating 2.1 m to 4.0 m into the deposit. The silt and sand to gravelly sand till deposit typically contains trace to some clay and trace to some gravel. Cobbles and boulders were also inferred to be present by the grinding of augers as they passed through the deposit.

The measured SPT “N” values within the silt and sand to gravelly sand till deposit range from 37 blows per 0.3 m of penetration to 100 blows per 0.13 m of penetration, indicating a dense to very dense relative density.

The results of grain size distribution tests performed on ten (10) samples of the silt and sand to gravelly sand till are shown on Figures G10A and G10B.

Atterberg limits testing carried out on three (3) samples of the silt and sand till portion of the deposit measured liquid limits ranging from about 13 per cent to 18 per cent, plastic limits ranging from about 10 per cent to 12 per cent and plasticity indices ranging from about 3 per cent to 6 per cent. The test results, which are plotted on a plasticity chart on Figure G11, indicate that the fines of the till consist of silt of slight plasticity to clayey silt of low plasticity.

4.9.8 Lower Clayey Silt

A lower deposit of clayey silt was encountered below the silt and sand till in Borehole F6-6 at a depth of 13.3 m below ground surface (Elevation 241.9 m). Borehole F6-6 was terminated within the lower clayey silt deposit at a depth of 14.3 m (Elevation 240.9 m) after penetrating 1.0 m into the deposit.

A measured SPT “N” value within the lower clayey silt deposit is 55 blows per 0.3 m of penetration, suggesting a hard consistency.



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Atterberg limits testing carried out on one sample of the lower clayey silt deposit measured a liquid limit of about 19 per cent, a plastic limit of about 12 per cent and a plasticity index of about 7 per cent. The test result, which is plotted on a plasticity chart on Figure G12, indicates that the material is a clayey silt of low plasticity.

4.9.9 Silt

A deposit of silt, trace clay, trace to some sand was encountered below the silt and sand till in Borehole F6-3 at a depth of 5.6 m below ground surface (Elevation 246.7 m) and the borehole was terminated within the silt deposit after penetrating 1.1 m into the deposit.

A measured SPT "N" value within the silt deposit was 53 blows per 0.3 m of penetration, indicating a very dense relative density.

The result of a grain size distribution test performed on one sample of the silt deposit is shown on Figure G13.

4.9.10 Groundwater Conditions

The observed/recorded water levels in the open boreholes following completion of drilling are shown on the Record of Borehole sheets and are summarized as follows:

Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F6-1	254.6	Dry	-	Dec. 3, 2010	Open Borehole
F6-2	256.1	Dry	-	Mar. 27, 2011	Open Borehole
F6-3	252.3	5.8	246.5	Dec. 6, 2010	Open Borehole
F6-4	255.5	5.8	249.7	Jan. 21, 2011	Open Borehole
F6-5	256.1	Dry	-	Dec. 16, 2010	Open Borehole
F6-6	255.2	6.4	248.8	Apr. 1, 2011	Open Borehole
F6-8	245.3	Dry	-	July 25, 2011	Open Borehole
F6-9	252.5	Dry	-	Dec. 15, 2010	Open Borehole
C42-1	248.6	1.8	246.8	July 25, 2011	Open Borehole
C42-2	254.2	9.9	244.3	Dec. 16, 2010	Open Borehole
C42-3	254.6	11.6	243.0	Mar. 26, 2011	Open Borehole
C42-4	249.1	1.5	247.6	July 20, 2011	Open Borehole

The water levels observed in the open boreholes on completion of drilling and in the piezometer may not represent long-term stabilized groundwater levels. The water level at the site is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during the spring and periods of precipitation.



4.10 High Fill Embankment Area 7 (Station 23+950 to 24+100 NBL and SBL)

Boreholes F7-1 to F7-6, supplemented with culvert Boreholes C43-1 to C43-4, were advanced within the limits of this embankment at the locations shown on Drawing H1, in Appendix H. The detailed subsurface soil and groundwater conditions encountered in the boreholes advanced for this investigation and the results of in situ and laboratory tests carried out on selected soil samples are provided in Appendix H. Stratigraphic profiles along the west toe of the W-S Ramp and along the east toe of the S-E/W Ramp are presented on Drawing H1, in Appendix H.

In summary, the subsoils encountered in the boreholes in this area consist of a surficial layer of topsoil or asphalt underlain by fill and an upper deposit of clayey silt. These layers were underlain by deposits of clayey silt till and silty sand to sand till which are underlain by deposits of sand to sand and gravel and clayey silt. A more detailed description of the subsurface conditions is provided in the following subsections.

4.10.1 Topsoil and Asphalt

An approximately 100 mm to 300 mm thick layer of topsoil was encountered immediately below the existing ground surface in Boreholes F7-2, F7-4, F7-5, F7-6 and C43-1 which were advanced at or near the toes of the existing ramp embankments.

An approximately 100 mm to 200 mm thick layer of asphalt was encountered beneath the road surface in Borehole F7-1, C43-2 and C43-3 which were advanced at the crest of the embankments on the shoulder of Highway 400 ramps.

4.10.2 Fill

Fill consisting of clayey silt, silt and sand, silty sand to sand, and silty sand and gravel was encountered in all boreholes advanced for the widening of the embankment in High Fill Area 7, except Boreholes F7-4 and F7-5 and is described in more detail below.

The silt and sand to silty sand and gravel portion of the fill deposit was encountered beneath the asphalt in Borehole F7-1 at a depth of 0.1 m below ground surface and at existing ground surface in Borehole F7-3 and C43-4, below the topsoil in Borehole C43-1 and below the asphalt in Borehole C43-2 and C43-3. The fill deposit was encountered at depths ranging from ground surface to 0.3 m below ground surface, except for a lower layer of silty sand fill which was encountered below clayey silt fill in Borehole C43-3 at a depth of 2.2 m below ground surface (Elevation 244.6 m) and the thickness of this portion of the fill deposit is between 0.4 m and 3.8 m thick.

The measured SPT "N" values within the silt and sand to silty sand and gravel fill range from 4 blows to 23 blows per 0.3 m of penetration, indicating a loose to compact relative density.

The results of two (2) grain size distribution tests performed on samples of the sand and silt to sand fill are shown on Figure H1.

A 0.7 m to 2.4 m thick layer of clayey silt fill was encountered below the silty sand and gravel in Borehole F7-1, below the topsoil in Borehole F7-2 and F7-6 and below the sand fill in Borehole C43-3. The clayey silt portion of



the fill deposit was encountered at depths ranging 0.1 m to 1.5 m below ground surface. The clayey silt fill is described to be organic and containing rootlets in Borehole F7-2 and the upper 0.6 m of the layer in Borehole F7-6. Rootlets and organics were also noted in Borehole F7-1 below a depth of 2.4 m below ground surface.

The measured SPT “N” values within the clayey silt portion of the fill deposit range from 7 blows to 18 blows per 0.3 m of penetration, suggesting a firm to very stiff consistency.

Atterberg limits testing carried out on one sample of the clayey silt fill measured a liquid limit of about 18 per cent, a plastic limit of about 12 per cent and a plasticity index of about 6 per cent. The test result is plotted on a plasticity chart on Figure H2, and indicates that the material is a clayey silt of low plasticity. Organic content testing carried out on a sample of the clayey silt fill indicates that the material contains about 3 per cent organics.

4.10.3 Organic Clayey Silt

A 1.3 m thick layer of organic clayey silt was encountered below the silt and sand fill in Borehole F7-3 at a depth of 0.8 m below ground surface (Elevation 242.4 m). The organic clayey silt contains rootlets, trace wood fragments and trace sand.

The measured SPT “N” values within the organic clayey silt are 9 blows and 23 blows per 0.3 m of penetration, suggesting a stiff to very stiff consistency.

Organic content testing carried out on a sample of the organic clayey silt indicated that the material contains about 6 per cent organics. An Atterberg limits test carried out on one sample of the organic clayey silt measured a liquid limit of about 31 per cent, a plastic limit of about 23 per cent and a plasticity index of about 8 per cent. The test result, which is plotted on a plasticity chart on Figure H3, indicates that the material is an organic clayey silt of low plasticity.

4.10.4 Upper Clayey Silt

A 2.3 m and 1.6 m thick upper layer of clayey silt, trace sand and trace gravel, was encountered below the silt and sand to silty sand fill deposit in Boreholes C43-1 and C43-4, respectively, at depths of 0.7 m and 0.6 m below ground surface (Elevation 243.5 m and 244.4 m). Rootlets were also noted to be present within the layer in Borehole C43-1.

The measured SPT “N” values within the upper deposit of clayey silt range from 23 blows to 63 blows per 0.3 m of penetration, suggesting a very stiff to hard consistency.

An Atterberg limits test carried out on one sample of the upper clayey silt measured a liquid limit of about 24 per cent, a plastic limit of about 14 per cent and a plasticity index of about 10 per cent. The result, which is plotted on a plasticity chart on Figure H4, indicates that the material is a clayey silt of low plasticity.

4.10.5 Clayey Silt Till

A deposit of clayey silt till was encountered below the fill in Borehole F7-1, F7-2, F7-6 and C43-3, below the upper clayey silt in Borehole C43-1, below silt and sand till in Borehole C43-4 and below the topsoil in Boreholes F7-4 and F7-5. The clayey silt till deposit is typically sandy with trace to some gravel. The clayey silt till was encountered at depths ranging from 0.1 m to 4.5 m below ground surface (Elevation 247.2 m to 241.3 m) and



where fully penetrated is 0.7 m to 4.1 m thick. Borehole F7-4 was terminated within the clayey silt till at a depth of 6.6 m (Elevation 238.7 m) after penetrating 6.5 m into the deposit.

The measured SPT “N” values within the clayey silt till deposit range from 6 blows to 101 blows per 0.3 m of penetration, suggesting a firm to hard consistency, and generally a very stiff to hard consistency.

The results of grain size distribution tests performed on seven (7) samples of the clayey silt till are shown on Figure H5.

Atterberg limits testing carried out on eight (8) samples of the clayey silt till measured liquid limits ranging from about 16 per cent to 28 per cent, plastic limits ranging from about 11 per cent to 18 per cent and plasticity indices ranging from about 5 per cent to 12 per cent. The results of the Atterberg limits testing, which are plotted on a plasticity chart on Figure H6, indicate that the material is a clayey silt of low plasticity.

4.10.6 Silt and Sand to Silty Sand Till

A deposit of silt and sand to gravelly silt and sand to silty sand till was encountered below the clayey silt till in Boreholes F7-1, F7-5, F7-6, C43-1 and C43-3, below the organic clayey silt in Borehole F7-3, below the fill in Borehole C43-2 and C43-3 and below the upper clayey silt in Borehole C43-4. The surface of the silt and sand to silty sand till was encountered at depths ranging from 2.1 m to 5.6 m below ground surface (Elevation 245.7 m to 238.2 m) and, where fully penetrated, is 1.5 m to 5.7 m thick. Boreholes F7-1, F7-5, C43-1, C43-2 and C43-3 were terminated within the silt and sand to silty sand till at depths ranging from 5.9 m to 9.6 m below ground surface (Elevation 240.1 m to 236.4 m) after penetrating 0.6 m to 5.9 m into the deposit. The silt and sand to silty sand till deposit typically contains trace clay and trace to some gravel.

The measured SPT “N” values within the silt and sand to silty sand till range from 16 blows per 0.3 m of penetration to 126 blows per 0.15 m of penetration, indicating a compact to very dense relative density, but generally a very dense relative density.

The results of grain size distribution tests performed on ten (10) samples of the sand and silt to silty sand till deposit are shown on Figures H7A and H7B.

An Atterberg limits test was carried out on one sample of the silt and sand till and measured a liquid limit of about 12 per cent, a plastic limit of about 11 per cent and a plasticity index of about 1 per cent. The result of the Atterberg limits test, which is plotted on a plasticity chart on Figure H8, indicates that the fines of the silt and sand till material is a silt of slight plasticity.

4.10.7 Silty Sand to Sand and Gravel

Layers of silty sand, sand, and sand and gravel were encountered below the clayey silt till in Borehole F7-2 and C43-4 and below the silt and sand till in Boreholes F7-3 and F7-6. The surface of the silty sand to sand and gravel layers was encountered at depths ranging from 5.6 m to 8.7 m below ground surface (Elevation 240.0 m to 237.3 m) and, where fully penetrated, is up to 3.0 m thick. Boreholes F7-2, F7-3 and F7-6 were terminated within the silty sand to sand and gravel layers at depths ranging from 6.7 m to 9.5 m below ground surface (Elevation 239.2 m to 236.5 m) after penetrating 0.8 m to 1.1 m into the layers.



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The measured SPT “N” values within the silty sand to sand and gravel layers range from 33 blows per 0.3 m of penetration to 100 blows per 0.23 m, indicating a dense to very dense relative density.

The results of grain size distribution tests performed on three (3) samples of the silty sand to sand and gravel layers are shown on Figure H9.

4.10.8 Lower Clayey Silt

A lower deposit of clayey silt, trace sand, was encountered below the sand to sand and gravel deposit in Borehole C43-4 at a depth of 8.6 m below ground surface (Elevation 236.4 m), and the borehole was terminated within this deposit at a depth of 11.3 m below ground surface (Elevation 233.7 m) after penetrating 2.7 m into the deposit.

The measured SPT “N” values within the lower clayey silt deposit are 49 blows and 80 blows per 0.3 m of penetration, suggesting a hard consistency.

The results of a grain size distribution test performed on one sample of the lower clayey silt deposit are shown on Figure H10.

Atterberg limits testing carried out on one sample of the cohesive deposit measured a liquid limit of about 31 per cent, a plastic limit of about 15 per cent and a plasticity index of about 16 per cent. The result of the Atterberg limits test, which is plotted on a plasticity chart on Figure H11, indicates that the material is a clayey silt of low plasticity.

4.10.9 Groundwater Conditions

The observed/recorded water levels in the open boreholes following completion of drilling are shown on the Record of Borehole sheets and are summarized as follows:

Borehole / Piezometer	Ground Surface Elevation (m)	Depth Above/Below Ground Surface to Water Level (m)	Groundwater Level Elevation (m)	Date	Notes
F7-1	248.1	Dry	-	Mar. 25, 2011	Open Borehole
F7-2	245.5	2.9	242.6	Jan. 19, 2011	Open Borehole
F7-3	243.2	2.5	240.7	July 21, 2011	Open Borehole
F7-4	245.3	Dry	-	Aug. 25, 2011	Open Borehole
F7-5	243.5	0.1	243.4	Aug. 25, 2011	Open Borehole
F7-6	248.7	9.4	239.3	Jan. 21, 2011	Open Borehole
C43-1	244.2	2.7	241.5	July 25, 2011	Open Borehole
C43-2	246.7	3.0	243.7	Dec. 15, 2010	Open Borehole
C43-3	246.8	0.0	246.8	Mar. 27, 2011	Open Borehole
C43-4	245.0	4.0	241.0	July 21, 2011	Open Borehole



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The water levels observed in the open boreholes on completion of drilling and in the piezometer may not represent long-term stabilized groundwater levels. The water level at the site is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during the spring and periods of precipitation.

5.0 CLOSURE

This Foundation Investigation Report was prepared by Mr. Ted Beadle and reviewed by Ms. Sandra McGaghran, M.Eng., P.Eng., a Geotechnical Engineer and Associate with Golder. Mr. Jorge M.A. Costa, P.Eng., a Principal of Golder and a Designated MTO Contact for Foundations provided quality control review of this report for conformance with the project Terms of Reference.

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REFERENCES

Chapman, L.J., and Putnam, D.F., 1984. *The Physiography of Southern Ontario*, 3rd Edition. Ontario Geological Survey, Special Volume 2. Ontario Ministry of Natural Resources.

ASTM International:

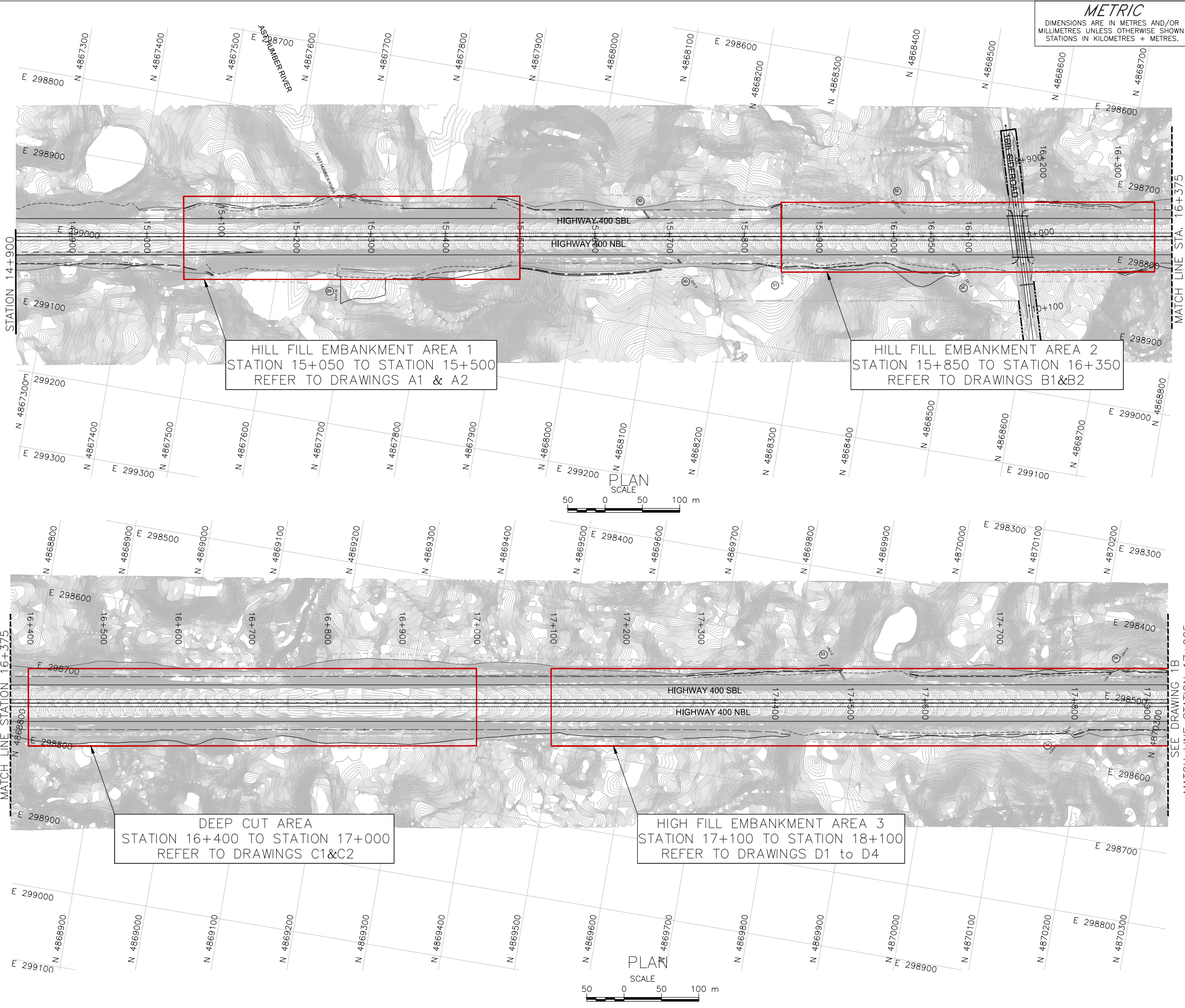
ASTM D1586	Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils
ASTM D2573	Standard Test Method for Field Vane Test in Cohesive Soil.

Ontario Occupational Health and Safety Act:

Ontario Regulation 213/91	Construction Projects
Ontario Regulation 443/09	Wells, Amendment to Ontario Regulation 213

Ontario Water Resources Act:

Ontario Regulation 372/97	Amendment to Ontario Regulation 903
Ontario Regulation 903/90	Wells



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

CONT No.
GWP No. 2835-02-00

HIGHWAY 400 WIDENING
HIGH FILL EMBANKMENT AND DEEP CUT AREAS
INDEX PLAN STATION 14+900 TO STATION 17+925
INDEX PLAN

SHEET



KEY PLAN
SCALE
4 0 4 8 km

LEGEND

Borehole - Current Investigation



NOTES

This drawing is for general location of the embankments and cut. Any 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 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.

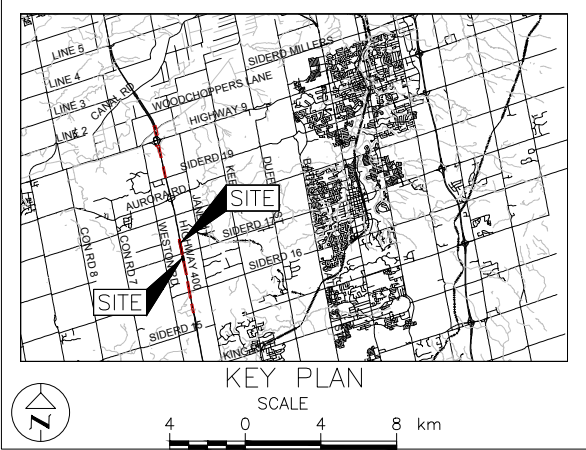
REFERENCES			
Base plans provided in digital format by URS, drawing file Hwy400_plan.dwg, received July 28, 2014 and Contour file provided in digital format by AECOM drawing file Hwy400_bgd_contours3D_for_Golder.dwg, received September 22, 2015.			
NO.	DATE	BY	REVISION
Geocres No. 30M13-217			
HWY. 400		PROJECT NO. 09-1111-0018	
SUBM'D. AMT		DATE: Nov. 2015	
DRAWN: JFC/MR		APPD. JMAC	
CHKD. TWB		SITE:	
CHKD. SMM		DWG. 1A	

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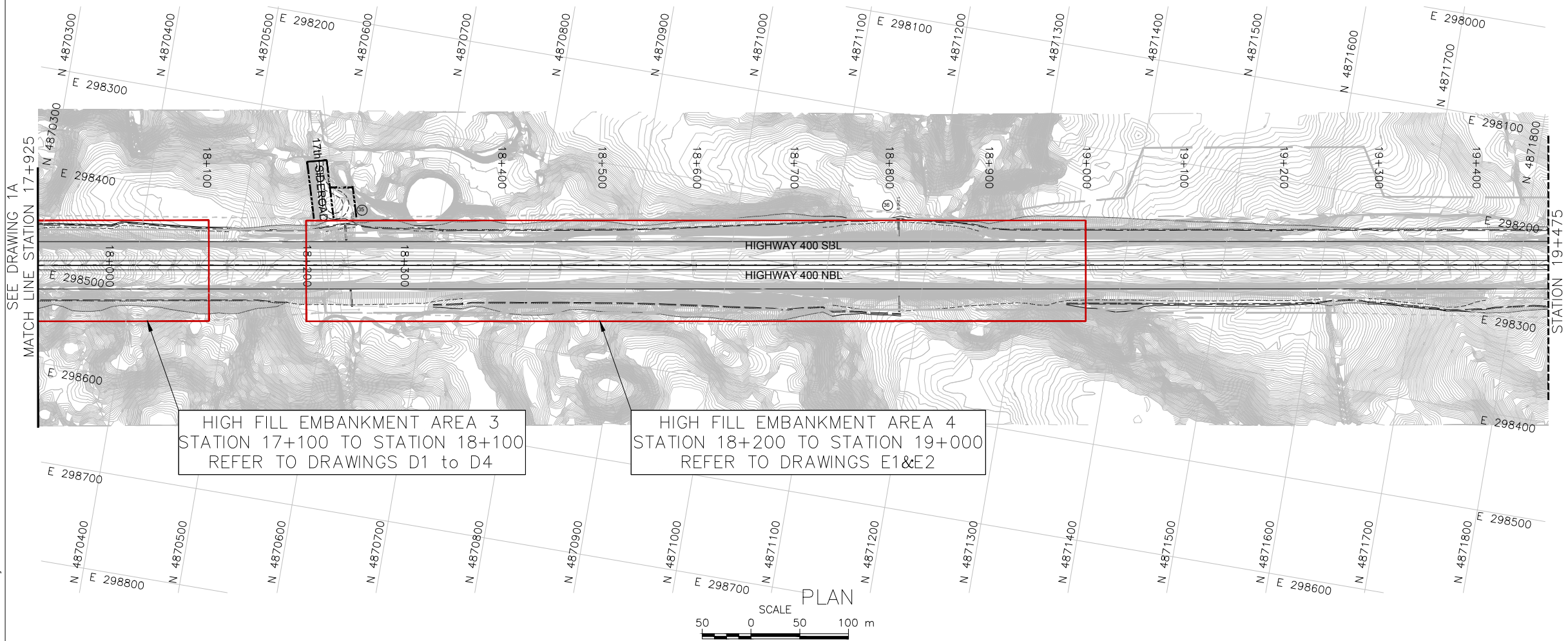
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GWP No. 2835-02-00

HIGHWAY 400 WIDENING
HIGH FILL EMBANKMENT AND DEEP CUT AREAS
INDEX PLAN STATION 17+925 TO 19+475
INDEX PLAN


SHEET



LEGEND



NOTES

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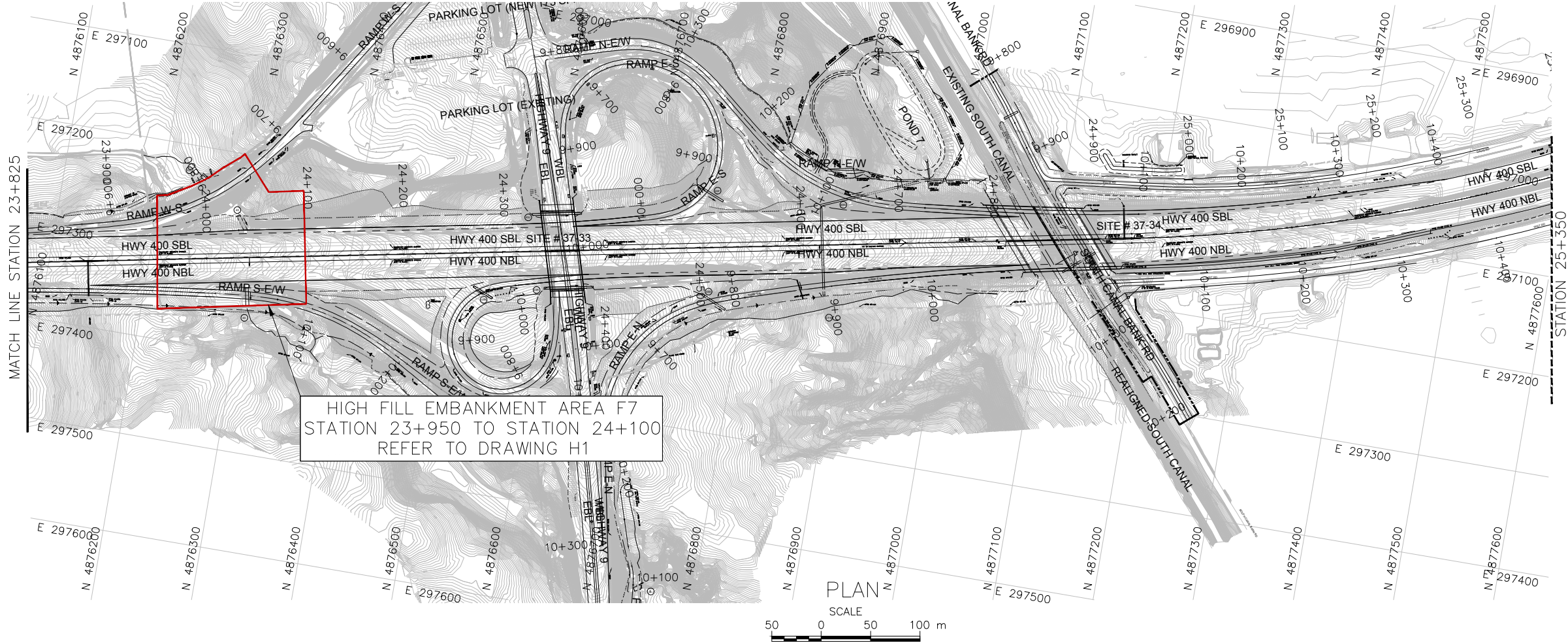
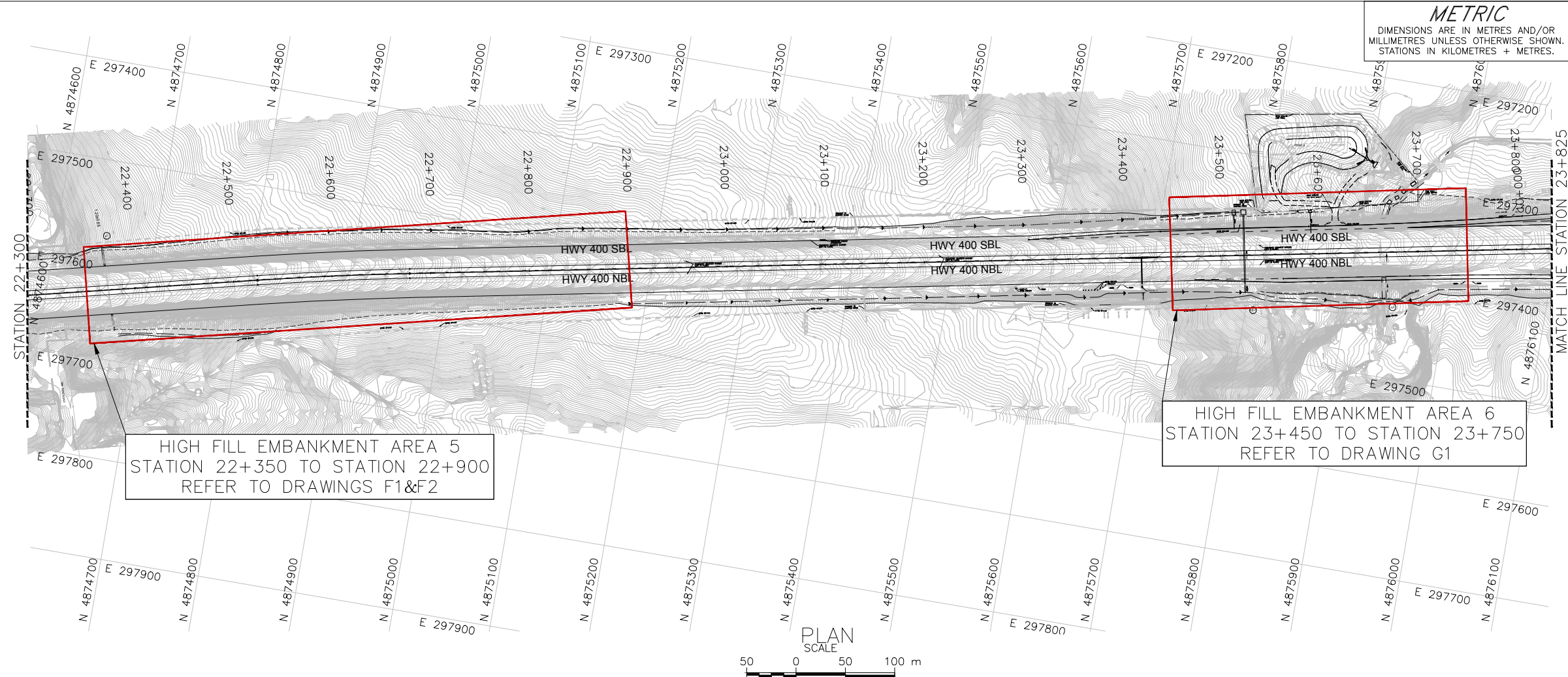
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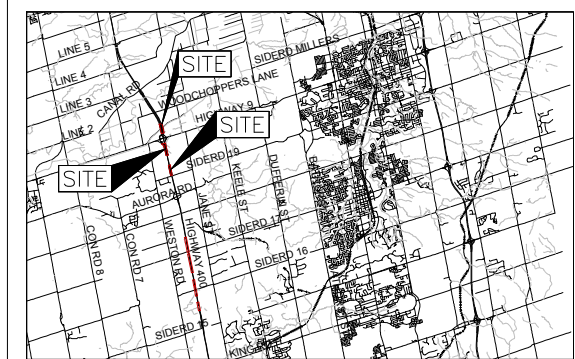
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NO.	DATE	BY	REVISION
HWY. 400			PROJECT NO. 09-1111-0018 DIST. .
SUBM'D. AMT	CHKD. TWB	DATE: Nov. 2015	SITE: .
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC	DWG. 1B



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STATIONS IN KILOMETRES + METRES.

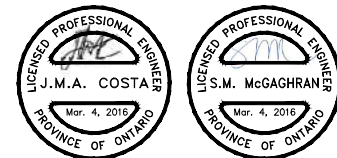
CONT No. .
GWP No. 2835-02-00

HIGHWAY 400 WIDENING
HIGH FILL EMBANKMENT AND DEEP CUT AREAS
INDEX PLAN STATION 22+350 TO STATION 25+350
INDEX PLAN



KEY PLAN
SCALE
0 4 8 km

LEGEND



NOTES

This drawing is for general location of the embankments and cut. Any 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 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.

REFERENCES

Base plans provided in digital format by URS, drawing file Hwy400_plan.dwg, received July 28, 2014 and Contour file provided in digital format by AECOM drawing file Hwy400_bgd_contours3D_for_Golder.dwg, received September 22, 2015.

NO.	DATE	BY	REVISION

Geocres No. 30M13-217

HWY. 400	PROJECT NO. 09-1111-0018	DIST. .
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC

SITE: .
DWG. 1C



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.

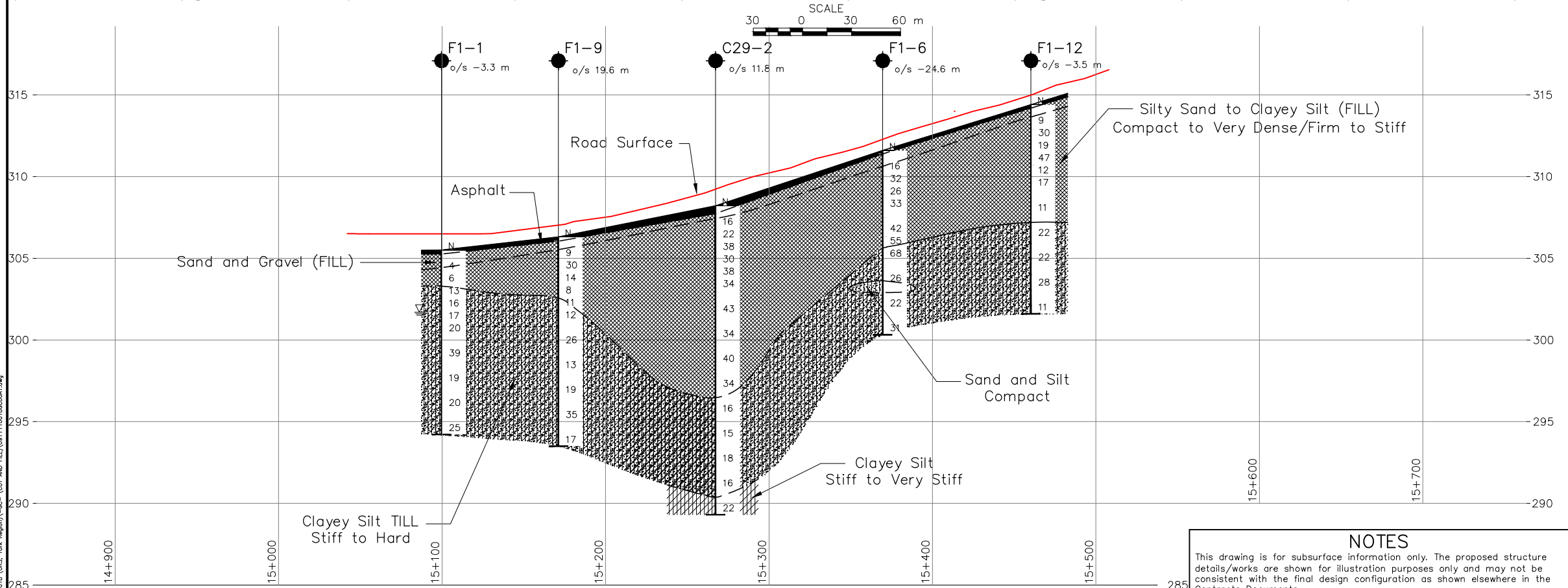
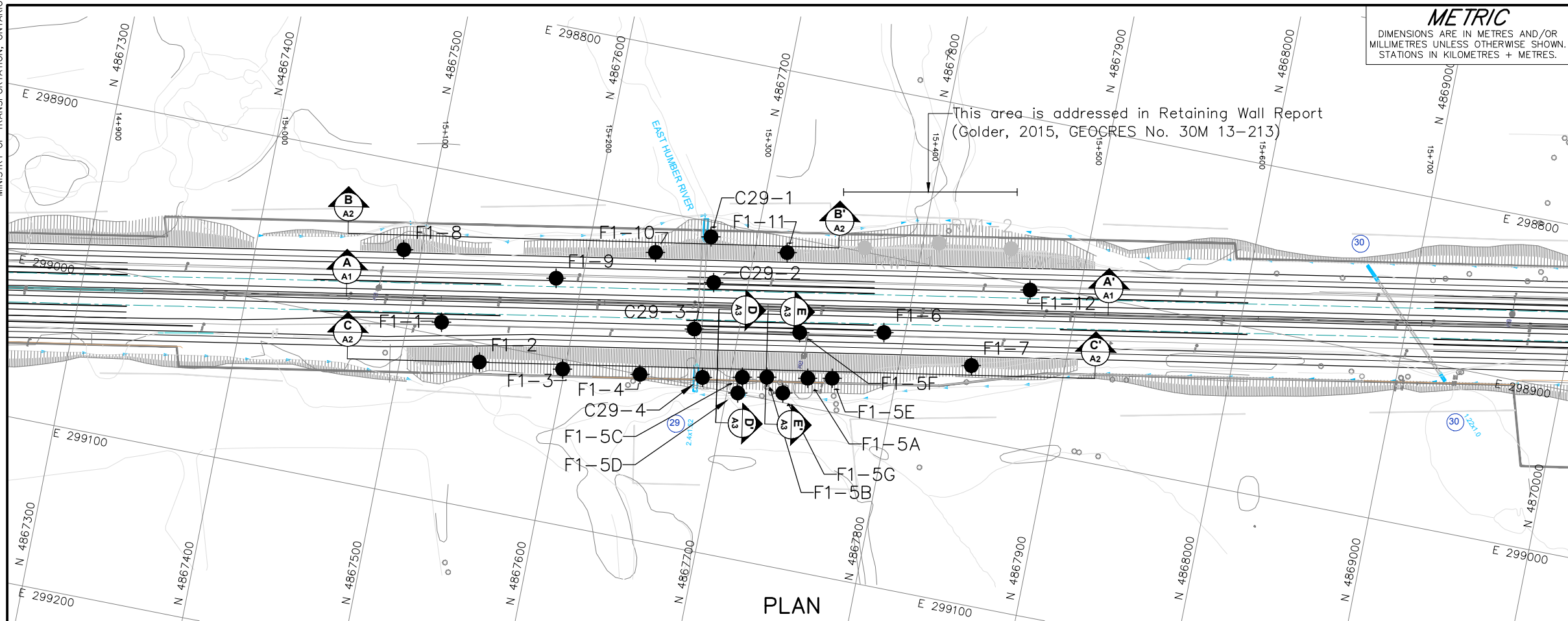
V. MINOR SOIL CONSTITUENTS

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



APPENDIX A

HIGH FILL EMBANKMENT AREA 1 (Stations 15+050 to 15+500 NBL and SBL)



REFERENCE

Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

A-A'
1HIGH FILL EMBANKMENT AREA 1 – CENTRELINE PROFILE
(STATION 15+050 to 15+500)

HORIZONTAL SCALE
0 30 60 m

VERTICAL SCALE
0 3 6 m



NOTES

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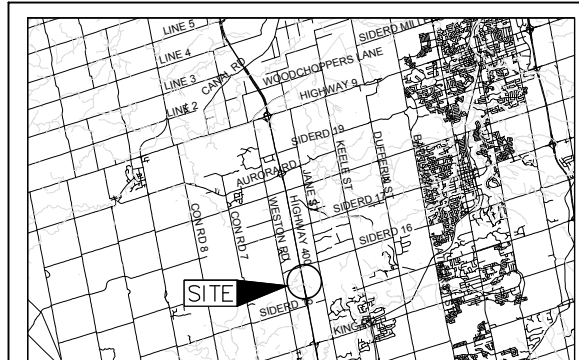
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS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

CONT No.
GWP No. 2835-02-00

HIGHWAY 400 HIGH FILL EMBANKMENTS
STA. 15+150 TO STA. 15+350 (SBL)
STA. 15+050 TO STA. 15+500 (NBL)
BOREHOLE LOCATIONS AND SOIL STRATA



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN
SCALE 0 4 8 km

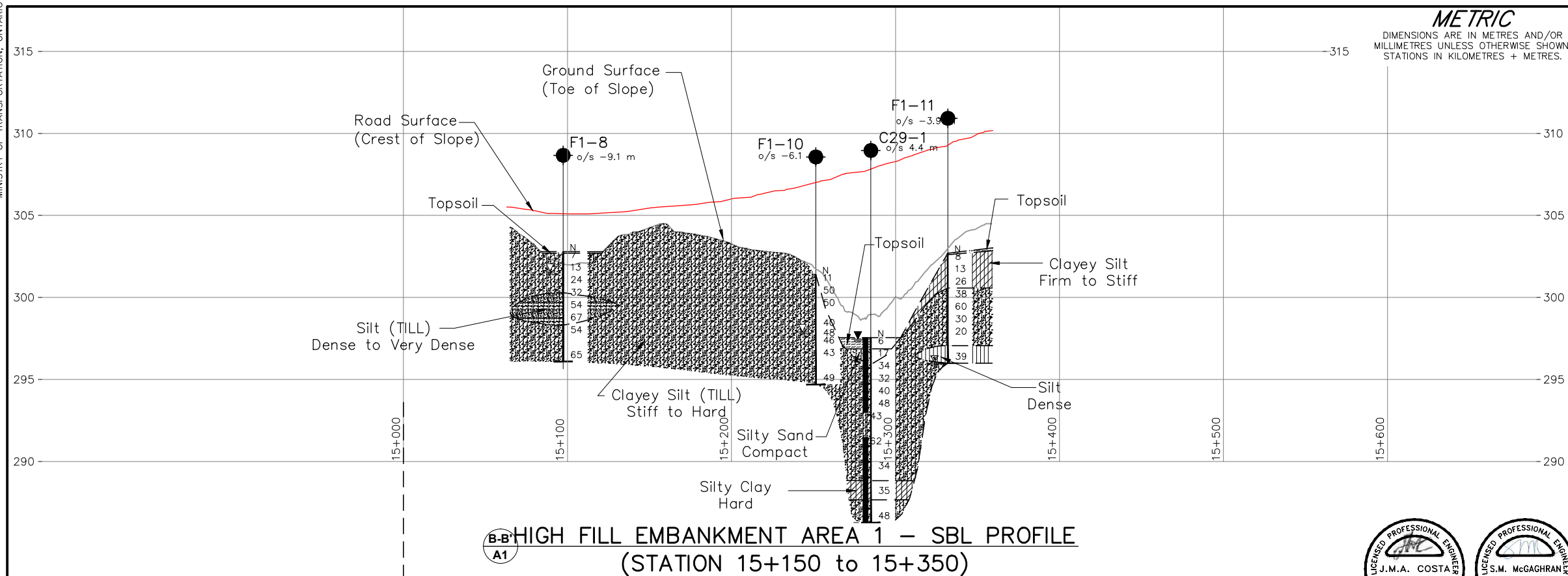
LEGEND

- Borehole – Current Investigation
- ⊥ Seal
- ⊥ Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
C29-1	297.6	4867672.0	298909.1
C29-2	308.2	4867679.1	298936.1
C29-3	308.2	4867673.0	298966.3
C29-4	297.5	4867683.6	298994.4
F1-1	305.5	4867520.4	298992.2
F1-2	301.6	4867547.8	299011.6
F1-3	299.6	4867598.6	299005.9
F1-4	299.5	4867645.7	298999.9
F1-5A	299.5	4867746.9	298982.5
F1-5B	299.1	4867722.2	298986.7
F1-5C	298.6	4867707.5	298989.6
F1-5D	298.5	4867706.6	298999.5
F1-5E	300.5	4867761.6	298979.6
F1-5F	310.0	4867736.7	298956.0
F1-5G	298.9	4867733.6	298994.2
F1-6	311.6	4867787.2	298946.0
F1-7	307.8	4867843.6	298955.5
F1-8	302.8	4867489.2	298953.1
F1-9	306.3	4867584.0	298952.2
F1-10	301.4	4867640.6	298924.9
F1-11	302.7	4867719.7	298909.5
F1-12	314.4	4867869.8	298903.2

NO.	DATE	BY	REVISION
Geores No. 30M13-217			
HWY. 400			PROJECT NO. 09-1111-0018 DIST. CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	SITE:
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC	DWG. A1



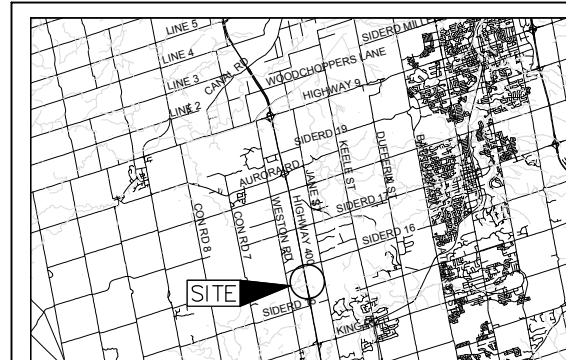
CONT No.
GWP No. 2835-02-00

HIGHWAY 400 HIGH FILL EMBANKMENTS
STA. 15+150 TO STA. 15+350 (SBL)
STA. 15+050 TO STA. 15+500 (NBL)
SOIL STRATA

SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

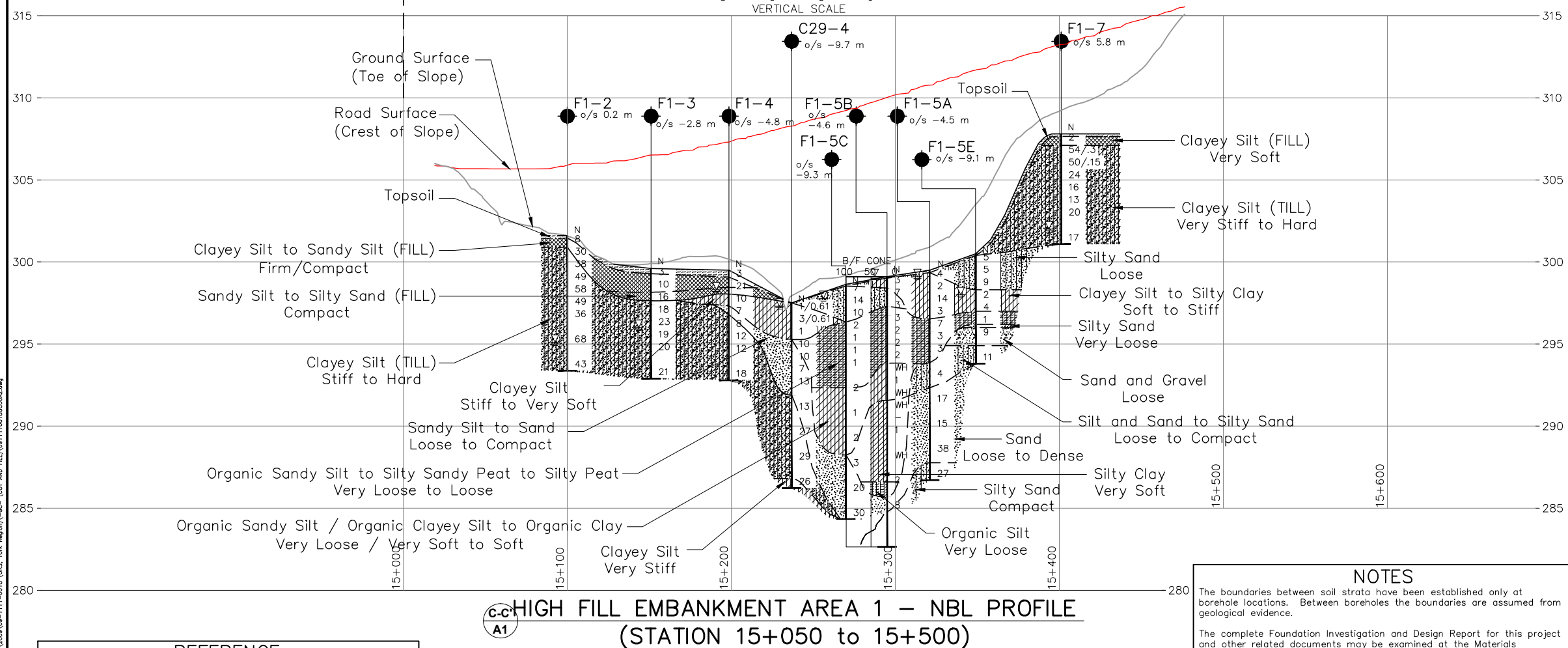
SCALE
4 0 4 8 km

LEGEND

- Borehole – Current Investigation
- ⬮ Seal
- ⬮ Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL in piezometer, measured on Dec. 02, 2010
- ≡ WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
C29-1	297.6	4867672.0	298909.1
C29-2	308.2	4867679.1	298936.1
C29-3	308.2	4867673.0	298966.3
C29-4	297.5	4867683.6	298994.4
F1-1	305.5	4867520.4	298992.2
F1-2	301.6	4867547.8	299011.6
F1-3	299.6	4867598.6	299005.9
F1-4	299.5	4867645.7	298999.9
F1-5A	299.5	4867746.9	298982.5
F1-5B	299.1	4867722.2	298986.7
F1-5C	298.6	4867707.5	298989.6
F1-5E	300.5	4867761.6	298979.6
F1-5F	310.0	4867736.7	298956.0
F1-6	311.6	4867787.2	298946.0
F1-7	307.8	4867843.6	298955.5
F1-8	302.8	4867489.2	298953.1
F1-9	306.3	4867584.0	298952.2
F1-10	301.4	4867640.6	298924.9
F1-11	302.7	4867719.7	298909.5
F1-12	314.4	4867869.8	298903.2



NOTES

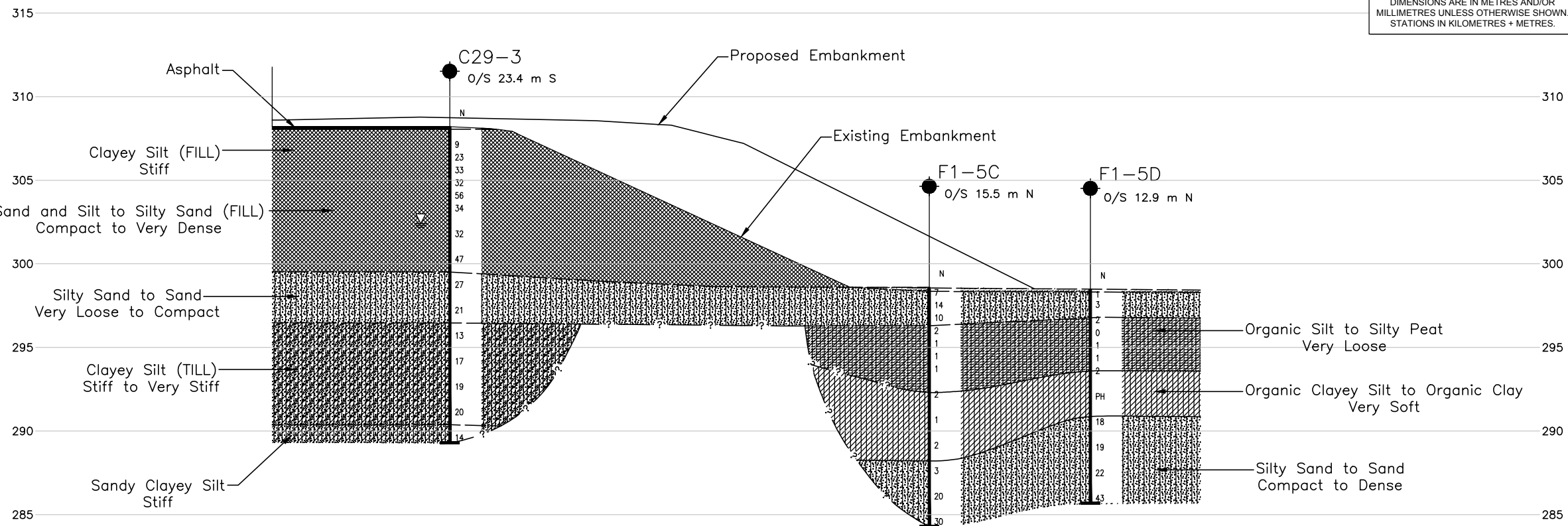
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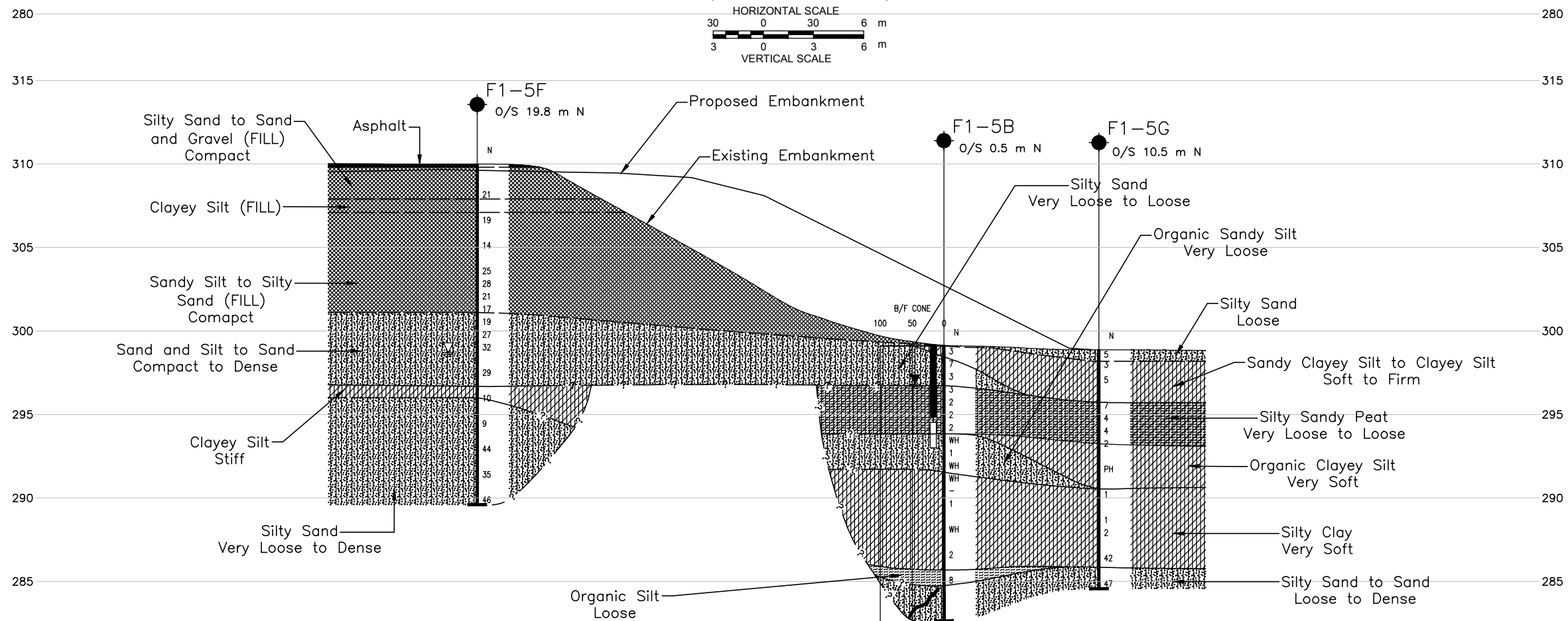
REFERENCE

Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

NO.	DATE	BY	REVISION
Geocres No. 30M13-217			
HWY. 400	PROJECT NO. 09-1111-0018		DIST. CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	SITE:
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC	DWG. A2



D-D'
1
HIGH FILL EMBANKMENT AREA 1 - NBL CROSS-SECTION
(STATION 15+270)

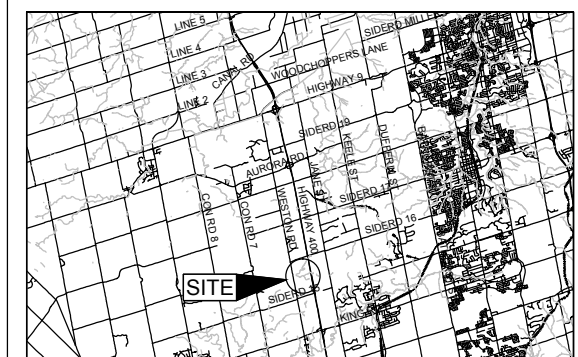


E-E'
1
HIGH FILL EMBANKMENT AREA 1 - NBL CROSS-SECTION
(STATION 15+300)

CONT No.
GWP No. 2835-02-00

HIGHWAY 400 HIGH FILL EMBANKMENTS
STA. 15+270 (NBL)
STA. 15+300 (NBL)
SOIL STRATA

SHEET



KEY PLAN
SCALE
4 0 4 8 km

LEGEND

- Borehole - Current Investigation
- Seal
- Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- WL in piezometer, measured on Nov. 11, 2011
- WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
F1-5B	299.1	4867722.2	298986.7
F1-5C	298.6	4867707.5	298989.6
F1-5D	298.5	4867706.6	298999.5
F1-5F	310.0	4867736.7	298956.0
F1-5G	298.9	4867733.6	298994.2

NOTES

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REFERENCE

Base plans provided in digital format by URS, drawing files no. "Hwy400_bgd.dwg" and "Hwy400_plan.dwg", received October 17, 2011. Proposed embankment profile provided in digital format by URS, drawing file no. "xs_Hwy400_2010-09-21.dwg", dated September 21, 2009.



NO.	DATE	BY	REVISION
Geocres No. 30M13-217			
HWY. 400			PROJECT NO. 09-1111-0018 DIST. CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	SITE:
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC	DWG. A3

PROJECT		09-1111-0018		RECORD OF BOREHOLE No C29-1		SHEET 1 OF 1		METRIC										
W.P.		2835-02-00		LOCATION		N 4867672.0 ; E 298909.1		ORIGINATED BY										
DIST		Central HWY 400		BOREHOLE TYPE		D-25, 108 mm Diameter Solid Stem Augers		COMPILED BY										
DATUM		Geodetic		DATE		December 16 and 17, 2010		CHECKED BY										
								SMM										
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ	GR SA SI CL
								20 40 60 80 100	20 40 60 80 100	W _p	W	W _L	10 20 30	kN/m ³				
297.6	0.0	GROUND SURFACE																
		TOPSOIL																
		Firm		1	SS	6												
		Black																
		Moist																
296.9	0.7	Silty SAND		2A	SS	17												
		Compact		2B														
		Grey																
		Wet																
296.1	1.5	Trace organics at a depth of 1.3 m																
		CLAYEY SILT, some sand, trace gravel (TILL)		3	SS	34												
		Hard																
		Brown to grey below 2.3 m		4	SS	32												
		Moist																
				5	SS	40												
				6	SS	48												
				7	SS	43												
				8	SS	62												
				9A	SS	34												
				9B														
289.8	7.8	SILTY CLAY, trace sand, trace gravel, silt pockets																
		Hard																
		Grey																
		Moist																
				10	SS	35												
287.4	10.2	CLAYEY SILT, trace to some sand, trace gravel (TILL)																
		Hard																
		Grey																
		Moist		11	SS	48												
286.3	11.3	END OF BOREHOLE																
NOTES:																		
1. Water level in open borehole at a depth of 1.3 m (Elev. 296.3 m) upon completion of drilling.																		
2. Water level measurements in piezometer:																		
Date	Depth (m)	Elev. (m)																
02/01/11	0.5	297.1																
04/07/11	0.1	297.5																


PROJECT 09-1111-0018		RECORD OF BOREHOLE No C29-2		SHEET 1 OF 2		METRIC	
W.P. 2835-02-00		LOCATION N 4867679.1 ;E 298936.1		ORIGINATED BY		SB	
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers		COMPILED BY		SKB/HS	
DATUM Geodetic		DATE November 22, 2010		CHECKED BY		SMM	

[illegible]


Continued Next Page

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

○ 3% STRAIN AT FAILURE

PROJECT 09-1111-0018			RECORD OF BOREHOLE No C29-2			SHEET 2 OF 2			METRIC															
W.P. 2835-02-00			LOCATION N 4867679.1 ; E 298936.1			ORIGINATED BY SB																		
DIST Central HWY 400			BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers			COMPILED BY SKB/HS																		
DATUM Geodetic			DATE November 22, 2010			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			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																			
	--- CONTINUED FROM PREVIOUS PAGE ---																							
	CLAYEY SILT, some sand, trace gravel (TILL) Very stiff Brown to grey below 13.7 m Moist		13	SS	18																			
			14	SS	16																			
290.4 17.8	CLAYEY SILT, trace sand, trace gravel Very stiff Grey Moist																							
289.3 18.9	END OF BOREHOLE																							
	NOTE: 1. Open borehole dry upon completion of drilling.																							

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 01/13/16 SIB

PROJECT 09-1111-0018			RECORD OF BOREHOLE No C29-3			SHEET 2 OF 2			METRIC															
W.P. 2835-02-00			LOCATION N 4867673.0 ; E 298966.3			ORIGINATED BY TT																		
DIST Central HWY 400			BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers			COMPILED BY SKB/HS																		
DATUM Geodetic			DATE November 8 and 9, 2010			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			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																			
	--- CONTINUED FROM PREVIOUS PAGE ---																							
	CLAYEY SILT, trace to some sand, trace gravel (TILL) Stiff to very stiff Brown and grey to grey below 13.7 m Moist to wet below 15.2 m		13	SS	19																			
290.4 17.8	Sandy CLAYEY SILT Stiff Grey Wet																							
289.3 18.9	END OF BOREHOLE																							
	NOTE: 1. Water level in open borehole at a depth of 5.8 m (Elev. 302.4 m) upon completion of drilling.																							

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 01/13/16 SIB

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

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F1-1		SHEET 1 OF 1		METRIC					
W.P.		2835-02-00		LOCATION		N 4867520.4 ; E 298992.2		ORIGINATED BY TT					
DIST		Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY SKB					
DATUM		Geodetic		DATE		November 8, 2010		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 (%)			
305.5	GROUND SURFACE												
0.0	ASPHALT												
0.2	Sand and gravel, some silt (FILL) Brown Wet												
304.4			1A	SS	4								
1.1	Clayey silt, some sand, trace gravel (FILL) Firm Brown Moist		1B										
303.3			2	SS	6								
2.2	CLAYEY SILT, trace to some sand, trace gravel (TILL) Stiff to hard Brown and grey Moist												
			3	SS	13								
			4	SS	16								
			5	SS	17								
			6	SS	20								
			7	SS	39								
			8	SS	19								
			9	SS	20								
			10	SS	25								
294.2	END OF BOREHOLE												
11.3	NOTE: 1. Water level in open borehole at a depth of 3.8 m below ground surface (Elev. 301.7 m) upon completion of drilling.												

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F1-2				SHEET 1 OF 1		METRIC						
W.P.		2835-02-00		LOCATION		N 4867547.8 ; E 299011.6		ORIGINATED BY		CS						
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		SKB						
DATUM		Geodetic		DATE		November 4, 2010		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								
301.6	GROUND SURFACE															
0.0	TOPSOIL															
0.2	Clayey silt with sand, trace gravel, trace rootlets (FILL) Firm		1	SS	8											
300.9	Brown Moist		2	SS	30											
0.7	CLAYEY SILT, trace to some sand, trace gravel (TILL) Hard		3	SS	38											
	Brown Moist															
	Becoming grey and brown at a depth of 2.2 m		4	SS	49											
	Sand pockets, silt seams and zones of oxidation staining between depths of 2.2 m and 3.7 m.		5	SS	58											
	Becoming grey at a depth of 3.7 m		6	SS	49											
			7	SS	36											
			8	SS	68											
			9	SS	43											
293.4	END OF BOREHOLE															
8.2	NOTE: 1. Water level in open borehole at a depth of 6.5 m below ground surface (Elev. 295.1 m) upon completion of drilling.															

PROJECT		2835-02-00		LOCATION		N 4867598.6 ; E 299005.9		ORIGINATED BY		CS								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		SKB								
DATUM		Geodetic		DATE		November 5, 2010		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					WATER CONTENT (%)							
299.6	GROUND SURFACE																	
0.0	TOPSOIL		1	SS	3													
0.3	Clayey silt with sand to trace to some sand, trace gravel, trace rootlets and zones of oxidation staining (FILL) Soft to very stiff Brown and grey Moist		2	SS	10													
297.6	Sandy silt, trace clay, containing sand pockets (FILL) Brown Moist		3A	SS	16													
2.2	CLAYEY SILT, trace sand, trace gravel, zones of oxidation staining to a depth of 3.1 m (TILL) Very stiff Brown Moist Sand pockets at a depth of 3.7 m		3B															
			4	SS	18													
			5A	SS	23													
			5B															
			6	SS	19													
			7	SS	20													
			8	SS	21													
292.9	END OF BOREHOLE																	
6.7	NOTE: 1. Water level in open borehole at a depth of 3.6 m below ground surface (Elev. 296.0 m) upon completion of drilling.																	

PROJECT 09-1111-0018			RECORD OF BOREHOLE No F1-4			SHEET 1 OF 1			METRIC								
W.P. 2835-02-00			LOCATION N 4867645.7 ; E 298999.9			ORIGINATED BY CS											
DIST Central HWY 400			BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger			COMPILED BY SKB											
DATUM Geodetic			DATE November 5, 2010			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									
299.5	GROUND SURFACE																
0.0	TOPSOIL																
299.1			1	SS	3	▽	299										
0.6	Clayey silt, some sand, containing rootlets (FILL) Brown Moist		2	SS	21		298										
298.1	Silty sand, some clay, some gravel, oxidation staining (FILL) Compact Brown Wet		3	SS	10		297										
297.3	CLAYEY SILT, trace sand, trace gravel, oxidation staining Stiff Brown Wet		4A	SS	7		296										
296.8			4B				295										
2.7	Sandy SILT, trace to some clay, trace gravel, clayey silt layers Loose Brown Wet		5	SS	8		294										
	CLAYEY SILT, trace to some sand, trace gravel (TILL) Stiff to very stiff Grey Wet		6	SS	12		293										
			7	SS	12												
292.8	END OF BOREHOLE		8	SS	18												
6.7	NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 298.3 m) upon completion of drilling.																

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


PROJECT 09-1111-0018		RECORD OF BOREHOLE No F1-5B		SHEET 1 OF 2	METRIC
W.P. 2835-02-00		LOCATION N 4867722.2 ; E 298986.7		ORIGINATED BY CS	
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY SKB	
DATUM Geodetic		DATE November 9, 2010		CHECKED BY SMM	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)			
299.1	GROUND SURFACE													GR SA SI CL
0.9	TOPSOIL		1	SS	3									
298.4	CLAYEY SILT, some sand, trace rootlets		2	SS	7								1 66 26 7	
0.7	Soft Grey Wet													
297.3	Silty SAND, some clay, trace gravel, shell fragments, trace organics		3	SS	3									
1.8	Very loose to loose Grey Wet													
296.7	Organic SILTY CLAY, trace sand		4	SS	3									
2.4	Soft Grey Wet													
	SILTY SANDY PEAT, trace clay, trace rootlets and wood fragments		5	SS	2							WC=320.4% OC=67.9	0 70 27 3	
	Very loose Black Wet		6	SS	2									
			7	SS	2							OC=54.1		
293.8	ORGANIC Sandy SILT, trace rootlets and wood fragments		8	SS	WH							WC=134.2% PL=62.3% LL=82.5%		
5.3	Very loose Black Wet		9	SS	1									
			10	SS	WH							WC=106.7% PL=59.2% LL=82.1%	0 23 70 7	
291.6	SILTY CLAY, silt seams, trace organics		11	SS	WH									
7.5	Very soft Grey Wet		12	TO	-							OC=3.5 WC=42.4 PL=22.3 LL=42.8	0 0 74 26	
			13	SS	1									
			14	SS	WH							WC=45.9% PL=25.5% LL=45.9%		
286.6	Organic SILT, some clay, trace sand, shell fragments		15A	SS	2									
12.5	Very loose Grey Wet		15B									WC=54.5% PL=37.8% LL=53.3%	0 17 76 7	
285.7	SAND, some gravel, some silt, trace clay													
13.4	Loose Grey Wet		16	SS	8									
284.8	Dynamic Core Penetration Test													14 71 11 4
14.3														

Continued Next Page

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

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F1-5B				SHEET 2 OF 2		METRIC															
W.P. 2835-02-00		LOCATION N 4867722.2 ; E 298986.7				ORIGINATED BY CS																	
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Inside Diameter Hollow Stem Auger				COMPILED BY SKB																	
DATUM Geodetic		DATE November 9, 2010				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 ---						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>					<div style="display: flex; justify-content: space-between;"> 10 20 30 </div>											
282.6	16.5					284																	
						283																	
	END OF BOREHOLE NOTES: 1. Water level in open borehole at a depth of 1.5 m below ground surface (Elev. 297.6 m) upon completion of drilling. 2. Water level measurements in piezometer: <table style="margin-left: 40px;"> <tr> <td>Date</td> <td>Depth (m)</td> <td>Elev. (m)</td> </tr> <tr> <td>11/10/11</td> <td>5.2</td> <td>293.9</td> </tr> <tr> <td>11/11/11</td> <td>2.3</td> <td>296.8</td> </tr> </table>	Date	Depth (m)	Elev. (m)	11/10/11	5.2	293.9	11/11/11	2.3	296.8													
Date	Depth (m)	Elev. (m)																					
11/10/11	5.2	293.9																					
11/11/11	2.3	296.8																					

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

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

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PROJECT		2835-02-00		LOCATION		N 4867706.6 ; E 298999.5		ORIGINATED BY		JIL									
DIST		Central HWY 400		BOREHOLE TYPE		D-25 Rubber Track Mount, 89 mm O.D. Tricone Wash Bore, N Casing		COMPILED BY		JC									
DATUM		Geodetic		DATE		October 30, 2015		CHECKED BY		TWB									
SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)								
298.5 0.0	GROUND SURFACE NO RECOVERY		1	SS	1														
			2	SS	3														
297.0																			
1.7	Organic CLAYEY SILT Grey Wet		3A	SS	2														
	ORGANIC SILT to SILTY PEAT, some sand, trace clay Very loose Dark brown to grey Wet Shells between depths of 3.0 m and 4.8 m		3B																
			4	SS	0														
			5	SS	1														
			6	SS	1														
293.6 4.9	ORGANIC CLAYEY SILT to ORGANIC SILT to ORGANIC CLAY, trace sand Very soft Brown to grey Moist		7A	SS	2														
			7B																
			8	TO	PH														
290.9 7.6	SILTY SAND, trace clay, trace gravel Compact to dense Grey Wet		9	SS	18														
			10	SS	19														
			11	SS	22														
			12	SS	43														
285.7 12.8	END OF BOREHOLE NOTE: 1. Borehole was advanced using wash boring techniques and therefore the water level inside casing, which was maintained at ground surface is not representative of the groundwater conditions.																		

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PROJECT		RECORD OF BOREHOLE		No F1-5E		SHEET 1 OF 1		METRIC						
W.P. 2835-02-00		LOCATION		N 4867761.6 ; E 298979.6		ORIGINATED BY		TWB						
DIST Central HWY 400		BOREHOLE TYPE		D-50 Turbo, 210 mm Inside Diameter Hollow Stem Augers		COMPILED BY		SKB						
DATUM Geodetic		DATE		May 17, 2012		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						
300.5	GROUND SURFACE													
0.0	TOPSOIL													
	SILTY SAND, trace clay, trace gravel, trace organics and rootlets to 0.6 m Loose Brown Moist to wet below 0.8 m		1	SS	5									
			2	SS	5									
			3	SS	9									
298.3	SILTY CLAY, trace to some sand, trace organics and rootlets Soft Dark grey Moist		4	SS	2									
			5A	SS	4									
297.0	Silty PEAT, some sand, trace clay, trace rootlets and wood fragments Very loose Dark brown Moist		5B	SS	1									
			6A	SS	1									
296.2	ORGANIC SILT, trace sand, trace shells and wood fragments Very loose Dark brown, grey and light grey Moist		6B	SS	9									
			7	SS	9									
294.9	SILTY SAND, trace clay, some gravel, trace organics Very loose Brown and dark grey Wet													
293.8	SAND and GRAVEL, trace to some silt Loose Grey Wet		8	SS	11									
293.8	SILTY SAND, trace clay, trace gravel Compact Brown Wet													
6.7	END OF BOREHOLE													
NOTES: 1. Water level in open borehole at a depth of 2.5 m below ground surface (Elev. 298.0 m) upon completion of drilling.														

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F1-5F		SHEET 1 OF 2	METRIC
W.P. 2835-02-00		LOCATION N 4867736.7 ; E 298956.0		ORIGINATED BY TWB	
DIST Central HWY 400		BOREHOLE TYPE D-90 Track Mount, 89 mm O.D. Tricone Wash Bore, N Casing		COMPILED BY SKB	
DATUM Geodetic		DATE June 4, 2012		CHECKED BY SMM	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)					
								20	40	60	80	100	w _p	w	w _L			
						○ UNCONFINED + FIELD VANE												
						● QUICK TRIAXIAL × REMOULDED												
310.0	GROUND SURFACE																	
0.0	Asphalt																	
0.2	Sand and gravel, some silt, trace clay (FILL) Brown moist																	
308.8							309											
1.2	Silty sand, trace clay (FILL) Compact Brown Moist		1A	SS	21													
307.9			1B				308											
2.1	Clayey silt, trace to some sand (FILL) Brown Moist																	
307.1																		
2.9	Silty sand, trace clay, pockets of clayey silt (FILL) Compact Brown Moist		2	SS	19		307											
							306											
			3	SS	14		305											
304.4																		
5.6	Sandy silt, trace clay, trace gravel (FILL) Compact Brown Moist		4	SS	25		304											
			5	SS	28		303											
			6	SS	21		302											
			7	SS	17		301											
301.1																		
8.9	SILTY SAND, trace clay, trace gravel Compact to dense Brown Moist		8	SS	19		300											
	dense below 10.2 m		9	SS	27													
	Clayey silt pockets below 10.7 m		10	SS	32		299											
298.3																		
11.7	SAND and SILT, trace clay, trace gravel Compact Brown Moist		11A	SS	29		298											
297.4			11B															
12.6	SAND, some silt, trace gravel Compact Brown Wet						297											
296.7																		
13.3	CLAYEY SILT, trace sand, trace gravel Stiff Brown Moist		12A	SS	10		296											
296.0			12B															
14.0																		

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

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F1-5F				SHEET 2 OF 2		METRIC									
W.P. 2835-02-00		LOCATION N 4867736.7 ; E 298956.0				ORIGINATED BY TWB											
DIST Central HWY 400		BOREHOLE TYPE D-90 Track Mount, 89 mm O.D. Tricone Wash Bore, N Casing				COMPILED BY SKB											
DATUM Geodetic		DATE June 4, 2012				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					
	SILTY SAND, trace clay, trace gravel Loose to dense Brown Wet Clayey silt pockets to 16.8 m		13	SS	9		294										
	Silt seam, shell fragments from 16.8 to 16.9		14	SS	44		293										
							292										
			15	SS	35		291										
							290										
289.6 20.4	END OF BOREHOLE NOTE: 1. Water level in open borehole at a depth of 11.3 m below ground surface (Elev. 298.7 m) upon completion of drilling.		16	SS	46												

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F1-5G		SHEET 1 OF 2		METRIC	
W.P. 2835-02-00		LOCATION N 4867733.6 ; E 298994.2		ORIGINATED BY JIL			
DIST Central HWY 400		BOREHOLE TYPE D-25 Rubber Track Mount, 89 mm O.D. Tricone Wash Bore, N Casing		COMPILED BY SKB			
DATUM Geodetic		DATE October 30, 2015 - November 2, 2015		CHECKED BY SMM			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								20	40	60	80	100			W _p	W	W _L
298.9	GROUND SURFACE																
0.0	SILTY SAND, rootlets in upper 0.15 m, trace organics		1	SS	5												
298.1	Loose Grey Wet		2A	SS	3												
0.8	Sandy CLAYEY SILT, trace gravel, trace organics		2B														
	Soft to firm Grey Moist		3	SS	5											3 24 61 12	
295.7																	
3.2	SILTY SANDY PEAT, trace clay		4A	SS	7								WC=53.0%				
	Very loose to loose Dark brown Moist to wet		4B														
			5	SS	4								WC=593.0% OC=76%				
			6	SS	4												
293.2			7A														
5.7	- Trace shells below a depth of 5.5 m		7B	SS	2								OC=18%				
	ORGANIC CLAYEY SILT		7C														
	Very soft Dark brown to black Moist to wet																
			8	TO	PH												
290.5																	
8.4	SILTY CLAY, trace organics		9	SS	1								OC=4% WC=45.2% PL=21.9% LL=45.0%		0 0 75 25		
	Very soft Grey with black laminations Moist																
			10	SS	1								OC=4%				
			11	SS	2												
	- Some sand to sandy at a depth of 11.0 m																
287.3																	
11.6	SILTY SAND, trace gravel, trace clay																
	Dense Grey Wet		12	SS	42												
284.6			13	SS	47												
14.3	END OF BOREHOLE																

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PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F1-5G		SHEET 2 OF 2	METRIC
W.P. <u>2835-02-00</u>	LOCATION <u>N 4867733.6 ;E 298994.2</u>	ORIGINATED BY <u>JIL</u>			
DIST <u>Central</u> HWY <u>400</u>	BOREHOLE TYPE <u>D-25 Rubber Track Mount, 89 mm O.D. Tricone Wash Bore, N Casing</u>	COMPILED BY <u>SKB</u>			
DATUM <u>Geodetic</u>	DATE <u>October 30, 2015 - November 2, 2015</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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W _p	W	W _L			GR	SA	SI	CL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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	NOTE: 1. Borehole was advanced using wash boring techniques and therefore the water level inside casing, which was maintained at ground surface is not representative of the groundwater conditions.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						</

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F1-6		SHEET 1 OF 1		METRIC	
W.P. 2835-02-00		LOCATION N 4867787.2 ;E 298946.0		ORIGINATED BY		TT	
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY		SKB	
DATUM Geodetic		DATE November 9, 2010		CHECKED BY		SMM	


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

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PROJECT 09-1111-0018			RECORD OF BOREHOLE No F1-8			SHEET 1 OF 1			METRIC						
W.P. 2835-02-00			LOCATION N 4867489.2 ; E 298953.1			ORIGINATED BY TT									
DIST Central HWY 400			BOREHOLE TYPE D-25 Track Mount, 108 mm Outside Diameter Solid Stem Auger			COMPILED BY MAS									
DATUM Geodetic			DATE December 16, 2010			CHECKED BY SMM									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							PLASTIC LIMIT W _p
302.8	GROUND SURFACE														
0.0	TOPSOIL		1A	SS	7										
	CLAYEY SILT, some sand, trace gravel, trace rootlets to a depth of 0.6 m (TILL) Firm to very stiff Brown and grey Moist		1B												
			2	SS	13										
			3	SS	24										
300.3															
2.5	SILT, trace to some sand, trace to some clay, trace gravel (TILL) Dense to very dense Brown Wet		4	SS	32										
			5	SS	54										
	Becoming grey below a depth of 4.0 m Sand layer at a depth of 4.1 m		6	SS	67										
298.3															
4.5	CLAYEY SILT, trace sand, trace gravel (TILL) Hard Grey Moist		7	SS	54										
296.1			8	SS	65										
6.7	END OF BOREHOLE														
NOTES:															
1. Water level at 1.2 m depth below ground surface (Elev. 301.6 m) in open borehole upon completion of drilling.															
2. Borehole caved at a depth of 1.4 m below ground surface (Elev. 301.4 m) upon completion of drilling.															

PROJECT 09-1111-0018			RECORD OF BOREHOLE No F1-9			SHEET 1 OF 1			METRIC								
W.P. 2835-02-00			LOCATION N 4867584.0 ; E 298952.2			ORIGINATED BY SB											
DIST Central HWY 400			BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger			COMPILED BY SKB											
DATUM Geodetic			DATE November 24, 2010			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									
306.3	GROUND SURFACE																
0.0	ASPHALT																
0.3	Sand and gravel (FILL) Brown Moist																
305.5	Silty sand, trace gravel, trace clay (FILL) Loose to compact Brown Moist		1	SS	9												
0.8																	
			2	SS	30												
304.1	Clayey silt, trace sand, trace gravel, slightly organic (FILL) Stiff Brown and grey Moist		3	SS	14												
2.2																	
			4	SS	8												
302.6	CLAYEY SILT, trace sand, trace gravel (TILL) Stiff to hard Brown Moist		5	SS	11												
3.7																	
			6	SS	12												
			7	SS	26												
			8	SS	13												
			9	SS	19												
			10	SS	35												
			11	SS	17												
293.5	END OF BOREHOLE																
12.8	NOTES: 1. Open borehole dry upon completion of drilling. 2. Borehole caved at a depth of 12.2 m below ground surface (Elev. 294.1 m) upon completion of drilling.																

PROJECT		2835-02-00		LOCATION		N 4867640.6 ; E 298924.9		ORIGINATED BY		TT									
DIST		Central		HWY		400		BOREHOLE TYPE		D-25 Track Mount, 108 mm Outside Diameter Solid Stem Auger									
DATUM		Geodetic		DATE		December 15, 2010		COMPILED BY		ARM									
								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	20			40	60	80	100	20						40
301.4	GROUND SURFACE																		
0.0	CLAYEY SILT, some sand, trace gravel (TILL) Stiff to hard Brown to grey Moist		1	SS	11														
			2	SS	50														
	Augers grinding at a depth of 1.5 m, inferred cobbles and boulders		3	SS	50														
	Becoming brown at a depth of 2.7 m		4	SS	40														
			5	SS	48														
	Becoming grey at a depth of 3.7 m		6	SS	46														
			7	SS	43														
			8	SS	49														
294.7	END OF BOREHOLE																		
6.7	NOTE: 1. Water level in open borehole at a depth of 3.5 m below ground surface (Elev. 297.9 m) upon completion of drilling.																		

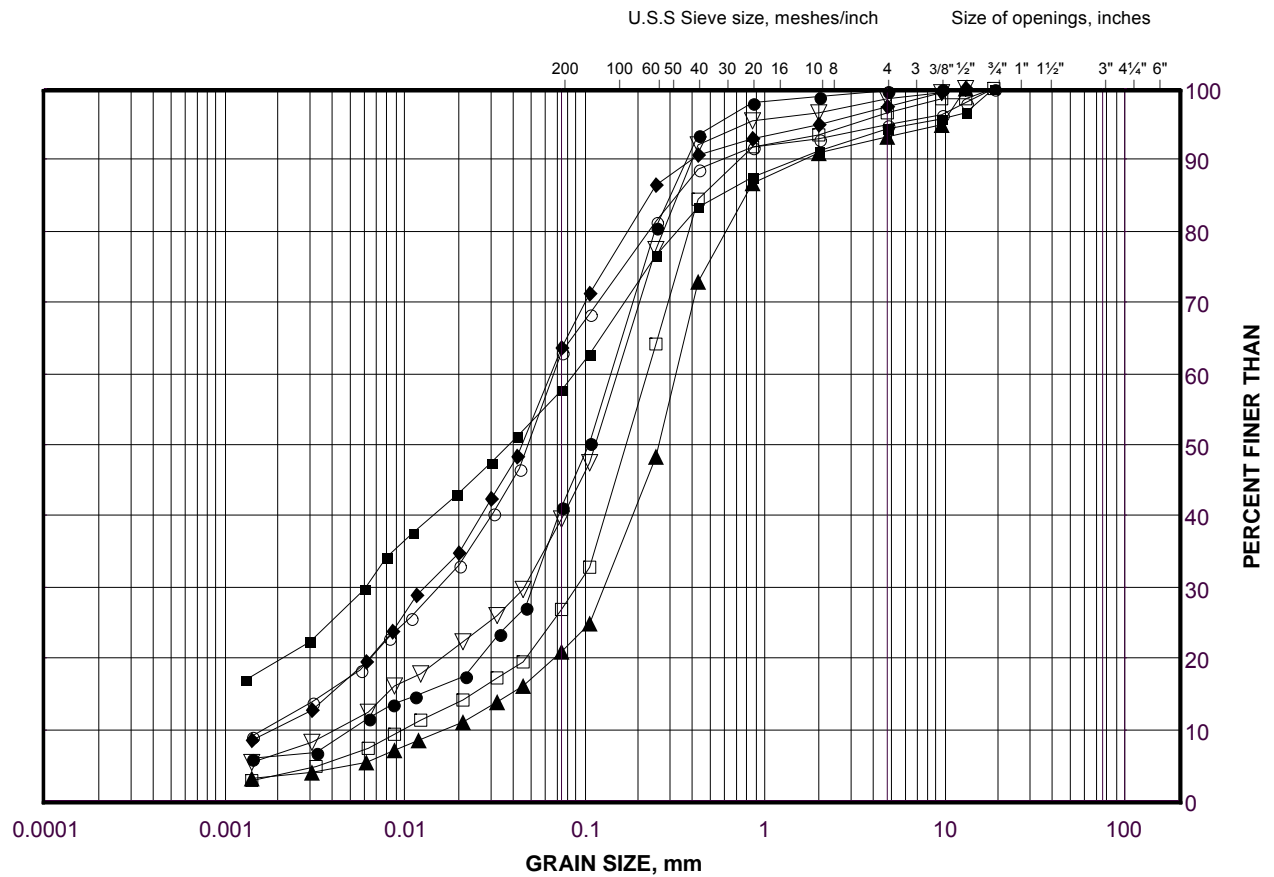
PROJECT 09-1111-0018			RECORD OF BOREHOLE No F1-11			SHEET 1 OF 1			METRIC														
W.P. 2835-02-00			LOCATION N 4867719.7 ; E 298909.5			ORIGINATED BY TT																	
DIST Central HWY 400			BOREHOLE TYPE D-25 Track Mount, 108 mm Outside Diameter Solid Stem Auger			COMPILED BY AM																	
DATUM Geodetic			DATE December 17, 2010			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			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																		
302.7	GROUND SURFACE																						
0.9	TOPSOIL		1	SS	8																		
	CLAYEY SILT, some sand, trace rootlets Firm to very stiff Brown Moist		2	SS	13																		
			3	SS	26																		
300.6	CLAYEY SILT, trace sand (TILL) Very stiff to hard Brown and grey Moist		4	SS	38																		
2.1			5	SS	60																		
	Becoming brown at a depth of 3.2 m		6	SS	30																		
			7	SS	20																		
297.1	SILT, trace to some clay Dense Grey Wet		8	SS	39																		
5.6																							
296.0	END OF BOREHOLE																						
6.7	NOTE: 1. Water level at a depth of 6.7 m (Elev. 296.0 m) in open borehole upon completion of drilling.																						

PROJECT		RECORD OF BOREHOLE		No F1-12		SHEET 1 OF 1		METRIC					
W.P.		LOCATION		ORIGINATED BY		DIST		BOREHOLE TYPE					
DATE		DATE		COMPILED BY		DATUM		CHECKED BY					
09-1111-0018		N 4867869.8 ; E 298903.2		SB		Central HWY 400		D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger					
2835-02-00		November 21, 2010		SKB		Geodetic		SMM					
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC NATURAL LIQUID UNIT REMARKS				
ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa	W _p	W	W _L	γ	GRAIN SIZE DISTRIBUTION (%)
314.4	GROUND SURFACE							20 40 60 80 100					
0.0	ASPHALT							20 40 60 80 100					
0.2	Sand and gravel (FILL)						314						
313.6	Brown Moist												
0.8	Clayey silt with sand, trace gravel (FILL)		1	SS	9		313						
312.9	Stiff Brown Moist												
1.5	Sand and silt, trace clay, trace gravel, clayey silt zones (FILL)		2	SS	30		312						
	Compact to dense Brown Moist		3	SS	19								2 44 47 7
			4	SS	47		311						
310.7	Clayey silt, trace sand, trace gravel, silt zones below a depth of 6.1 m (FILL)		5	SS	12		310						
3.7	Stiff to very stiff Grey Moist		6	SS	17								
			7	SS	11		309						
307.2	CLAYEY SILT, trace to some sand, trace gravel (TILL)		8	SS	22		308						
7.2	Stiff to very stiff Brown Moist												
			9	SS	22		307						
			10	SS	28		306						
			11	SS	11		305						2 8 68 22
301.6	END OF BOREHOLE						304						
12.8	NOTES:						303						
	1. Open borehole dry upon completion of drilling.						302						

GRAIN SIZE DISTRIBUTION

Silty Sand to Clayey Silt Fill

FIGURE A1A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C29-3	2	306.4
■	F1-3	2	298.5
◆	C29-2	3	305.6
▲	C29-3	4	304.9
▽	C29-2	6	303.3
○	C29-3	7	301.8
□	C29-2	9	298.8

Project Number: 09-1111-0018

Checked By: TWB

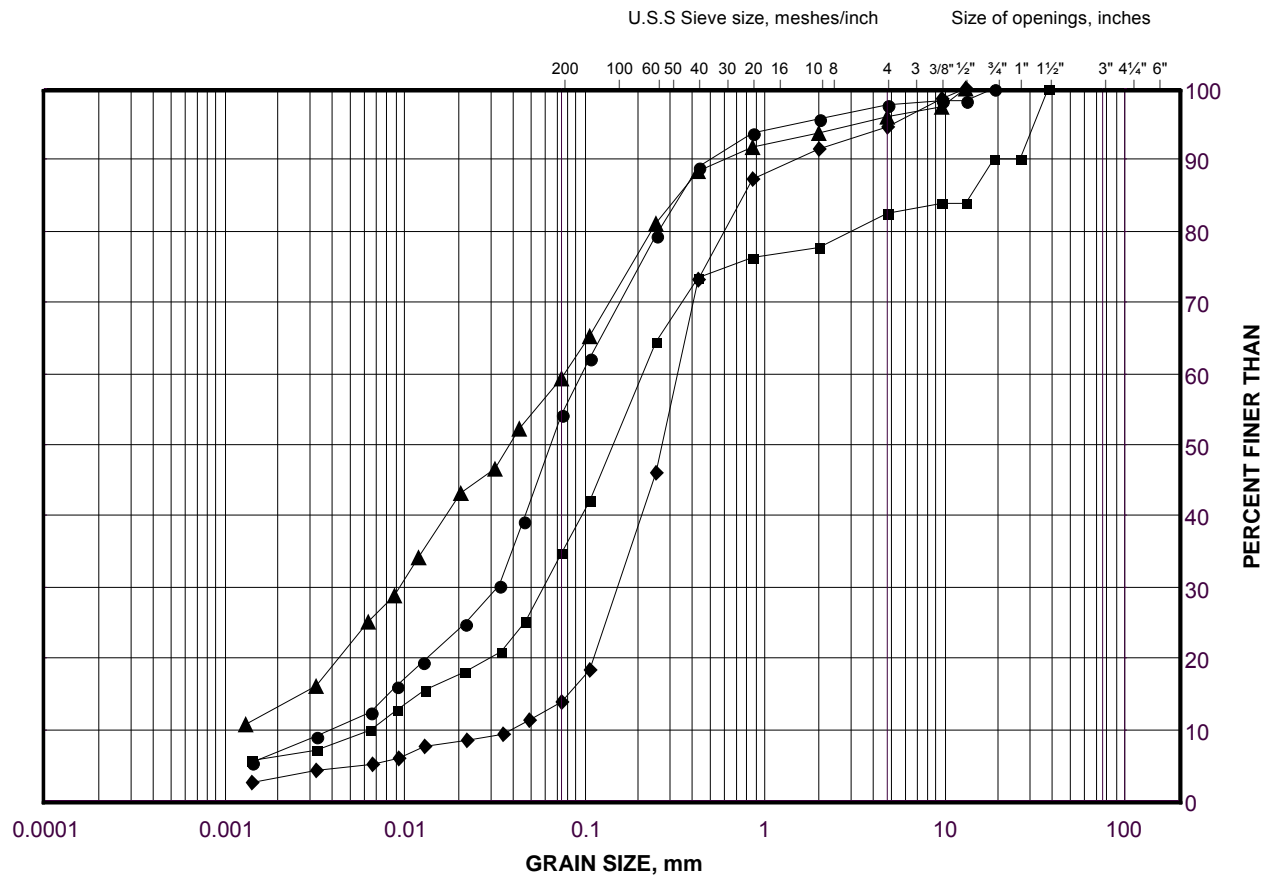
Golder Associates

Date: 06-Jan-16

GRAIN SIZE DISTRIBUTION

Silty Sand to Clayey Silt Fill

FIGURE A1B



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

LEGEND

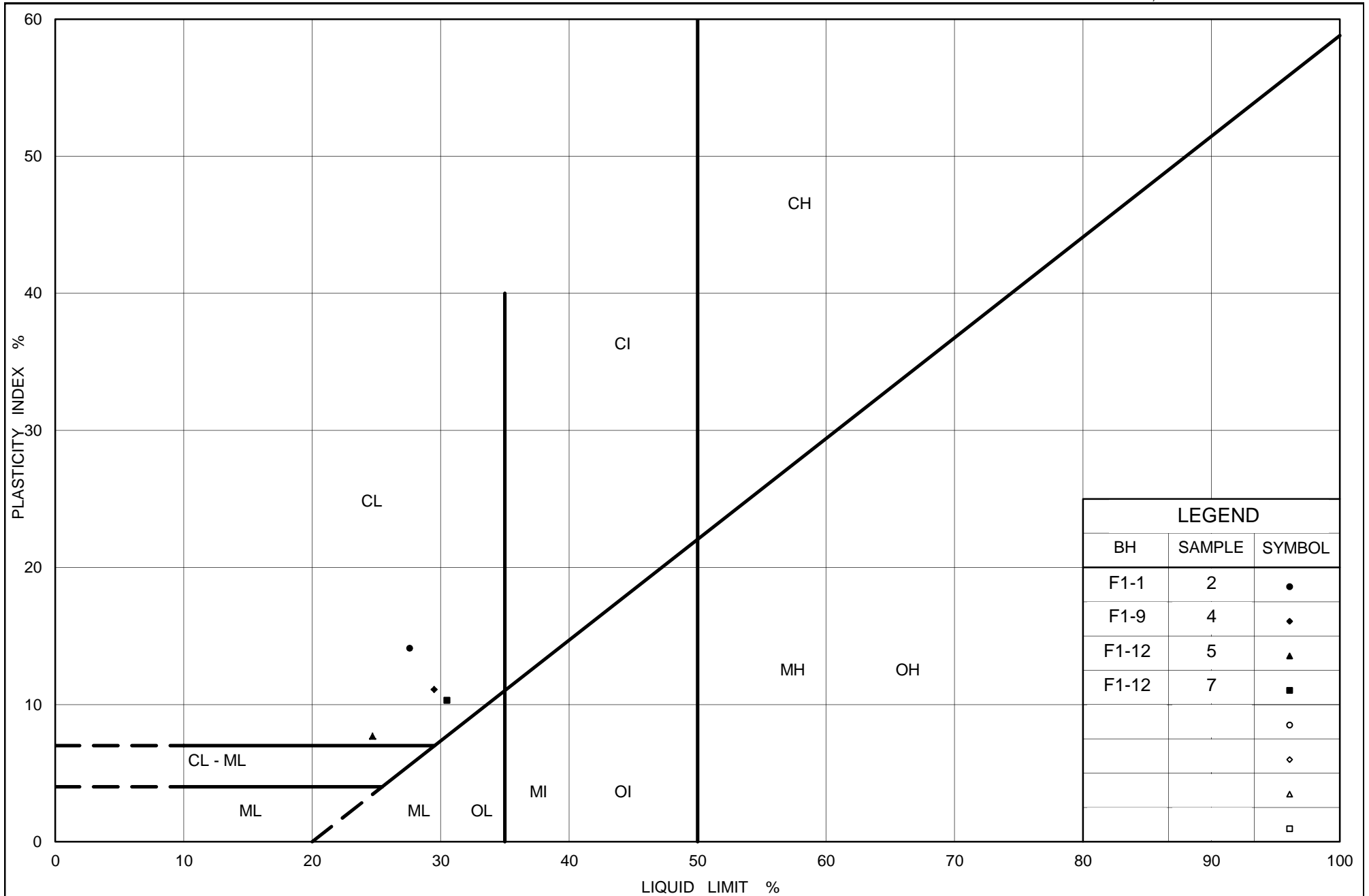
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F1-12	3	311.8
■	F1-6	3	309.0
◆	F1-6	5	306.7
▲	F1-6	7	305.2

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 06-Jan-16



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PLASTICITY CHART

Clayey Silt Fill

Figure No. A2

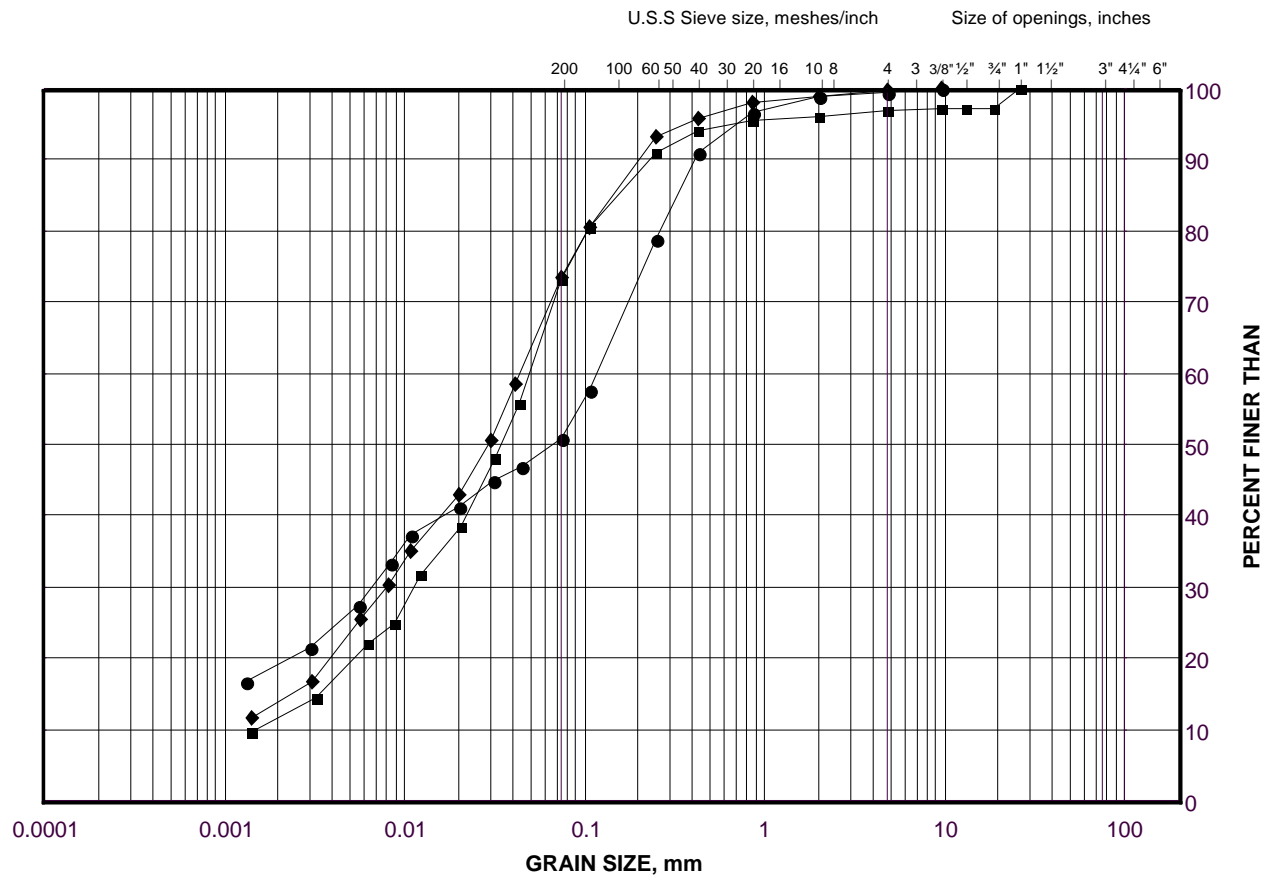
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Upper Clayey Silt with Sand

FIGURE A3



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

LEGEND

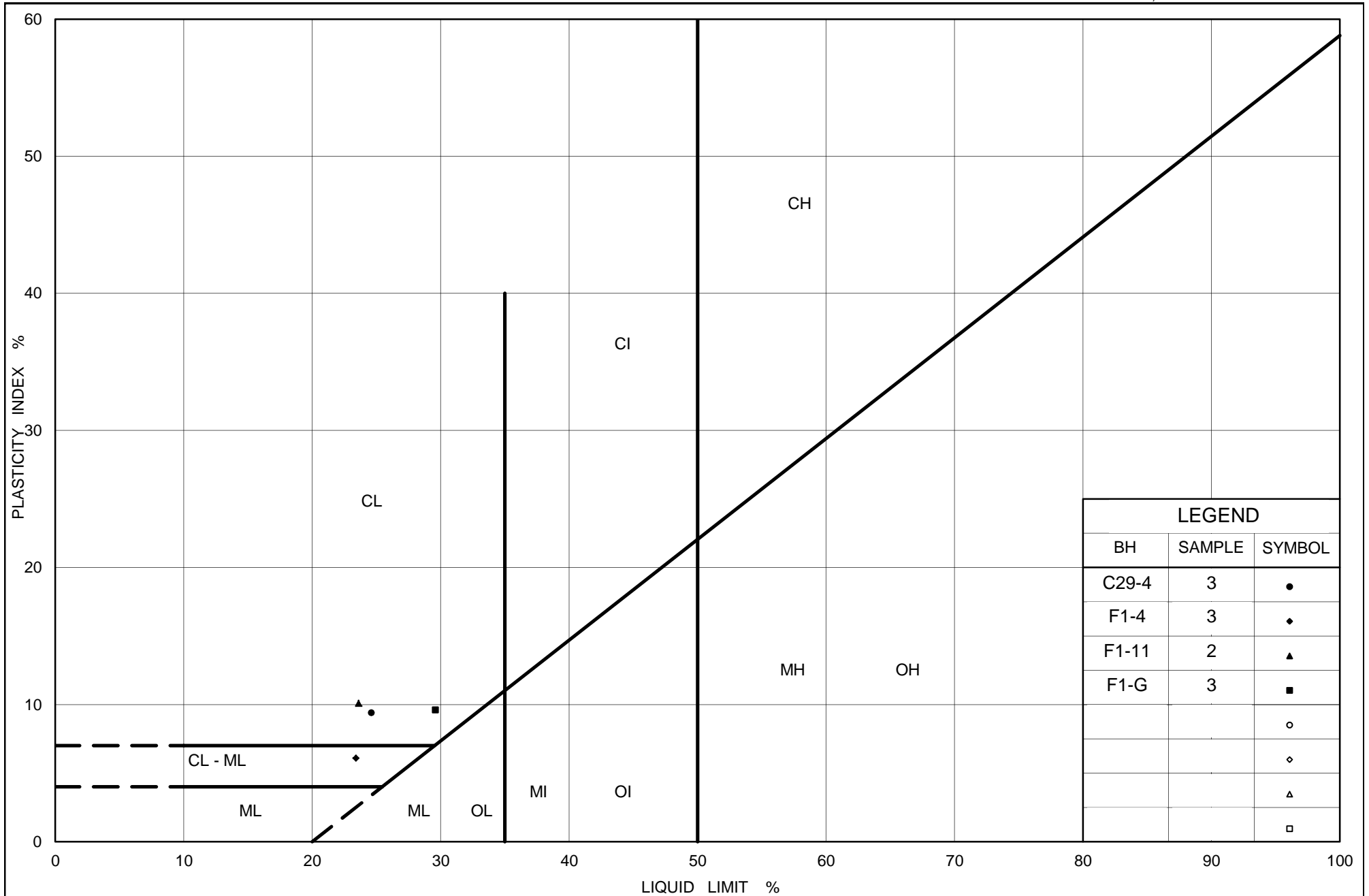
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F1-5A	2	298.4
■	F1-5G	3	297.2
◆	C29-4	3	297.7

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 06-Jan-16



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PLASTICITY CHART Upper Clayey Silt to Sandy Clayey Silt

Figure No. A4

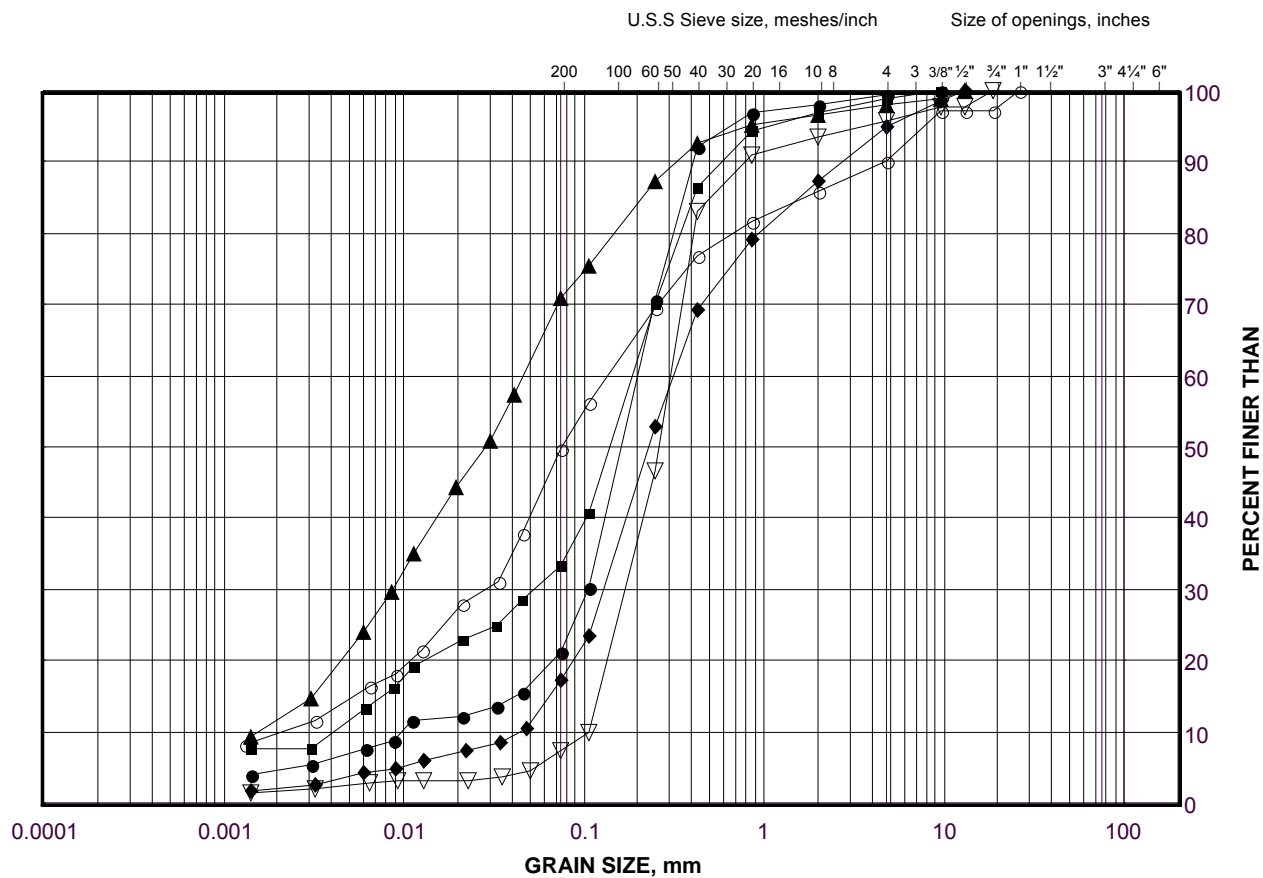
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Silt to Sand

FIGURE A5A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C29-3	10	297.2
■	F1-5B	2	298.0
◆	C29-4	4	296.9
▲	F1-4	4A	297.0
▽	C29-4	6	295.4
○	F1-6	8B	303.6

Project Number: 09-1111-0018

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Date: 06-Jan-16

Silt to Sand

U.S.S Sieve size, meshes/inch

Size of openings, inches

PERCENT FINER THAN

GRAIN SIZE, mm

Grain Size (mm)	Percent Finer Than (No. 1)	Percent Finer Than (No. 2)
0.0075	10	8
0.015	15	12
0.03	20	15
0.06	25	20
0.1	35	30
0.2	45	40
0.4	60	55
0.75	75	70
1.5	85	80
3	90	85
6	95	90
12	98	95
25	100	100

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

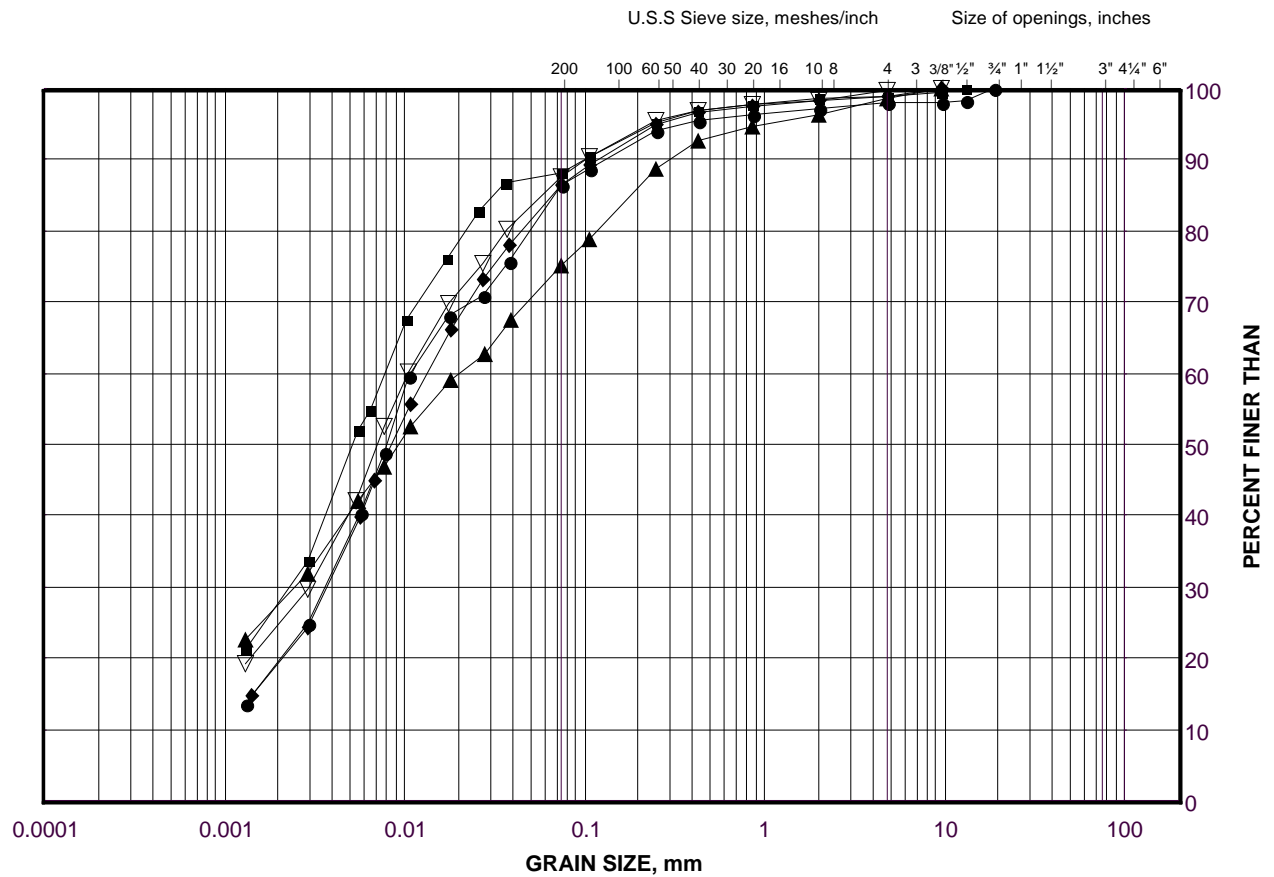
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F1-5C	2	297.6
■	F1-11	8	296.3

Date: 06-Jan-16

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE A6A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C29-2	11	295.7
■	C29-3	12	294.2
◆	F1-10	3	299.6
▲	F1-8	3	301.0
▽	F1-2	3	299.8

Project Number: 09-1111-0018

Checked By: TWB

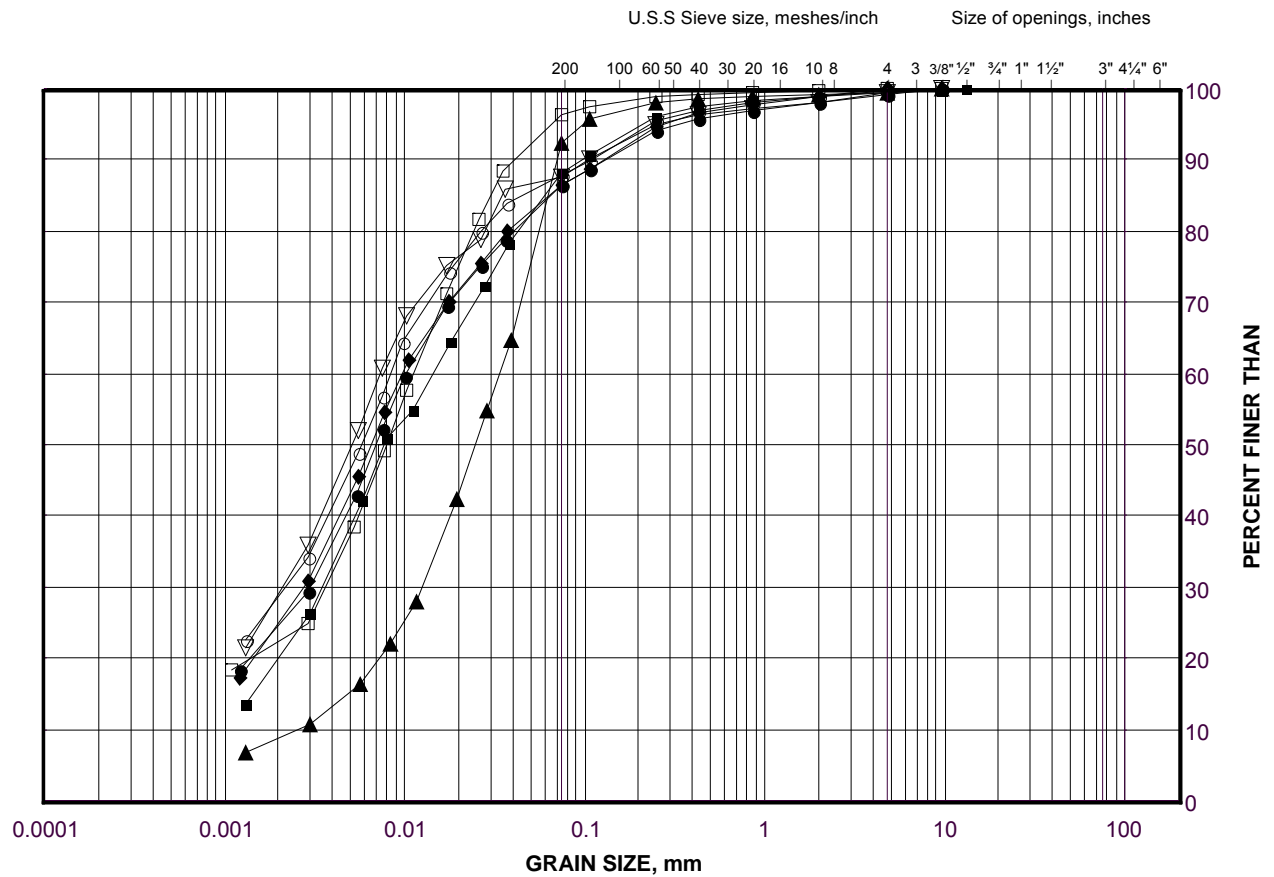
Golder Associates

Date: 06-Jan-16

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE A6B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C29-1	4	295.7
■	F1-1	4	302.1
◆	F1-7	4A	305.4
▲	F1-8	5	299.4
▽	F1-9	6	301.4
○	F1-4	6	295.4
□	F1-11	6	298.6

Project Number: 09-1111-0018

Checked By: TWB

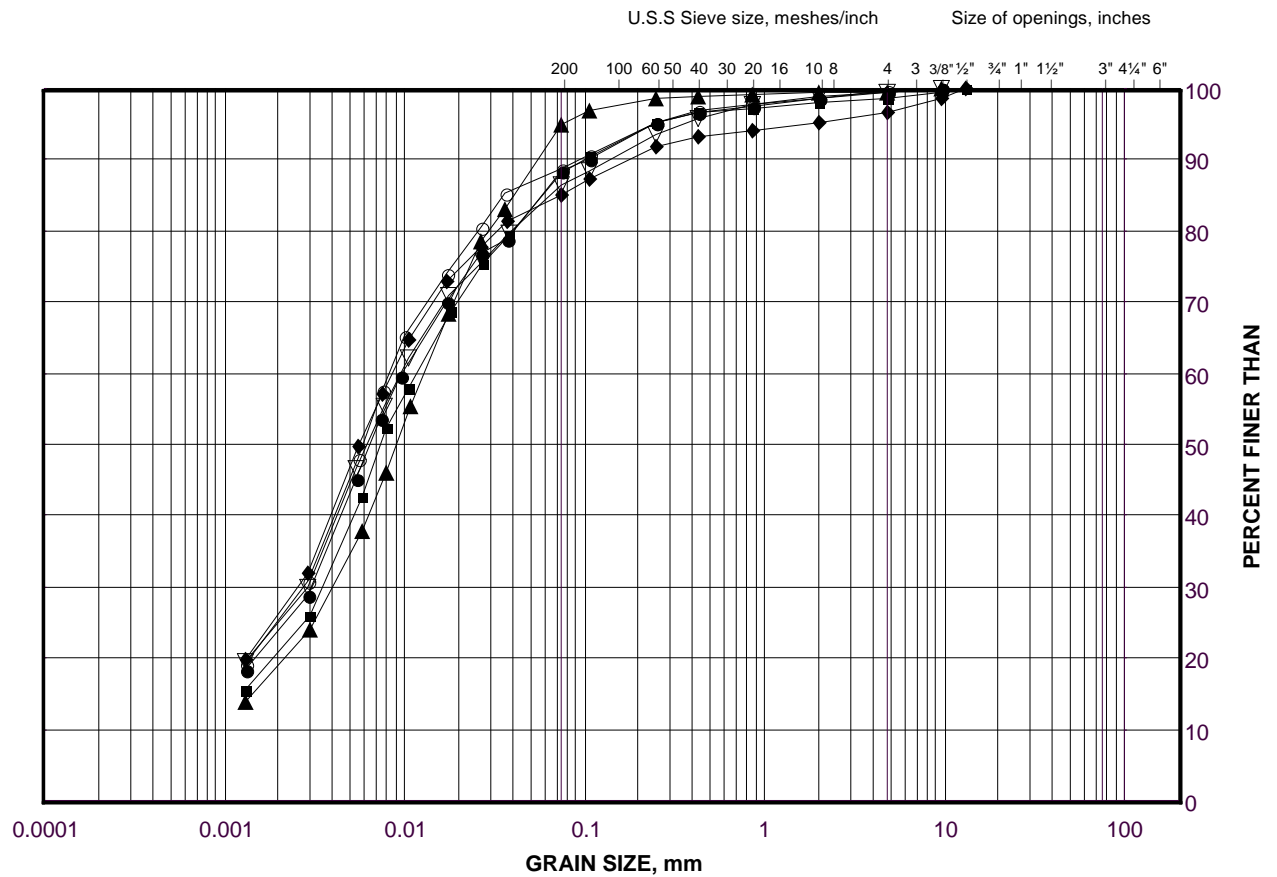
Golder Associates

Date: 06-Jan-16

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE A6C



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F1-10	6	297.3
■	F1-3	6	295.5
◆	F1-2	7	296.7
▲	F1-7	8	301.4
▽	F1-1	8	297.6
○	C29-4	8	293.1

Project Number: 09-1111-0018

Checked By: TWB

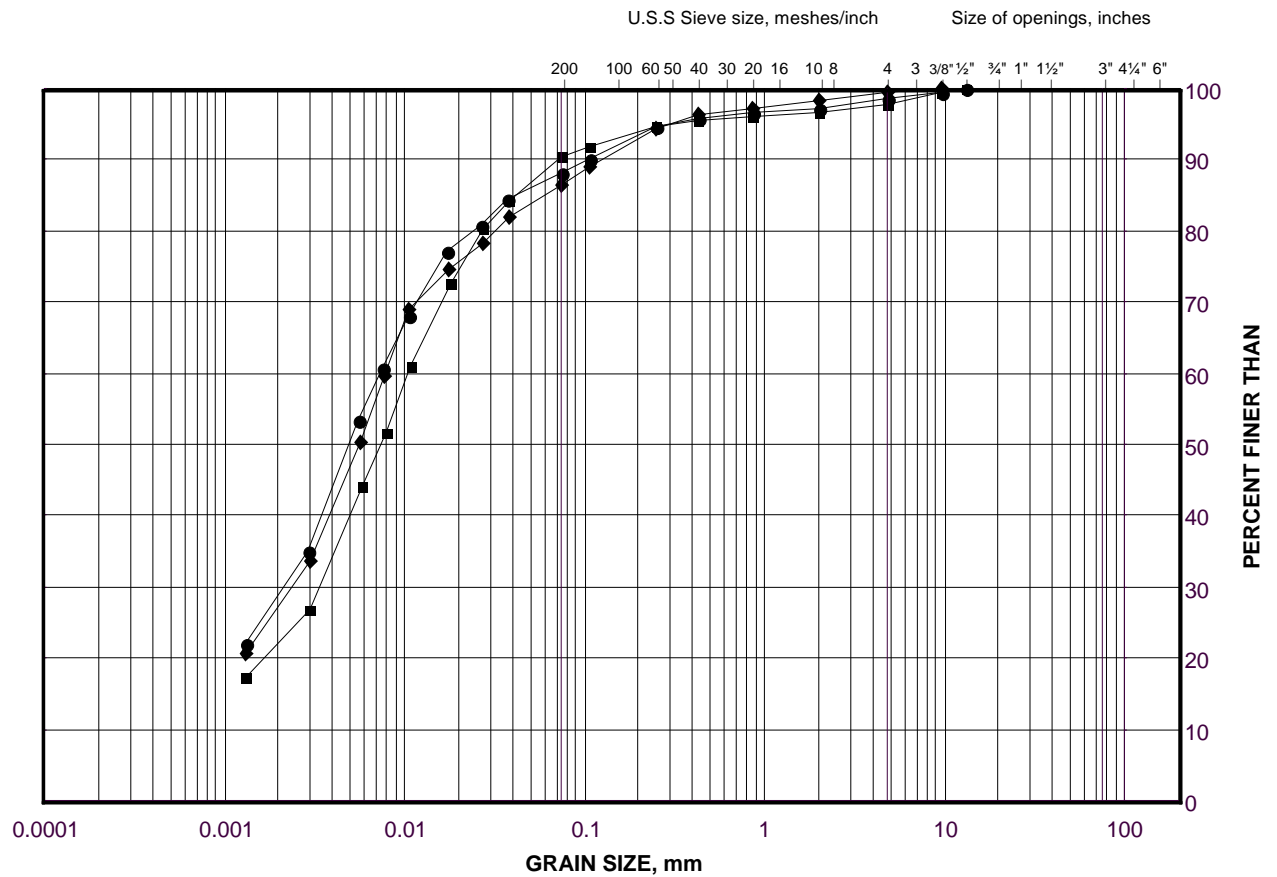
Golder Associates

Date: 06-Jan-16

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE A6D



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

LEGEND

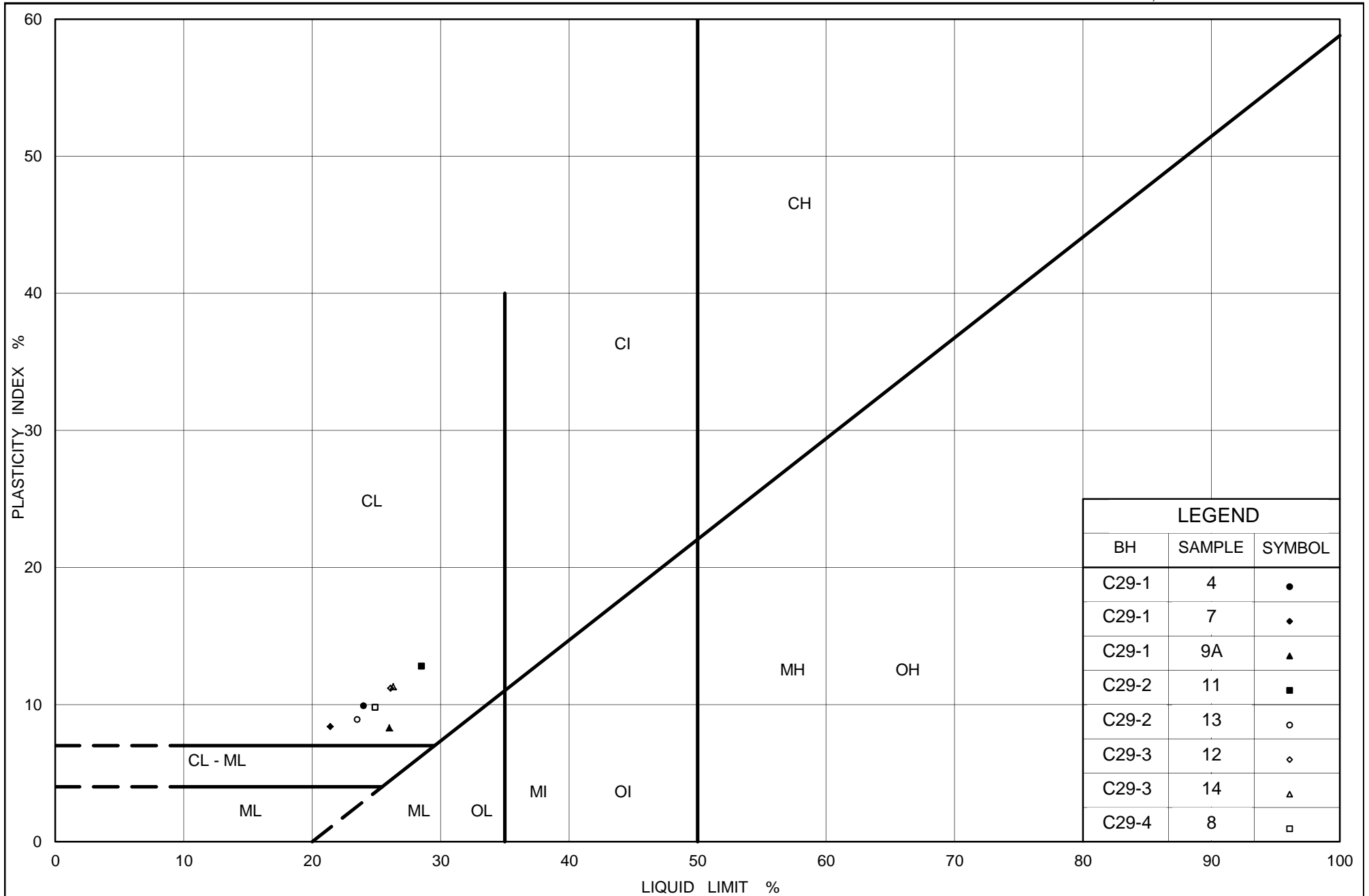
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F1-9	8	298.4
■	F1-12	9	305.0
◆	F1-6	9	302.2

Project Number: 09-1111-0018

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Date: 06-Jan-16



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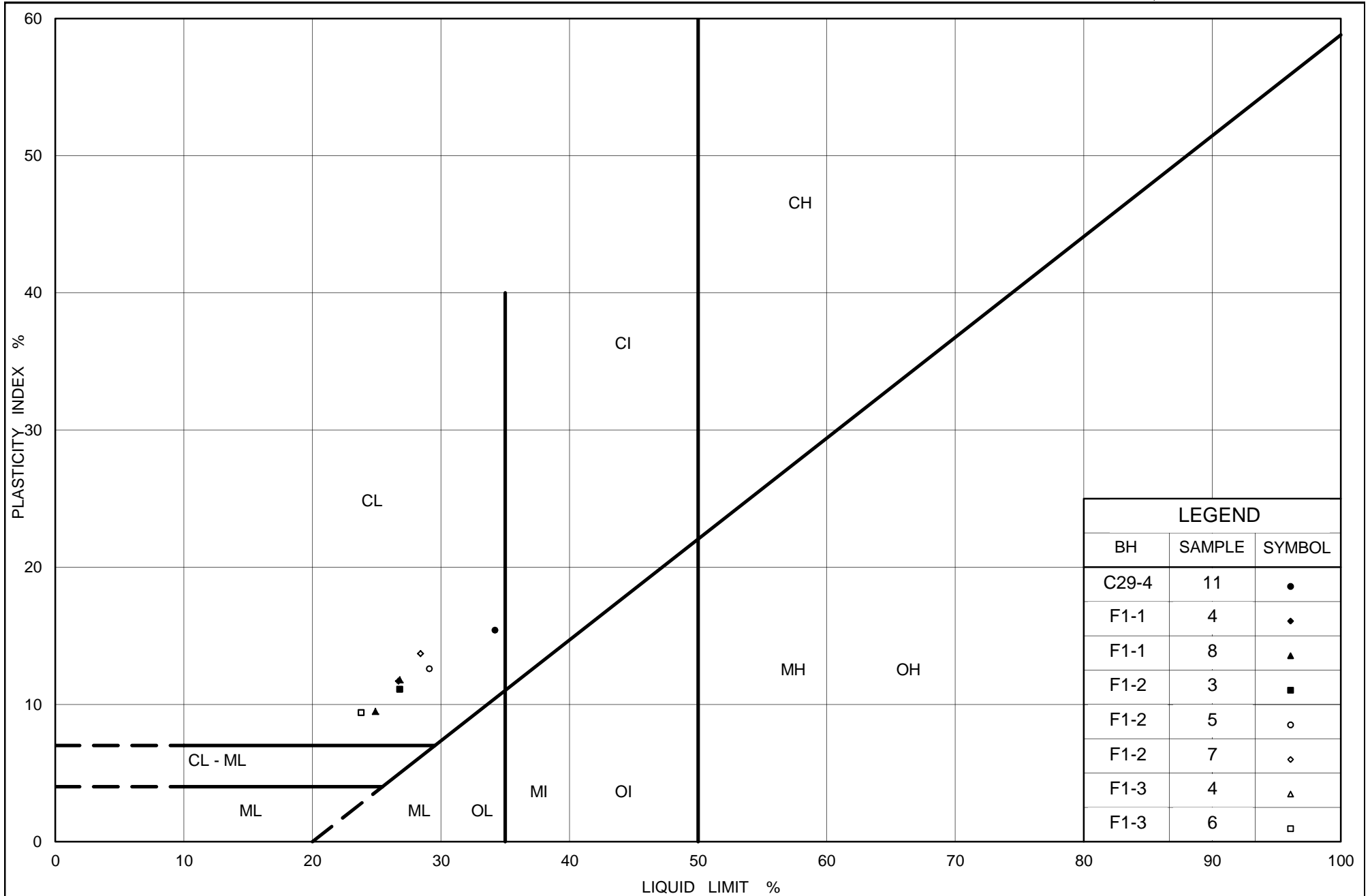
PLASTICITY CHART

Clayey Silt Till

Figure No. A7A

Project No. 09-1111-0018

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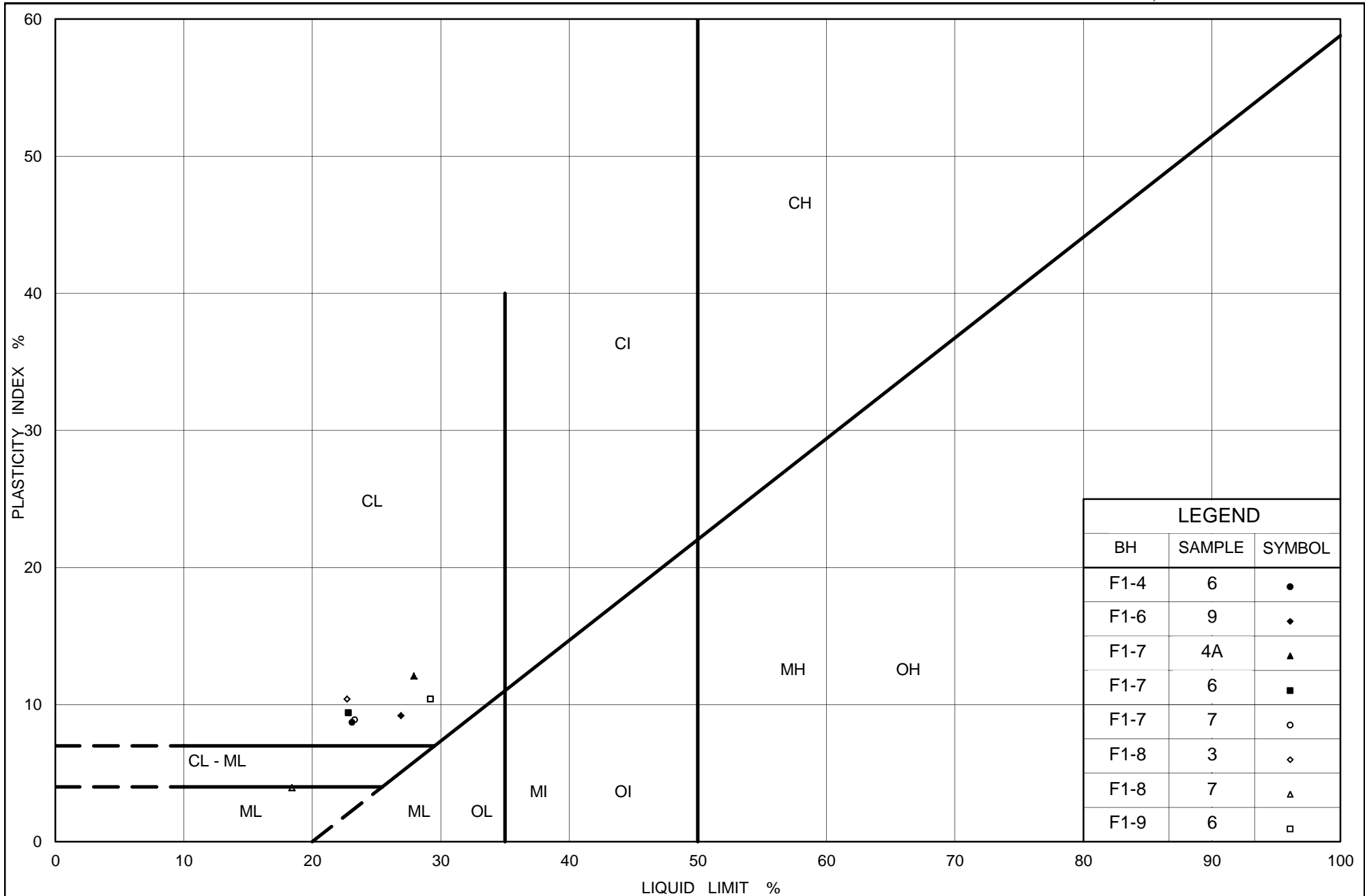
PLASTICITY CHART

Clayey Silt Till

Figure No. A7B

Project No. 09-1111-0018

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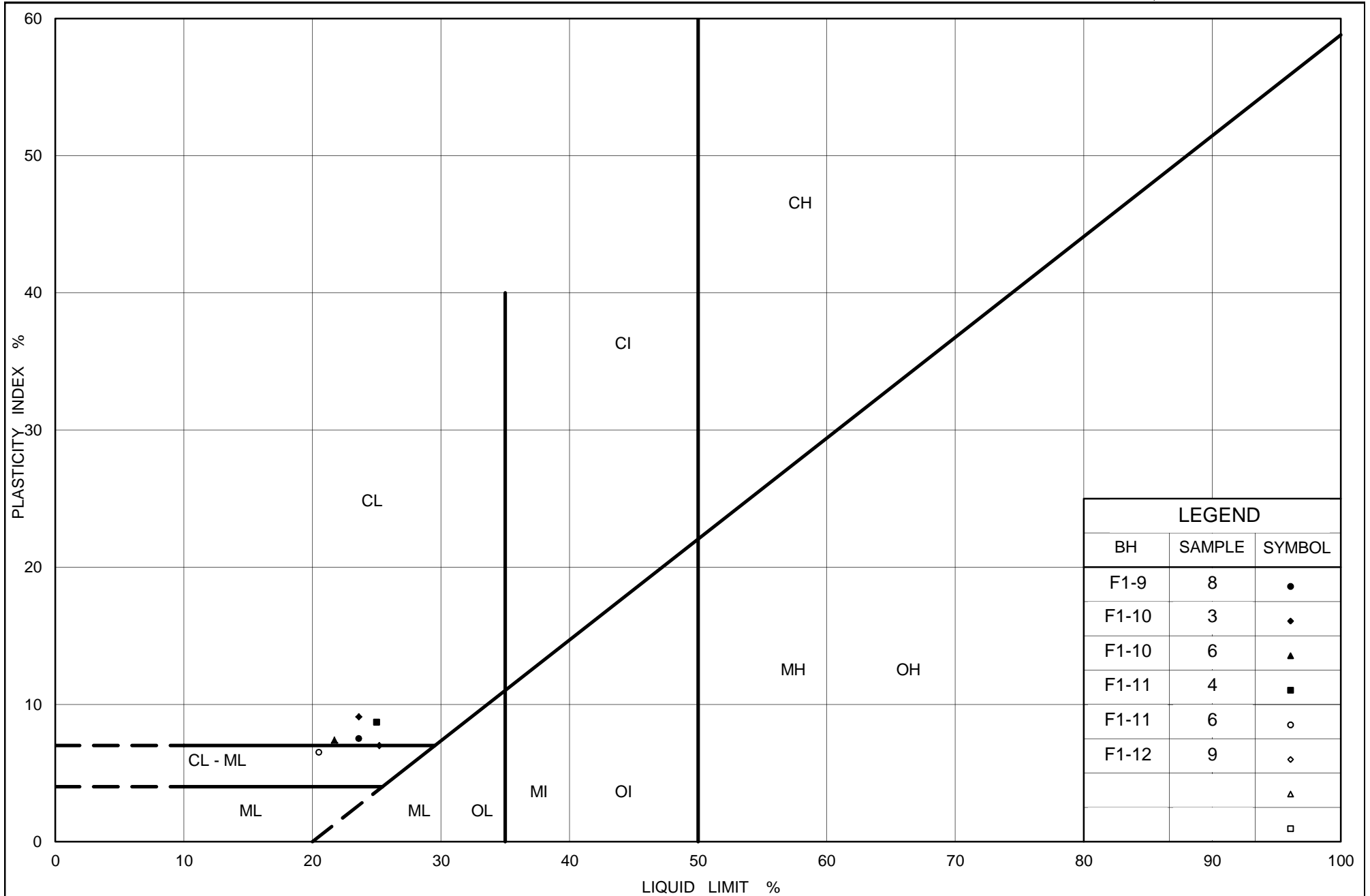
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PLASTICITY CHART Clayey Silt to Silt Till

Figure No. A7C

Project No. 09-1111-0018

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PLASTICITY CHART

Clayey Silt Till

Figure No. A7D

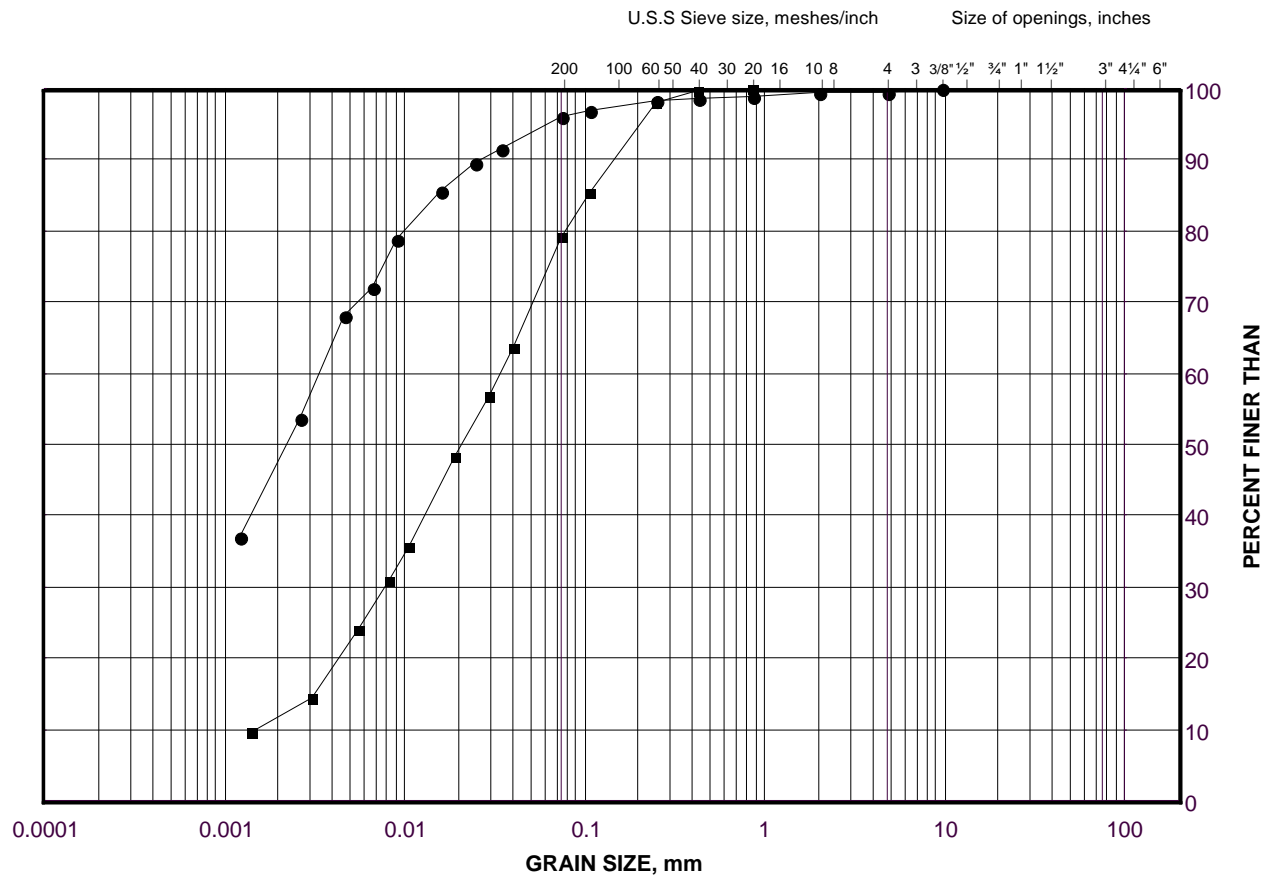
Project No. 09-1111-0018

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GRAIN SIZE DISTRIBUTION

Lower Clayey Silt to Silty Clay

FIGURE A8



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

LEGEND

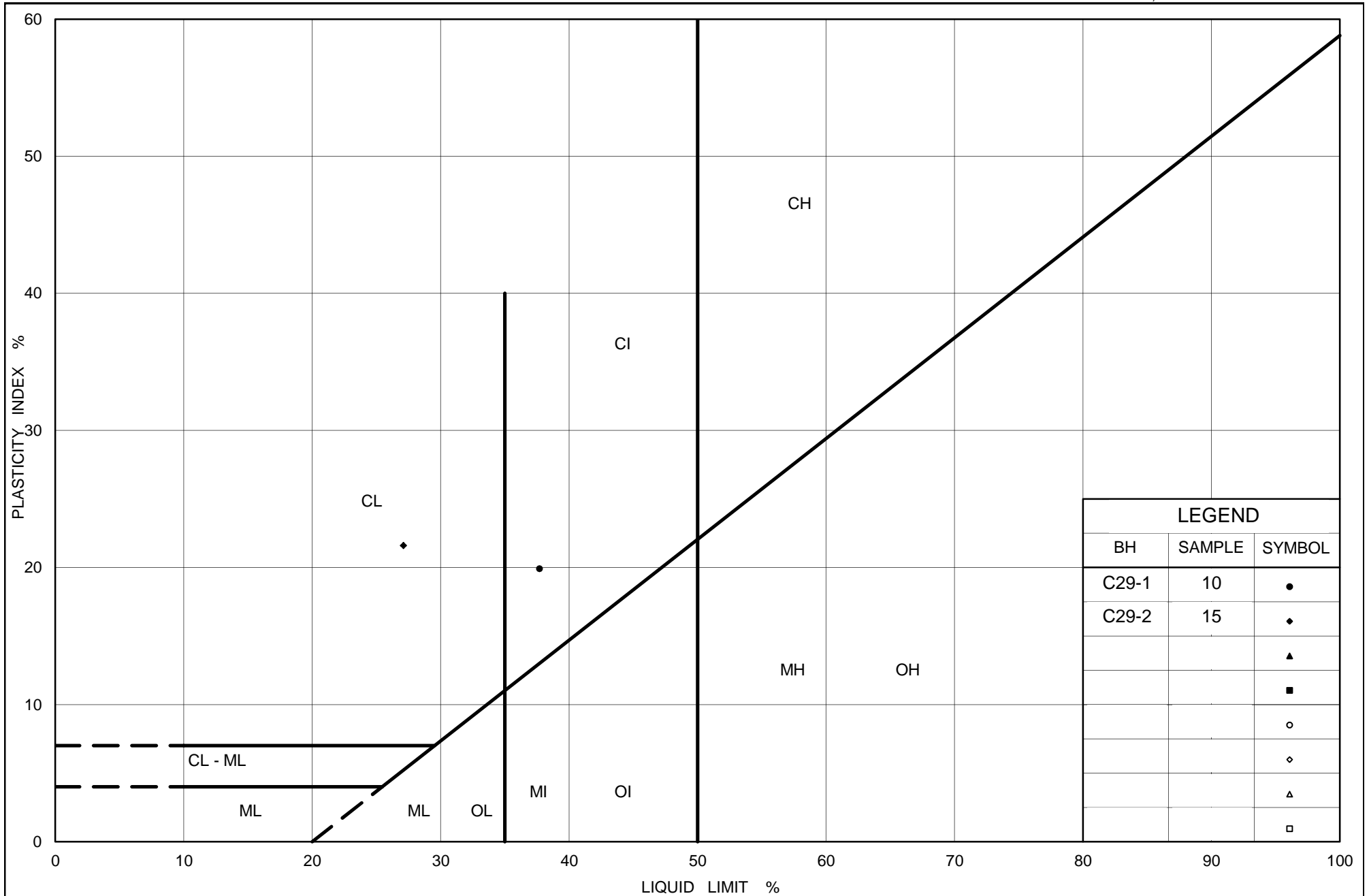
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C29-1	10	288.1
■	C29-3	15	289.6

Project Number: 09-1111-0018

Checked By: TWB

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Date: 06-Jan-16



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PLASTICITY CHART Lower Clayey Silt to Silty Clay

Figure No. A9

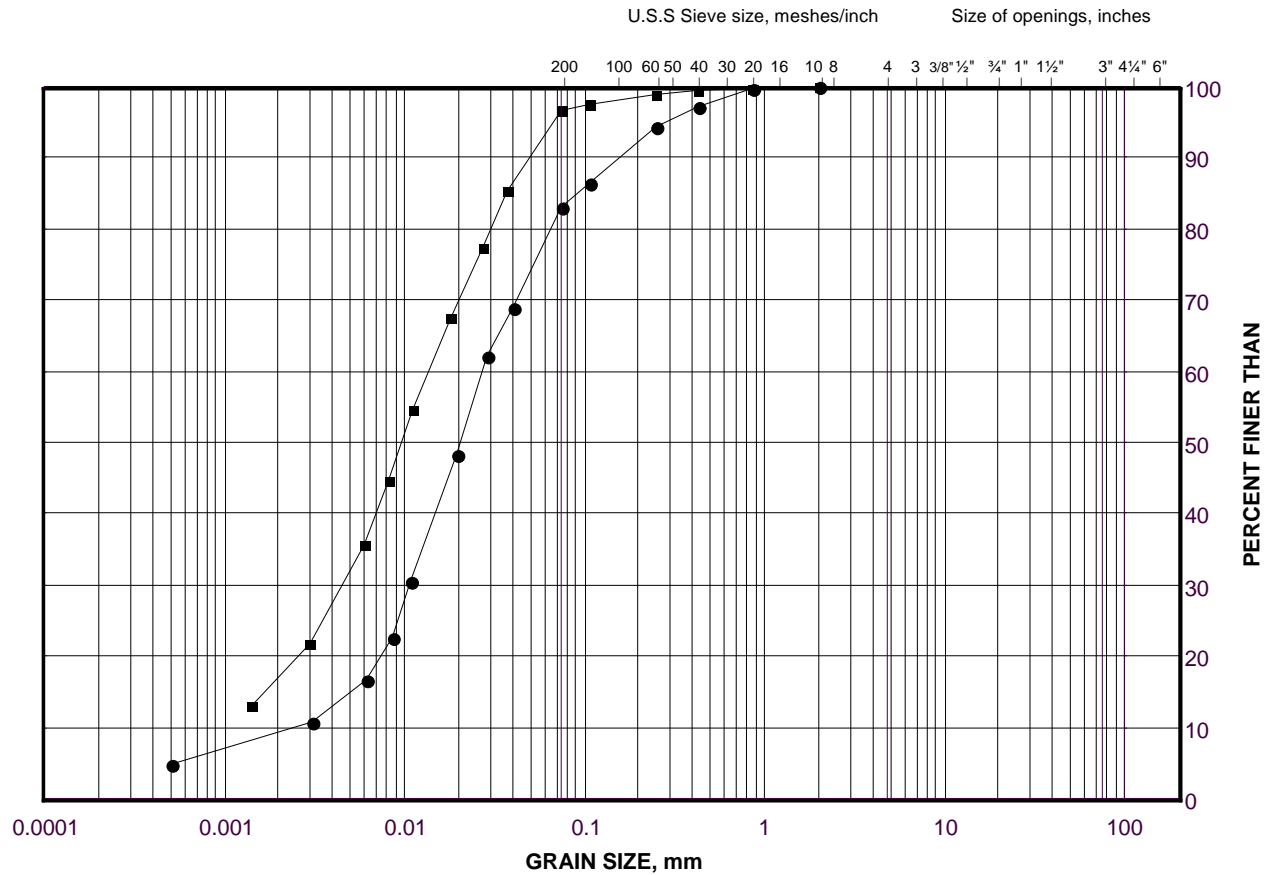
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Organic Silt

FIGURE A10A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F1-5B	15B	286.4
■	F1-5A	5	296.2

Project Number: 09-1111-0018

Checked By: TWB

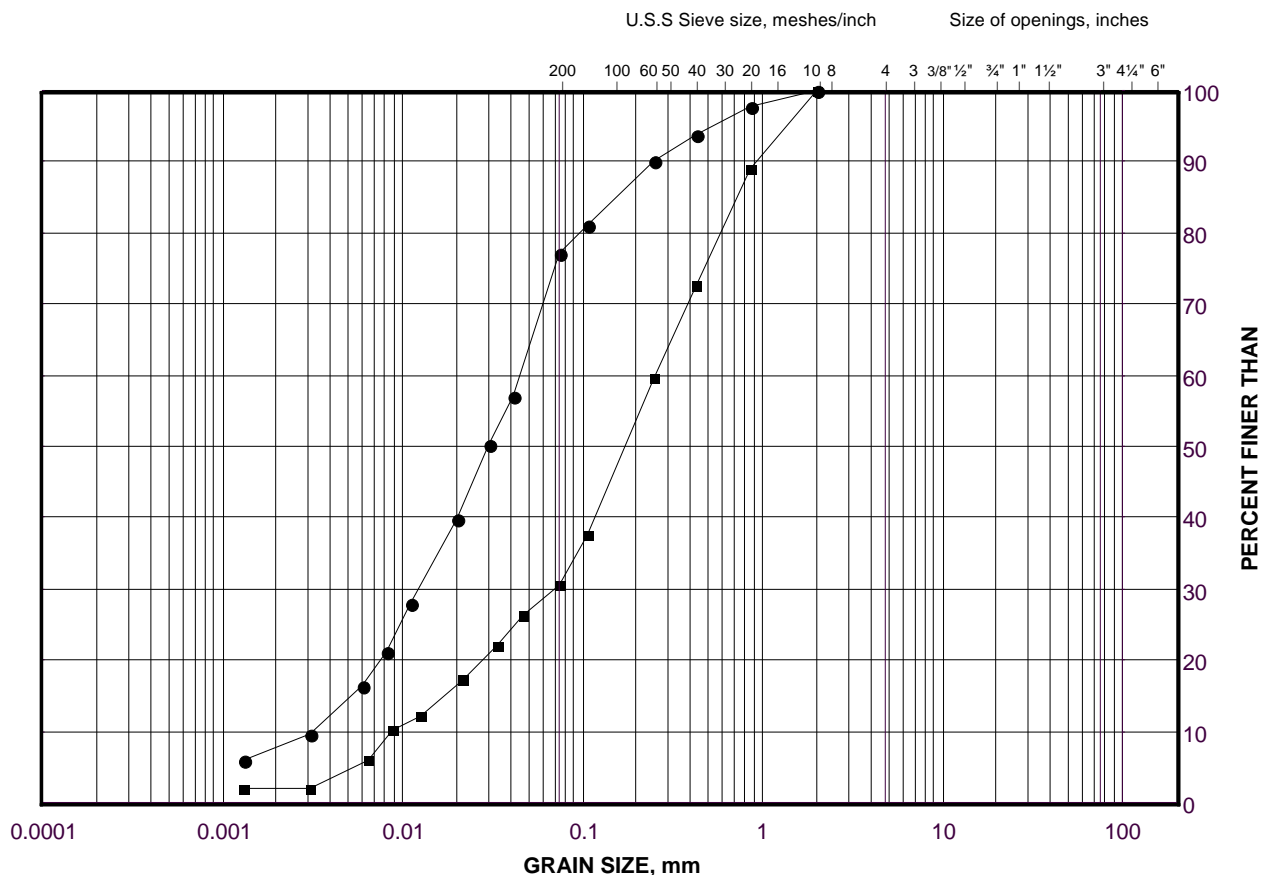
Golder Associates

Date: 06-Jan-16

GRAIN SIZE DISTRIBUTION

Organic Sandy Silt to Silty Sandy Peat

FIGURE A10B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	F1-5B	10	291.9
■	F1-5B	5	295.7

Project Number: 09-1111-0018

Checked By: TWB

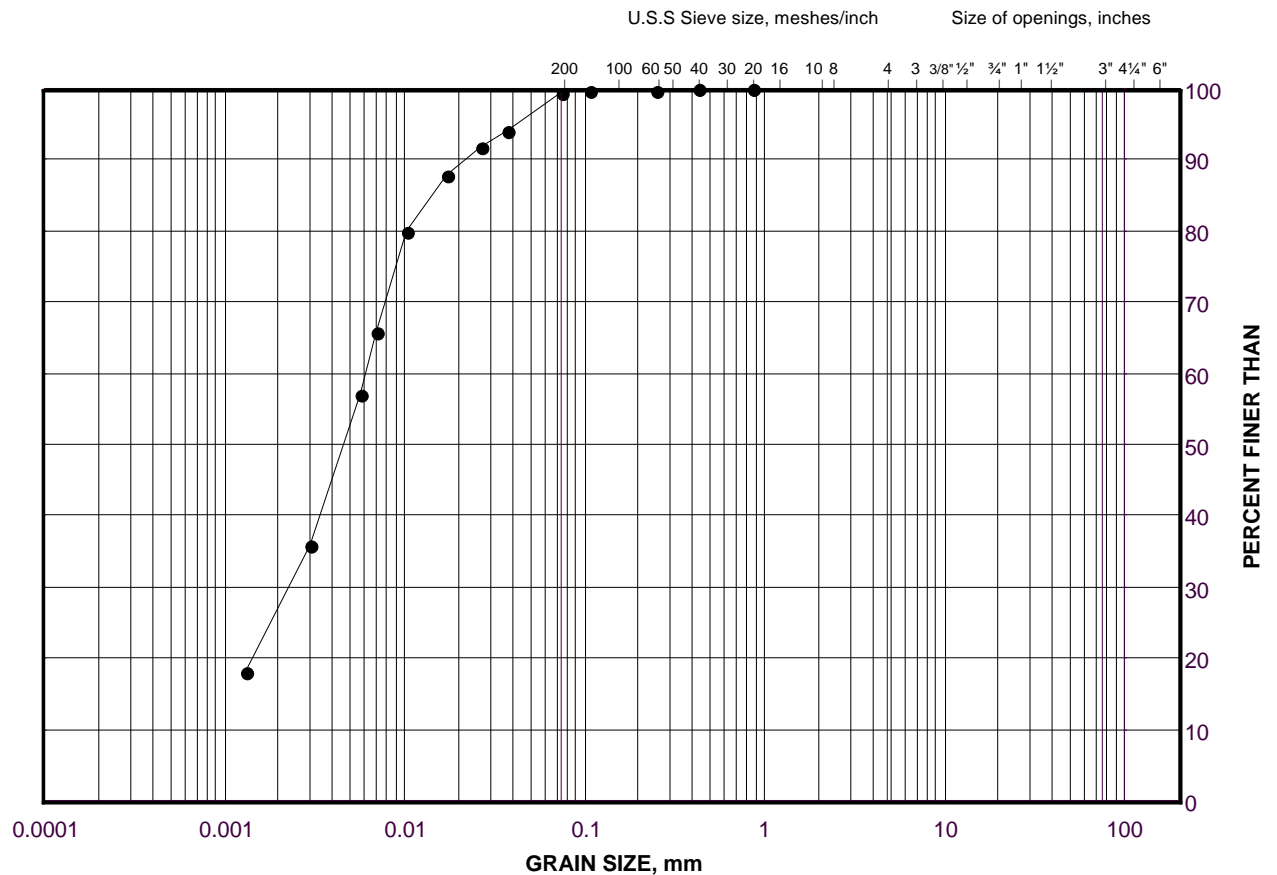
Golder Associates

Date: 06-Jan-16

GRAIN SIZE DISTRIBUTION

Organic Clay

FIGURE A10C



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F1-5D	8	292.0

Project Number: 09-1111-0018

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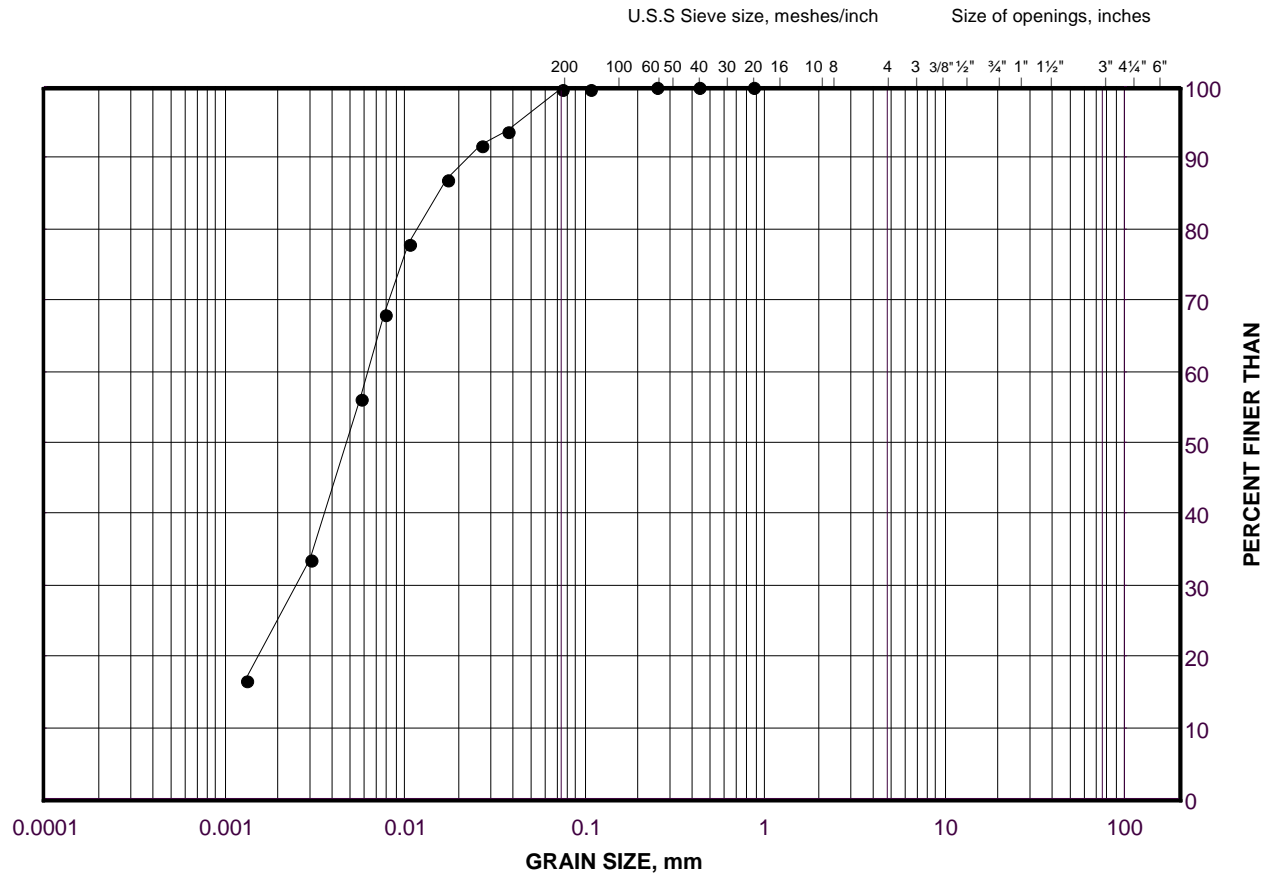
Golder Associates

Date: 06-Jan-16

GRAIN SIZE DISTRIBUTION

Silty Clay, Trace Organics

FIGURE A10D



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

LEGEND

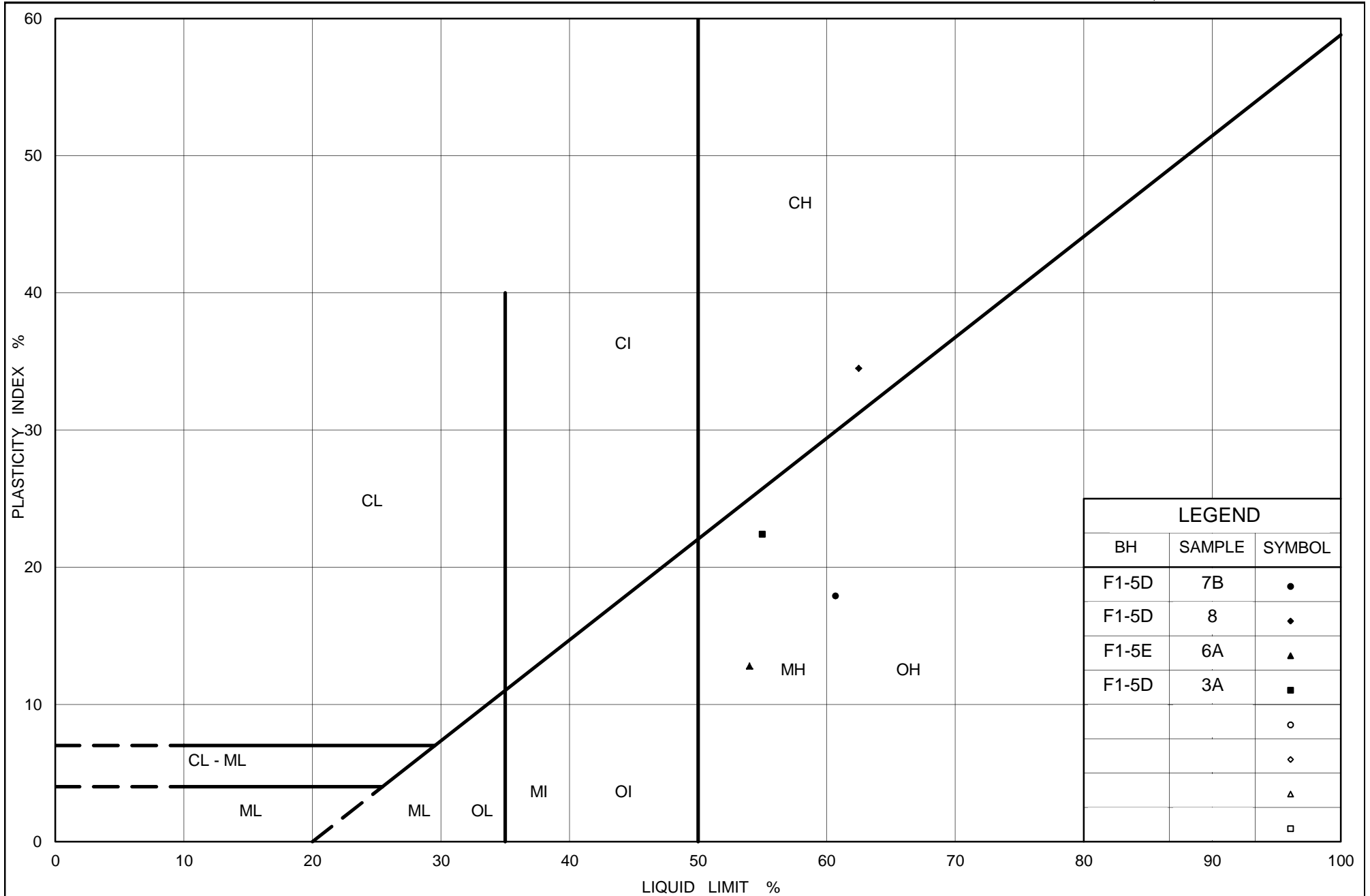
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F1-5G	9	290.2

Project Number: 09-1111-0018

Checked By: TWB

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Date: 06-Jan-16



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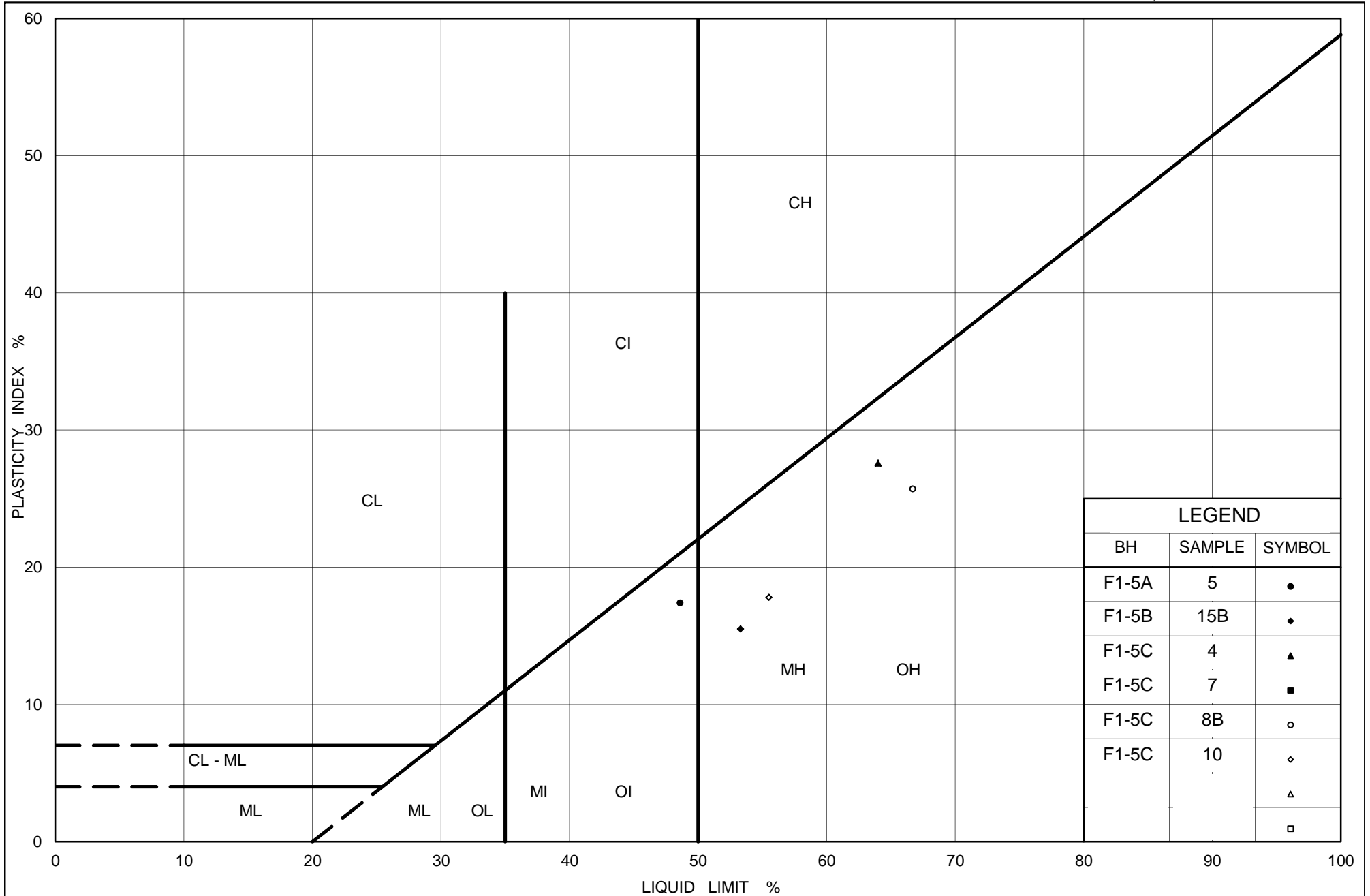
Ontario

PLASTICITY CHART Organic Silt to Organic Clayey Silt to Organic Clay

Figure No. A11A

Project No. 09-1111-0018

Checked By: TWB



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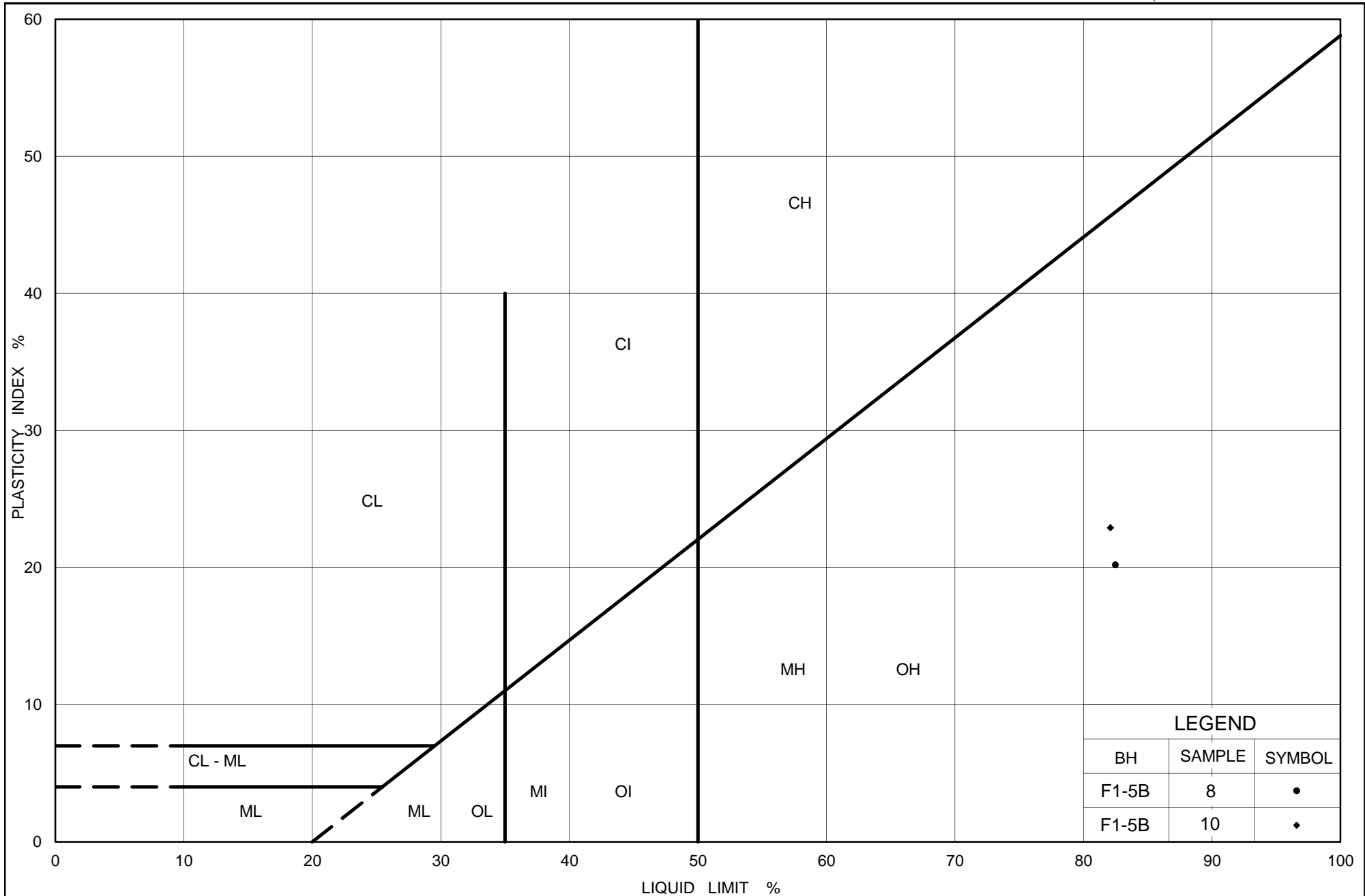
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PLASTICITY CHART Organic Silt to Organic Clayey Silt

Figure No. A11B

Project No. 09-1111-0018

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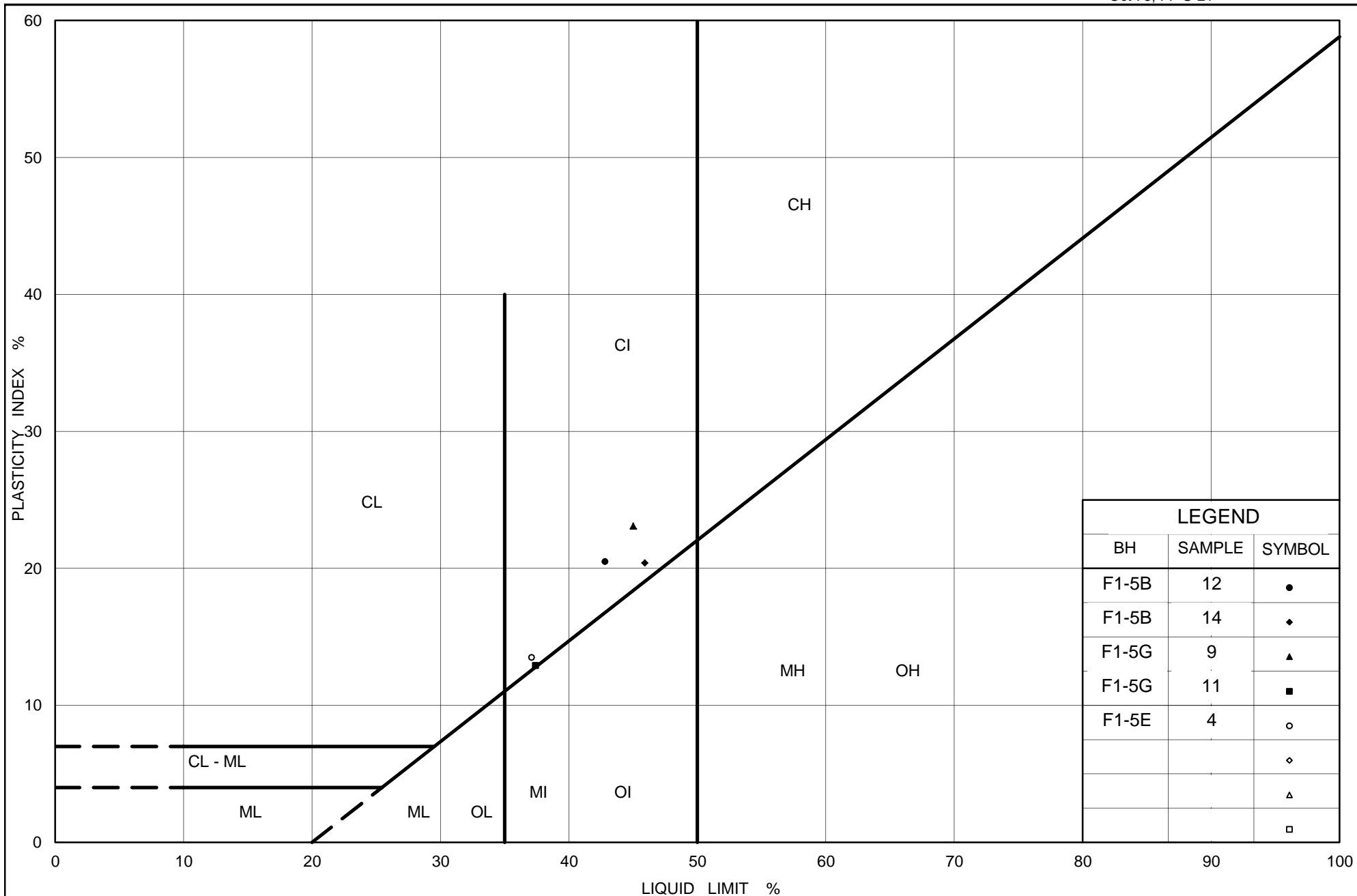
PLASTICITY CHART

Organic Sandy Silt

Figure No. A11C

Project No. 09-1111-0018

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PLASTICITY CHART Silty Clay, Trace Organics

Figure No. A11D

Project No. 09-1111-0018

Checked By: TWB

CONSOLIDATION TEST SUMMARY**FIGURE A12****SAMPLE IDENTIFICATION**

Project Number	09-1111-0018	Sample Number	12
Borehole Number	F1-5B	Sample Depth, m	8.38-8.91

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	8		
Date Started	11/30/2010		
Date Completed	12/14/2010		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	1.91	Unit Weight, kN/m ³	17.33
Sample Diameter, cm	6.32	Dry Unit Weight, kN/m ³	12.17
Area, cm ²	31.40	Specific Gravity, measured	2.75
Volume, cm ³	59.97	Solids Height, cm	0.862
Water Content, %	42.39	Volume of Solids, cm ³	27.07
Wet Mass, g	105.98	Volume of Voids, cm ³	32.91
Dry Mass, g	74.43	Degree of Saturation, %	95.9

TEST COMPUTATIONS

Pressure kPa	Corr. Height cm	Void Ratio	Average Height cm	t ₉₀ sec	c _v cm ² /s	m _v m ² /kN	k cm/s
0.00	1.910	1.216	1.910				
4.97	1.905	1.210	1.908	18	4.29E-02	5.27E-04	2.21E-06
10.00	1.893	1.196	1.899	305	2.51E-03	1.30E-03	3.20E-07
20.00	1.871	1.171	1.882	327	2.30E-03	1.12E-03	2.52E-07
40.00	1.837	1.131	1.854	240	3.04E-03	9.01E-04	2.68E-07
80.00	1.776	1.061	1.807	360	1.92E-03	7.89E-04	1.49E-07
160.00	1.700	0.972	1.738	290	2.21E-03	4.99E-04	1.08E-07
320.00	1.619	0.878	1.659	202	2.89E-03	2.67E-04	7.56E-08
640.00	1.537	0.783	1.578	178	2.96E-03	1.34E-04	3.88E-08
1280.00	1.461	0.695	1.499	109	4.37E-03	6.22E-05	2.66E-08
2560.00	1.384	0.605	1.422	94	4.56E-03	3.15E-05	1.41E-08
1280.00	1.393	0.616	1.388				
320.00	1.416	0.643	1.405				
80.00	1.446	0.678	1.431				
20.00	1.482	0.720	1.464				
4.98	1.525	0.769	1.503				

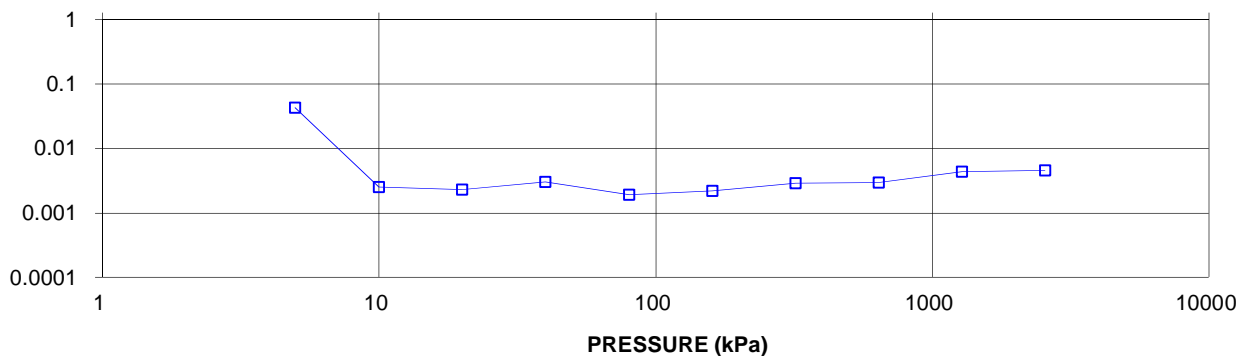
Note:
k calculated using cv based on t₉₀ values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	1.52	Unit Weight, kN/m ³	19.78
Sample Diameter, cm	6.32	Dry Unit Weight, kN/m ³	15.25
Area, cm ²	31.40	Specific Gravity, measured	2.75
Volume, cm ³	47.87	Solids Height, cm	0.862
Water Content, %	29.72	Volume of Solids, cm ³	27.07
Wet Mass, g	96.55	Volume of Voids, cm ³	20.80
Dry Mass, g	74.43		

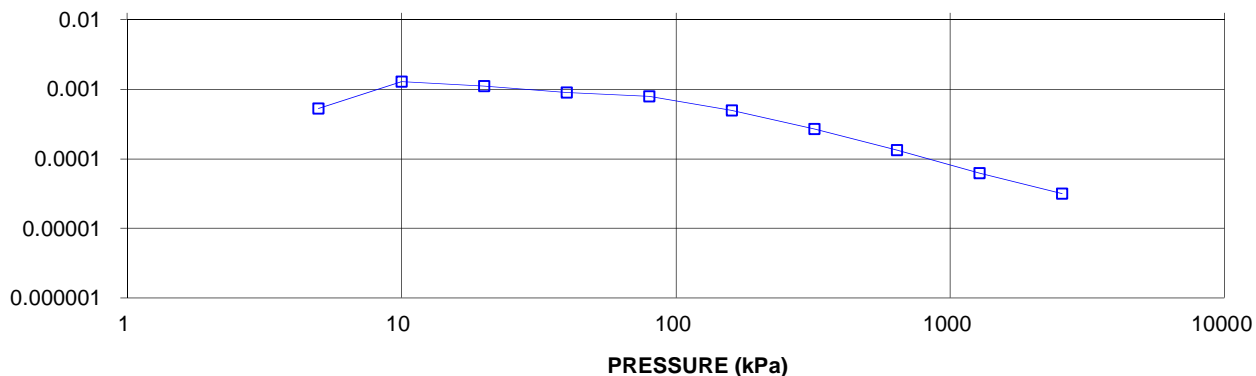
COEFFICIENT OF CONSOLIDATION,
cm²/s

CONSOLIDATION TEST
C_v cm²/s VS PRESSURE (kPa)
BH F1-5B SA 12



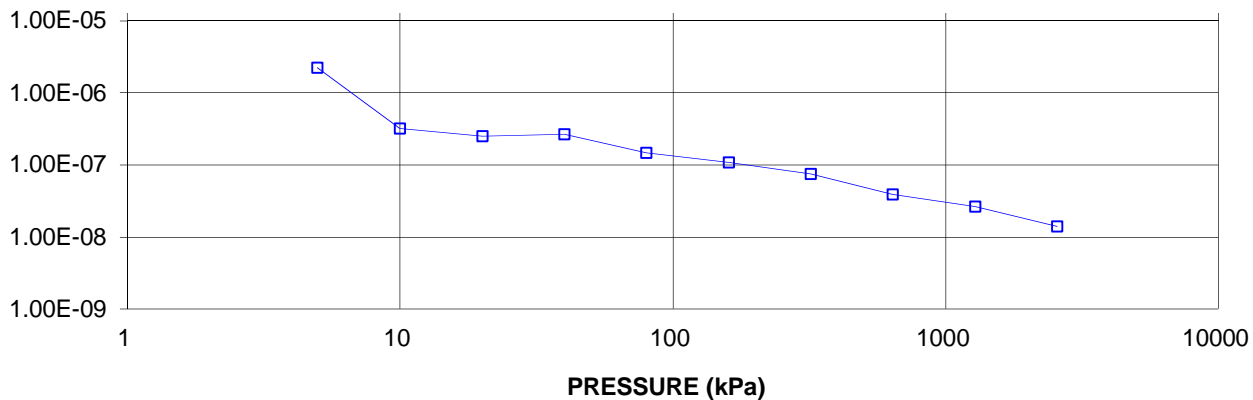
VOLUME COMPRESSIBILITY, m²/kN

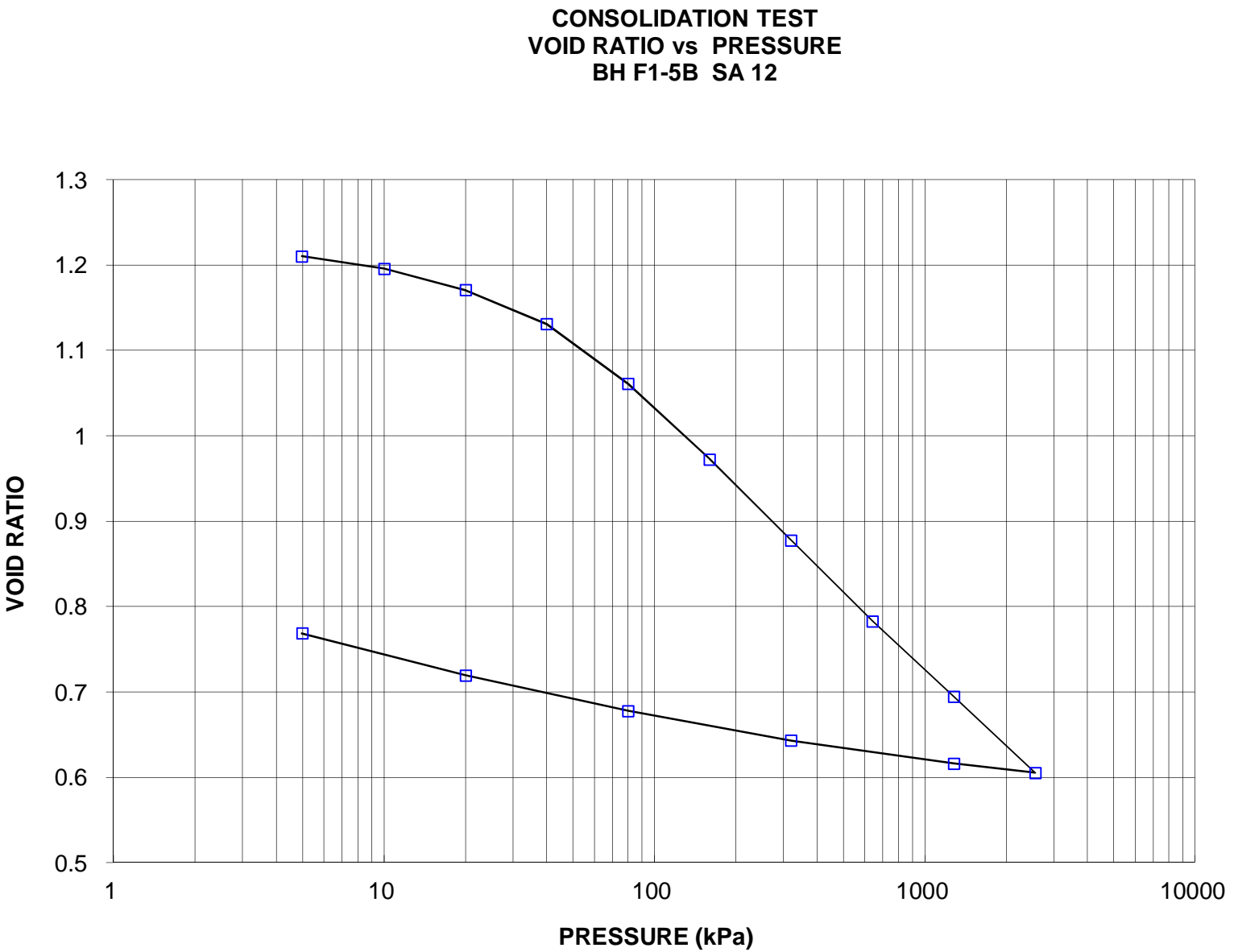
CONSOLIDATION TEST
M_v m²/kN vs PRESSURE (kPa)
BH F1-5B SA 12

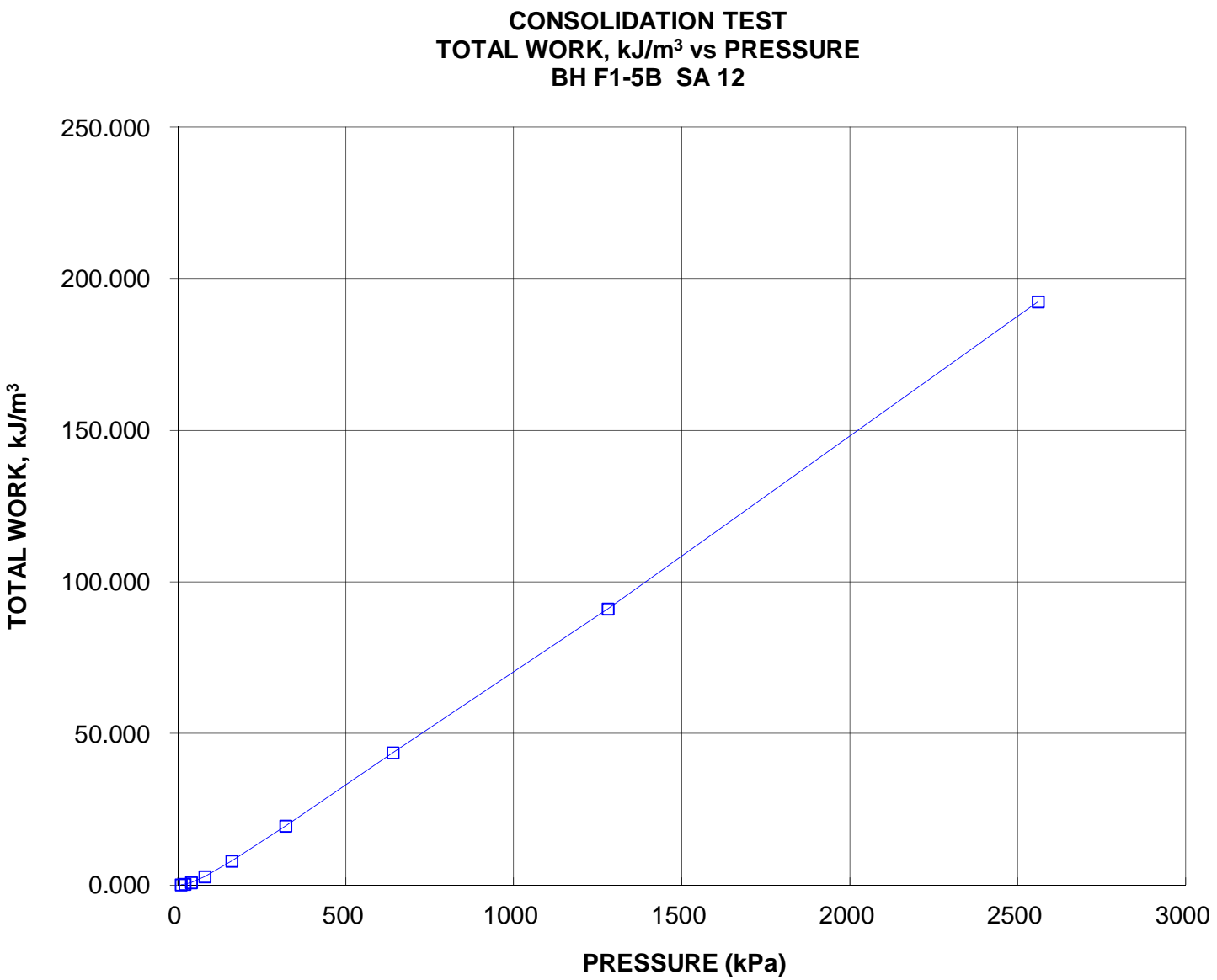


HYDRAULIC CONDUCTIVITY,
cm/s

CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH F1-5B SA 12







CONSOLIDATION TEST SUMMARY**ASTM D2435/D2435M****FIGURE A13****SAMPLE IDENTIFICATION**

Project Number	09-1111-0018	Sample Number	8
Borehole Number	F1-5D	Sample Depth, m	6.10-6.71

TEST CONDITIONS

Test Type	Laboratory Standard	Load Duration, hr	24
Oedometer Number	7		
Date Started	11/10/2015		
Date Completed	11/30/2015		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	1.89	Unit Weight, kN/m ³	17.81
Sample Diameter, cm	6.31	Dry Unit Weight, kN/m ³	12.22
Area, cm ²	31.23	Specific Gravity, measured	2.72
Volume, cm ³	58.90	Solids Height, cm	0.864
Water Content, %	45.77	Volume of Solids, cm ³	26.97
Wet Mass, g	106.95	Volume of Voids, cm ³	31.93
Dry Mass, g	73.37	Degree of Saturation, %	105.2

TEST COMPUTATIONS

Stress	Corr.		Average				
kPa	Height	Void	Height	t ₉₀	cv.	mv	k
	cm	Ratio	cm	sec	cm ² /s	m ² /kN	cm/s
0.00	1.886	1.184	1.886				
5.80	1.865	1.159	1.875	2774	2.69E-04	1.97E-03	5.18E-08
10.70	1.858	1.151	1.861	3840	1.91E-04	7.57E-04	1.42E-08
20.59	1.828	1.116	1.843	3937	1.83E-04	1.60E-03	2.86E-08
40.26	1.778	1.059	1.803	3330	2.07E-04	1.34E-03	2.72E-08
79.50	1.707	0.976	1.742	3745	1.72E-04	9.63E-04	1.62E-08
20.56	1.723	0.994	1.715				
5.80	1.741	1.016	1.732				
20.56	1.731	1.004	1.736	470	1.36E-03	3.70E-04	4.93E-08
79.50	1.694	0.961	1.712	346	1.80E-03	3.33E-04	5.86E-08
157.79	1.628	0.885	1.661	1109	5.27E-04	4.45E-04	2.30E-08
314.53	1.554	0.799	1.591	1033	5.19E-04	2.52E-04	1.28E-08
627.83	1.484	0.718	1.519	645	7.58E-04	1.18E-04	8.80E-09
1255.23	1.414	0.637	1.449	487	9.14E-04	5.87E-05	5.25E-09
2509.74	1.335	0.546	1.375	205	1.95E-03	3.33E-05	6.37E-09
1255.23	1.349	0.562	1.342				
314.53	1.376	0.593	1.363				
79.50	1.409	0.632	1.392				
20.56	1.450	0.678	1.429				
5.80	1.489	0.724	1.469				

Note:

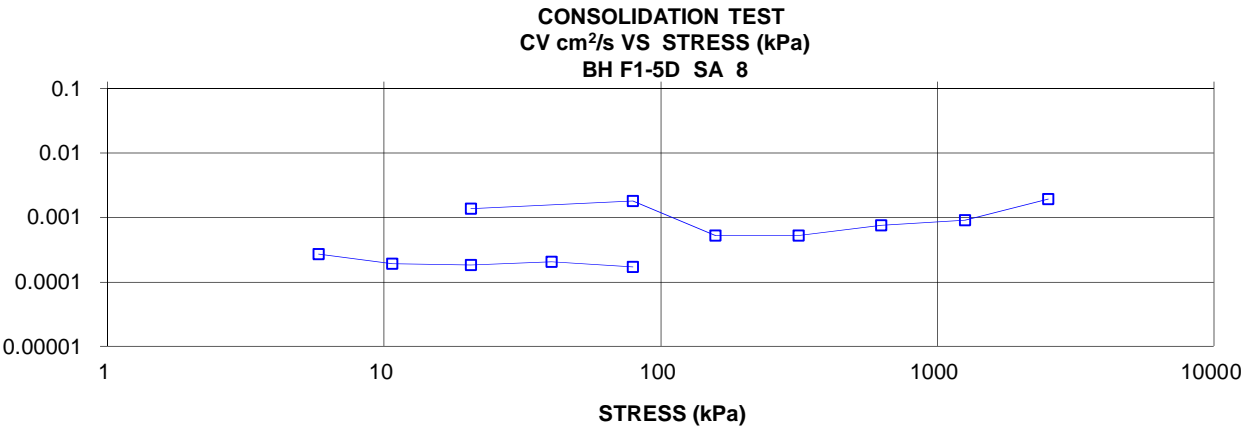
Consolidation loading and unloading schedule assigned by the client.

Specimen taken 23-33 cm from bottom of the tube

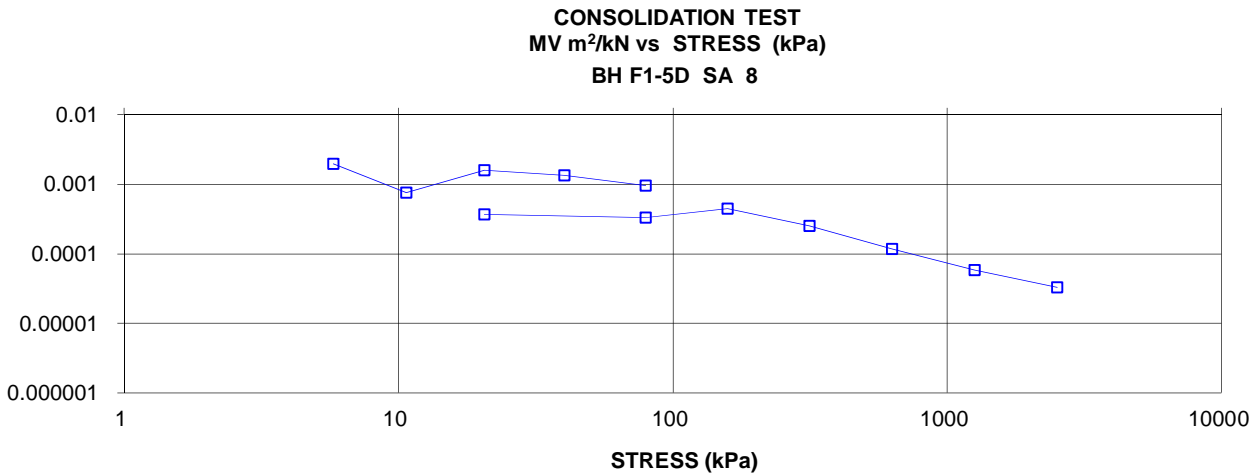
k calculated using cv based on t₉₀ values.**SAMPLE DIMENSIONS AND PROPERTIES - FINAL**

Sample Height, cm	1.49	Unit Weight, kN/m ³	20.08
Sample Diameter, cm	6.31	Dry Unit Weight, kN/m ³	15.47
Area, cm ²	31.23	Specific Gravity, measured	2.72
Volume, cm ³	46.50	Solids Height, cm	0.864
Water Content, %	29.81	Volume of Solids, cm ³	26.97
Wet Mass, g	95.24	Volume of Voids, cm ³	19.53
Dry Mass, g	73.37		

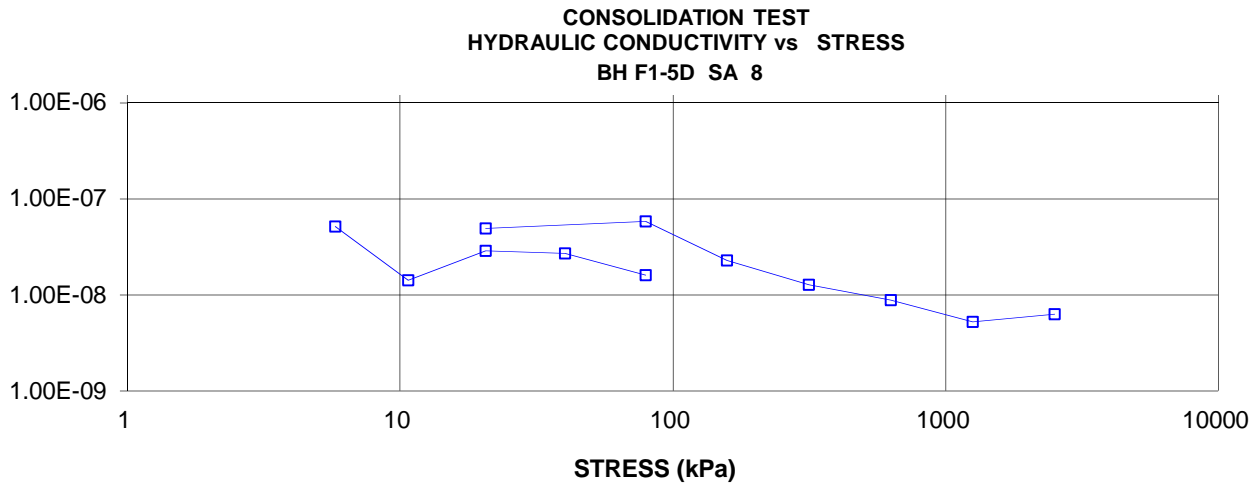
COEFFICIENT OF CONSOLIDATION,
cm²/s

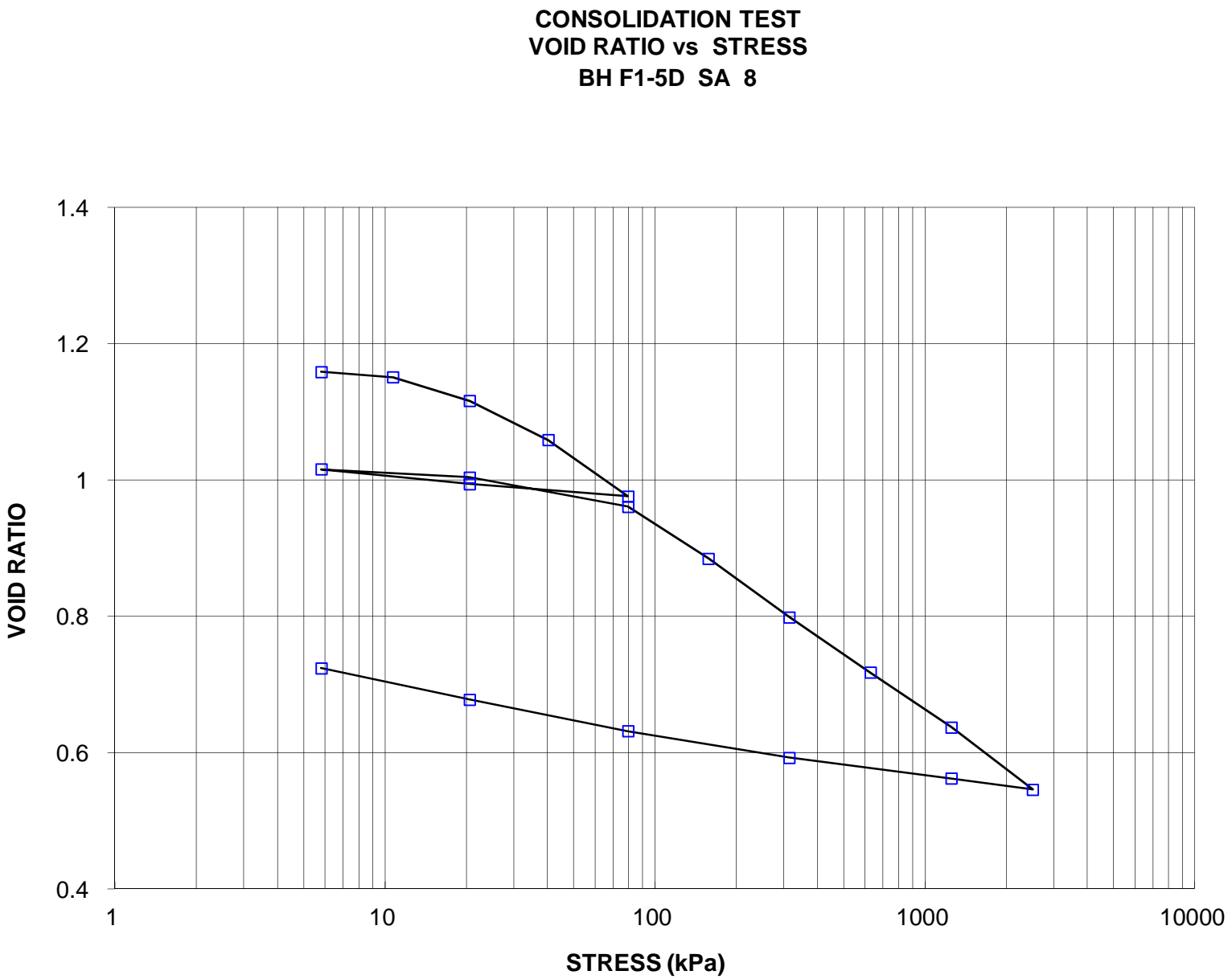


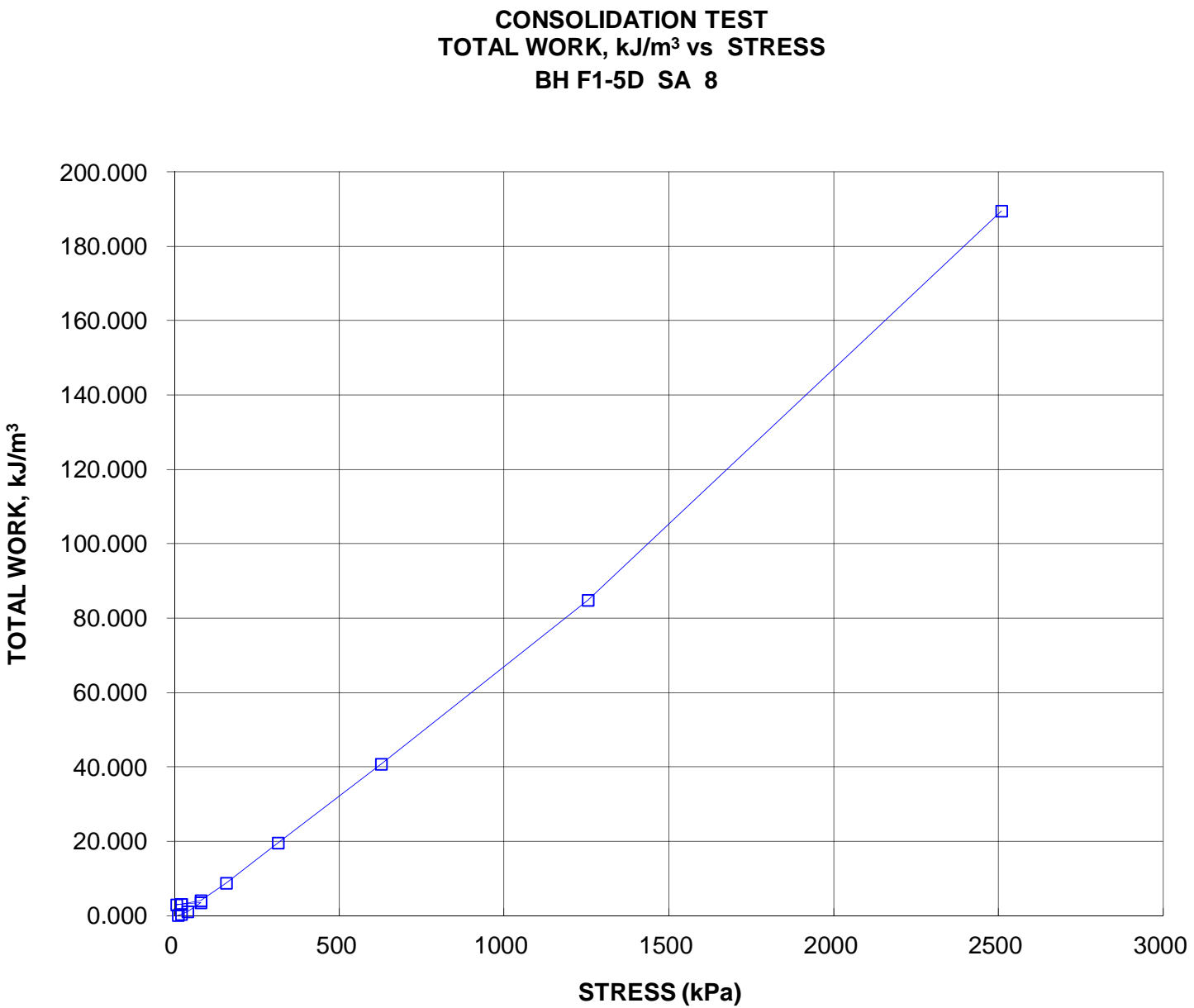
VOLUME COMPRESSIBILITY, m²/kN



HYDRAULIC CONDUCTIVITY,
cm/s



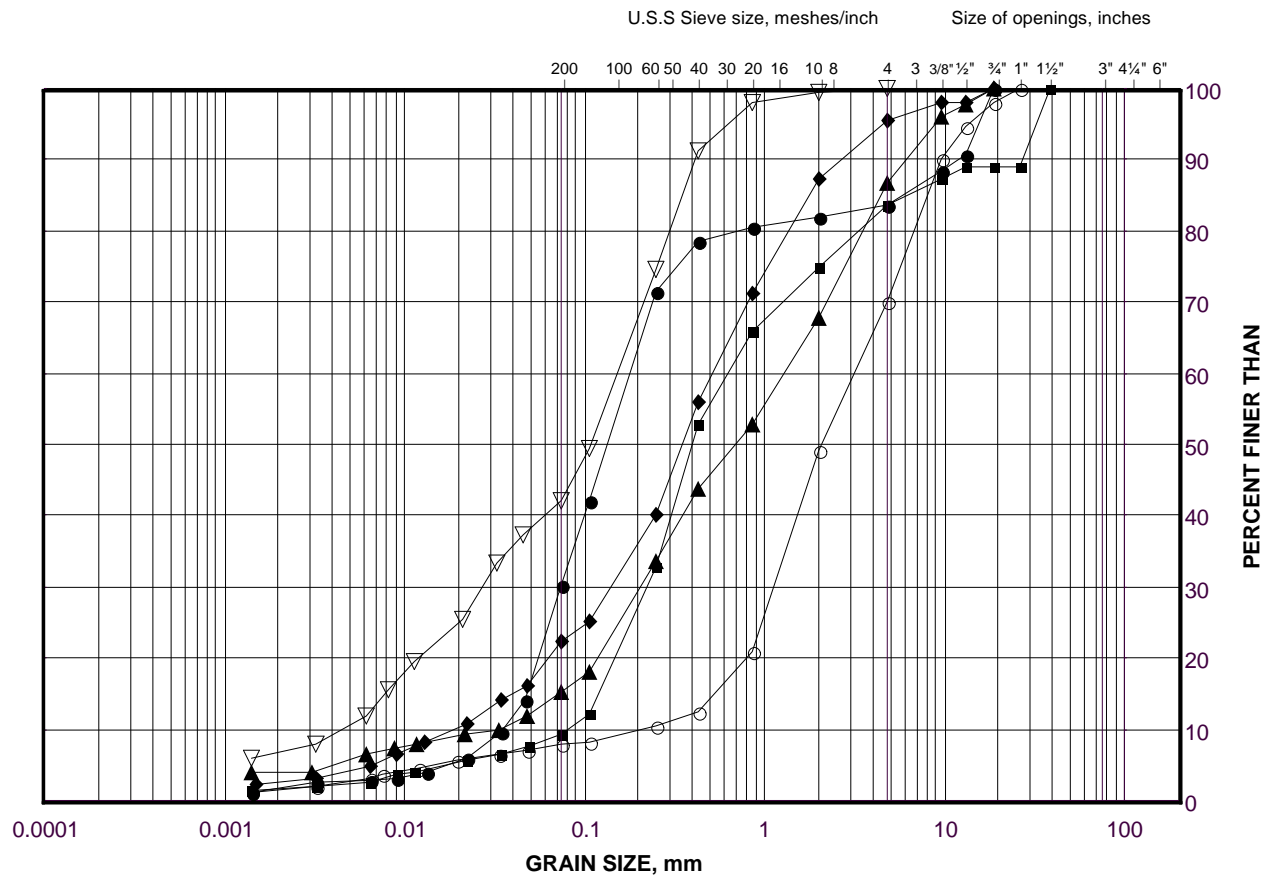




GRAIN SIZE DISTRIBUTION

Silty Sand to Sand and Gravel

FIGURE A14



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F1-5D	10	289.0
■	F1-5A	11	288.5
◆	F1-5G	13	284.8
▲	F1-5B	16	285.1
▽	F1-5A	8	293.1
○	F1-5A	9	291.6

Project Number: 09-1111-0018

Checked By: TWB

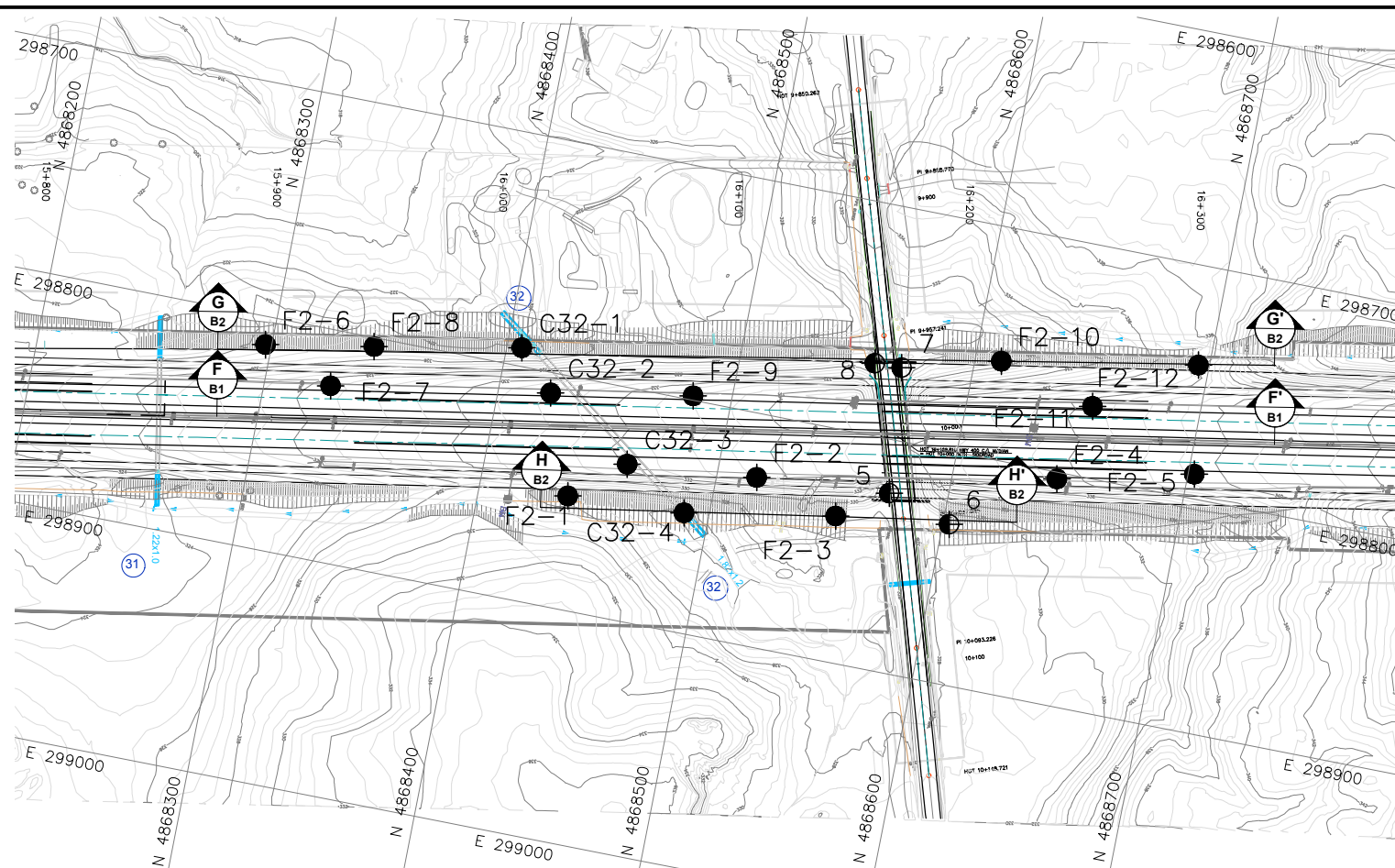
Golder Associates

Date: 06-Jan-16

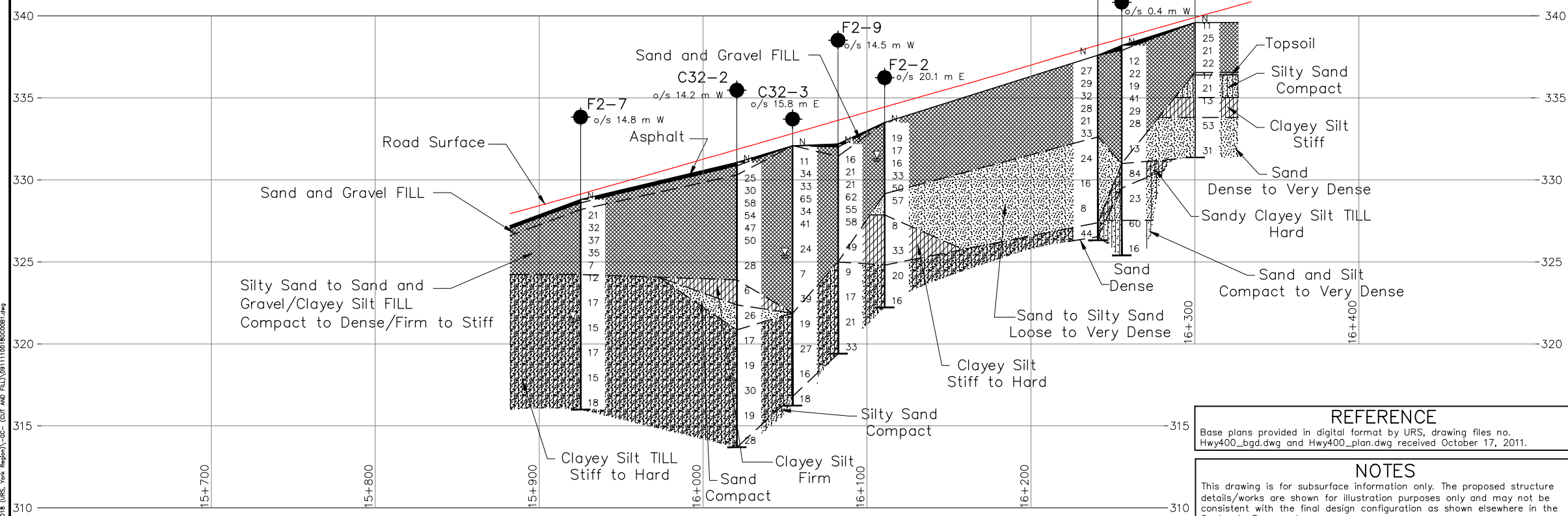


APPENDIX B

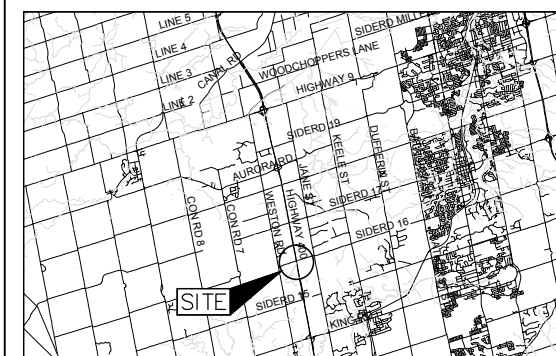
**HIGH FILL EMBANKMENT AREA 2 (Stations 16+000 to 16+350
NBL and Stations 15+850 to 16+350 SBL)**



PLAN

SCALE
30 0 30 60 mHIGH FILL EMBANKMENT AREA 2 – CENTRELINE PROFILE
(STATION 15+850 to 16+350)HORIZONTAL SCALE
30 0 30 60 m
VERTICAL SCALE
3 0 3 6 m**METRIC**
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.CONT No.
GWP No. 2835-02-00HIGHWAY 400 HIGH FILL EMBANKMENTS
STAT. 15+850 TO STA. 16+350 (SBL)
STAT. 16+000 TO STA. 16+350 (NBL)
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

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

KEY PLAN

SCALE
4 0 4 8 km

LEGEND

- Borehole – Current Investigation
- Borehole – Previous Investigation 1
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
5	328.8	4868574.7	298823.0
6	328.9	4868602.7	298831.2
7	329.8	4868569.5	298768.7
8	329.6	4868557.7	298769.0
C32-1	324.1	4868406.5	298792.0
C32-2	331.1	4868422.5	298808.8
C32-3	332.1	4868461.0	298832.6
C32-4	327.7	4868489.2	298848.5
F2-1	328.0	4868438.4	298851.1
F2-2	333.5	4868517.1	298827.4
F2-3	328.4	4868553.8	298837.2
F2-4	337.6	4868644.8	298802.9
F2-5	339.6	4868702.7	298789.4
F2-6	324.5	4868297.4	298812.1
F2-7	328.8	4868328.4	298824.1
F2-8	325.0	4868343.6	298803.8
F2-9	332.2	4868483.3	298798.1
F2-10	331.5	4868611.3	298757.6
F2-11	338.2	4868653.8	298769.1
F2-12	337.5	4868695.3	298742.8

REFERENCE

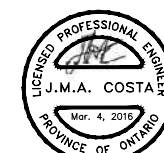
Base plans provided in digital format by URS, drawing files no.
Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

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.

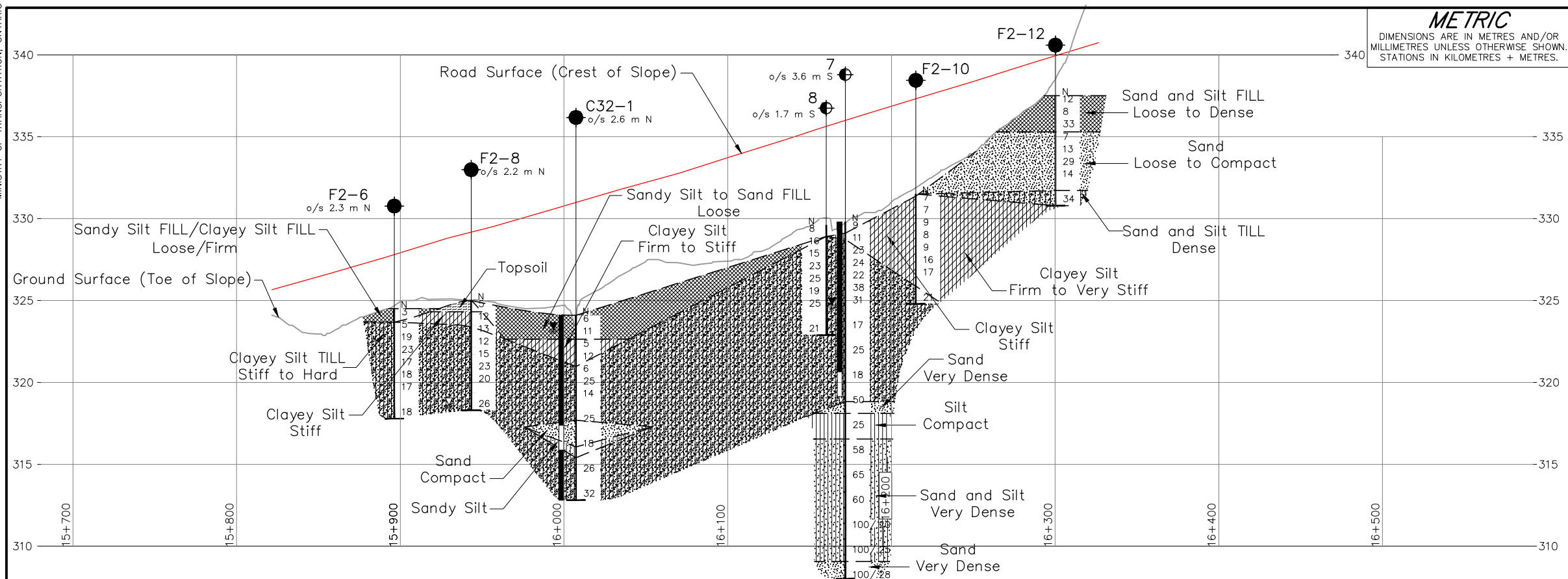
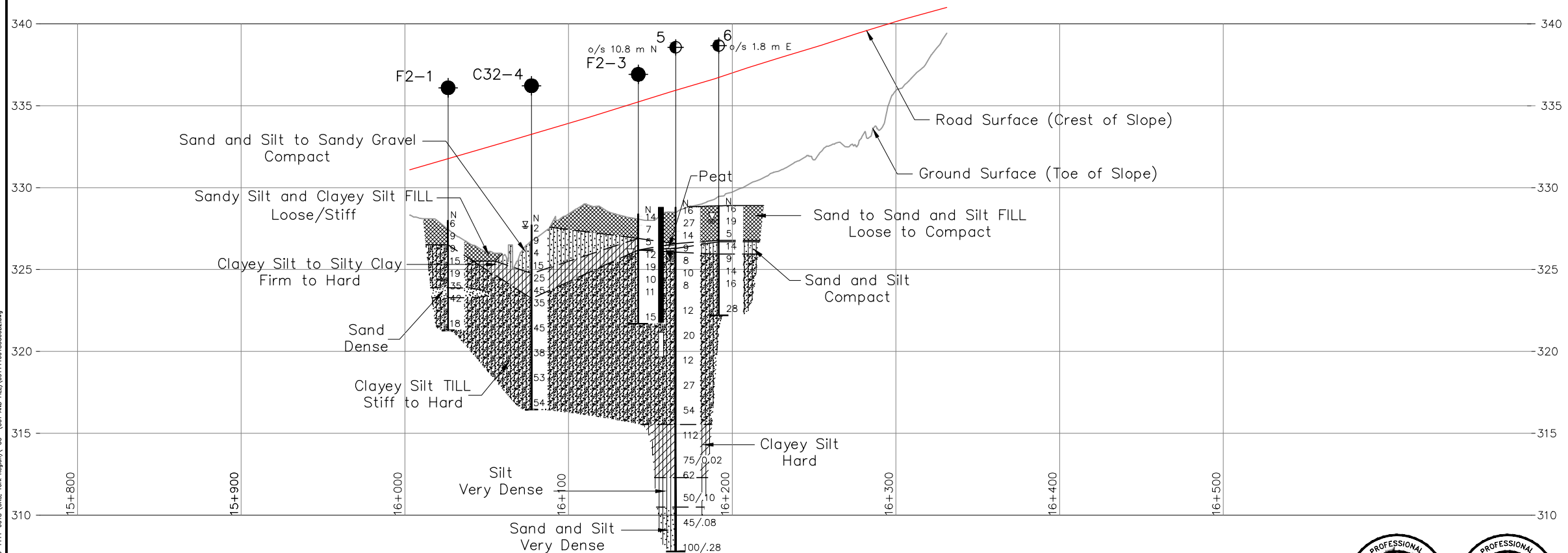
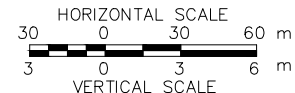
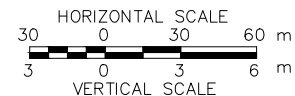
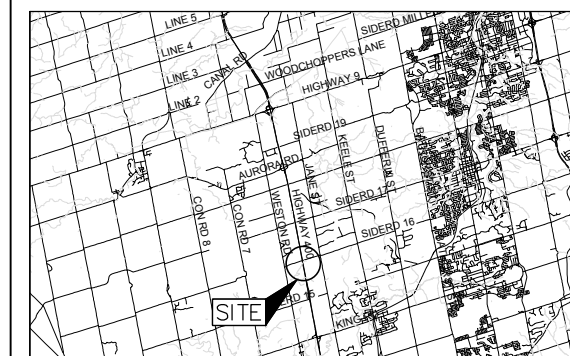
The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

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.



Geocres No. 30M13-217

HWY. 400	PROJECT NO. 09-1111-0018	DIST. CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC
		DWG. B1

G-G
B1**HIGH FILL EMBANKMENT AREA 2 – SBL PROFILE**
(STATION 15+850 to 16+350)H-H
B1**HIGH FILL EMBANKMENT AREA 2 – NBL PROFILE**
(STATION 16+000 to 16+350)**CONT No.**
GWP No. 2835-02-00**HIGHWAY 400 HIGH FILL EMBANKMENTS****SHEET**STAT. 15+850 TO STA. 16+350 (SBL)
STAT. 15+850 TO STA. 16+350 (NBL)**SOIL STRATA****Golder Associates Ltd.**
MISSISSAUGA, ONTARIO, CANADA**KEY PLAN**SCALE
4 0 4 8 km**LEGEND**

- Borehole – Current Investigation
- Borehole – Previous Investigation 1
- ⊥ Seal
- ⊥ Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- WL in piezometer, measured on Apr. 07, 2011
- WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
5	328.8	4868574.7	298823.0
6	328.9	4868602.7	298831.2
7	329.8	4868569.5	298768.7
8	329.6	4868557.7	298769.0
C32-1	324.1	4868406.5	298792.0
C32-4	327.7	4868489.2	298848.5
F2-1	328.0	4868438.4	298851.1
F2-3	328.4	4868553.8	298837.2
F2-6	324.5	4868297.4	298812.1
F2-8	325.0	4868343.6	298803.8
F2-10	331.5	4868611.3	298757.6
F2-12	337.5	4868695.3	298742.8

REFERENCE

Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

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.



Geocres No. 30M13-217

HWY. 400	PROJECT NO. 09-1111-0018	DIST. CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC
		DWG. B2

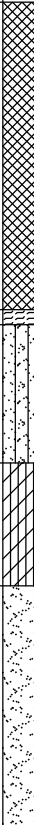
PROJECT		09-1111-0018		RECORD OF BOREHOLE No F2-1		SHEET 1 OF 1		METRIC																				
W.P.		2835-02-00		LOCATION		N 4868438.4 ; E 298851.1		ORIGINATED BY CS																				
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY SKB																				
DATUM		Geodetic		DATE		November 11, 2010		CHECKED BY JMAC																				
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			WATER CONTENT (%)			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																						
328.0	0.0	GROUND SURFACE																										
	0.2	TOPSOIL																										
		Sandy silt, trace gravel, trace clay, containing rootlets (FILL)		1	SS	6																						
		Loose Brown Moist																										
327.1	0.9	Clayey silt, trace gravel, trace sand (FILL)		2	SS	9																						
		Stiff Brown Moist																										
326.5	1.5	CLAYEY SILT, trace to some sand, trace gravel (TILL)																										
		Stiff to very stiff Brown Moist																										
		Silt and sand seams between depths of 1.5 m and 2.1 m																										
				3	SS	9																						
				4	SS	15																						
				5	SS	19																						
323.9	4.1	SAND, some silt, trace clay		6A	SS	35																						
		Dense Brown Wet		6B																								
323.3	4.7	CLAYEY SILT, some sand, trace gravel (TILL)		7A																								
		Very stiff to hard Brown Moist		7B	SS	42																						
		Becoming grey and wet at a depth of 5.6 m																										
				8	SS	18																						
321.3	6.7	END OF BOREHOLE																										
		NOTE:																										
		1. Water level in open borehole at a depth of 3.6 m below ground surface (Elev. 324.4 m) upon completion of drilling.																										

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F2-2		SHEET 1 OF 1		METRIC												
W.P. 2835-02-00		LOCATION N 4868517.1 ; E 298827.4		ORIGINATED BY TT														
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY SKB														
DATUM Geodetic		DATE November 11, 2010		CHECKED BY JMAC														
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)					
								20 40 60 80 100	20 40 60 80 100	W _p	W	W _L						
								○ UNCONFINED + FIELD VANE	○ UNCONFINED + FIELD VANE									
								● QUICK TRIAXIAL × REMOULDED	● QUICK TRIAXIAL × REMOULDED									
								20 40 60 80 100	20 40 60 80 100									
333.5	GROUND SURFACE																	
0.0	Sand and silt, trace to some clay, trace gravel (FILL) Compact Brown Moist																	
			1A	SS	19													
			1B															
			2	SS	17													
	Silt and sand lenses below a depth of 2.3 m		3	SS	16													
			4	SS	33													
329.8																		
3.7	Silty sand, trace gravel, trace clay (FILL)		5	SS	50													
329.2	Very dense Brown Moist																	
4.3	SILTY SAND, trace clay Very dense Brown Moist		6	SS	57													
327.9																		
5.6	Sandy CLAYEY SILT, trace gravel Stiff to hard Brown Moist		7	SS	8													
			8	SS	33													
324.8																		
8.7	CLAYEY SILT, trace to some sand, trace gravel (TILL) Very stiff Brown Moist		9	SS	20													
322.2			10	SS	16													
11.3	END OF BOREHOLE																	
	NOTE: 1. Water level in open borehole at a depth of 2.1 m below ground surface (Elev. 331.4 m) upon completion of drilling.																	

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F2-3		SHEET 1 OF 1		METRIC					
W.P.		2835-02-00		LOCATION		N 4868553.8 ; E 298837.2		ORIGINATED BY					
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY					
DATUM		Geodetic		DATE		November 11, 2010		CHECKED BY					
								JMAC					
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC NATURAL LIQUID UNIT REMARKS				
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 (%)	γ	GR SA SI CL
328.4	0.0	GROUND SURFACE											
	0.2	TOPSOIL											
	0.7	Silty sand, some clay, trace gravel, containing rootlets (FILL) Compact Brown Moist		1	SS	14		328					
				2	SS	7							
	1.5	Clayey silt, some sand, trace gravel, slightly organic (FILL) Firm Brown Moist		3	SS	5		327					
	2.2	SILTY CLAY, some sand, containing zones of oxidation staining, slightly organic Firm Brown and grey Moist		4	SS	12		326					
		CLAYEY SILT, trace to some sand, trace gravel, containing zones of oxidation stain to a depth of 4.5 m (TILL) Stiff to very stiff Brown to grey Moist Becoming grey at a depth of 3.7 m Becoming wet at a depth of 4.5 m		5	SS	19		325					
				6	SS	10		324					
				7	SS	11		323					
				8	SS	15		322					
321.7	6.7	END OF BOREHOLE											
NOTE: 1. Water level in open borehole at a depth of 2.6 m below ground surface (Elev. 325.8 m) upon completion of drilling.													

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F2-4		SHEET 1 OF 1		METRIC	
W.P. <u>2835-02-00</u>		LOCATION <u>N 4868644.8 ; E 298802.9</u>		ORIGINATED BY <u>TT</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger</u>		COMPILED BY <u>SKB</u>			
DATUM <u>Geodetic</u>		DATE <u>November 12, 2010</u>		CHECKED BY <u>JMAC</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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)							
								20	40	60	80	100	W _p	W	W _L					
337.6	GROUND SURFACE																			
0.0	Silty sand to sandy silt, trace gravel, trace clay (FILL) Dense Brown Moist		1	SS	27															
			2	SS	29															
	Clayey silt lenses between depths of 2.2 m and 3.0 m		3	SS	32															
			4	SS	28															
			5	SS	21															
332.6			6	SS	33															
5.0	SAND, some silt, trace to some gravel, trace clay Loose to compact Brown Moist		7	SS	24															
			8	SS	16															
			9	SS	8															
327.4																				
10.2	Sandy CLAYEY SILT, trace gravel (TILL) Hard Brown Moist		10A	SS	44															
326.5			10B																	
11.3	SAND, some silt, trace gravel Dense Brown Moist END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.																			

PROJECT		2835-02-00		LOCATION		N 4868702.7 ; E 298789.4		ORIGINATED BY		SB								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		ARM								
DATUM		Geodetic		DATE		November 12, 2010		CHECKED BY		JMAC								
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												
339.6 0.0	GROUND SURFACE Sand and silt, trace to some clay, trace gravel, containing rootlets (FILL) Compact Brown Moist		1	SS	11													5 57 31 7
			2	SS	25													
			3	SS	21													
			4A 4B	SS	22													
336.6 3.2	TOPSOIL Silty SAND, trace clay, trace gravel Compact Brown Moist		5	SS	17													2 45 42 11
		6	SS	21														
335.0 4.6	CLAYEY SILT, some sand, trace gravel Stiff Brown Moist	7	SS	13														
333.8 5.8	SAND, some silt, trace clay, trace gravel Dense to very dense Brown Moist	8	SS	53														
331.4 8.2	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.		9	SS	31													1 77 19 3

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F2-6		SHEET 1 OF 1		METRIC	
W.P. 2835-02-00		LOCATION N 4868297.4 ; E 298812.1		ORIGINATED BY TT			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY			
DATUM Geodetic		DATE November 15, 2011		CHECKED BY JMAC			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED									
							20	40	60	80	100		10	20	30		
324.5	GROUND SURFACE																
0.9	TOPSOIL													○			
323.7	Sandy silt, trace clay, trace gravel, containing roots (FILL)		1	SS	3												
0.8	Loose Brown Moist		2	SS	5									○			
323.0	Clayey silt, some sand, trace gravel (FILL)																
1.5	Firm Brown Moist		3	SS	19									○	—		3 25 48 24
	CLAYEY SILT, some sand to sandy, trace gravel (TILL)																
	Very stiff Brown and grey Moist		4A 4B	SS	23									○			
	Sand seam at a depth of 2.7 m																
	Becoming brown at a depth of 2.7 m		5	SS	17									○	—		
	Becoming grey at a depth of 3.4 m																
			6	SS	18									○			
			7	SS	17									○	—		1 14 60 25
			8	SS	18									○			
317.8	Sand seam at a depth of 6.5 m																
6.7	END OF BOREHOLE																
	NOTE: 1. Borehole dry upon completion of drilling.																

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PROJECT 09-1111-0018			RECORD OF BOREHOLE No F2-7			SHEET 1 OF 1			METRIC								
W.P. 2835-02-00			LOCATION N 4868328.4 ; E 298824.1			ORIGINATED BY SB											
DIST Central HWY 400			BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger			COMPILED BY SKB											
DATUM Geodetic			DATE November 16 and 17, 2010			CHECKED BY JMAC											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)
328.8	GROUND SURFACE							20	40	60	80	100					
0.0	ASPHALT																
0.2	Sand and gravel (FILL)																
328.2	Brown Moist																
0.6	Silty sand, trace gravel, trace to some clay (FILL) Loose to dense Brown Moist		1	SS	21		328										
			2	SS	32		327										
			3	SS	37		326									2	69 24 5
			4	SS	35		325										
			5	SS	7		324									0	66 24 10
324.2	CLAYEY SILT, trace to some sand, trace gravel (TILL) Stiff to very stiff Brown Moist		6	SS	12		323										
4.6			7	SS	17		322										
			8	SS	15		321									2	10 62 26
			9	SS	17		320										
			10	SS	15		319										
			11	SS	18		318										
							317										
316.0	END OF BOREHOLE						316										
12.8	NOTE: 1. Water level in open borehole at a depth of 7.3 m below ground surface (Elev. 321.5 m) upon completion of drilling.																



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


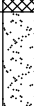

+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F2-10		SHEET 1 OF 1		METRIC	
W.P. <u>2835-02-00</u>		LOCATION <u>N 4868611.3 ; E 298757.6</u>		ORIGINATED BY <u>SB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>ARM</u>			
DATUM <u>Geodetic</u>		DATE <u>November 12, 2010</u>		CHECKED BY <u>JMAC</u>			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED												
331.5	GROUND SURFACE						20	40	60	80	100									
0.0	TOPSOIL																			
0.1	CLAYEY SILT, some sand to CLAYEY SILT with SAND, trace to some gravel, containing rootlets Firm to very stiff Brown Moist		1	SS	7								○							
			2	SS	7								○							
			3	SS	9								⊞			6 38 40 16				
			4A	SS	8								○							
	Sand interlayer between depths of 2.7 m and 3 m		4B										○							
			5	SS	9								⊞			0 13 65 22				
			6	SS	16								○							
			7	SS	17								⊞							
325.9																				
5.6	CLAYEY SILT, some sand, trace gravel (TILL) Very stiff Brown Moist																			
			8	SS	21								○							
324.8																				
6.7	END OF BOREHOLE																			
	NOTE: 1. Open borehole dry upon completion of drilling.																			

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PROJECT		09-1111-0018		RECORD OF BOREHOLE No F2-11		SHEET 1 OF 1		METRIC																
W.P.		2835-02-00		LOCATION		N 4868653.8 ; E 298769.1		ORIGINATED BY																
DIST		Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY																
DATUM		Geodetic		DATE		November 14, 2010		CHECKED BY																
JMAC																								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																		
338.2	0.0	GROUND SURFACE																						
337.9	0.3	ASPHALT																						
337.4	0.8	Sand and gravel (FILL) Brown Moist																						
		Sandy clayey silt, trace to some gravel (FILL) Stiff to very stiff Brown Moist		1	SS	12																		
				2	SS	22																		
				3	SS	19																		
335.1	3.1	Sand, trace to some silt, trace clay (FILL) Compact to dense Brown Moist		4	SS	41																		
				5	SS	29																		
				6	SS	28																		
		Containing trace gravel below a depth of 6.1 m below ground surface		7	SS	13																		
331.0	7.2	Sandy CLAYEY SILT, trace gravel (TILL) Hard Brown Moist		8A 8B	SS	84																		
329.5	8.7	Silty SAND, trace clay Compact Brown Moist		9	SS	23																		
327.5	10.7	SILT and SAND, trace to some clay Compact to very dense Brown Moist		10	SS	60																		
				11	SS	16																		
325.4	12.8	END OF BOREHOLE																						
		NOTE: 1. Open borehole dry upon completion of drilling.																						

PROJECT		RECORD OF BOREHOLE		No F2-12		SHEET 1 OF 1		METRIC										
W.P. 2835-02-00		LOCATION		N 4868695.3 ; E 298742.8		ORIGINATED BY		SB										
DIST Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY												
DATUM Geodetic		DATE		November 12, 2010		CHECKED BY		JMAC										
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
337.5 0.0	GROUND SURFACE Sand and silt, trace to some clay, trace gravel, slightly organic (FILL) Loose to dense Brown Moist		1	SS	12													
			2	SS	8													
			3	SS	33													
335.3 2.2	SAND, some silt, trace clay Loose to compact Brown Moist		4	SS	7													
			5	SS	13													
			6	SS	29													
			7	SS	14													
331.7 5.8	Gravelly SILT and SAND, trace to some clay (TILL) Dense Brown Moist		8	SS	34													
330.8 6.7	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.																	

PROJECT		09-1111-0018		RECORD OF BOREHOLE No C32-1		SHEET 1 OF 1		METRIC																
W.P.		2835-02-00		LOCATION		N 4868406.5 ; E 298792.0		ORIGINATED BY																
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Diameter Solid Stem Augers		COMPILED BY																
DATUM		Geodetic		DATE		November 15 and 16, 2010		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			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																		
324.1	0.0	GROUND SURFACE																						
	0.9	TOPSOIL		1	SS	6																		
		Sand, some silt, trace gravel (FILL)		2	SS	11																		
		Loose to compact Brown Moist																						
322.6	1.5	CLAYEY SILT with sand, zones of silty sand, trace organics to a depth of 2.2 m		3	SS	5																		
		Firm to stiff Brown and black to grey below 2.2 m		4	SS	12																		
		Moist Trace to some sand below a depth of 2.2 m																						
321.0	3.1	CLAYEY SILT, trace to some sand, trace gravel (TILL)		5	SS	6																		
		Firm to very stiff Brown to grey below 4.1 m		6	SS	25																		
		Moist to wet below 4.6 m		7	SS	14																		
		Clayey silt to silt layer between 5.6 m and 6.4 m																						
317.7	6.4	SAND, trace to some silt, trace gravel, trace clay		8A	SS	25																		
		Compact Brown Wet		8B																				
316.1	8.0	Sandy SILT, trace gravel, trace clay		9A	SS	18																		
		Compact Brown Moist		9B																				
315.4	8.7	CLAYEY SILT, some sand, trace gravel (TILL)																						
		Very stiff to hard Grey Moist		10	SS	26																		
312.8	11.3	END OF BOREHOLE		11	SS	32																		
		NOTES:																						
		1. Water level in open borehole at a depth of 2.1 m (Elev. 322.0 m) upon completion of drilling.																						
		2. Water level measurements in piezometer:																						
		Date Depth (m) Elev. (m)																						
		12/22/10 0.9 323.2																						
		02/01/11 0.9 323.2																						
		04/07/11 0.2 323.9																						

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PROJECT		RECORD OF BOREHOLE		No C32-2		SHEET 1 OF 2		METRIC	
W.P.		LOCATION		ORIGINATED BY		DIST		BOREHOLE TYPE	
DATE		DATE		COMPILED BY		DATUM		CHECKED BY	
09-1111-0018		N 4868422.5 ; E 298808.8		SB		Central HWY 400		D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers	
November 15 and 16, 2010		November 15 and 16, 2010		SKB/HS		Geodetic		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			20	40	60	80	100	W _p	W	W _L		
331.1	GROUND SURFACE																
0.0	ASPHALT																
0.2	Sand and gravel (FILL) Brown Moist																
330.3	Silty sand, trace gravel, trace to some clay (FILL) Compact to very dense Brown Moist		1	SS	25												
0.8			2	SS	30												
			3	SS	58												
			4	SS	54												
			5	SS	47												
			6	SS	50												
			7	SS	28												
323.9	CLAYEY SILT, trace to some sand, sand pockets and trace organics Firm Grey Moist		8	SS	6												
7.2																	
322.4	SAND, some silt, some clay, some gravel Compact Brown Moist to wet		9	SS	26												
8.7																	
320.9	CLAYEY SILT, some sand, trace gravel (TILL) Very stiff Brown to grey below 13.7 m Moist		10	SS	17												
10.2																	
			11	SS	19												
			12	SS	30												

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

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PROJECT 09-1111-0018				RECORD OF BOREHOLE No C32-2				SHEET 2 OF 2				METRIC						
W.P. 2835-02-00				LOCATION N 4868422.5 ; E 298808.8				ORIGINATED BY SB										
DIST Central HWY 400				BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers				COMPILED BY SKB/HS										
DATUM Geodetic				DATE November 15 and 16, 2010				CHECKED BY SMM										
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					WATER CONTENT (%)					
	--- CONTINUED FROM PREVIOUS PAGE ---							20	40	60	80	100						
	CLAYEY SILT, some sand, trace gravel (TILL) Very stiff Brown to grey below 13.7 m Moist		13	SS	19		315											
313.7 17.4	END OF BOREHOLE		14	SS	28		314											
	NOTE: 1. Water level in open borehole at a depth of 13.1 m (Elev. 318.0 m) upon completion of drilling.																	

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No C32-3		SHEET 1 OF 2		METRIC	
W.P. <u>2835-02-00</u>		LOCATION <u>N 4868461.0 ; E 298832.6</u>		ORIGINATED BY <u>TT</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers</u>		COMPILED BY <u>SKB/HS</u>			
DATUM <u>Geodetic</u>		DATE <u>November 10, 2010</u>		CHECKED BY <u>SMM</u>			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					w _p	w	w _L		GR	SA	SI	CL		
								20	40	60	80	100									○ UNCONFINED	+ FIELD VANE
332.1	GROUND SURFACE																					
0.0	Clayey silt with sand, some gravel (FILL) Stiff Brown Moist		1	SS	11																	
330.6																						
1.5	Silty sand to sand, some silt, trace to some clay, trace gravel, clayey silt lenses to a depth of 2.9 m (FILL) Compact to very dense Brown Moist		2	SS	34																	
			3	SS	33								○				13	55	26	6		
			4	SS	65																	
			5	SS	34																	
			6	SS	41								○					0	85	14	1	
			7	SS	24																	
324.9																						
7.2	Clayey silt, trace to some sand, trace organics to a depth of 7.7 m (FILL) Firm Brown Moist		8	SS	7																	
323.4																						
8.7	Sand and gravel, some silt, trace clay, lenses of clayey silt (FILL) Dense Brown Wet		9	SS	39								○					35	50	13	2	
321.9																						
10.2	CLAYEY SILT, trace to some sand, trace gravel (TILL) Very stiff Grey Moist		10	SS	19														0	12	68	20
			11	SS	27																	
			12	SS	16																	

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

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PROJECT		RECORD OF BOREHOLE No C32-3				SHEET 2 OF 2		METRIC									
W.P. 09-1111-0018		LOCATION N 4868461.0 ; E 298832.6				ORIGINATED BY TT											
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers				COMPILED BY SKB/HS											
DATUM Geodetic		DATE November 10, 2010				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									WATER CONTENT (%)
	--- CONTINUED FROM PREVIOUS PAGE ---						20	40	60	80	100						
316.8						317											
15.3	Silty SAND		13A	SS	18												
316.2	Compact Brown Wet		13B														
15.9	END OF BOREHOLE																
NOTE: Water level in open borehole at a depth of 6.7 m (Elev. 325.4 m) upon completion of drilling.																	

PROJECT 09-1111-0018			RECORD OF BOREHOLE No C32-4			SHEET 1 OF 1			METRIC								
W.P. 2835-02-00			LOCATION N 4868489.2 ; E 298848.5			ORIGINATED BY CS											
DIST Central HWY 400			BOREHOLE TYPE D-50 Track Mount, 108 mm Diameter Solid Stem Augers			COMPILED BY SKB/HS											
DATUM Geodetic			DATE October 29, 2010			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									WATER CONTENT (%)
327.7	GROUND SURFACE							20	40	60	80	100					
0.0	Sandy clayey silt, zones of oxidation staining, trace rootlets (FILL) Very soft to stiff Brown to grey below 0.8 m Moist to wet below 1.5 m		1	SS	2											44.8	
			2	SS	9												
			3	SS	4												
325.5																	
2.2	Sand and silt, trace clay, trace gravel (FILL) Compact Brown Wet		4A	SS	15												
325.0			4B														
3.0	Sandy gravel, trace to some silt, trace clay, trace organics (FILL) Compact Brown Wet		5	SS	25												
			6	SS	45												
323.2	CLAYEY SILT, trace to some sand, sand seams and silty clay lens at a depth of 4.3 m Very stiff to hard Brown Wet		7	SS	35												
4.5																	
	CLAYEY SILT, trace to some sand, trace gravel (TILL) Hard Grey Wet																
			8	SS	45												
			9	SS	38												
			10	SS	53												
			11	SS	54												
316.4	END OF BOREHOLE																
11.3	NOTE: 1. Water level in open borehole at a depth of 0.1 m (Elev. 327.6 m) upon completion of drilling.																

PROJECT 09-1111-0018		RECORD OF BOREHOLE No 5		SHEET 1 OF 2	METRIC
W.P. 2835-02-00		LOCATION N 4868574.7 ; E 298823.0		ORIGINATED BY TT	
DIST Central HWY 400		BOREHOLE TYPE 108 mm Inside Diameter Hollow Stem Augers		COMPILED BY CS	
DATUM Geodetic		DATE March 30 and 31, 2011		CHECKED BY TVA	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × REMOULDED					
328.8	GROUND SURFACE							20 40 60 80 100	10 20 30					
0.0	Gravelly sand, some silt, containing clayey silt layers and rootlets (FILL)		1	SS	16									
328.1	Compact Brown Moist		2	SS	27									
0.7	Sand, some silt, trace gravel, containing zones of clayey silt (FILL)													
327.4	Compact Brown Moist		3	SS	14									
1.5	Sand and silt, trace clay (FILL)													
326.6	Compact Grey Moist		4A	SS	9									
326.3	PEAT Stiff Black Moist		4B	SS	9									
2.7	SILT and SAND Loose Grey Moist		5	SS	8									
	CLAYEY SILT, trace sand to sandy, trace gravel, containing sand seams to a depth of 4.5 m (TILL) Stiff to hard Brown and grey Moist		6	SS	10									
			7	SS	8									
			8	SS	12									
			9	SS	20									
			10	SS	12									
			11	SS	27									
			12	SS	54									
315.5	CLAYEY SILT, some sand to sandy, containing sand and silt seams Hard Brown Moist		13	SS	112									
13.3														

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

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

PROJECT		2835-02-00		LOCATION		N 4868602.7 ; E 298831.2		ORIGINATED BY		TT									
DIST		Central HWY 400		BOREHOLE TYPE		108 mm Outside Diameter Solid Stem Augers		COMPILED BY		CS									
DATUM		Geodetic		DATE		March 31, 2011		CHECKED BY		TVA									
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													
328.9	GROUND SURFACE					20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					20 40 60 80 100 WATER CONTENT (%)								
0.9	TOPSOIL		1	SS	16														
	Silty sand, trace to some clay, trace to some gravel (FILL) Loose to compact Brown Moist Becoming grey below a depth of 1.1 m		2	SS	19													1 43 45 11	
			3	SS	5														
326.8	PEAT																		
2.2	SAND and SILT, some clay, containing rootlets Compact Grey Moist		4	SS	14													0 31 55 14	
325.9	CLAYEY SILT, trace to some sand, trace gravel (TILL) Stiff to very stiff Brown and grey Moist		5	SS	9														
3.0	Containing zones of oxidation stain and silty sand interlayers between depths of 3.8 m and 4.4 m		6	SS	14														
			7	SS	16													0 10 65 25	
			8	SS	28														
322.2	END OF BOREHOLE																		
6.7	NOTE: 1. Water level in open borehole at a depth of 0.9 m below ground surface (Elev. 328.0 m) upon completion of drilling.																		

PROJECT 09-1111-0018			RECORD OF BOREHOLE No 7			SHEET 2 OF 2			METRIC								
W.P. 2835-02-00			LOCATION N 4868569.5 ; E 298768.7			ORIGINATED BY TT											
DIST Central HWY 400			BOREHOLE TYPE 108 mm Outside Diameter Solid Stem Augers			COMPILED BY CS											
DATUM Geodetic			DATE March 31 and April 1, 2011			CHECKED BY TVA											
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					WATER CONTENT (%)					
							20	40	60	80	100	10	20	30			
309.1	SAND and SILT, trace clay, containing clayey silt seams between depths of 13.3 m and 14.8 m Very dense Brown Moist		14	SS	65							○					
			15	SS	60												
			16	SS	100/20							○				0 37 61 2	
			17	SS	100/25												
309.1 20.7	SAND, some silt, trace clay Very dense Brown Moist		18	SS	100/28							○				0 86 13 1	
308.0 21.8	END OF BOREHOLE																
	NOTES: 1. Open borehole dry upon completion of drilling. 2. Water level measurements in Piezometer: Date Depth (m) Elev. (m) 04/01/11 Dry - 04/07/11 5.1 324.7																

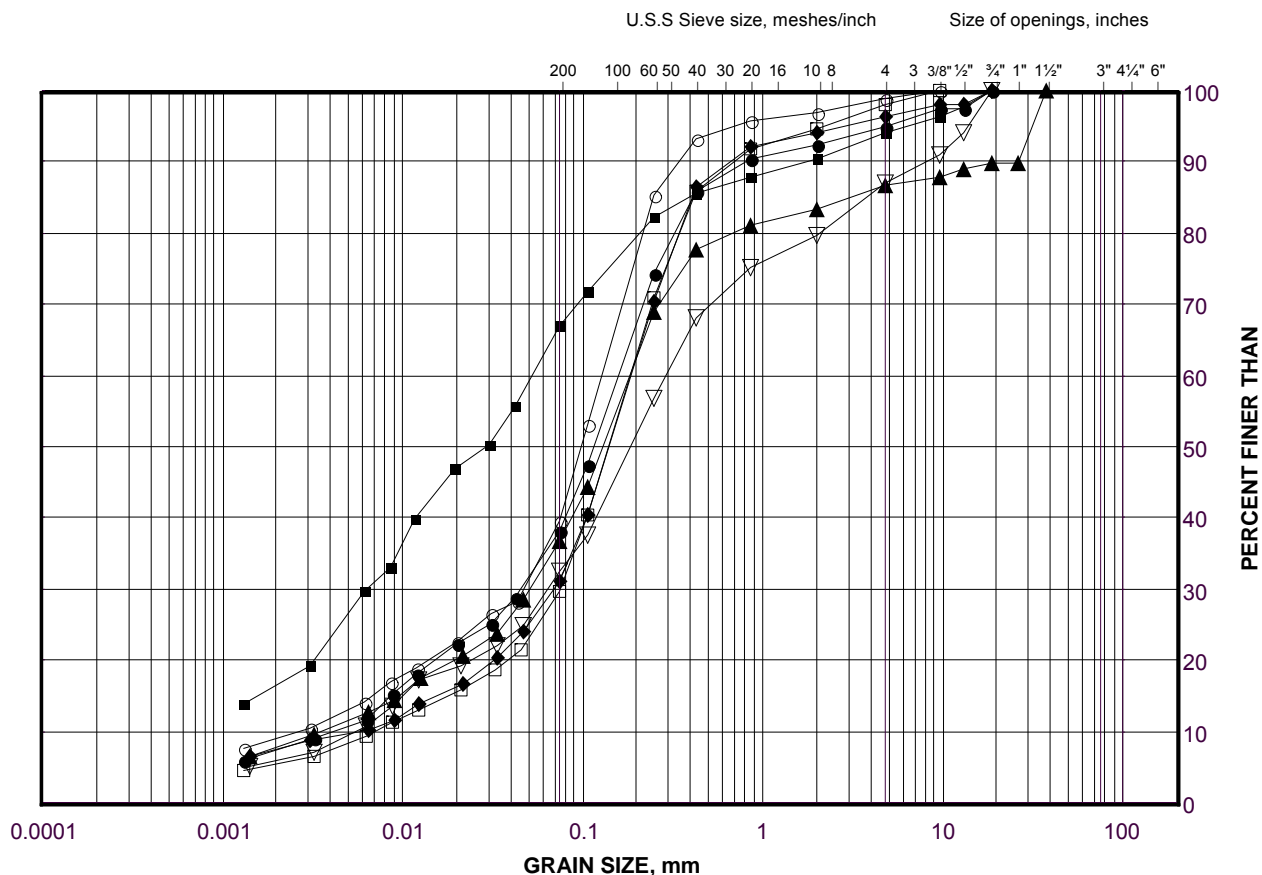
PROJECT 09-1111-0018			RECORD OF BOREHOLE No 8			SHEET 1 OF 1			METRIC															
W.P. 2835-02-00			LOCATION N 4868557.7 ; E 298769.0			ORIGINATED BY TT																		
DIST Central HWY 400			BOREHOLE TYPE 108 mm Outside Diameter Solid Stem Augers			COMPILED BY CS																		
DATUM Geodetic			DATE April 1, 2011			CHECKED BY TVA																		
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																			
329.6	GROUND SURFACE																							
0.0	Silty sand, trace clay, trace gravel, containing rootlets (FILL) Loose Brown Moist		1	SS	8																			
328.9																								
0.7	CLAYEY SILT, trace to some sand, trace gravel, containing silt interlayers (TILL) Very stiff Brown to grey Moist		2	SS	16																			
			3	SS	15																			
			4	SS	23																			
			5	SS	25																			
			6	SS	19																			
			7	SS	25																			
	Becoming grey below a depth of 5.6 m																							
			8	SS	21																			
322.9																								
6.7	END OF BOREHOLE																							
	NOTE: 1. Unable to obtain water level reading upon completion due to damaged water level reading equipment.																							

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 11/30/15 SJB

GRAIN SIZE DISTRIBUTION

Sand and Gravel to Silty Sand to Clayey Silt Fill

FIGURE B1A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F2-5	2	338.5
■	F2-11	2	326.2
◆	C32-2	3	328.5
▲	F2-9	3	329.6
▽	C32-3	3	329.5
○	F2-12	3	335.7
□	F2-7	3	326.2

Project Number: 09-1111-0018

Checked By: TWB

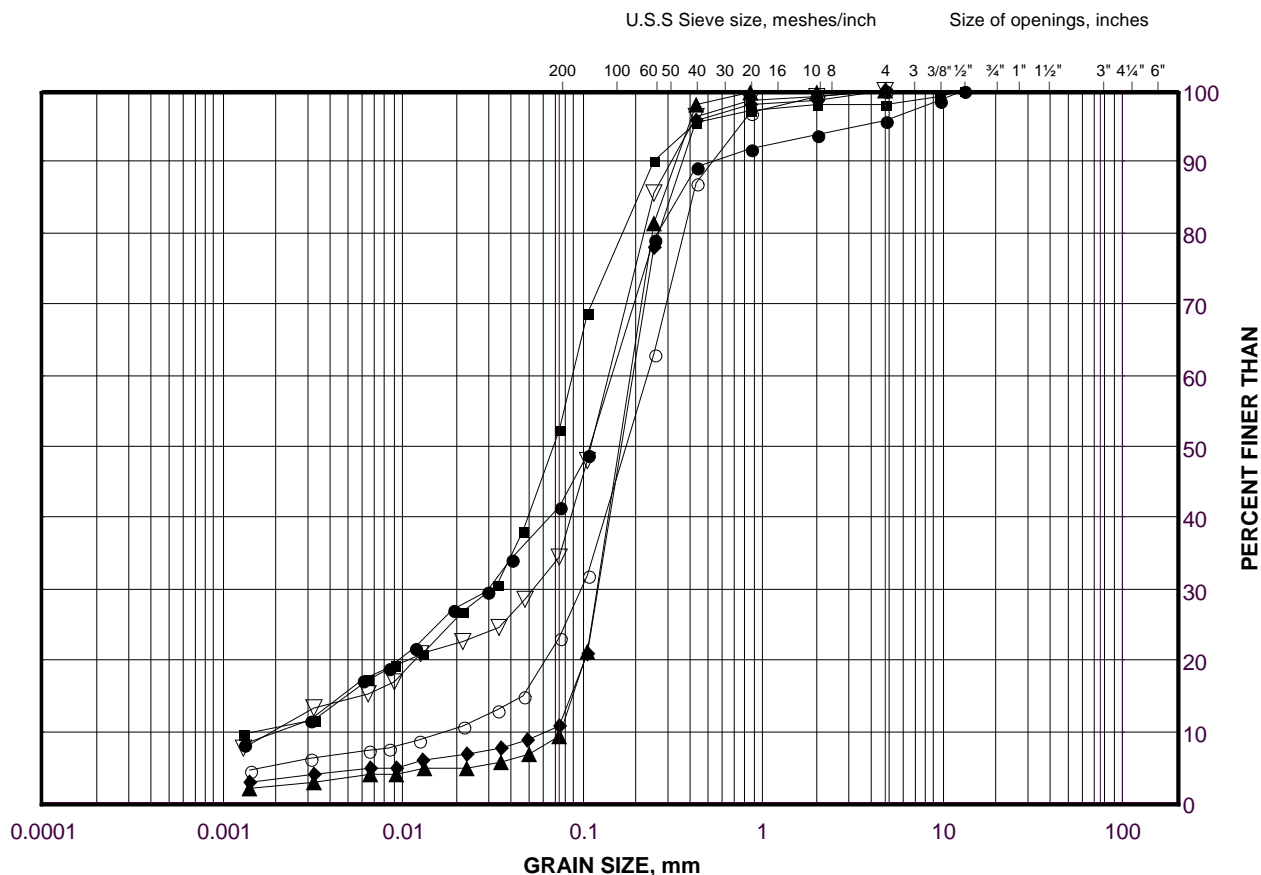
Golder Associates

Date: 02-Dec-15

GRAIN SIZE DISTRIBUTION

Sand and Gravel to Silty Sand to Clayey Silt Fill

FIGURE B1B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F2-4	3	335.0
■	F2-5	4B	336.7
◆	F2-4	5	333.5
▲	F2-11	5	334.1
▽	F2-7	5	324.7
○	C32-2	5	327.0

Project Number: 09-1111-0018

Checked By: TWB

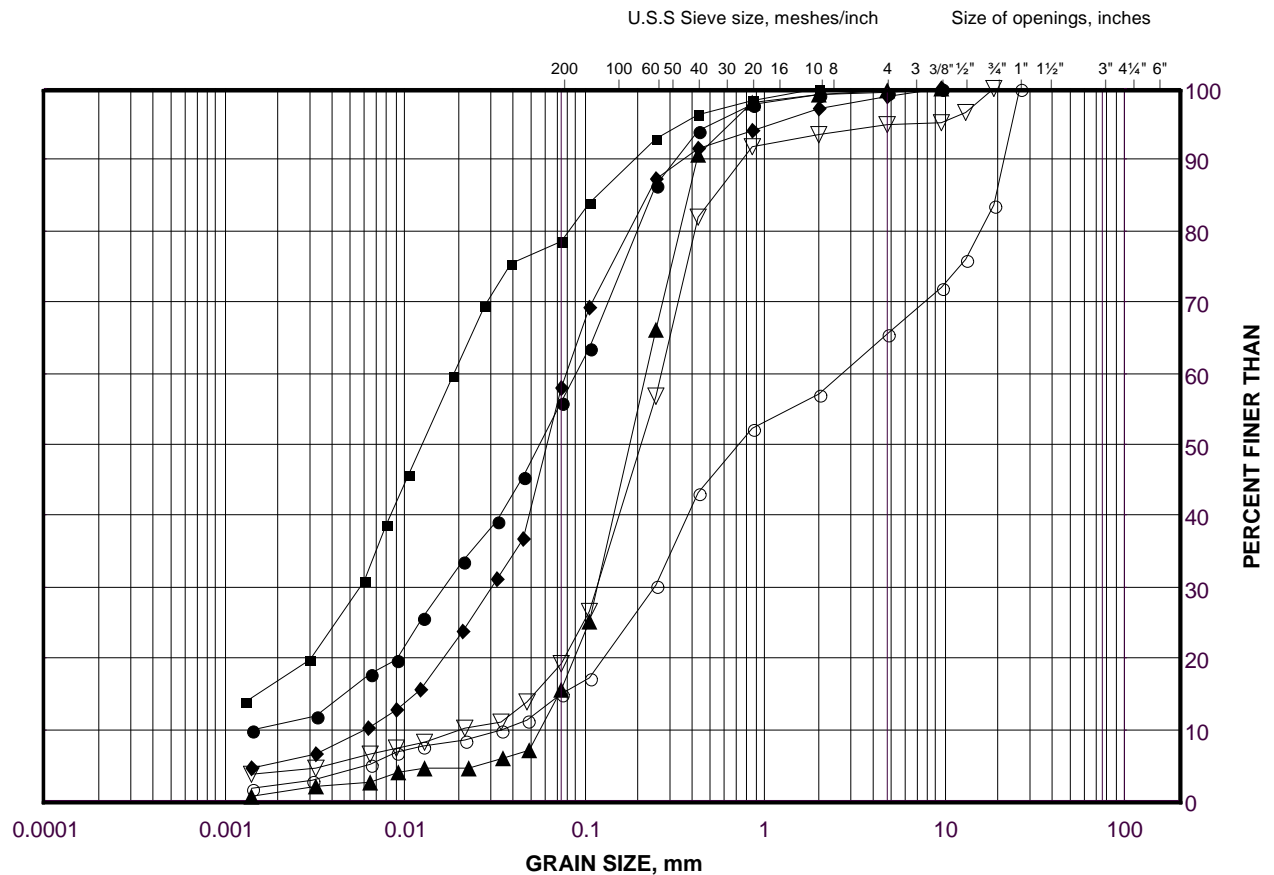
Golder Associates

Date: 03-Dec-15

GRAIN SIZE DISTRIBUTION

Sand and Gravel to Silty Sand to Clayey Silt Fill

FIGURE B1C



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

LEGEND

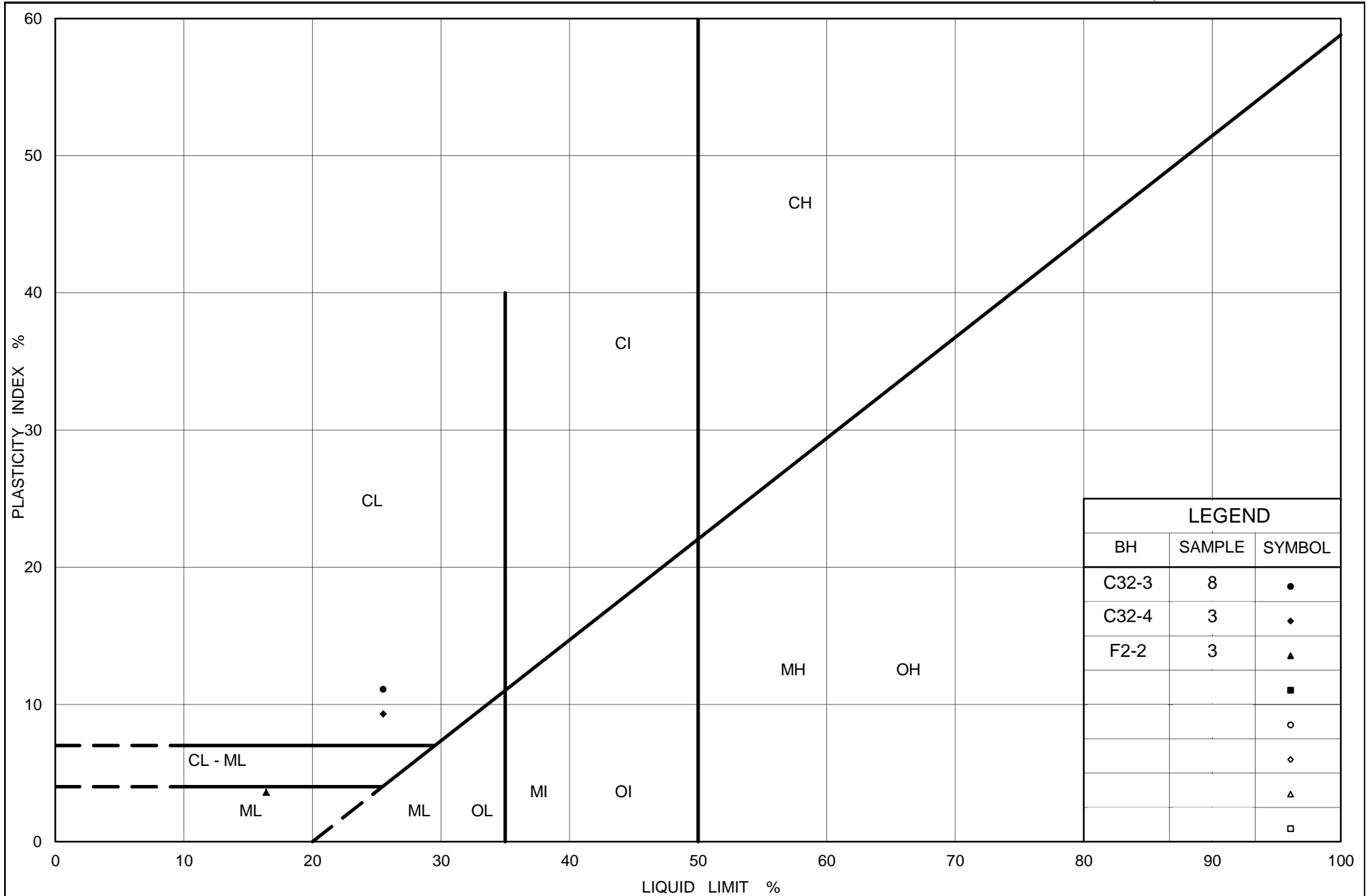
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	6	2	327.8
■	C32-4	3	325.9
◆	C32-4	4A	325.2
▲	C32-3	6	327.2
▽	F2-9	6	327.3
○	C32-3	9	322.6

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 03-Dec-15



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt Fill

Figure No. B2

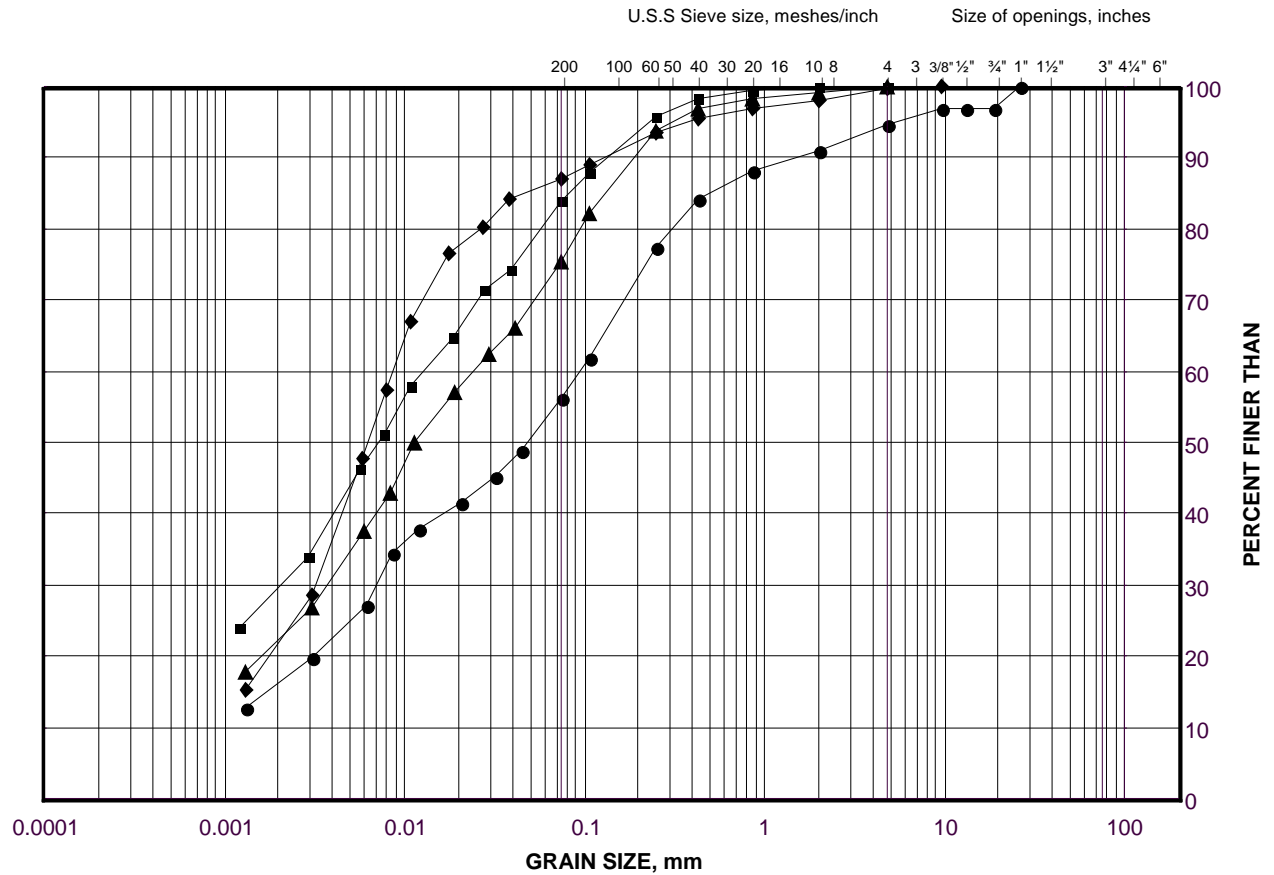
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Clayey Silt to Silty Clay

FIGURE B3



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

LEGEND

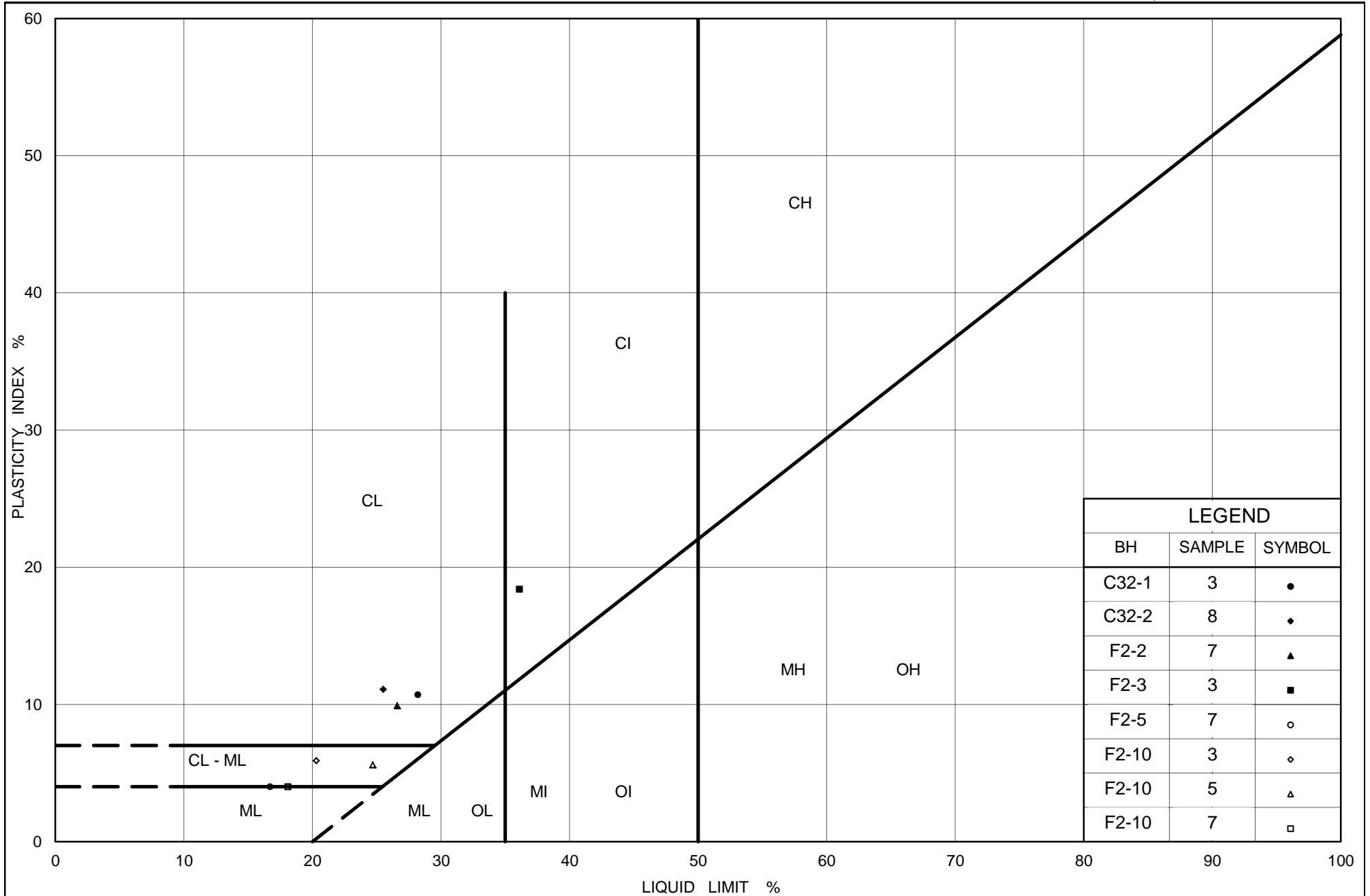
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F2-10	3	329.7
■	F2-3	3	326.6
◆	F2-10	5	328.2
▲	F2-2	7	327.1

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 03-Dec-15



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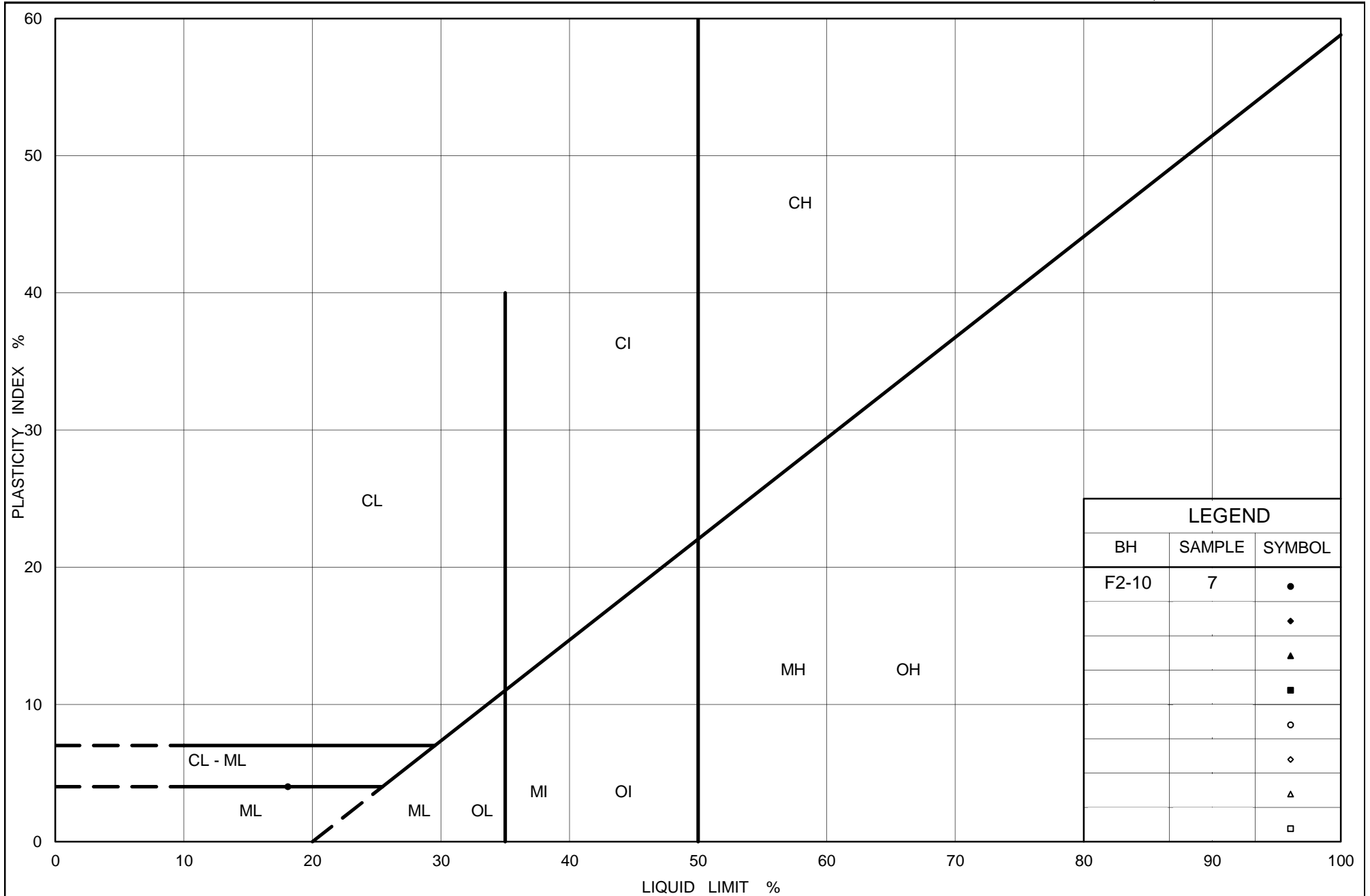
Ontario

PLASTICITY CHART Clayey Silt to Silty Clay

Figure No. B4A

Project No. 09-1111-0018

Checked By: TWB



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Ontario

PLASTICITY CHART Clayey Silt to Silty Clay

Figure No. B4B

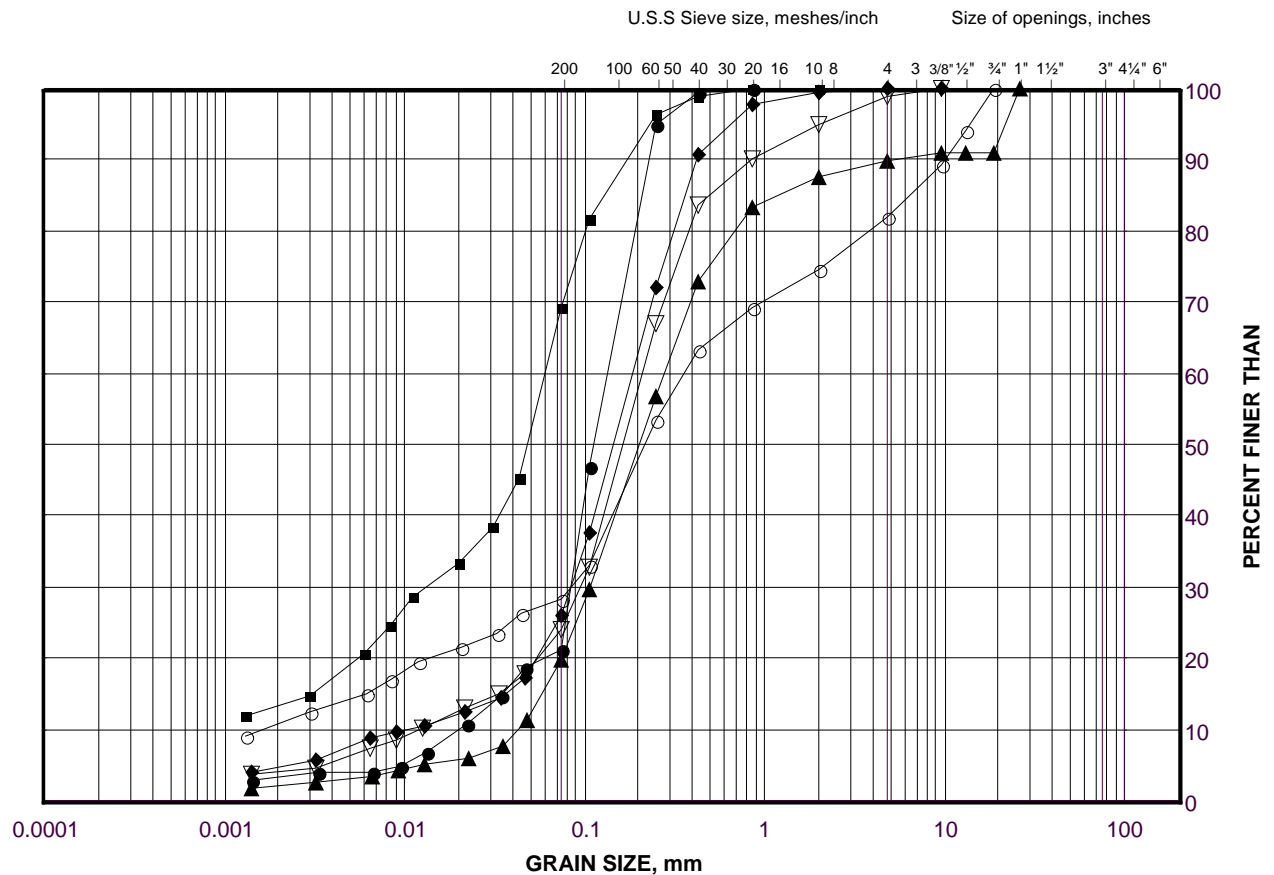
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Silt and Sand to Sand

FIGURE B5



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F2-12	4	334.9
■	6	4	326.3
◆	F2-2	6	328.6
▲	F2-4	8	329.7
▽	F2-5	8	333.2
○	C32-2	9	321.9

Project Number: 09-1111-0018

Checked By: TWB

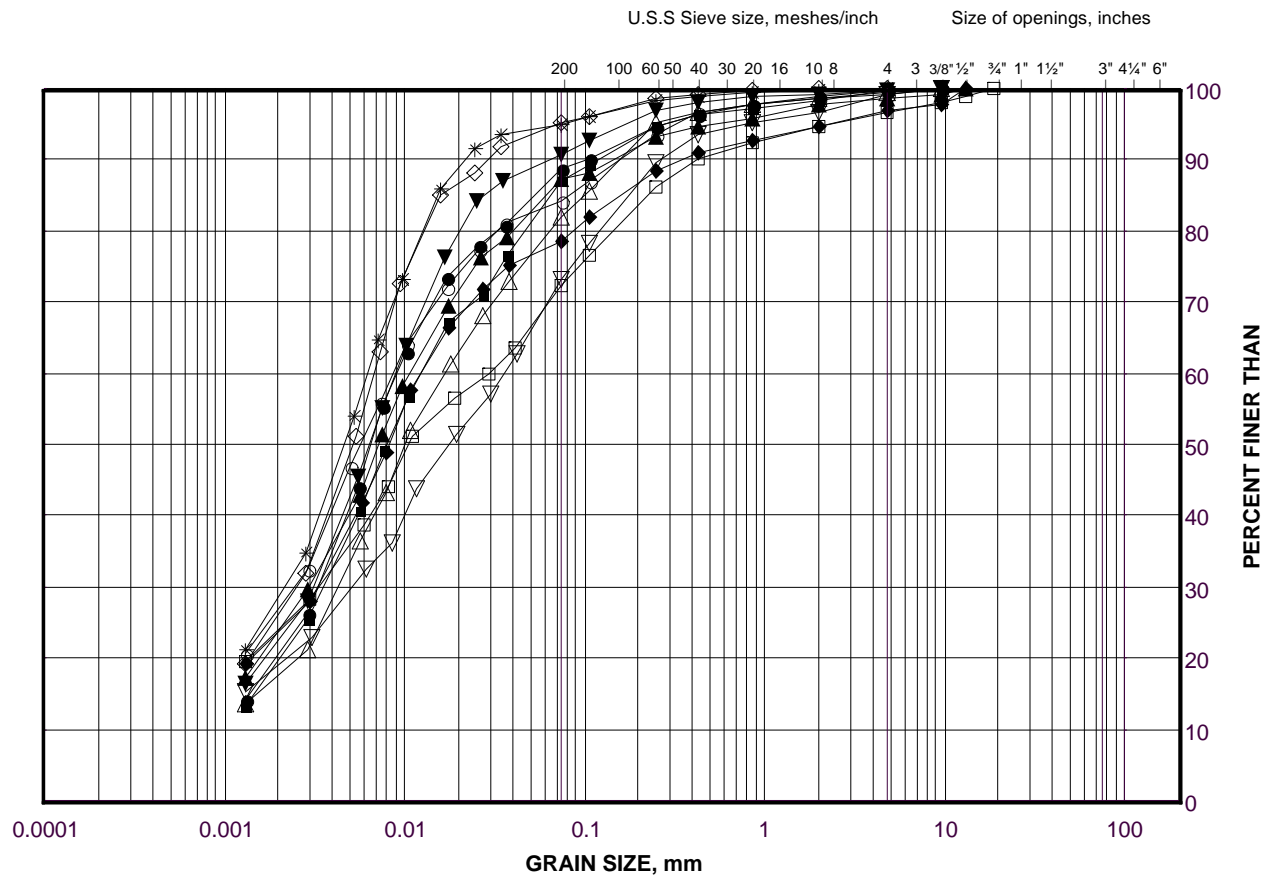
Golder Associates

Date: 03-Dec-15

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE B6A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C32-3	10	321.1
■	C32-1	10	314.6
◆	F2-9	10	326.5
▲	C32-4	10	315.8
▽	F2-4	10A	317.4
○	C32-2	11	318.6
□	F2-6	3	322.8
△	7	3	328.0
▽	8	4	327.0
✱	8	7	324.8
×	7	8	323.4

Project Number: 09-1111-0018

Checked By: TWB

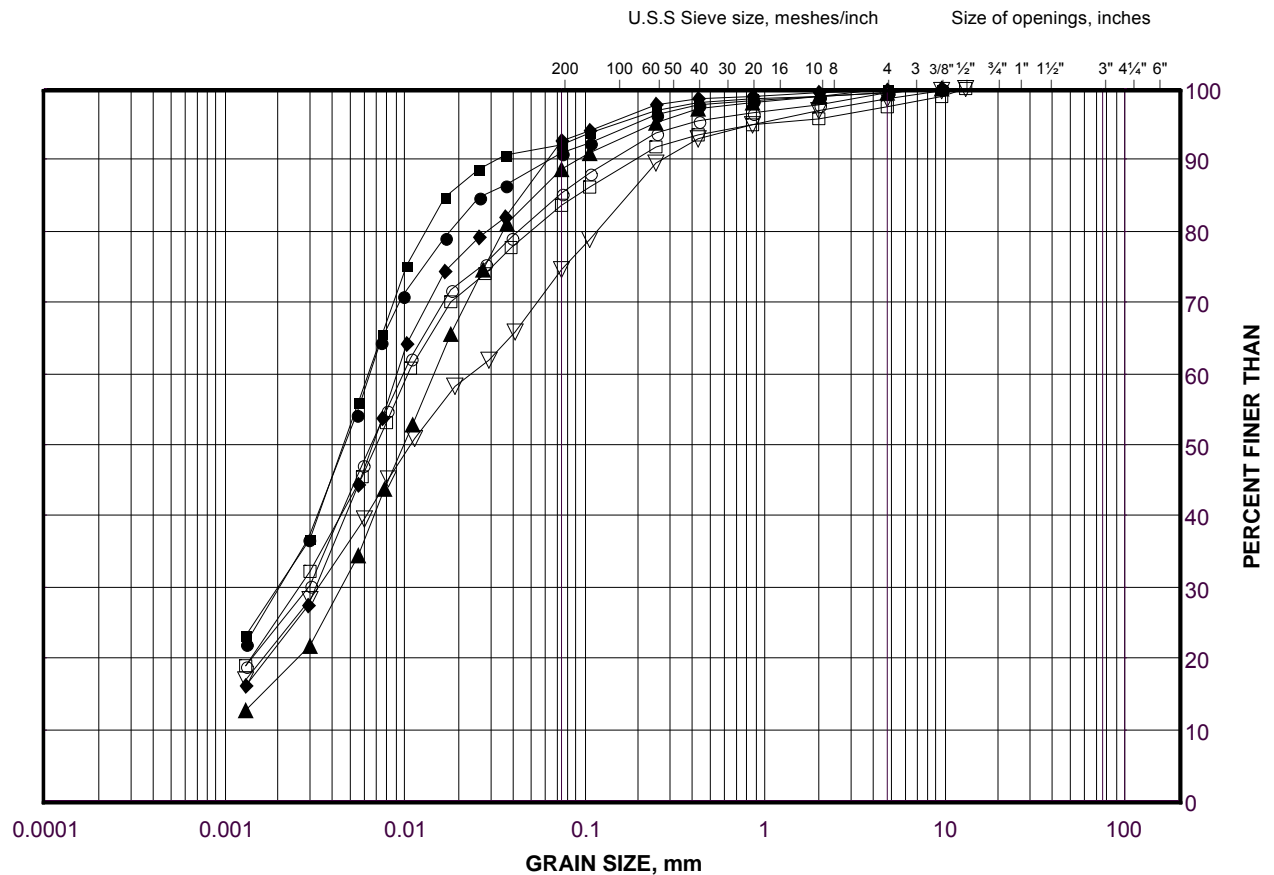
Golder Associates

Date: 03-Dec-15

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE B6B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F2-1	3	326.2
■	F2-8	3	323.2
◆	C32-1	5	320.7
▲	F2-3	6	324.3
▽	F2-8	6	320.9
○	F2-6	7	319.7
□	F2-9	8	329.6

Project Number: 09-1111-0018

Checked By: TWB

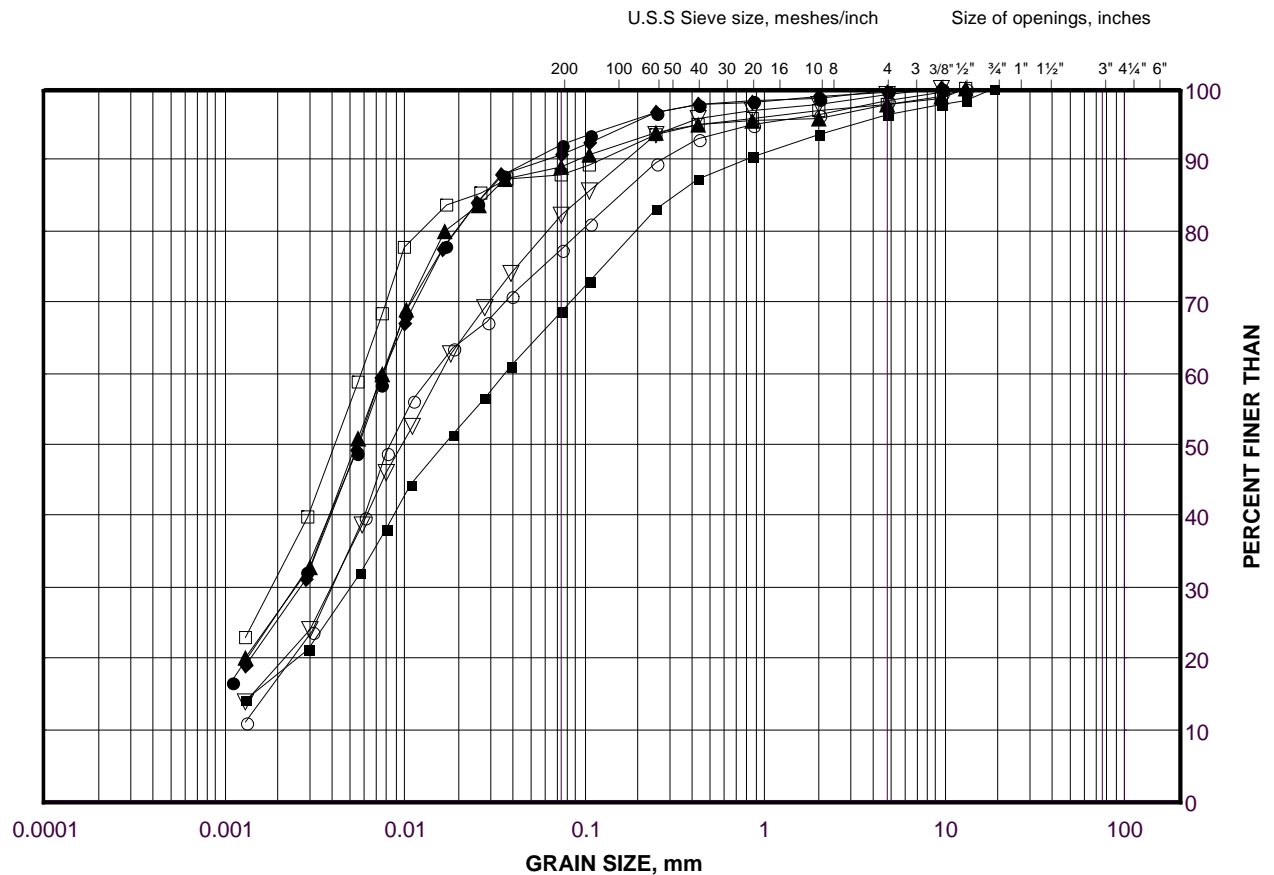
Golder Associates

Date: 02-Dec-15

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE B6C



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	5	10	319.4
■	5	5	325.5
◆	6	7	324.0
▲	F2-7	8	320.9
▽	F2-1	8	321.6
○	F2-11	8B	320.1
□	F2-2	9	324.1

Project Number: 09-1111-0018

Checked By: TWB

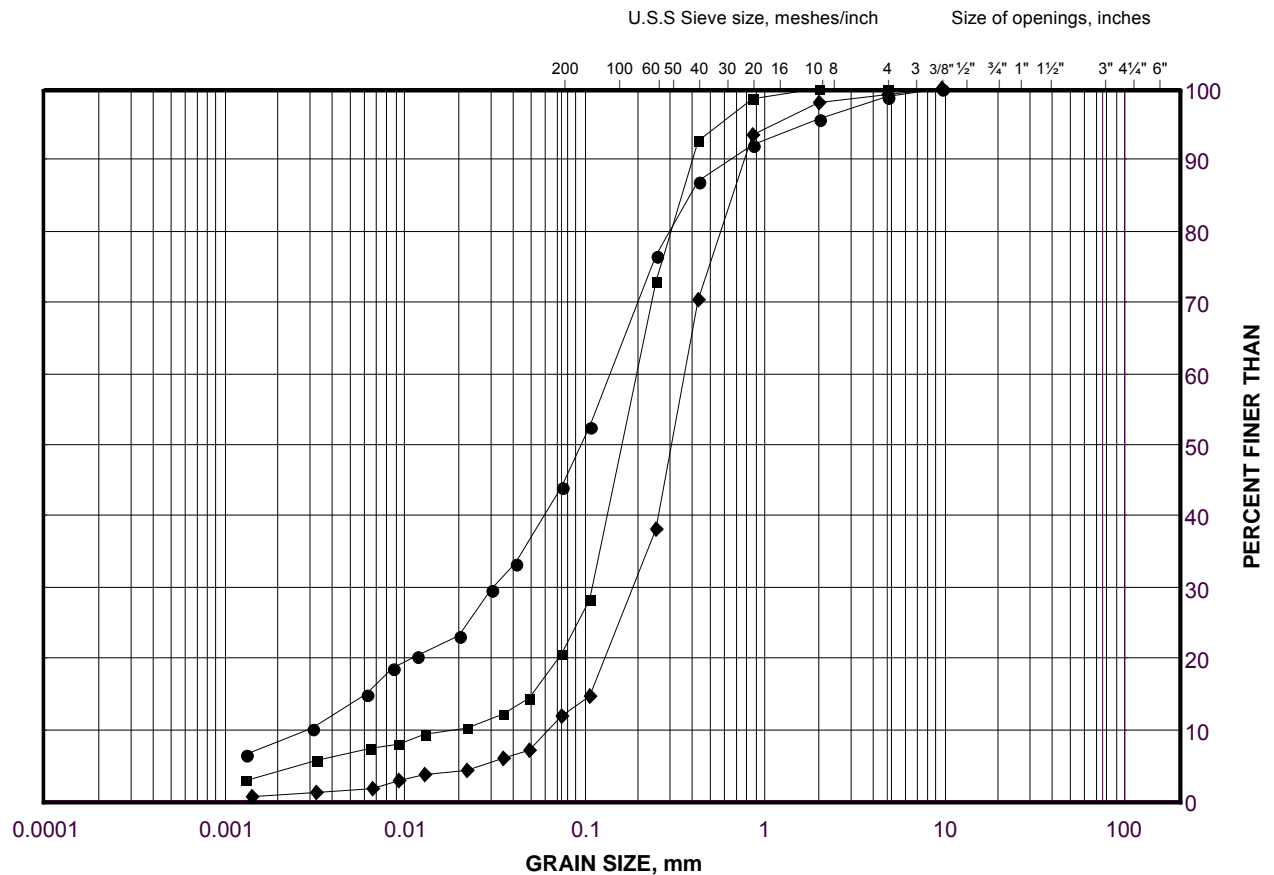
Golder Associates

Date: 03-Dec-15

GRAIN SIZE DISTRIBUTION

Sand (Interlayers in Till)

FIGURE B7



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

LEGEND

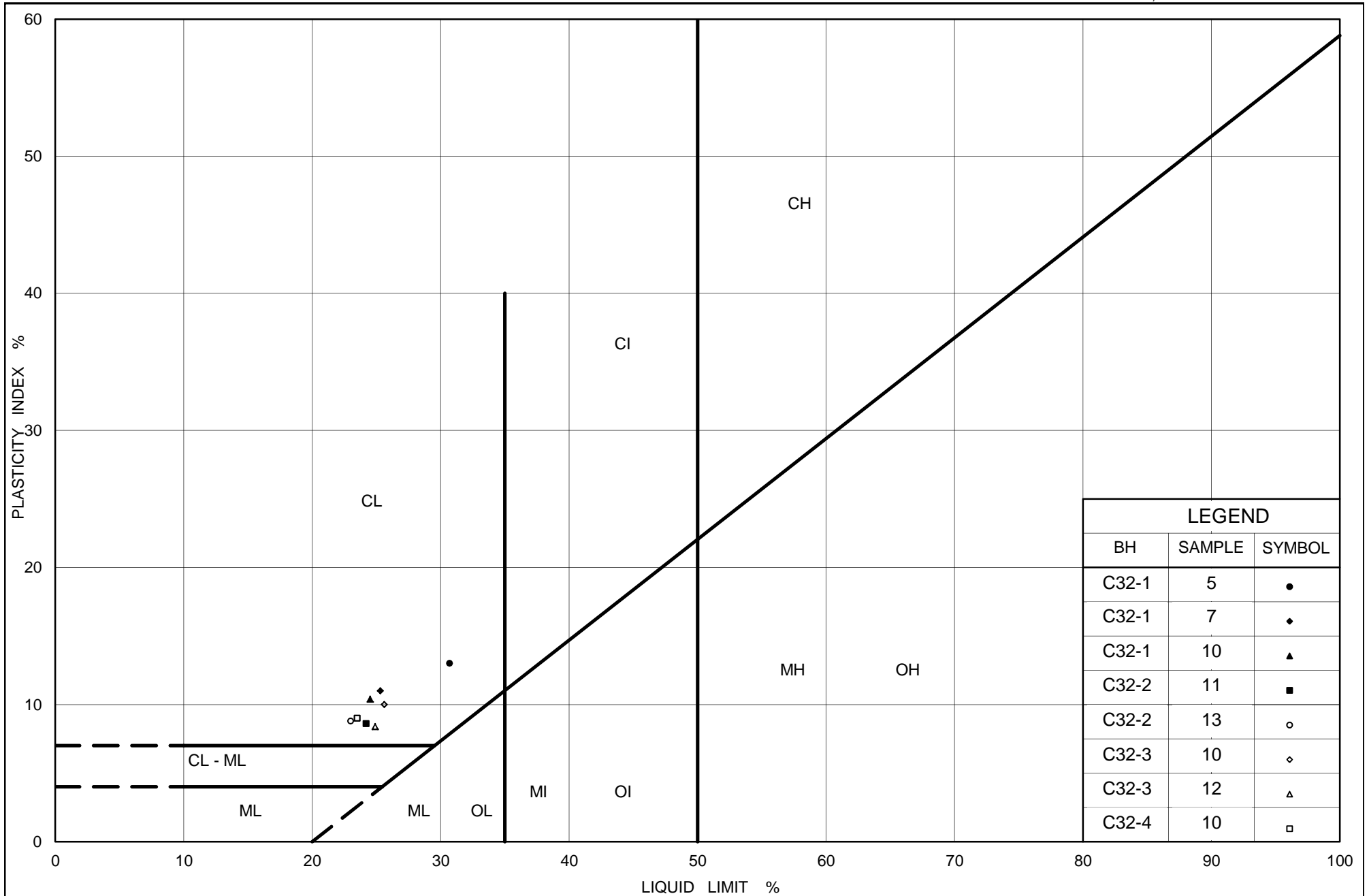
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F2-8	5A	321.9
■	F2-1	6B	323.6
◆	C32-1	9A	316.1

Project Number: 09-1111-0018

Checked By: TWB

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Date: 02-Dec-15



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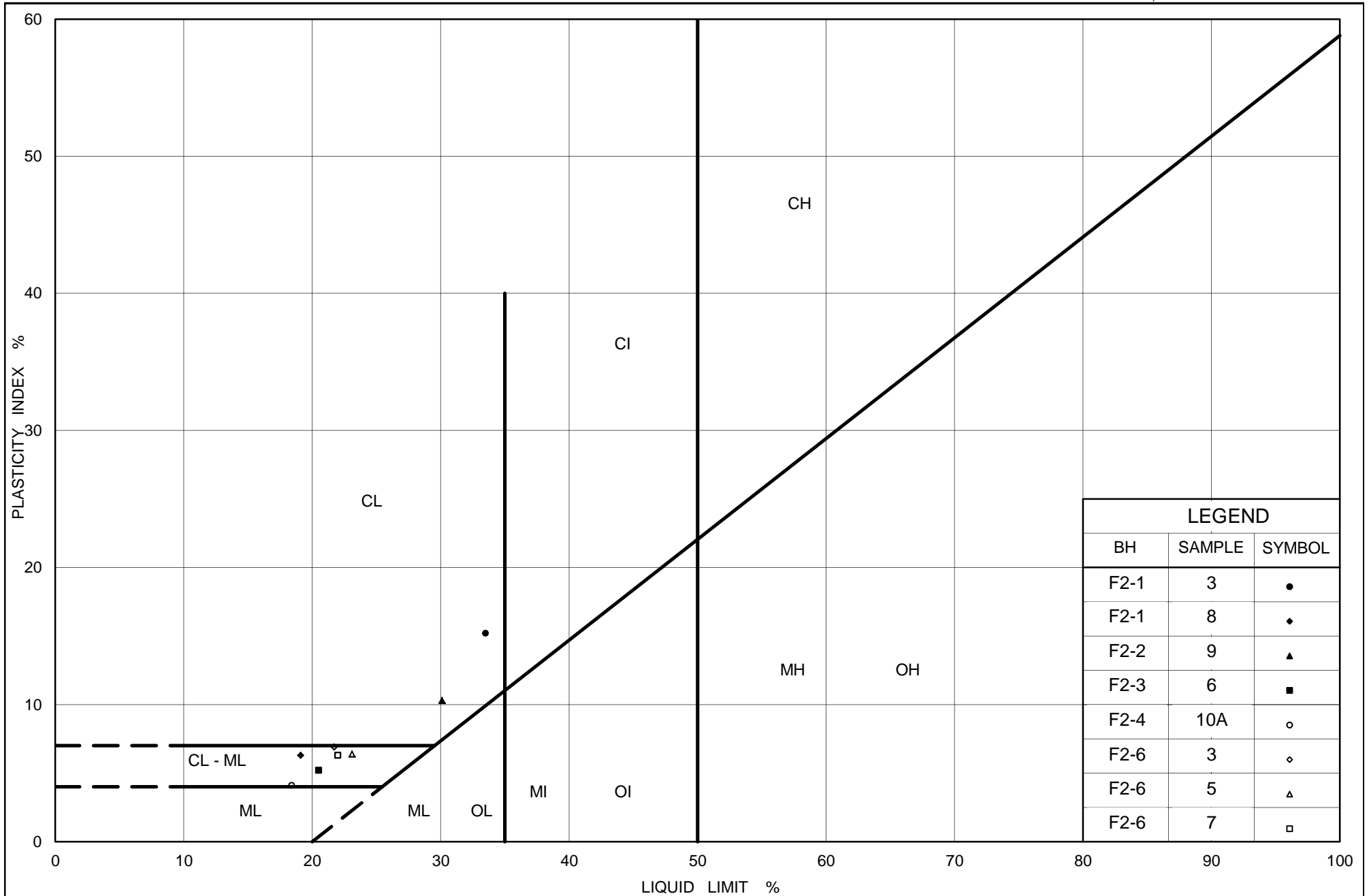
Ontario

PLASTICITY CHART Clayey Silt Till

Figure No. B8A

Project No. 09-1111-0018

Checked By: TWB



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Ontario

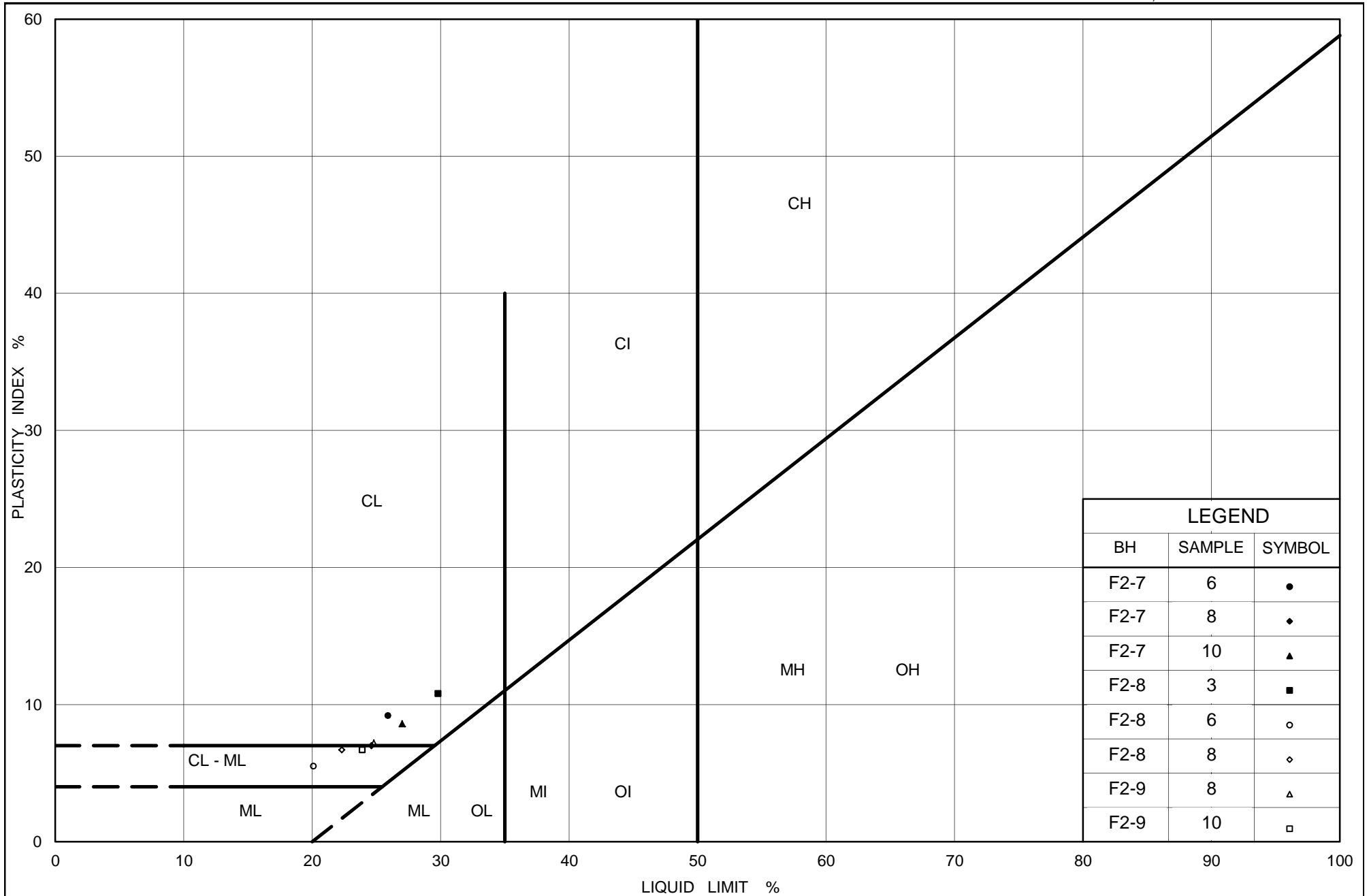
PLASTICITY CHART

Clayey Silt Till

Figure No. B8B

Project No. 09-1111-0018

Checked By: TWB



Ministry of Transportation

Ontario

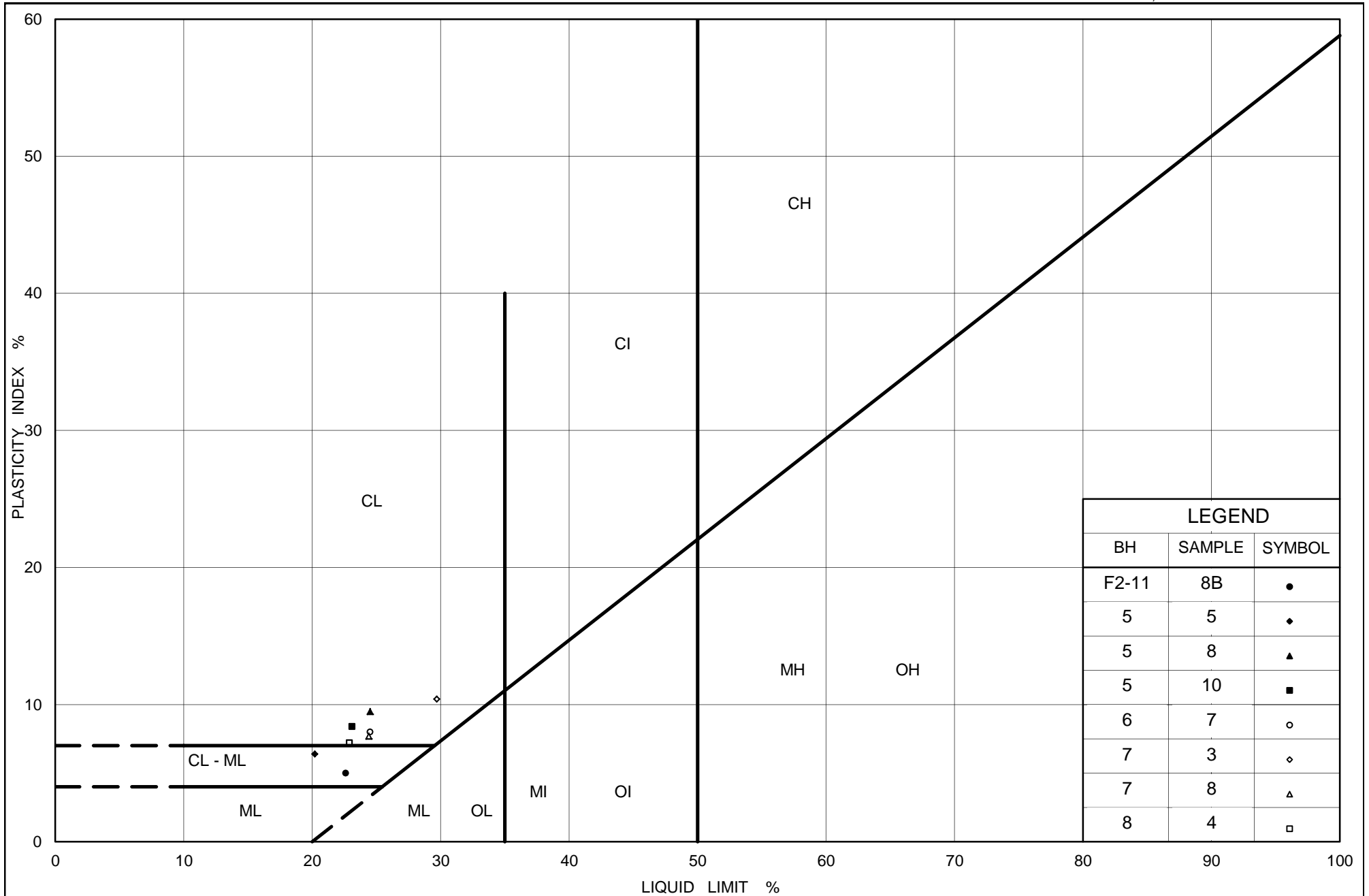
PLASTICITY CHART

Clayey Silt Till

Figure No. B8C

Project No. 09-1111-0018

Checked By: TWB



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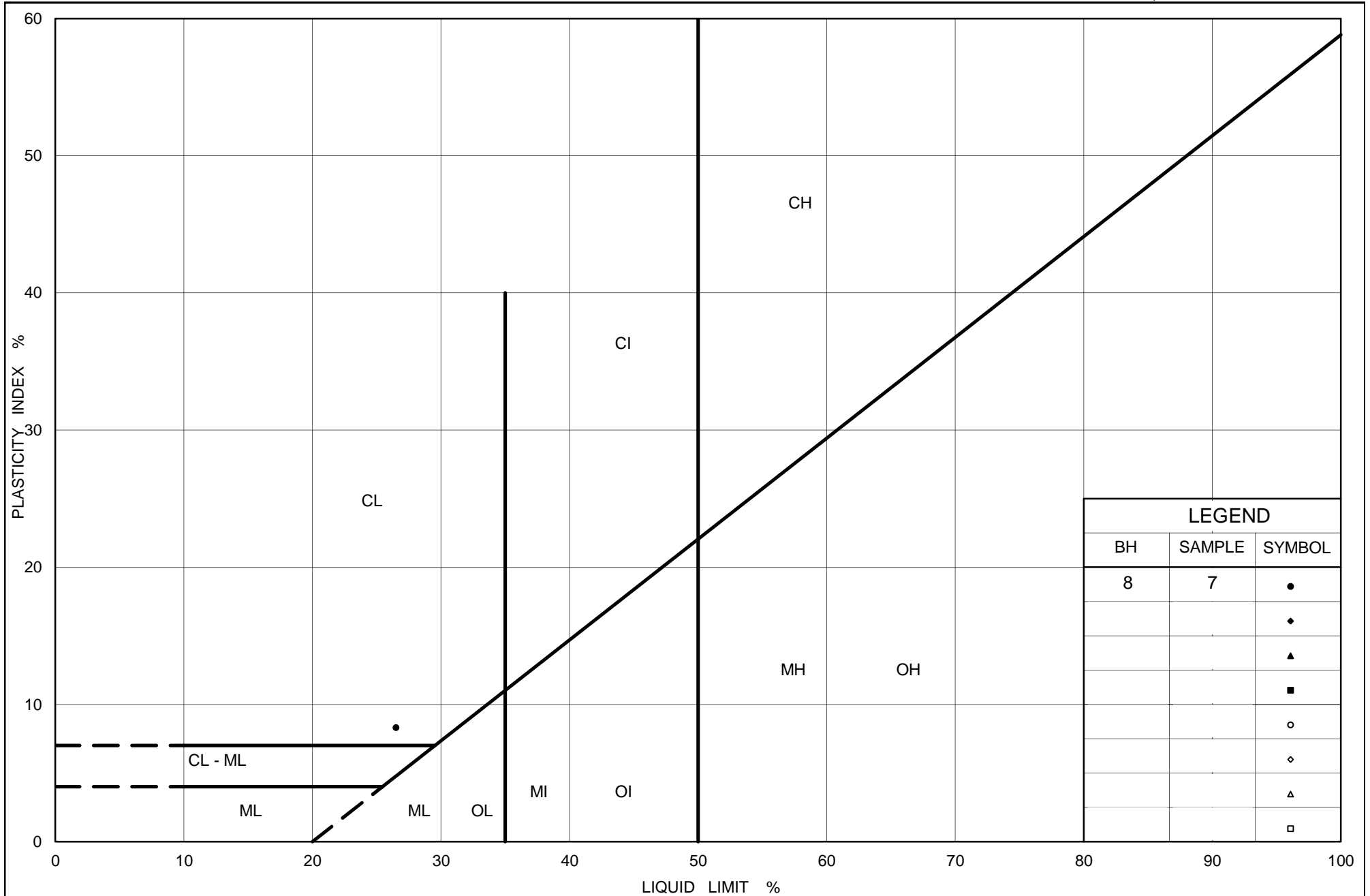
PLASTICITY CHART

Clayey Silt Till

Figure No. B8D

Project No. 09-1111-0018

Checked By: TWB



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PLASTICITY CHART

Clayey Silt Till

Figure No. B8E

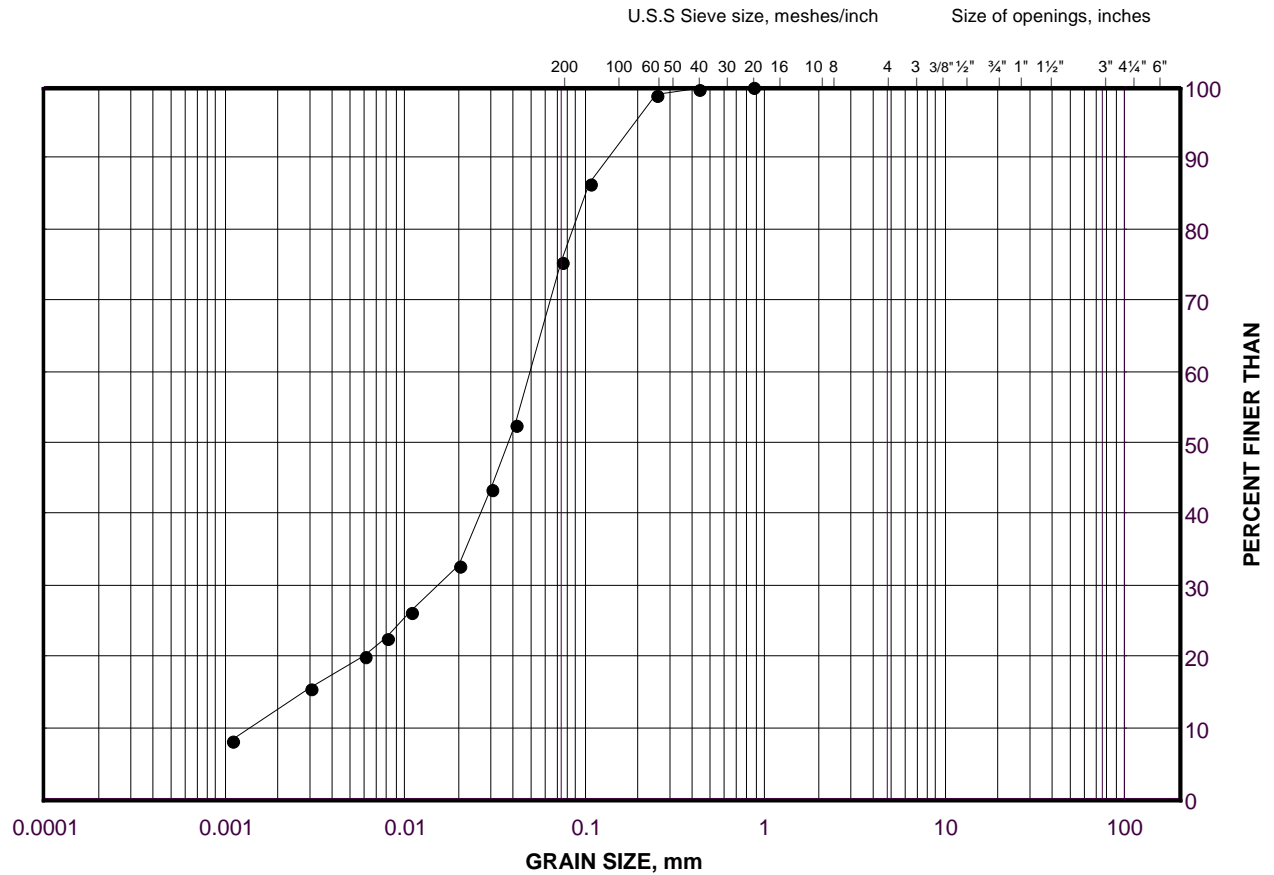
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Lower Clayey Silt

FIGURE B9



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

LEGEND

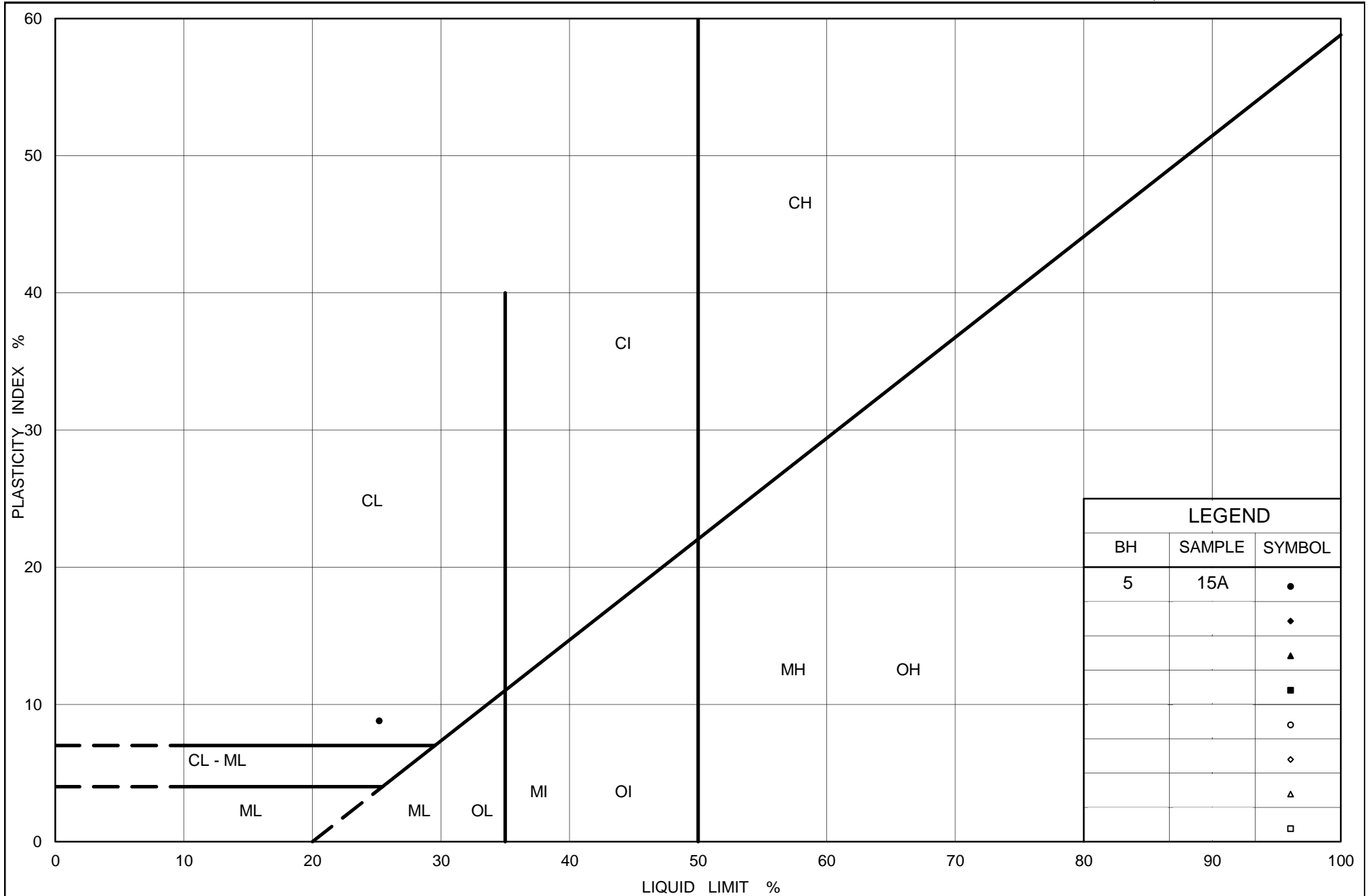
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	5	13	314.8

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 03-Dec-15



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PLASTICITY CHART Lower Clayey Silt

Figure No. B10

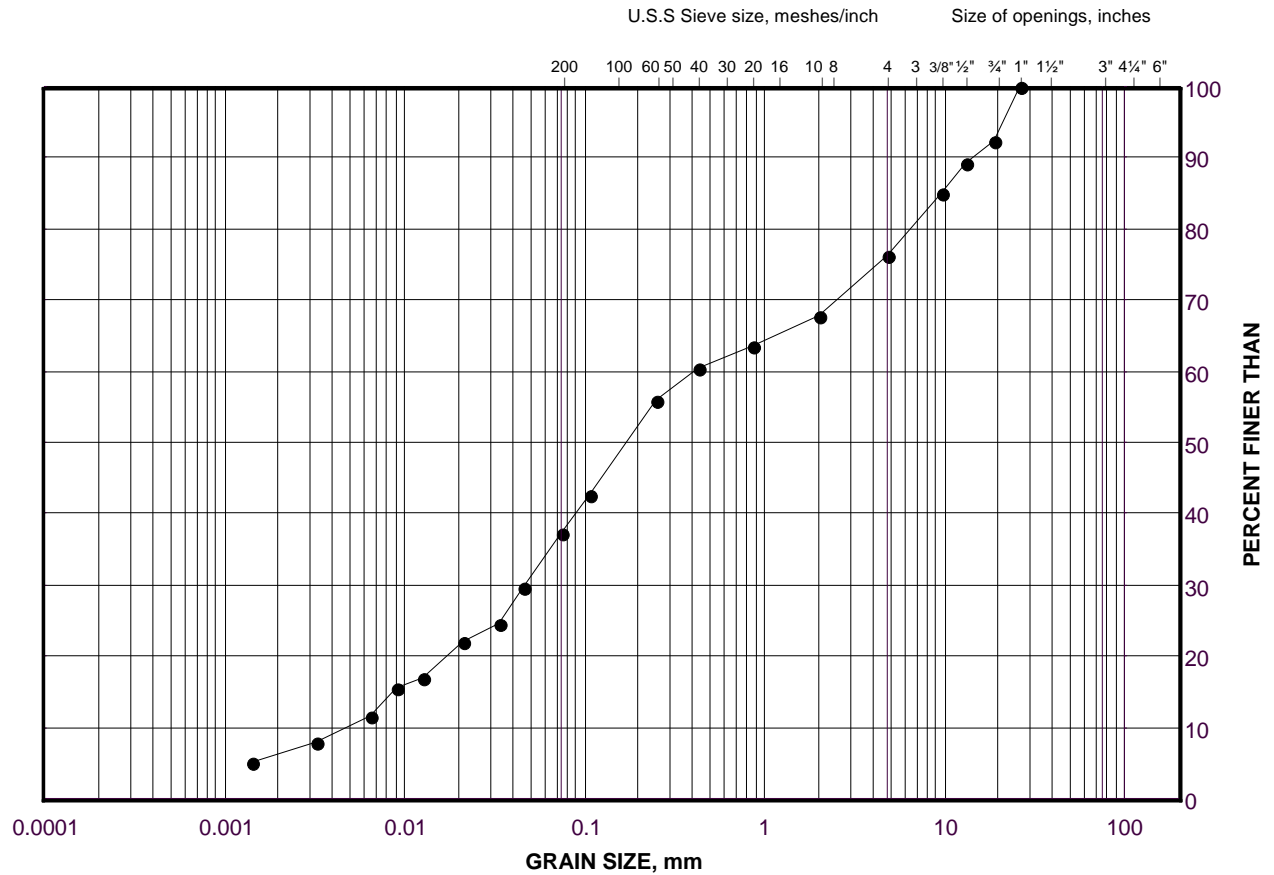
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Gravelly Silt and Sand Till

FIGURE B11



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F2-12	8	331.1

Project Number: 09-1111-0018

Checked By: TWB

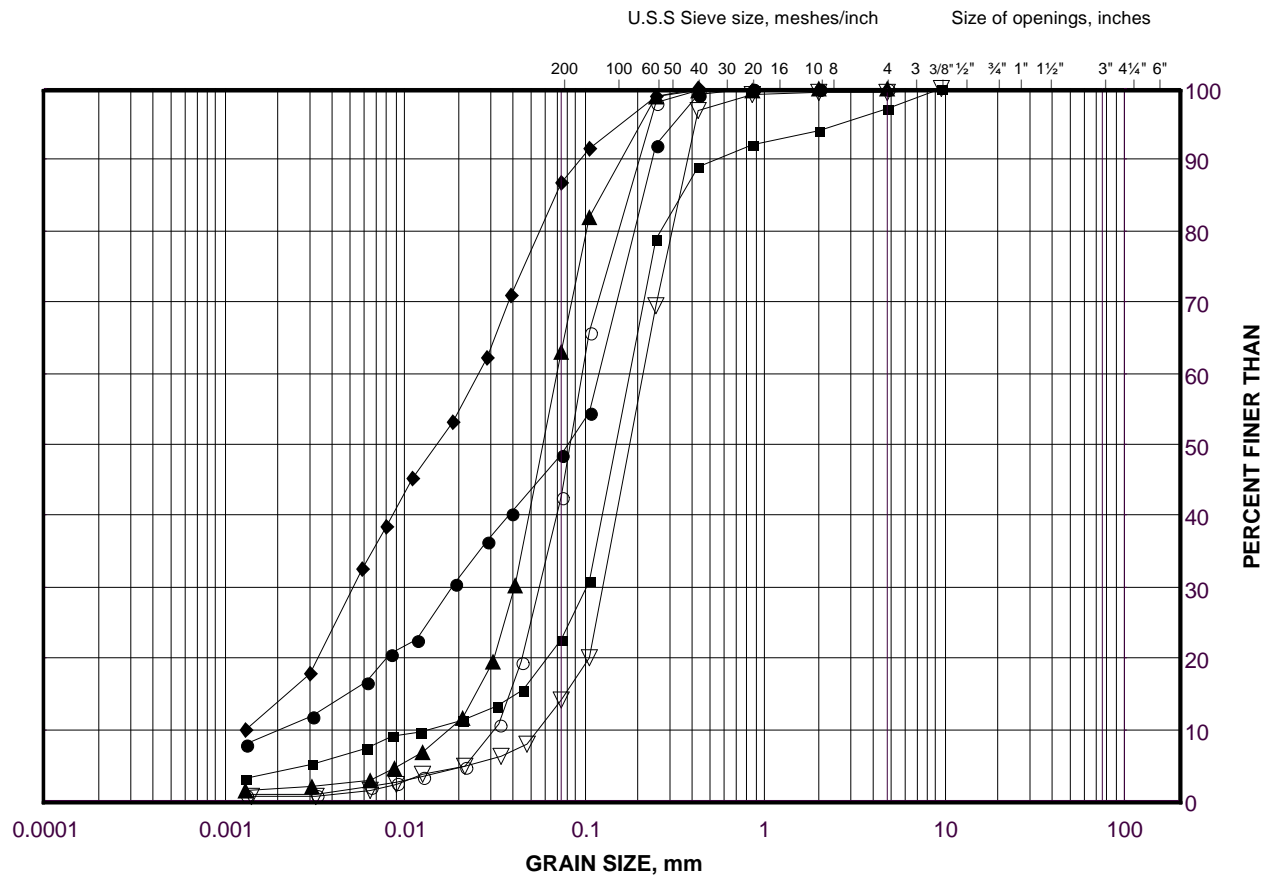
Golder Associates

Date: 03-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silt to Sand

FIGURE B12



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

LEGEND

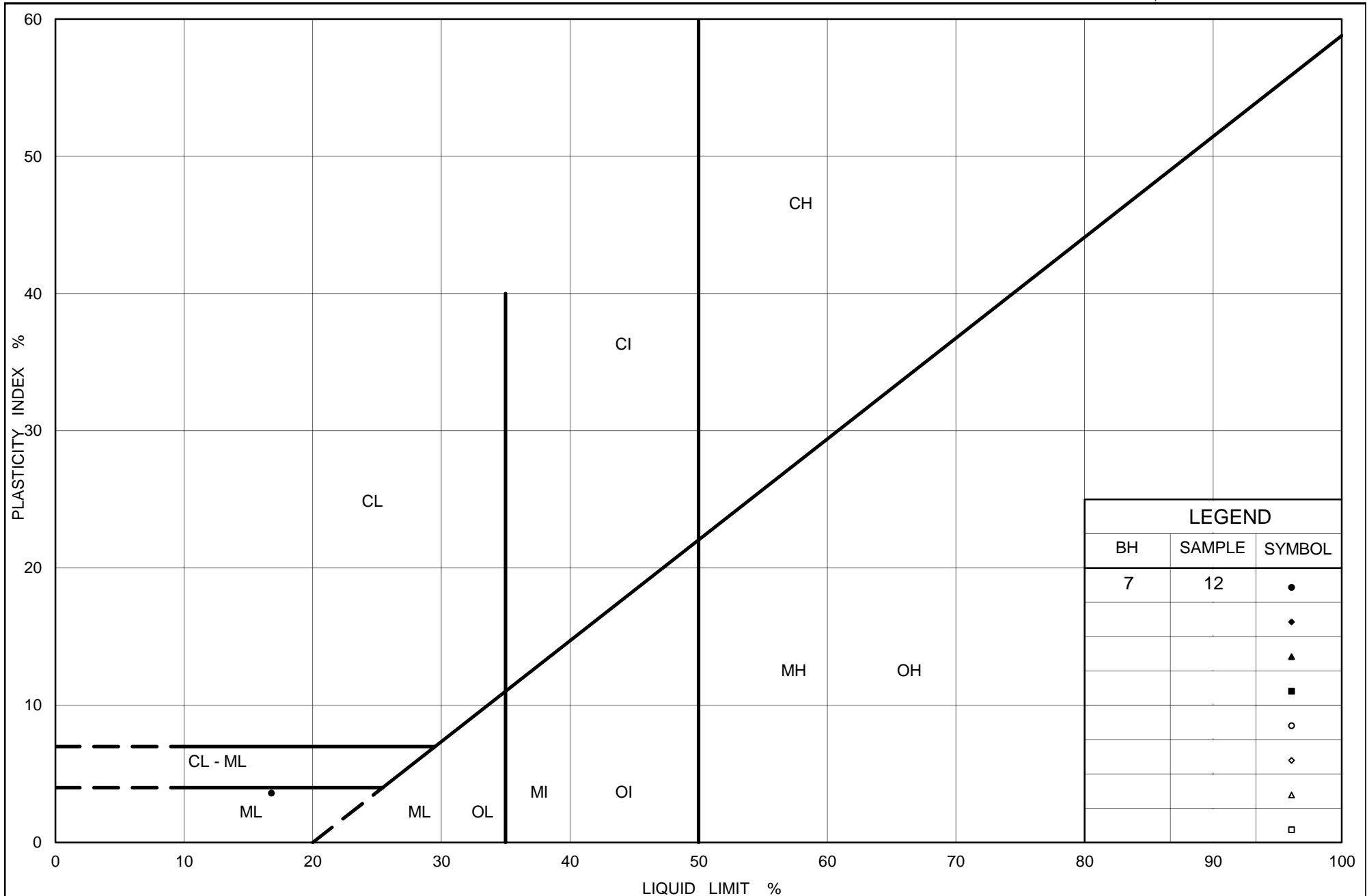
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F2-11	10	327.2
■	7	11B	318.7
◆	7	12	317.3
▲	7	16	311.4
▽	7	18	308.2
○	5	18	308.0

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 03-Dec-15



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PLASTICITY CHART Lower Silt

Figure No. B13

Project No. 09-1111-0018

Checked By: TWB



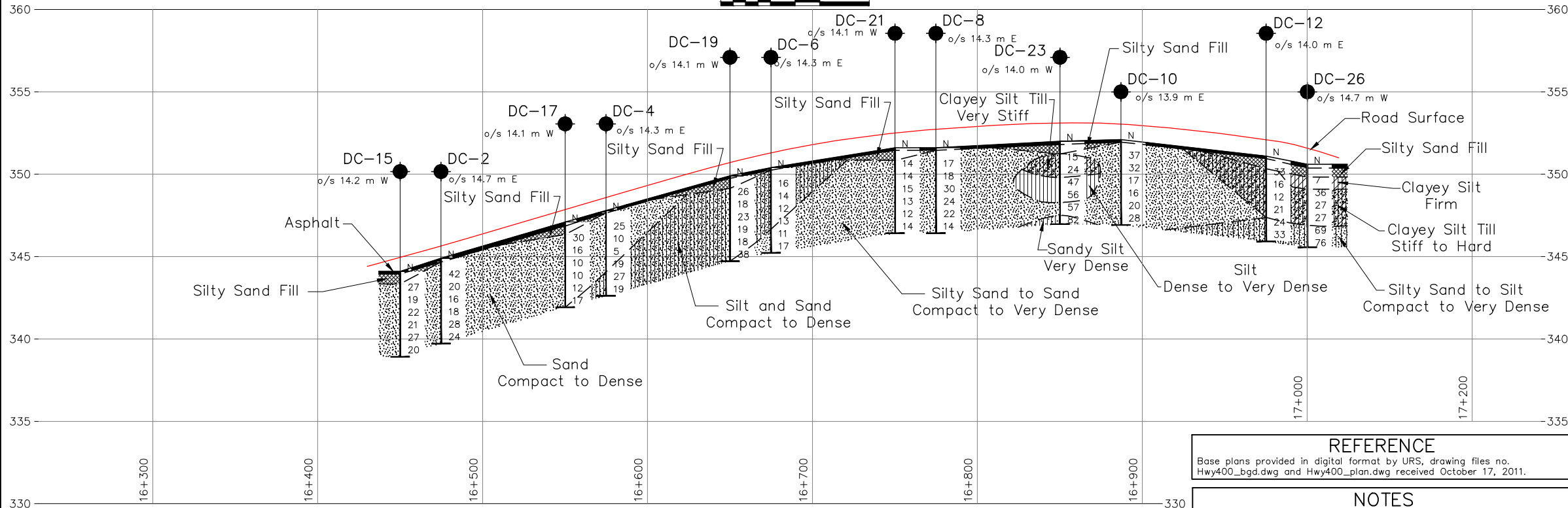
APPENDIX C

DEEP CUT AREA (Stations 16+400 to 17+000 NBL and SBL)



PLAN

SCALE
30 0 30 60 m



DEEP CUT - CENTRELINE PROFILE
(STATION 16+400 to 17+000)

HORIZONTAL SCALE
30 0 30 60 m
VERTICAL SCALE
3 0 3 6 m



REFERENCE

Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

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.

METRIC

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

CONT No.
GWP No. 2835-02-00



HIGHWAY 400 DEEP CUT

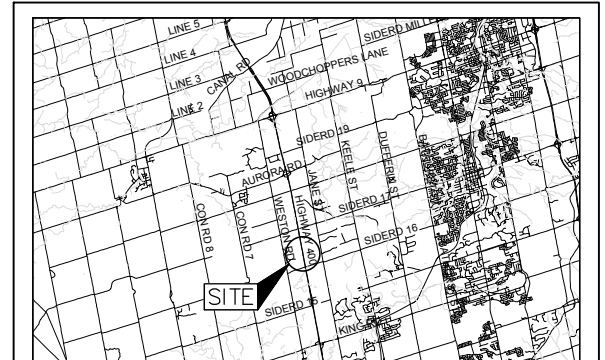
STAT. 16+400 TO STA. 17+000 (SBL)
STAT. 16+400 TO STA. 17+000 (NBL)

SHEET

BOREHOLE LOCATIONS AND SOIL STRATA



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

SCALE
4 0 4 8 km

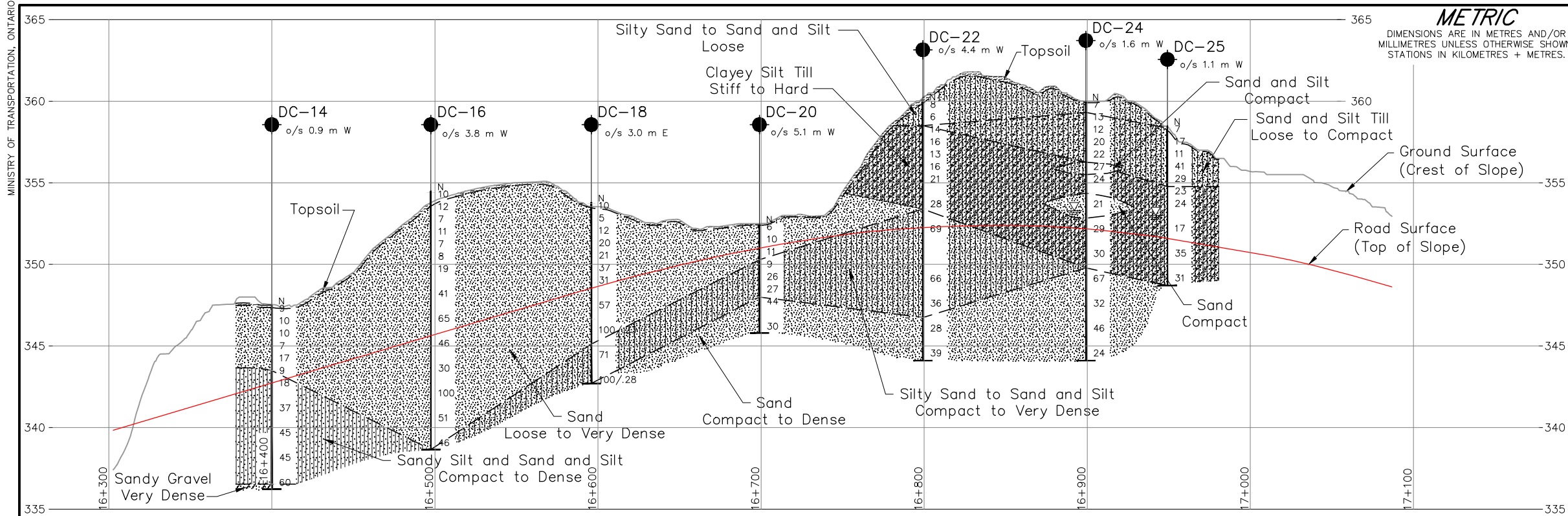
LEGEND

- Borehole - Current Investigation
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)

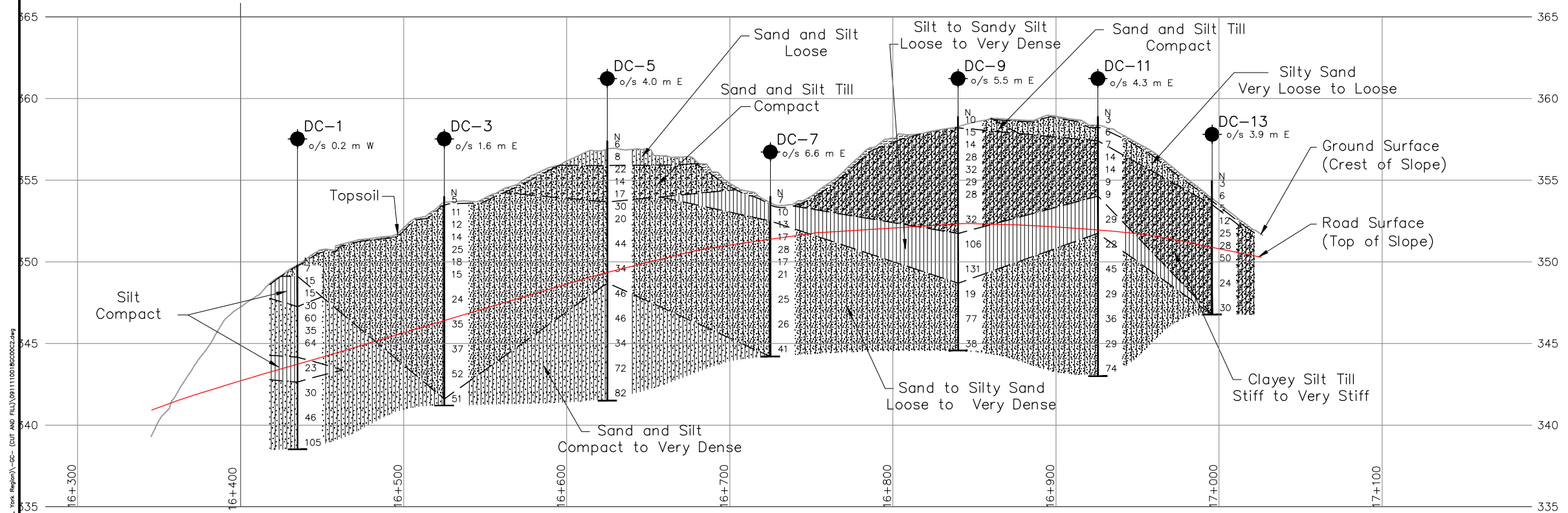
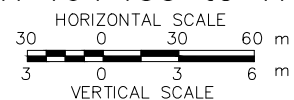
BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
DC-1	349.8	4868839.2	298791.0
DC-2	344.9	4868875.0	298760.5
DC-3	354.0	4868928.0	298776.1
DC-4	347.8	4868973.5	298743.3
DC-5	357.4	4869026.7	298759.9
DC-6	350.4	4869072.1	298726.4
DC-7	354.0	4869125.4	298744.0
DC-8	351.6	4869170.7	298709.5
DC-9	358.9	4869238.5	298722.7
DC-10	352.1	4869281.3	298690.2
DC-11	358.9	4869323.0	298708.0
DC-12	351.1	4869368.0	298675.4
DC-13	355.0	4869392.1	298696.6
DC-14	347.5	4868793.3	298720.5
DC-15	344.1	4868845.7	298736.2
DC-16	354.5	4868889.0	298701.4
DC-17	347.1	4868944.3	298719.4
DC-18	353.8	4868987.2	298691.8
DC-19	349.9	4869042.9	298702.5
DC-20	352.5	4869087.6	298666.8
DC-21	351.6	4869141.5	298685.7
DC-22	360.0	4869186.2	298649.8
DC-23	352.0	4869240.1	298669.0
DC-24	360.0	4869284.9	298633.9
DC-25	358.5	4869334.1	298625.0
DC-26	350.6	4869387.8	298642.9

Geocres No. 30M13-217

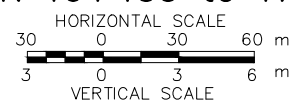
HWY. 400	PROJECT NO. 09-1111-0018	DIST. CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC
		SITE: DWG. C1



DEEP CUT – SBL PROFILE
(STATION 16+400 to 17+000)



DEEP CUT – NBL PROFILE
(STATION 16+400 to 17+000)



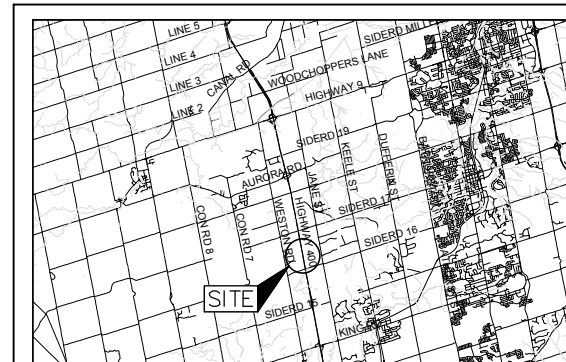
CONT No.
GWP No. 2835-02-00

HIGHWAY 400 DEEP CUT
STAT. 16+400 TO STA. 17+000 (SBL)
STAT. 16+400 TO STA. 17+000 (NBL)
SOIL STRATA

SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

SCALE
4 0 4 8 km

LEGEND

- Deep Cut Borehole – Current Investigation
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
DC-1	349.8	4868839.2	298791.0
DC-3	354.0	4868928.0	298776.1
DC-5	357.4	4869026.7	298759.9
DC-7	354.0	4869125.4	298744.0
DC-9	358.9	4869238.5	298722.7
DC-11	358.9	4869323.0	298708.0
DC-13	355.0	4869392.1	298696.6
DC-14	347.5	4868793.3	298720.5
DC-16	354.5	4868889.0	298701.4
DC-18	353.8	4868987.2	298691.8
DC-20	352.5	4869087.6	298666.8
DC-22	360.0	4869186.2	298649.8
DC-24	360.0	4869284.9	298633.9
DC-25	358.5	4869334.1	298625.0

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 plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.



Geocres No. 30M13-217

HWY. 400	PROJECT NO. 09-1111-0018	DIST. CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC
		SITE: DWG. C2

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

PROJECT		RECORD OF BOREHOLE		No DC-2		SHEET 1 OF 1		METRIC									
W.P. 09-1111-0018		LOCATION		N 4868875.0 ; E 298760.5		ORIGINATED BY		SB									
DIST Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY		MAS									
DATUM Geodetic		DATE		December 23, 2010		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									
344.9	GROUND SURFACE																
0.0	ASPHALT																
0.2	SAND, trace gravel, trace silt Compact to dense Brown Moist Containing seams/pockets of clayey silt between depths of 0.8 m and 1.4 m		1	SS	42												
			2	SS	20												
			3	SS	16												
			4	SS	18												
			5	SS	28												
			6	SS	24												
339.7	END OF BOREHOLE																
5.2	NOTE: 1. Open borehole dry upon completion of drilling.																

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PROJECT		RECORD OF BOREHOLE		No DC-4		SHEET 1 OF 1		METRIC					
W.P.		LOCATION		ORIGINATED BY									
DIST		BOREHOLE TYPE		COMPILED BY									
DATUM		DATE		CHECKED BY									
09-1111-0018		N 4868973.5 ; E 298743.3		SB									
2835-02-00		D-90 Track Mount, 108 mm Outside Diameter Solid Stem Auger		MAS									
Central HWY 400		December 23, 2010		SMM									
Geodetic													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	GR SA SI CL
347.8	GROUND SURFACE												
0.0	ASPHALT												
0.2	SAND, trace to some silt, trace gravel, trace clay Compact Brown Moist		1	SS	25		347						
			2	SS	10		346						
			3	SS	5		345						2 82 15 1
			4	SS	19		344						
344.1	SAND and SILT, trace gravel Compact Brown Moist		5	SS	27		343						2 41 57 0
342.6			6	SS	19								
5.2	END OF BOREHOLE												
NOTE: 1. Open borehole dry upon completion of drilling.													

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

PROJECT 09-1111-0018		RECORD OF BOREHOLE No DC-5		SHEET 2 OF 2		METRIC												
W.P. 2835-02-00		LOCATION N 4869026.7 ; E 298759.9		ORIGINATED BY AM														
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY SKB														
DATUM Geodetic		DATE December 20, 2010		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					WATER CONTENT (%) 10 20 30						
341.5	SILT and SAND, trace clay Dense to very dense Brown Moist	14	SS	82		342												
15.9	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.																	

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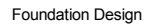
PROJECT		2835-02-00		LOCATION		N 4869072.1 ; E 298726.4		ORIGINATED BY		SB											
DIST		Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		MAS											
DATUM		Geodetic		DATE		December 23, 2010		CHECKED BY		SMM											
SOIL PROFILE				SAMPLES			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			20	40	60	80	100						20	40	60
350.4	GROUND SURFACE																				
0.0	ASPHALT																				
0.2	SAND and SILT Compact Brown Moist		1	SS	16																
			2	SS	14																
			3	SS	12																
			4	SS	13																
346.7	SAND, some silt, trace clay Compact Brown Moist		5	SS	11																
			6	SS	17																
345.2	END OF BOREHOLE																				
5.2	NOTE: 1. Open borehole dry upon completion of drilling.																				



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

PROJECT		09-1111-0018		RECORD OF BOREHOLE No DC-8		SHEET 1 OF 1		METRIC																
W.P.		2835-02-00		LOCATION		N 4869170.7 ; E 298709.5		ORIGINATED BY																
DIST		Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY																
DATUM		Geodetic		DATE		December 24, 2010		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			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																			
351.6	GROUND SURFACE																							
0.0	ASPHALT																							
0.2	SAND, trace to some silt Compact Brown Moist		1	SS	17																			
			2	SS	18																			
			3	SS	30																			
			4	SS	24																			
			5	SS	22																			
			6	SS	14																			
346.4	END OF BOREHOLE																							
5.2	NOTE: 1. Open borehole dry upon completion of drilling.																							

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

PROJECT 09-1111-0018		RECORD OF BOREHOLE No DC-9				SHEET 2 OF 2		METRIC													
W.P. 2835-02-00		LOCATION N 4869238.5 ; E 298722.7				ORIGINATED BY AM															
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger				COMPILED BY SKB															
DATUM Geodetic		DATE December 20, 2010				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 ---						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>					<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 10 20 30 </div>									
	END OF BOREHOLE NOTE: 1. Open borehole dry on completion of drilling.																				

PROJECT 09-1111-0018		RECORD OF BOREHOLE No DC-10		SHEET 1 OF 1		METRIC												
W.P. 2835-02-00		LOCATION N 4869281.3 ; E 298690.2		ORIGINATED BY SB														
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY MAS														
DATUM Geodetic		DATE December 24, 2010		CHECKED BY SMM														
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)					
352.1	GROUND SURFACE							20 40 60 80 100	20 40 60 80 100	W _p	W	W _L	10 20 30	γ	GR	SA	SI	CL
0.0	ASPHALT						352											
0.2	Silty SAND to SAND, some silt Compact to dense Brown Moist		1	SS	37		351											
			2	SS	32		350											1 70 29 0
			3	SS	17		349											
			4	SS	16		348											0 82 17 1
			5	SS	20		347											
346.9	END OF BOREHOLE		6	SS	28													
5.2	NOTE: 1. Open borehole dry upon completion of drilling.																	

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No DC-11		SHEET 1 OF 2		METRIC	
W.P. 2835-02-00		LOCATION N 4869323.0 ;E 298708.0		ORIGINATED BY		AM	
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY		MAS	
DATUM Geodetic		DATE December 21, 2010		CHECKED BY		SMM	

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

○ 3% STRAIN AT FAILURE

PROJECT		09-1111-0018		RECORD OF BOREHOLE No DC-11		SHEET 2 OF 2		METRIC								
W.P.		2835-02-00		LOCATION		N 4869323.0 ; E 298708.0		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY								
DATUM		Geodetic		DATE		December 21, 2010		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								
	--- CONTINUED FROM PREVIOUS PAGE ---															
343.0	SAND, some silt Compact to very dense Brown Moist		14	SS	74											
15.9	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.															

PROJECT		09-1111-0018		RECORD OF BOREHOLE No DC-12		SHEET 1 OF 1		METRIC								
W.P.		2835-02-00		LOCATION		N 4869368.0 ; E 298675.4		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY								
DATUM		Geodetic		DATE		December 24, 2010		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								
351.1	GROUND SURFACE															
0.0	ASPHALT															
0.2	Silty sand, trace gravel (FILL) Brown Moist															
350.3	Gravelly CLAYEY SILT with SAND (TILL) Stiff to hard Brown Moist		1	SS	33											
0.8			2	SS	16											
	Containing sand and silt seams between depths of 2.3 m and 2.9 m		3	SS	12											
			4	SS	21											
347.4	Silty SAND, trace gravel and clay Compact Brown Moist		5	SS	24											
346.6			6	SS	33											
4.5	SILT, some sand, trace to some clay Dense Brown Moist															
345.9	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.															
5.2																

PROJECT 09-1111-0018		RECORD OF BOREHOLE No DC-13				SHEET 1 OF 1		METRIC									
W.P. 2835-02-00		LOCATION N 4869392.1 ; E 298696.6				ORIGINATED BY AM											
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers				COMPILED BY MAS											
DATUM Geodetic		DATE December 21, 2010				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									
355.0	GROUND SURFACE																
0.0	TOPSOIL																
0.2	Silty SAND, trace gravel, containing rootlets, slightly organic Very loose to loose Brown Moist		1	SS	3												
			2	SS	6												
353.5																	
1.5	CLAYEY SILT, some sand to sandy, trace to some gravel (TILL) Firm to very stiff Brown Moist		3	SS	5												
			4	SS	12												
			5	SS	25												
			6	SS	28												
			7	SS	50												
	Augers grinding at a depth of 5.5 m																
			8	SS	24												
			9	SS	30												
346.8	END OF BOREHOLE																
8.2	NOTE: 1. Open borehole dry upon completion of drilling.																

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PROJECT		2835-02-00		LOCATION		N 4868793.3 ; E 298720.5		ORIGINATED BY		TT								
DIST		Central HWY 400		BOREHOLE TYPE		D-25 Track Mount, 108 mm Outside Diameter Hollow Stem Augers		COMPILED BY		ARM								
DATUM		Geodetic		DATE		January 13, 2011		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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					WATER CONTENT (%)							
347.5	GROUND SURFACE																	
0.0	TOPSOIL																	
0.2	SAND, trace to some silt, slightly organic to a depth of 0.6 m Loose to compact Brown Moist		1	SS	9													
			2	SS	10													
			3	SS	10													0 95 5 0
			4	SS	7													
			5	SS	17													0 83 17 0
343.5			6	SS	9													
4.0	Sandy SILT to SAND and SILT, trace to some clay, trace gravel, containing zones of silty sand Compact to dense Brown Moist		7	SS	18													
			8	SS	37													4 21 65 10
			9	SS	45													
	Becoming wet below a depth of 8.1 m		10	SS	45													2 32 66 0
			11A	SS	60													
336.5	Sandy GRAVEL, trace silt		11B															
336.2	Very dense																	
11.3	Moist END OF BOREHOLE																	
	NOTE: 1. Open borehole dry upon completion of drilling.																	

PROJECT 09-1111-0018		RECORD OF BOREHOLE No DC-15		SHEET 1 OF 1		METRIC	
W.P. 2835-02-00		LOCATION N 4868845.7 ; E 298736.2		ORIGINATED BY SB			
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY MAS			
DATUM Geodetic		DATE December 22, 2010		CHECKED BY SMM			

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 (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL
								20	40	60	80	100	W _p	W	W _L					
344.1	GROUND SURFACE																			
0.0	ASPHALT																			
0.2	Silty sand, trace gravel (FILL) Brown Moist																			
343.3																				
0.8	SAND, trace silt, trace gravel Compact Brown Moist Trace clay between depths of 1.5 m and 2.1 m		1	SS	27															
			2	SS	19															
			3	SS	22												0 96 4 0			
			4	SS	21															
			5	SS	27												1 96 3 0			
			6	SS	20															
338.9																				
5.2	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.																			

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


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

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No DC-16		SHEET 2 OF 2		METRIC	
W.P. <u>2835-02-00</u>		LOCATION <u>N 4868889.0 ; E 298701.4</u>		ORIGINATED BY <u>TT</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-25 Track Mount, 108 mm Outside Diameter Hollow Stem Augers</u>		COMPILED BY <u>ARM</u>			
DATUM <u>Geodetic</u>		DATE <u>January 14, 2011</u>		CHECKED BY <u>SMM</u>			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W _p	W	W _L		GR	SA	SI	CL
								20	40	60	80	100								
	--- CONTINUED FROM PREVIOUS PAGE ---																			
338.6	SAND, trace to some silt Loose to very dense Brown Moist		14	SS	46															
15.9	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.																			

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PROJECT		2835-02-00		LOCATION		N 4868944.3 ; E 298719.4		ORIGINATED BY		SB									
DIST		Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY		MAS									
DATUM		Geodetic		DATE		December 22, 2010		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	20			40	60	80	100	20						40
347.1	GROUND SURFACE																		
0.0	ASPHALT																		
0.2	Silty sand, trace gravel (FILL) Brown Moist																		
346.3																			
0.8	SAND, trace silt Compact Brown Moist		1	SS	30														
			2	SS	16														
			3	SS	10														
			4	SS	10														
			5	SS	12														
			6	SS	17														
341.9	END OF BOREHOLE																		
5.2	NOTE: 1. Open borehole dry upon completion of drilling.																		

PROJECT 09-1111-0018		RECORD OF BOREHOLE No DC-18		SHEET 1 OF 1		METRIC											
W.P. 2835-02-00		LOCATION N 4868987.2 ; E 298691.8		ORIGINATED BY TT													
DIST Central HWY 400		BOREHOLE TYPE D-25 Track Mount, 108 mm Outside Diameter Hollow Stem Augers		COMPILED BY ARM													
DATUM Geodetic		DATE January 13, 2011		CHECKED BY SMM													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ kN/m³	GR SA SI CL
								20 40 60 80 100	20 40 60 80 100	W _p	W	W _L	10 20 30				
353.8	GROUND SURFACE																
0.9	TOPSOIL																
	SAND, some silt, trace gravel, trace clay, containing rootlets to a depth of 1.4 m Loose to very dense Brown Moist		1	SS	10		353										
			2	SS	5												
			3	SS	12		352										0 80 18 2
	Containing lenses/seams of clayey silt between depths of 2.2 m and 5.6 m		4	SS	20		351										
			5	SS	21		350										
			6	SS	37												3 84 12 1
			7	SS	31		349										
							348										
			8	SS	57												
							347										
346.6																	
7.2	SAND, some gravel, trace to some silt, trace clay Very dense Brown Moist		9	SS	100/23		346										16 72 10 2
345.1							345										
8.7	Silty SAND, trace clay Very dense Grey Moist		10	SS	71												0 76 24 1
							344										
342.7			11	SS	100/28		343										
11.1	END OF BOREHOLE																
	NOTE: 1. Open borehole dry upon completion of drilling.																

PROJECT 09-1111-0018			RECORD OF BOREHOLE No DC-19			SHEET 1 OF 1			METRIC															
W.P. 2835-02-00			LOCATION N 4869042.9 ; E 298702.5			ORIGINATED BY SB																		
DIST Central HWY 400			BOREHOLE TYPE D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Augers			COMPILED BY MAS																		
DATUM Geodetic			DATE December 22, 2010			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			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																			
349.9	GROUND SURFACE																							
0.0	ASPHALT																							
0.2	Silty sand, trace gravel (FILL) Brown Moist																							
349.1	SAND and SILT Compact to dense Brown Moist		1	SS	26																			
0.8			2	SS	18																			
			3	SS	23																			
			4	SS	19																			
			5	SS	18																			
			6	SS	38																			
344.7	END OF BOREHOLE																							
5.2	NOTE: 1. Open borehole dry upon completion of drilling.																							

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PROJECT		RECORD OF BOREHOLE No DC-20		SHEET 1 OF 1		METRIC											
W.P. 09-1111-0018		LOCATION N 4869087.6 ; E 298666.8		ORIGINATED BY AM													
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY MAS													
DATUM Geodetic		DATE December 23, 2010		CHECKED BY SMM													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ kN/m³	GR SA SI CL
							20 40 60 80 100	○ UNCONFINED + FIELD VANE	● QUICK TRIAXIAL × REMOULDED	W _p W W _L	10 20 30						
352.5	GROUND SURFACE																
0.0	TOPSOIL																
	SAND, trace silt Loose to compact Brown Moist		1	SS	6		352										
			2	SS	10												
			3	SS	11		351										
350.3																	
2.2	SAND and SILT, trace clay Loose to compact Brown Moist		4	SS	9		350										
			5	SS	26												
			6	SS	27		349										
348.0																	
4.5	SAND, some silt Compact to dense Brown Moist		7	SS	44		348										
							347										
345.8			8	SS	30		346										
6.7	END OF BOREHOLE																
	NOTE: 1. Open borehole dry upon completion of drilling.																

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PROJECT		RECORD OF BOREHOLE No DC-21		SHEET 1 OF 1		METRIC																
W.P. 09-1111-0018		LOCATION N 4869141.5 ; E 298685.7		ORIGINATED BY SB																		
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY MAS																		
DATUM Geodetic		DATE December 21, 2010		CHECKED BY SMM																		
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)							
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ						
								20 40 60 80 100						W _p W W _L								
351.6	GROUND SURFACE																					
0.0	ASPHALT																					
0.2	Silty sand, trace gravel (FILL)																					
350.8	Brown Moist																					
0.8	Silty SAND to SAND, some silt																					
	Compact		1	SS	14																	
	Brown Moist																					
			2	SS	14																	
			3	SS	15																	
			4	SS	13																	
			5	SS	12																	
			6	SS	14																	
346.4	END OF BOREHOLE																					
5.2	NOTE: 1. Open borehole dry upon completion of drilling.																					

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No DC-22		SHEET 1 OF 2		METRIC	
W.P. 2835-02-00		LOCATION N 4869186.2 ;E 298649.8		ORIGINATED BY		AM	
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY		MAS	
DATUM Geodetic		DATE December 23, 2010		CHECKED BY		SMM	

SOIL PROFILE					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT
360.0	GROUND SURFACE		NUMBER TYPE "N" VALUES		
0.0	TOPSOIL				
0.2	Silty SAND, trace clay, trace gravel, containing rootlets Loose Brown Moist		1 SS 8		
			2 SS 6		
358.5	CLAYEY SILT, some sand, trace gravel (TILL) Stiff to very stiff Brown Moist		3 SS 14		
1.5			4 SS 16		
			5 SS 13		
			6 SS 16		
			7 SS 21		
			8 SS 28		
353.4	SAND and SILT, trace to some gravel, trace clay, containing 25 mm thick clayey silt seams to a depth of 8.7 m Dense to very dense Brown Moist		9 SS 69		
6.6			10 SS 102		
	Containing rock fragments at a depth of 10.7 m		11 SS 66		
			12 SS 36		
346.7	SAND, some silt, trace gravel Compact to dense Brown Moist		13 SS 28		
13.3					

Continued Next Page

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

○ 3% STRAIN AT FAILURE

PROJECT 09-1111-0018				RECORD OF BOREHOLE No DC-22				SHEET 2 OF 2				METRIC						
W.P. 2835-02-00				LOCATION N 4869186.2 ; E 298649.8				ORIGINATED BY AM										
DIST Central HWY 400				BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers				COMPILED BY MAS										
DATUM Geodetic				DATE December 23, 2010				CHECKED BY SMM										
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					WATER CONTENT (%)					
	--- CONTINUED FROM PREVIOUS PAGE ---						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED </div>					<div style="display: flex; justify-content: space-between;"> W_p W W_L </div>						
344.1	SAND, some silt, trace gravel Compact to dense Brown Moist	14	SS	39														
15.9	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.																	

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PROJECT		09-1111-0018		RECORD OF BOREHOLE No DC-23		SHEET 1 OF 1		METRIC								
W.P.		2835-02-00		LOCATION		N 4869240.1 ; E 298669.0		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY								
DATUM		Geodetic		DATE		December 21, 2010		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								
352.0	GROUND SURFACE															
0.0	ASPHALT															
0.2	Silty sand, trace gravel (FILL) Brown Moist															
351.2																
0.8	CLAYEY SILT, some sand, trace to some gravel (TILL) Very stiff Brown Moist		1	SS	15											
			2	SS	24											
349.8																
2.2	SILT, some sand, trace to some clay, trace gravel Dense to very dense Brown Moist		3	SS	47											
			4	SS	56											
348.3																
3.7	Silty SAND Very dense Brown Moist		5	SS	57											
347.5																
4.5	Sandy SILT Very dense Brown Moist		6	SS	82											
347.0																
5.0	END OF BOREHOLE															
NOTE: 1. Open borehole dry upon completion of drilling.																


PROJECT 09-1111-0018		RECORD OF BOREHOLE No DC-24		SHEET 1 OF 2		METRIC	
W.P. 2835-02-00		LOCATION N 4869284.9 ; E 298633.9		ORIGINATED BY AM			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY MAS			
DATUM Geodetic		DATE December 22, 2010		CHECKED BY SMM			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE	● QUICK TRIAXIAL × REMOULDED								
360.0	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL																
0.1	Silty SAND, trace gravel		1	SS	7												
359.3	Loose Brown																
0.7	Moist																
	SAND and SILT, trace to some clay, trace gravel (TILL)		2	SS	13												
	Compact																
	Brown		3	SS	12												
	Moist																
			4	SS	20												
			5	SS	22												
356.3																	
3.7	SAND and SILT, trace clay, trace gravel		6	SS	27												
	Compact																
355.5	Brown																
4.5	Moist																
	CLAYEY SILT, trace sand, trace gravel (TILL)		7	SS	24												
	Very stiff																
	Brown																
354.4	Moist																
5.6	SAND, trace to some silt																
	Compact		8	SS	21												
	Brown																
	Moist																
352.8																	
7.2	CLAYEY SILT, trace sand, trace gravel (TILL)		9	SS	29												
	Very stiff																
	Grey																
	Moist																
			10	SS	30												
349.8																	
10.2	SAND, trace to some silt, trace to some gravel		11	SS	67												
	Compact to very dense																
	Brown																
	Moist																
	Containing clayey silt pocket at a depth of 12.2 m		12	SS	32												
			13	SS	46												
													</				

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

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PROJECT		2835-02-00		LOCATION		N 4869284.9 ; E 298633.9		ORIGINATED BY		AM		DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		MAS		DATUM		Geodetic		DATE		December 22, 2010		CHECKED BY		SMM	
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SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT			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			20	40	60	80	100	W _p	W	W _L																				
	--- CONTINUED FROM PREVIOUS PAGE ---																																		
344.2	Containing clayey silt pocket at a depth of 15.2 m		14	SS	24																														
15.8	END OF BOREHOLE																																		
	NOTE: 1. Water level in open borehole at a depth of 6.7 m below ground surface (Elev. 353.3 m) upon completion of drilling.																																		

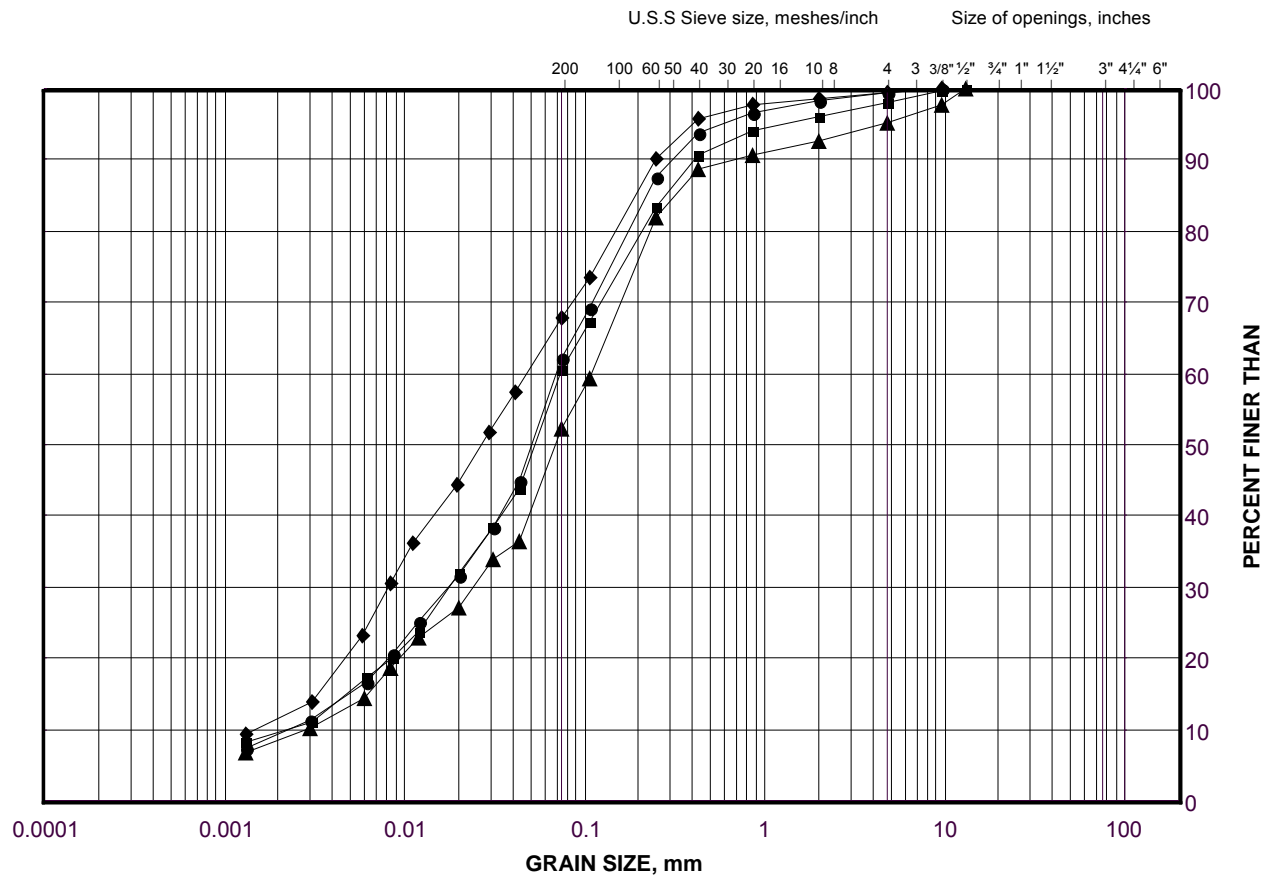
PROJECT		RECORD OF BOREHOLE		No DC-25		SHEET 1 OF 1		METRIC									
W.P. 09-1111-0018		LOCATION		N 4869334.1 ; E 298625.0		ORIGINATED BY		AM									
DIST Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		MAS									
DATUM Geodetic		DATE		December 22, 2010		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									
358.5	GROUND SURFACE																
0.0	TOPSOIL																
0.2	SAND and SILT, trace to some clay, trace gravel, containing rootlets to a depth of 3.0 m (TILL) Loose to compact Brown Moist		1	SS	7												
			2	SS	17												
			3	SS	11												
			4	SS	32/0.20												
	Cobble at tip of split spoon at 2.6 m depth																
			5	SS	29												
354.8	CLAYEY SILT, some sand, trace gravel, containing sand pockets (TILL) Very stiff to hard Brown Moist		6	SS	23												
3.7			7	SS	24												
			8	SS	17												
			9	SS	35												
	Becoming grey below 9.1 m depth		10	SS	31												
348.7	END OF BOREHOLE																
9.8	NOTE: 1. Water level in open borehole at a depth of 5.5 m below ground surface (Elev. 353.0 m) upon completion of drilling.																

PROJECT		2835-02-00		LOCATION		N 4869387.8 ; E 298642.9		ORIGINATED BY		SB								
DIST		Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		MAS								
DATUM		Geodetic		DATE		December 21, 2010		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					WATER CONTENT (%)							
350.6	GROUND SURFACE																	
0.0	ASPHALT																	
0.2	Silty sand, trace gravel (FILL)																	
349.8	Brown Moist																	
0.8	CLAYEY SILT, with sand, trace gravel, containing zones of sandy silt		1	SS	7													
349.1	Firm Brown Moist																	
1.5	CLAYEY SILT, some sand, trace gravel, containing zones of oxidation staining (TILL)		2	SS	36													
	Very stiff to hard Brown Moist																	
			3	SS	27													
			4	SS	27													
346.9	SAND and SILT, trace to some clay, trace gravel																	
3.7	Very dense Brown Moist		5	SS	69													
			6	SS	76													
345.6	END OF BOREHOLE																	
5.0	NOTE: 1. Open borehole dry upon completion of drilling.																	

GRAIN SIZE DISTRIBUTION

Silt and Sand Till

FIGURE C1



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-24	3	358.2
■	DC-25	3	356.7
◆	DC-5	4	354.8
▲	DC-25	5	355.1

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Date: 13-Nov-12

LEGEND		
BH	SAMPLE	SYMBOL
DC-5	4	●
DC-24	3	◆
DC-25	3	▲
		■
		○
		◇
		△
		□



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PLASTICITY CHART

Silt and Sand Till

Figure No. C2

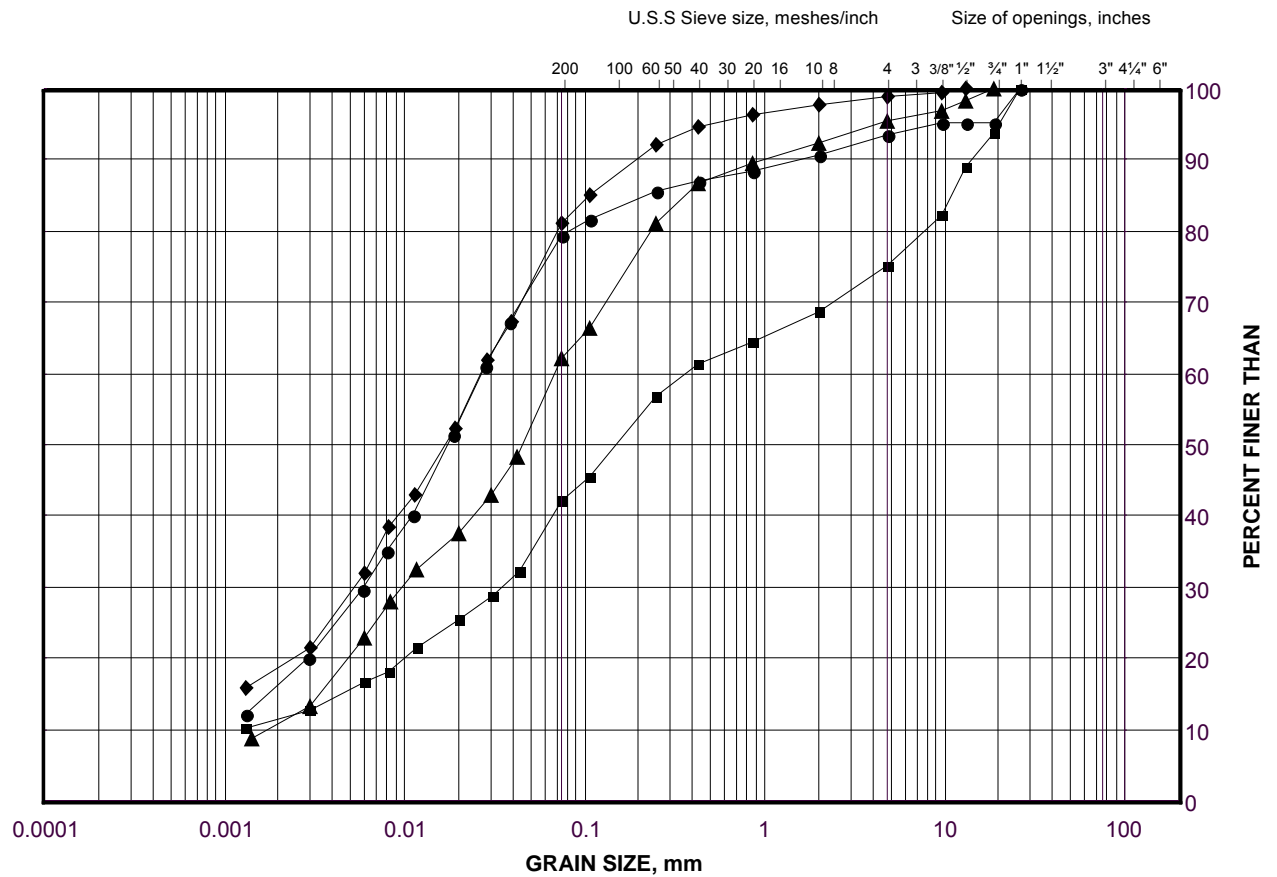
Project No. 09-1111-0018

Checked By:	TWB
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GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE C3A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-23	2	350.2
■	DC-12	2	349.3
◆	DC-26	3	348.0
▲	DC-11	4	356.3

Project Number: 09-1111-0018

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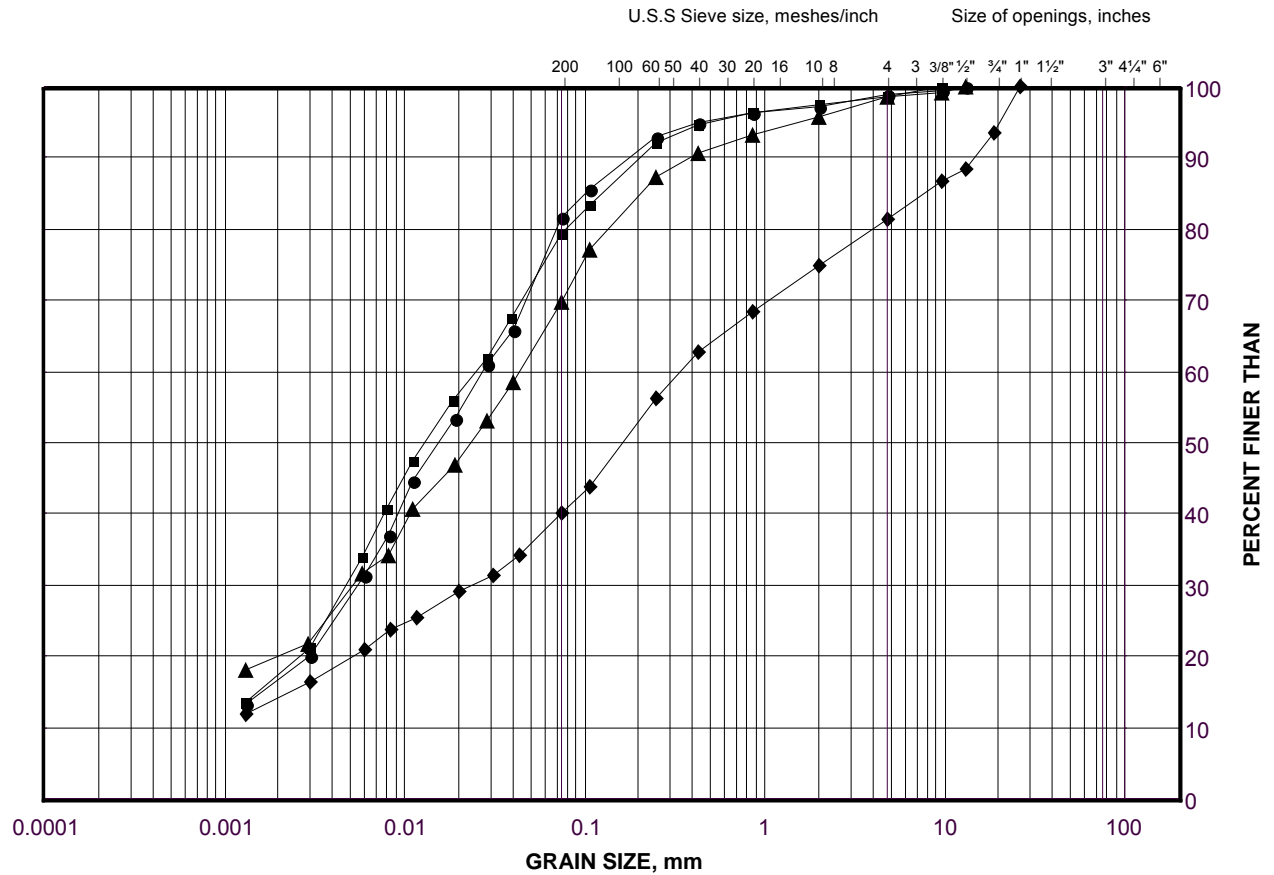
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GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE C3B



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

LEGEND

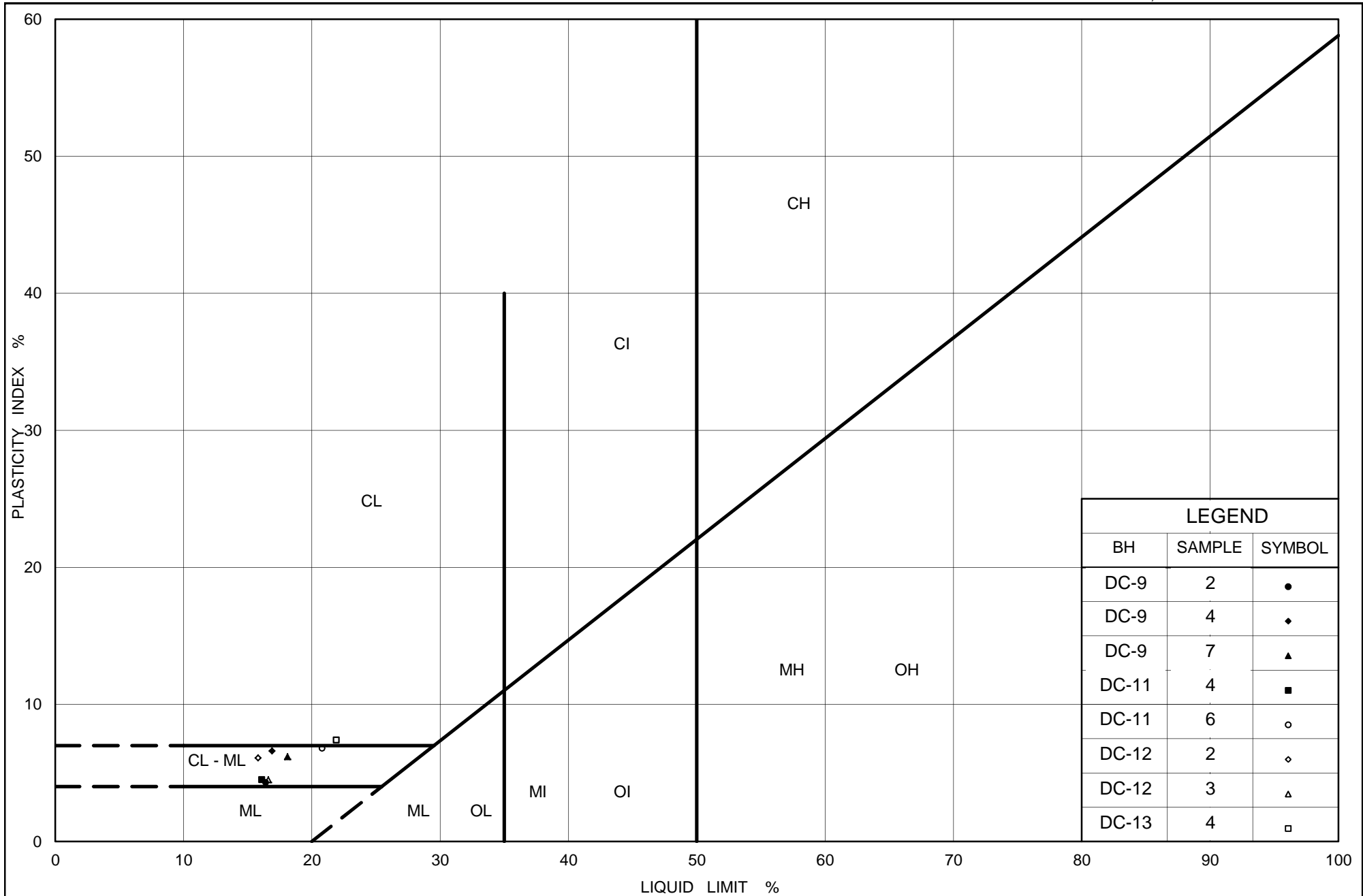
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-22	4	357.4
■	DC-13	4	352.4
◆	DC-9	4	356.3
▲	DC-13	8	348.6

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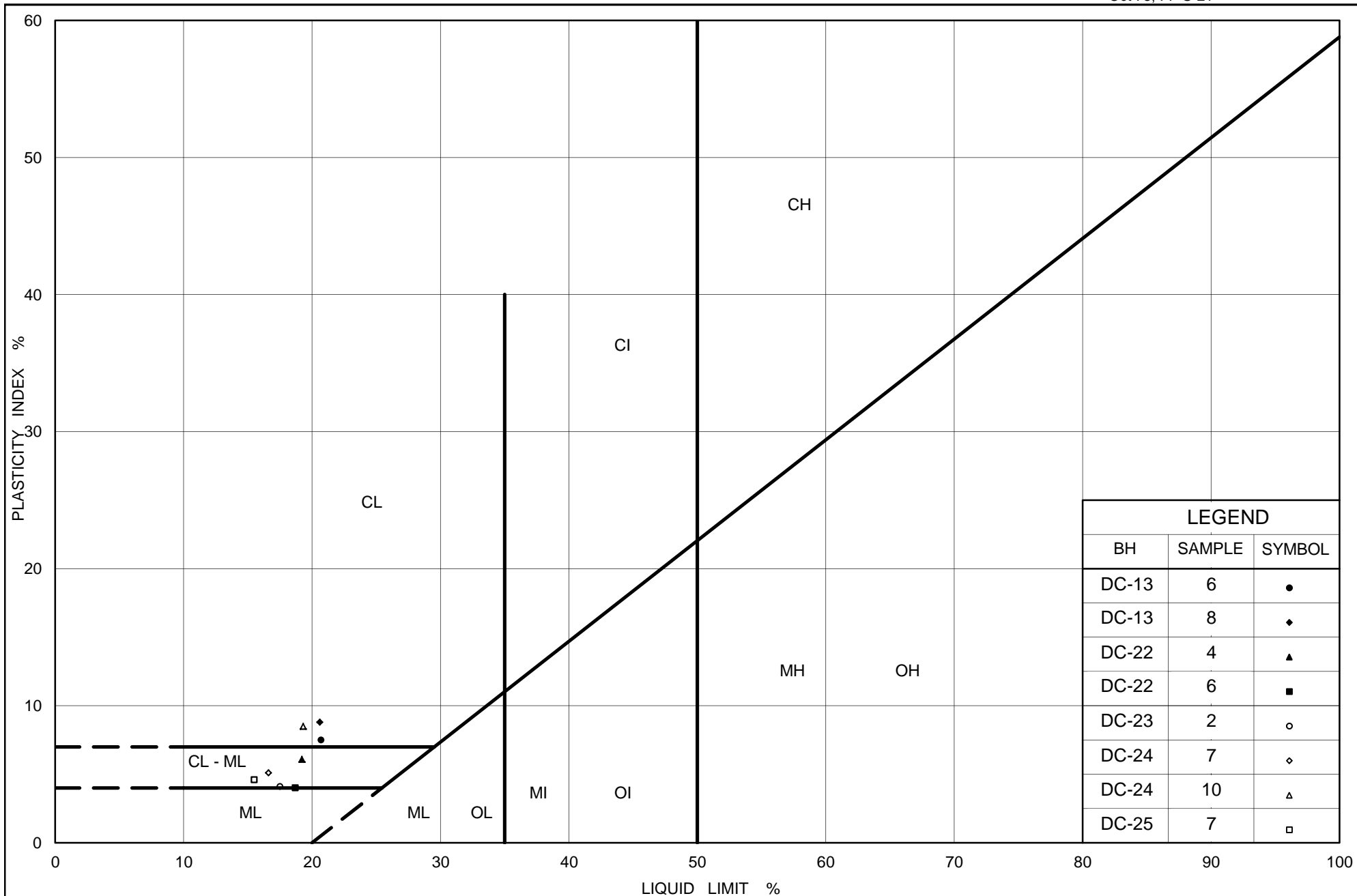
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PLASTICITY CHART Clayey Silt Till

Figure No. C4A

Project No. 09-1111-0018

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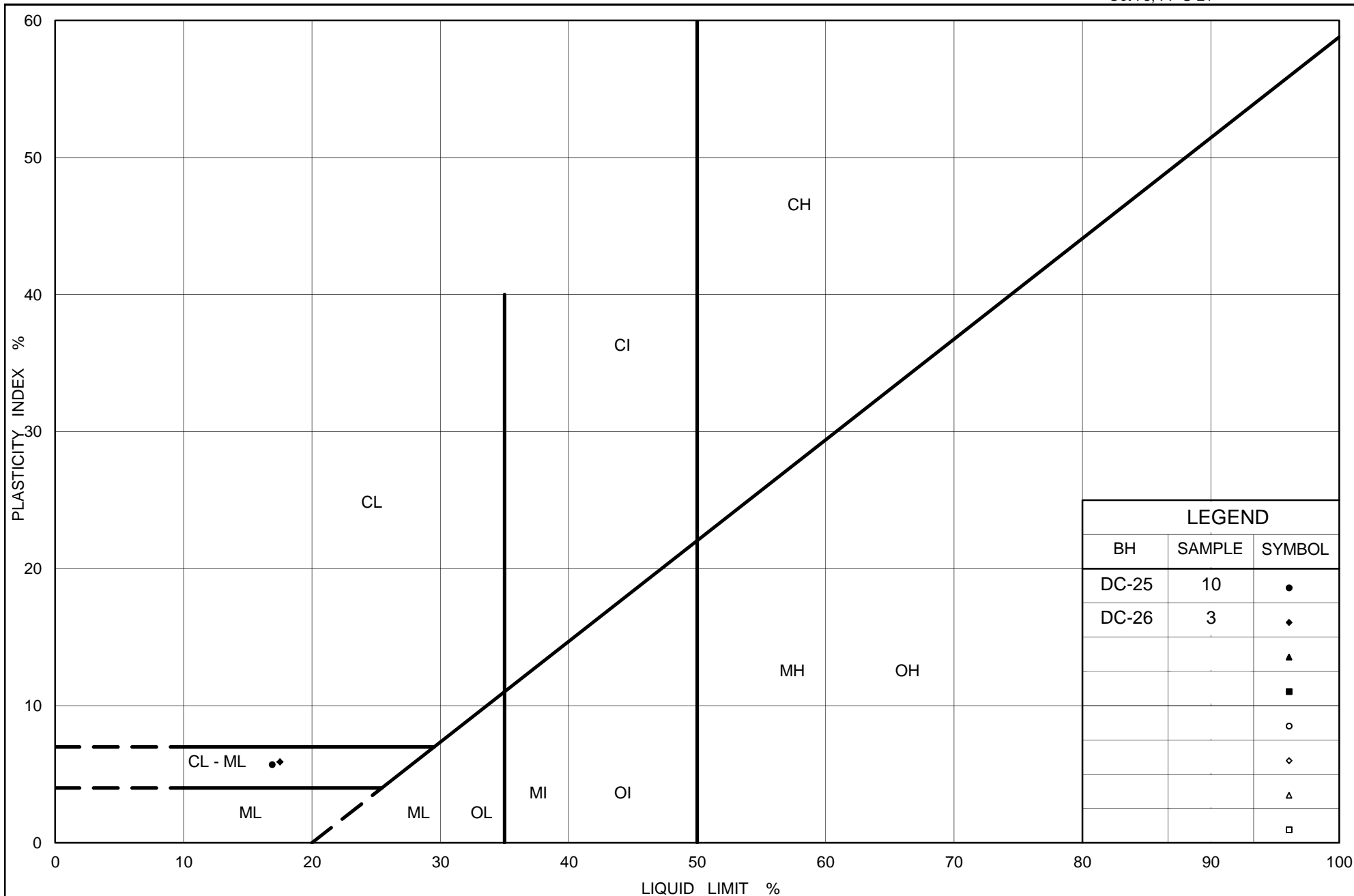
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PLASTICITY CHART Clayey Silt Till

Figure No. C4B

Project No. 09-1111-0018

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PLASTICITY CHART

Clayey Silt Till

Figure No. C4C

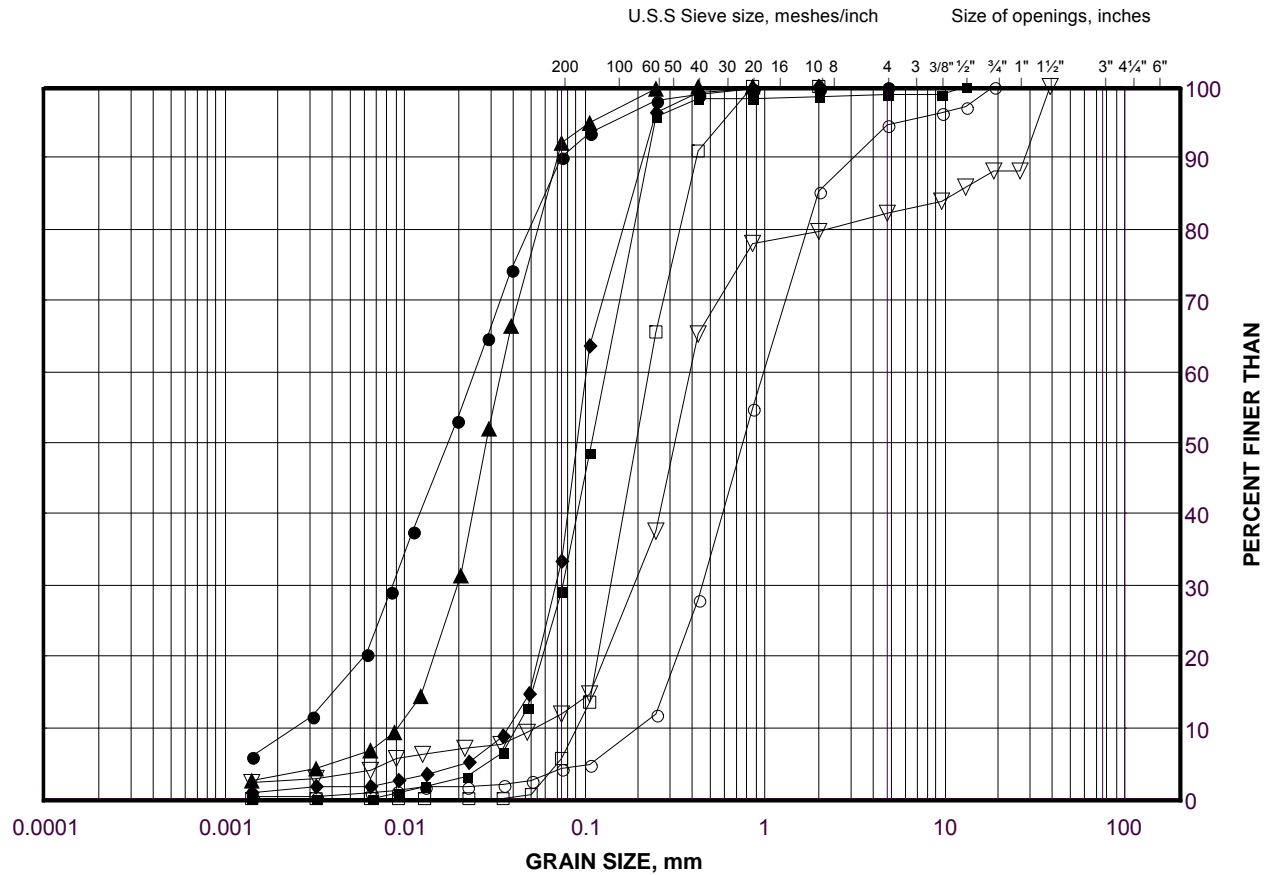
Project No. 09-1111-0018

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GRAIN SIZE DISTRIBUTION

Sand to Sand and Silt to Silt

FIGURE C5A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-1	2	348.7
■	DC-10	2	350.2
◆	DC-5	2	356.3
▲	DC-7	2	352.9
▽	DC-3	2	352.9
○	DC-2	3	342.3
□	DC-14	3	345.7

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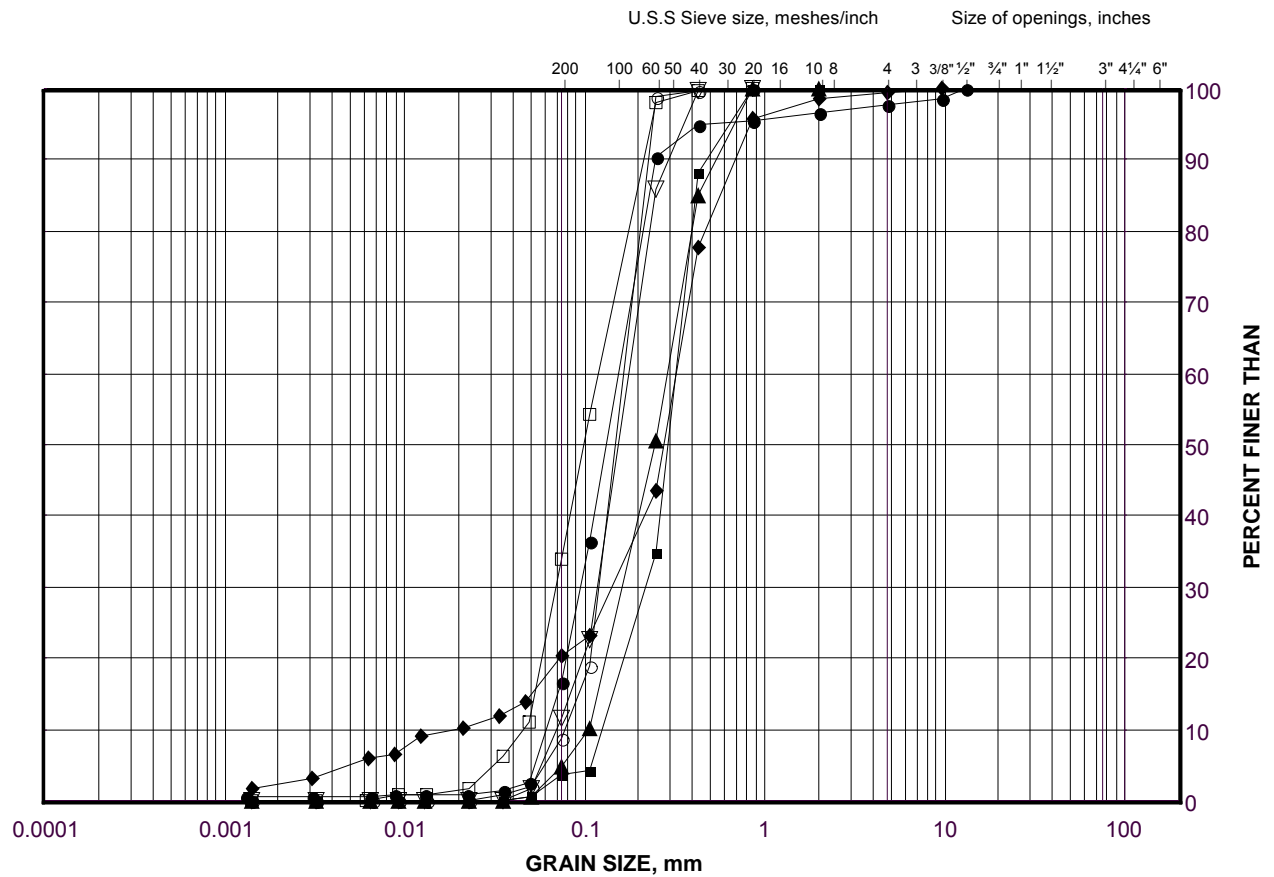
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GRAIN SIZE DISTRIBUTION

Sand to Sand and Silt

FIGURE C5B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-4	3	345.2
■	DC-17	3	344.6
◆	DC-18	3	352.0
▲	DC-20	3	323.7
▽	DC-21	3	349.0
○	DC-8	3	349.0
□	DC-6	3	347.8

Project Number: 09-1111-0018

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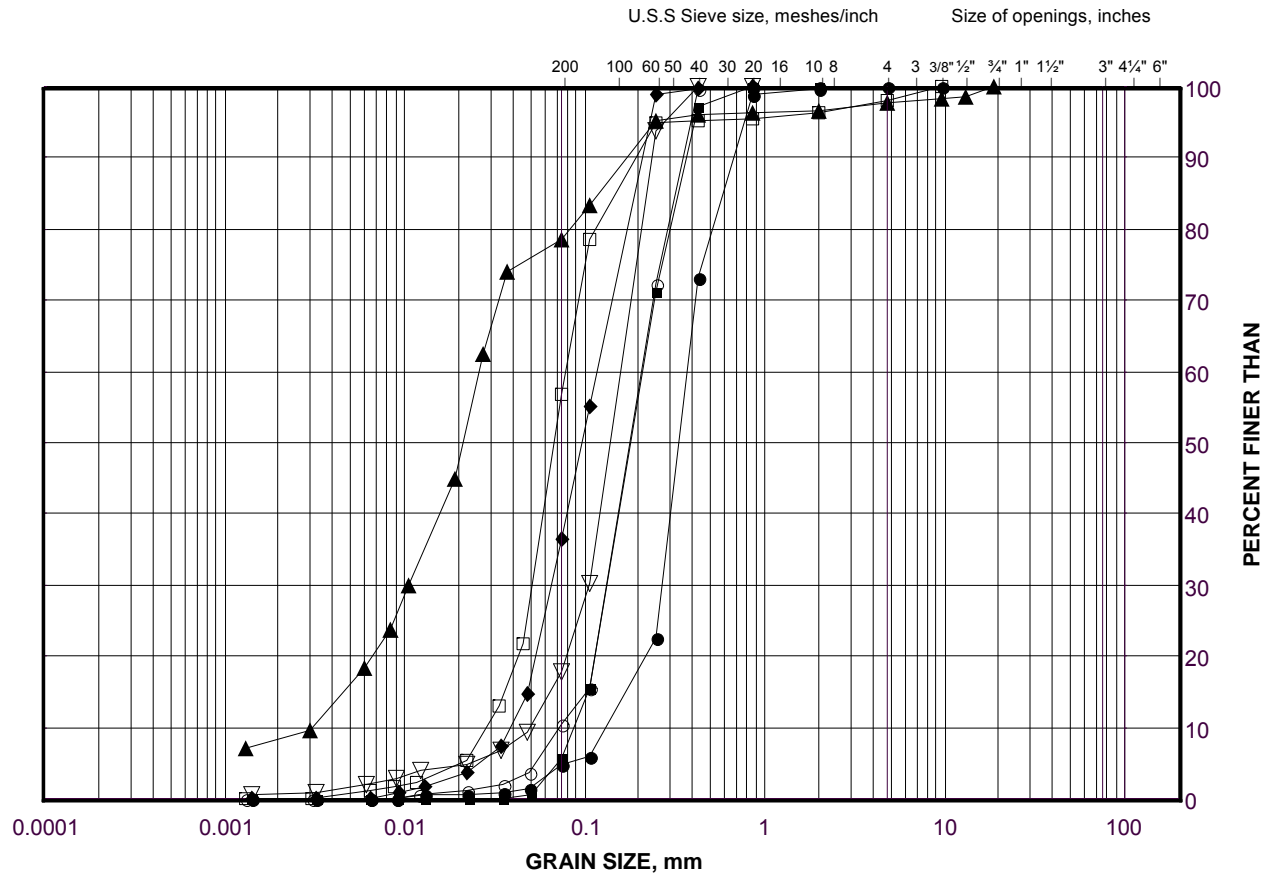
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GRAIN SIZE DISTRIBUTION

Sand to Sand and Silt to Silt

FIGURE C5C



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-15	3	341.6
■	DC-16	3	352.7
◆	DC-19	3	347.3
▲	DC-23	4	348.6
▽	DC-10	5	348.0
○	DC-8	5	347.6
□	DC-4	5	343.7

Project Number: 09-1111-0018

Checked By: TWB

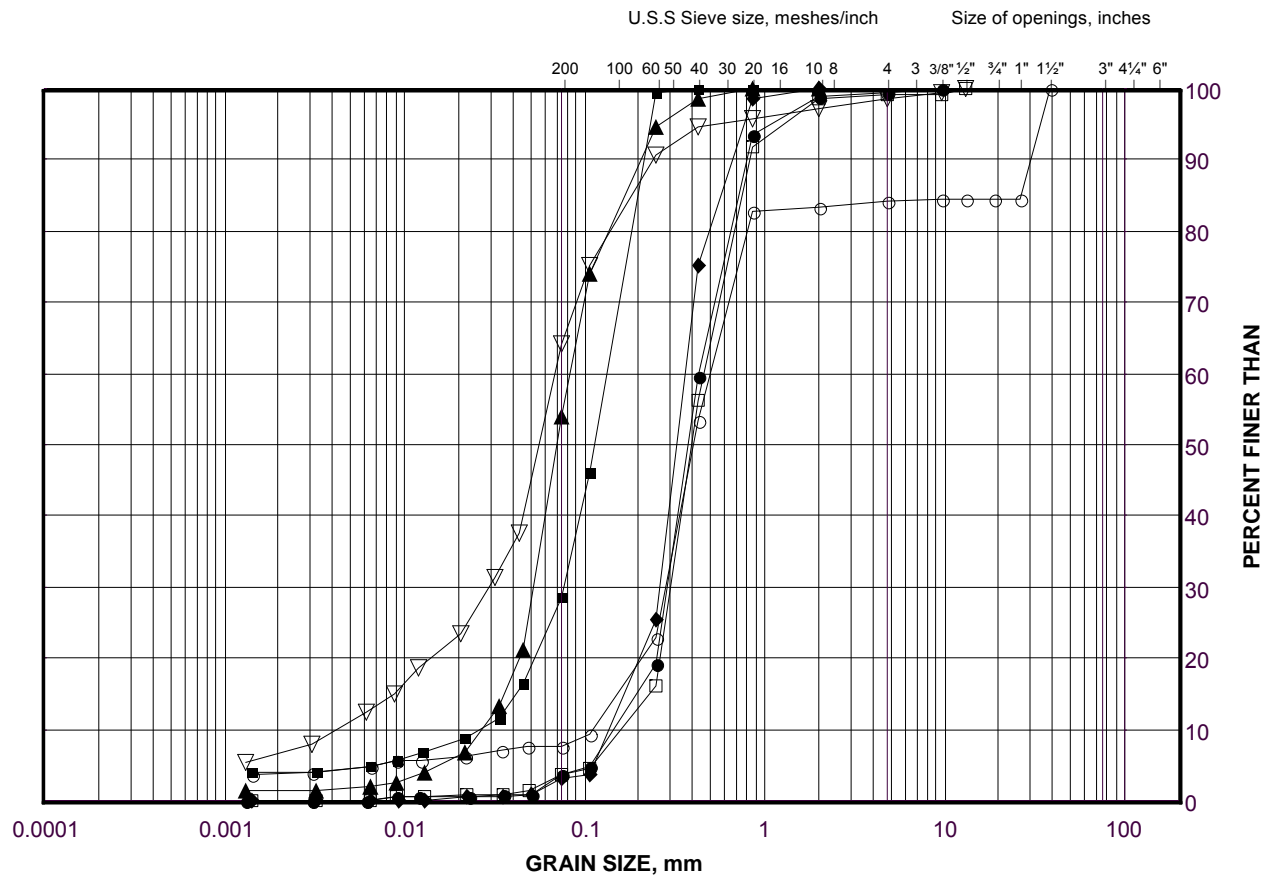
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Date: 13-Nov-12

GRAIN SIZE DISTRIBUTION

Sand to Sand and Silt

FIGURE C5D



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-2	5	340.8
■	DC-7	5	350.7
◆	DC-17	5	343.0
▲	DC-20	5	322.1
▽	DC-26	5	346.6
○	DC-3	5	350.7
□	DC-15	5	340.0

Project Number: 09-1111-0018

Checked By: TWB

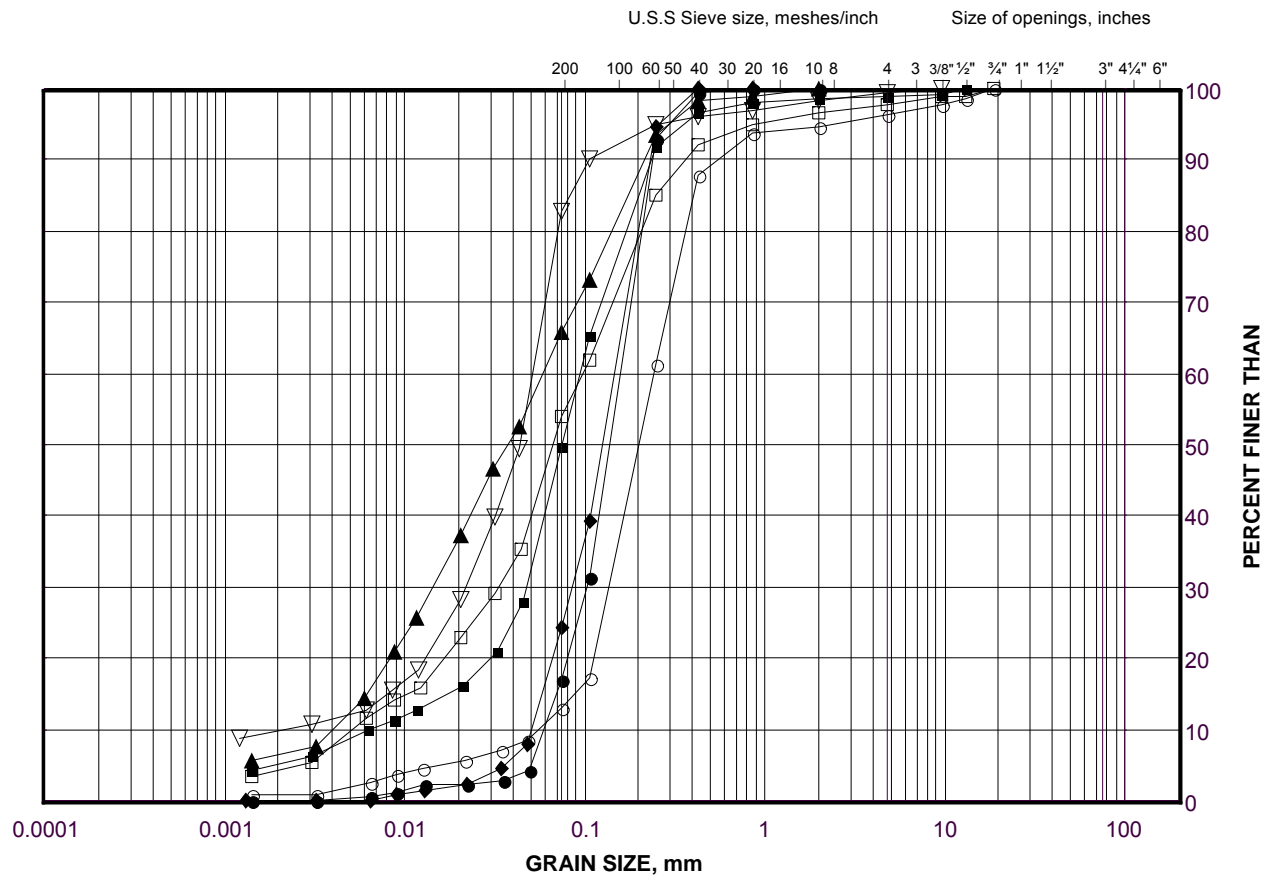
Golder Associates

Date: 13-Nov-12

GRAIN SIZE DISTRIBUTION

Sand to Sand and Silt to Silt

FIGURE C5E



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-14	5	344.1
■	DC-1	5	346.4
◆	DC-21	5	347.5
▲	DC-1	6	345.8
▽	DC-12	6	346.2
○	DC-18	6	349.8
□	DC-24	6	355.8

Project Number: 09-1111-0018

Checked By: TWB

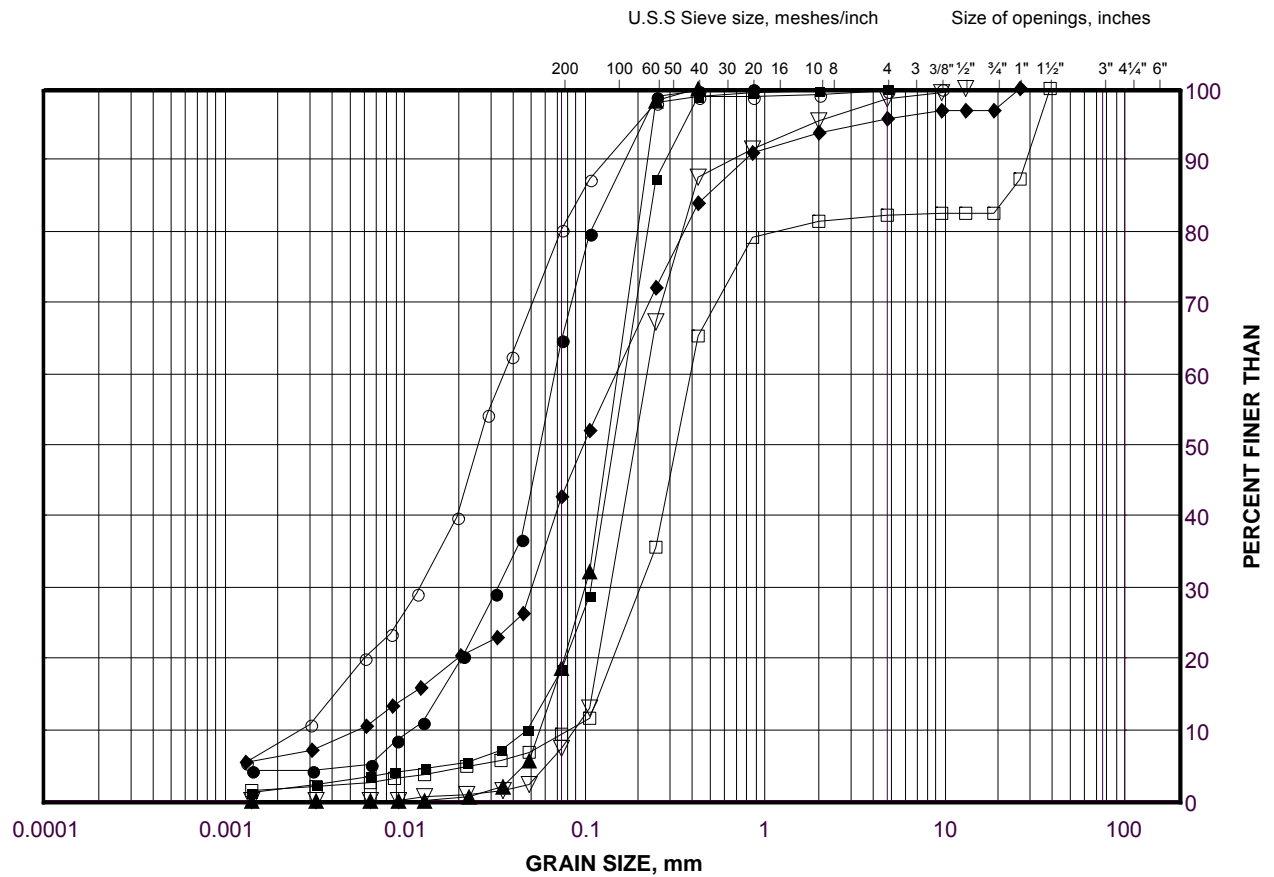
Golder Associates

Date: 13-Nov-12

GRAIN SIZE DISTRIBUTION

Sand to Sand and Silt to Silt

FIGURE C5F



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-19	6	345.0
■	DC-6	6	345.6
◆	DC-16	7	349.6
▲	DC-20	7	320.6
▽	DC-24	8	353.6
○	DC-11	8	352.5
□	DC-3	8	347.6

Project Number: 09-1111-0018

Checked By: TWB

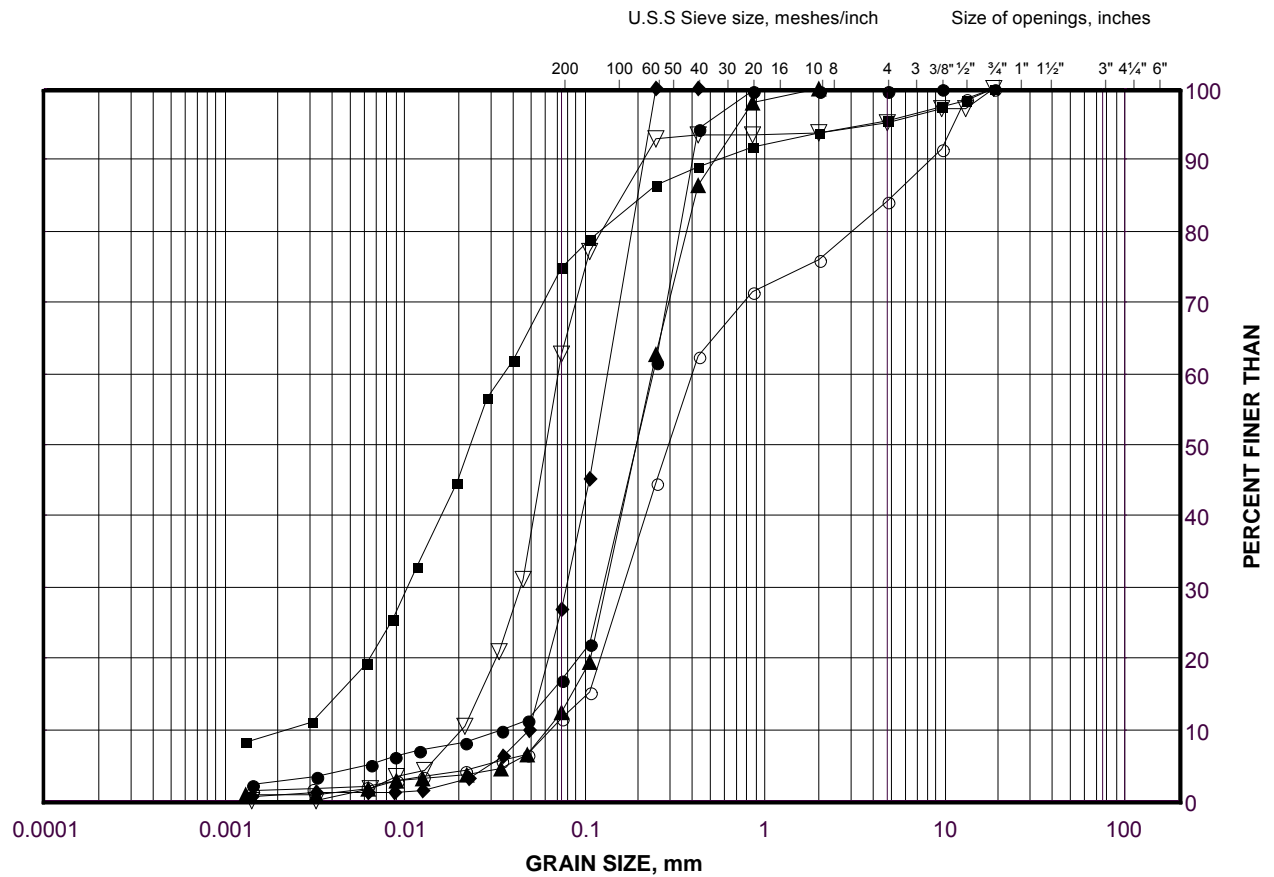
Golder Associates

Date: 13-Nov-12

GRAIN SIZE DISTRIBUTION

Sand to Sand and Silt to Silt

FIGURE C5G



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-5	8	351.0
■	DC-14	8	341.1
◆	DC-7	8	347.6
▲	DC-16	9	346.6
▽	DC-22	9	352.1
○	DC-18	9	346.1

Project Number: 09-1111-0018

Checked By: TWB

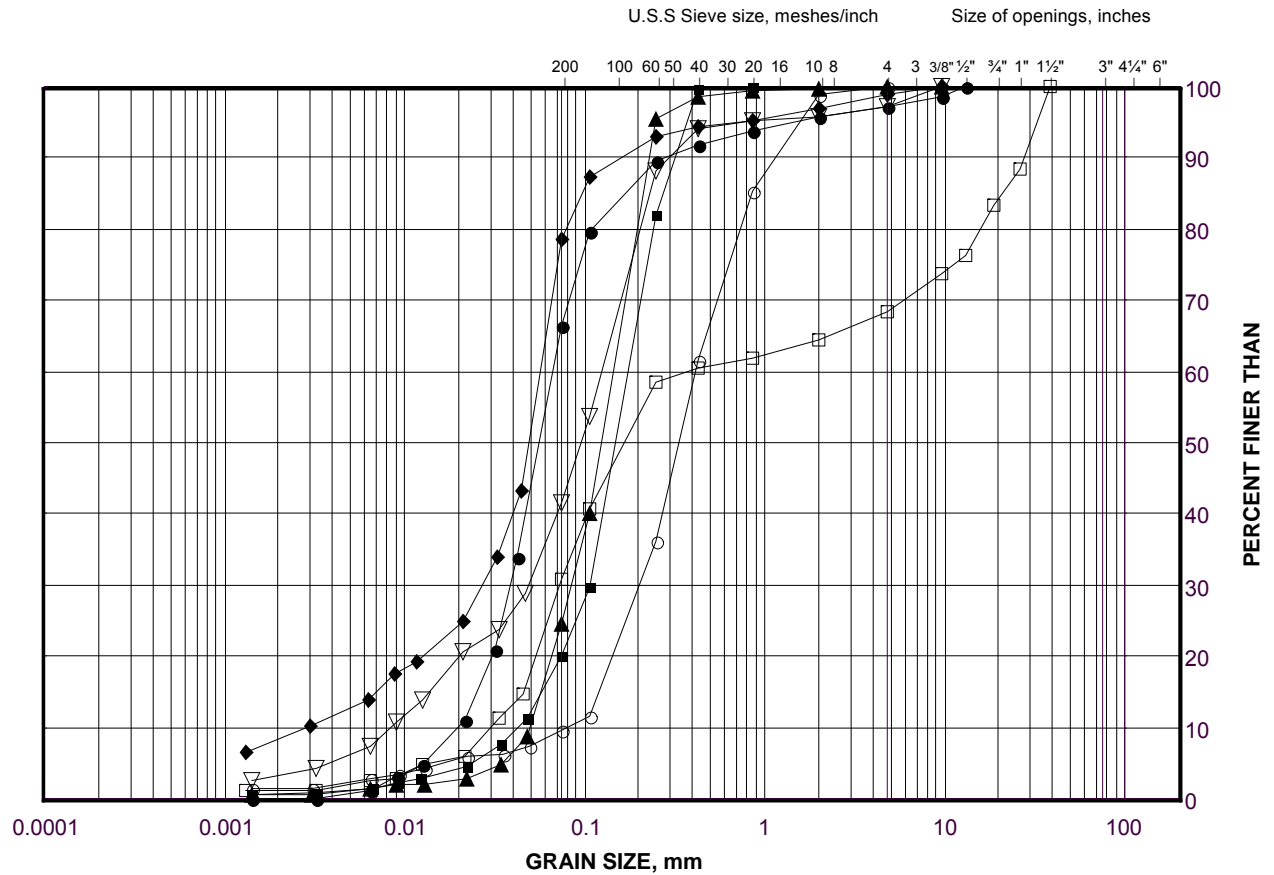
Golder Associates

Date: 13-Nov-12

GRAIN SIZE DISTRIBUTION

Sand to Sand and Silt to Silt

FIGURE C5H



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-14	10	338.1
■	DC-7	10	344.6
◆	DC-9	10	349.6
▲	DC-18	10	344.4
▽	DC-1	10	340.4
○	DC-3	11	343.0
□	DC-22	11	349.0

Project Number: 09-1111-0018

Checked By: TWB

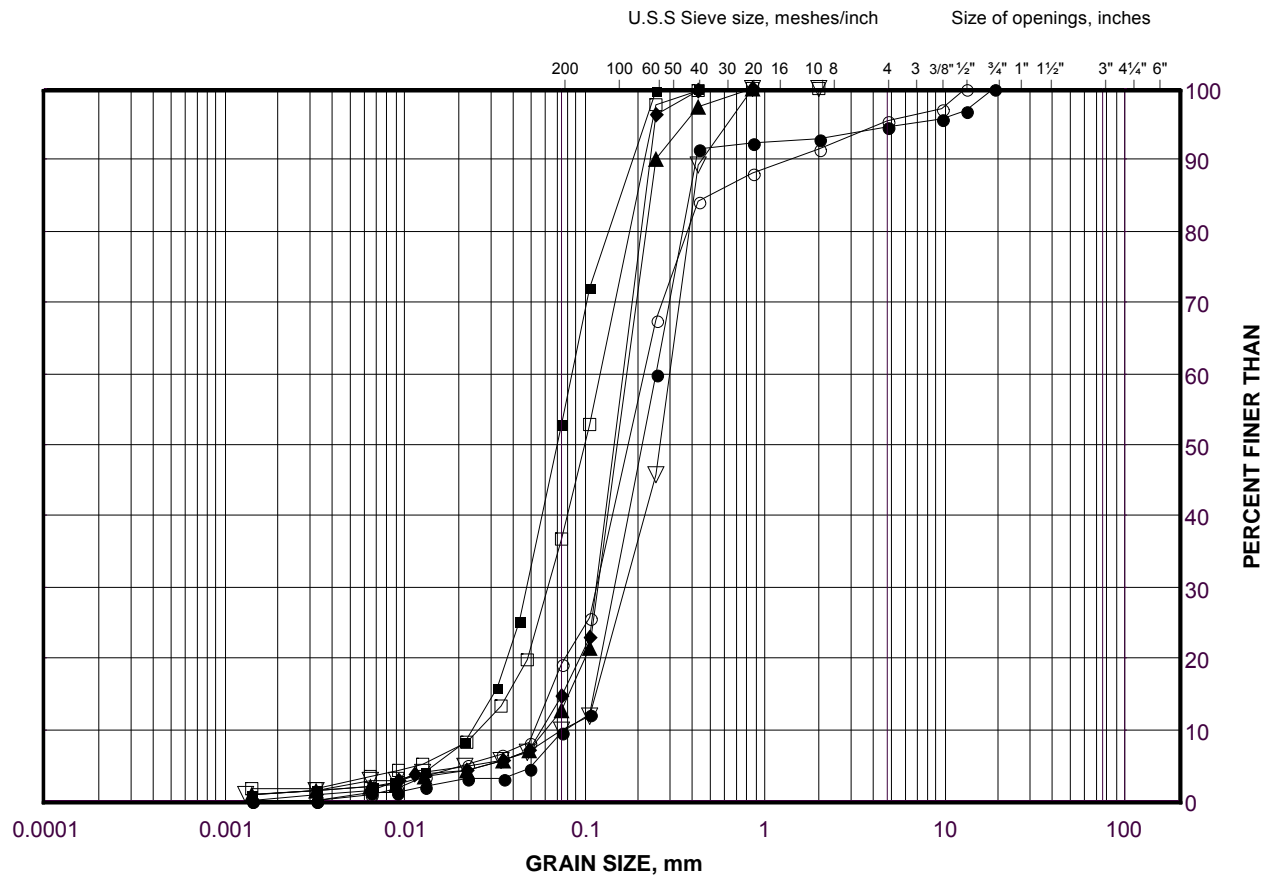
Golder Associates

Date: 13-Nov-12

GRAIN SIZE DISTRIBUTION

Sand to Sand and Silt

FIGURE C5I



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

LEGEND

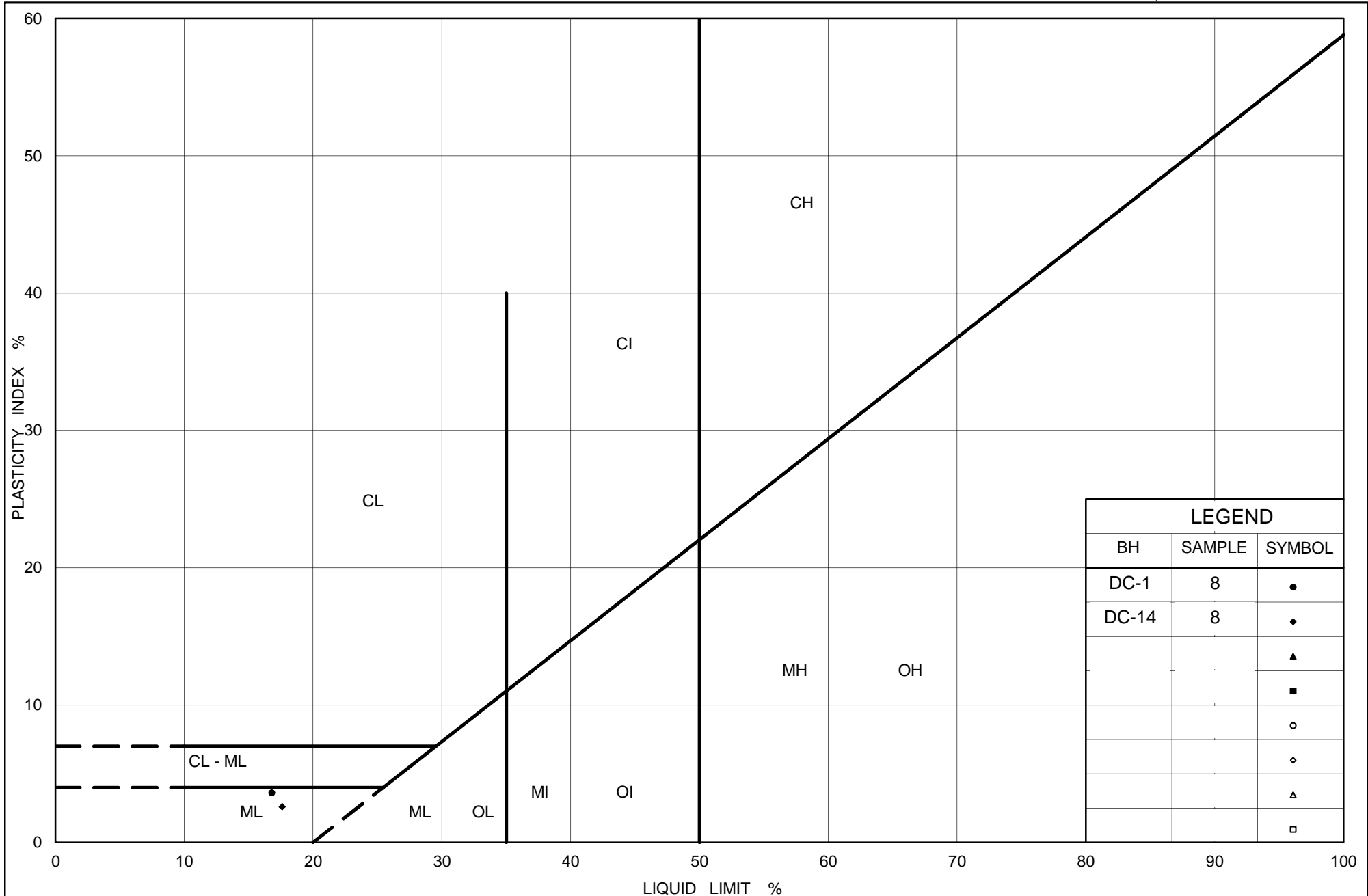
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	DC-24	11	349.0
■	DC-5	11	346.4
◆	DC-11	12	346.4
▲	DC-9	12	346.4
▽	DC-16	12	342.0
○	DC-24	13	346.0
□	DC-5	13	343.4

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 13-Nov-12



Ministry of Transportation

Ontario

PLASTICITY CHART Silt to Sandy Silt

Figure No. C6

Project No. 09-1111-0018

Checked By: TWB



APPENDIX D

**HIGH FILL EMBANKMENT AREA 3 (Stations 17+350 to 17+800
NBL and Stations 17+100 to 18+100 SBL)**

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
C33-1	331.4	4869871.8	298544.2
C33-2	336.0	4869886.5	298558.1
C33-3	335.6	4869908.4	298583.5
C33-4	330.1	4869917.6	298597.4
C34-1	321.7	4870213.4	298485.5
C34-2	326.2	4870212.1	298502.6
C34-3	327.2	4870182.4	298536.4
C34-4	323.8	4870177.6	298555.0
F3-1	339.1	4869791.8	298603.2
F3-2	332.5	4869850.4	298619.6
F3-3	330.0	4869958.8	298601.2
F3-4	327.5	4870006.1	298586.8
F3-5	331.0	4870057.8	298556.9
F3-6	325.2	4870106.6	298570.5
F3-7	324.5	4870146.1	298557.9
F3-9	347.0	4869494.5	298614.7
F3-10	345.0	4869543.3	298603.3
F3-11	345.1	4869589.9	298608.8
F3-12	341.5	4869641.9	298586.5
F3-13	339.0	4869701.0	298576.3
F3-14	339.8	4869762.4	298579.6
F3-15	334.4	4869819.8	298559.1
F3-16	331.0	4869907.7	298537.8

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
F3-17	331.9	4869972.6	298532.9
F3-18	332.1	4870008.4	298534.9
F3-19	330.0	4870056.7	298520.8
F3-20	326.8	4870119.5	298505.0
F3-21	323.5	4870168.7	298493.4
F3-22	324.5	4870264.8	298492.2
F3-23	319.9	4870307.7	298472.8
F3-24	321.6	4870368.6	298475.8
F3-25	317.5	4870410.4	298453.2
F3-26	317.0	4870462.7	298445.8

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

CONT No.
GWP No. 2835-02-00

HIGHWAY 400 HIGH FILL EMBANKMENTS
STAT. 17+100 TO STA. 18+100 (SBL)
STAT. 17+350 TO STA. 17+800 (NBL)
BOREHOLE LOCATIONS



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LEGEND

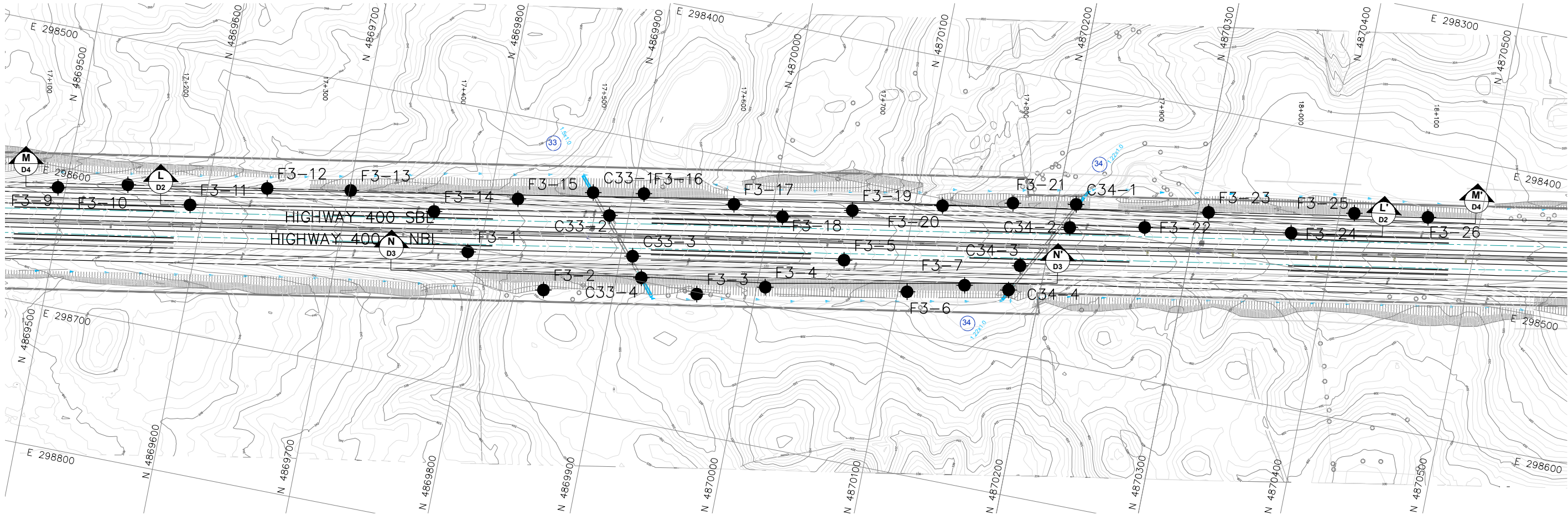
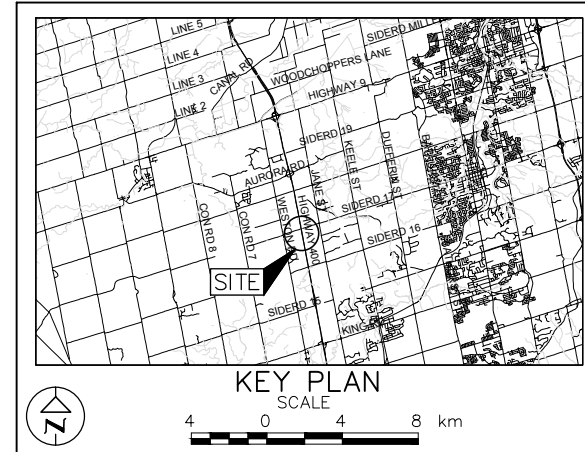
 Borehole – Current Investigation

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.

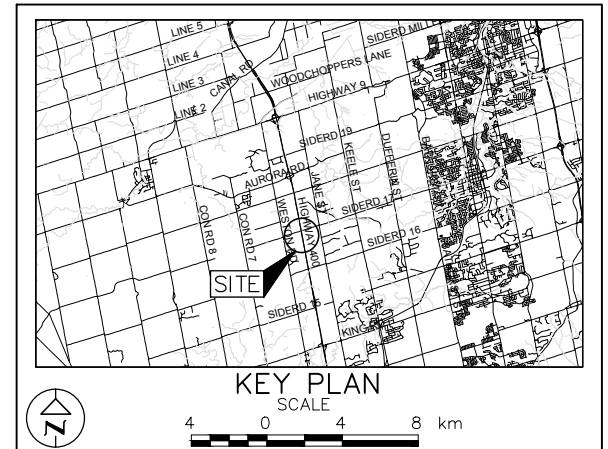
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS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



REFERENCE			
Base plan provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.			
NO.	DATE	BY	REVISION
Geocres No. 30M13-217			
HWY. 400		PROJECT NO. 09-1111-0018	
SUBM'D. AMT		CHKD. TWB	DATE: Mar. 2016
DRAWN: JFC/MR		CHKD. SMM	APPD. JMAC
		SITE: DWG.D1	



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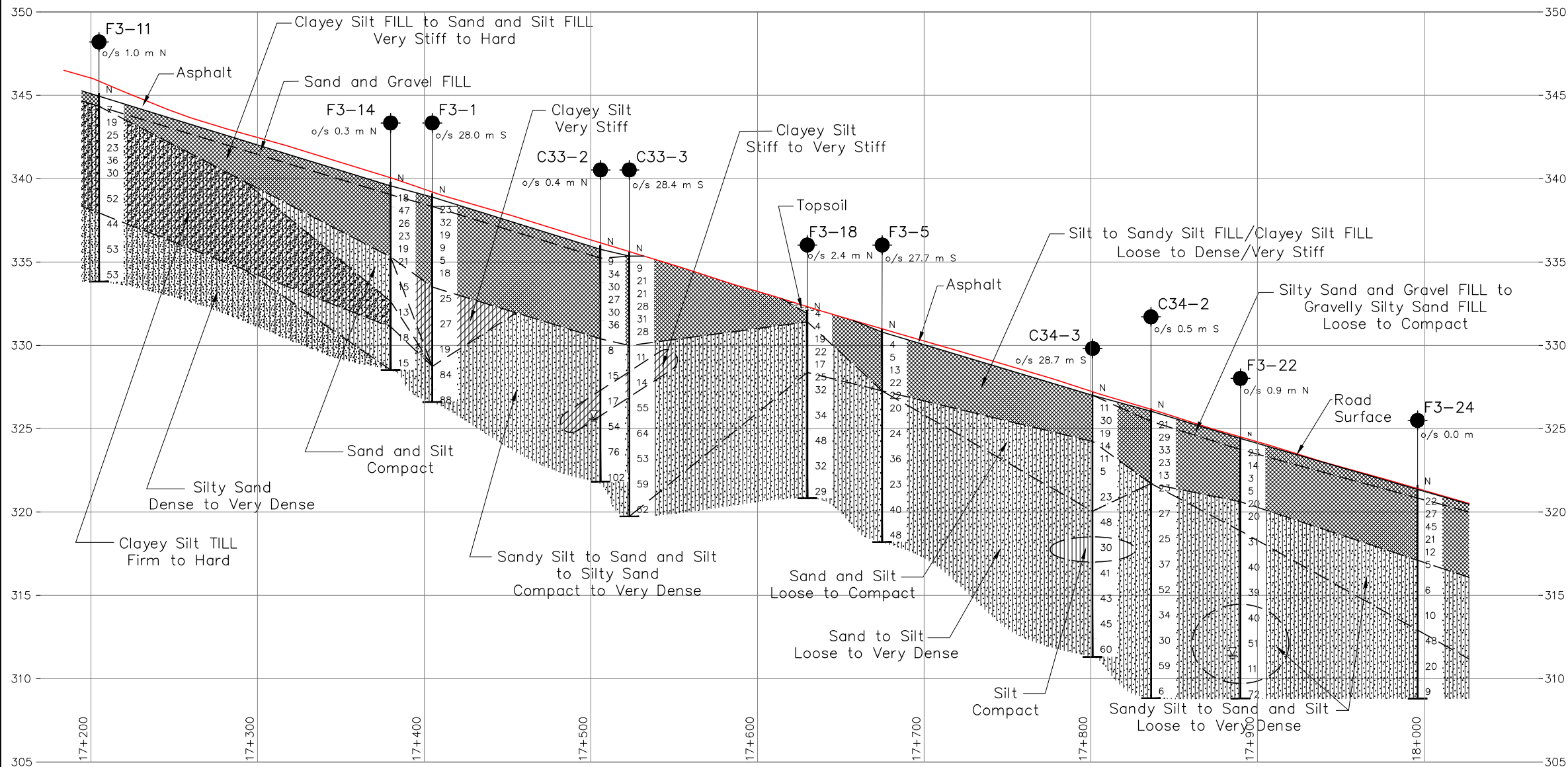
LEGEND	
	Borehole - Current Investigation
N	Standard Penetration Test Value
16	Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
	WL upon completion of or during drilling

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
C33-2	336.0	4869886.5	298558.1
C33-3	335.6	4869908.4	298583.5
C34-2	326.2	4870212.1	298502.6
C34-3	327.2	4870182.4	298536.4
F3-1	339.1	4869791.8	298603.2
F3-5	331.0	4870057.8	298556.9
F3-11	345.1	4869589.9	298608.8
F3-14	339.8	4869762.4	298579.6
F3-18	332.1	4870008.4	298534.9
F3-22	324.5	4870264.8	298492.2
F3-24	321.6	4870368.6	298475.8

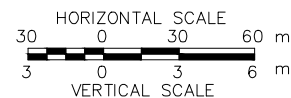
REFERENCE	
Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.	

NOTES	
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NO.	DATE	BY	REVISION
Geocres No. 30M13-217			
HWY. 400	PROJECT NO. 09-1111-0018		DIST.CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	SITE:
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC	DWG.D2



HIGH FILL EMBANKMENT AREA 3 - CENTRELINE PROFILE
(STATION 17+100 to 18+100)



BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
C33-1	331.4	4869871.8	298544.2
C34-1	321.7	4870213.4	298485.5
F3-9	347.0	4869494.5	298614.7
F3-10	345.0	4869543.3	298603.3
F3-12	341.5	4869641.8	298586.5
F3-13	339.0	4869701.0	298576.3
F3-15	334.4	4869819.8	298559.1
F3-16	331.0	4869907.7	298537.8
F3-17	331.9	4869972.6	298532.9
F3-19	330.0	4870056.7	298520.8
F3-20	326.8	4870119.4	298505.0
F3-21	323.5	4870168.7	298493.4
F3-23	319.9	4870307.7	298472.8
F3-25	317.4	4870410.4	298453.2
F3-26	317.0	4870462.7	298445.8

LEGEND	
	Borehole - Current Investigation
	Seal
	Piezometer
N	Standard Penetration Test Value
16	Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
	WL in piezometer, measured on Feb. 01, 2011
	WL upon completion of or during drilling

REFERENCE	
Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.	

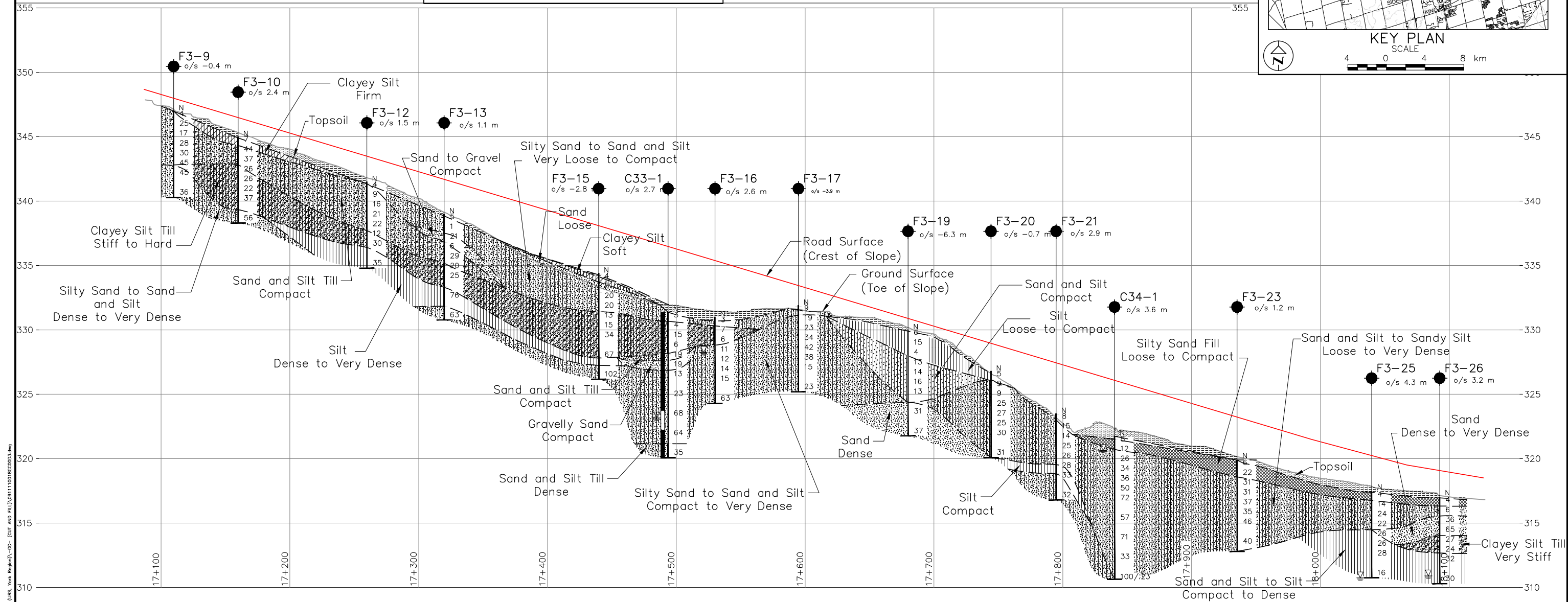
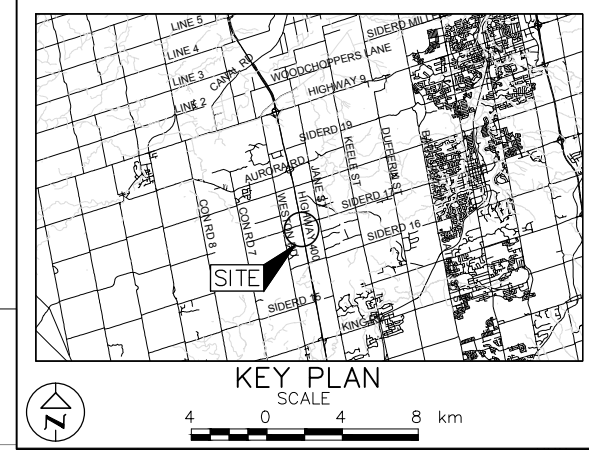
NOTES	
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METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 2835-02-00

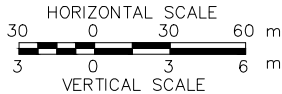
HIGHWAY 400 HIGH FILL EMBANKMENTS
STAT. 17+100 TO STA. 18+100 (SBL)
STAT. 17+350 TO STA. 17+800 (NBL)
SOIL STRATA

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M-M
D1

**HIGH FILL EMBANKMENT AREA 3 - SBL PROFILE
(STATION 17+200 to 18+100)**



NO.	DATE	BY	REVISION
Geocres No. 30M13-217			
HWY. 400	PROJECT NO. 09-1111-0018		
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	SITE:
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC	DWG.D3

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

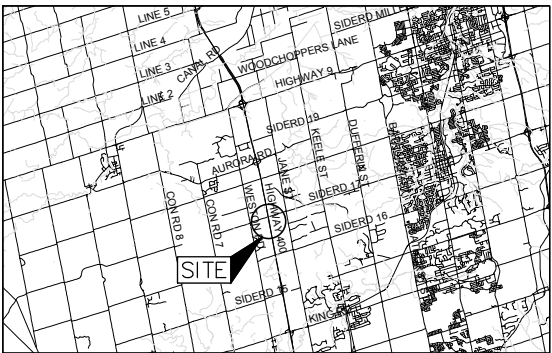
CONT No.
GWP No. 2835-02-00

HIGHWAY 400 HIGH FILL EMBANKMENTS
STAT. 17+100 TO STA. 18+100 (SBL)
STAT. 17+350 TO STA. 17+800 (NBL)
SOIL STRATA

SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

SCALE
4 0 4 8 km

LEGEND

- Borehole - Current Investigation
- ⬮ Seal
- ⬮ Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
C33-4	330.1	4869917.6	298597.4
C34-4	323.8	4870177.6	298555.0
F3-2	332.5	4869850.4	298619.6
F3-3	330.0	4869958.8	298601.2
F3-4	327.5	4870006.1	298586.8
F3-6	325.2	4870106.6	298570.5
F3-7	324.5	4870146.1	298557.9

REFERENCE

Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

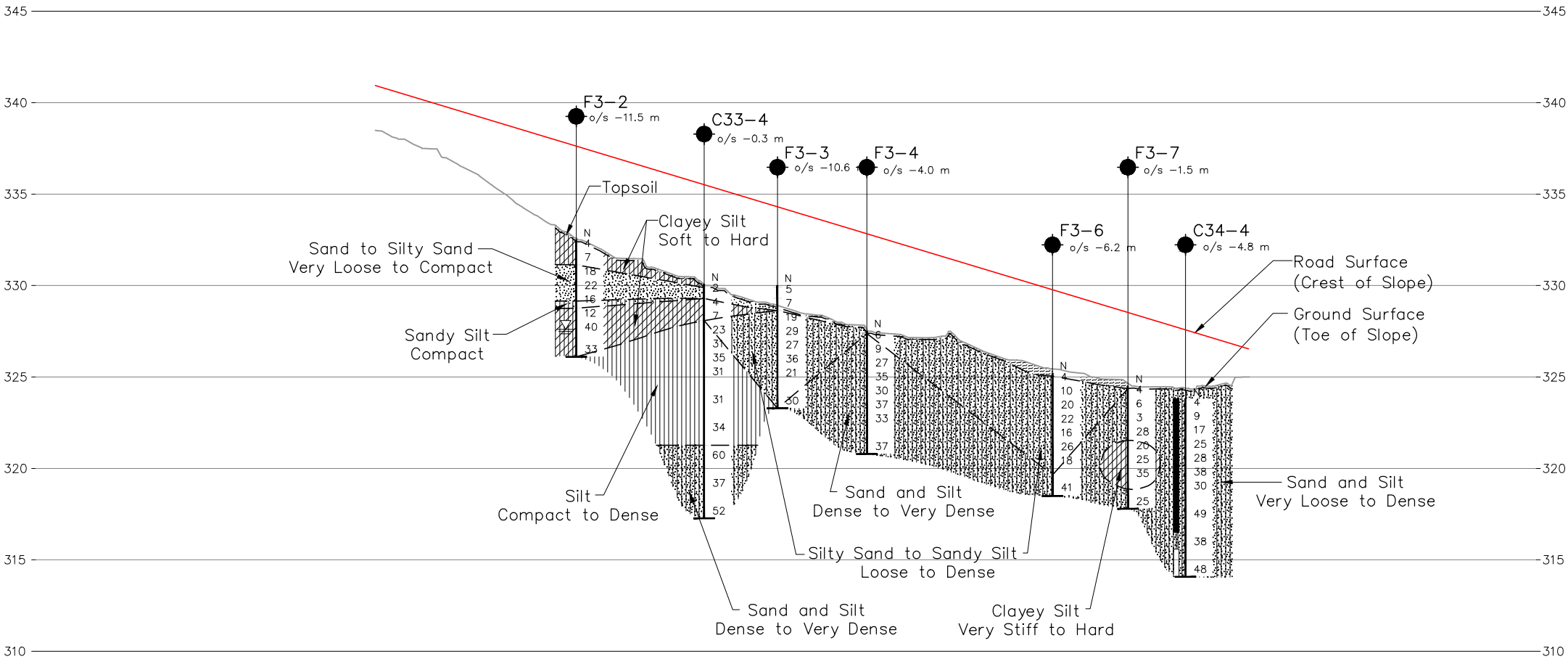
NOTES

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

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NO.	DATE	BY	REVISION
Geocres No. 30M13-217			
HWY. 400			PROJECT NO. 09-1111-0018 DIST.CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	SITE:
DRAWN: JFC/MR	CHKD. SMM	APPD. JMAC	DWG.D4



HIGH FILL EMBANKMENT AREA 3 - NBL PROFILE
(STATION 17+350 to 17+810)

HORIZONTAL SCALE
30 0 30 60 m
VERTICAL SCALE
3 0 3 6 m





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

PROJECT		2835-02-00		LOCATION		N 4869850.4 ; E 298619.6		ORIGINATED BY		TT									
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		ARM									
DATUM		Geodetic		DATE		November 18, 2010		CHECKED BY		JMAC									
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													
332.5	GROUND SURFACE																		
0.9	TOPSOIL		1	SS	4														
	CLAYEY SILT with SAND, containing rootlets Soft to firm Brown Moist		2	SS	7														
331.1	Silty clay lens and slightly organic at a depth of 0.8 m																	0 22 57 21	
1.4	SAND, some silt, trace clay Compact Brown Moist		3	SS	18														
	Becoming wet at a depth of 2.2 m		4	SS	22													0 82 14 4	
329.2			5A	SS	16														
328.8	Sandy SILT, trace clay Compact Brown Wet		5B																
3.7	CLAYEY SILT, some sand Stiff to hard Brown Wet becoming moist at a depth of 4.6 m Silty sand interlayer between depths of 4.9 m and 5.2 m		6	SS	12													0 12 61 27	
			7A 7B	SS	40														
			8	SS	33														
326.1	END OF BOREHOLE																		
6.4																			
NOTE: 1. Water level in open borehole at a depth of 4.9 m below ground surface (Elev. 327.6m) upon completion of drilling. 2. Up to 1.2 m of "blowing sands" were encountered in the borehole before sampling at a depth of 5.8 m.																			

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F3-3		SHEET 1 OF 1		METRIC								
W.P.		2835-02-00		LOCATION		N 4869958.8 ; E 298601.2		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY								
DATUM		Geodetic		DATE		November 18, 2010		CHECKED BY								
								JMAC								
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								
330.0	GROUND SURFACE															
0.9	TOPSOIL															
329.3	Sandy SILT, trace gravel, trace clay, containing lenses of clayey silt		1	SS	5											
0.7	Loose Brown Moist		2	SS	7											
328.6	Silty SAND, trace to some gravel, trace clay															
1.4	Loose Brown Moist		3	SS	19											
	SAND and SILT to Sandy SILT, trace clay, containing lenses of clayey silt															
	Compact Brown Moist		4	SS	29											
			5	SS	27											
			6	SS	36											
			7	SS	21											
			8	SS	30											
323.3	END OF BOREHOLE															
6.7	NOTE: 1. Open borehole dry upon completion of drilling.															

PROJECT		2835-02-00		LOCATION		N 4870006.1 ; E 298586.8		ORIGINATED BY		SKB/PKS								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		ARM								
DATUM		Geodetic		DATE		November 22, 2010		CHECKED BY		JMAC								
SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)							
327.5	GROUND SURFACE																	
0.0	TOPSOIL																	
0.1	SAND and SILT, some gravel, trace to some clay Loose to dense Brown Moist		1	SS	6													
			2	SS	9													14 37 41 8
			3	SS	27													
			4	SS	35													
	Containing lenses of clayey silt between depths of 3.0 m and 3.7 m		5	SS	30													0 31 59 10
			6	SS	37													
			7	SS	33													
			8	SS	37													
320.8	END OF BOREHOLE																	
6.7	NOTE: 1. Borehole dry upon completion of drilling.																	

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F3-5		SHEET 1 OF 1		METRIC																
W.P.		2835-02-00		LOCATION		N 4870057.8 ; E 298556.9		ORIGINATED BY																
DIST		Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY																
DATUM		Geodetic		DATE		January 6, 2011		CHECKED BY																
JMAC																								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																		
331.0	0.0	GROUND SURFACE																						
	0.2	ASPHALT																						
		Silt, trace to some sand, trace clay (FILL) Loose to compact Brown Moist Containing clayey silt seams between depths of 0.8 m and 1.4 m and between 3.0 m to 3.7 m Containing silt seams between depths of 1.5 m and 2.1 m		1	SS	4																		
				2	SS	5																		
				3	SS	13																		
				4	SS	22																		
327.3	3.7	SILT, some clay Compact Brown Moist Clayey silt interlayers between depths of 4.6 m and 5.2 m		5	SS	22																		
				6	SS	20																		
325.4	5.6	SAND and SILT to Sandy SILT, trace to some clay Compact to dense Brown Moist Containing zones of sand to a depth of 7.2 m		7	SS	24																		
				8	SS	36																		
				9	SS	23																		
				10	SS	40																		
				11	SS	48																		
318.2	12.8	END OF BOREHOLE																						
		NOTES: 1. Open borehole dry upon completion of drilling. 2. Borehole caved at a depth of 12.2 m below ground surface (Elev. 318.8 m) upon completion of drilling.																						

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PROJECT		RECORD OF BOREHOLE		No F3-6		SHEET 1 OF 1		METRIC					
W.P.		LOCATION		ORIGINATED BY		SKB/PKS							
DIST		BOREHOLE TYPE		COMPILED BY		ARM							
DATUM		DATE		CHECKED BY		JMAC							
09-1111-0018		N 4870106.6 ; E 298570.5											
2835-02-00		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger											
Central HWY 400		November 22, 2010											
Geodetic													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	GR SA SI CL
325.2	GROUND SURFACE												
0.0	TOPSOIL												
0.2	Sandy SILT, trace to some clay Loose to compact Brown Moist		1	SS	4		325			o			
			2	SS	10		324			o			
			3	SS	20		323						0 23 73 4
	Silty clay seams between depths of 2.2 m and 3.7 m		4	SS	22		322			o			
			5	SS	16		321			o			0 21 70 9
			6	SS	26		320						
	Clayey silt lenses at a depth of 4.9 m		7	SS	18		319			o			
319.6	SAND and SILT, trace clay Dense Brown Moist		8	SS	41					o			0 55 41 4
318.5	END OF BOREHOLE												
6.7	NOTE: 1. Open borehole dry upon completion of drilling.												

PROJECT 09-1111-0018			RECORD OF BOREHOLE No F3-7			SHEET 1 OF 1			METRIC															
W.P. 2835-02-00			LOCATION N 4870146.1 ; E 298557.9			ORIGINATED BY SKB/PKS																		
DIST Central HWY 400			BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger			COMPILED BY ARM																		
DATUM Geodetic			DATE November 22, 2010			CHECKED BY JMAC																		
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																			
324.5	GROUND SURFACE																							
0.0	TOPSOIL																							
0.1	SAND and SILT, trace gravel, trace clay, containing rootlets Very loose to compact Brown Moist		1	SS	4																			
			2	SS	6																			
			3	SS	3																			
			4	SS	28																			
321.5	Rock fragments at a depth of 2.4 m Augers grinding between a depth of 2.4 m and 2.7 m CLAYEY SILT with sand Very stiff to hard Brown Moist																							
3.0			5	SS	20																			
320.8	SAND and SILT, trace clay Compact Brown Moist		6	SS	25																			
3.7			7	SS	35																			
319.6	CLAYEY SILT with SAND Hard Brown Moist																							
4.9																								
318.9	SAND and SILT, trace clay Compact Brown Moist		8	SS	25																			
5.6																								
317.8	END OF BOREHOLE																							
6.7	NOTE: 1. Open borehole dry upon completion of drilling.																							

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PROJECT		2835-02-00		LOCATION		N 4869494.5 ; E 298614.7		ORIGINATED BY		SKB											
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		ARM											
DATUM		Geodetic		DATE		November 29, 2010		CHECKED BY		JMAC											
SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	20			40	60	80	100	20						40	60	80
347.0	GROUND SURFACE																				
0.0	TOPSOIL																				
	SAND and SILT, trace to some clay, some gravel, containing rootlets, slightly organic to a depth of 1.4 m (TILL) Loose to dense Brown Moist		1	SS	4																
			2	SS	25																
			3	SS	17																
			4	SS	28																
			5	SS	30																
342.8			6A	SS	45																
4.2	Silty SAND, trace to some clay, trace gravel Dense Brown Moist Clayey silt lenses between a depth of 4.5 m and 5.6 m		7	SS	45																
			8	SS	36																
340.3																					
6.7	END OF BOREHOLE																				
	NOTE: 1. Open borehole dry upon completion of drilling.																				

PROJECT 09-1111-0018			RECORD OF BOREHOLE No F3-10			SHEET 1 OF 1			METRIC																	
W.P. 2835-02-00			LOCATION N 4869543.3 ; E 298603.3			ORIGINATED BY SKB																				
DIST Central HWY 400			BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger			COMPILED BY ARM																				
DATUM Geodetic			DATE November 29, 2010			CHECKED BY JMAC																				
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																					
345.0	GROUND SURFACE																									
0.9	TOPSOIL		1	SS	7																					
344.3	CLAYEY SILT, trace to some sand, containing rootlets and zones of oxidation staining		2	SS	44																					
0.7	Firm Brown Moist																									
342.8	SAND and SILT, trace to some clay, trace to some gravel, containing sand pockets, rootlets and zones of oxidation staining (TILL)		3	SS	37																					
2.2	Dense Brown Moist																									
	Clayey SILT with SAND, trace gravel (TILL)		4	SS	26																					
	Very Stiff to hard Brown Moist																									
			5	SS	26																					
			6	SS	22																					
			7	SS	37																					
	Augers grinding at a depth of 5.2 m																									
339.4																										
5.6	SAND and SILT, trace to some gravel, trace clay, containing clayey silt lenses																									
	Very dense Brown Moist																									
338.3			8	SS	56																					
6.7	END OF BOREHOLE																									
NOTE:																										
1. Open borehole dry upon completion of drilling.																										

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

PROJECT 09-1111-0018			RECORD OF BOREHOLE No F3-12			SHEET 1 OF 1			METRIC															
W.P. 2835-02-00			LOCATION N 4869641.9 ; E 298586.5			ORIGINATED BY SKB																		
DIST Central HWY 400			BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger			COMPILED BY ARM																		
DATUM Geodetic			DATE November 29, 2010			CHECKED BY JMAC																		
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																			
341.5	GROUND SURFACE																							
0.0	TOPSOIL																							
0.2	SAND and SILT, trace to some clay, trace gravel (TILL) Loose to compact Brown Moist		1	SS	4																			
			2	SS	9																			
			3	SS	16																			
			4	SS	21																			
	500 mm thick Silty sand interlayer at a depth of 3.1 m		5	SS	22																			
337.8																								
3.7	CLAYEY SILT, trace to some sand, trace gravel (TILL) Stiff to very stiff Brown Moist		6	SS	12																			
			7	SS	30																			
336.5																								
5.0	SILT, some sand Dense Brown Moist																							
			8	SS	35																			
334.8																								
6.7	END OF BOREHOLE																							
	NOTE: 1. Open borehole dry upon completion of drilling.																							

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PROJECT		09-1111-0018		RECORD OF BOREHOLE No F3-13		SHEET 1 OF 1		METRIC								
W.P.		2835-02-00		LOCATION		N 4869701.0 ; E 298576.3		ORIGINATED BY SKB								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY MAS								
DATUM		Geodetic		DATE		November 30, 2010		CHECKED BY JMAC								
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								
339.0	GROUND SURFACE															
0.0	TOPSOIL															
0.2	Silty SAND, trace clay, trace gravel, containing rootlets Very loose to loose Brown Moist		1	SS	5											
			2	SS	1											
337.5																
1.5	SAND and GRAVEL, some silt Compact Brown Moist		3	SS	21											
336.8																
2.2	Augers grinding at a depth of 1.5 m SAND and SILT, some gravel, trace to some clay (TILL) Loose to compact Brown Moist		4	SS	6											13 47 32 8
			5	SS	29											
335.3																
3.7	CLAYEY SILT, some sand, trace gravel (TILL) Very stiff Brown Moist		6	SS	20											
			7	SS	25											2 14 61 23
	Sandy silt layer between depths of 5.0 m and 5.1 m															
333.4																
5.6	SILT, some sand, trace clay, trace gravel Very dense Brown Moist		8	SS	76											2 13 80 5
331.8																
7.2	Silty SAND, trace clay Very dense Brown Moist		9	SS	63											
330.8																
8.2	END OF BOREHOLE															
NOTE:																
1. Open borehole dry upon completion of drilling.																

PROJECT		RECORD OF BOREHOLE No F3-14				SHEET 1 OF 1		METRIC				
W.P.		2835-02-00		LOCATION		N 4869762.4 ;E 298579.6		ORIGINATED BY		SB		
DIST		Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		SKB		
DATUM		Geodetic		DATE		December 10, 2010		CHECKED BY		JMAC		
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				
339.8	GROUND SURFACE											
0.0	ASPHALT											
0.2	Sand and gravel (FILL) Brown Moist											
339.0	Silty sand, trace clay, trace gravel (FILL) Compact Brown Moist		1	SS	18							
338.3	Clayey silt with sand, trace gravel (FILL) Very stiff to hard Brown Moist		2	SS	47							
1.5	Containing silty sand seams between depths of 3.7 m and 4.6 m		3	SS	26							
			4	SS	23							
			5	SS	19							
335.3												
4.5	SAND and SILT, trace clay Compact Brown Moist		6	SS	21							
			7	SS	15							
332.6												
7.2	CLAYEY SILT, trace to some sand and gravel (TILL) Stiff Brown Moist		8	SS	13							
331.1												
8.7	SAND and SILT, trace to some clay, trace gravel Compact Brown Moist		9	SS	18							
			10	SS	15							
328.5												
11.3	END OF BOREHOLE											
	NOTE: 1. Open borehole dry upon completion of drilling.											

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

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PROJECT		RECORD OF BOREHOLE No F3-15		SHEET 1 OF 1		METRIC								
W.P. 09-1111-0018		LOCATION N 4869819.8 ; E 298559.1		ORIGINATED BY SKB										
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY ARM										
DATUM Geodetic		DATE November 30, 2010		CHECKED BY JMAC										
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		W _p	W	W _L		
334.4	GROUND SURFACE													
0.0	TOPSOIL													
0.1	CLAYEY SILT, some sand, trace gravel		1	SS	4									
333.7	Soft Brown Moist													
0.7			2	SS	8									
332.9	SAND, some silt, trace gravel													
1.5	Loose Brown Moist													
	SAND and SILT, trace clay		3	SS	20									
	Compact Brown Moist													
	Becoming wet at a depth of 2.7 m		4	SS	20									
331.4														
3.0	CLAYEY SILT, some sand, trace gravel (TILL)		5	SS	13									
	Stiff to hard Brown Moist													
			6	SS	15									
			7	SS	34									
			8A 8B	SS	67									
327.8														
6.6	SILT, trace to some sand, trace gravel, trace clay													
327.2	Brown Moist													
7.2	Silty SAND													
	Very dense Brown Moist		9	SS	102									
326.2														
8.2	END OF BOREHOLE													
NOTE:														
1. Open borehole dry upon completion of drilling.														

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PROJECT		RECORD OF BOREHOLE		No F3-16		SHEET 1 OF 1		METRIC							
W.P.		LOCATION		ORIGINATED BY		DIST		BOREHOLE TYPE		COMPILED BY		DATE		CHECKED BY	
09-1111-0018		N 4869907.7 ; E 298537.8		SKB		Central		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		ARM		December 2, 2010		JMAC	
2835-02-00															
Geodetic															

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 (%)				
							20	40	60	80	100	W _p	W	W _L			
331.0	GROUND SURFACE																
0.0	TOPSOIL																
0.2	Silty SAND, trace gravel, containing rootlets, slightly organic Very loose to loose		1	SS	3								o				
330.3	Brown Moist		2	SS	7								o				
0.7	SAND and SILT, trace to some gravel and clay, containing rootlets to a depth of 2.2 m (TILL)		3	SS	6								o			8 52 30 10	
328.8	Loose Brown Moist		4	SS	11								o				
2.2	SAND and SILT, trace clay Compact to very dense		5	SS	12								o			0 44 52 4	
	Brown Moist		6	SS	14								o				
	Clayey silt interlayers below a depth of 4.5 m		7	SS	15								o				
	Becoming wet at a depth of 5.6 m		8	SS	63								o				
324.3	Becoming moist at a depth of 6.6 m																
6.7	END OF BOREHOLE																
NOTES: 1. Water level in open borehole at a depth of 2.7 m below ground surface (Elev. 328.3 m) upon completion of drilling. 2. Open borehole caved at a depth of 3.0 m below ground surface upon completion of drilling.																	

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

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F3-18		SHEET 1 OF 1		METRIC																					
W.P.		2835-02-00		LOCATION		N 4870008.4 ; E 298534.9		ORIGINATED BY																					
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY																					
DATUM		Geodetic		DATE		December 1, 2010		CHECKED BY																					
								JMAC																					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			SHEAR STRENGTH kPa			WATER CONTENT (%)			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																							
332.1	0.0	GROUND SURFACE																											
0.2		TOPSOIL																											
331.4	0.7	Silty sand, trace to some gravel, trace clay, containing rootlets, slightly organic (FILL)		1	SS	4																							
		Loose Brown Moist		2	SS	4																							
		SAND and SILT, trace clay																											
		Loose to compact Brown Moist		3	SS	19																							
				4	SS	22																							
		25 mm thick clayey silt lens at a depth of 3.4 m		5	SS	17																							
328.4	3.7	SAND, some silt, trace clay		6	SS	25																							
		Compact to dense Brown Moist		7	SS	32																							
				8	SS	34																							
324.9	7.2	SAND and SILT, trace clay		9	SS	48																							
		Compact to dense Brown Moist		10	SS	32																							
				11	SS	29																							
320.8	11.3	END OF BOREHOLE																											
		NOTE: 1. Open borehole dry upon completion of drilling.																											

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F3-19		SHEET 1 OF 1		METRIC									
W.P.		2835-02-00		LOCATION		N 4870056.7 ; E 298520.8		ORIGINATED BY		SKB							
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		ARM							
DATUM		Geodetic		DATE		December 1, 2010		CHECKED BY		JMAC							
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									
330.0	GROUND SURFACE																
0.0	TOPSOIL																
	SILT, some sand, some clay, containing rootlets, slightly organics Loose to compact Brown Moist Augers grinding at a depth of 0.3 m Clayey silt seams between depths of 0.8 m and 2.2 m		1	SS	6												
			2	SS	15												
			3	SS	4												
327.8																	
2.2	SAND and SILT, trace clay Compact Brown Moist		4	SS	13												
			5	SS	14												
			6	SS	16												
			7	SS	13												
324.4																	
5.6	SAND, trace to some silt Dense Brown Moist		8	SS	31												
			9	SS	37												
321.8																	
8.2	END OF BOREHOLE																
	NOTE: 1. Open borehole dry upon completion of drilling.																

PROJECT		RECORD OF BOREHOLE		No F3-20		SHEET 1 OF 1		METRIC					
W.P.		LOCATION		ORIGINATED BY		TT							
DIST		BOREHOLE TYPE		COMPILED BY		ARM							
DATUM		DATE		CHECKED BY		JMAC							
09-1111-0018		N 4870119.5 ; E 298505.0											
2835-02-00		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger											
Central HWY 400		December 1, 2010											
Geodetic													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	GR SA SI CL
326.8	GROUND SURFACE												
0.0	Sandy SILT, containing rootlets Loose Brown Moist		1	SS	5		326						
326.1													
0.7	SAND and SILT, trace clay Loose to dense Grey Moist		2	SS	9		325						0 46 53 1
			3	SS	9								
			4	SS	25		324						
			5	SS	27								
			6	SS	25		323						0 37 61 2
			7	SS	30		322						
			8	SS	31		321						
320.1													
6.7	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.												

PROJECT		RECORD OF BOREHOLE		No F3-21		SHEET 1 OF 1		METRIC					
W.P.		LOCATION		ORIGINATED BY		TT							
DIST		BOREHOLE TYPE		COMPILED BY		ARM							
DATUM		DATE		CHECKED BY		JMAC							
09-1111-0018		N 4870168.7 ; E 298493.4											
2835-02-00		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger											
Central HWY 400		December 1, 2010											
Geodetic													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	GR SA SI CL
323.5	GROUND SURFACE												
0.0	TOPSOIL		1	SS	8		323						
	SAND and SILT, trace gravel, trace clay, containing rootlets to a depth of 0.7 m Loose to compact Brown Moist		2	SS	15								
			3	SS	14		322		o				0 43 54 3
	Becoming grey at a depth of 2.2 m		4	SS	25		321						
			5	SS	26		320						
319.5			6	SS	28		319			o			0 8 81 11
4.0	SILT, trace to some sand, trace to some clay Compact Grey Moist		7	SS	33		318						
318.8			8	SS	32		317						
4.7	Silty SAND Dense Grey Moist												
316.8	END OF BOREHOLE												
6.7	NOTE: 1. Borehole dry upon completion of drilling.												


PROJECT 09-1111-0018		RECORD OF BOREHOLE No F3-22		SHEET 1 OF 2		METRIC	
W.P. 2835-02-00		LOCATION N 4870264.8 ; E 298492.2		ORIGINATED BY AM			
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY CS			
DATUM Geodetic		DATE March 29, 2011		CHECKED BY JMAC			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _p	W	W _L		
324.5	GROUND SURFACE													
0.0	ASPHALT													
	Silty sand and gravel (FILL)													
323.7														
0.8	Silty sand to sand and silt, trace clay, trace gravel (FILL) Very loose to compact Brown Moist		1	SS	23									
			2	SS	14									
			3	SS	3									
			4	SS	5									
320.6														
3.9	Sandy SILT, trace to some clay Compact Brown Moist		5	SS	20									
			6	SS	20									
318.9														
5.6	Silty SAND, trace clay Dense Brown Moist		7	SS	31									
			8	SS	40									
			9	SS	39									
314.4														
10.1	Sandy SILT, trace clay Dense Brown Moist		10	SS	40									
			11	SS	51									
			12	SS	11									
309.7														
14.8														

Continued Next Page

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

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PROJECT 09-1111-0018				RECORD OF BOREHOLE No F3-22				SHEET 2 OF 2				METRIC				
W.P. 2835-02-00				LOCATION N 4870264.8 ; E 298492.2				ORIGINATED BY AM								
DIST Central HWY 400				BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger				COMPILED BY CS								
DATUM Geodetic				DATE March 29, 2011				CHECKED BY JMAC								
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 (%)			
	--- CONTINUED FROM PREVIOUS PAGE ---						20	40	60	80	100	W _p	W	W _L		
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED									
							20	40	60	80	100	10	20	30		
308.8	SAND, trace silt, trace gravel Very dense Brown Moist		13	SS	72		309									
15.7	END OF BOREHOLE															
	NOTE: 1. Open borehole dry upon completion of drilling.															

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

PROJECT		RECORD OF BOREHOLE		No F3-24		SHEET 1 OF 1		METRIC																
W.P.		LOCATION		ORIGINATED BY		DIST		BOREHOLE TYPE		COMPILED BY														
DATUM		DATE		CHECKED BY		JMAC																		
09-1111-0018		N 4870368.6 ; E 298475.8		SB		Central HWY 400		D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger																
Geodetic		November 24, 2010																						
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																		
321.6	0.0	GROUND SURFACE																						
	0.3	ASPHALT																						
	0.8	Sand and gravel (FILL) Brown Moist																						
	0.8	Sand and silt, trace to some clay, trace to some gravel (FILL) Compact to dense Brown Moist		1	SS	22																		
				2	SS	27																		
				3	SS	45																		
				4	SS	21																		
				5	SS	12																		
317.1	4.5	SAND and SILT, trace clay Loose Brown Moist		6	SS	5																		
				7	SS	6																		
				8	SS	10																		
312.9	8.7	Silty SAND, some gravel, trace clay Compact to dense Brown Moist		9	SS	48																		
				10	SS	20																		
309.9	11.7	SAND, some silt Loose Brown Moist																						
				11	SS	9																		
308.8	12.8	END OF BOREHOLE																						
		NOTES:																						
		1. Borehole dry upon completion of drilling.																						
		2. Borehole caved at a depth of 10.7 m below ground surface (Elev. 311.5 m) upon completion of drilling.																						

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PROJECT		RECORD OF BOREHOLE		No F3-25		SHEET 1 OF 1		METRIC					
W.P.		LOCATION		ORIGINATED BY		TT							
DIST		BOREHOLE TYPE		COMPILED BY		ARM							
DATUM		DATE		CHECKED BY		JMAC							
PROJECT 09-1111-0018		N 4870410.4 ; E 298453.2											
W.P. 2835-02-00		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger											
DIST Central HWY 400		November 29, 2010											
DATUM Geodetic													
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	GR SA SI CL
317.5	GROUND SURFACE												
0.9	TOPSOIL												
316.8	Silty sand, trace clay, containing rootlets, slightly organic (FILL)		1	SS	4		317						
0.7	Loose Brown Moist		2	SS	14		316						1 48 45 6
	SAND and SILT, trace clay, trace gravel		3	SS	24		315						
	Compact Reddish brown Moist		4	SS	22		314						0 31 65 4
	Becoming grey at a depth of 1.4 m		5	SS	26		313						0 18 79 3
314.5	SAND and SILT to SILT, some sand, trace clay		6	SS	26		312						
3.0	Compact Grey Moist to wet		7	SS	28		311						
			8	SS	16								
310.8	END OF BOREHOLE												
6.7	NOTE: 1. Open borehole dry upon completion of drilling.												

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

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

PROJECT		2835-02-00		LOCATION		N 4869886.5 ; E 298558.1		ORIGINATED BY		SB									
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Diameter Solid Stem Augers		COMPILED BY		SKB/HS									
DATUM		Geodetic		DATE		December 9, 2010		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 (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	20			40	60	80	100						20	40
336.0	GROUND SURFACE																		
0.0	ASPHALT																		
0.2	Sand and gravel, trace clay (FILL) Brown and grey																		
335.2	Moist																		
0.8	Silty sand, trace to some gravel, trace clay, containing clayey silt layers and organics (FILL) Loose to dense		1	SS	9														
	Brown and grey																		
	Moist		2	SS	34														
333.8																			
2.2	Clayey silt with sand, trace gravel (FILL) Very stiff		3	SS	30														
	Brown																		
	Moist		4	SS	27														
			5	SS	30														
331.5																			
4.5	Sand and silt, some clay, trace gravel (FILL) Dense		6	SS	36														
	Brown																		
	Moist																		
330.4																			
5.6	SILT and SAND, trace clay Loose to compact		7	SS	8														
	Brown																		
	Moist																		
			8	SS	15														
327.3																			
8.7	CLAYEY SILT, trace to some sand, trace gravel Very stiff		9	SS	17														
	Brown																		
	Moist																		
325.8																			
10.2	Sandy SILT, trace to some clay Very dense		10	SS	54														
	Brown																		
	Moist																		
			11	SS	66														
			12	SS	102														
321.8																			
14.2	END OF BOREHOLE																		

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

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No C33-2				SHEET 2 OF 2		METRIC										
W.P. 2835-02-00		LOCATION N 4869886.5 ; E 298558.1				ORIGINATED BY SB												
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Diameter Solid Stem Augers				COMPILED BY SKB/HS												
DATUM Geodetic		DATE December 9, 2010				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 ---							<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>					<div style="display: flex; justify-content: space-between;"> 10 20 30 </div>						
NOTES: 1. Borehole caved at a depth of 10.7 m (Elev. 325.3 m) upon completion of drilling. 2. Water level in open borehole at a depth of 10.4 m (Elev. 325.6 m) upon completion of drilling.																		

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PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No C33-3		SHEET 1 OF 2		METRIC	
W.P. <u>2835-02-00</u>		LOCATION <u>N 4869908.4 ; E 298583.5</u>		ORIGINATED BY <u>SB/AM</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Truck Mount, 101 mm Diameter Solid Stem Augers</u>		COMPILED BY <u>TT/HS</u>			
DATUM <u>Geodetic</u>		DATE <u>January 5, 2011</u>		CHECKED BY <u>SMM</u>			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)							
													20	40	60		80	100	W _p	W
335.6	GROUND SURFACE																			
0.0	ASPHALT																			
0.2	Clayey silt with sand, trace gravel (FILL) Stiff to hard Brown Moist																			
			1	SS	9															
			2	SS	21															
			3	SS	21															
			4	SS	28															
	Trace organics at a depth of 3.8 m		5	SS	41															
	Containing lenses of sand at a depth of 4.6 m		6	SS	28															
330.0																				
5.6	Silty SAND, trace clay, trace gravel, lenses of clayey silt Compact Brown Moist		7	SS	11															
328.4																				
7.2	CLAYEY SILT, trace sand, trace gravel Stiff Brown Moist		8	SS	14															
326.9																				
8.7	SILT and SAND, trace clay, trace gravel, lenses of clayey silt Very dense Brown Moist		9	SS	55															
			10	SS	64															
			11	SS	53															
			12	SS	59															

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

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PROJECT		RECORD OF BOREHOLE		No C33-3		SHEET 2 OF 2		METRIC									
W.P. 2835-02-00		LOCATION		N 4869908.4 ; E 298583.5		ORIGINATED BY		SB/AM									
DIST Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 101 mm Diameter Solid Stem Augers		COMPILED BY		TT/HS									
DATUM Geodetic		DATE		January 5, 2011		CHECKED BY		SMM									
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ kN/m³	GR SA SI CL
								20 40 60 80 100	20 40 60 80 100	W _p	W	W _L	10 20 30				
319.7	SILT and SAND, trace clay, trace gravel, lenses of clayey silt Very dense Brown Moist		13	SS	62		320										
15.9	END OF BOREHOLE																
NOTES: 1. Borehole caved at a depth of 15.2 m (Elev. 320.4 m) upon completion of drilling. 2. Open borehole dry upon completion of drilling.																	

PROJECT		RECORD OF BOREHOLE				No C33-4		SHEET 1 OF 1		METRIC		
W.P.		2835-02-00		LOCATION		N 4869917.6 ; E 298597.4		ORIGINATED BY		SB		
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Diameter Solid Stem Augers		COMPILED BY		ARM/HS		
DATUM		Geodetic		DATE		December 19, 2010		CHECKED BY		SMM		
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				
330.1	GROUND SURFACE											
0.0	TOPSOIL											
329.3	Silty SAND, trace clay, trace gravel, containing rootlets Very loose Brown Moist		1	SS	2							
0.8	CLAYEY SILT, trace sand, trace gravel Firm Brown Moist		2	SS	4							
328.1			3A	SS	7							
2.0	SILT to Sandy SILT, trace to some sand, trace to some clay Compact to dense Brown Moist		3B									
			4	SS	23							
			5	SS	31							
			6	SS	35							
			7	SS	31							
			8	SS	31							
			9	SS	34							
321.3												
8.8	SILT and SAND, trace clay Dense to very dense Brown Moist		10	SS	60							
			11	SS	37							
317.3			12	SS	52							
12.8	END OF BOREHOLE											
	NOTE: 1. Open borehole dry upon completion of drilling.											

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

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PROJECT		RECORD OF BOREHOLE		No C34-1		SHEET 1 OF 1		METRIC									
W.P. 2835-02-00		LOCATION		N 4870213.4 ; E 298485.5		ORIGINATED BY		TT									
DIST Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Diameter Solid Stem Augers		COMPILED BY		ARM/HS									
DATUM Geodetic		DATE		November 30 and December 1, 2010		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									
321.7	GROUND SURFACE																
0.0	TOPSOIL																
0.2	Sandy silt, trace gravel, trace clay (FILL)		1	SS	8												
320.7	Loose to compact Brown Moist		2	SS	12												
1.0	SAND and SILT, trace clay Compact to very dense Grey to brown below 8.7 m Moist		3	SS	26												
			4	SS	34												0 51 46 3
			5	SS	36												
			6	SS	50												
			7	SS	72												
			8	SS	57												0 54 42 4
			9	SS	71												
			10	SS	33												0 30 65 5
310.6	END OF BOREHOLE		11	SS	100/23												
11.1	NOTES: 1. Borehole caved at a depth of 8.4 m (Elev. 313.3 m) upon completion of drilling. 2. Water level in open borehole at a depth of 1.1 m (Elev. 320.6 m) upon completion of drilling.																

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

PROJECT		RECORD OF BOREHOLE		No C34-2		SHEET 2 OF 2		METRIC									
W.P. 2835-02-00		LOCATION		N 4870212.1 ; E 298502.6		ORIGINATED BY		SB									
DIST Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers		COMPILED BY		ARM/HS									
DATUM Geodetic		DATE		November 29 and 30, 2010		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					WATER CONTENT (%)				
								20	40	60	80	100	10	20	30		
308.8	Sandy SILT to SAND, some silt, trace to some clay Compact to very dense Brown Moist		13	SS	59		311										
							310										
			14	SS	6*		309										
17.4	END OF BOREHOLE																
	NOTE: *Due to blowing sands, the SPT "N"-value recorded during the driving of the split spoon to obtain sample 14 is not considered to represent in-situ soil conditions. 1. Borehole caved to a depth of 15.3 m (Elev. 310.9 m) upon completion of drilling. 2. Open borehole dry upon completion of drilling.																

PROJECT 09-1111-0018		RECORD OF BOREHOLE No C34-3		SHEET 1 OF 2		METRIC	
W.P. 2835-02-00		LOCATION N 4870182.4 ; E 298536.4		ORIGINATED BY AM			
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers		COMPILED BY TT/HS			
DATUM Geodetic		DATE January 7, 2011		CHECKED BY SMM			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL
								20	40	60	80	100	W _p	W	W _L					
327.2	GROUND SURFACE																			
0.0	ASPHALT																			
0.2	Clayey silt, some sand, trace gravel, zones of silty sand (FILL) Stiff to very stiff Brown Moist		1	SS	11															
			2	SS	30															
			3	SS	19															
324.2																				
3.0	SAND and SILT, trace to some gravel, trace to some clay, trace wood fragments between 3.8 m and 5.2 m depth Loose to compact Brown Moist		4	SS	14															
			5	SS	11															
			6	SS	5															
			7	SS	23															
320.0																				
7.2	SAND, trace to some silt, trace clay, trace gravel, clayey silt lenses Dense Brown Moist		8	SS	48															
318.5																				
8.7	SILT, trace to some clay, trace to some sand, and sand lenses Dense Brown Moist		9	SS	30															
317.0																				
10.2	SAND, some silt, trace clay, clayey silt lenses Dense Brown Moist		10	SS	41															
			11	SS	43															
			12	SS	45															
312.4																				
14.8																				

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

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PROJECT <u>09-1111-0018</u>				RECORD OF BOREHOLE No C34-3				SHEET 2 OF 2				METRIC												
W.P. <u>2835-02-00</u>				LOCATION <u>N 4870182.4 ; E 298536.4</u>				ORIGINATED BY <u>AM</u>																
DIST <u>Central</u> HWY <u>400</u>				BOREHOLE TYPE <u>D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers</u>				COMPILED BY <u>TT/HS</u>																
DATUM <u>Geodetic</u>				DATE <u>January 7, 2011</u>				CHECKED BY <u>SMM</u>																
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL							
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)											
	--- CONTINUED FROM PREVIOUS PAGE ---							20	40	60	80	100												
311.3	Silty SAND, trace clay, trace gravel Very dense Brown Moist	[Strat Plot]	13	SS	60		312										o							
15.9	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.																							

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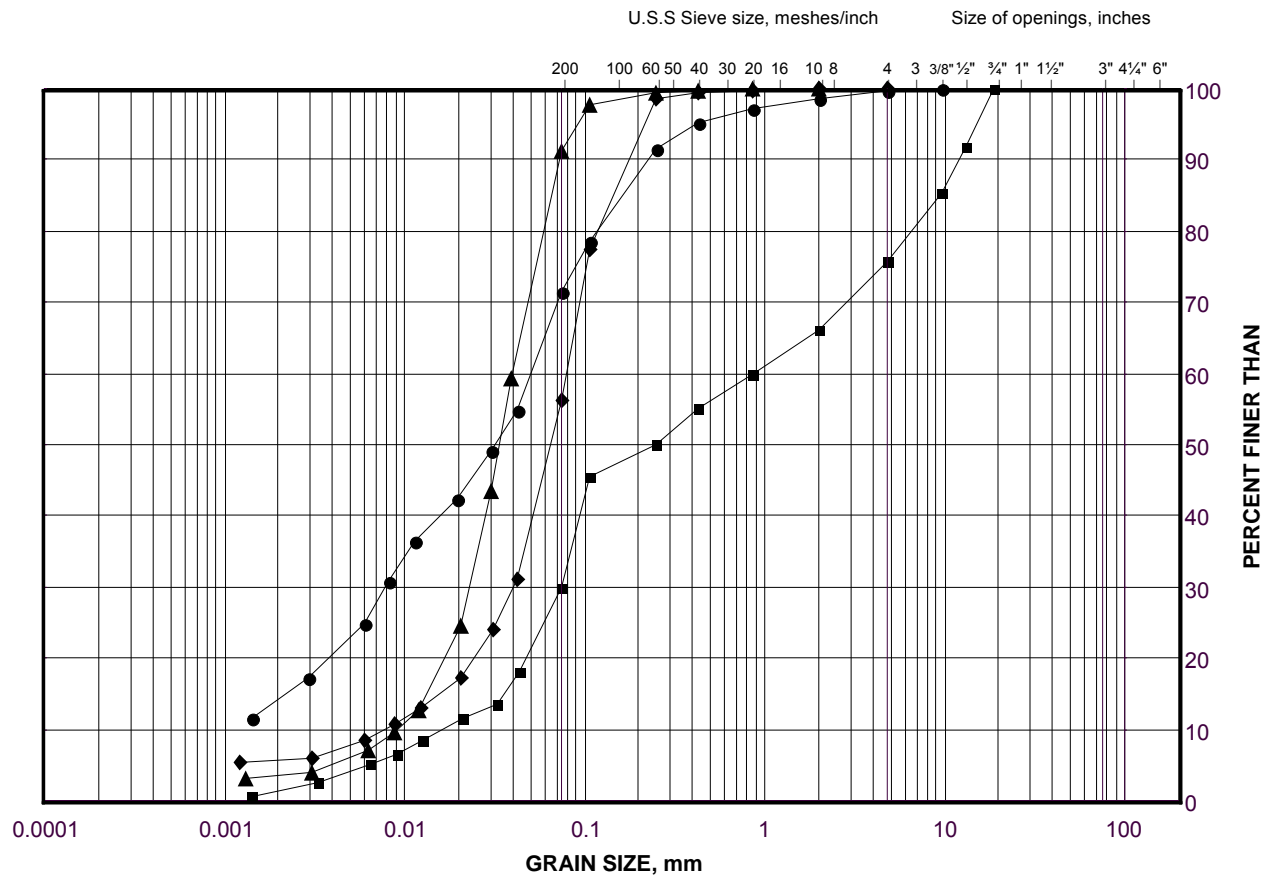
PROJECT 09-1111-0018			RECORD OF BOREHOLE No C34-4			SHEET 1 OF 1			METRIC															
W.P. 2835-02-00			LOCATION N 4870177.6 ; E 298555.0			ORIGINATED BY PS/SKB																		
DIST Central HWY 400			BOREHOLE TYPE D-50 Track Mount, 108 mm Diameter Solid Stem Augers			COMPILED BY ARM/HS																		
DATUM Geodetic			DATE November 22, 2010			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			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																			
323.8	GROUND SURFACE																							
0.9	TOPSOIL		1	SS	4																			
	SILT and SAND, trace clay, trace rootlets and organics to a depth of 1.5 m Loose to dense Brown Moist		2	SS	9																			
			3	SS	17																			
			4	SS	25																			
			5	SS	28																			
			6	SS	38																			
			7	SS	30																			
			8	SS	49																			
			9	SS	38																			
			10	SS	48																			
314.0	END OF BOREHOLE																							
9.8																								
NOTE:																								
1. Open borehole dry upon completion of drilling.																								
2. Water level measurements in piezometer:																								
Date 12/16/10			Depth (m) Dry -			Elev. (m) -																		
02/01/11			Dry -																					

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 12/1/15 SIB

GRAIN SIZE DISTRIBUTION

Sand and Silt to Clayey Silt Fill

FIGURE D1A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-14	2	338.0
■	F3-23	2	318.8
◆	F3-22	3	319.9
▲	F3-5	3	314.4

Project Number: 09-1111-0018

Checked By: TWB

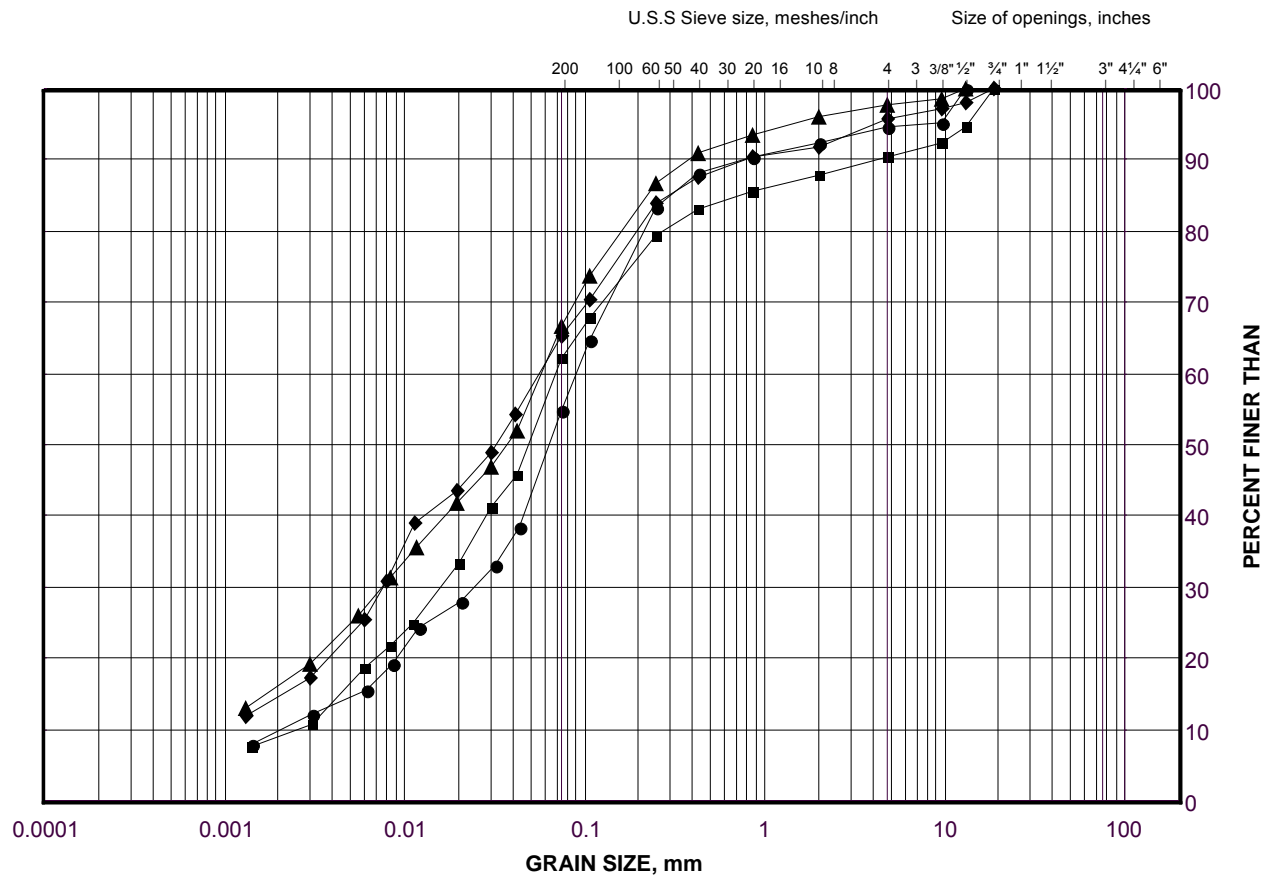
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Sand and Silt to Clayey Silt Fill

FIGURE D1B



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

LEGEND

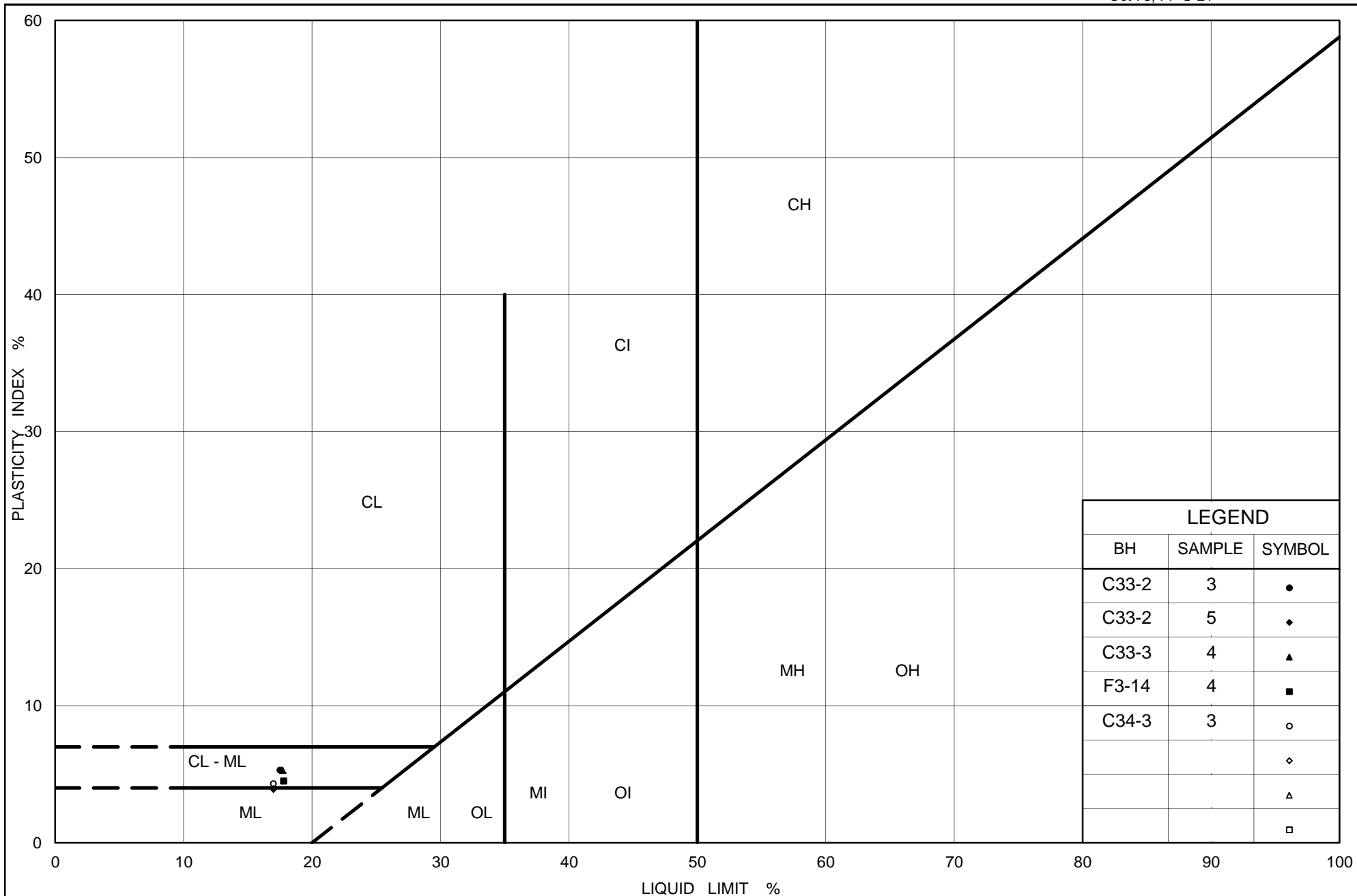
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-24	3	319.0
■	C34-2	3	324.4
◆	C33-3	4	332.2
▲	C33-2	5	336.0

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 01-Dec-15



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt Fill

Figure No. D2

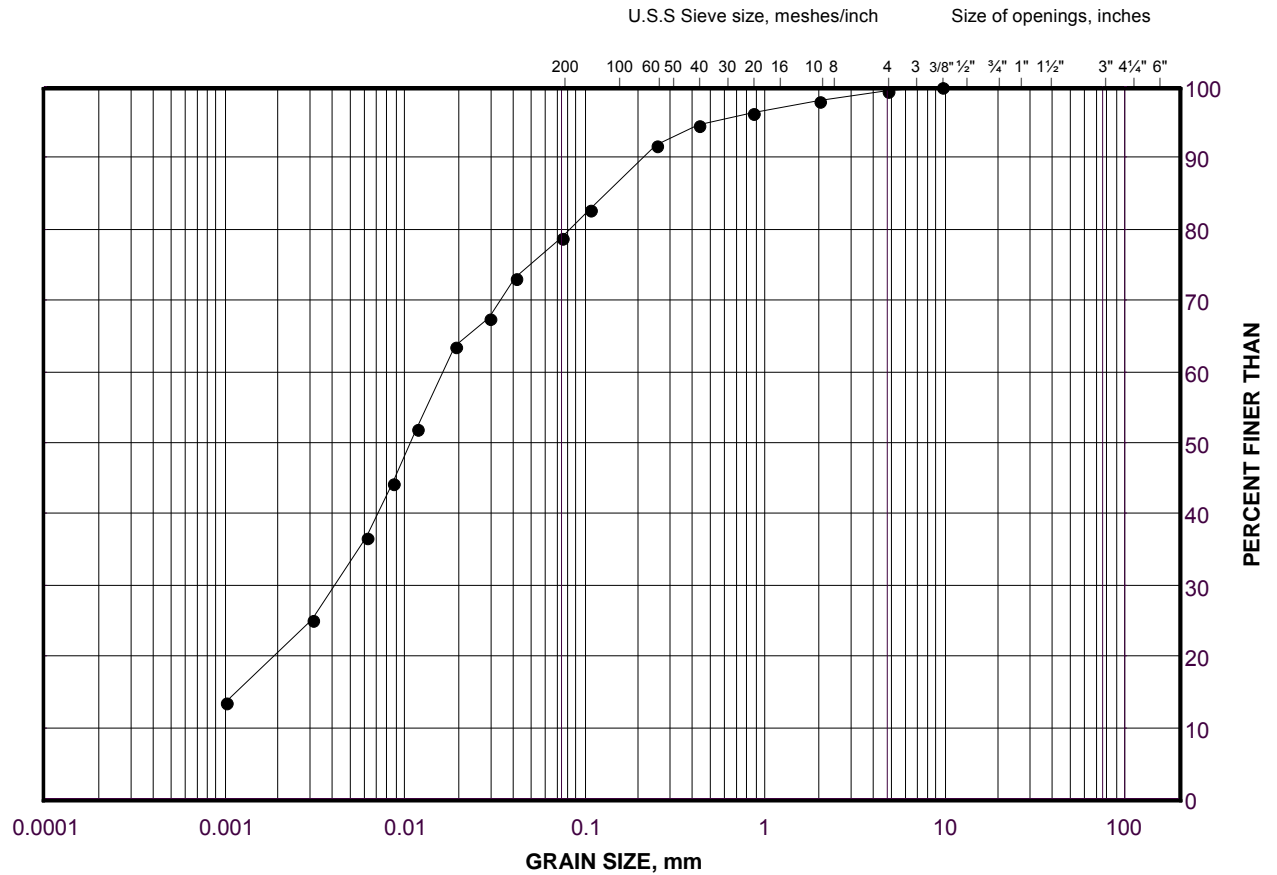
Project No. 09-1111-0018

Checked By: TWD

GRAIN SIZE DISTRIBUTION

Upper Clayey Silt

FIGURE D3



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

LEGEND

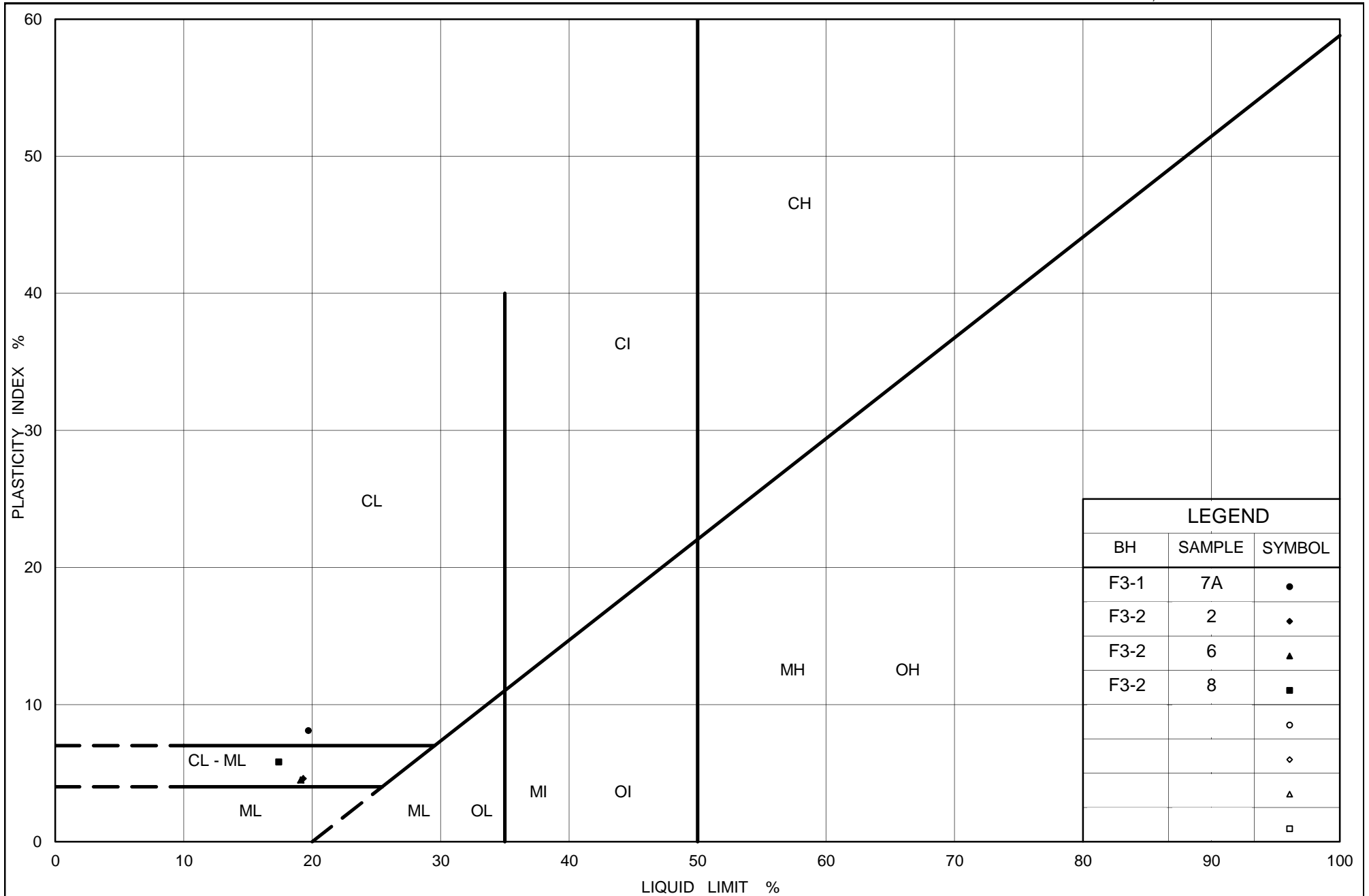
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F3-2	2	328.9

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 01-Dec-15



Ministry of Transportation

Ontario

PLASTICITY CHART

Upper Clayey Silt

Figure No. D4

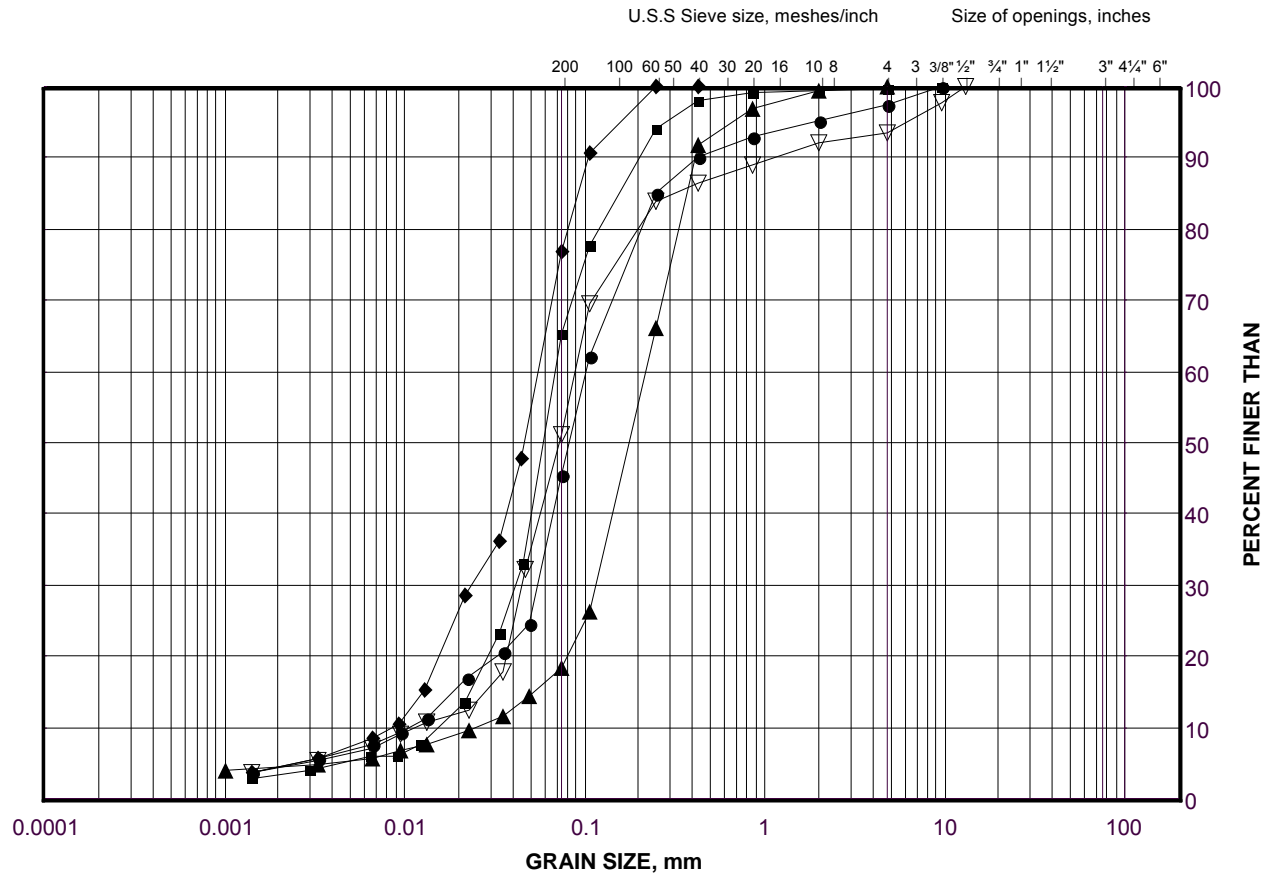
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Sandy Silt to Sand

FIGURE D5A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-7	2	315.9
■	F3-15	3	332.6
◆	F3-6	3	315.2
▲	F3-2	4	327.4
▽	F3-7	4	314.4

Project Number: 09-1111-0018

Checked By: TWB

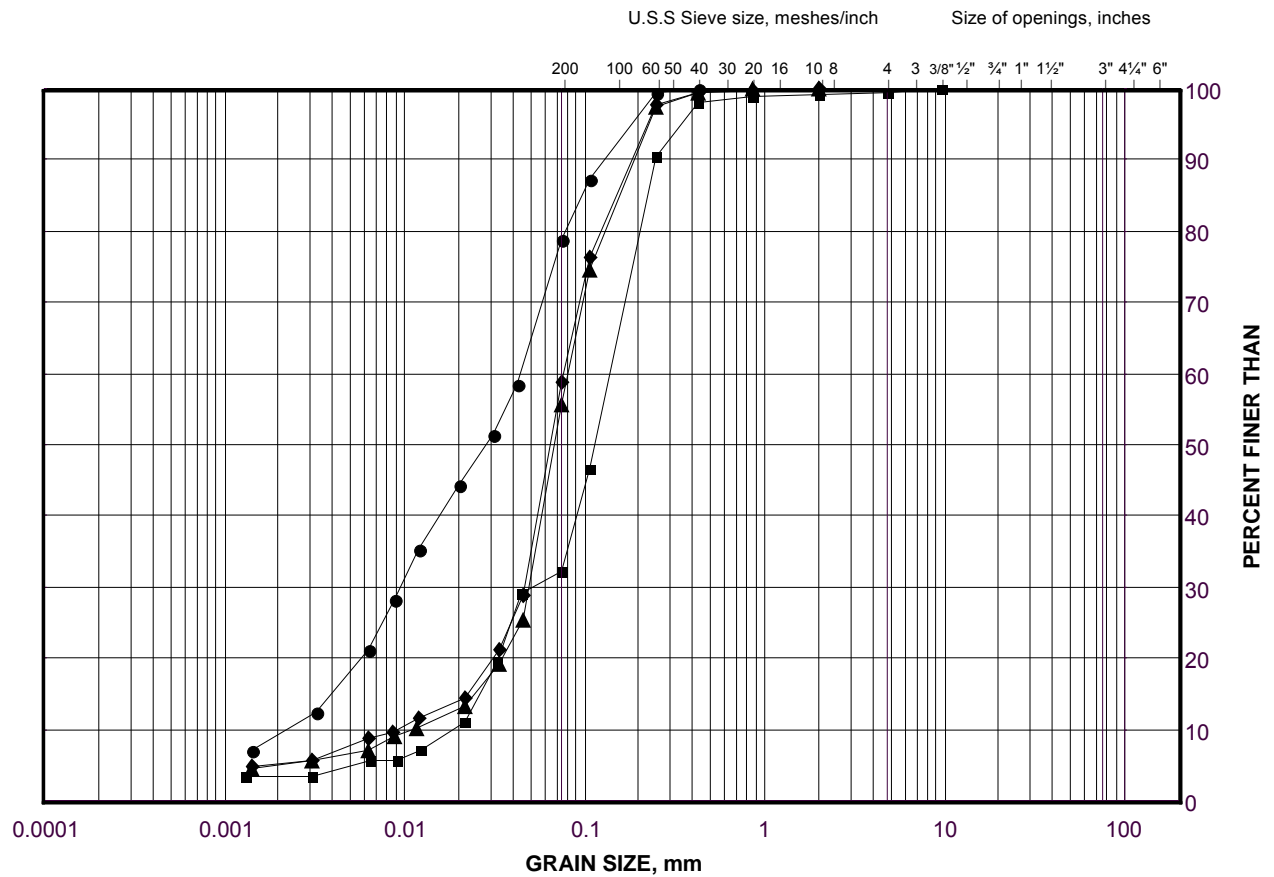
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Sandy Silt to Sand

FIGURE D5B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-6	5	313.6
■	C33-3	7	329.2
◆	F3-14	7	333.4
▲	C33-2	7	329.6

Project Number: 09-1111-0018

Checked By: TWB

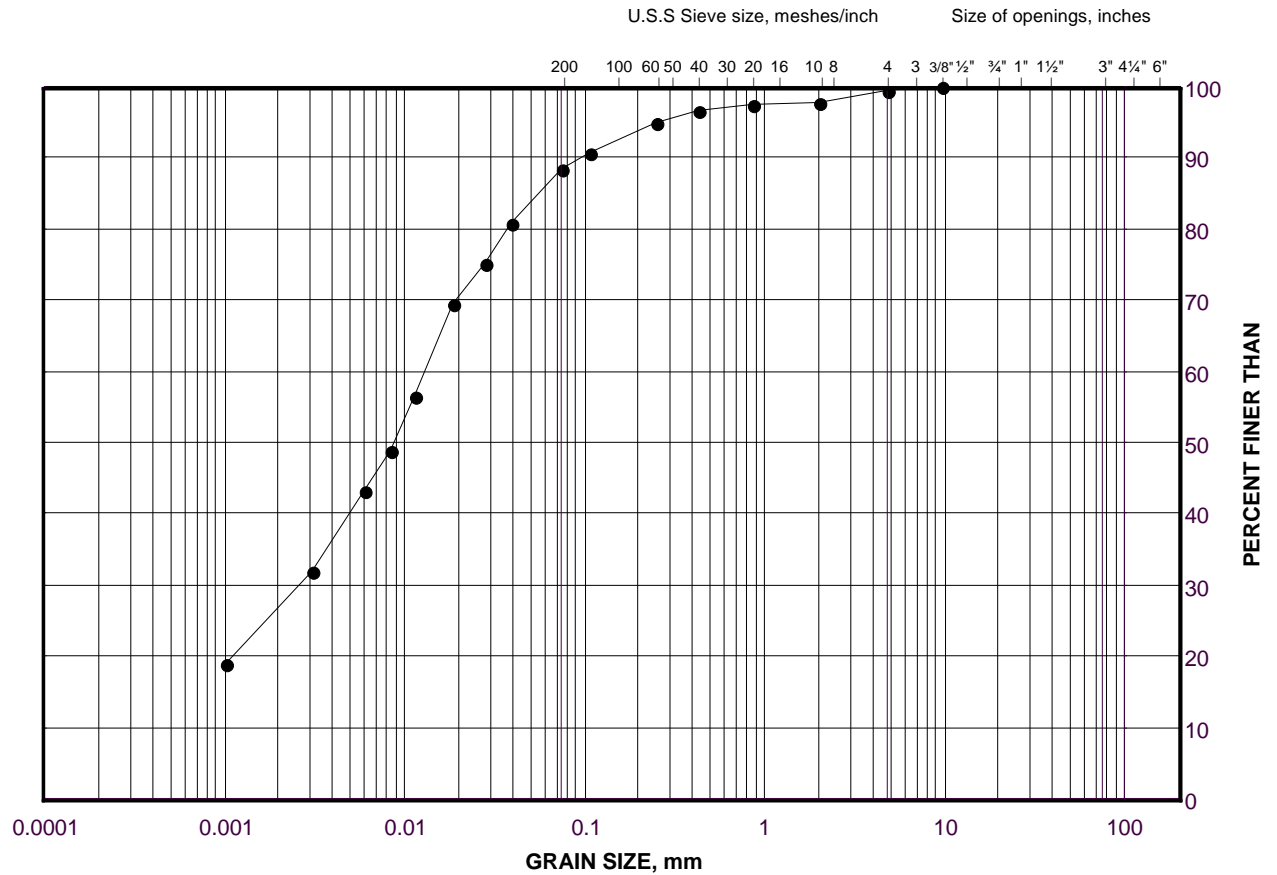
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Clayey Silt

FIGURE D6



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F3-2	6	328.4

Project Number: 09-1111-0018

Checked By: TWB

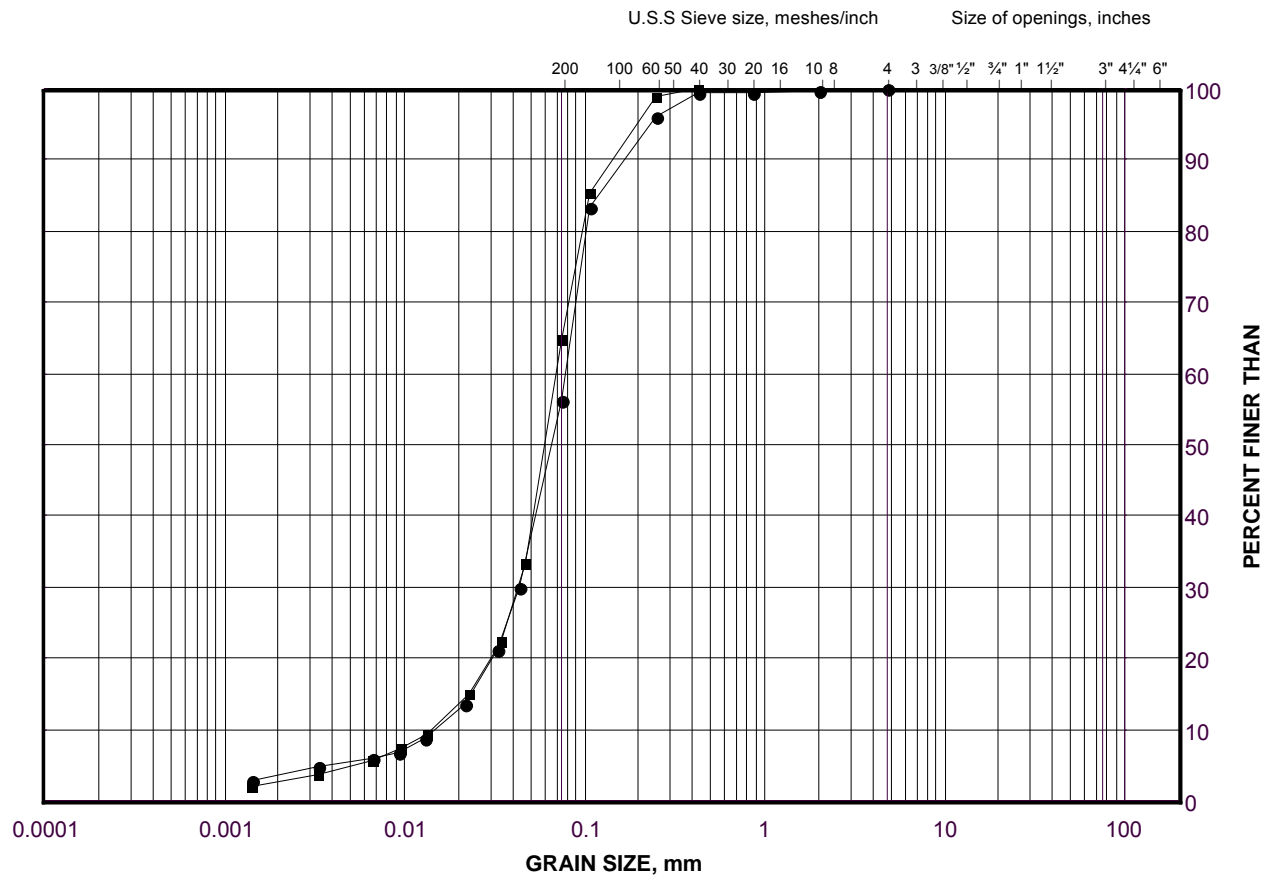
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Sand and Silt to Silty Sand Interlayers within Lower Clayey Silt Deposit

FIGURE D7



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

LEGEND

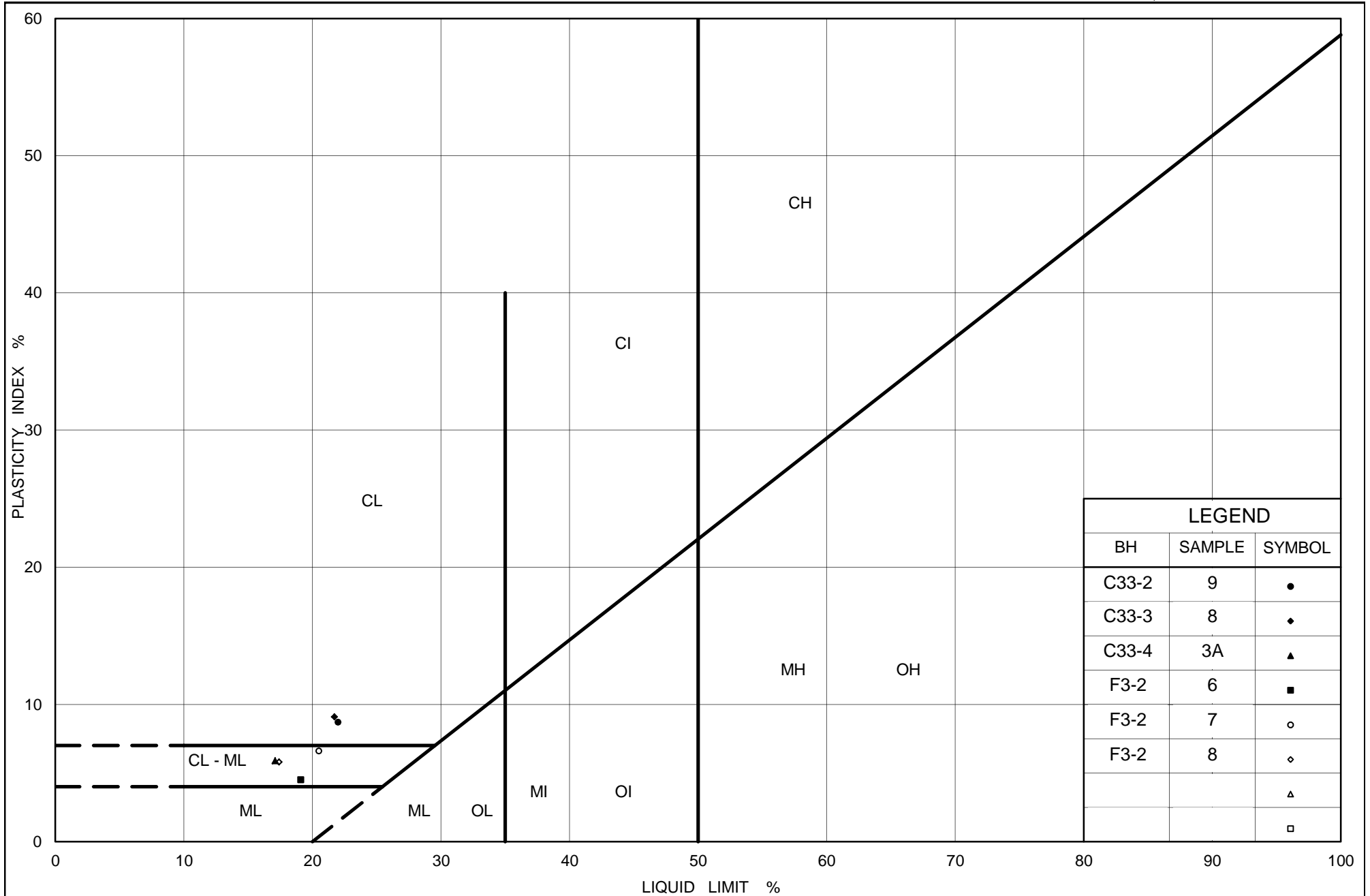
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-16	5	327.6
■	F3-7	6	312.9

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 01-Dec-15



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Ontario

PLASTICITY CHART

Lower Clayey Silt and Interlayers

Figure No. D8

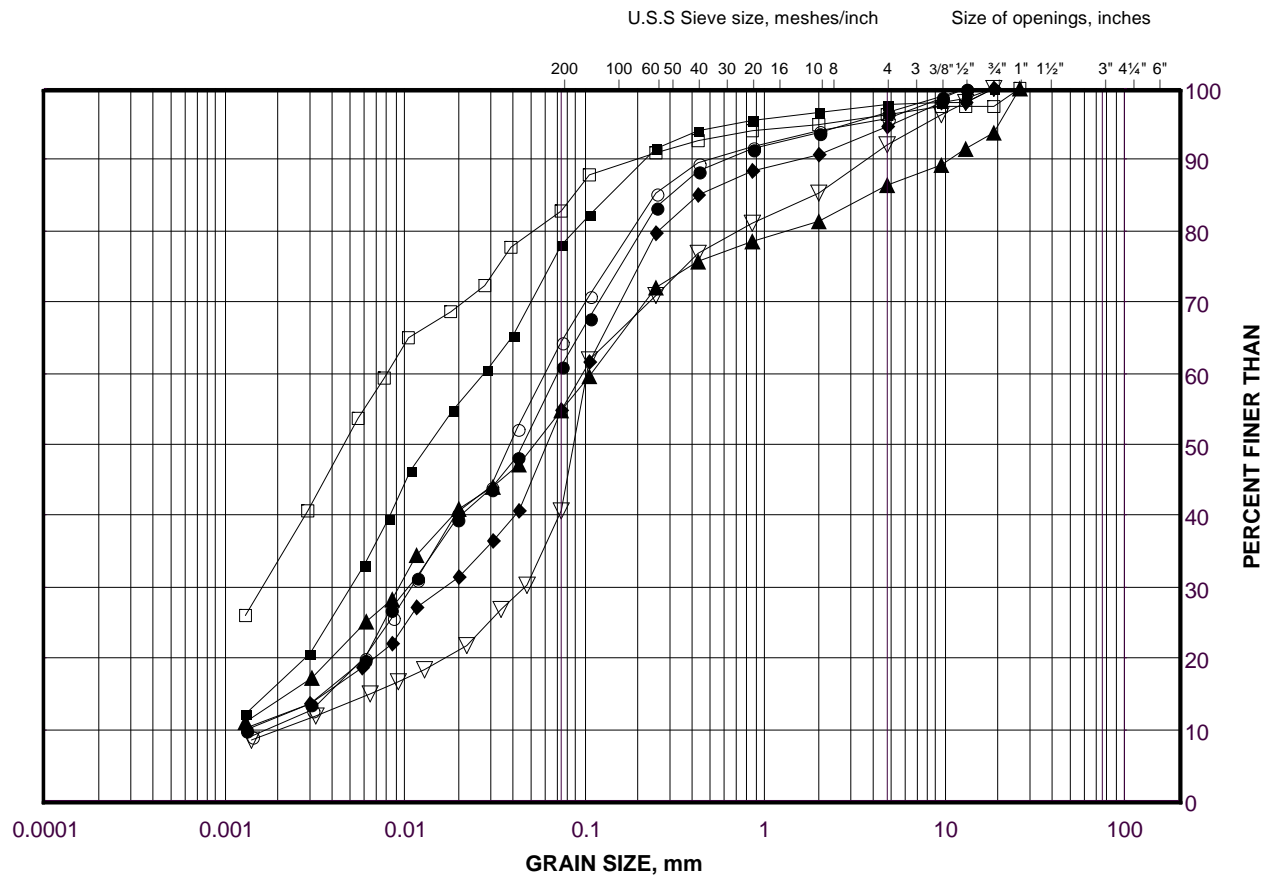
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Clayey Silt to Sand and Silt Till

FIGURE D9A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-12	2	340.4
■	F3-11	2	343.2
◆	F3-10	3	343.2
▲	F3-9	3	315.2
▽	F3-16	3	329.2
○	C33-1	3	329.5
□	F3-26	5	317.7

Project Number: 09-1111-0018

Checked By: TWB

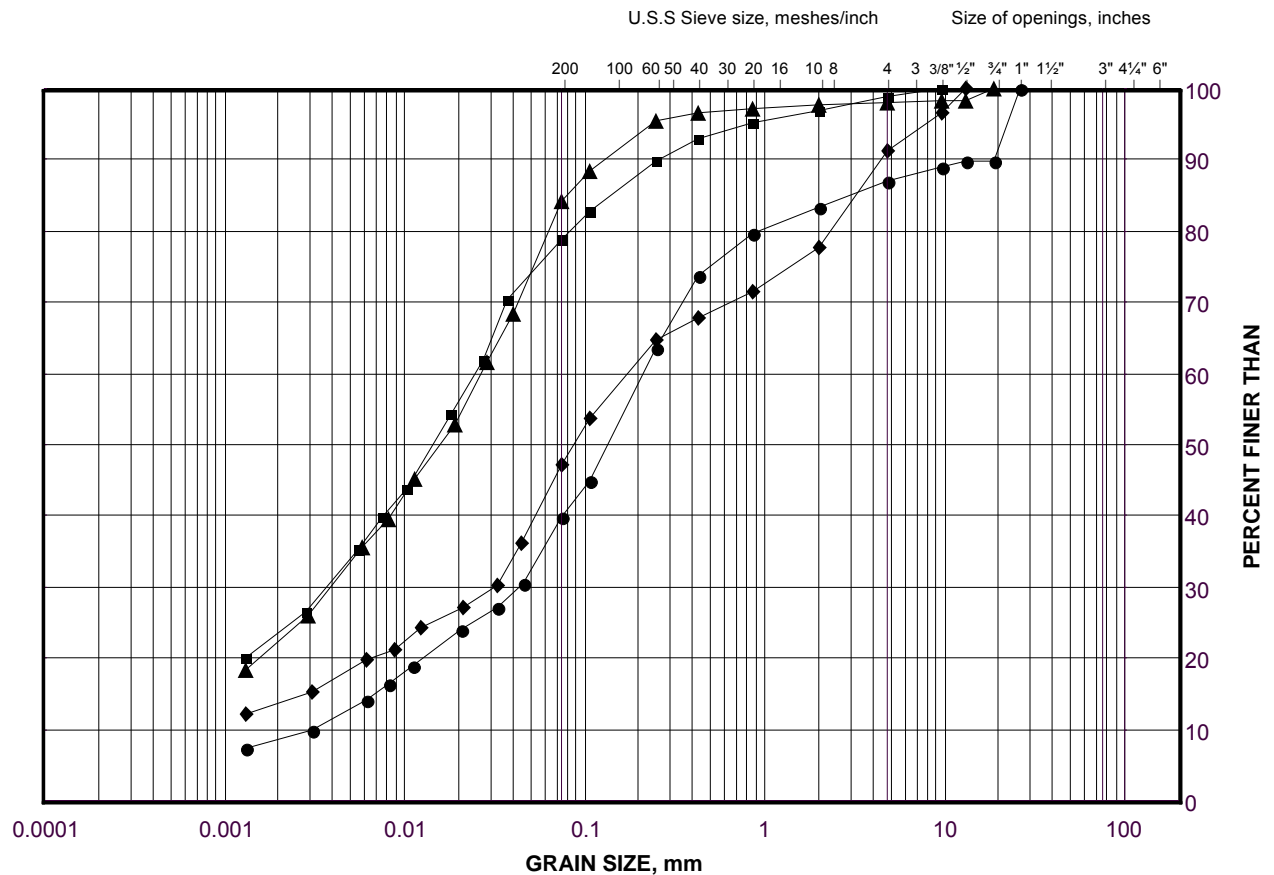
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Clayey Silt to Sand and Silt Till

FIGURE D9B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-13	4	336.4
■	F3-15	5	331.0
◆	F3-9	5	313.6
▲	F3-13	7	334.1

Project Number: 09-1111-0018

Checked By: TWB

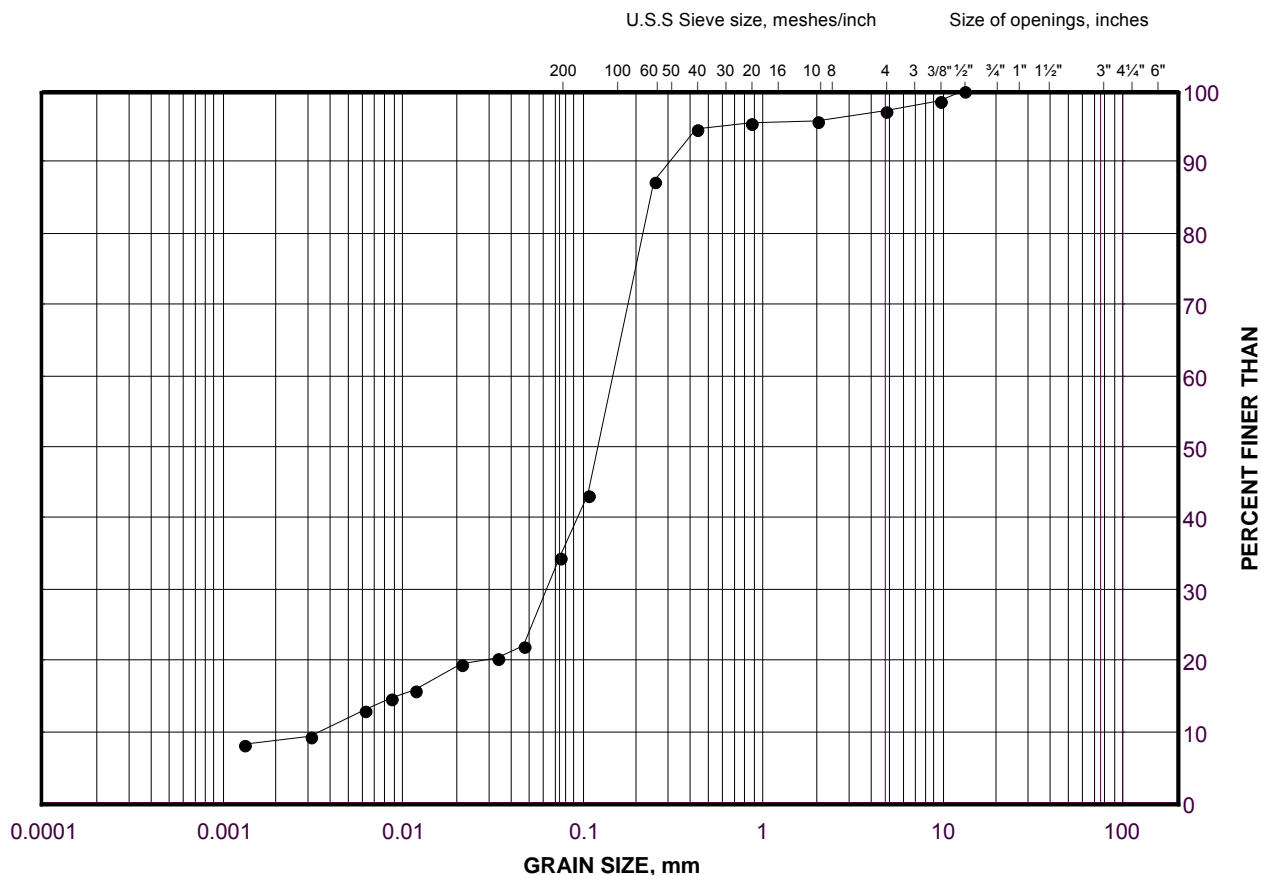
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Silty Sand (Interlayers within Clayey Silt Till)

FIGURE D10



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

LEGEND

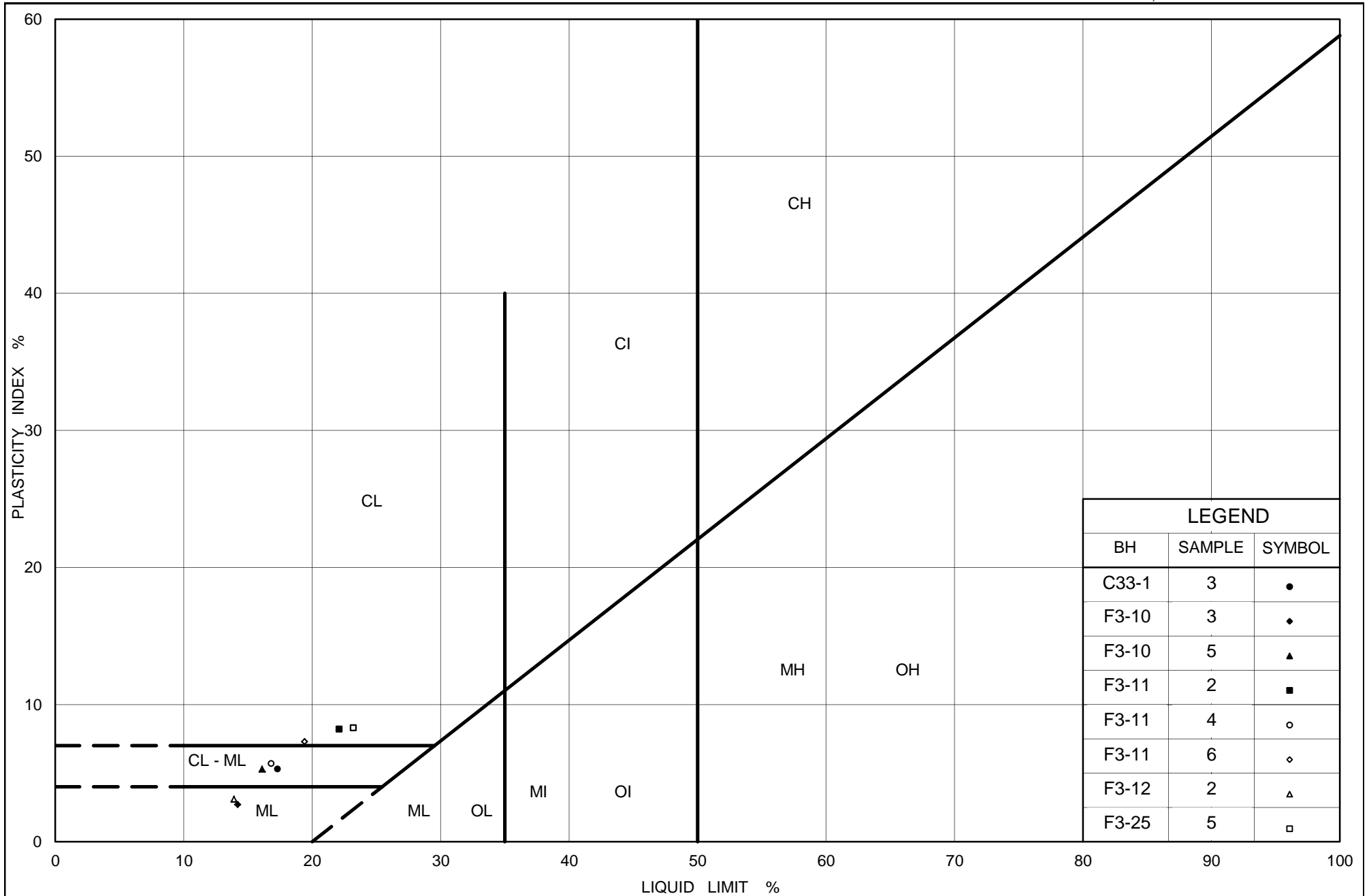
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F3-12	5	338.3

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 01-Dec-15



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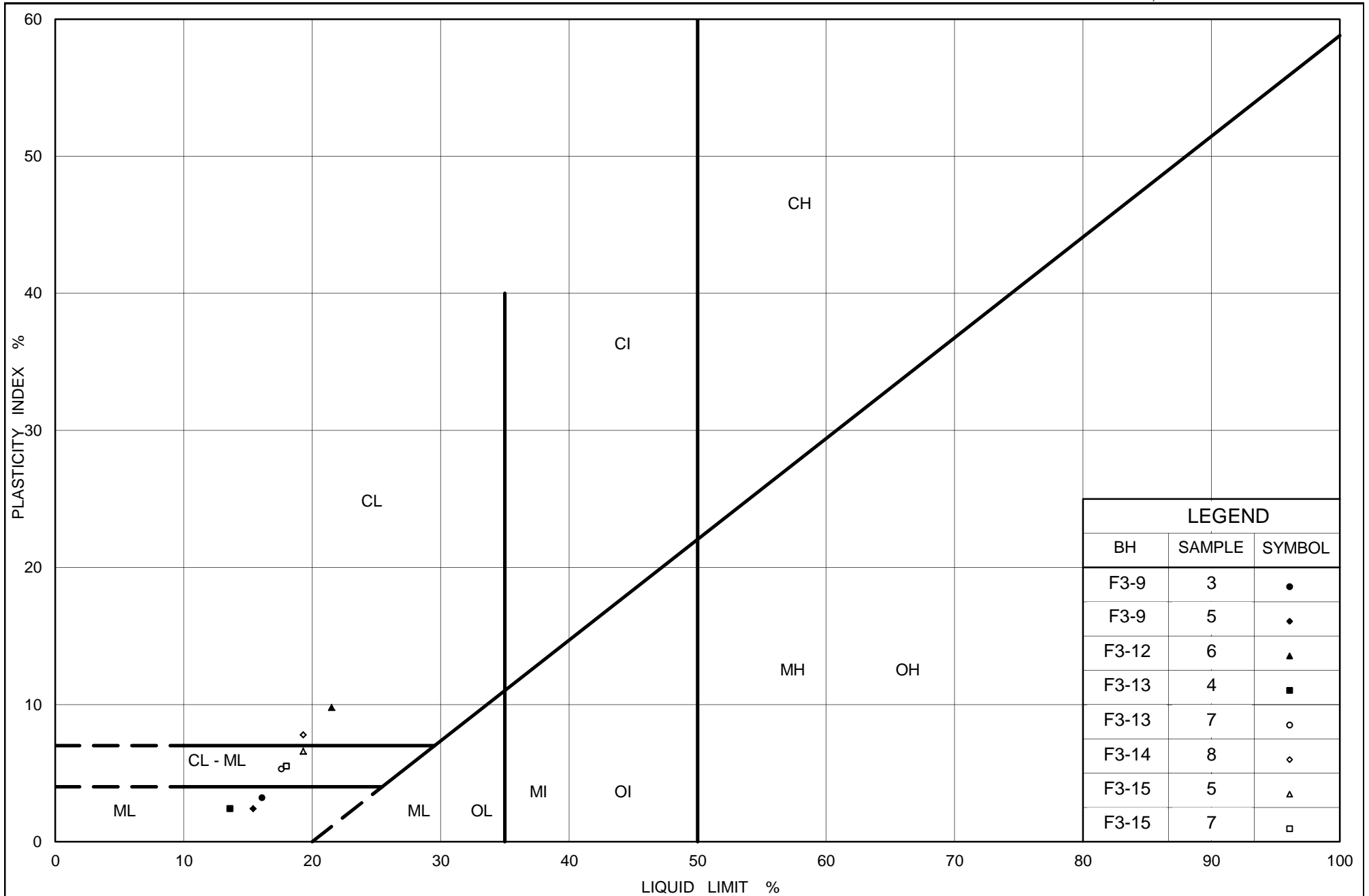
Ontario

PLASTICITY CHART Clayey Silt to Sand and Silt Till

Figure No. D11A

Project No. 09-1111-0018

Checked By: TWB



Ministry of Transportation

Ontario

PLASTICITY CHART Clayey Silt to Sand and Silt Till

Figure No. D11B

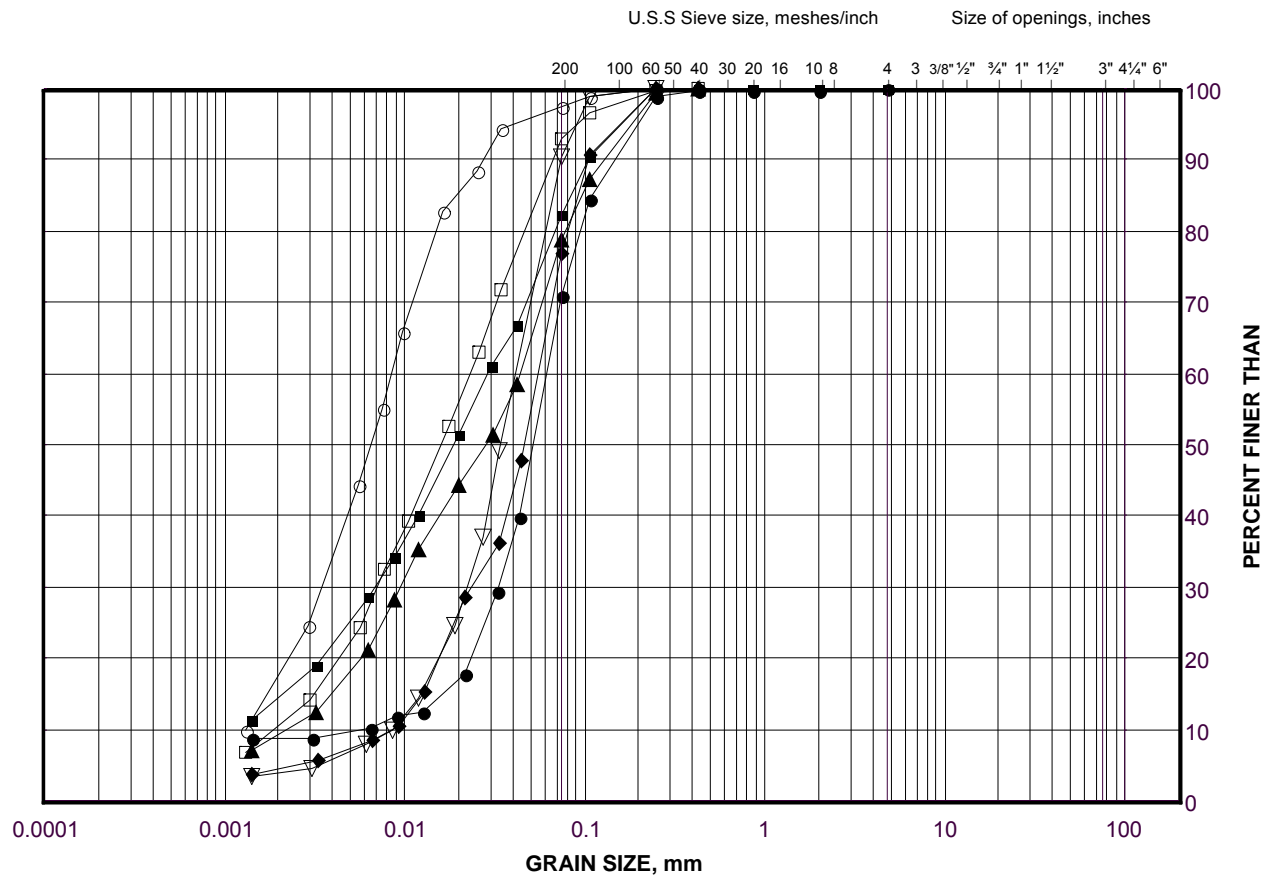
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Lower Silt and Sand

FIGURE D12A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C33-2	11	323.5
■	F3-19	3	328.2
◆	F3-6	3	323.3
▲	F3-6	5	321.9
▽	C33-4	5	326.7
○	F3-5	6	326.1
□	F3-21	6	319.5

Project Number: 09-1111-0018

Checked By: TWB

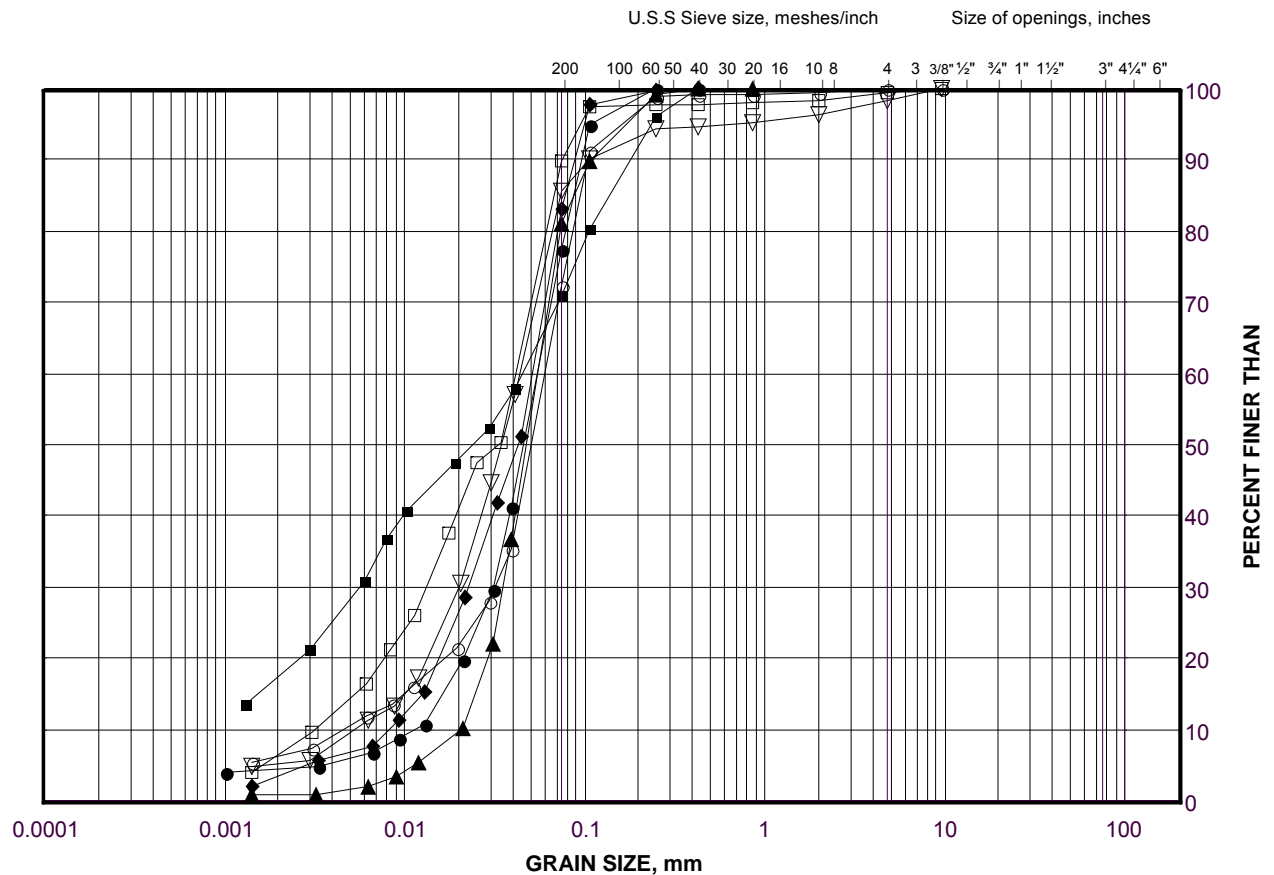
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Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silt and Sand

FIGURE D12B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-3	6	325.9
■	F3-22	6	319.6
◆	F3-25	7	312.6
▲	F3-12	8	335.1
▽	F3-13	8	332.6
○	C33-4	8	323.7
□	F3-26	8	310.6

Project Number: 09-1111-0018

Checked By: TWB

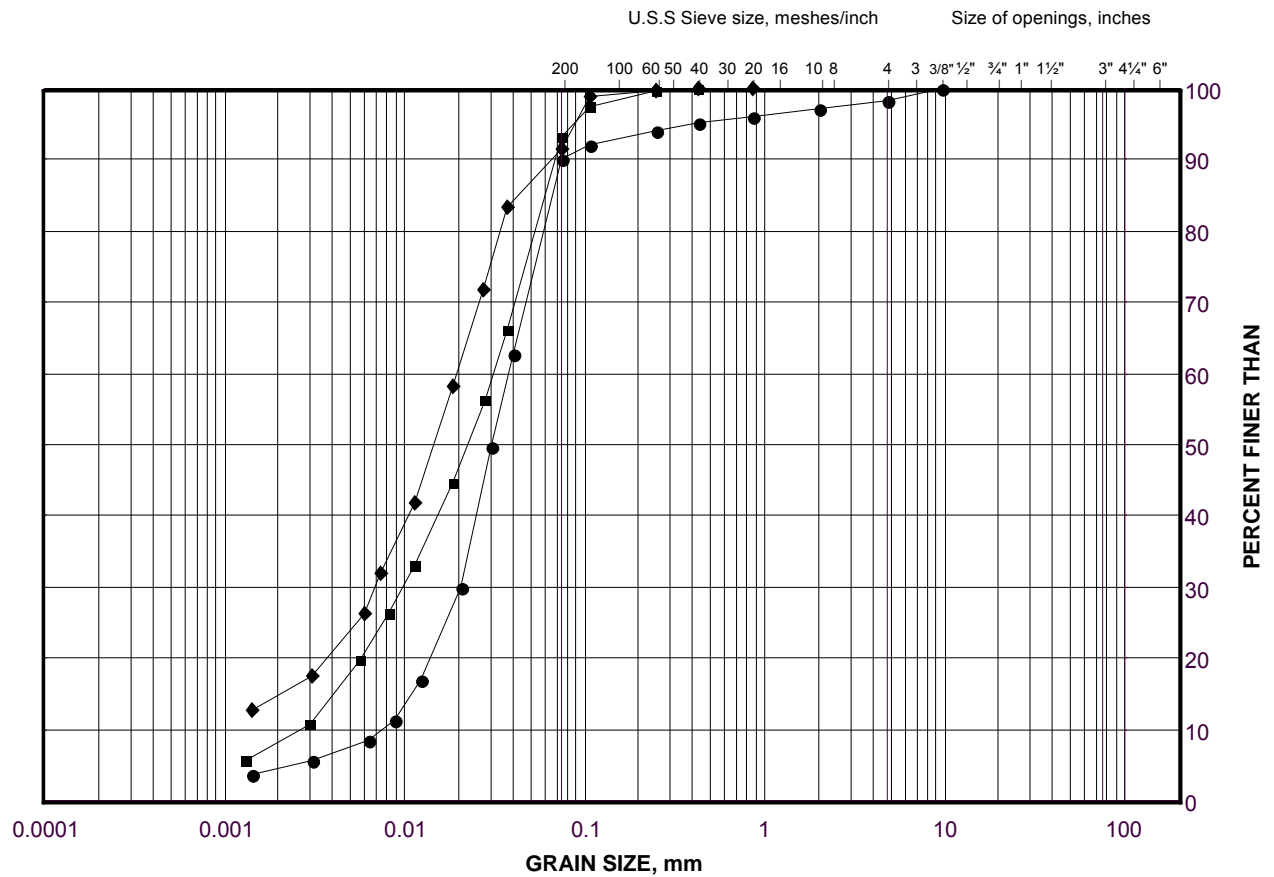
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silt and Sand

FIGURE D12C



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-15	8B	327.7
■	C34-3	9	317.8
◆	C33-4	9	322.1

Project Number: 09-1111-0018

Checked By: TWB

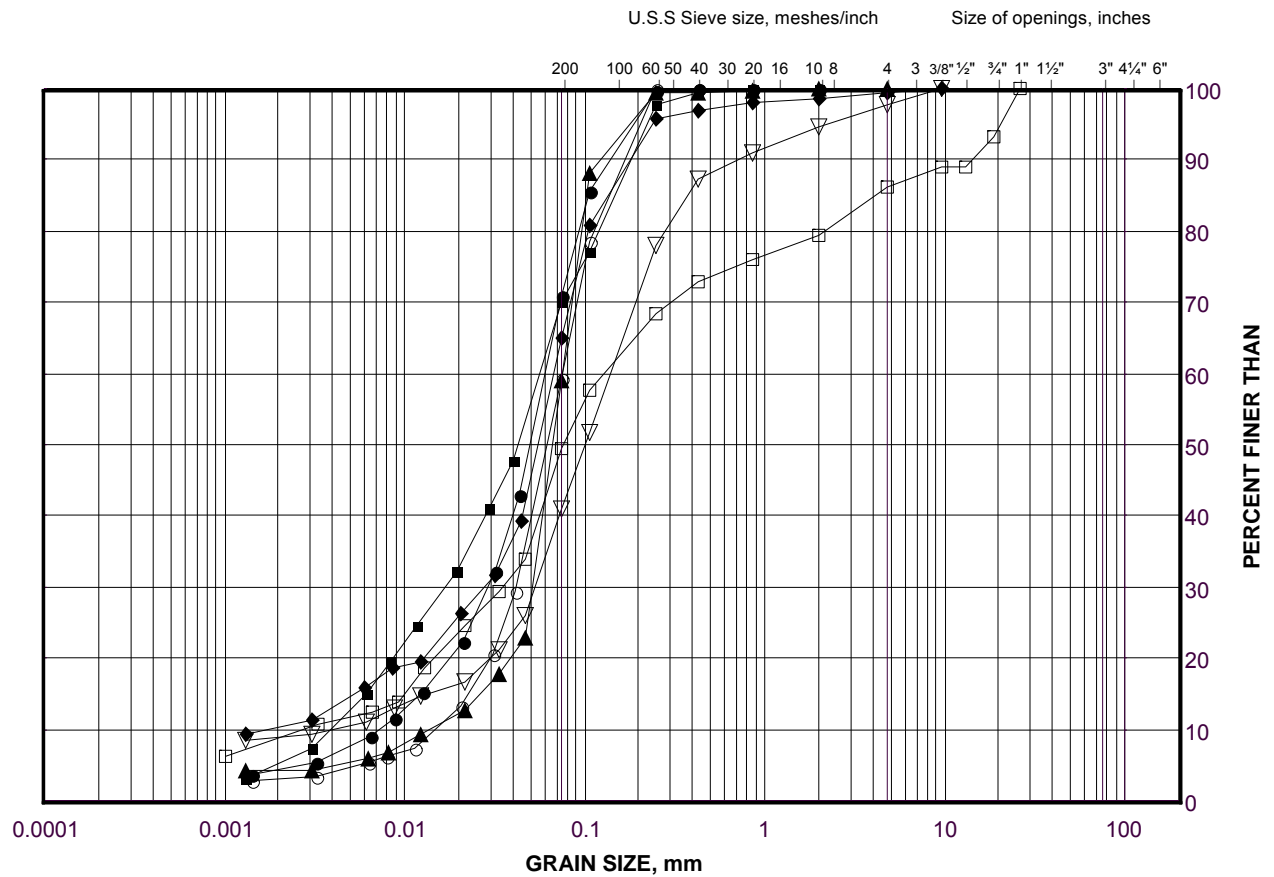
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silt and Sand

FIGURE D12D



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-22	10	313.6
■	C34-1	10	312.3
◆	F3-14	10	328.8
▲	C33-3	10	324.6
▽	C33-1	11	320.4
○	C33-4	11	319.1
□	F3-4	2	326.5

Project Number: 09-1111-0018

Checked By: TWB

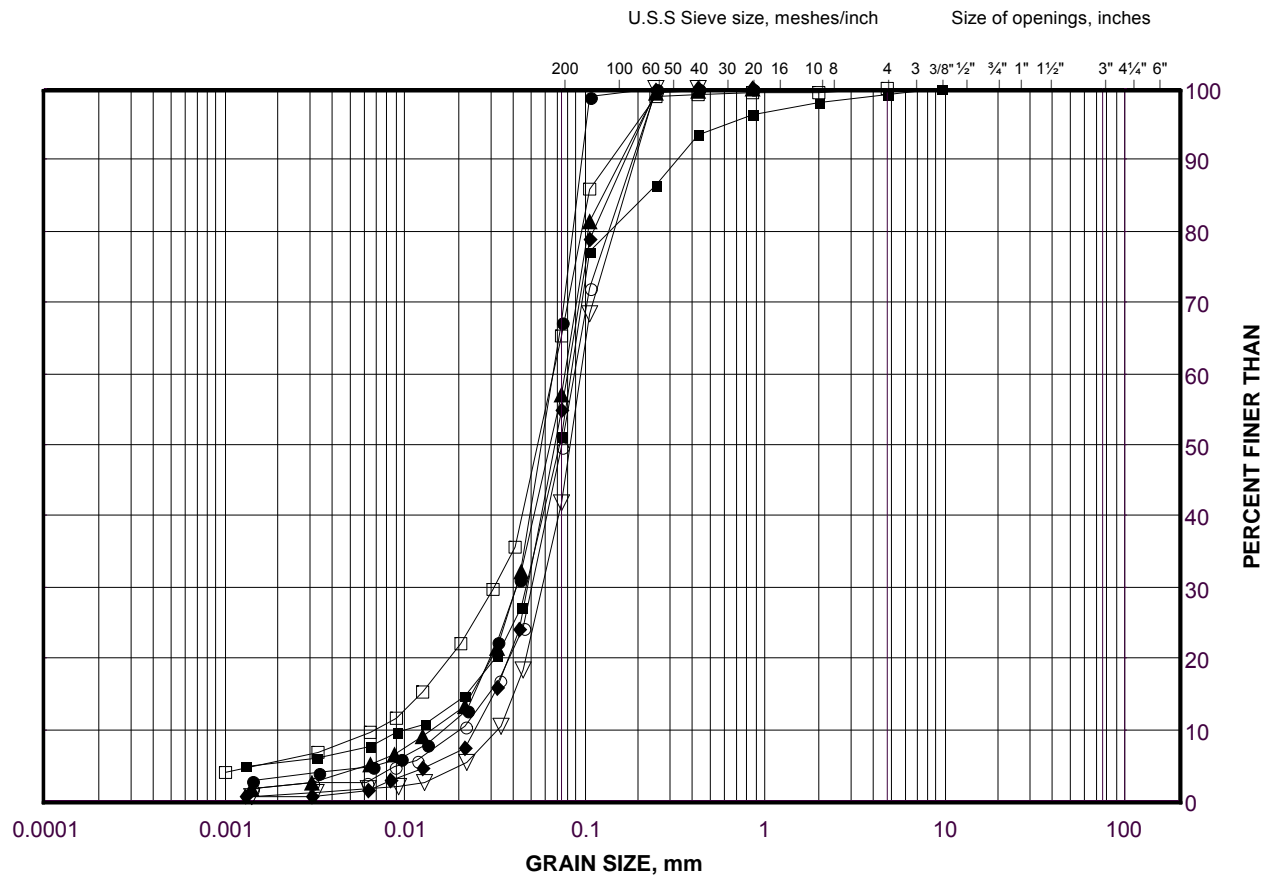
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silt and Sand

FIGURE D12E



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-18	2	331.0
■	F3-25	2	316.4
◆	F3-20	3	325.0
▲	F3-21	3	321.7
▽	C34-4	3	322.0
○	C34-1	4	319.1
□	F3-3	4	327.4

Project Number: 09-1111-0018

Checked By: TWB

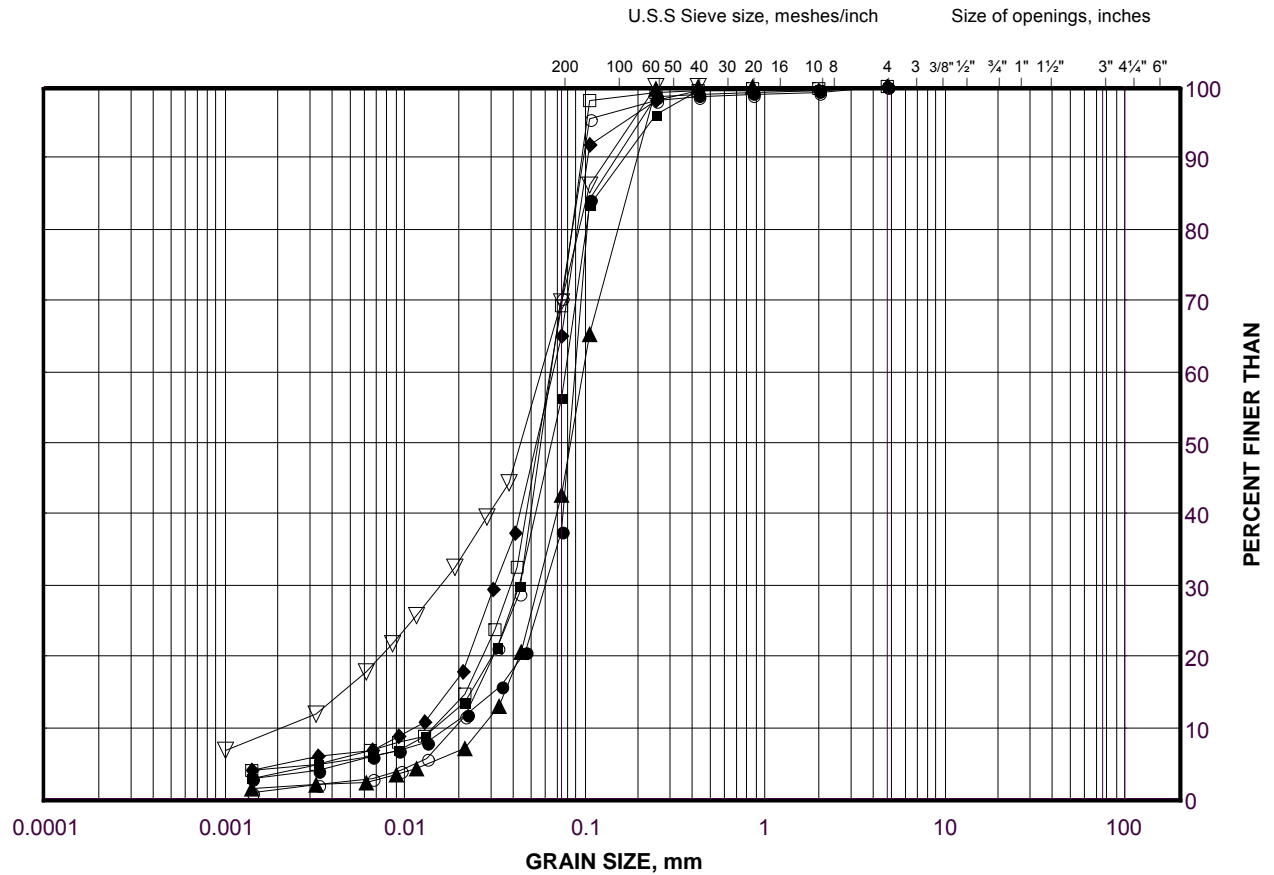
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silt and Sand

FIGURE D12F



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-18	4	329.6
■	F3-16	5	327.7
◆	F3-17	5	328.5
▲	C34-4	5	320.7
▽	F3-4	5	324.1
○	F3-23	5	316.5
□	F3-25	5	314.1

Project Number: 09-1111-0018

Checked By: TWB

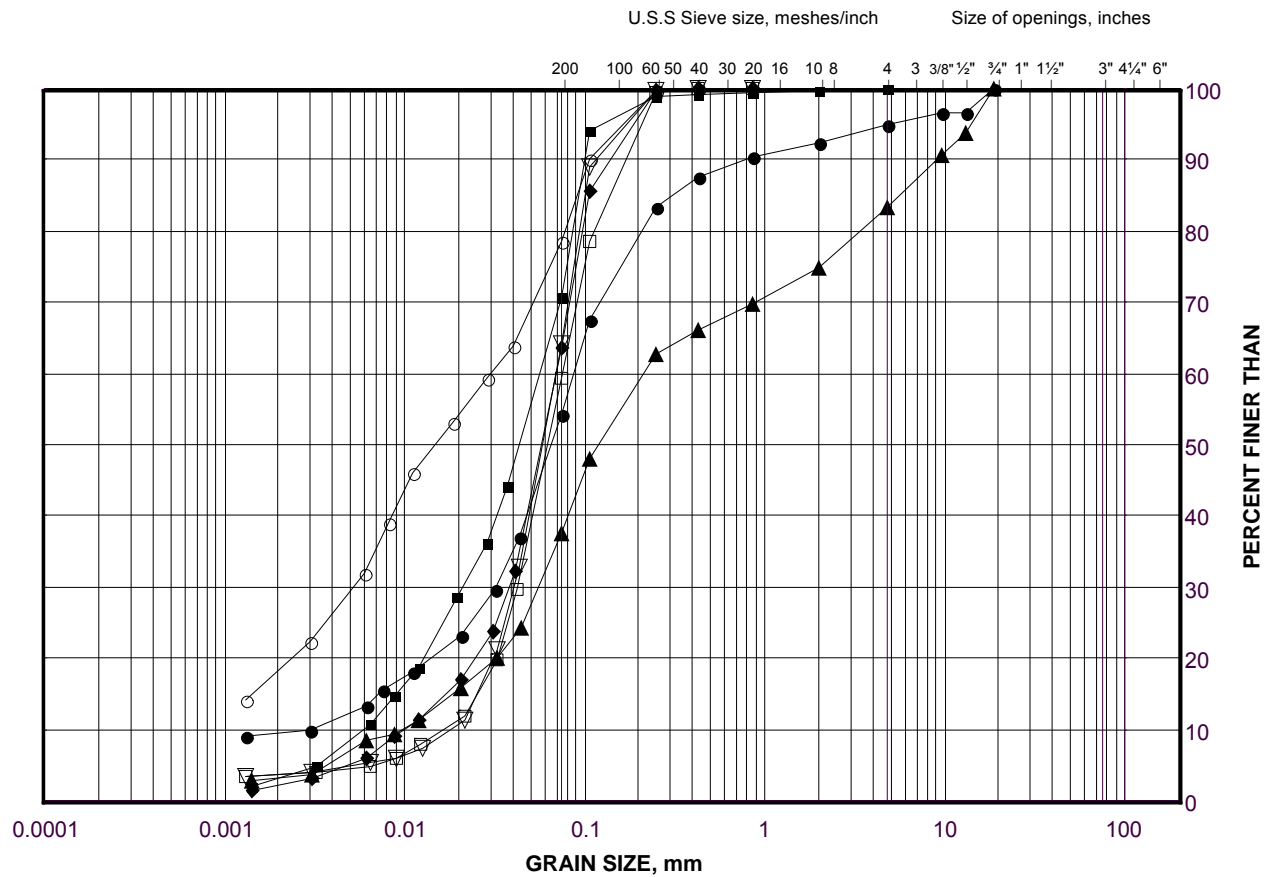
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silt and Sand

FIGURE D12G



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C34-3	5	323.2
■	F3-19	5	326.7
◆	F3-20	6	322.7
▲	C34-3	7	320.8
▽	F3-5	7	324.7
○	C34-2	7	319.7
□	F3-24	7	315.2

Project Number: 09-1111-0018

Checked By: TWB

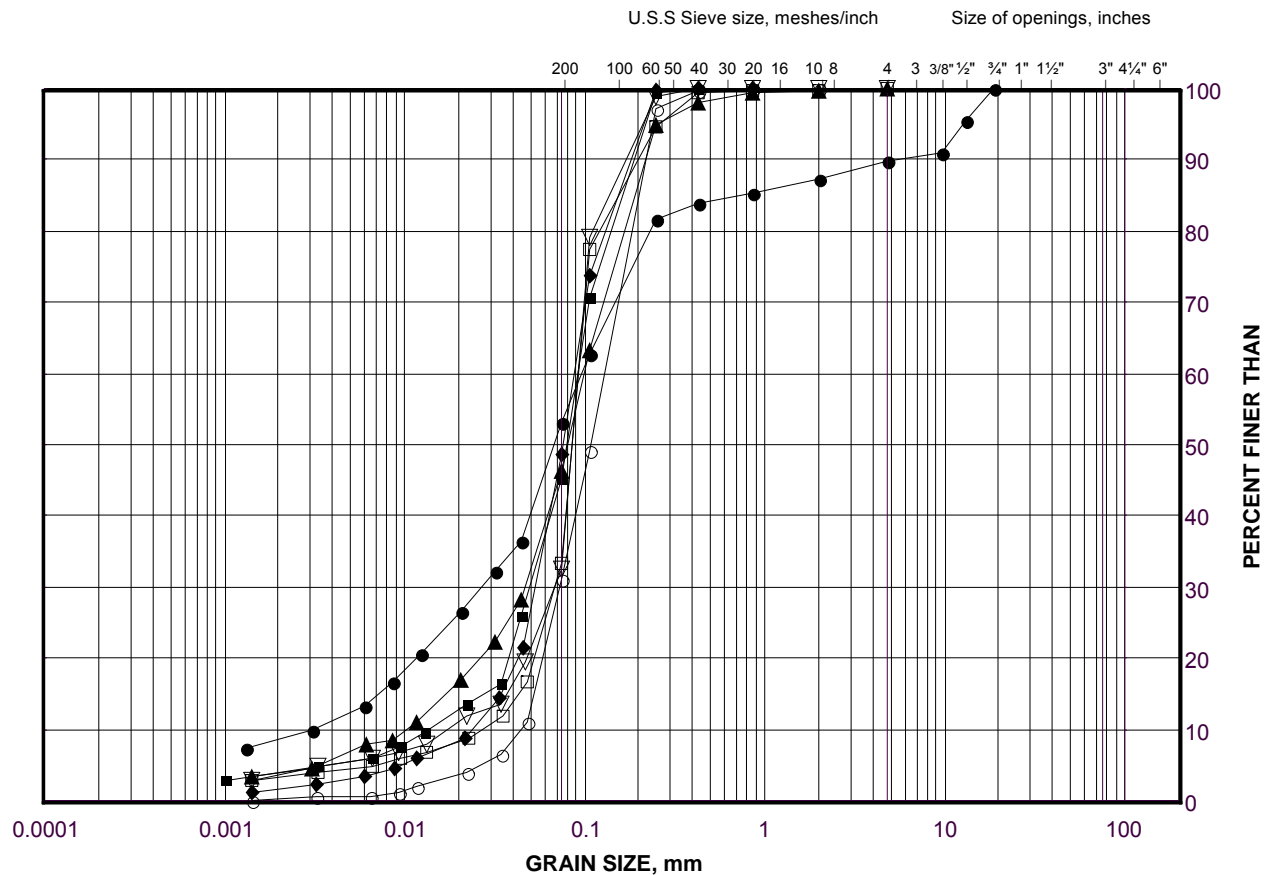
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silt and Sand

FIGURE D12H



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-10	8	338.6
■	F3-6	8	318.8
◆	C34-4	8	317.4
▲	C34-1	8	315.3
▽	F3-17	8	325.5
○	F3-11	8	337.2
□	F3-18	9	324.2

Project Number: 09-1111-0018

Checked By: TWB

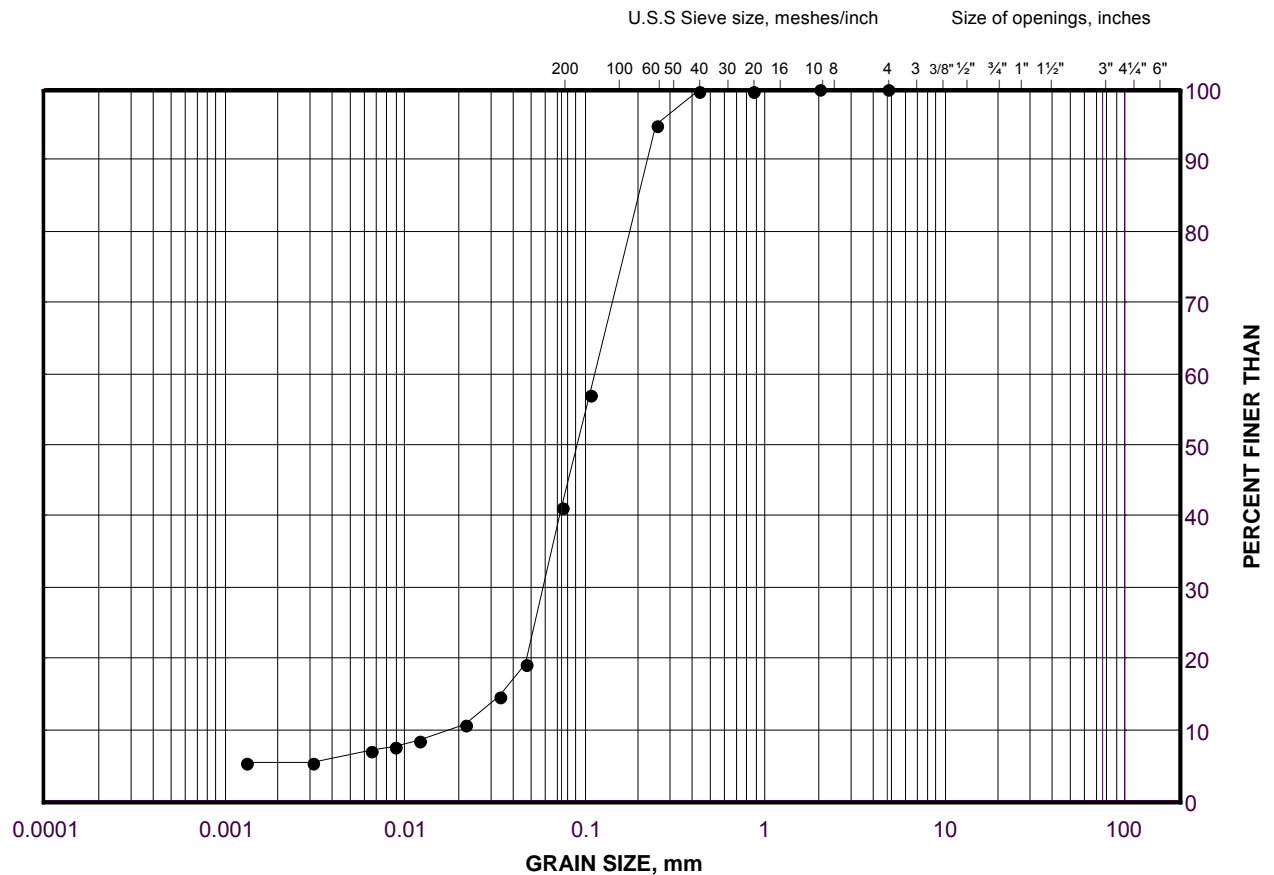
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silt and Sand

FIGURE D12I



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F3-1	10	328.1

Project Number: 09-1111-0018

Checked By: TWB

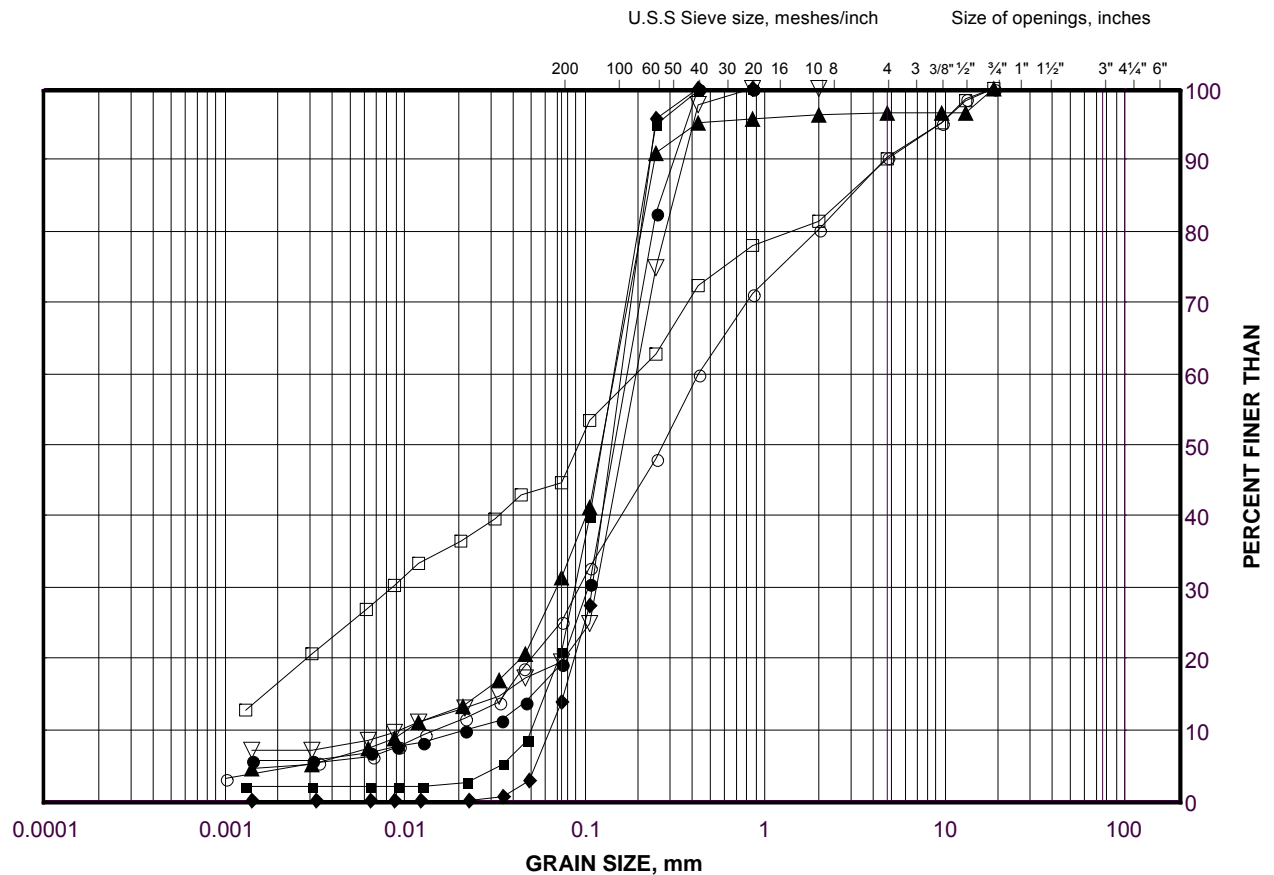
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silty Sand to Sand

FIGURE D12J



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C34-2	10	315.2
■	C34-3	11	314.7
◆	F3-24	11	309.1
▲	C34-3	13	311.7
▽	C34-2	13	310.7
○	F3-3	2	328.9
□	F3-17	2	330.8

Project Number: 09-1111-0018

Checked By: TWB

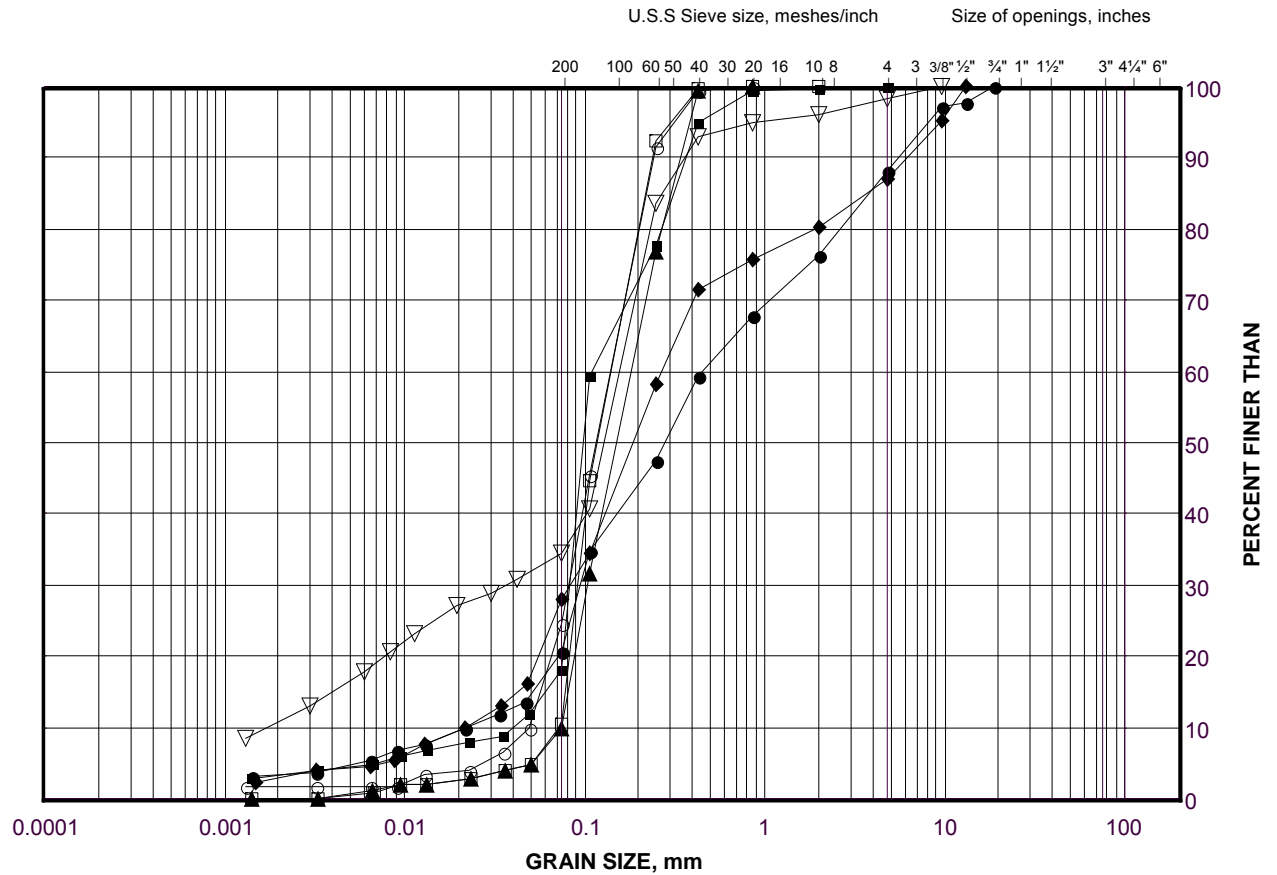
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silty Sand to Sand

FIGURE D12K



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-26	3	315.2
■	F3-18	7	327.2
◆	C33-1	7	326.5
▲	F3-23	7	315.0
▽	F3-9	7	342.1
○	F3-22	8	316.6
□	F3-19	8	323.6

Project Number: 09-1111-0018

Checked By: TWB

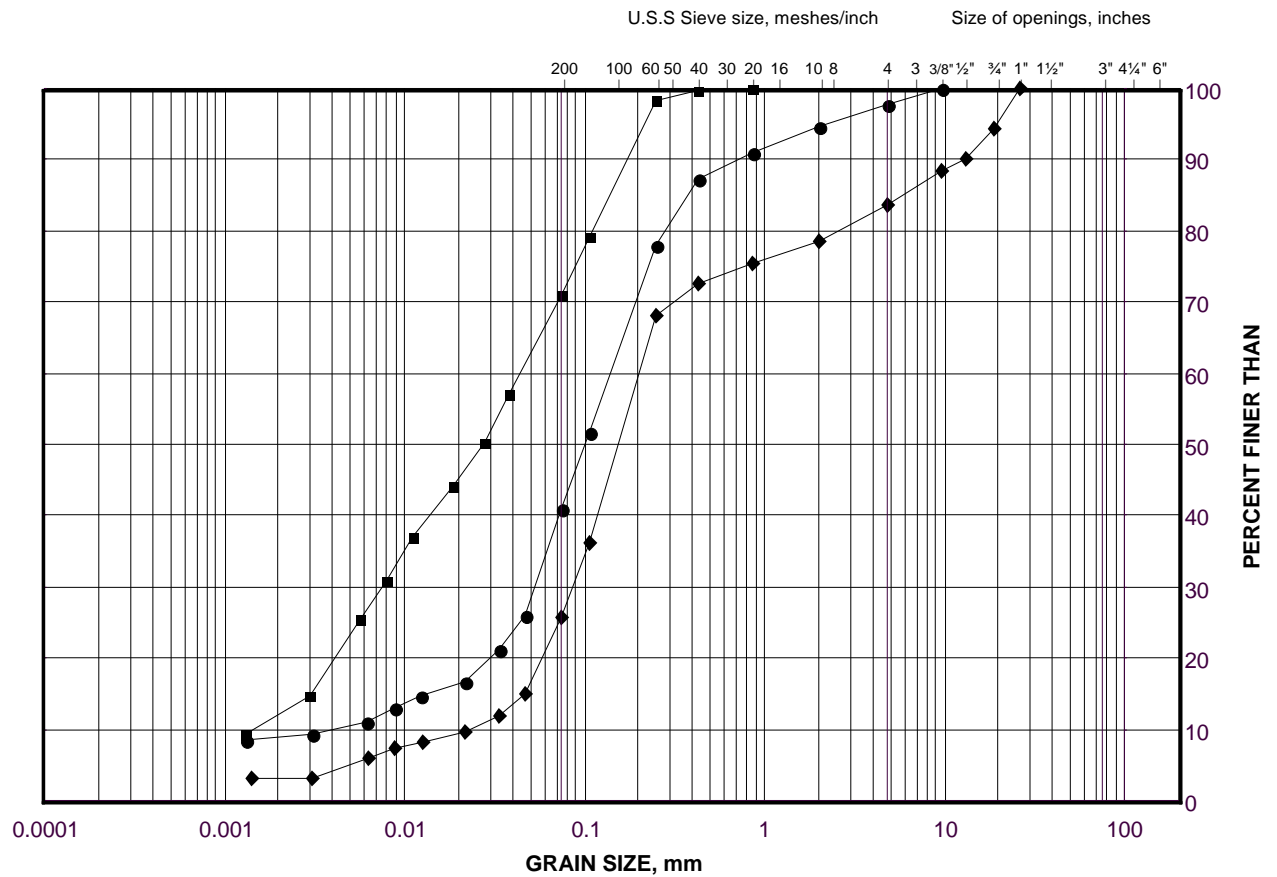
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Lower Silty Sand to Sand

FIGURE D12L



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C33-1	11	320.4
■	F3-5	9	321.6
◆	F3-24	9	312.2

Project Number: 09-1111-0018

Checked By: TWB

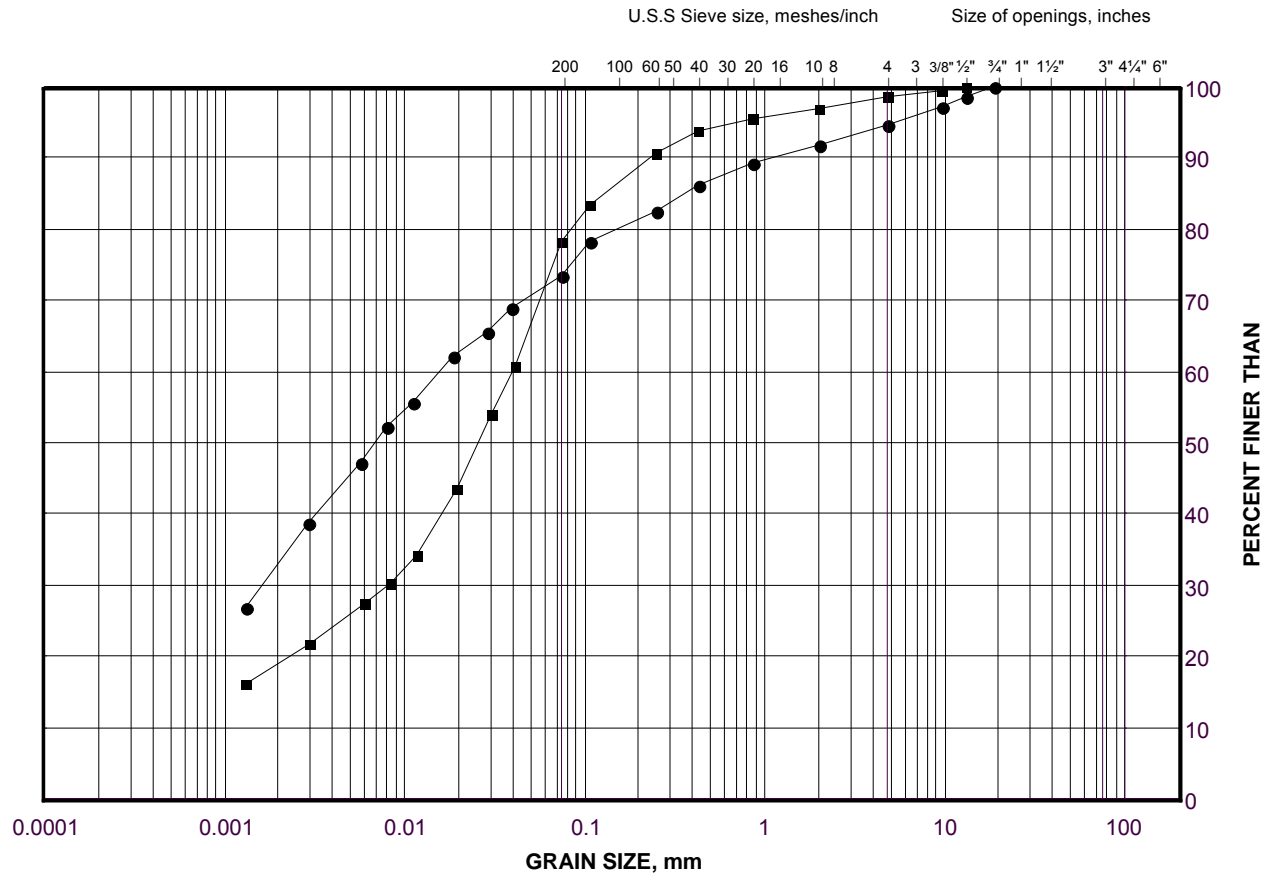
Golder Associates

Date: 01-Dec-15

GRAIN SIZE DISTRIBUTION

Clayey Silt Interlayers

FIGURE D12M



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

LEGEND

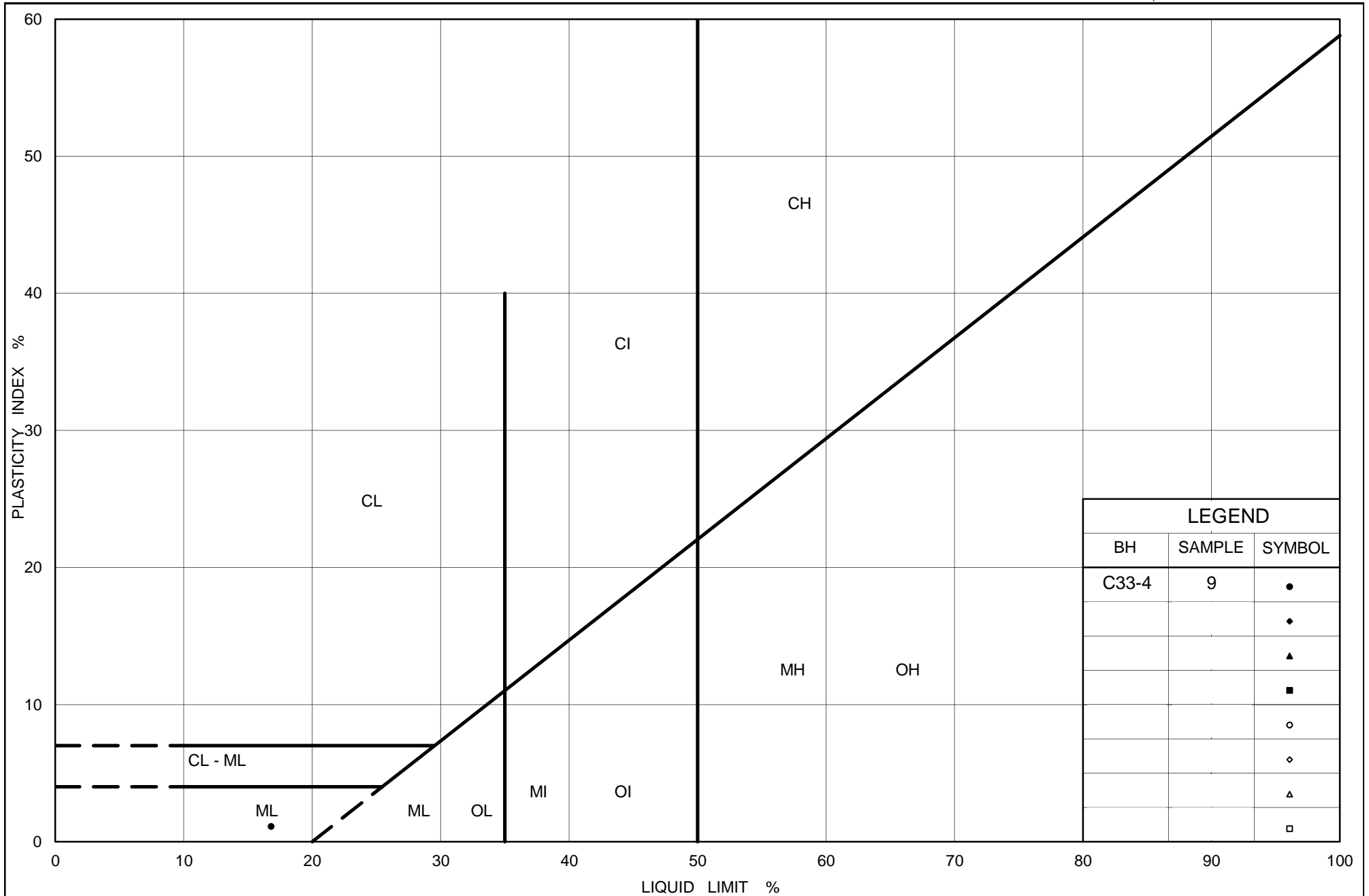
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F3-17	3A	331.1
■	C33-1	9	323.4

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 01-Dec-15



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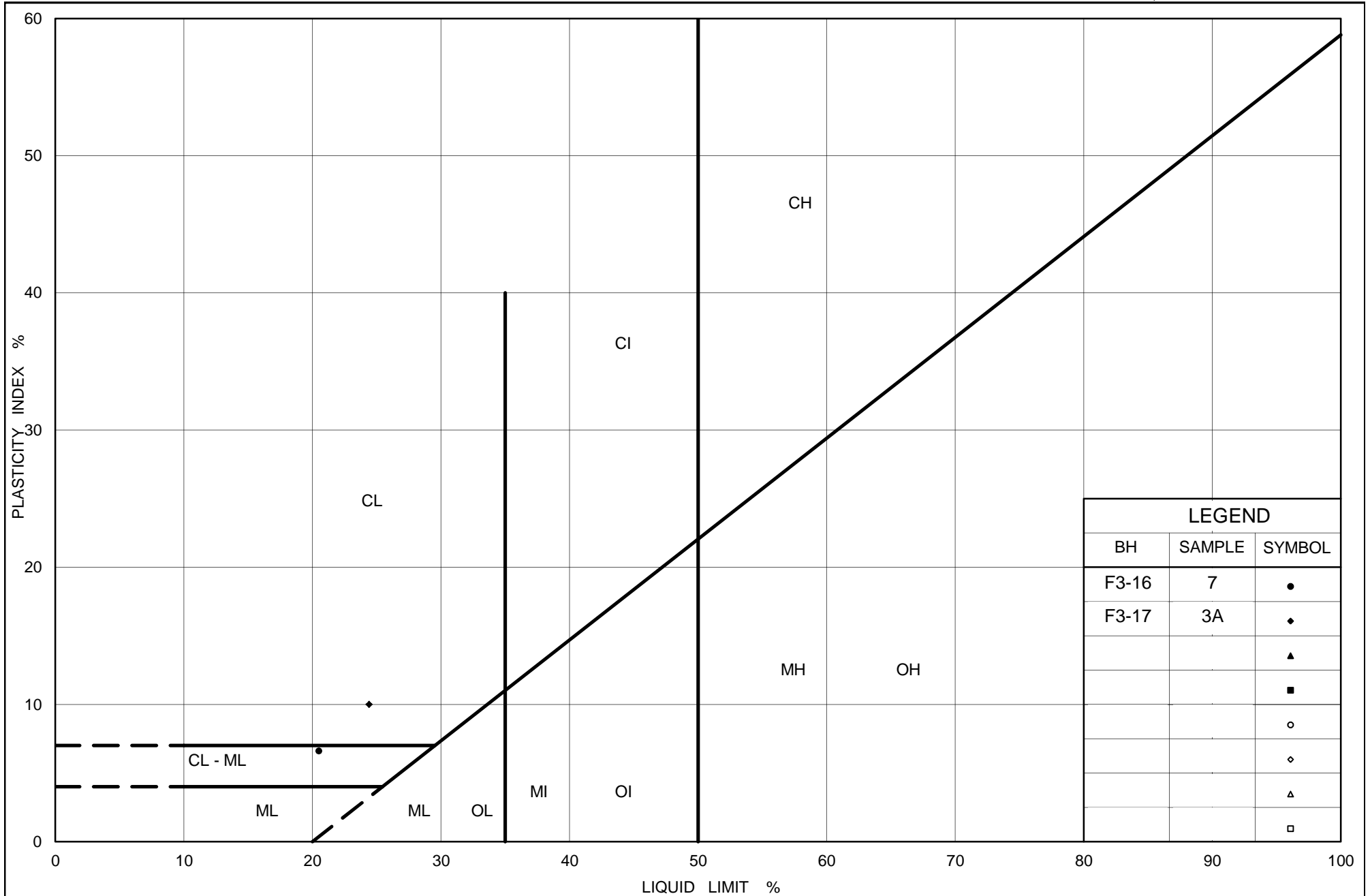
PLASTICITY CHART

Silt

Figure No. D13A

Project No. 09-1111-0018

Checked By: TWB



Ministry of Transportation

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PLASTICITY CHART

Clayey Silt Interlayers

Figure No. D13B

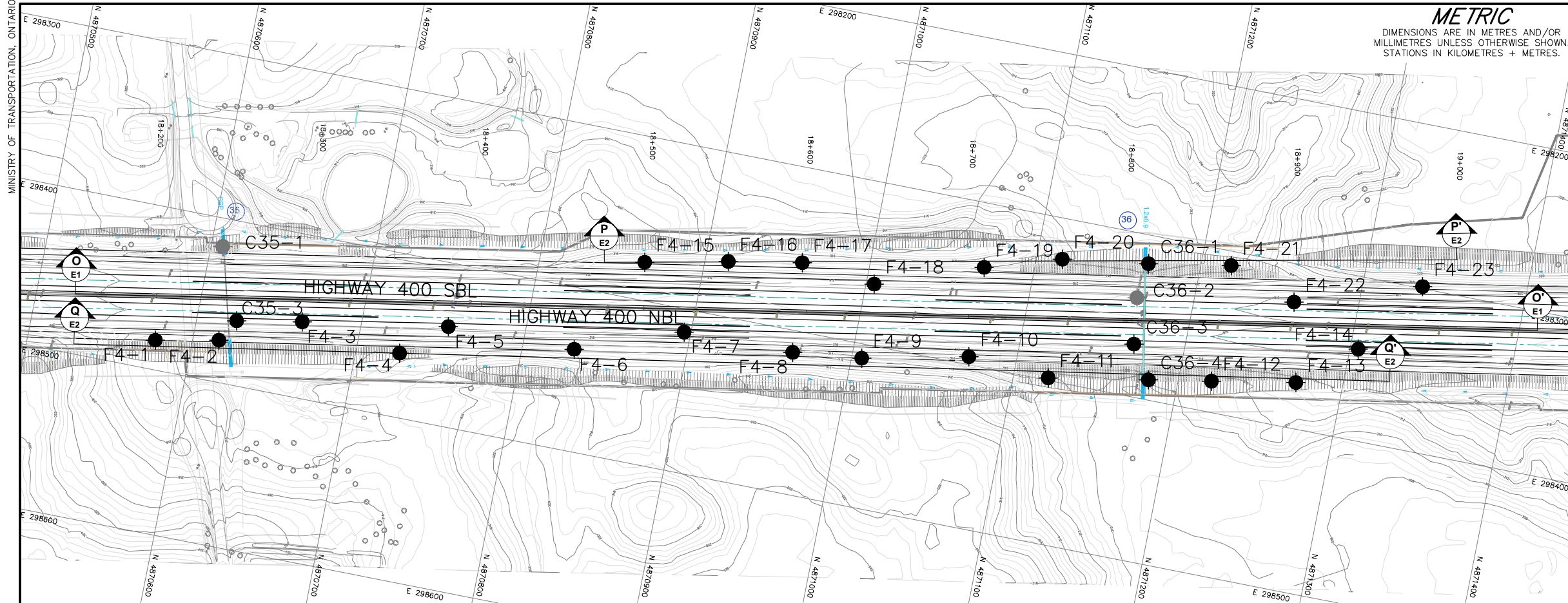
Project No. 09-1111-0018

Checked By: TWB

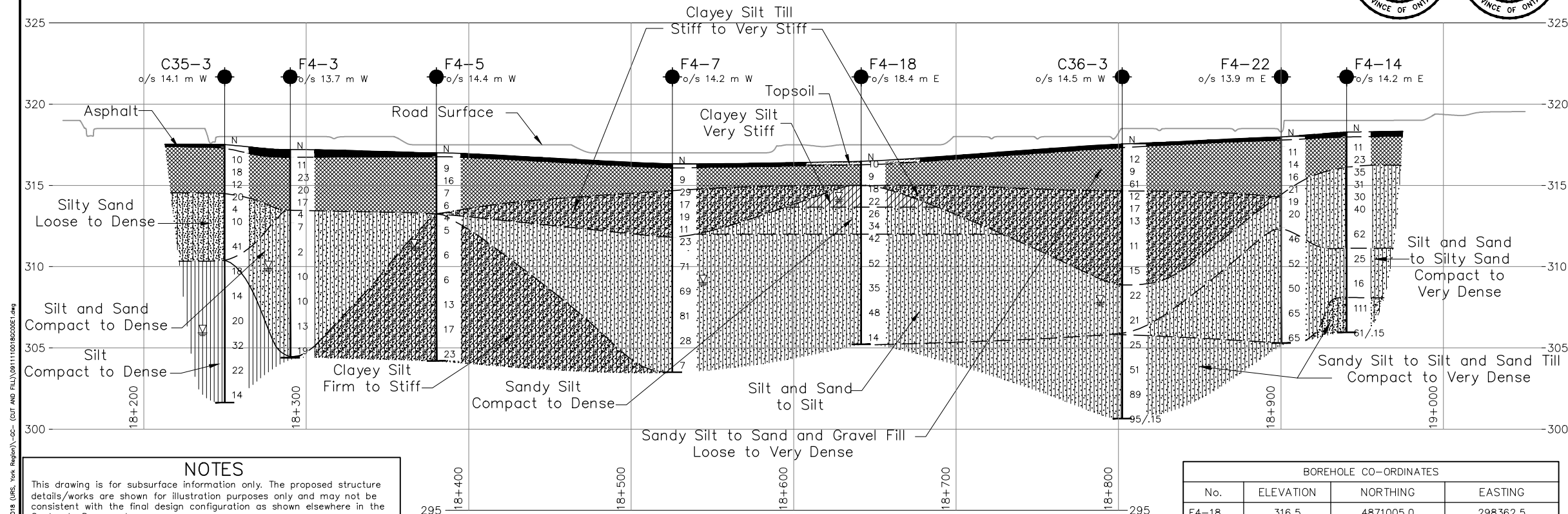


APPENDIX E

**HIGH FILL EMBANKMENT AREA 4 (Stations 18+200 to 19+000
NBL and Stations 18+500 to 19+000 SBL)**



PLAN



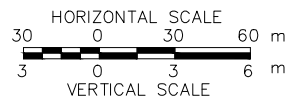
NOTES

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.

HIGH FILL EMBANKMENT AREA 4 – CENTRELINE PROFILE
(STATION 18+200 to 19+000)



BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
F4-18	316.5	4871005.0	298362.5
F4-19	314.0	4871069.4	298339.3
F4-20	312.5	4871115.6	298325.0
F4-21	313.0	4871218.4	298308.8
F4-22	318.0	4871260.6	298323.3
F4-23	317.5	4871336.5	298298.7

CONT No.
GWP No. 2835-02-00

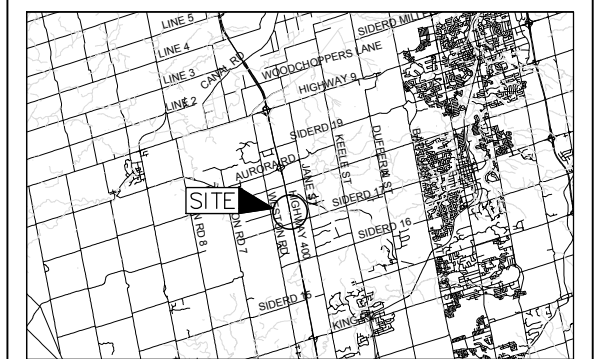


HIGHWAY 400 HIGH FILL EMBANKMENTS
STAT. 18+500 TO STAT. 19+000 (SBL)
STAT. 18+200 TO STAT. 18+900 (NBL)
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

SCALE

LEGEND

- Borehole – Current Investigation
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

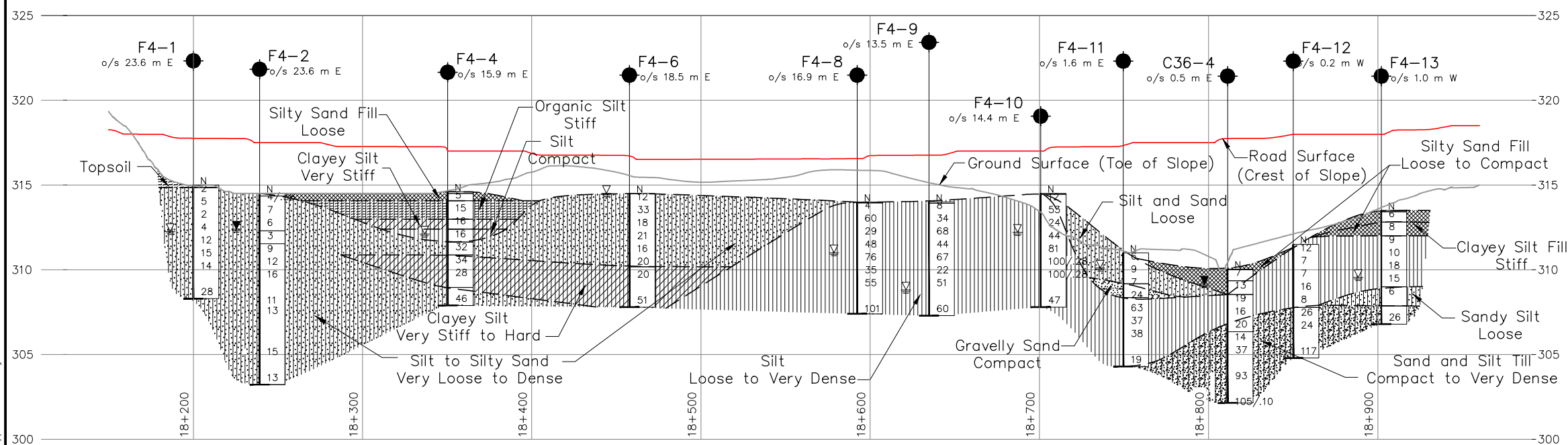
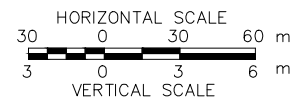
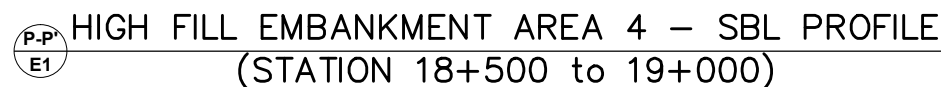
No.	ELEVATION	NORTHING	EASTING
C35-3	317.5	4870624.4	298460.5
C36-1	310.5	4871168.2	298317.5
C36-3	317.6	4871169.0	298367.8
C36-4	310.0	4871182.0	298387.7
F4-1	315.0	4870577.6	298481.9
F4-2	314.5	4870616.0	298474.4
F4-3	317.2	4870664.1	298453.4
F4-4	314.6	4870726.6	298460.7
F4-5	317.0	4870752.9	298438.9
F4-6	314.5	4870831.6	298437.6
F4-7	316.3	4870896.0	298414.2
F4-8	314.0	4870963.9	298413.4
F4-9	314.0	4871006.3	298408.7
F4-10	314.5	4871070.9	298395.2
F4-11	311.0	4871121.2	298398.4
F4-12	311.5	4871220.2	298381.0
F4-13	313.5	4871271.4	298371.8
F4-14	318.3	4871305.0	298344.2
F4-15	315.0	4870863.8	298376.6
F4-16	315.0	4870914.2	298366.2
F4-17	314.6	4870959.0	298358.1

REFERENCE

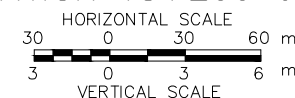
Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

Geocres No. 30M13-217

HWY. 400		PROJECT NO. 09-1111-0018		DIST.CENTRAL	
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	SITE:		
DRAWN: JFC/MR	CHKD. SMM	APPD: JMAC	DWG.E1		



Q-Q' E1 HIGH FILL EMBANKMENT AREA 4 – NBL PROFILE (STATION 18+200 to 18+900)



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.

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

CONT No.
GWP No. 2835-02-00

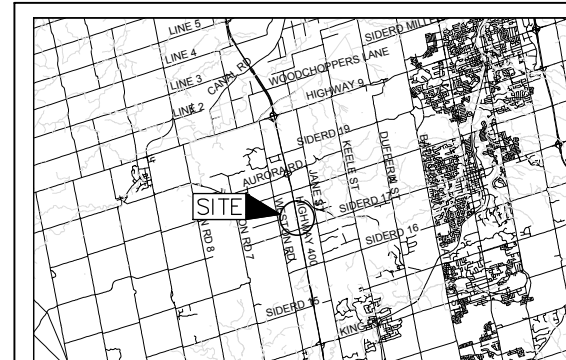
HIGHWAY 400 HIGH FILL EMBANKMENTS

STAT. 18+500 TO STAT. 19+000 (SBL)
STAT. 18+200 TO STAT. 18+900 (NBL)

SOIL STRATA



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA






KEY PLAN

SCALE

4 0 4 8 km

LEGEND

- | | |
|---|--|
|  | Borehole – Current Investigation |
| | Seal |
| | Piezometer |
| N | Standard Penetration Test Value |
| 16 | Blows/0.3m unless otherwise stated
(Std. Pen. Test, 475 j/blow) |
|  | WL in piezometer, measured on Feb. 01, 2011 |
|  | WL upon completion of or during drilling |

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
C35-3	317.5	4870624.4	298460.5
C36-3	317.6	4871169.0	298367.8
C36-4	310.0	4871182.0	298387.7
F4-1	315.0	4870577.6	298481.9
F4-2	314.5	4870616.0	298474.4
F4-3	317.2	4870664.1	298453.4
F4-4	314.6	4870726.6	298460.7
F4-5	317.0	4870752.9	298438.9
F4-6	314.5	4870831.6	298437.6
F4-7	316.3	4870896.0	298414.2
F4-8	314.0	4870963.9	298413.4
F4-9	314.0	4871006.3	298408.7
F4-10	314.5	4871070.9	298395.2
F4-11	311.0	4871121.2	298398.4
F4-12	311.5	4871220.2	298381.0
F4-13	313.5	4871271.4	298371.8
F4-14	318.3	4871305.0	298344.2
F4-18	316.5	4871005.0	298362.5
F4-22	318.0	4871260.6	298323.3



REFERENCE

Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

Geocres No. 30M13-217

HWY. 400		PROJECT NO. 09-1111-0018		DIST. CENTRAL	
SUBM'D. AMT		CHKD. TWB		DATE: Mar. 2016	
DRAWN: JFC/MR		CHKD. SMM		APPD. JMAC	
				DWG. E2	

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No C35-3		SHEET 1 OF 2		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4870624.4 ; E 298460.5</u>		ORIGINATED BY <u>SB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers</u>		COMPILED BY <u>ARM/HS</u>			
DATUM <u>Geodetic</u>		DATE <u>January 10, 2011</u>		CHECKED BY <u>SMM</u>			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)							
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					w _p w w _L							
317.5	GROUND SURFACE							20	40	60	80	100								
0.0	ASPHALT																			
0.2	Silt and sand, trace to some gravel, trace to some clay (FILL) Compact Brown Moist						317													
			1	SS	10															
			2	SS	18		316													
			3	SS	12		315													
314.5																				
3.0	Silty SAND, trace to some gravel, trace clay Loose to dense Brown Moist		4	SS	20		314													
			5	SS	4															
			6	SS	10		313													
							312													
			7	SS	41		311													
310.3																				
7.2	SILT, trace to some sand, trace to some clay, trace gravel Compact to dense Brown to grey below 9.1 m Moist to wet		8	SS	18		310													
							309													
			9	SS	14		308													
			10	SS	20		307													
							306													
			11	SS	32		305													
							304													
			12	SS	22		303													

Continued Next Page

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

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA GDT 19/11/15 SIB

PROJECT		RECORD OF BOREHOLE No C35-3				SHEET 2 OF 2		METRIC									
G.W.P. 09-1111-0018		LOCATION N 4870624.4 ; E 298460.5				ORIGINATED BY SB											
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers				COMPILED BY ARM/HS											
DATUM Geodetic		DATE January 10, 2011				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									WATER CONTENT (%)
	--- CONTINUED FROM PREVIOUS PAGE ---						20	40	60	80	100						
301.6	SILT, trace to some sand, trace to some clay, trace gravel Compact to dense Brown to grey below 9.1 m Moist to wet		13	SS	14		302										
15.9	END OF BOREHOLE NOTES: 1. Water level inside augers at a depth of 11.6 m (Elev. 305.9) upon completion of drilling. 2. Borehole caved at a depth of 6.7 m (Elev. 310.8 m) upon completion of drilling.																

PROJECT		RECORD OF BOREHOLE No C36-1		SHEET 1 OF 1		METRIC							
G.W.P. 09-1111-0018		LOCATION N 4871168.2 ; E 298317.5		ORIGINATED BY TT									
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Diameter Solid Stem Augers		COMPILED BY SB/HS									
DATUM Geodetic		DATE November 25, 2010		CHECKED BY SMM									
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT		REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa		WATER CONTENT (%)		γ	GR SA SI CL
310.5	GROUND SURFACE							20 40 60 80 100	20 40 60 80 100	10 20 30			
0.0	TOPSOIL		1A	SS	3		310						
0.3	Silty sand, trace gravel (FILL) Very loose Brown Moist		2B										
309.4	CLAYEY SILT, trace sand, trace gravel, trace organics Soft to very stiff Brown and black Moist		2A	SS	16		309						
1.1			2B										
308.3	SILT, trace to some sand, trace clay Compact Brown and grey Moist		3	SS	17								0 6 89 5
2.2							308						
	SILT and SAND, trace gravel, trace clay (TILL) Compact to very dense Brown to grey below 5.0 m Wet to moist below 3.7 m		4	SS	16								
							307						6 56 37 1
			5	SS	10								
			6	SS	41		306						
			7	SS	51								
							305						
303.9	END OF BOREHOLE		8	SS	105		304						5 47 45 3
6.6	NOTES: 1. Borehole caved at a depth of 3.0 m (Elev. 307.5 m) upon completion of drilling. 2. Water level in open borehole at a depth of 2.1 m (Elev. 308.4 m) upon completion of drilling.												

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

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 01/11/16 SIB

PROJECT 09-1111-0018		RECORD OF BOREHOLE No C36-2				SHEET 2 OF 2		METRIC								
W.P. 2835-02-00		LOCATION N 4871165.3 ; E 298339.5				ORIGINATED BY SB										
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers				COMPILED BY SKB/HS										
DATUM Geodetic		DATE November 27 and 28, 2010				CHECKED BY SMM										
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					WATER CONTENT (%)			
	--- CONTINUED FROM PREVIOUS PAGE ---															
302.2		A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	13	SS	87/15											
15.4	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.															

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 01/11/16 SIB

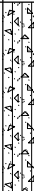
PROJECT 09-1111-0018		RECORD OF BOREHOLE No C36-3		SHEET 1 OF 2		METRIC	
G.W.P. 2835-02-00		LOCATION N 4871169.0 ; E 298367.8		ORIGINATED BY SB			
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers		COMPILED BY ARM/HS			
DATUM Geodetic		DATE January 14, 2011		CHECKED BY SMM			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL
								20	40	60	80	100	W _p	W	W _L					
317.6	GROUND SURFACE																			
0.0	ASPHALT																			
0.2	Silty sand, trace gravel, trace clay (FILL) Compact to very dense Brown Moist		1	SS	12															
			2	SS	9															
			3	SS	61															
314.7	Spoon refusal at a depth of 2.7 m																			
2.9	Sandy clayey silt, trace gravel (FILL) Stiff to very stiff Brown Moist		4	SS	12												1	28		
			5	SS	17												45	26		
			6	SS	13															
			7	SS	11															
			8	SS	15															
308.9																				
8.7	SILT, trace clay, trace sand Compact Grey Moist to wet		9	SS	22												0	1		
	Becoming wet at a depth of 10.2 m																96	3		
			10	SS	21															
305.9																				
11.7	Sandy SILT to SILT and SAND, trace to some gravel, trace to some clay (TILL) Compact to very dense Brown to grey below 13.7 m Moist		11	SS	25												9	21		
																	65	5		
			12	SS	51															

Continued Next Page

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

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 19/11/15 SIB

PROJECT		RECORD OF BOREHOLE No C36-3		SHEET 2 OF 2		METRIC										
G.W.P. 09-1111-0018		LOCATION N 4871169.0 ; E 298367.8		ORIGINATED BY SB												
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers		COMPILED BY ARM/HS												
DATUM Geodetic		DATE January 14, 2011		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								
	--- CONTINUED FROM PREVIOUS PAGE ---															
	Sandy SILT to SILT and SAND, trace to some gravel, trace to some clay (TILL) Compact to very dense Brown to grey below 13.7 m Moist		13	SS	89		302									2 33 56 9
300.7 16.9	END OF BOREHOLE		14	SS	95/15		301									
NOTES: 1. Borehole caved at a depth of 13.7 m depth (Elev. 303.9 m) upon removal of augers. 2. Water level in open borehole at a depth of 9.8 m (Elev. 307.8 m) upon completion of drilling.																

PROJECT 09-1111-0018			RECORD OF BOREHOLE No C36-4			SHEET 1 OF 1			METRIC								
G.W.P. 2835-02-00			LOCATION N 4871182.0 ; E 298387.7			ORIGINATED BY SKB											
DIST Central HWY 400			BOREHOLE TYPE D-50 Track Mount, 108 mm Diameter Solid Stem Augers			COMPILED BY TT/HS											
DATUM Geodetic			DATE November 24, 2010			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									
310.0	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL																
309.3	Silty sand, trace clay, trace rootlets (FILL)		1	SS	7												
0.7	Loose Grey Moist		2A	SS	13												
308.5	Organic silty sand, trace clay, trace gravel, trace rootlets and zones of clayey silt (FILL)		2B														
1.5	Compact Grey Moist		3	SS	19												
	SILT, trace clay, trace sand, silty sand layers and sand pockets		4	SS	16												
	Compact Brown to grey below 2.3 m Wet		5	SS	20												
306.3																	
3.7	SILT and SAND, trace to some clay, trace gravel (TILL)		6	SS	14												
	Compact to very dense Brown to grey below 5.6 m Wet		7	SS	37												
			8	SS	93												
302.1			9	SS	105/10												
7.9	END OF BOREHOLE																
NOTES:																	
1. Water level in open borehole at a depth of 0.6 m (Elev. 309.4 m) upon completion of drilling.																	
2. Water level measurements in piezometer:																	
Date	Depth (m)	Elev. (m)															
12/16/10	0.6	309.4															
02/01/11	0.9	309.1															

PROJECT		2835-02-00		LOCATION		N 4870577.6 ; E 298481.9		ORIGINATED BY		SKB								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		ARM								
DATUM		Geodetic		DATE		November 23, 2010		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					WATER CONTENT (%)							
315.0	GROUND SURFACE																	
0.0	TOPSOIL																	
0.2	SAND and SILT to Sandy SILT, trace to some clay, containing rootlets, slightly organic Very loose to compact Brown Moist		1	SS	2													
			2	SS	5													0 30 61 9
			3	SS	2													
			4	SS	4													
	Containing 25 mm thick layers of sand between depths of 3.0 m and 5.6 m		5	SS	12													0 21 66 13
	Containing clayey silt seams between depths of 3.7 m and 5.6 m		6	SS	15													
			7	SS	14													
			8	SS	28													0 48 43 9
308.3	END OF BOREHOLE																	
6.7	NOTES: 1. Water level in open borehole at s depth of 2.7 m below ground surface (Elev. 312.3 m) upon completion of drilling. 2. Borehole caved at a depth of 2.7 m below ground surface (Elev. 312.3 m) upon completion of drilling.																	

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F4-2		SHEET 1 OF 1		METRIC											
G.W.P.		2835-02-00		LOCATION		N 4870616.0 ; E 298474.4		ORIGINATED BY											
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY											
DATUM		Geodetic		DATE		November 23, 2010		CHECKED BY											
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa					WATER CONTENT (%)			γ	GR SA SI CL	
								20 40 60 80 100	20 40 60 80 100	W _p	W	W _L	10 20 30	kN/m ³					
314.5	0.0	GROUND SURFACE							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED										
0.2		TOPSOIL		1	SS	1		314								○			
		SILT and SAND, trace to some clay, containing rootlets, slightly organic Very loose to loose Brown Moist		2	SS	7										○			
				3	SS	6		313										41.2	0 48 42 10
312.3	2.2	Containing a 75 mm thick layer of peat at a depth of 1.8 m																	
		SILT and SAND to SILT, some sand, trace to some clay Very loose to compact Grey Wet		4	SS	3		312								○			
				5	SS	9		311								○			
				6	SS	12		310								○			0 30 63 7
				7	SS	16										○			
								309											
				8	SS	11		308								○			
				9	SS	13		307								○			
								306											
				10	SS	15		305								○			0 19 77 4
								304											
303.2	11.3	END OF BOREHOLE		11	SS	13													
NOTES:																			
1. Up to 0.9 m of blowing sands were encountered in the borehole before sampling at a depth of 7.6 m below ground surface.																			
2. Water was used below a depth of 7.6 m below ground surface to minimize "blowback" of sands into hollow stem augers.																			
3. Water level measurements in piezometer:																			
Date	Depth (m)	Elev. (m)																	
12/16/10	2.1	312.4																	
02/01/11	2.2	312.3																	

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F4-3		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4870664.1 ; E 298453.4</u>		ORIGINATED BY <u>SB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>ARM</u>			
DATUM <u>Geodetic</u>		DATE <u>January 11, 2011</u>		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 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 (%)					
317.2	GROUND SURFACE																			
0.0	ASPHALT																			
316.7																				
0.5	Sand and silt, trace to some clay, trace gravel (FILL) Compact Brown Moist		1	SS	11															
			2	SS	23															
			3	SS	20															
			4	SS	17															
313.5																				
3.7	Sandy SILT, trace to some clay, slightly organic Loose Grey Moist		5	SS	4															
312.7																				
4.5	SAND and SILT, trace gravel, trace clay Very loose to compact Brown Moist Becoming wet at a depth of 5.6 m		6	SS	7															
			7	SS	2															
			8	SS	10															
			9	SS	10															
			10	SS	13															
				</																

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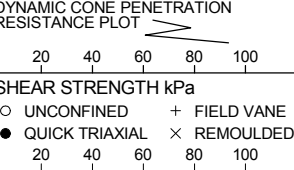
PROJECT		09-1111-0018		RECORD OF BOREHOLE No F4-4				SHEET 1 OF 1		METRIC						
G.W.P.		2835-02-00		LOCATION		N 4870726.6 ; E 298460.7		ORIGINATED BY		TT						
DIST		Central HWY 400		BOREHOLE TYPE		D-25 Track Mount, 108 mm Outside Diameter Hollow Stem Auger		COMPILED BY		ARM						
DATUM		Geodetic		DATE		January 12, 2011		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 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
314.6	GROUND SURFACE															
0.0	TOPSOIL															
314.1	Silty sand, trace clay, trace rootlets, organic (FILL)		1	SS	5											
0.5	Loose Brown Moist															
	Organic SILT, trace sand, trace clay		2	SS	15											
313.0	Stiff Black Moist															
1.6	CLAYEY SILT with SAND		3	SS	16											
312.4	Very stiff Brown Moist															
2.2	SILT, some sand, trace clay		4	SS	16											
311.6	Compact Brown Wet															
3.0	Silty SAND, trace gravel, clayey silt zones		5	SS	32											
310.9	Dense Brown Moist															
3.7	CLAYEY SILT, some sand, trace gravel, sand seams		6	SS	34											
	Very stiff to hard Brown Moist															
	Becoming grey at a depth of 4.3 m		7	SS	28											
309.0	Sandy SILT, trace clay, trace gravel															
5.6	Dense Brown Wet															
307.9			8	SS	46											
6.7	END OF BOREHOLE															
NOTES: 1. Water level in open borehole at a depth of 2.5 m below ground surface (Elev. 312.1 m) upon completion of drilling. 2. Borehole caved at a depth of 3.2 m below ground surface (Elev. 311.4 m) upon completion of drilling.																

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F4-5		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4870752.9 ; E 298438.9</u>		ORIGINATED BY <u>SB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>TT</u>			
DATUM <u>Geodetic</u>		DATE <u>January 12 & 13, 2011</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL
								20	40	60	80	100	w _p	w	w _L					
317.0	GROUND SURFACE																			
0.0	ASPHALT																			
0.2	Sand and silt, some clay, trace gravel (FILL) Loose to compact Brown Moist		1	SS	9															
			2	SS	16															
			3	SS	7															
	Becoming brown, black and grey at a depth of 2.3 m, trace organic rootlets at a depth of 2.3 m, and clayey silt pocket below 3.1 m depth		4	SS	6															
313.3			5	SS	4															
3.7	CLAYEY SILT, some sand, slightly organic Firm Grey and brown Moist		6	SS	5															
312.5			7	SS	6															
4.5	CLAYEY SILT, trace sand, containing zones of silty sand Firm to stiff Grey and brown Moist		8	SS	6															
			9	SS	13															
			10	SS	17															
	Becoming grey at a depth of 8.7 m																			
305.4																				
11.6	CLAYEY SILT with SAND, some gravel Stiff Grey Wet		11	SS	23															
304.2	END OF BOREHOLE NOTES:																			
12.8	1. Water level in open borehole at a depth of 5.8 m below ground surface (Elev. 311.2 m) upon completion of drilling. 2. Borehole open to a depth of 11.6 m below ground surface (Elev. 315.4) upon completion of drilling.																			

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

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PROJECT		09-1111-0018		RECORD OF BOREHOLE No F4-6		SHEET 1 OF 1		METRIC										
G.W.P.		2835-02-00		LOCATION		N 4870831.6 ; E 298437.6		ORIGINATED BY										
DIST		Central HWY 400		BOREHOLE TYPE		D-25 Track Mount, 108 mm Outside Diameter Hollow Stem Auger		COMPILED BY										
DATUM		Geodetic		DATE		January 10, 2011		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 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 (%)	
314.5 0.0	GROUND SURFACE SAND and SILT, trace to some clay, trace to some gravel Compact to dense Brown Wet		1	SS	12		314											
			2	SS	33		313											
			3	SS	18		312											
			4	SS	21		311											
			5	SS	16		310											
			6A	SS	20		309											
			6B				308											
			7	SS	20													
310.2 4.3	CLAYEY SILT, some sand Very stiff to hard Grey Moist		8	SS	51													
307.8 6.7	END OF BOREHOLE NOTES: 1. Water level in open borehole at ground surface upon completion of drilling. 2. Borehole caved at a depth of 1.7 m below ground surface (Elev. 312.8 m) upon completion of drilling.																	

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PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F4-7		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4870896.0 ; E 298414.2</u>		ORIGINATED BY <u>SB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>TT</u>			
DATUM <u>Geodetic</u>		DATE <u>January 13, 2011</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)							
								20	40	60	80	100	w _p	w	w _L					
316.3	GROUND SURFACE																			
0.0	ASPHALT																			
0.2	Clayey silt, trace gravel, containing zones of silty sand (FILL) Stiff Brown Moist		1	SS	9															
314.8																				
1.5	Sand, trace silt, trace clay (FILL) Compact Brown Moist		2	SS	29															
			3	SS	17															
			4	SS	19															
			5	SS	11															
311.8																				
4.5	SILT and SAND to SILT, trace clay, trace gravel, containing zones of clayey silt Loose to very dense Brown Moist		6	SS	23															
			7	SS	71															
			8	SS	69															
			9	SS	81															
			10	SS	28															
	Becoming grey at a depth of 11.7 m																			
			11	SS	7															
303.5																				
12.8	END OF BOREHOLE NOTES: 1. Borehole open to a depth of 10.0 m below ground surface (Elev. 306.3 m) on removal of augers. 2. Water level in open borehole at a depth of 7.3 m below ground surface (Elev. 309.0 m) upon completion of drilling.																			

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

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PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F4-8		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4870963.9 ; E 298413.4</u>		ORIGINATED BY <u>TT</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-25 Track Mount, 108 mm Outside Diameter Hollow Stem Auger</u>		COMPILED BY <u>ARM</u>			
DATUM <u>Geodetic</u>		DATE <u>January 10, 2011</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					w _p	w	w _L		GR	SA	SI	CL
								20	40	60	80	100								
314.0	GROUND SURFACE																			
0.9	TOPSOIL		1	SS	4		313													
	SILT, some sand, trace to some clay, trace to some gravel Loose to very dense Brown Wet		2	SS	60															
			3	SS	29															
			4	SS	48															
			5	SS	76															
			6	SS	35															
			7	SS	55															
	Becoming grey at a depth of 5.6 m																			
307.4			8	SS	101		308													
6.6	END OF BOREHOLE																			
	NOTES: 1. Water level in open borehole at a depth of 3.0 m below ground surface (Elev. 311.0 m) upon completion of drilling. 2. Borehole caved at a depth of 3.7 m below ground surface (Elev. 310.3 m) upon completion of drilling.																			

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PROJECT		09-1111-0018		RECORD OF BOREHOLE No F4-9		SHEET 1 OF 1		METRIC								
G.W.P.		2835-02-00		LOCATION		N 4871006.3 ; E 298408.7		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		D-25 Track Mount, 108 mm Outside Diameter Hollow Stem Auger		COMPILED BY								
DATUM		Geodetic		DATE		January 11, 2011		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								
314.0	GROUND SURFACE															
0.9	TOPSOIL		1	SS	8											
	SILT, trace to some clay, trace to some sand, containing zones of oxidation staining Loose to very dense Brown Moist		2	SS	34											0 6 79 15
	Containing a layer of clayey silt at a depth of 1.4 m		3	SS	68											
			4	SS	44											0 7 81 12
			5	SS	67											
	Becoming grey at a depth of 3.8 m		6	SS	22											
			7	SS	51											0 1 92 7
	Becoming wet at a depth of 4.6 m															
			8	SS	60											
307.3	END OF BOREHOLE															
6.7	NOTES: 1. Water level in open borehole at a depth of 5.2 m below ground surface (Elev. 308.8 m) upon completion of drilling. 2. Borehole caved at a depth of 5.9 m below ground surface (Elev. 308.1 m) upon completion of drilling.															

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F4-10		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4871070.9 ; E 298395.2		ORIGINATED BY TT			
DIST Central HWY 400		BOREHOLE TYPE D-25 Track Mount, 108 mm Outside Diameter Hollow Stem Auger		COMPILED BY ARM			
DATUM Geodetic		DATE January 11, 2011		CHECKED BY			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL		
								20	40	60	80	100	W _p	W	W _L						○ UNCONFINED	+ FIELD VANE
314.5	GROUND SURFACE																					
314.0	TOPSOIL		1	SS	12	▽	314											0	6	80	14	
	SILT, trace to some clay, trace to some sand Compact to very dense Brown Moist		2	SS	53		313															
	Containing zones of silty sand at a depth of 1.2 m Becoming wet at a depth of 1.4 m		3	SS	24		312												0	2	91	7
			4	SS	44		311															
			5	SS	81		310															
			6	SS	100/28		309															
			7	SS	100/28		308															
	Containing a clayey silt layer at a depth of 4.6 m		8	SS	47														0	1	88	11
	Becoming grey at a depth of 5.6 m																					
307.8	END OF BOREHOLE																					
6.7	NOTES: 1. Water level in open borehole at a depth of 2.3 m below ground surface (Elev. 312.2 m) upon completion of drilling. 2. Borehole caved at a depth of 5.5 m below ground surface (Elev. 309.0 m) upon completion of drilling.																					

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

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F4-12		SHEET 1 OF 1		METRIC								
G.W.P.		2835-02-00		LOCATION		N 4871220.2 ; E 298381.0		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY								
DATUM		Geodetic		DATE		November 25, 2010		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								
311.5	GROUND SURFACE															
0.0	SILT, trace to some sand, trace to some clay Loose to compact Brown Moist		1	SS	12											
			2	SS	7											
	Containing rootlets to a depth of 9.5 m Becoming wet at a depth of 1.5 m		3	SS	7											0 6 78 16
			4	SS	16											0 7 81 12
			5	SS	8											
307.8																
3.7	SILT and SAND, trace to some clay, trace gravel (TILL) Compact to very dense Brown Wet		6	SS	26											2 41 49 8
			7	SS	24											3 38 52 7
			8	SS	117											
304.8																
6.7	END OF BOREHOLE															
NOTES:																
1. Water level in open borehole at a depth of 2.4 m below ground surface (Elev. 309.1 m) in upon completion of drilling.																
2. Borehole caved at a depth 3.0 m below ground surface upon completion of drilling.																

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F4-13		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4871271.4 ; E 298371.8		ORIGINATED BY SKB			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY ARM			
DATUM Geodetic		DATE November 24, 2010		CHECKED BY			

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 (%)							
								<div><div><div>○ UNCONFINED</div><div>● QUICK TRIAXIAL</div></div><div><div>+ FIELD VANE</div><div>× REMOULDED</div></div></div>					<div><div><div><div><div></div><div></div></div></div><div><div></div><div></div></div></div></div>							
313.5	GROUND SURFACE							20	40	60	80	100								
0.0	TOPSOIL		1	SS	6		313								○					
312.8	Silty sand, trace gravel, trace clay, trace rootlets (FILL)																			
0.7	Loose Brown Moist		2	SS	8											○				
312.0	Clayey silt, some sand, containing rootlets, slightly organic (FILL)																			
1.5	Stiff Brown Moist		3	SS	9												○			
	SILT, trace to some clay, trace sand, containing zones of oxidation staining																			
	Loose to compact Brown Moist		4	SS	10												○			
	Becoming wet at a depth of 2.4 m																			
	Containing sand pockets at a depth of 3.0 m		5	SS	18											○				
			6	SS	15											○				
309.0							309									○				
4.5	Sandy SILT, trace to some clay																			
	Loose Brown Wet		7	SS	6											○				
307.9							308													
5.6	SILT and SAND, trace to some gravel, trace to some clay (TILL)																			
	Compact Brown Wet																			
			8	SS	26		307									○				
306.8																				
6.7	END OF BOREHOLE																			
NOTES: 1. Water level in open borehole at a depth of 4.0 m below ground surface (Elev. 309.5 m) in upon completion of drilling. 2. Borehole caved at a depth of 4.9 m below ground surface upon completion of drilling.																				

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PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F4-14		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4871305.0 ; E 298344.2</u>		ORIGINATED BY <u>SB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>ARM</u>			
DATUM <u>Geodetic</u>		DATE <u>January 15, 2011</u>		CHECKED BY _____			

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					W _p	W	W _L		
							20	40	60	80	100						
318.3	GROUND SURFACE																
0.0	ASPHALT																
0.3	Silty sand, trace gravel (FILL) Compact Brown Moist		1	SS	11												
			2	SS	23												
316.1																	
2.2	SILT, trace to some clay, trace sand Dense to very dense Brown Moist		3	SS	35												
			4	SS	31												0 2 90 8
			5	SS	30												
			6	SS	40												0 3 95 2
			7	SS	62												0 17 83 0
311.1																	
7.2	Silty SAND Compact Brown Moist		8	SS	25												
	Becoming wet at a depth of 8.7 m																
			9	SS	16												0 75 24 1
308.1																	
10.2	SILT and SAND, trace to some gravel, trace clay (TILL) Very dense Brown Moist		10	SS	111												10 40 45 5
306.0			11	SS	61/15												
12.3	END OF BOREHOLE																
	NOTES: 1. Borehole dry upon completion of drilling. 2. Borehole caved at a depth of 7.6 m below ground surface upon completion of drilling.																

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PROJECT		09-1111-0018		RECORD OF BOREHOLE No F4-15		SHEET 1 OF 1		METRIC								
G.W.P.		2835-02-00		LOCATION		N 4870863.8 ; E 298376.6		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY								
DATUM		Geodetic		DATE		November 29, 2010		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								
315.0	GROUND SURFACE															
0.0	TOPSOIL		1A	SS	7											1 87 8 4
0.3	Sand, trace to some silt, trace clay, trace gravel, containing rootlets (FILL) Loose to compact Brown Moist		1B													
313.8			2	SS	20											
1.2	SILT, some clay, trace sand, containing oxidation staining Dense to very dense Brown Moist															
			3	SS	36											
			4	SS	38											
			5	SS	37											0 3 80 17
			6	SS	49											
			7	SS	54											
	Becoming grey and wet at a depth of 5.6 m															
			8	SS	36											
308.3	Containing a silty sand layer at a depth of 6.4 m															
6.7	END OF BOREHOLE															
NOTES:																
1. Water level in open borehole at a depth of 5.9 m below ground surface (Elev. 309.1 m) upon completion of drilling.																
2. Borehole caved at a depth of 6.5 m below ground surface (Elev. 308.5) upon completion of drilling.																

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F4-16		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4870914.2 ; E 298366.2		ORIGINATED BY TT			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY SB			
DATUM Geodetic		DATE November 26, 2010		CHECKED BY			



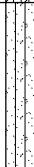

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					w _p	w	w _L		GR	SA	SI	CL
								20	40	60	80	100								
315.0	GROUND SURFACE																			
0.9	TOPSOIL		1	SS	2															
	CLAYEY SILT, some sand, containing rootlets, slightly organic Soft to stiff Brown Moist		2	SS	17															
313.5																				
1.5	SILT, trace to some clay, trace sand Compact to very dense Brown Moist		3	SS	19								41				2	9	76	13
			4	SS	40															
			5	SS	41								41				0	2	88	10
	Becoming grey at a depth of 3.8 m		6	SS	28															
			7	SS	26															
			8	SS	51															
308.3																				
6.7	END OF BOREHOLE																			
	NOTE: 1. Open borehole dry upon completion of drilling.																			

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F4-17		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4870959.0 ; E 298358.1</u>		ORIGINATED BY <u>TT</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>SB</u>			
DATUM <u>Geodetic</u>		DATE <u>November 26, 2010</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)								
								20 40 60 80 100					w _p w w _L								
314.6	GROUND SURFACE																				
0.0	TOPSOIL																				
0.2	Silty SAND, trace clay		1	SS	5																
313.9	Loose Brown Moist						314														
0.7	Becoming wet at a depth of 0.6 m		2	SS	18																
	CLAYEY SILT, trace to some sand, trace gravel																				
313.1	Very stiff Brown Wet		3	SS	19		313														
1.5	SILT, some clay, trace to some sand																				
	Dense Brown Moist		4	SS	38		312														
			5	SS	38		311														
			6	SS	32		310														
			7	SS	40		309														
	Containing a silty sand layer at a depth of 6.5 m																				
	Becoming grey at a depth of 6.6 m		8	SS	44		308														
307.9																					
6.7	END OF BOREHOLE																				

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F4-18		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4871005.0 ; E 298362.5		ORIGINATED BY TT			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY SB			
DATUM Geodetic		DATE November 26, 2010		CHECKED BY			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL
								20	40	60	80	100	W _p	W	W _L					
316.5	GROUND SURFACE																			
0.0	TOPSOIL																			
0.2	Clayey silt, trace gravel, trace sand (FILL) Stiff Brown Moist		1	SS	10	▽	316													
			2	SS	9															
315.0							315													
1.5	CLAYEY SILT, trace to some sand, trace gravel Very stiff Brown Moist		3	SS	18															
			4	SS	22															
313.7							314													
2.8	Sandy SILT, trace to some clay Compact to dense Brown Moist		5	SS	26															
	Becoming wet at a depth of 3.7 m		6	SS	34															
312.0							313													
4.5	SILT, some clay, trace sand Compact to very dense Brown Moist		7	SS	42															
				8	SS	52														
				9	SS	35														
			10	SS	48															

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 19/11/15 SIB

PROJECT		RECORD OF BOREHOLE		No F4-19		SHEET 1 OF 1		METRIC										
G.W.P. 2835-02-00		LOCATION		N 4871069.4 ; E 298339.3		ORIGINATED BY		TT										
DIST Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		SB										
DATUM Geodetic		DATE		November 25, 2010		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										WATER CONTENT (%)
314.0	GROUND SURFACE							20	40	60	80	100						
0.9	TOPSOIL		1	SS	10													
313.5	CLAYEY SILT, some sand, trace gravel, slightly organic		2	SS	29													
0.5	Stiff Brown Moist		3	SS	14													
	SAND, trace silt, trace clay, containing zones of sandy silt to a depth of 1.4 m		4	SS	28													
	Compact		5	SS	48													
	Moist		6	SS	51													
	Becoming wet at a depth of 2.1 m		7	SS	85													
311.4	SILT, trace sand		8	SS	107/25													
2.6	Compact to very dense																	
	Brown																	
	Moist																	
307.5	END OF BOREHOLE																	
6.5	NOTES:																	
	1. Borehole dry on completion of drilling.																	
	2. Borehole caved at a depth of 2.1 m below ground surface (Elev. 311.9 m) upon completion of drilling.																	

PROJECT		RECORD OF BOREHOLE		No F4-20		SHEET 1 OF 1		METRIC										
G.W.P. 09-1111-0018		LOCATION		N 4871115.6 ; E 298325.0		ORIGINATED BY		TT										
DIST Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		SB										
DATUM Geodetic		DATE		November 25, 2010		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 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
312.5 0.0	GROUND SURFACE TOPSOIL							20	40	60	80	100						
311.8 0.7	CLAYEY SILT with SAND, slightly organic, containing rootlets Firm Brown Moist		1	SS	5													
	Sandy SILT, trace clay, containing rootlets, slightly organic Loose Black Moist		2	SS	7													0 43 47 10
310.3 2.2	SAND and SILT, trace to some clay Loose to compact Brown Moist Becoming wet at a depth of 1.4 m SILT, trace sand, some clay Compact to dense Brown Moist		3	SS	12													
			4	SS	27													0 1 82 17
			5	SS	41													
			6	SS	39													0 2 84 14
			7	SS	34													0 4 82 14
305.9 6.7	Silty SAND, trace clay, trace gravel (TILL) Grey Moist END OF BOREHOLE		8	SS	14													
NOTES: 1. Water level in open borehole at a depth of 1.8 m below ground surface (Elev. 310.7 m) upon completion of drilling. 2. Borehole caved at a depth of 2.4 m below ground surface (Elev. 310.1 m) upon completion of drilling.																		

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F4-21		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4871218.4 ; E 298308.8		ORIGINATED BY TT			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY SB			
DATUM Geodetic		DATE November 25, 2010		CHECKED BY			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL	
								20	40	60	80	100	W _p	W	W _L						
313.0	GROUND SURFACE																				
0.0	TOPSOIL																				
0.2	SAND and SILT, trace clay, to SILT, trace to some sand, trace to some clay, slightly organic and containing rootlets to a depth of 0.6 m Loose to dense Brown Moist becoming wet at a depth of 0.7 m		1	SS	5												0	8	83	9	
			2	SS	10																
			3	SS	29																
			4	SS	28													0	32	64	4
	Containing seams of sand and silt at a depth of 2.6 m		5	SS	38																
			6	SS	33																
			7	SS	30													0	14	79	7
307.4																					
5.6	SILT and SAND, trace to some clay, trace gravel (TILL) Hard Brown to grey Moist Becoming grey at a depth of 6.6 m		8	SS	63													2	44	42	12
306.3	END OF BOREHOLE																				
6.7	NOTES: 1. Borehole dry upon completion of drilling. 2. Borehole caved at a depth of 2.7 m below ground surface (Elev. 310.3 m) upon completion of drilling.																				

PROJECT		RECORD OF BOREHOLE		No F4-22		SHEET 1 OF 1		METRIC								
G.W.P. 09-1111-0018		LOCATION		N 4871260.6 ; E 298323.3		ORIGINATED BY		SB								
DIST Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		SKB								
DATUM Geodetic		DATE		November 26, 2010		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 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
318.0	GROUND SURFACE															
0.0	ASPHALT															
0.2	Sand and gravel (FILL)															
317.4	Brown Moist															
0.6	Sandy silt, trace clay (FILL)															
	Compact Brown Moist		1	SS	11											
			2	SS	14											
			3	SS	16											
			4	SS	21											
314.3																
3.7	SILT, trace to some sand, trace to some clay		5	SS	19											
	Compact Brown Moist		6	SS	20											
312.4																
5.6	SAND and SILT to Silty SAND, trace clay		7	SS	46											
	Dense to very dense Brown Moist		8	SS	52											
			9	SS	50											
			10	SS	65											
			11	SS	65											
305.3																
12.7	END OF BOREHOLE															
NOTES:																
1. Open borehole dry upon completion of drilling.																
2. Borehole caved at a depth of 6.4 m below ground surface (Elev. 311.6 m) upon completion of drilling.																

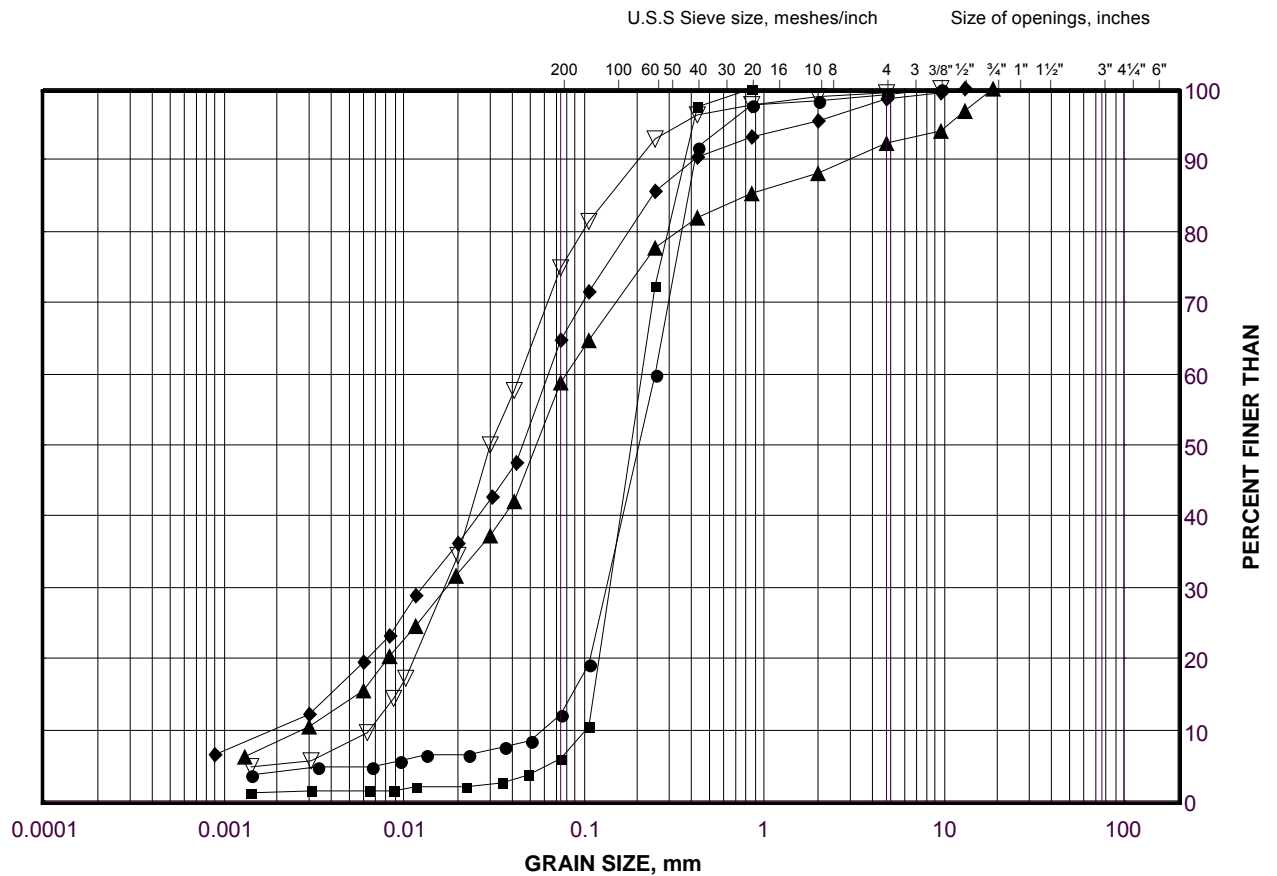
PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F4-23		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4871336.5 ; E 298298.7</u>		ORIGINATED BY <u>TT</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>SB</u>			
DATUM <u>Geodetic</u>		DATE <u>November 24, 2010</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)							
													20	40	60		80	100	W _p	W
317.5	GROUND SURFACE																			
0.0	TOPSOIL																			
0.2	SILT, trace to some sand, trace to some clay, trace gravel Loose to dense Brown Wet		1	SS	9		317													
			2	SS	21			316												
			3	SS	37															
			4	SS	44				315											
			5	SS	61			314												
314.1	Silty SAND, trace to some gravel, trace clay (TILL) Dense to very dense Brown to grey Moist		6	SS	54				313											
			7	SS	52															
			310.8								312									
						8	SS					40	311							
6.7	END OF BOREHOLE																			
NOTES: 1. Borehole dry upon completion of drilling. 2. Borehole caved at a depth of 5.6 m below ground surface (Elev. 311.9 m) upon completion of dilling.																				

GRAIN SIZE DISTRIBUTION

Sandy Silt to Sand Fill

FIGURE E1A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-15	1B	314.6
■	F4-7	3	313.7
◆	F4-3	3	314.6
▲	C35-3	3	314.9
▽	F4-22	3	315.4

Project Number: 09-1111-0018

Checked By: TWB

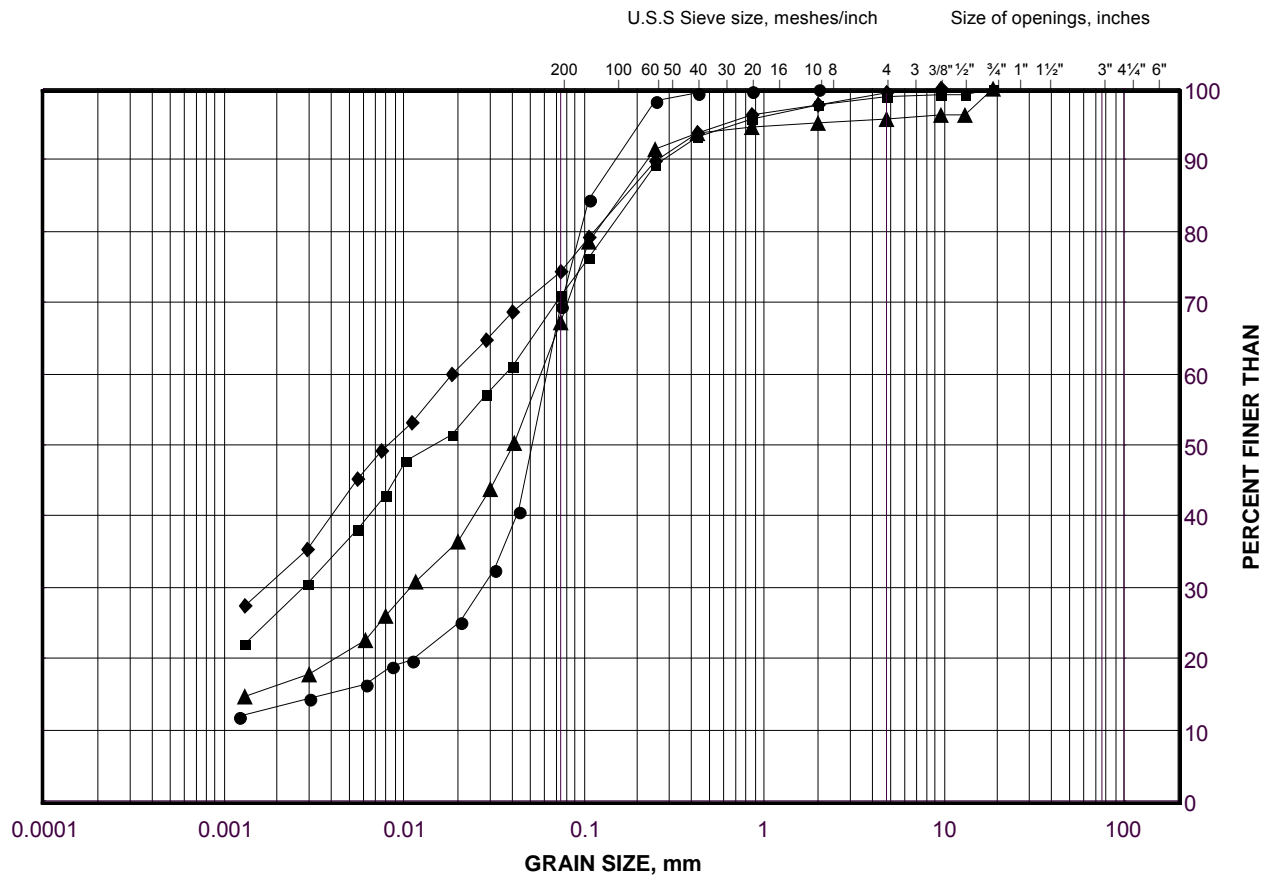
Golder Associates

Date: 29-Oct-13

GRAIN SIZE DISTRIBUTION

Sandy Silt and Clayey Silt Fill

FIGURE E1B



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

LEGEND

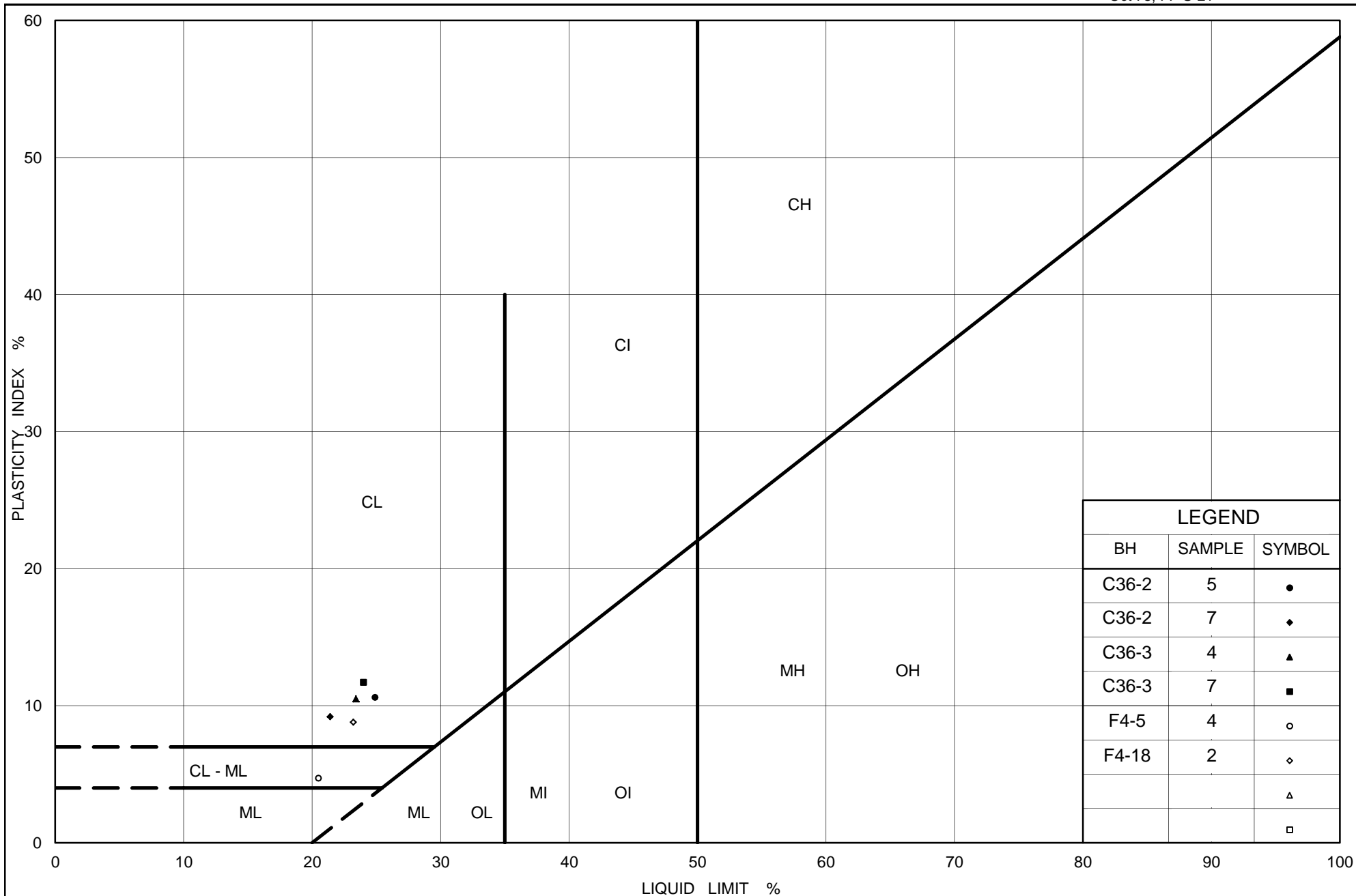
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-5	4	313.7
■	C36-3	4	314.2
◆	C36-2	5	313.5
▲	C36-2	6	312.8

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 08-Jan-16



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt Fill

Figure No. E2

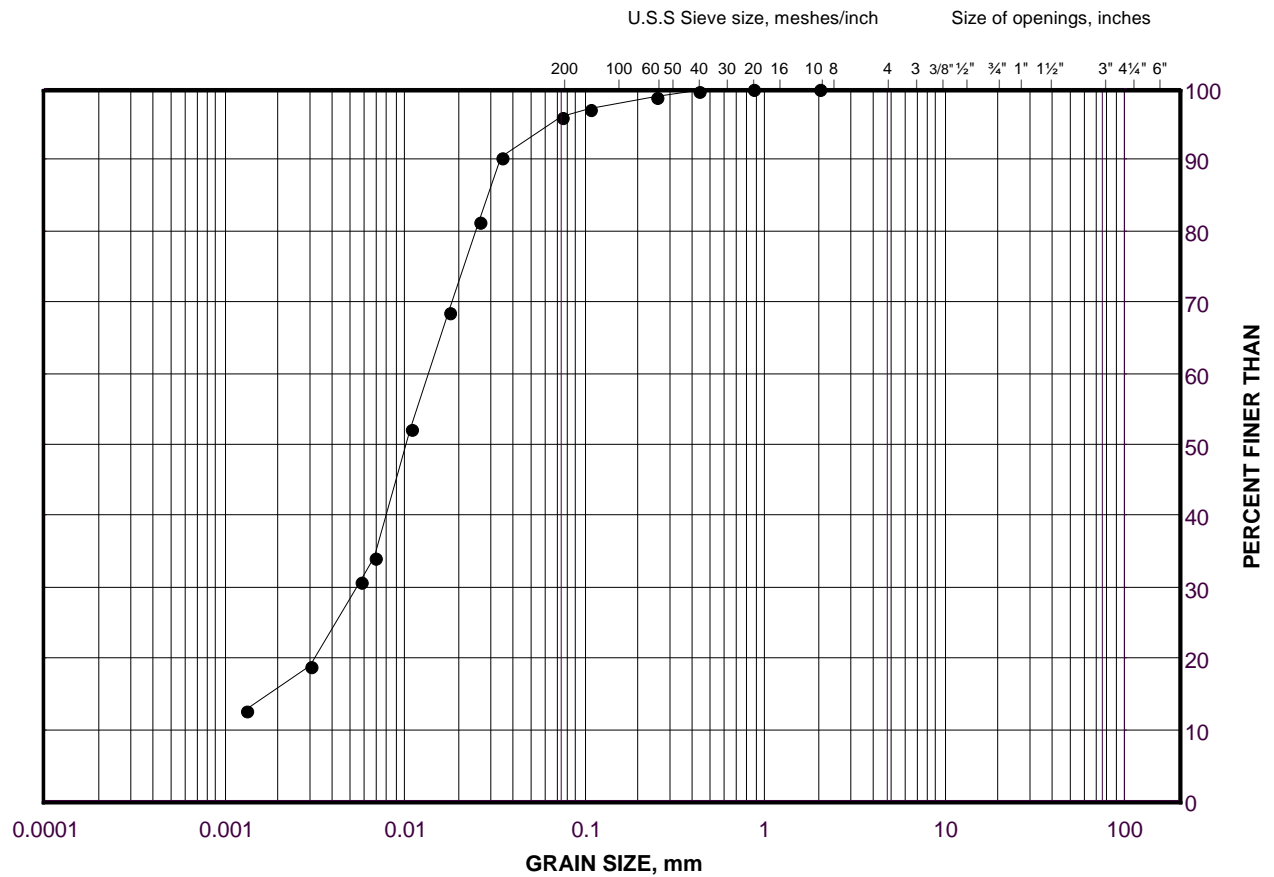
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Clayey Silt

FIGURE E3



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

LEGEND

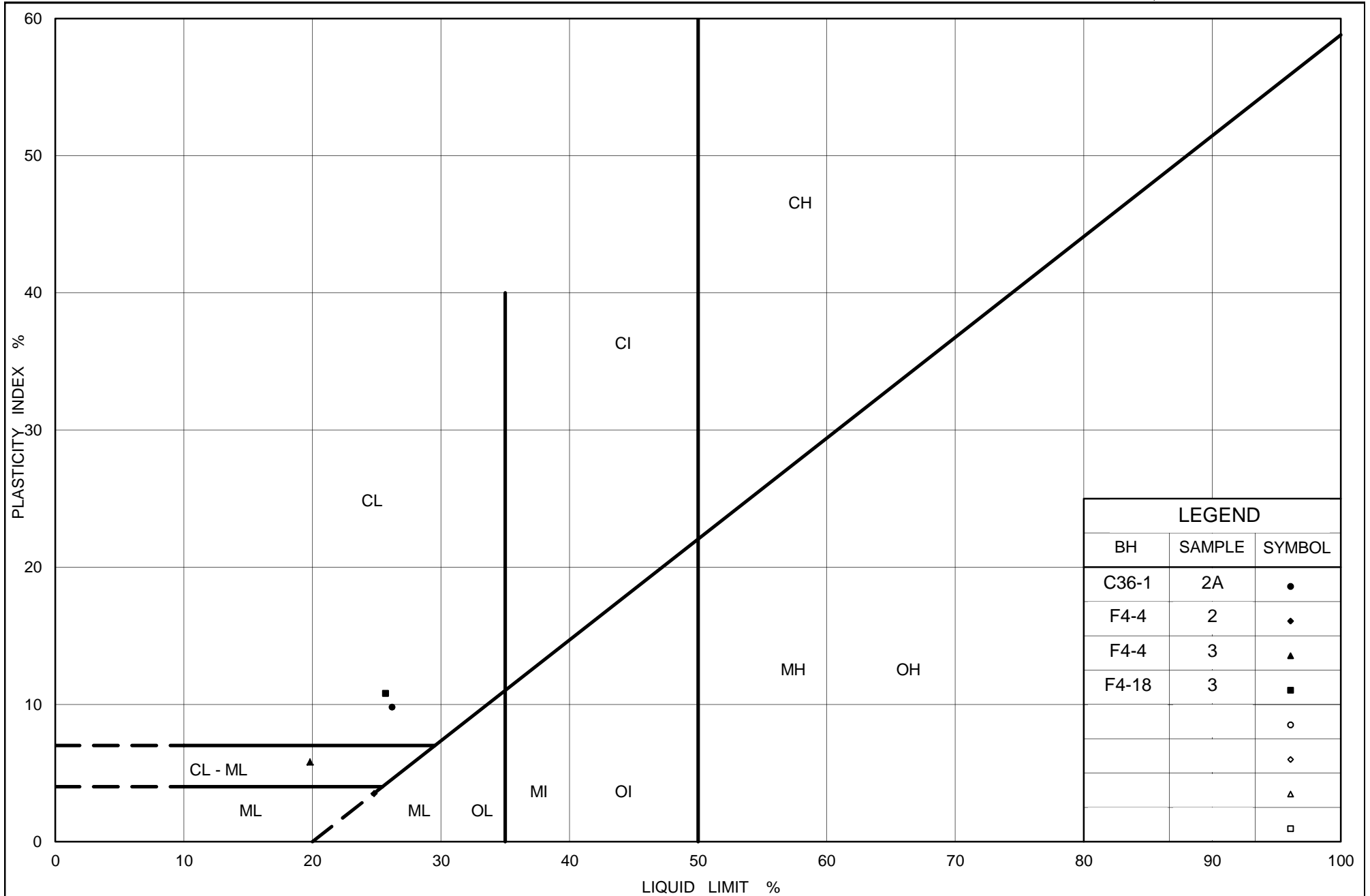
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	C36-2	9	308.1

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 11-Jan-16



Ministry of Transportation

Ontario

PLASTICITY CHART Clayey Silt and Organic Silt

Figure No. E4

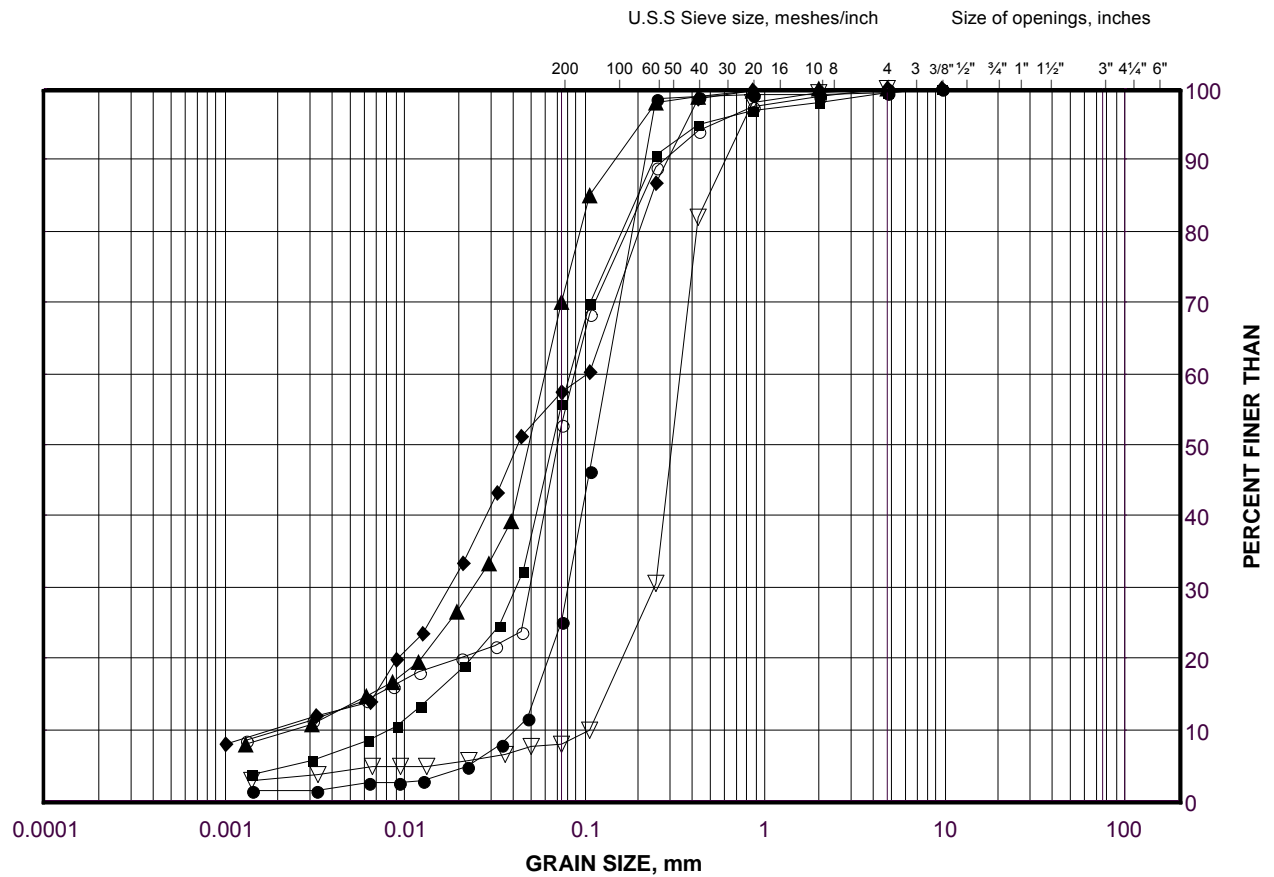
Project No. 09-1111-0018

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GRAIN SIZE DISTRIBUTION

Sandy Silt to Sand

FIGURE E5A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-22	10	307.0
■	F4-11	2	309.9
◆	F4-20	2	311.4
▲	F4-1	2	313.9
▽	F4-19	3	312.2
○	F4-2	3	312.7

Project Number: 09-1111-0018

Checked By: TWB

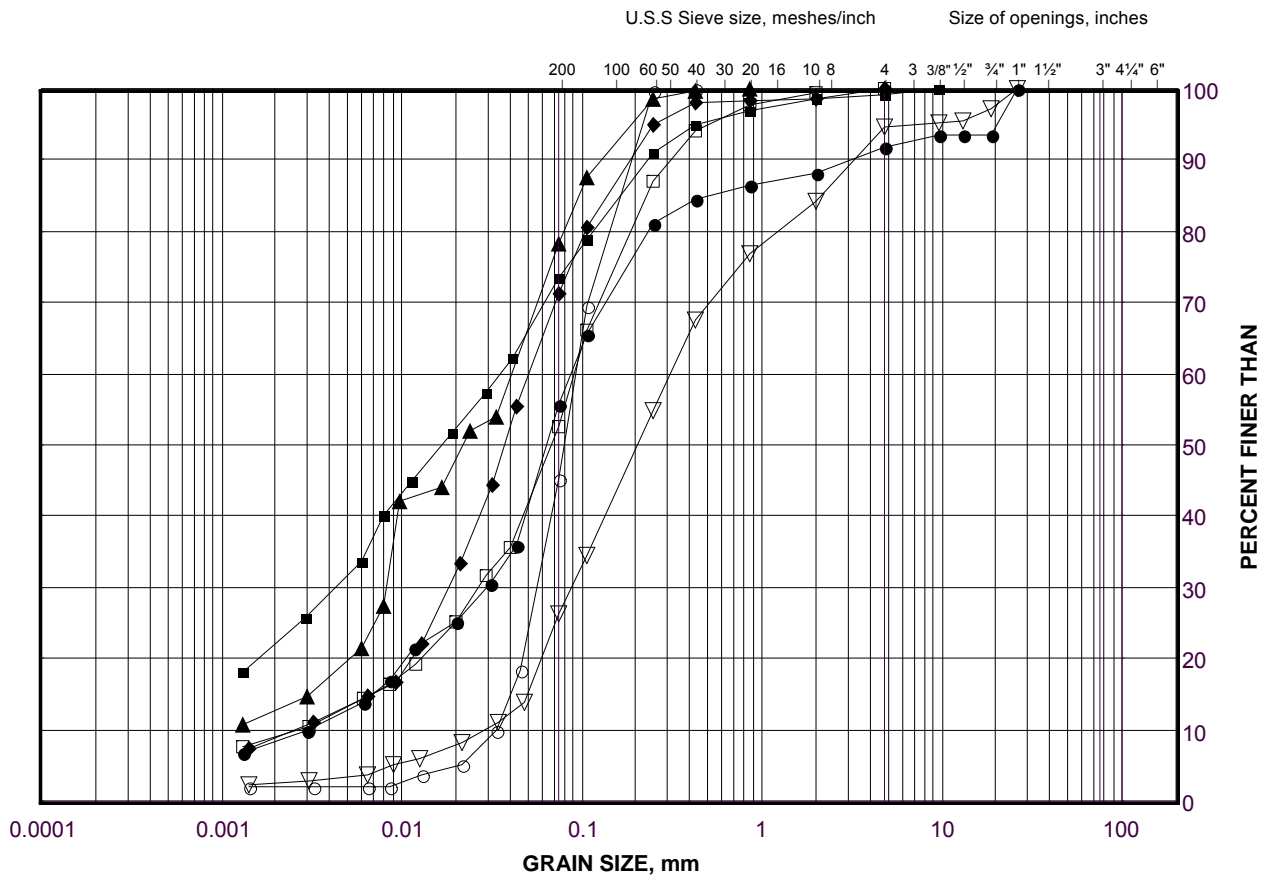
Golder Associates

Date: 19-Nov-15

GRAIN SIZE DISTRIBUTION

Sandy Silt to Sand

FIGURE E5B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-6	4	311.9
■	F4-3	5	313.1
◆	F4-18	5	313.1
▲	F4-1	5	311.7
▽	C35-3	6	312.7
○	F4-3	7	310.8
□	F4-1	8	308.6

Project Number: 09-1111-0018

Checked By: TWB

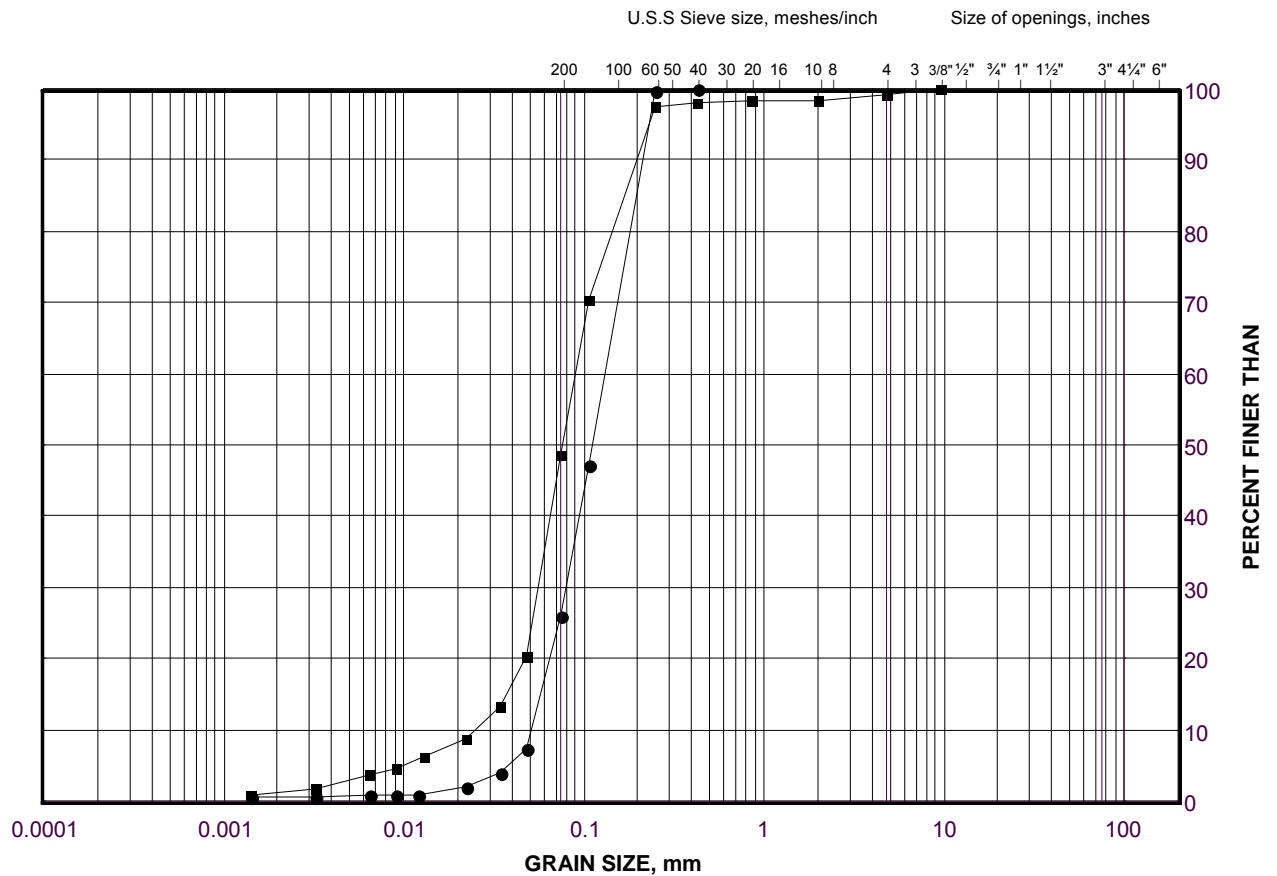
Golder Associates

Date: 29-Oct-13

GRAIN SIZE DISTRIBUTION

Silt and Sand to Silty Sand

FIGURE E5C



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-14	9	308.9
■	F4-3	9	307.8

Project Number: 09-1111-0018

Checked By: TWB

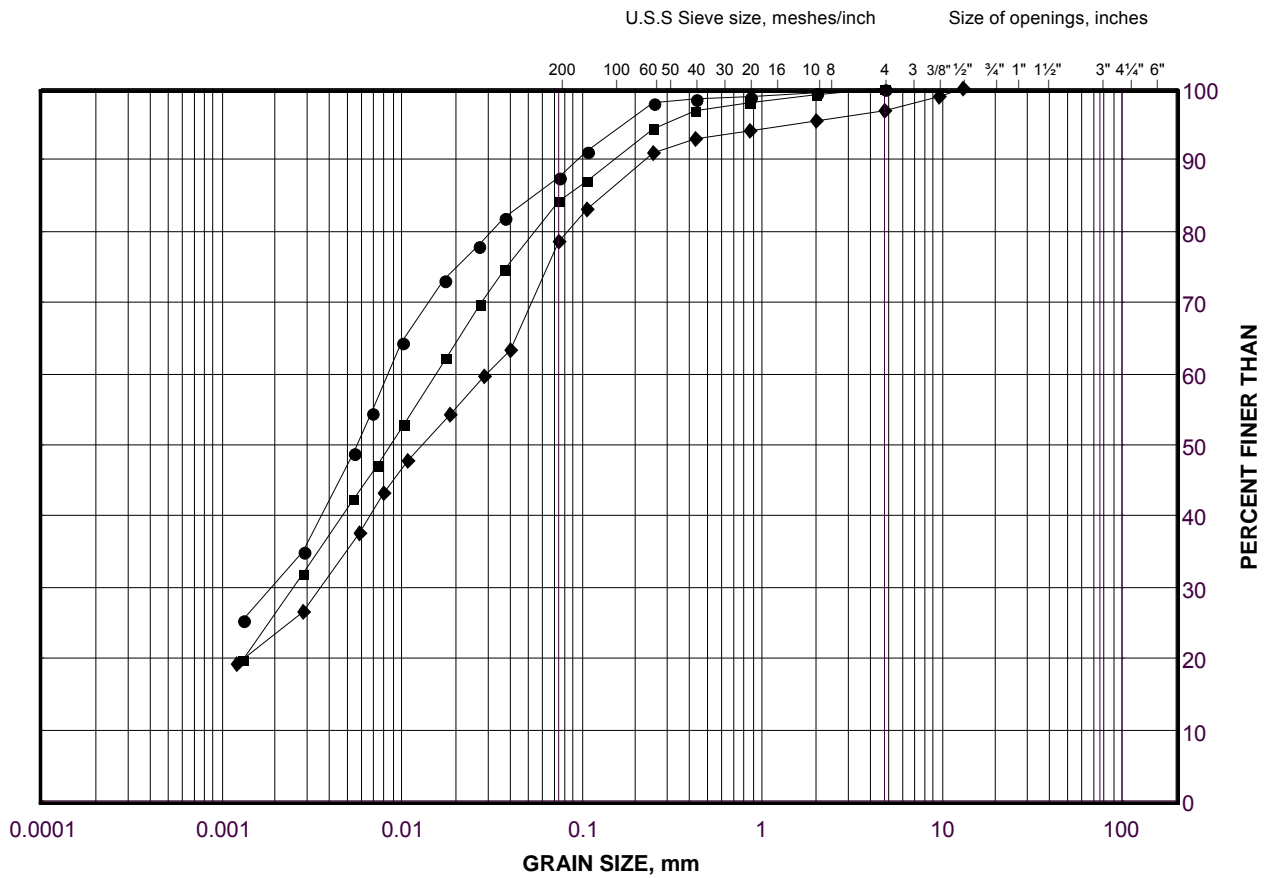
Golder Associates

Date: 11-Jan-16

GRAIN SIZE DISTRIBUTION

Clayey Silt

FIGURE E6



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-5	6	312.1
■	F4-6	7	309.7
◆	F4-4	7	309.7

Project Number: 09-1111-0018

Checked By: TWB

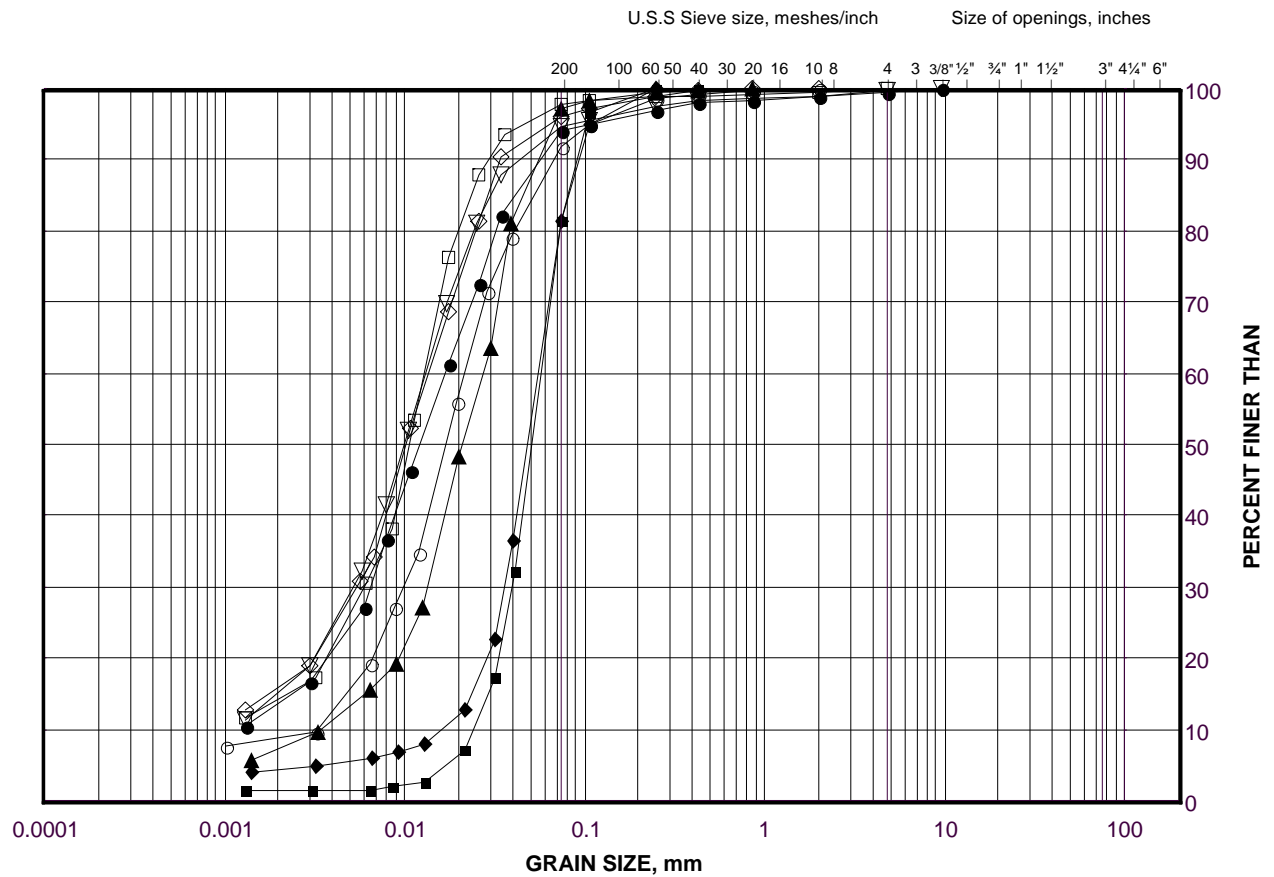
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Date: 11-Jan-16

GRAIN SIZE DISTRIBUTION

Silt to Sandy Silt

FIGURE E7A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-10	1	314.2
■	C35-3	10	306.6
◆	F4-2	10	305.0
▲	F4-18	11	305.7
▽	F4-9	2	312.9
○	F4-21	2	311.9
□	F4-13	3	311.7
△	C36-2	9	308.1

Project Number: 09-1111-0018

Checked By: TWB

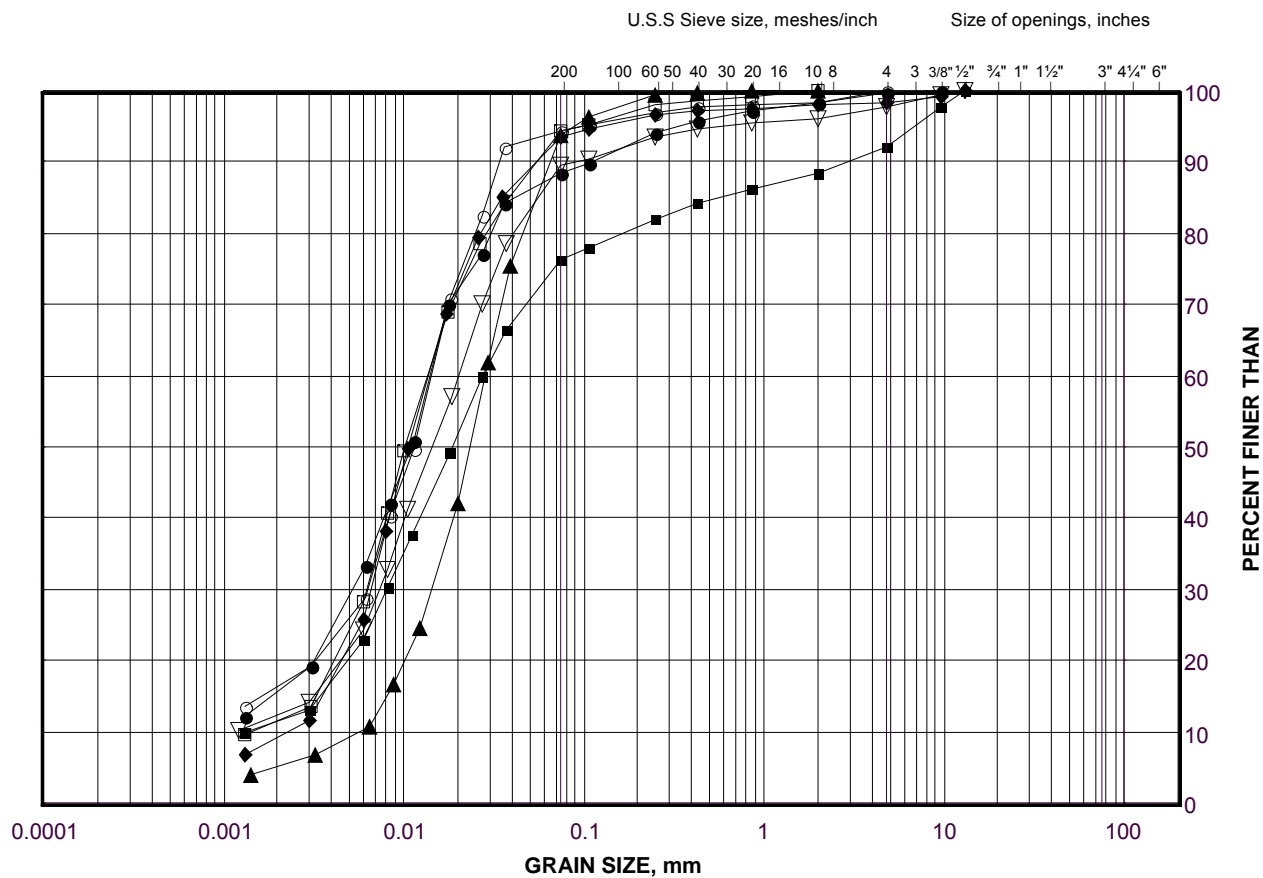
Golder Associates

Date: 11-Jan-16

GRAIN SIZE DISTRIBUTION

Silt to Sandy Silt

FIGURE E7B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-17	3	312.8
■	F4-8	3	312.2
◆	F4-23	3	315.7
▲	C36-1	3	308.7
▽	F4-16	3	313.2
○	F4-12	3	309.7
□	F4-9	4	311.4

Project Number: 09-1111-0018

Checked By: TWB

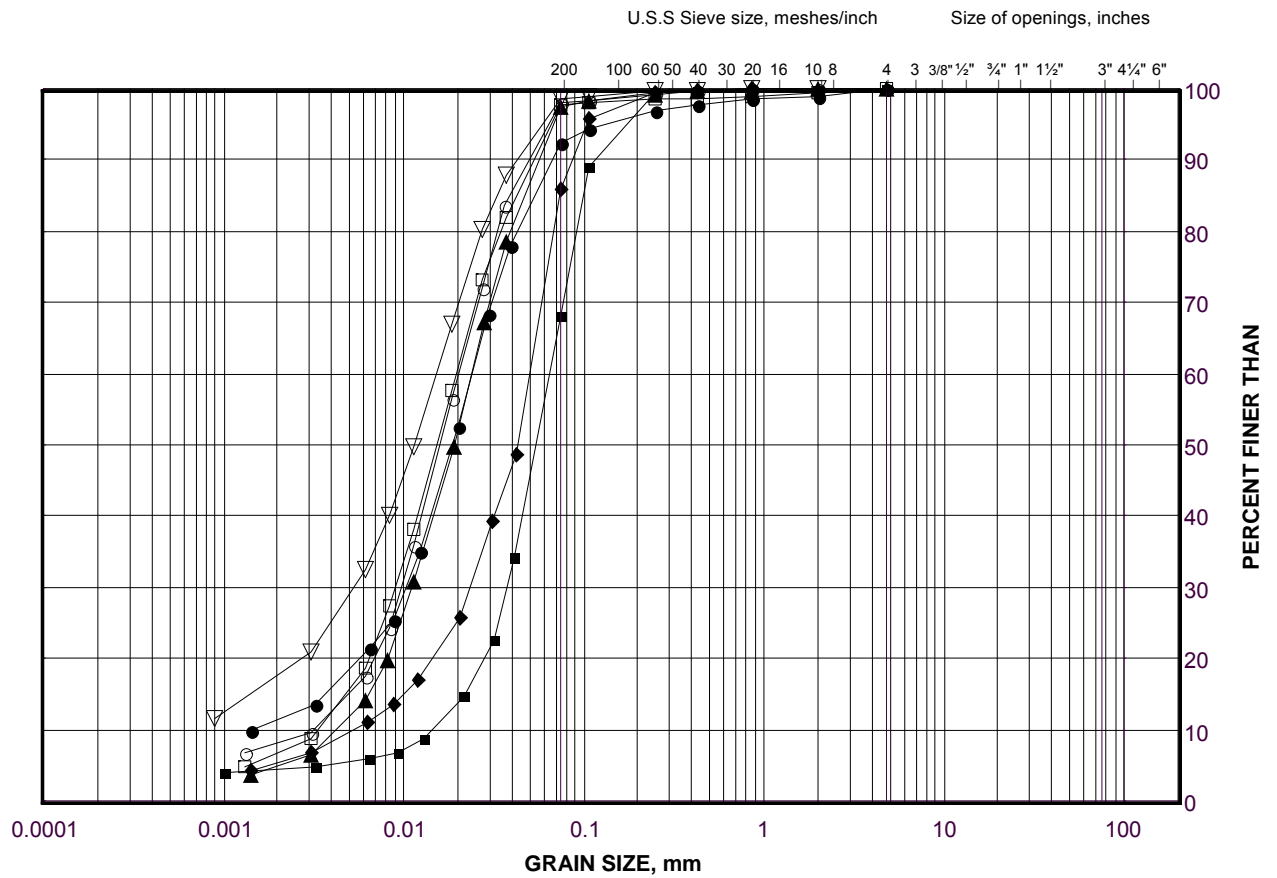
Golder Associates

Date: 11-Jan-16

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

FIGURE E7C



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-12	4	308.9
■	F4-21	4	310.4
◆	F4-4	4	312.0
▲	C36-4	4	307.5
▽	F4-20	4	309.9
○	F4-14	4	315.0
□	F4-10	4	311.9

Project Number: 09-1111-0018

Checked By: TWB

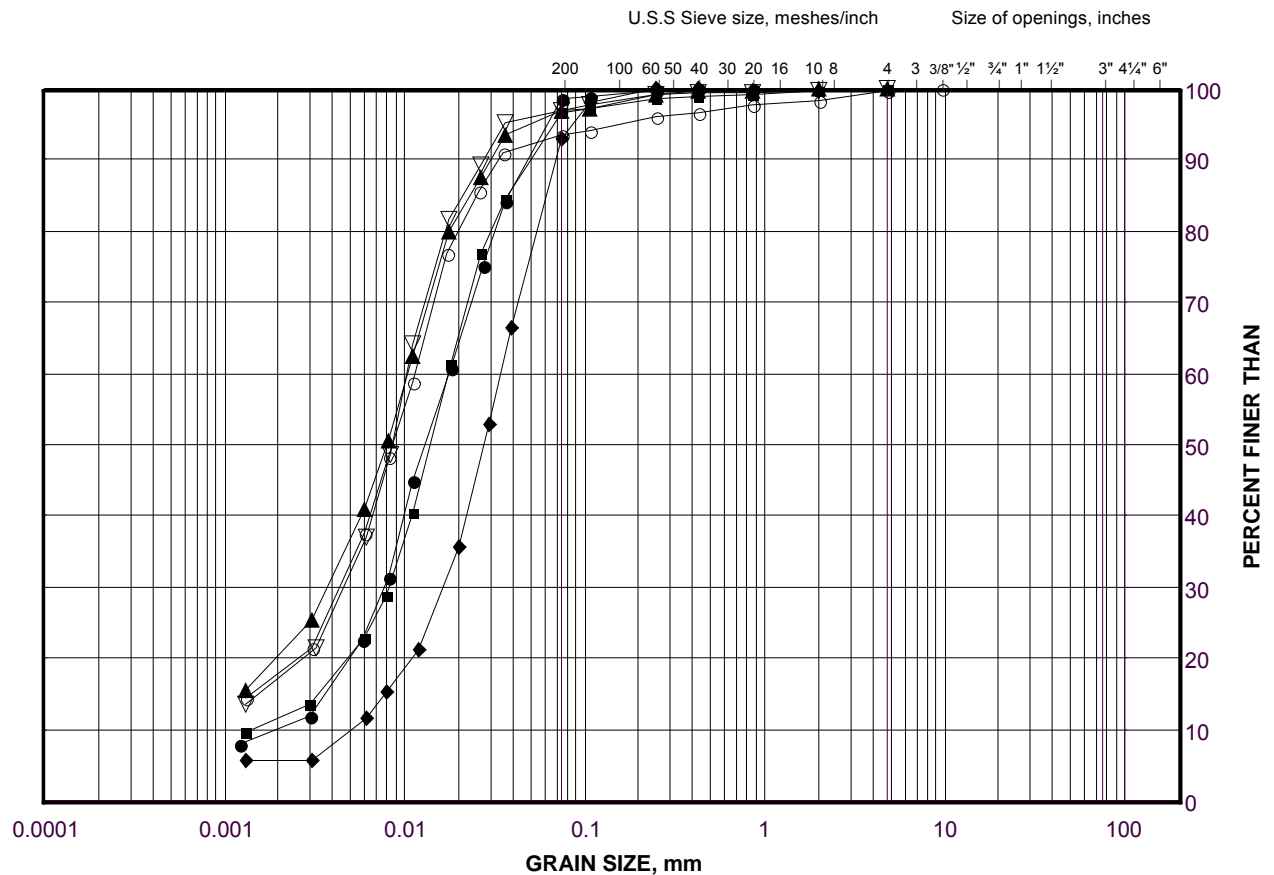
Golder Associates

Date: 11-Jan-16

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

FIGURE E7D



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-16	5	311.7
■	F4-11	5	307.7
◆	F4-22	5	314.9
▲	F4-19	5	310.7
▽	F4-15	5	311.7
○	F4-17	6	310.5

Project Number: 09-1111-0018

Checked By: TWB

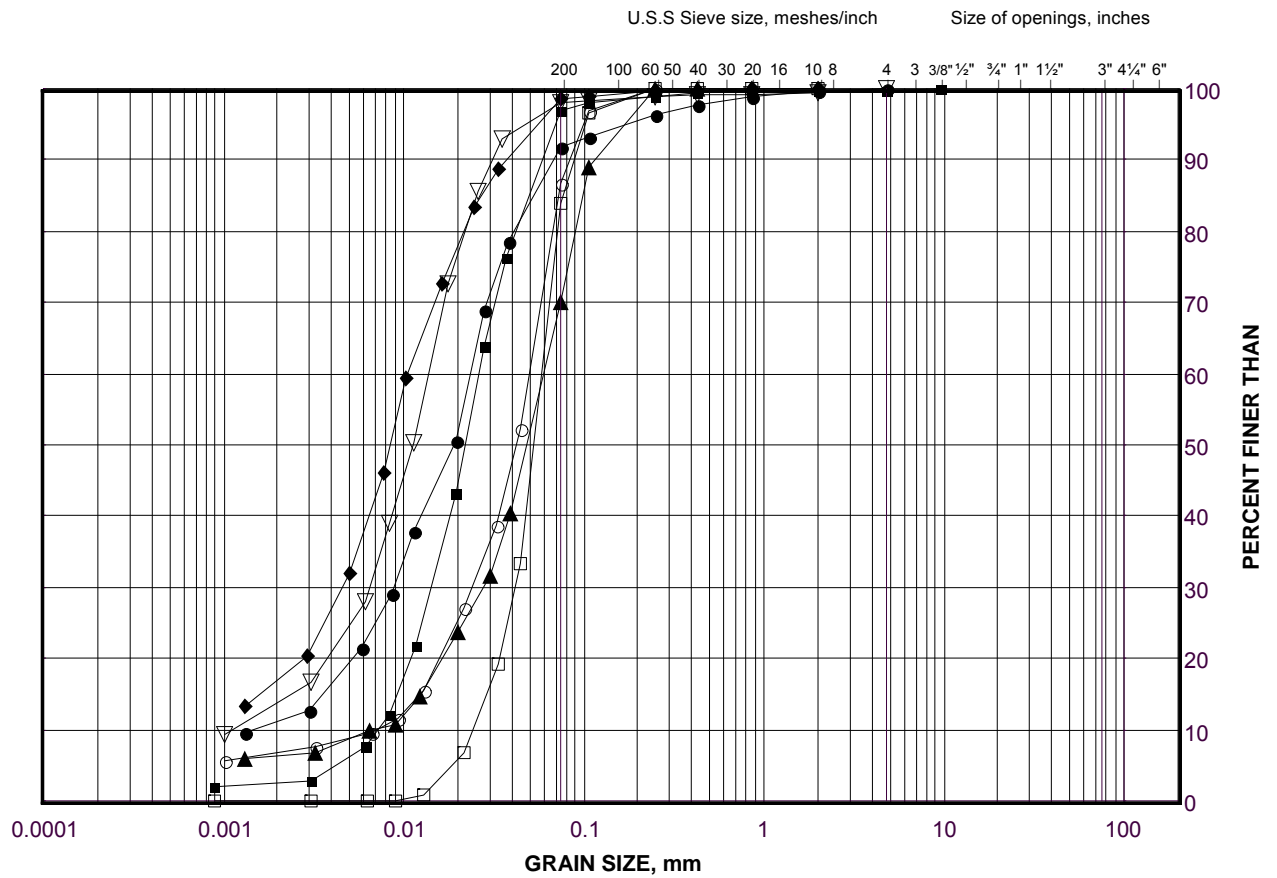
Golder Associates

Date: 11-Jan-16

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

FIGURE E7E



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-22	6	313.1
■	F4-14	6	313.4
◆	F4-8	6	309.9
▲	F4-2	6	310.4
▽	F4-20	6	308.4
○	F4-21	7	308.1
□	F4-14	7	311.9

Project Number: 09-1111-0018

Checked By: TWB

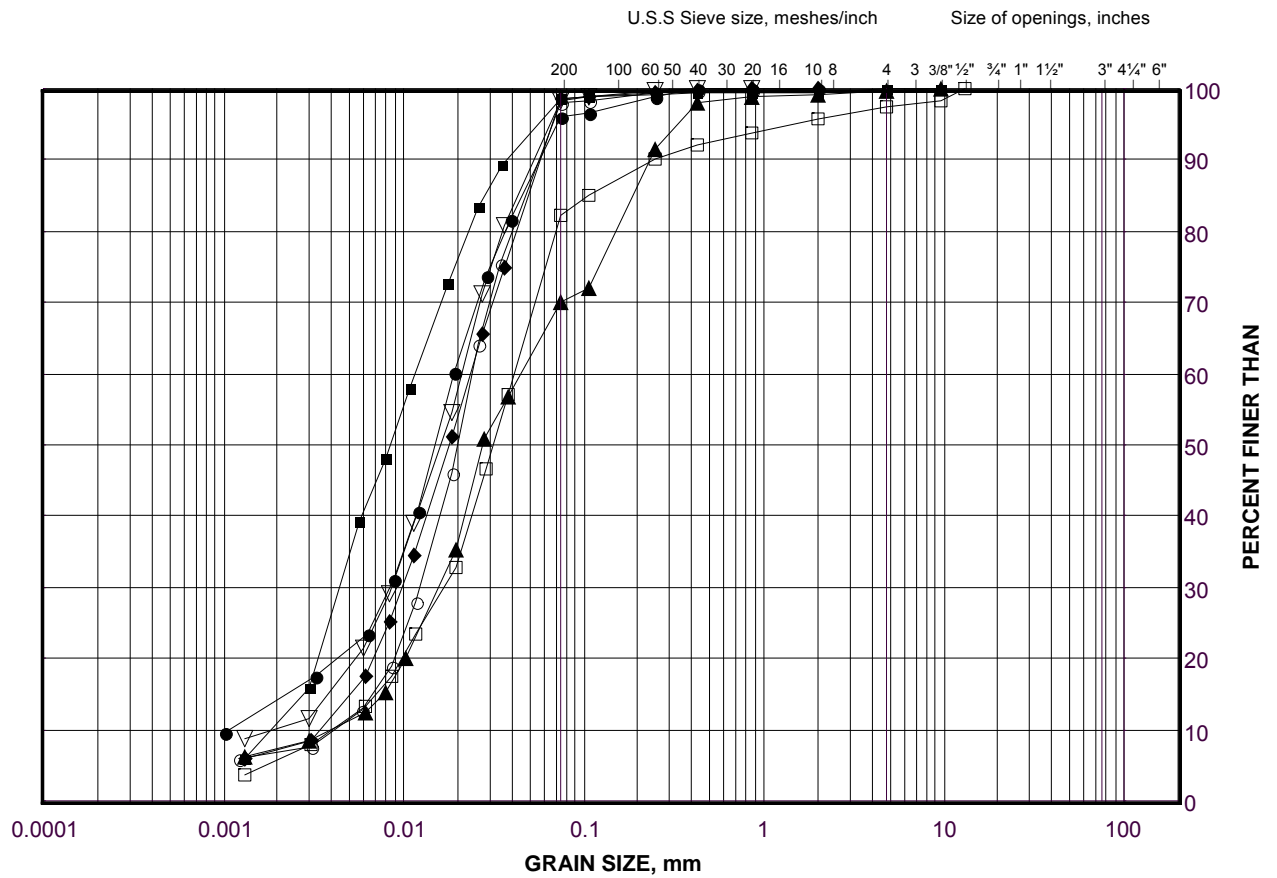
Golder Associates

Date: 11-Jan-16

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

FIGURE E7F



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-20	7	307.6
■	F4-10	7	309.7
◆	F4-9	7	309.1
▲	F4-7	7	309.9
▽	F4-16	8	308.7
○	F4-11	8	304.7
□	F4-8	8	307.7

Project Number: 09-1111-0018

Checked By: TWB

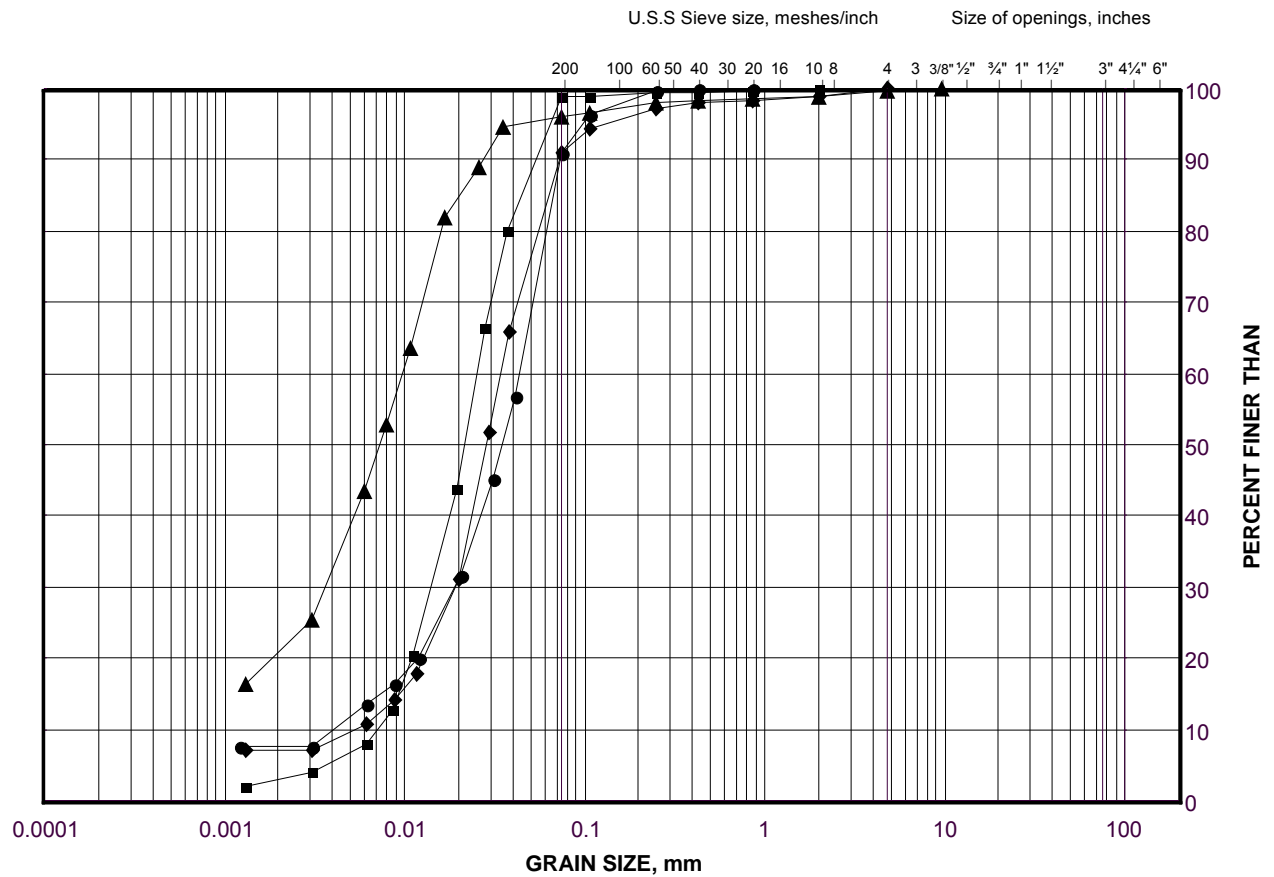
Golder Associates

Date: 11-Jan-16

GRAIN SIZE DISTRIBUTION

Silt to Sandy Silt

FIGURE E7G



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

LEGEND

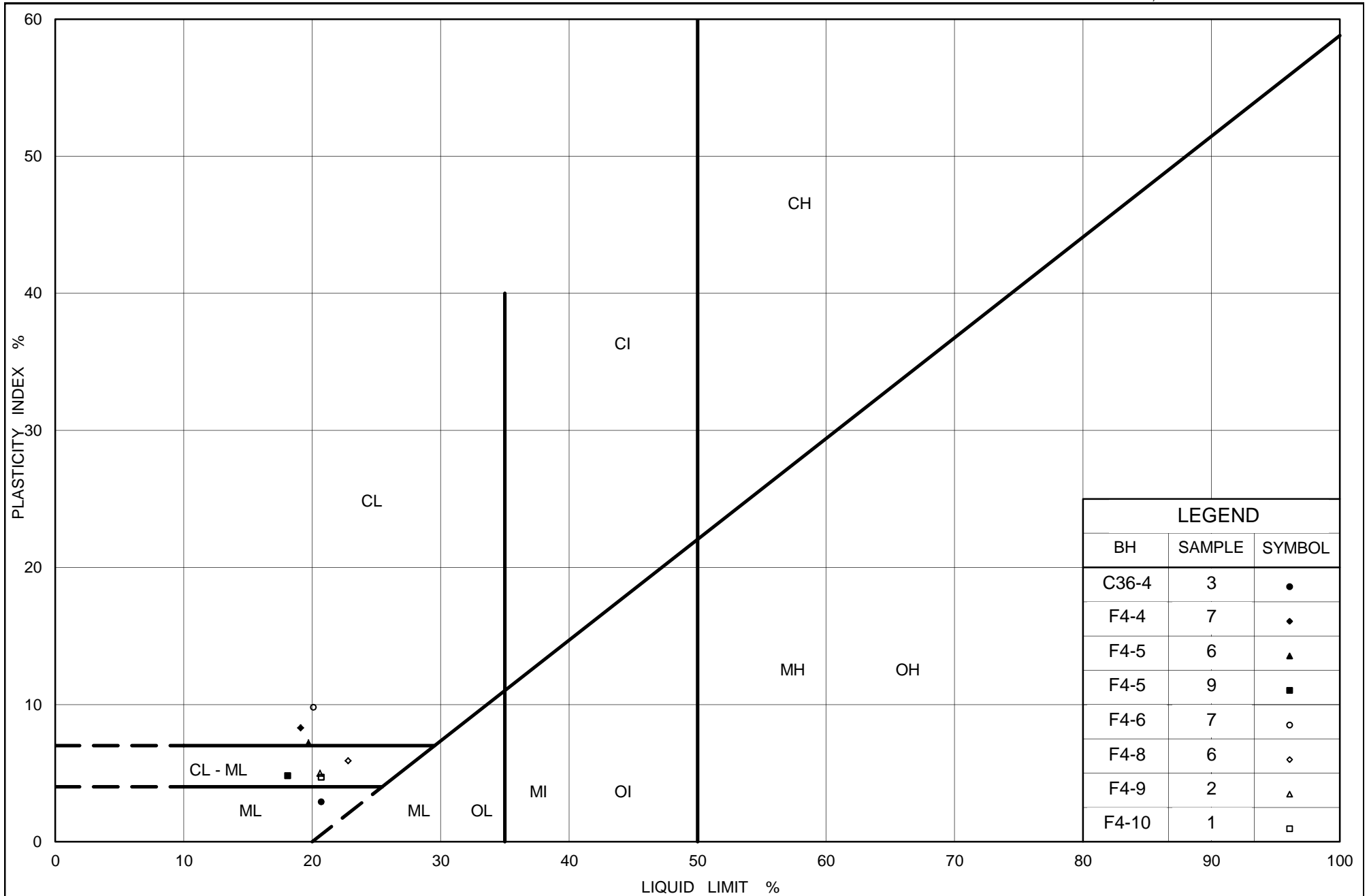
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C35-3	8	309.6
■	C36-3	9	308.1
◆	F4-7	9	306.9
▲	F4-18	9	308.6

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 11-Jan-16



Ministry of Transportation

Ontario

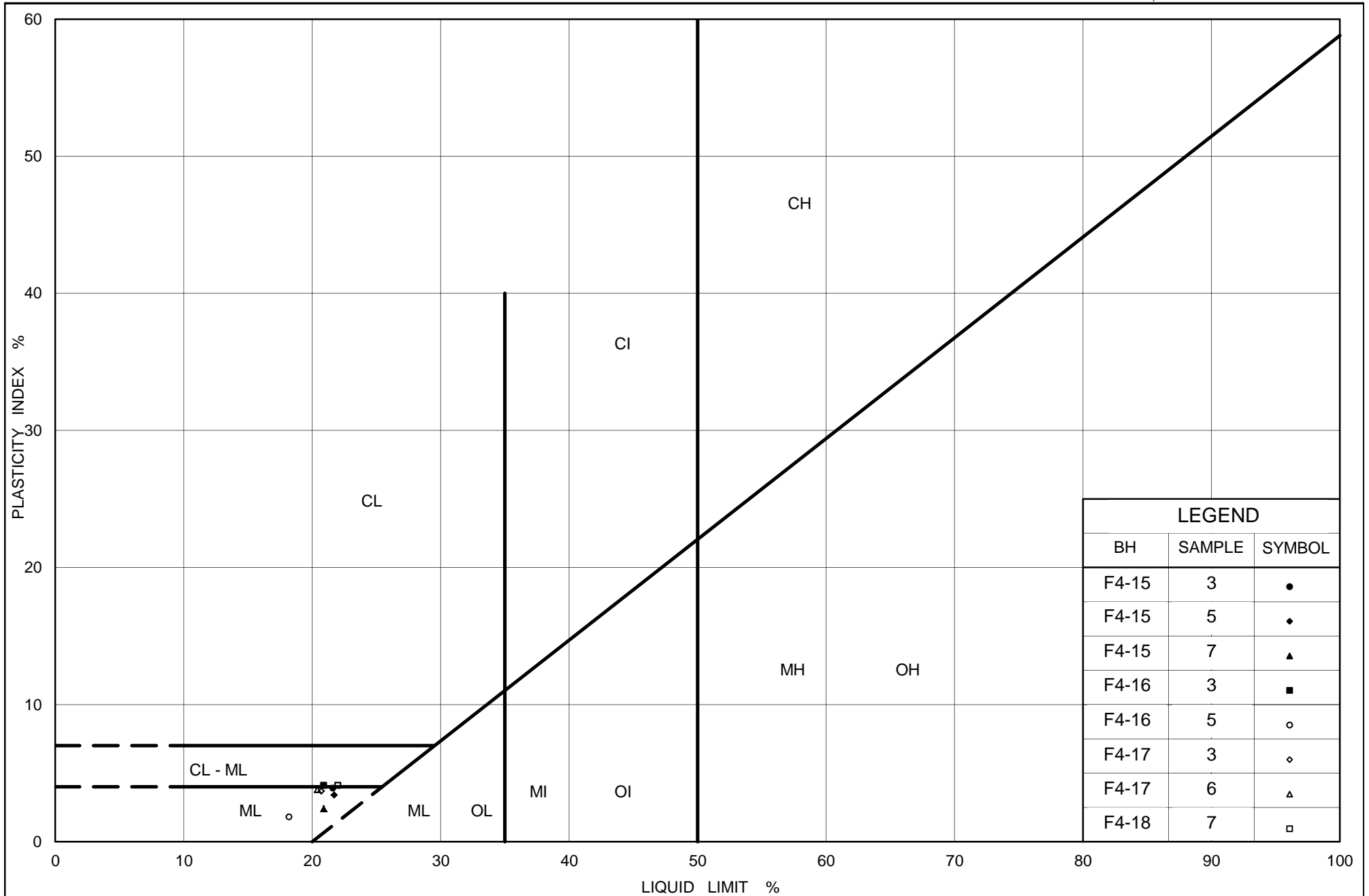
PLASTICITY CHART

Clayey Silt to Silt

Figure No. E8A

Project No. 09-1111-0018

Checked By: TWB



Ministry of Transportation

Ontario

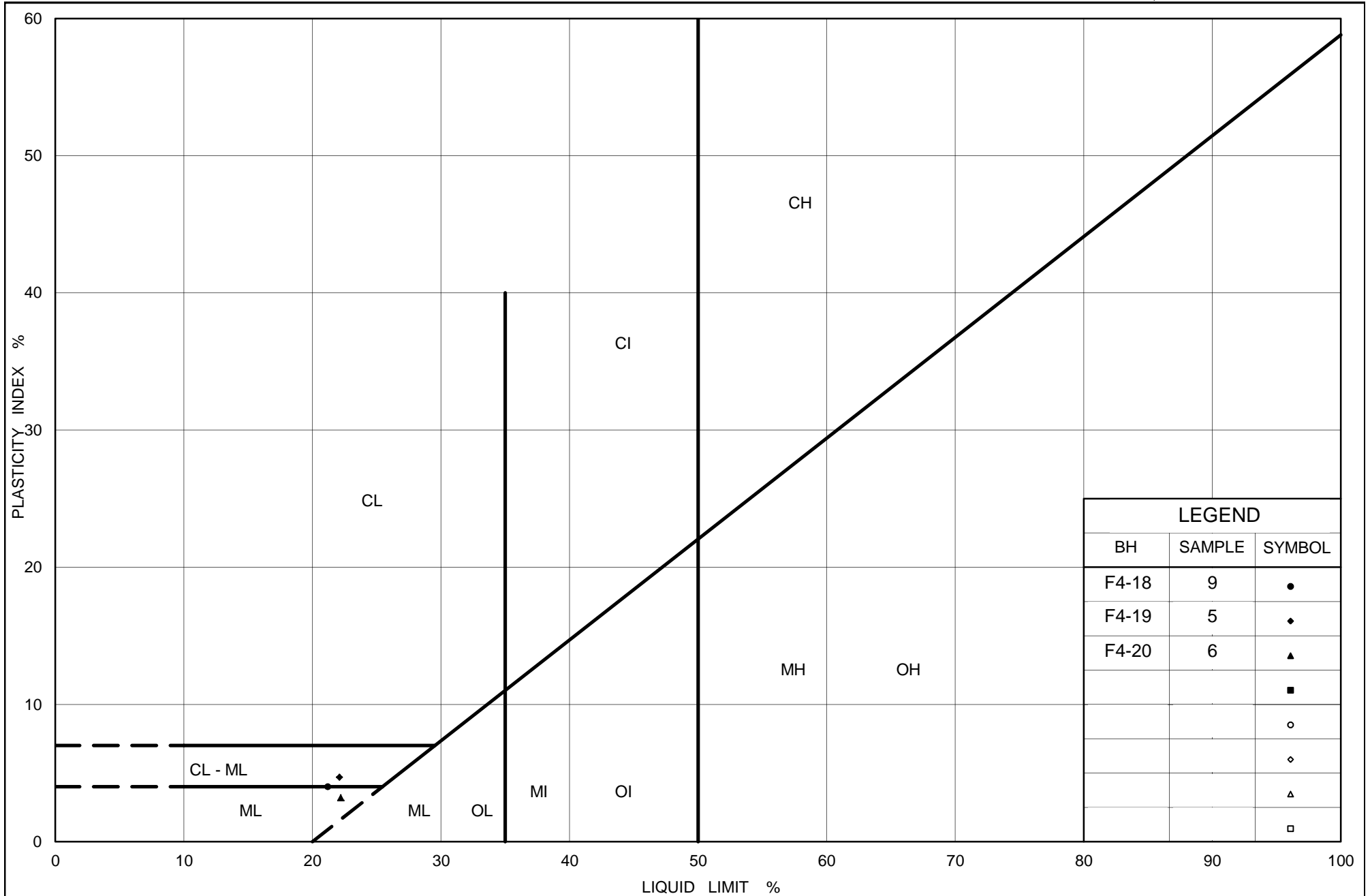
PLASTICITY CHART

Clayey Silt to Silt

Figure No. E8B

Project No. 09-1111-0018

Checked By: TWB



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt to Silt

Figure No. E8C

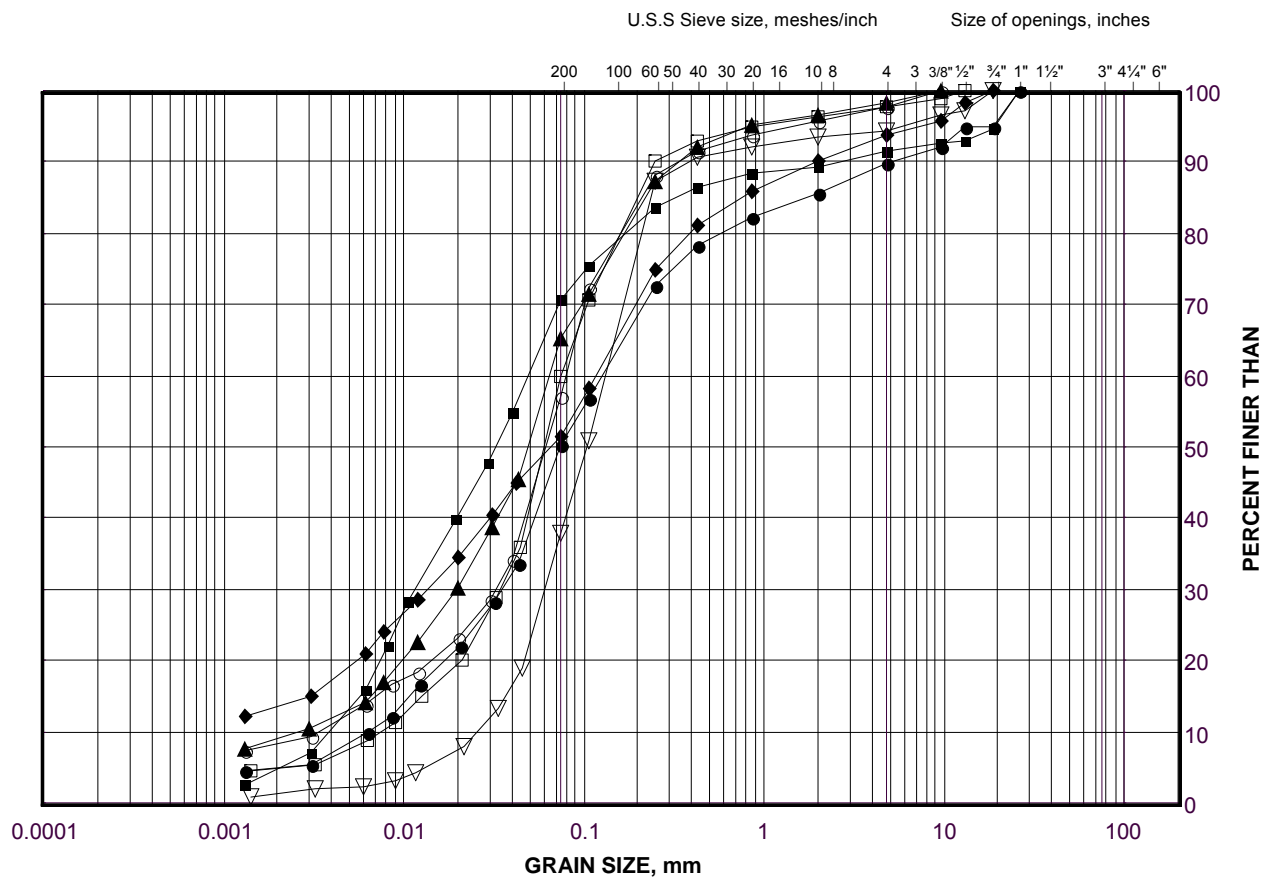
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Sandy Silt to Silt and Sand Till

FIGURE E9A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F4-14	10	307.4
■	C36-3	11	305.1
◆	C36-2	11	305.1
▲	C36-3	13	302.0
▽	C36-1	5	307.2
○	F4-12	6	307.4
□	C36-4	6	305.9

Project Number: 09-1111-0018

Checked By: TWB

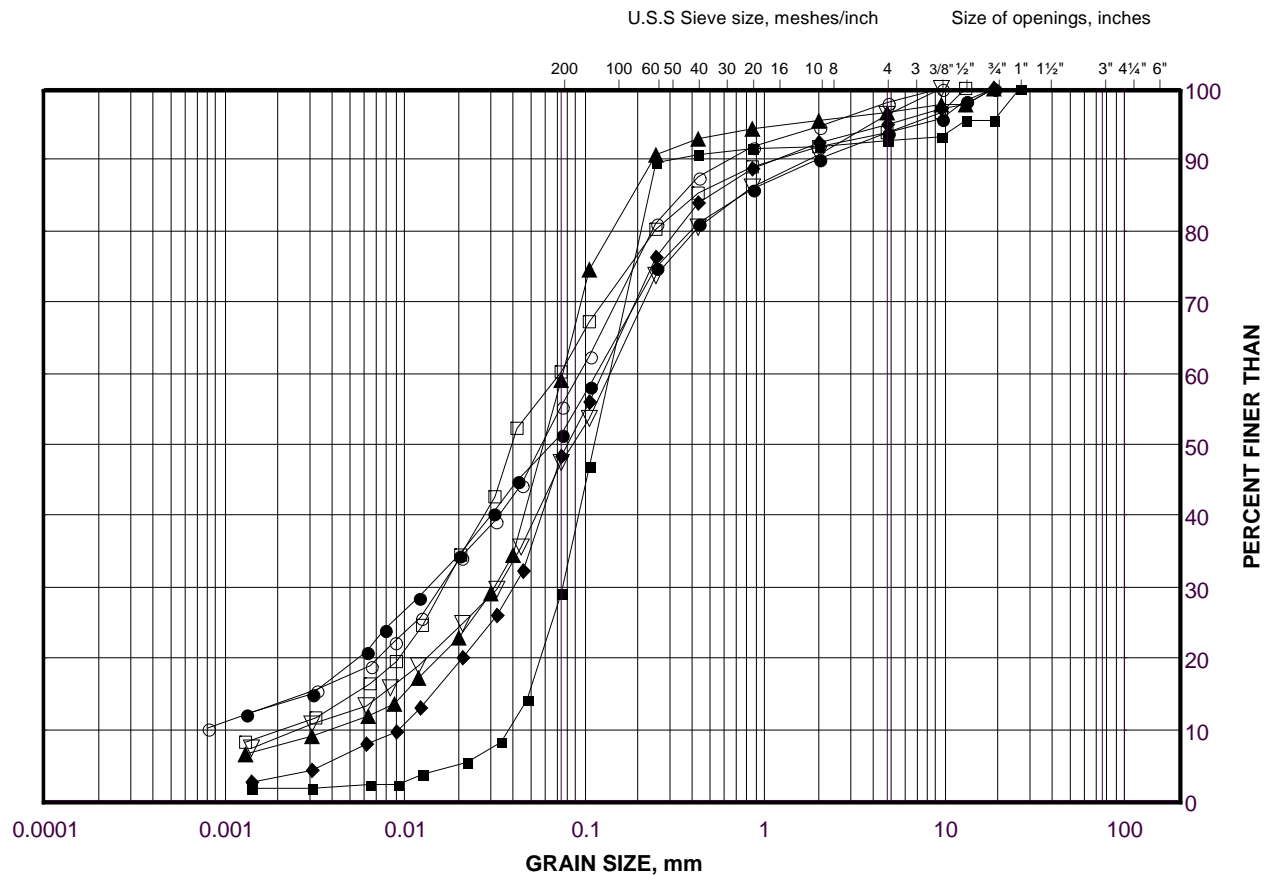
Golder Associates

Date: 08-Jan-16

GRAIN SIZE DISTRIBUTION

Sandy Silt to Silt and Sand Till

FIGURE E9B



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

LEGEND

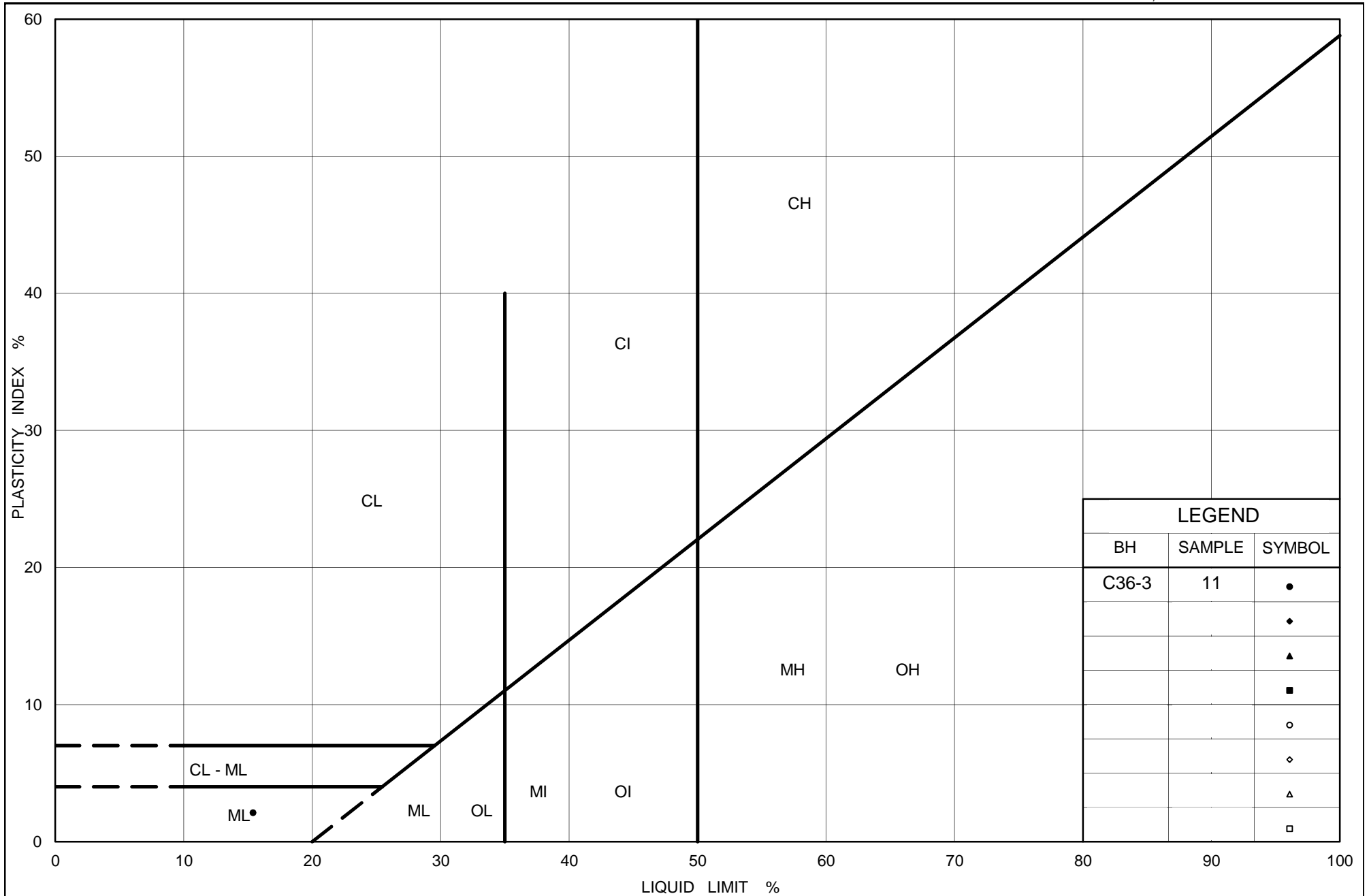
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C36-2	11	305.1
■	F4-23	7	312.7
◆	C36-1	7	305.7
▲	F4-12	7	306.7
▽	C36-4	8	303.7
○	F4-21	8	306.7
□	F4-13	8	307.1

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 11-Jan-16



Ministry of Transportation

Ontario

PLASTICITY CHART

Sandy Silt Till

Figure No. E10

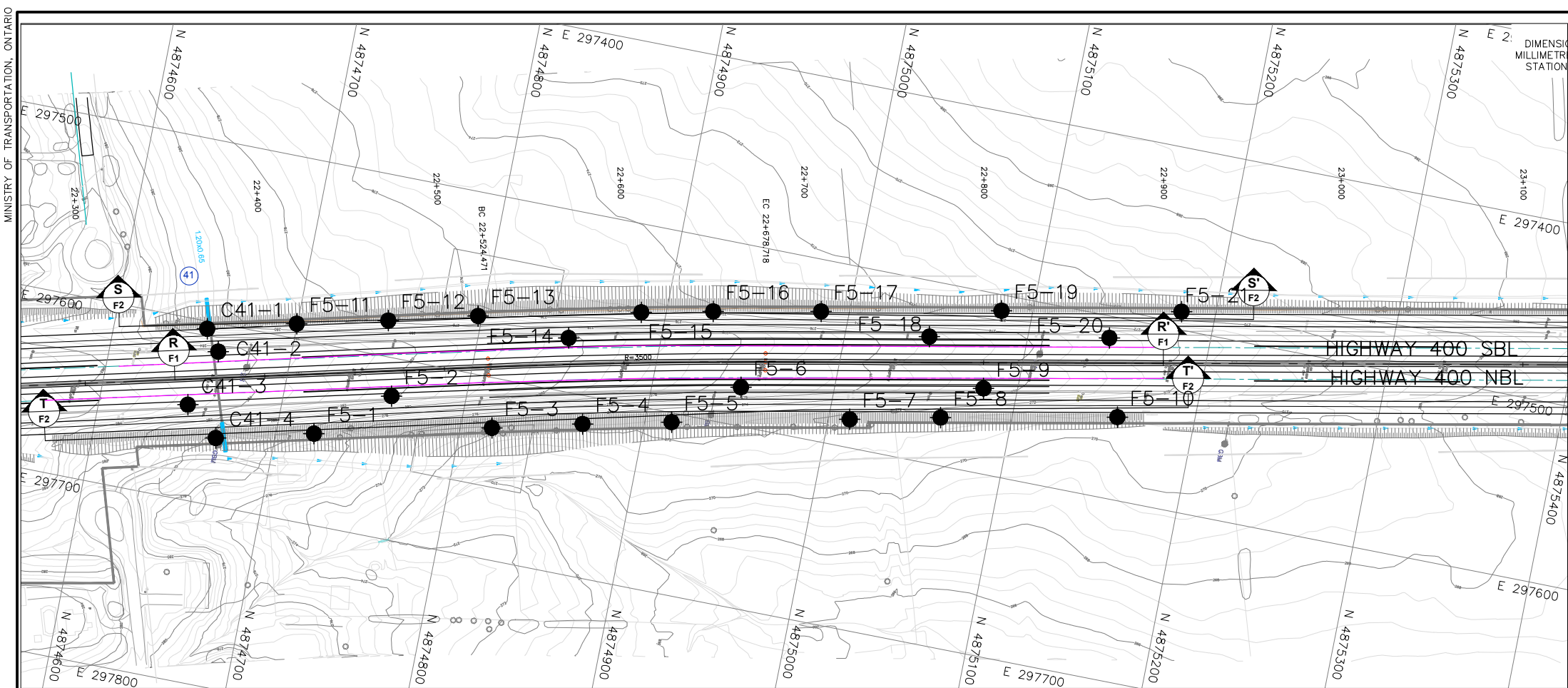
Project No. 09-1111-0018

Checked By: TWB



APPENDIX F

HIGH FILL EMBANKMENT AREA 5 (Stations 22+350 to 22+900 NBL and SBL)



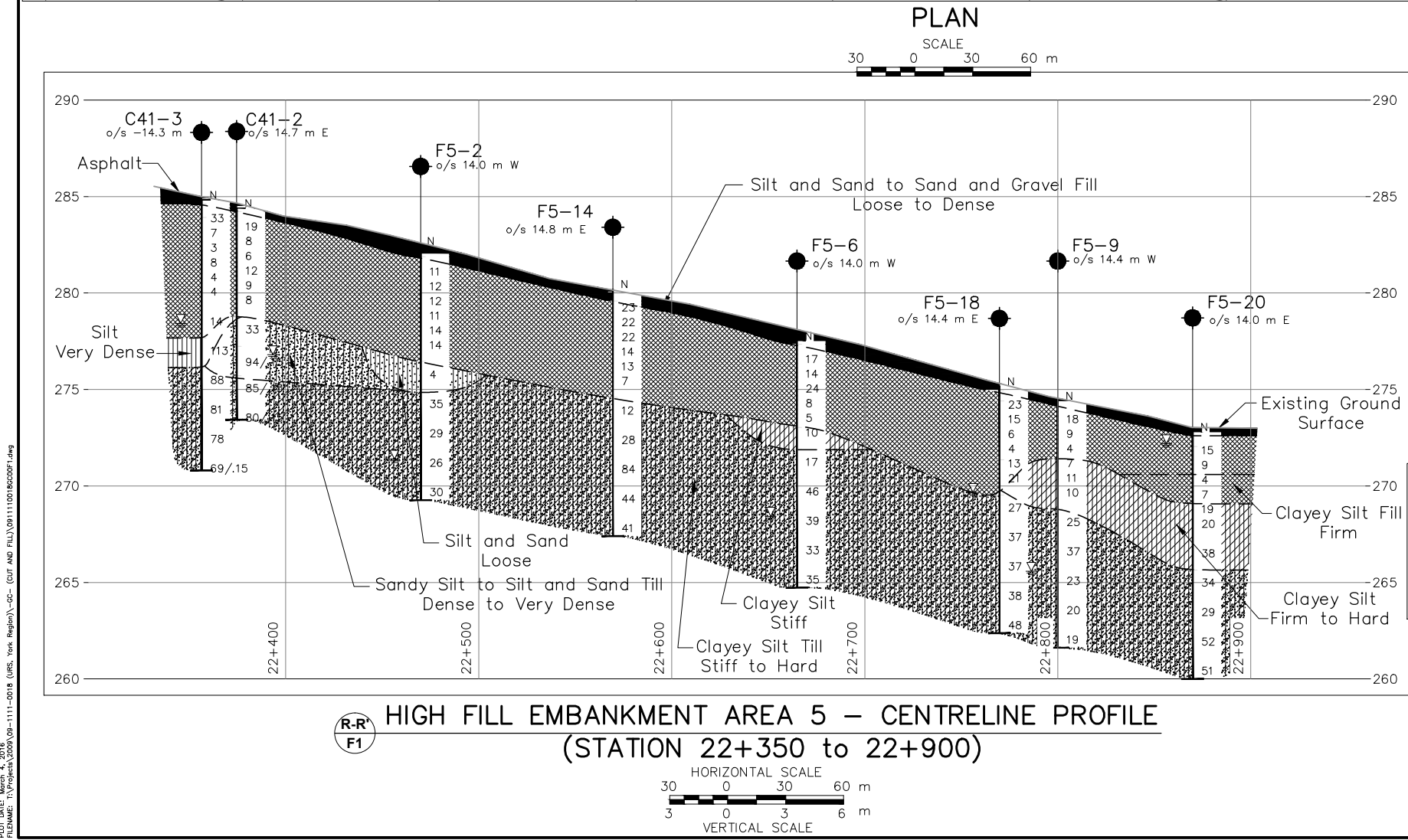
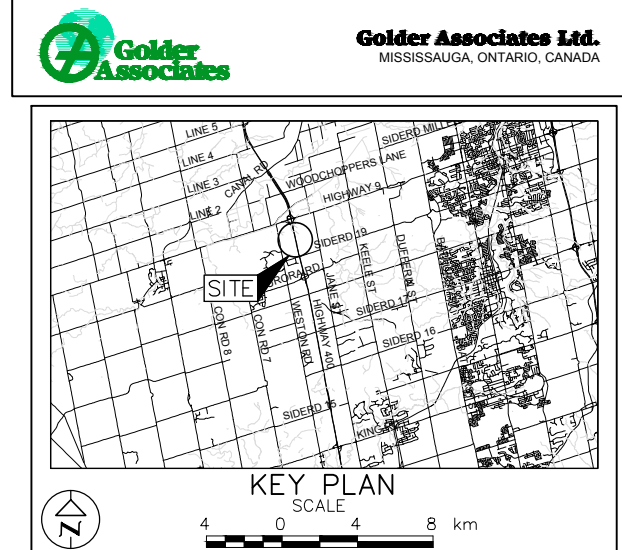
METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 2835-02-00

HIGHWAY 400 HIGH FILL EMBANKMENTS
STA. 22+350 TO STA. 22+900 (SBL)
STA. 22+350 TO STA. 22+900 (NBL)
BOREHOLE LOCATIONS AND SOIL STRATA

Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA

SHEET



BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
C41-1	280.8	4874651.3	297604.1
C41-2	284.3	4874659.7	297615.4
C41-3	284.7	4874648.8	297647.6
C41-4	279.8	4874667.7	297662.8

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.

LEGEND

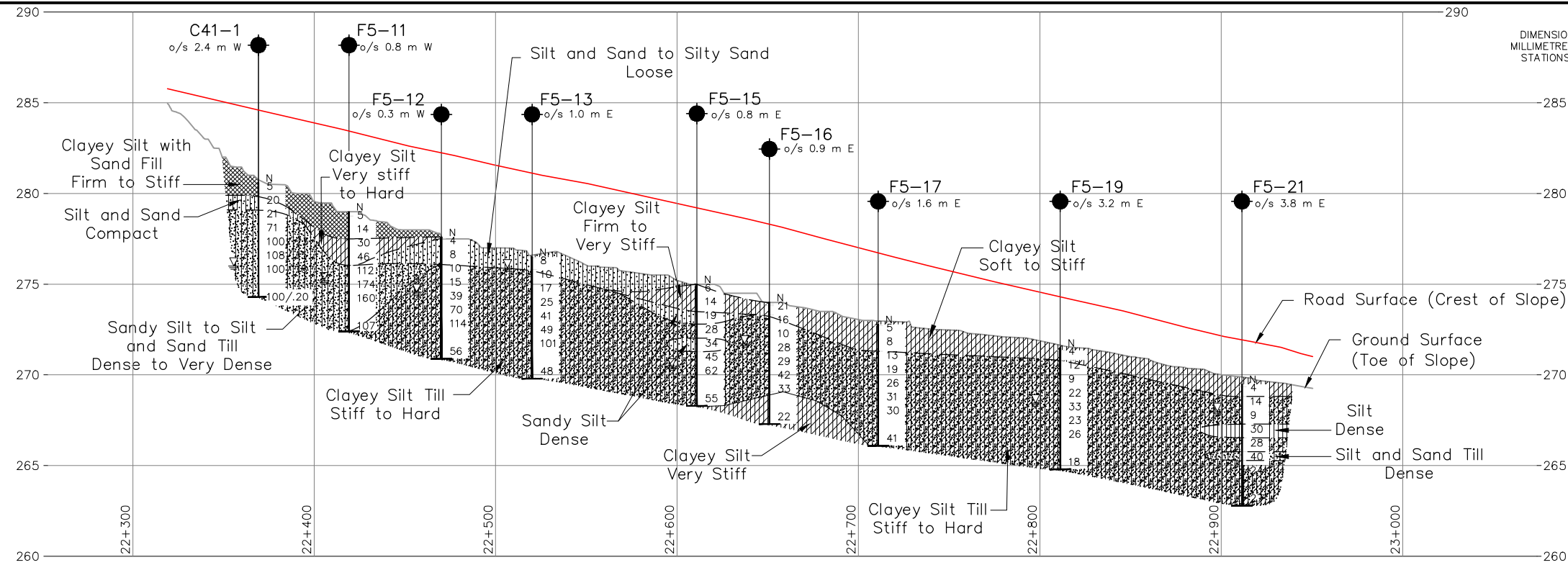
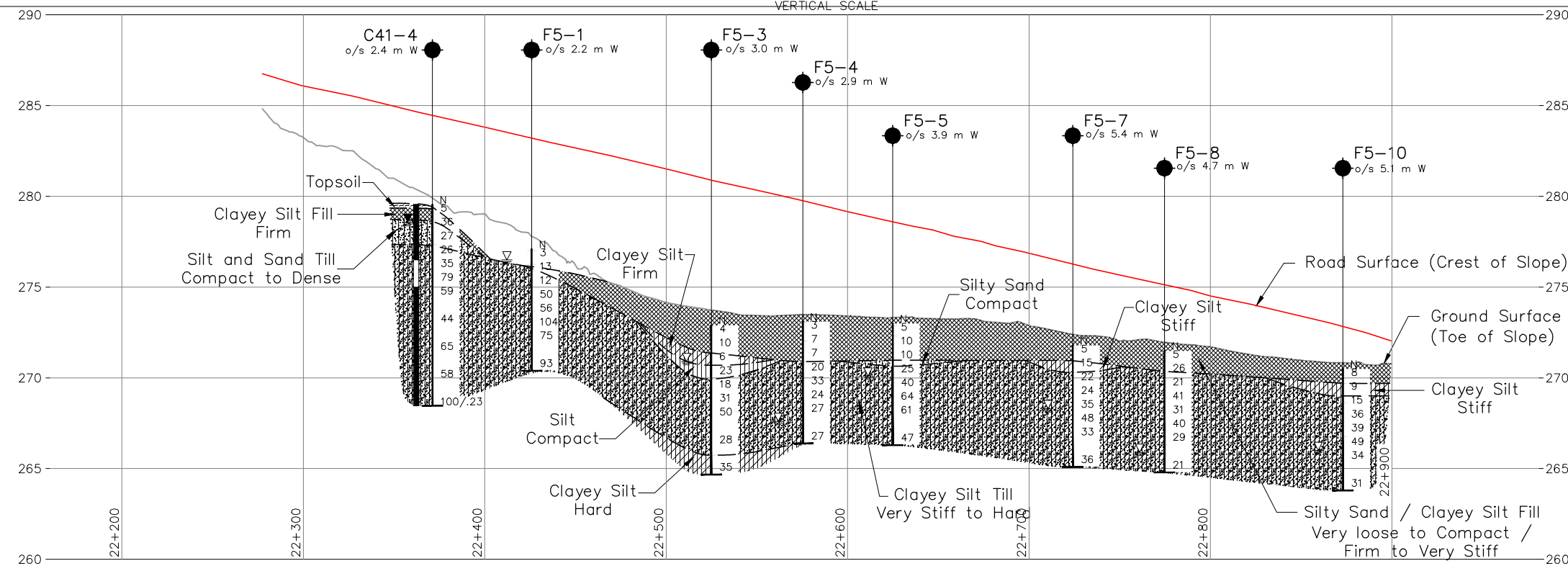
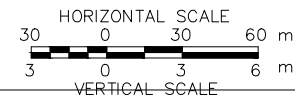
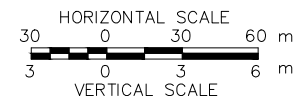
- Borehole - Current Investigation
- Seal
- Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- WL upon completion of or during drilling

BOREHOLE CO-ORDINATES			
No.	ELEVATION	NORTHING	EASTING
F5-1	277.3	4874720.8	297649.9
F5-2	282.1	4874759.1	297621.0
F5-3	272.9	4874817.3	297627.5
F5-4	273.1	4874866.4	297615.7
F5-5	272.9	4874914.8	297605.1
F5-6	277.5	4874948.8	297578.6
F5-7	271.8	4875011.7	297584.4
F5-8	271.5	4875061.1	297573.6
F5-9	274.4	4875081.4	297553.2
F5-10	270.5	4875157.5	297554.4
F5-11	279.0	4874699.6	297591.7
F5-12	277.8	4874749.3	297580.2
F5-13	276.5	4874797.8	297568.0
F5-14	280.1	4874849.6	297570.3
F5-15	275.0	4874886.4	297548.4
F5-16	274.0	4874925.6	297540.2
F5-17	272.9	4874984.4	297528.6
F5-18	275.2	4875046.3	297530.7
F5-19	271.5	4875082.8	297508.8
F5-20	272.8	4875144.7	297512.0
F5-21	269.5	4875181.2	297490.0

REFERENCE
Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

Geocres No. 30M13-217

HWY. 400		PROJECT NO. 09-1111-0018		DIST.CENTRAL	
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	SITE:		
DRAWN: JFC/MR	CHKD. SMM	APPD: JMAC	DWG.F1		

S-S'
F1HIGH FILL EMBANKMENT AREA 5 – SBL PROFILE
(STATION 22+350 to 22+900)T-T'
F1HIGH FILL EMBANKMENT AREA 5 – NBL PROFILE
(STATION 22+350 to 22+900)

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.

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

CONT No.
GWP No. 2835-02-00



HIGHWAY 400 HIGH FILL EMBANKMENTS

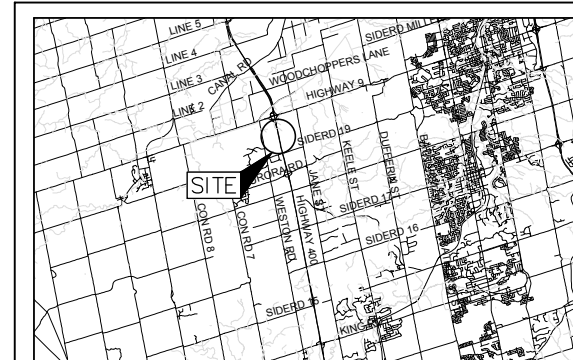
SHEET

STA. 22+350 TO STA. 22+900 (SBL)
STA. 22+350 TO STA. 22+900 (NBL)

BOREHOLE LOCATIONS AND SOIL STRATA



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA

KEY PLAN
SCALE

4 0 4 8 km

LEGEND

- Borehole – Current Investigation
- ⊥ Seal
- ⊥ Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
C41-1	280.8	4874651.3	297604.1
C41-4	279.8	4874667.7	297662.8
F5-1	277.3	4874720.8	297649.9
F5-3	272.9	4874817.3	297627.5
F5-4	273.1	4874866.4	297615.7
F5-5	272.9	4874914.8	297605.1
F5-7	271.8	4875011.7	297584.4
F5-8	271.5	4875061.1	297573.6
F5-10	270.5	4875157.5	297554.4
F5-11	279.0	4874699.6	297591.7
F5-12	277.8	4874749.3	297580.2
F5-13	276.5	4874797.8	297568.0
F5-15	275.0	4874886.4	297548.4
F5-16	274.0	4874925.6	297540.2
F5-17	272.9	4874984.4	297528.6
F5-19	271.5	4875082.8	297508.8
F5-21	269.5	4875181.2	297490.0

REFERENCE

Base plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

Geocres No. 30M13-217

HWY. 400	PROJECT NO. 09-1111-0018	DIST. CENTRAL
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016
DRAWN: JFC/MR	CHKD. SMM	APPD: JMAC
		DWG. F2

PROJECT 09-1111-0018		RECORD OF BOREHOLE No C41-1				SHEET 1 OF 1		METRIC									
G.W.P. 2835-02-00		LOCATION N 4874651.3 ; E 297604.1				ORIGINATED BY TT											
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Diameter Solid Stem Augers				COMPILED BY SKB/HS											
DATUM Geodetic		DATE December 7, 2010				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									
280.6	GROUND SURFACE																
0.0	TOPSOIL																
0.2	Clayey silt with sand, zones of silty sand and trace rootlets (FILL)		1	SS	5												
279.9	Firm																
0.7	Brown Moist		2	SS	20												
279.1	SILT and SAND																
1.5	Compact Brown Moist																
	Sandy SILT to SILT and SAND, trace to some clay, trace gravel, sand pockets to a depth of 3.0 m (TILL)		3	SS	21												
	Compact to very dense																
	Brown to grey below 5.6 m		4	SS	71												
	Wet to moist below 2.3 m																
			5	SS	51/0.08												
			6	SS	108/15												
			7	SS	100/18												
274.3	END OF BOREHOLE		8	SS	30/0.05												
6.3	NOTE: 1. Water level in open borehole at a depth of 4.6 m (Elev. 276.0 m) upon completion of drilling.																

PROJECT 09-1111-0018			RECORD OF BOREHOLE No C41-2			SHEET 1 OF 1			METRIC							
G.W.P. 2835-02-00			LOCATION N 4874659.7 ; E 297615.4			ORIGINATED BY SB										
DIST Central HWY 400			BOREHOLE TYPE D-90 Truck Mount, 101 mm Diameter Solid Stem Augers			COMPILED BY MAS/HS										
DATUM Geodetic			DATE December 17, 2010			CHECKED BY SMM										
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
284.4	GROUND SURFACE						20	40	60	80	100	W _p	W	W _L		
0.0	ASPHALT															
0.2	Silt and sand, trace to some clay, trace to some gravel, pockets of clayey silt (FILL) Loose to compact Brown Moist		1	SS	19											
			2	SS	8											
			3	SS	6											
			4	SS	12											
			5	SS	9											
			6	SS	8											
278.8																
5.6	SAND and SILT, trace to some clay, trace gravel (TILL) Dense to very dense Brown Moist		7	SS	33											
			8	SS	94/15											
275.7																
8.7	CLAYEY SILT with sand, trace gravel (TILL) Hard Brown to grey below 10.7 m Moist		9	SS	85/15											
273.4			10	SS	80/15											
11.0	END OF BOREHOLE															
NOTES: 1. Borehole caved at a depth of 10.7 m (Elev. 273.7 m) upon completion of drilling.. 2. Water level in open borehole at a depth of 7.6 m (Elev. 276.8 m) upon completion of drilling.																



PROJECT	09-1111-0018	RECORD OF BOREHOLE No C41-3		SHEET 1 OF 2	METRIC
G.W.P.	2835-02-00	LOCATION	N 4874648.8 ;E 297647.8		ORIGINATED BY SB
DIST	Central	HWY	400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers
DATUM	Geodetic	DATE	March 25, 2011		COMPILED BY CS/HS
					CHECKED BY SMM

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Continued Next Page

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


PROJECT 09-1111-0018		RECORD OF BOREHOLE No C41-3				SHEET 2 OF 2		METRIC								
G.W.P. 2835-02-00		LOCATION N 4874648.8 ; E 297647.8				ORIGINATED BY SB										
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers				COMPILED BY CS/HS										
DATUM Geodetic		DATE March 25, 2011				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	SHEAR STRENGTH kPa					W _p W W _L			
	--- CONTINUED FROM PREVIOUS PAGE ---						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100					10 20 30 WATER CONTENT (%)				GR SA SI CL
	NOTES: 1. Open borehole caved at a depth of 11.0 m (Elev. 273.8 m) upon completion of drilling. 2. Water level in open borehole at a depth of 6.4 m (Elev. 278.4 m) upon completion of drilling.															

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No C41-4		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4874667.7 ;E 297662.8		ORIGINATED BY TT			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Diameter Solid Stem Augers		COMPILED BY SKB/HS			
DATUM Geodetic		DATE December 10, 2010		CHECKED BY SMM			

[illegible]

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F5-1		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4874720.8 ; E 297649.9		ORIGINATED BY AM			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY SKB			
DATUM Geodetic		DATE December 15, 2010		CHECKED BY			

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	20	40	60			80
277.1	GROUND SURFACE																	
0.9	TOPSOIL		1	SS	3		277											
276.3	Silty SAND, trace clay, trace gravel, rootlets, slightly organic Very loose Brown Moist						276											
0.8	CLAYEY SILT with SAND, trace to some gravel (TILL) Stiff to hard Brown Moist		2	SS	13		275											11 31 45 13
			3	SS	12		274											
			4	SS	50		273											13 51 29 7
			5	SS	56		272											
			6	SS	104		271											
			7	SS	75													
270.4	Containing sand pockets between depths of 3.7 m and 4.5 m		8	SS	93													
6.7	END OF BOREHOLE																	
	NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 276.5 m) upon completion of drilling.																	

PROJECT		RECORD OF BOREHOLE		No F5-2		SHEET 1 OF 1		METRIC								
G.W.P. 09-1111-0018		LOCATION		N 4874759.1 ; E 297621.0		ORIGINATED BY		SB								
DIST Central HWY 400		BOREHOLE TYPE		D-90 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		CS								
DATUM Geodetic		DATE		March 25, 2011		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								
282.1	GROUND SURFACE															
0.0	ASPHALT															
0.2	Silty sand, trace to some clay, trace gravel (FILL) Compact Brown Moist		1	SS	11											
			2	SS	12											
			3	SS	12											
			4	SS	11											
			5	SS	14											
			6	SS	14											
276.5	SILT and SAND, trace clay, slightly organic Loose Brown to grey Moist		7	SS	4											
274.9	CLAYEY SILT with SAND, trace gravel (TILL) Very stiff to hard Brown Moist		8	SS	35											
			9	SS	29											
			10	SS	26											
	Becoming grey at a depth of 10.7 m		11	SS	30											
269.3	END OF BOREHOLE															
12.8	NOTE: 1. Water level in open borehole at a depth of 10.7 m below ground surface (Elev. 271.4 m) upon completion of drilling.															

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F5-3		SHEET 1 OF 1		METRIC								
G.W.P.		2835-02-00		LOCATION		N 4874817.3 ; E 297627.5		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY								
DATUM		Geodetic		DATE		December 13, 2010		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								
272.9	GROUND SURFACE															
0.9	TOPSOIL															
	Silty sand, trace gravel, containing rootlets (FILL) Loose Brown Moist		1	SS	4											
			2	SS	10											
271.4																
1.5	CLAYEY SILT with SAND, containing rootlets Firm Brown Moist		3	SS	6											
270.7																
2.2	SILT, some sand, some clay Compact Brown Moist		4	SS	23											
269.9																
3.0	CLAYEY SILT with SAND, trace gravel (TILL) Very stiff to hard Brown Moist		5	SS	18											
			6	SS	31											
			7	SS	50											
			8	SS	28											
265.7																
7.2	CLAYEY SILT Hard Grey Moist		9	SS	35											
264.7																
8.2	END OF BOREHOLE															
NOTES:																
1. Water level in open borehole at a depth of 2.0 m below ground surface (Elev. 270.9 m) upon completion of drilling.																
2. Borehole caved to a depth of 3.2 m below ground surface (Elev. 269.7 m) upon completion of drilling.																

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PROJECT		RECORD OF BOREHOLE		No F5-4		SHEET 1 OF 1		METRIC								
G.W.P. 2835-02-00		LOCATION		N 4874866.4 ; E 297615.7		ORIGINATED BY		AM/TT								
DIST Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		SKB								
DATUM Geodetic		DATE		December 2, 2010		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 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
273.1	GROUND SURFACE															
0.9	TOPSOIL															
272.0	Silty sand, trace clay, trace gravel, slightly organic, containing rootlets (FILL) Very loose to loose Brown Moist		1	SS	3											
1.1	Clayey silt, trace to some sand, trace gravel, slightly organic to a depth of 1.4 m (FILL) Firm Brown Moist		2	SS	7											
270.9	Containing sand pockets below a depth of 1.5 m CLAYEY SILT, some sand, trace gravel (TILL) Very stiff to hard Brown Moist		3	SS	7											
2.2	Containing sand seams, pockets and lenses of oxidation staining below a depth of 3.7 m		4	SS	20											
	CLAYEY SILT, some sand, trace gravel (TILL) Very stiff to hard Brown Moist		5	SS	33											
			6	SS	24											
			7	SS	27											
	Becoming grey at a depth of 5.6 m															
266.4	END OF BOREHOLE		8	SS	27											
6.7	NOTE: 1. Water level in open borehole at a depth of 5.5 m below ground surface (Elev. 267.6 m) upon completion of drilling.															

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F5-6		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4874948.8 ; E 297578.6</u>		ORIGINATED BY <u>SB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Track Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>CS</u>			
DATUM <u>Geodetic</u>		DATE <u>March 26, 2011</u>		CHECKED BY _____			

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 (%)							
								20	40	60	80	100	W _p	W	W _L					
277.5	GROUND SURFACE																			
0.0	ASPHALT																			
0.2	Silty sand, trace gravel, trace to some clay (FILL) Loose to compact Brown Moist		1	SS	17															
			2	SS	14															
			3	SS	24															
			4	SS	8															
			5	SS	5															
273.0	CLAYEY SILT, trace to some sand, trace gravel, slightly organic Stiff Grey Moist		6	SS	10															
271.9	CLAYEY SILT with SAND, trace to some gravel (TILL) Very stiff to hard Brown Moist		7	SS	17															
			8	SS	46															
			9	SS	39															
			10	SS	33															
			11	SS	35															
264.7	END OF BOREHOLE																			
12.8	NOTE: 1. Water level in open borehole at a depth of 9.1 m below ground surface (Elev. 268.4 m) upon completion of drilling.																			

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F5-7		SHEET 1 OF 1		METRIC						
G.W.P.		2835-02-00		LOCATION		N 4875011.7 ; E 297584.4		ORIGINATED BY						
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY						
DATUM		Geodetic		DATE		December 2, 2010		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						
271.8	GROUND SURFACE													
0.0	TOPSOIL													
0.2	Clayey silt, trace sand, trace gravel, containing zones of silty sand (FILL)		1	SS	5									
271.0	Firm													
0.9	Brown Moist		2	SS	15									
270.3	TOPSOIL													
1.5	CLAYEY SILT, trace sand, trace gravel, containing lenses of silty sand		3	SS	22									
	Very stiff													
	Brown and grey													
	Moist													
	CLAYEY SILT with SAND, trace gravel (TILL)		4	SS	24									
	Very stiff to hard													
	Brown													
	Moist													
	Becoming grey at a depth of 4.0 m		5	SS	35									
			6	SS	48									
			7	SS	33									
			8	SS	36									
265.1	END OF BOREHOLE													
6.7	NOTE: 1. Water level in open borehole at a depth of 3.5 m below ground surface (Elev. 268.3 m) upon completion of drilling.													

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F5-8		SHEET 1 OF 1		METRIC								
G.W.P.		2835-02-00		LOCATION		N 4875061.1 ; E 297573.6		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY								
DATUM		Geodetic		DATE		December 2, 2010		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								
271.5	GROUND SURFACE															
0.0	TOPSOIL															
270.3	CLAYEY SILT, trace to some sand, trace gravel, slightly organic and rootlets to a depth of 0.6 m Firm to very stiff Brown Moist		1	SS	5											
1.2	CLAYEY SILT, some sand, trace gravel (TILL) Very stiff to hard Brown Moist		2	SS	26											
			3	SS	21											
			4	SS	41											
			5	SS	31											
	Becoming grey below a depth of 4.0 m		6	SS	40											
			7	SS	29											
			8	SS	21											
264.8	END OF BOREHOLE															
6.7	NOTE: 1. Water level in open borehole at a depth of 5.6 m below ground surface (Elev. 265.9 m) upon completion of drilling.															


PROJECT 09-1111-0018		RECORD OF BOREHOLE No F5-9		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4875081.4 ; E 297553.2		ORIGINATED BY SB			
DIST Central HWY 400		BOREHOLE TYPE D-90 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY CS			
DATUM Geodetic		DATE March 26, 2011		CHECKED BY			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIMIT MOISTURE LIQUID CONTENT CONTENT 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					w _p	w	w _L					
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED												
274.4	GROUND SURFACE							20	40	60	80	100								
0.0	ASPHALT																			
0.3	Silt and sand, trace gravel, trace to some clay (FILL) Loose to compact Brown Moist						274													
		1	SS	18																
		2	SS	9																
			3	SS	4		272													
271.4	CLAYEY SILT with SAND, trace to some gravel, slightly organic to a depth of 3.7 m Firm to stiff Grey Moist Becoming brown at a depth of 3.7 m																			
3.0		4	SS	7			271													
		5	SS	11																
			6	SS	10		270													
268.8	CLAYEY SILT with SAND, trace gravel (TILL) Very stiff to hard Brown Moist						269													
5.6		7	SS	25			268													
		8	SS	37			267													
	becoming grey at a depth of 8.7 m						266													
		9	SS	23			265													
		10	SS	20			264													
							263													
			11	SS	19		262													
261.6	END OF BOREHOLE NOTES: 1. Water level in open borehole at a depth of 8.8 m below ground surface (Elev. 265.6 m) upon completion of drilling. 2. Borehole caved at a depth of 11.9 m below ground surface (Elev. 262.5 m) upon completion of drilling.																			
12.8																				

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F5-11		SHEET 1 OF 1		METRIC										
G.W.P.		2835-02-00		LOCATION		N 4874699.6 ; E 297591.7		ORIGINATED BY										
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY										
DATUM		Geodetic		DATE		December 7, 2010		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										WATER CONTENT (%)
279.0	GROUND SURFACE							20	40	60	80	100						
0.0	TOPSOIL							20	40	60	80	100						
0.3	Clayey silt with sand, trace gravel, containing rootlets (FILL) Firm to stiff Brown Moist		1	SS	5													
			2	SS	14													
277.5																		
1.5	CLAYEY SILT, some sand Very stiff to hard Brown Moist		3	SS	30													
			4	SS	46													
276.0																		
3.0	SAND and SILT, trace clay, trace to some gravel (TILL) Very dense Brown Moist		5	SS	112													
			6	SS	174													
	Becoming grey at a depth of 4.5 m		7	SS	160													
272.4			8	SS	107													
6.6	END OF BOREHOLE																	
	NOTE: 1. Water level in open borehole at a depth of 3.8 m below ground surface (Elev. 275.2 m) upon completion of drilling.																	

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

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F5-13		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4874797.8 ; E 297568.0</u>		ORIGINATED BY <u>SKB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>ARM</u>			
DATUM <u>Geodetic</u>		DATE <u>December 3, 2010</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					w _p	w	w _L		GR	SA	SI	CL
								20	40	60	80	100								
276.5	GROUND SURFACE																			
0.9	TOPSOIL		1	SS	8		276													
275.8	Silty SAND, trace clay, trace gravel, slightly organic and containing rootlets						275										8	27	47	18
0.7	Loose Brown Moist		2	SS	10															
	CLAYEY SILT with SAND, trace to some gravel, containing rootlets, slightly organic and sand pockets to a depth of 2.2 m (TILL) Stiff to hard Brown Moist		3	SS	17															
			4	SS	25		274													
			5	SS	41		273										3	32	53	12
			6A 6B	SS	49		272													
			7	SS	101		271													
							270										0	20	65	15
		8A 8B	SS	48																
269.8	END OF BOREHOLE																			
6.7	NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 275.9 m) upon completion of drilling.																			

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F5-14		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4874849.6 ; E 297570.3		ORIGINATED BY SB			
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY MAS			
DATUM Geodetic		DATE December 3, 2010		CHECKED BY			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)							
								20	40	60	80	100	W _p	W	W _L					
280.2	GROUND SURFACE																			
0.0	ASPHALT																			
0.2	Sand and gravel (FILL)																			
279.6	Brown Moist																			
0.6	Silt and sand, trace to some gravel, trace to some clay (FILL)		1	SS	23															
	Loose to compact		2	SS	22															
	Brown Moist		3	SS	22															
			4	SS	14															
			5	SS	13															
			6	SS	7															
274.6																				
5.6	CLAYEY SILT with SAND, trace gravel (TILL)		7	SS	12															
	Stiff to hard																			
	Brown and grey		8	SS	28															
	Moist																			
			9	SS	84															
	Becoming grey at a depth of 10.2 m		10	SS	44															
			11	SS	41															
267.4	END OF BOREHOLE																			
12.8	NOTE: 1. Borehole dry upon completion of drilling.																			

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F5-16		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4874925.6 ; E 297540.2		ORIGINATED BY SKB			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY SB			
DATUM Geodetic		DATE December 2, 2010		CHECKED BY			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED									
274.0	GROUND SURFACE					▽										1 16 61 22	
0.0	TOPSOIL		1	SS	21												
0.2	Silty SAND																
273.3	Brown Moist		2	SS	16												
0.7	CLAYEY SILT, some sand, trace gravel, containing rootlets																
	Very stiff																
	Brown Moist		3	SS	10												
	CLAYEY SILT, some sand, trace gravel, containing sand seams and pockets (TILL)																
	Stiff to hard																
	Brown Moist		4	SS	28												
	becoming wet at a depth of 3.1 m																
269.1			7A	SS	33												
4.9	CLAYEY SILT, trace to some sand, trace gravel, containing sand seams to a depth of 5.6 m		7B														
	Very stiff																
	Grey Wet																
267.3			8	SS	22												
6.7	END OF BOREHOLE																
	NOTE: 1. Water level in open borehole at a depth of 2.3 m below ground surface (Elev. 271.7 m) upon completion of drilling.																

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F5-17		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4874984.4 ; E 297528.6</u>		ORIGINATED BY <u>SKB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>SB</u>			
DATUM <u>Geodetic</u>		DATE <u>December 2, 2010</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
													W _p W W _L				
272.8	GROUND SURFACE						20	40	60	80	100						
0.9	TOPSOIL		1	SS	5												
	CLAYEY SILT, some sand, containing rootlets, slightly organic Firm Brown Moist		2	SS	8												
271.3																	
1.5	CLAYEY SILT, some sand, trace gravel (TILL) Very stiff to hard brown Wet		3	SS	13												
			4	SS	19												
	Containing sand pockets between depths of 3.0 m and 4.5 m		5	SS	26												
	Becoming moist at a depth of 3.7 m Becoming grey at a depth of 4.1 m		6	SS	31												
			7	SS	30												
	Becoming wet at a depth of 5.6 m																
266.1			8	SS	41												
6.7	END OF BOREHOLE																
	NOTES: 1. Borehole caved to a depth of 2.1 m below ground surface (Elev. 270.7 m) upon completion of drilling (dry to a depth of 2.1 m).																

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F5-18		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4875046.3 ; E 297530.7		ORIGINATED BY SB			
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY SKB			
DATUM Geodetic		DATE December 3, 2010		CHECKED BY			

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 (%)				GR	SA	SI	CL	
								20	40	60	80	100	W _p	W	W _L						
275.2	GROUND SURFACE																				
0.0	ASPHALT																				
0.2	Sand and gravel (FILL)																				
274.4	Brown Moist																				
0.8	Silt and sand, trace to some clay, trace gravel (FILL)		1	SS	23												4	50			
	Loose to compact		2	SS	15																
	Brown Moist		3	SS	6																
			4	SS	4																
271.4	Clayey silt, trace sand, trace gravel (FILL)		5	SS	13																
3.8	Stiff to very stiff		6	SS	21																
	Brown and grey Moist																				
269.6	CLAYEY SILT, some sand, trace gravel (TILL)		7	SS	27												1	23			
5.6	Very stiff to hard		8	SS	37																
	Brown Moist																				
	Becoming grey at a depth of 9.1 m		9	SS	37																
			10	SS	38																

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

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 19/11/15 SIB

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F5-19		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4875082.8 ; E 297508.8		ORIGINATED BY SKB			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY SB			
DATUM Geodetic		DATE December 2, 2010		CHECKED BY			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIMIT MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED	20	40	60	80	100	w _p	w		w _L			
271.5	GROUND SURFACE																			
0.0	TOPSOIL																			
0.1	CLAYEY SILT, some sand, trace gravel, containing rootlets		1	SS	4															
270.8	Soft																			
0.7	Brown Moist																			
	CLAYEY SILT with SAND, trace gravel (TILL)		2	SS	12															
	Stiff to hard																			
	Brown Moist		3	SS	9															
	Becoming wet at a depth of 1.5 m																			
	Becoming moist at a depth of 2.2 m																			
	Containing sand pockets between depths of 2.2 m and 3.0 m		4	SS	22															
			5	SS	33															
	Containing sand pockets and zones of oxidation staining between depths of 3.7 m and 5.6 m		6	SS	23															
			7	SS	26															
	Becoming grey at a depth of 5.6 m																			
264.8	END OF BOREHOLE		8	SS	18															
6.7	NOTE: 1. Water level in open borehole at a depth of 3.0 m below ground surface (Elev. 268.5 m) upon completion of drilling.																			

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 19/11/15 SIB

PROJECT		RECORD OF BOREHOLE		No F5-20		SHEET 1 OF 1		METRIC						
G.W.P. 09-1111-0018		LOCATION		N 4875144.7 ; E 297512.0		ORIGINATED BY		SB						
DIST Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY		SKB						
DATUM Geodetic		DATE		December 3, 2010		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						
272.8	GROUND SURFACE													
0.0	ASPHALT													
0.2	Sand and gravel (FILL)													
272.0	Brown Moist													
0.8	Silty sand, trace clay, trace gravel (FILL)		1	SS	15									
	Loose to compact Brown Moist		2	SS	9									
270.6														
2.2	Clayey silt, trace sand, trace gravel, slightly organic (FILL)		3	SS	4									
	Firm Brown, black and grey Moist		4	SS	7									
269.1														
3.7	CLAYEY SILT with SAND, trace gravel, containing sand seams (TILL)		5	SS	19									
	Very stiff to hard Brown Moist		6	SS	20									2 32 54 12
			7	SS	38									1 37 55 7
265.6														
7.2	CLAYEY SILT, some sand (TILL)		8	SS	34									
	Very stiff to hard Grey Moist													
			9	SS	29									0 11 61 28
			10	SS	52									
			11	SS	51									
260.0														
12.8	END OF BOREHOLE													
NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 272.2 m) upon completion of drilling.														

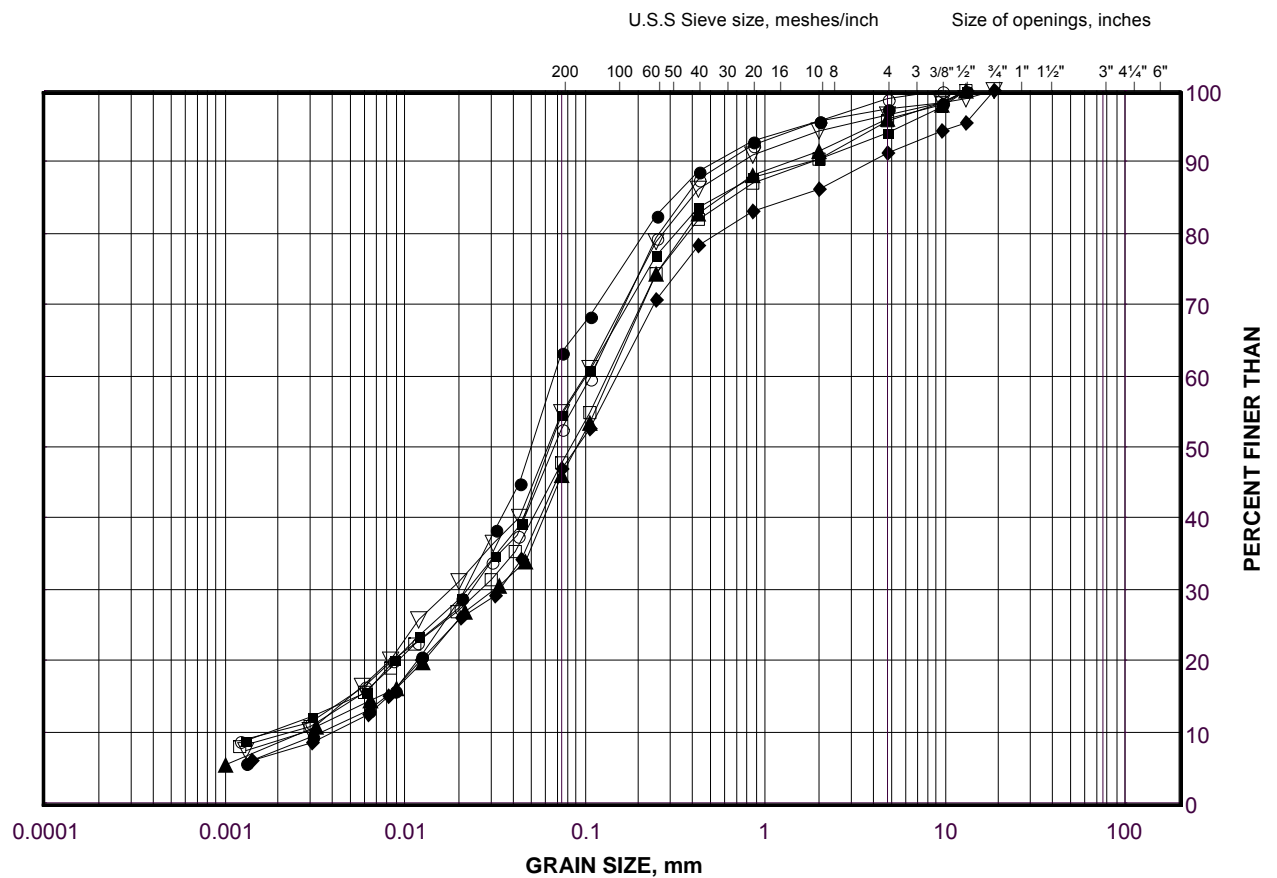
PROJECT 09-1111-0018		RECORD OF BOREHOLE No F5-21		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4875181.2 ; E 297490.0		ORIGINATED BY SKB			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY SB			
DATUM Geodetic		DATE December 2, 2010		CHECKED BY			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL	
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					w _p w w _L								
269.5	GROUND SURFACE																				
0.0	TOPSOIL																				
0.2	CLAYEY SILT, trace to some sand, trace gravel, containing rootlets		1	SS	4	▽	269														
268.8	Soft Brown Moist																				
0.7	CLAYEY SILT, some sand, trace gravel, containing rootlets and sand pockets (TILL)		2	SS	14		268														
	Stiff Brown Moist																				
267.3	Becoming wet at a depth of 1.4 m																				
2.2	SILT, some clay, trace to some sand		4	SS	30		267														
266.5	Dense Brown Wet																				
3.0	CLAYEY SILT, some sand, trace gravel (TILL)		5	SS	28		266														
265.8	Very stiff Brown Wet		6A	SS	40																
265.3	SILT and SAND, trace gravel, trace clay (TILL)		6B	SS																	
4.2	Dense Brown Wet		7	SS	24	265															
	CLAYEY SILT, some sand, trace gravel, containing sand pockets to a depth of 4.5 m (TILL)					264															
	Very stiff Brown Moist																				
	Becoming grey at a depth of 4.9 m		8	SS	27	263															
262.8	END OF BOREHOLE																				
6.7	NOTE: 1. Water level in open borehole at a depth of 1.5 m below ground surface (Elev. 268.0 m) upon completion of drilling.																				

GRAIN SIZE DISTRIBUTION

Silt and Sand Fill

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)
●	F5-9	2	272.7
■	F5-14	2	278.4
◆	F5-14	3	277.7
▲	F5-18	3	272.6
▽	C41-3	4	281.5
○	F5-6	4	274.2
□	F5-2	5	278.0

Project Number: 09-1111-0018

Checked By: TWB

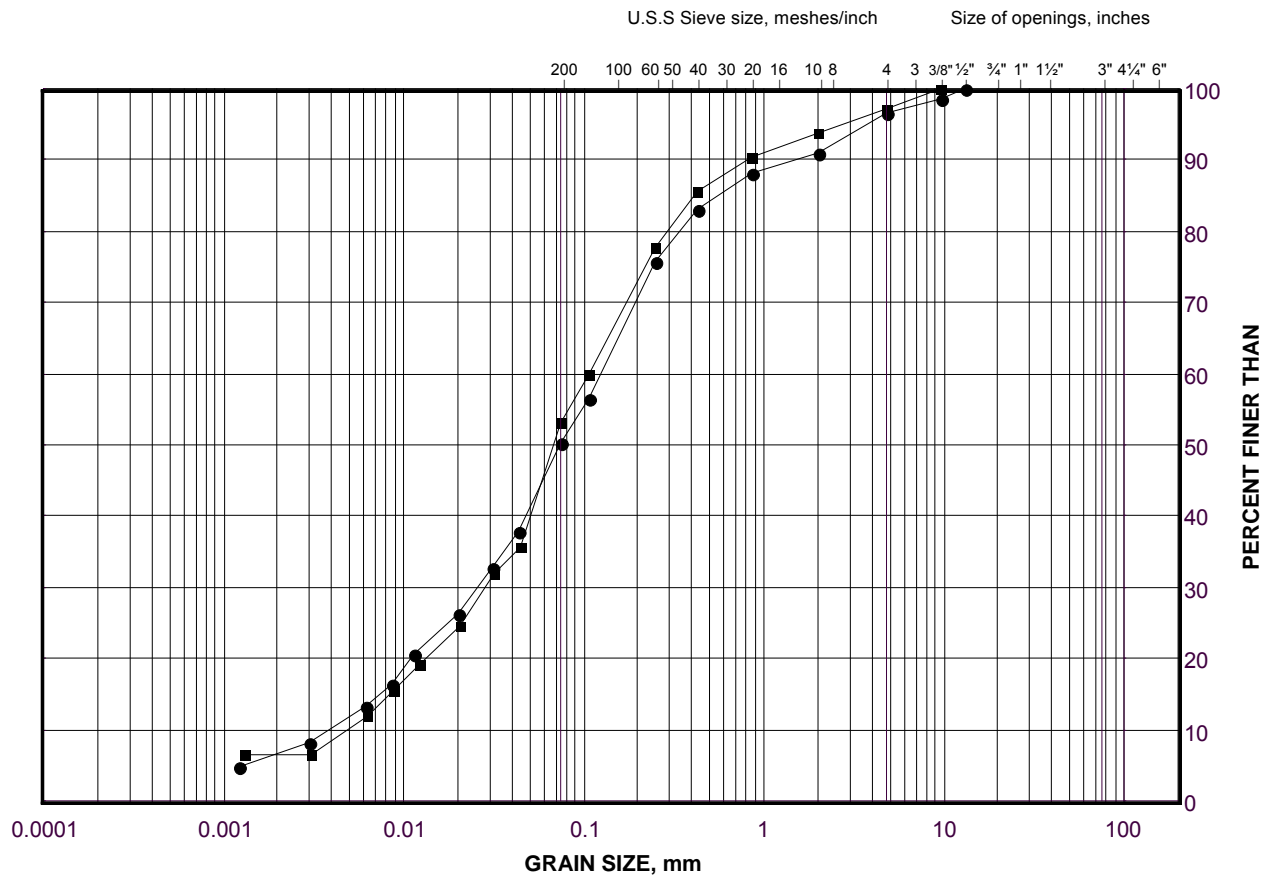
Golder Associates

Date: 30-Oct-13

GRAIN SIZE DISTRIBUTION

Silt and Sand Fill

FIGURE F1B



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

LEGEND

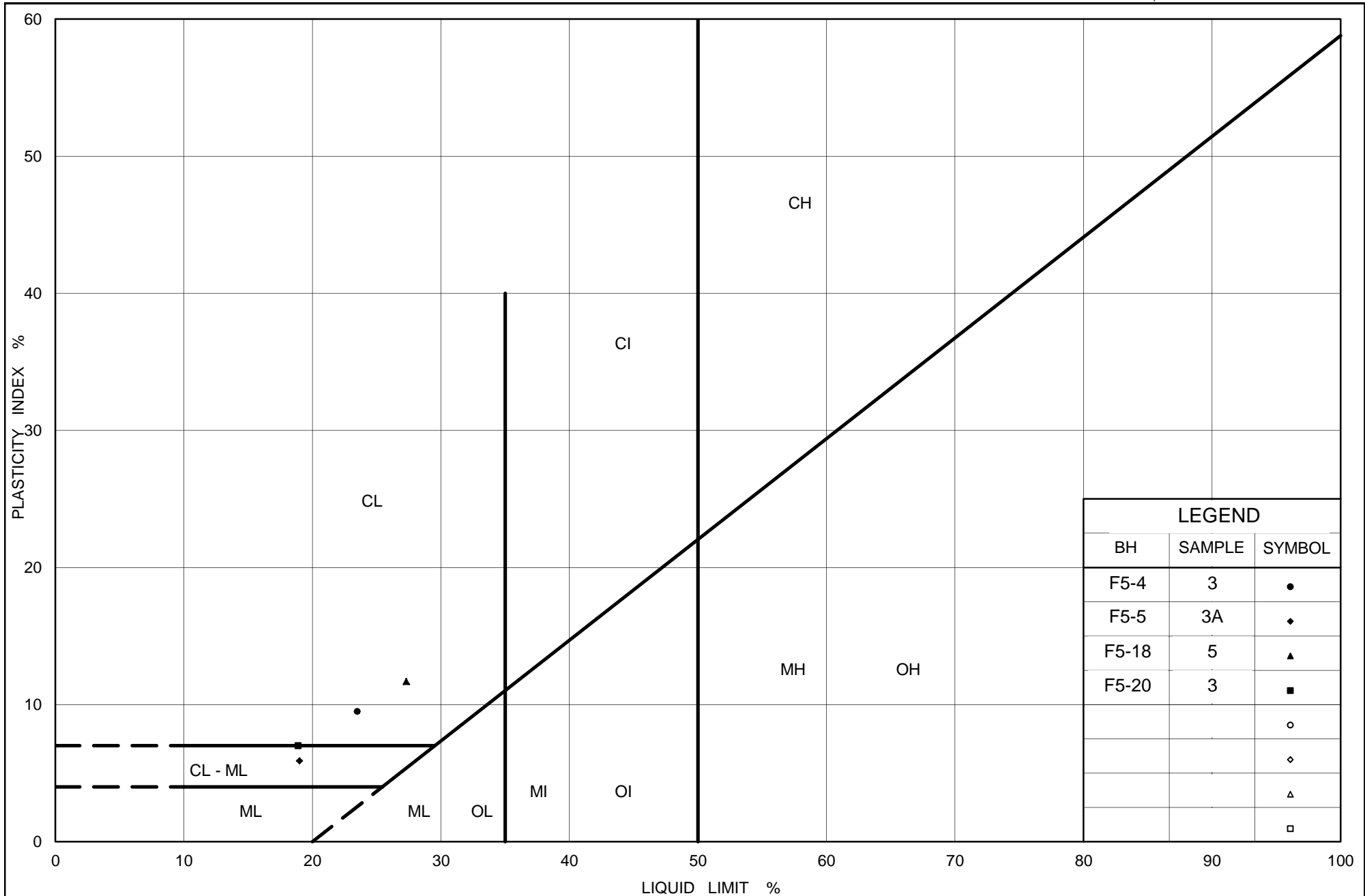
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C41-2	5	280.3
■	F5-14	5	276.1

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 30-Oct-13



Ministry of Transportation

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PLASTICITY CHART

Clayey Silt Fill

Figure No. F2

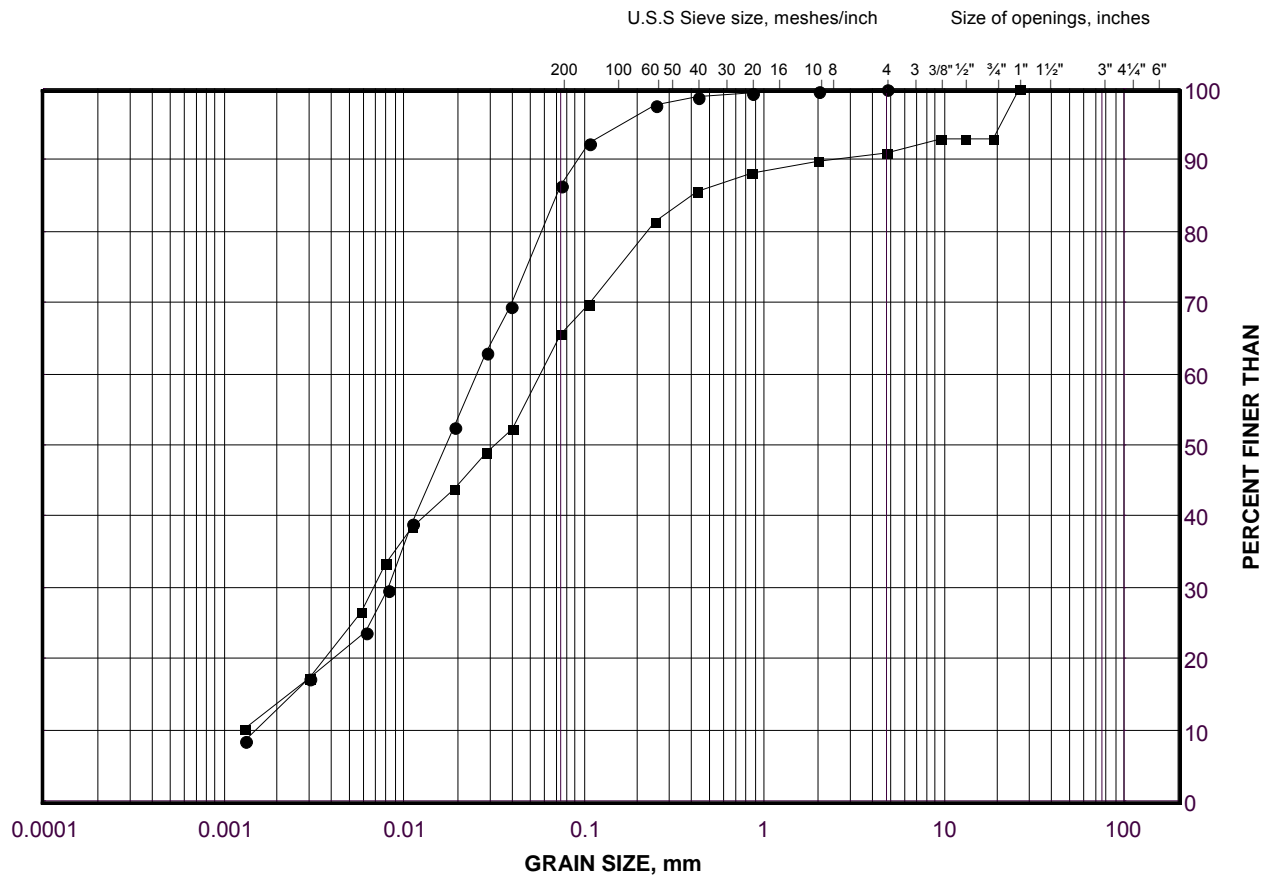
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Clayey Silt

FIGURE F3



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

LEGEND

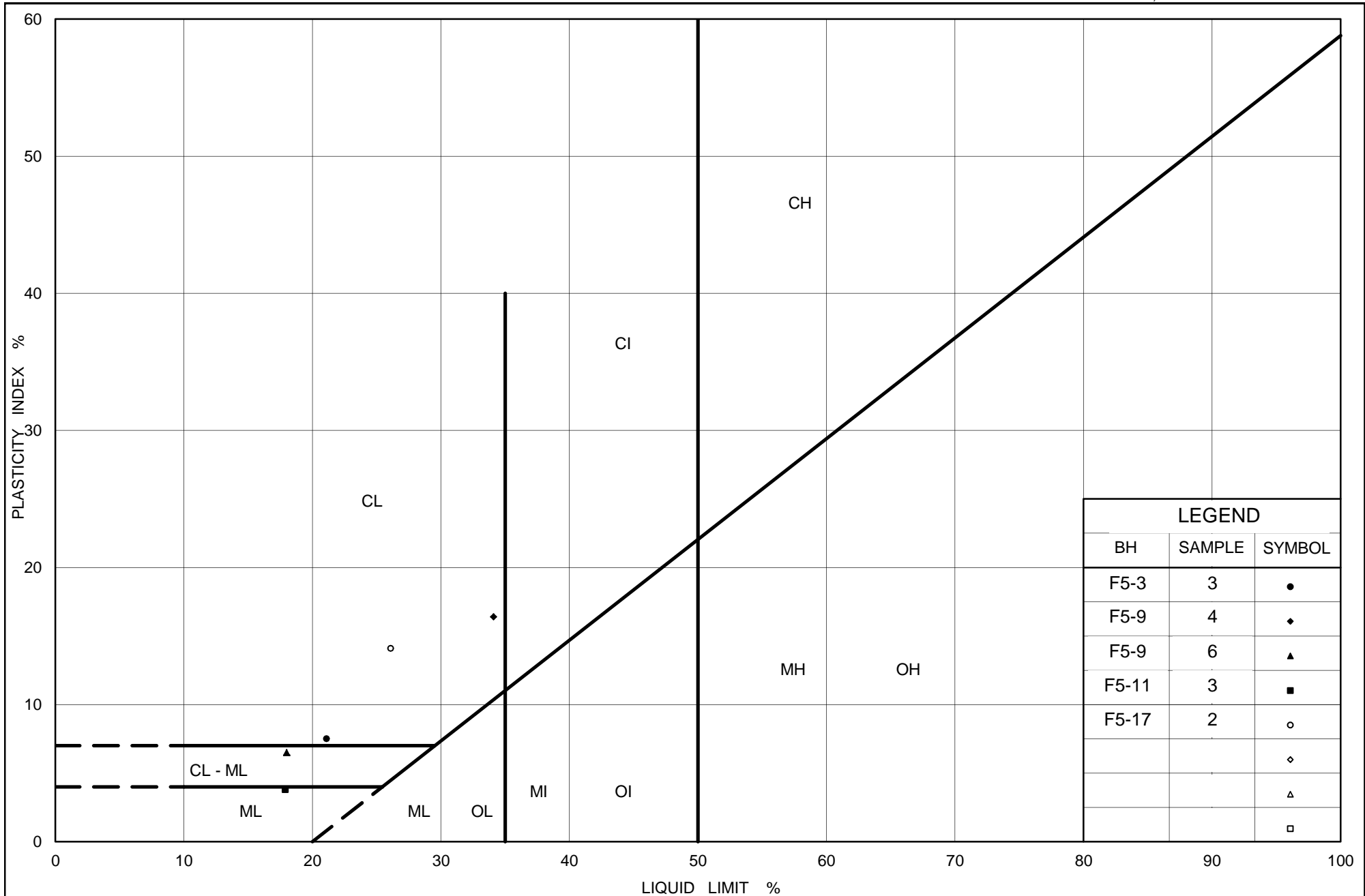
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F5-11	3	277.2
■	F5-9	6	269.5

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Date: 30-Oct-13



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PLASTICITY CHART

Clayey Silt

Figure No. F4

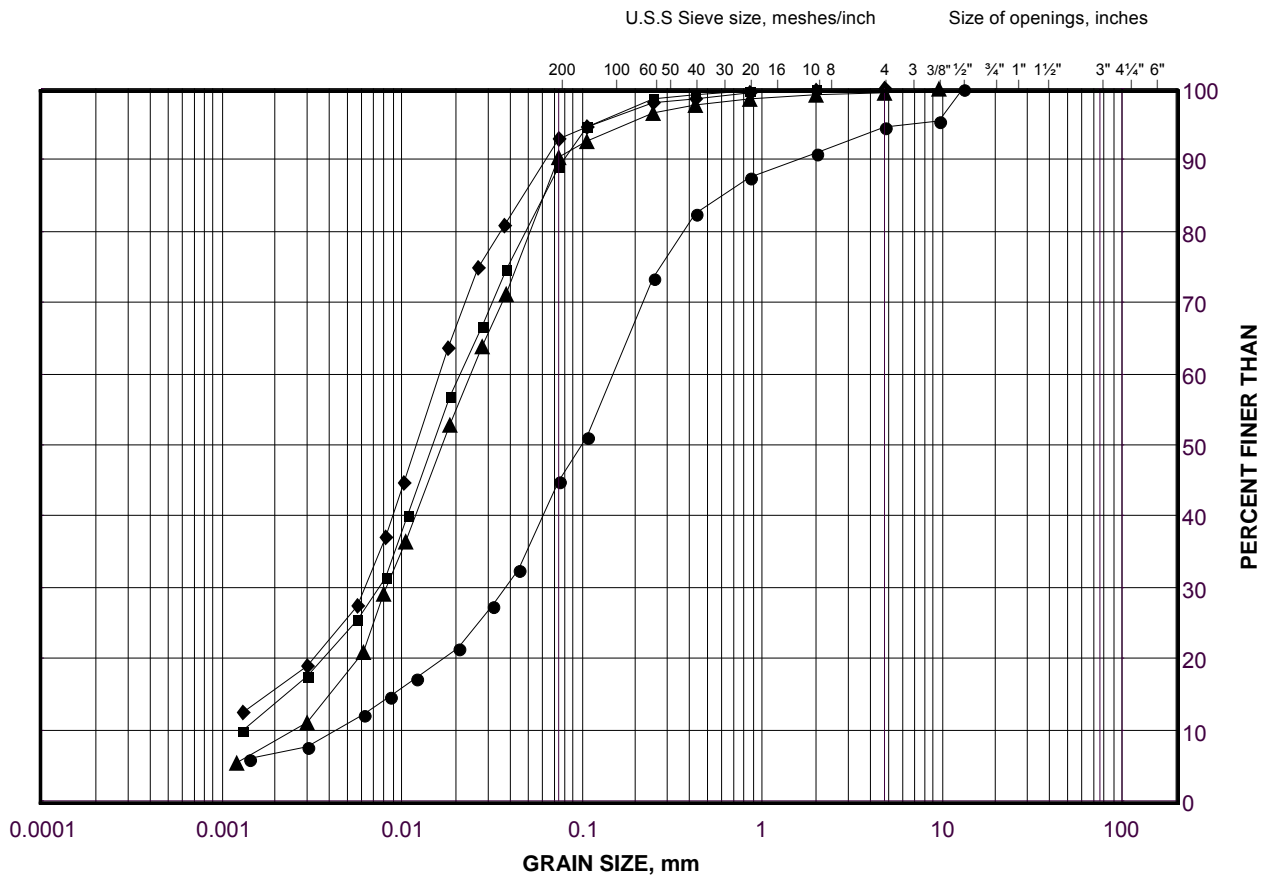
Project No. 09-1111-0018

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GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

FIGURE F5



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

LEGEND

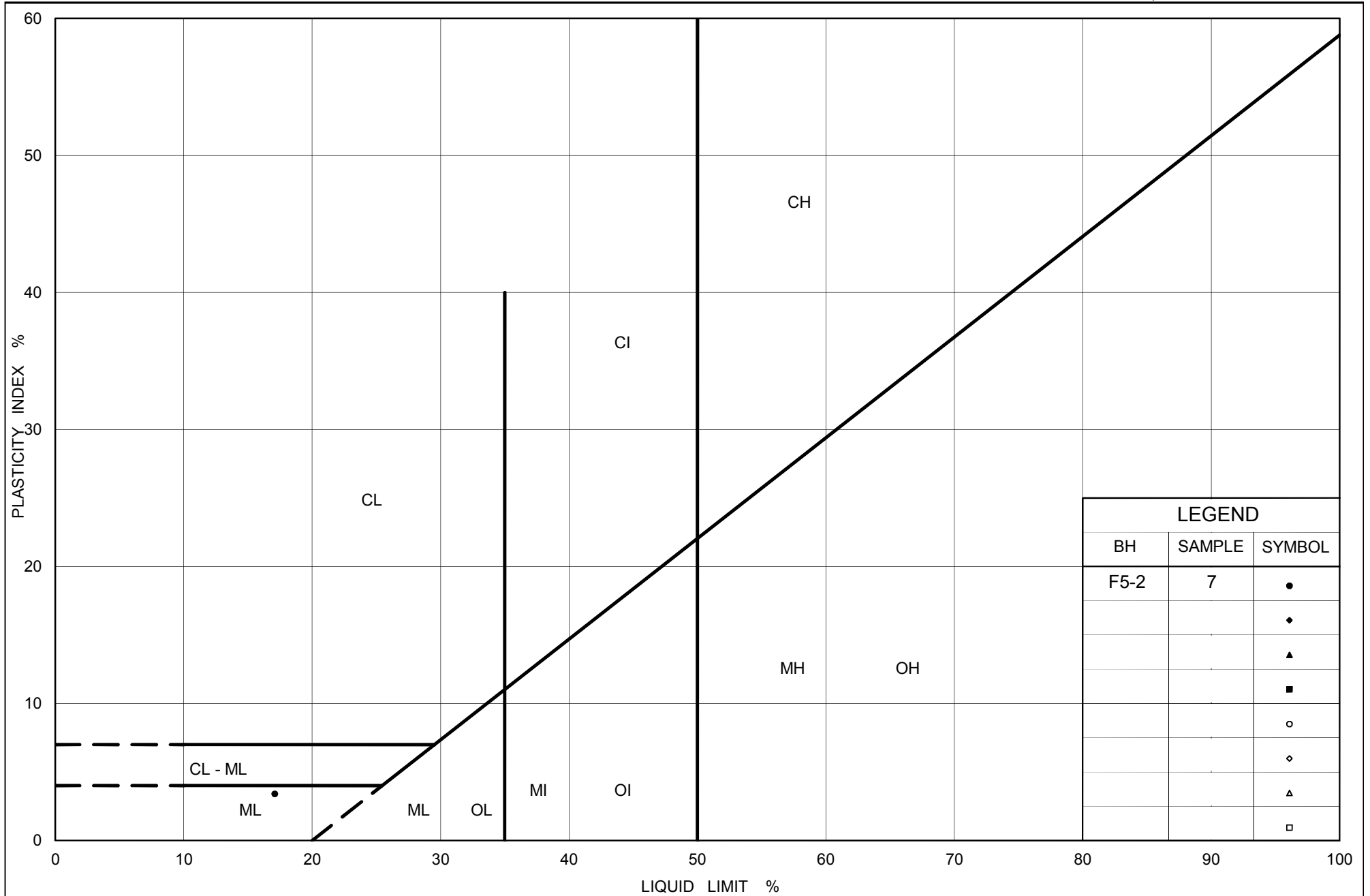
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F5-12	2	276.5
■	F5-3	4	270.3
◆	F5-21	4	266.9
▲	C41-3	8	277.0

Project Number: 09-1111-0018

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Golder Associates

Date: 30-Oct-13



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PLASTICITY CHART

Silt and Sand

Figure No. F6

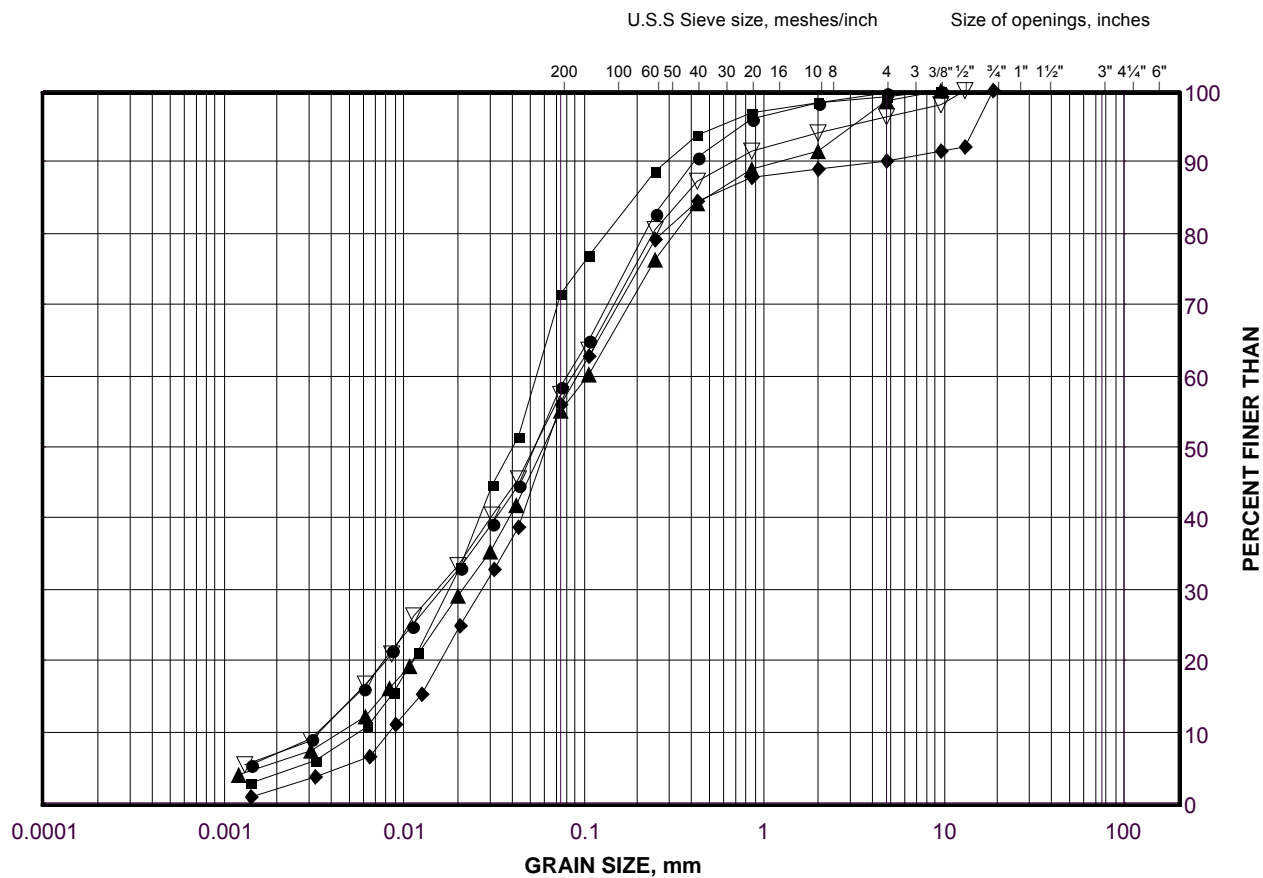
Project No. 09-1111-0018

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GRAIN SIZE DISTRIBUTION

Sandy Silt to Silt and Sand Till

FIGURE F7



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C41-4	3	277.8
■	C41-1	3	278.8
◆	F5-11	5	275.7
▲	C41-2	7	278.0
▽	C41-1	7	275.9

Project Number: 09-1111-0018

Checked By: TWB

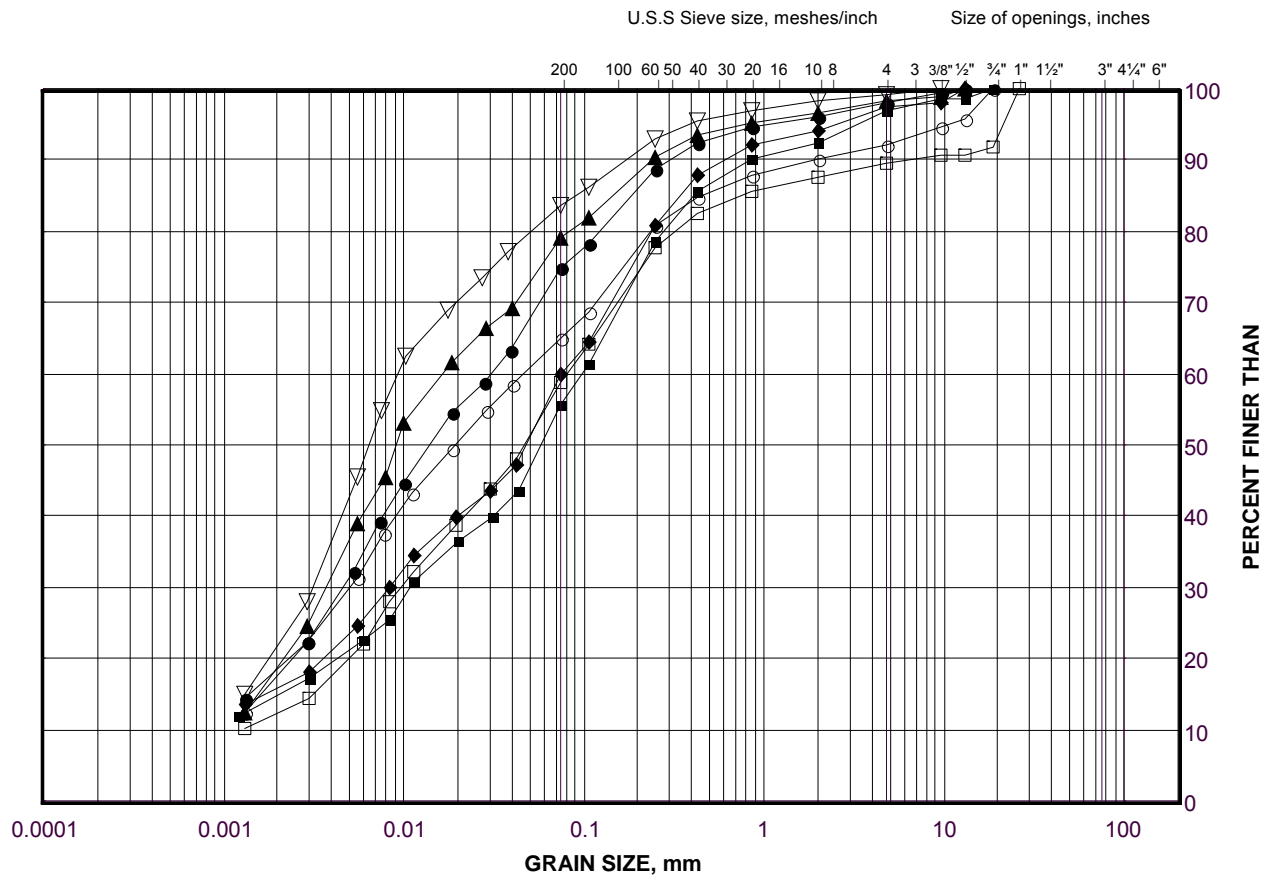
Golder Associates

Date: 30-Oct-13

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE F8A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F5-6	10	266.6
■	C41-2	10	273.7
◆	C41-3	11	272.4
▲	F5-8	3	269.7
▽	F5-16	3	272.2
○	F5-13	3	274.7
□	F5-1	3	275.3

Project Number: 09-1111-0018

Checked By: TWB

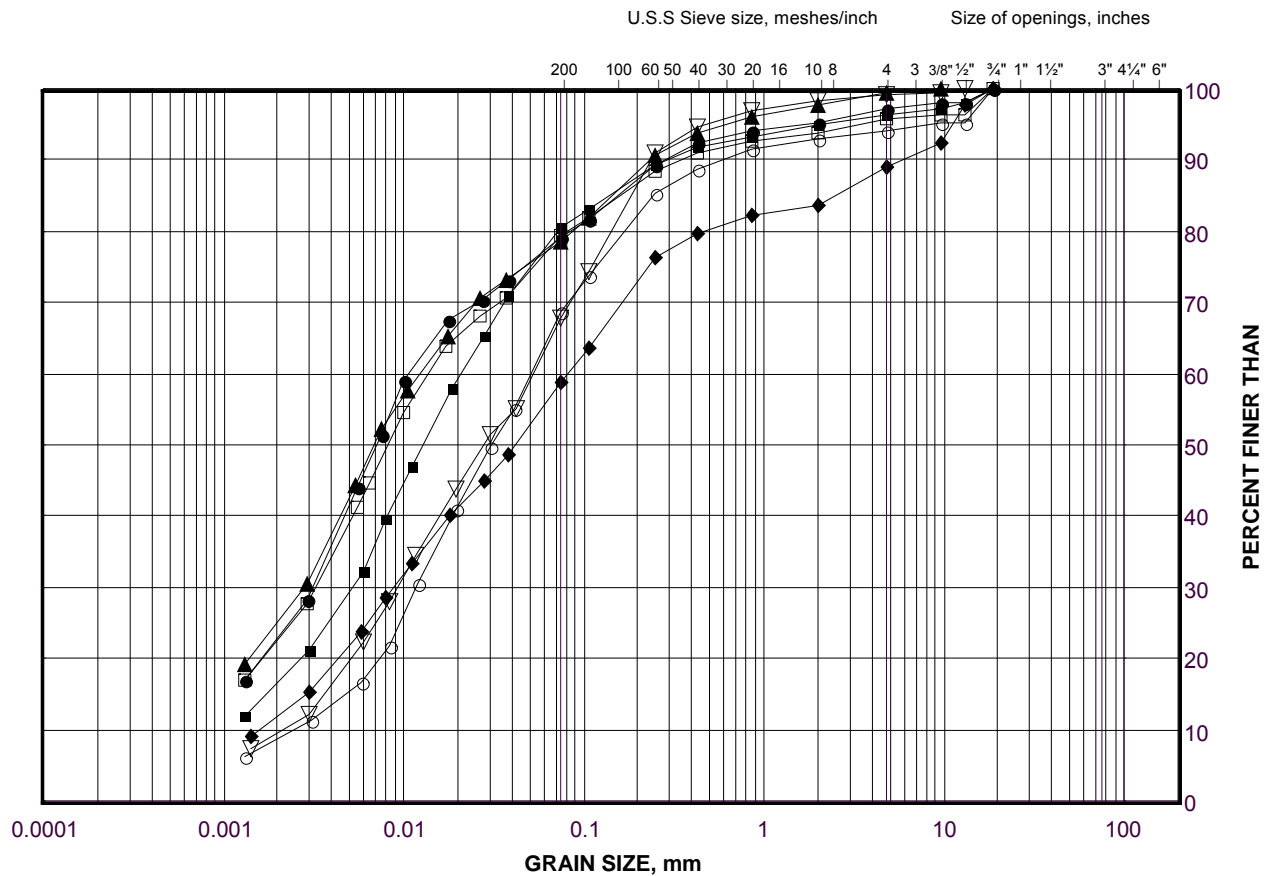
Golder Associates

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GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE F8B



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F5-17	3	271.0
■	F5-7	3	270.0
◆	F5-10	3A	268.8
▲	F5-5	4	270.4
▽	F5-12	4	275.0
○	F5-15	4	272.4
□	F5-8	5	268.2

Project Number: 09-1111-0018

Checked By: TWB

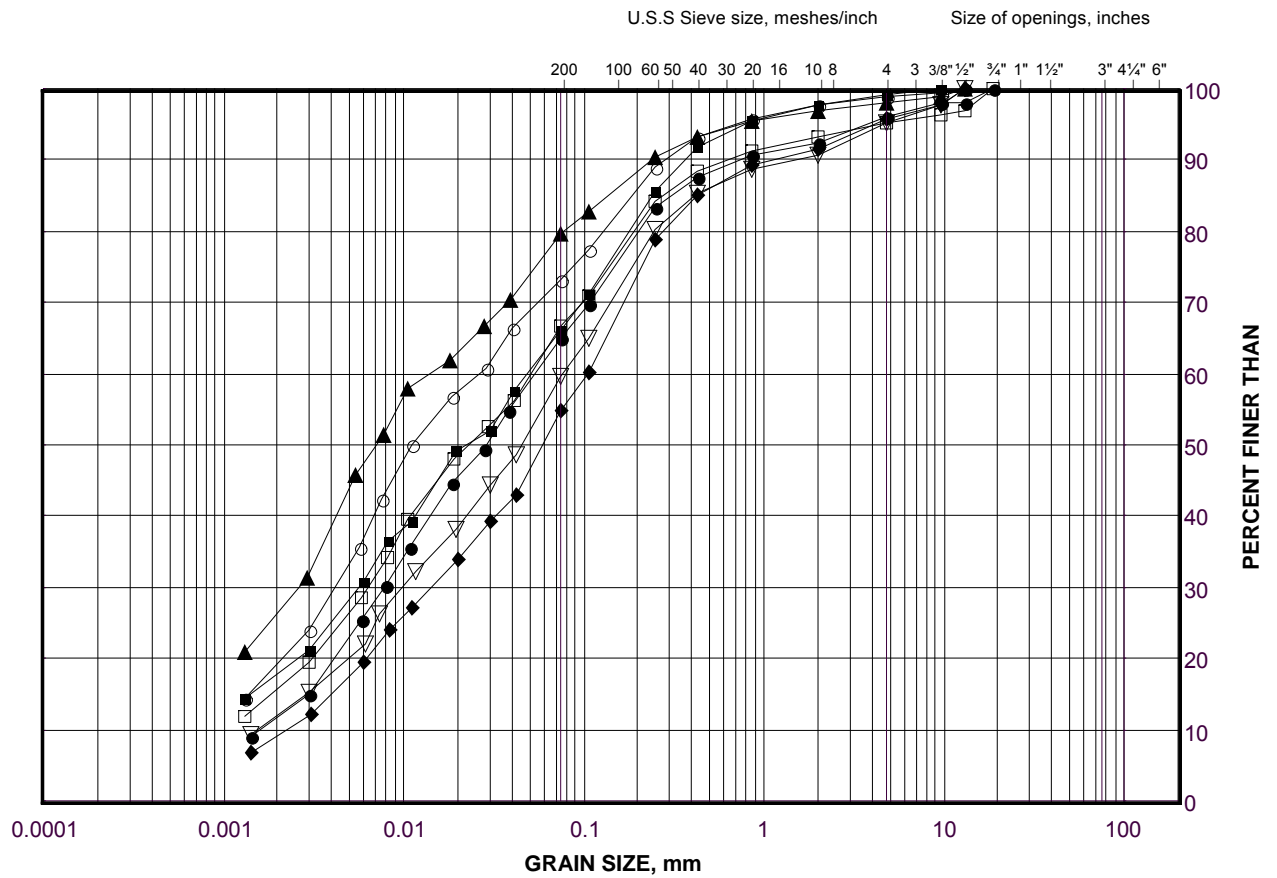
Golder Associates

Date: 31-Oct-13

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE F8C



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F5-13	5	273.1
■	C41-4	5	276.2
◆	F5-10	5	267.1
▲	F5-4	5	269.8
▽	F5-7	6	267.7
○	F5-3	6	268.8
□	F5-19	6	267.4

Project Number: 09-1111-0018

Checked By: TWB

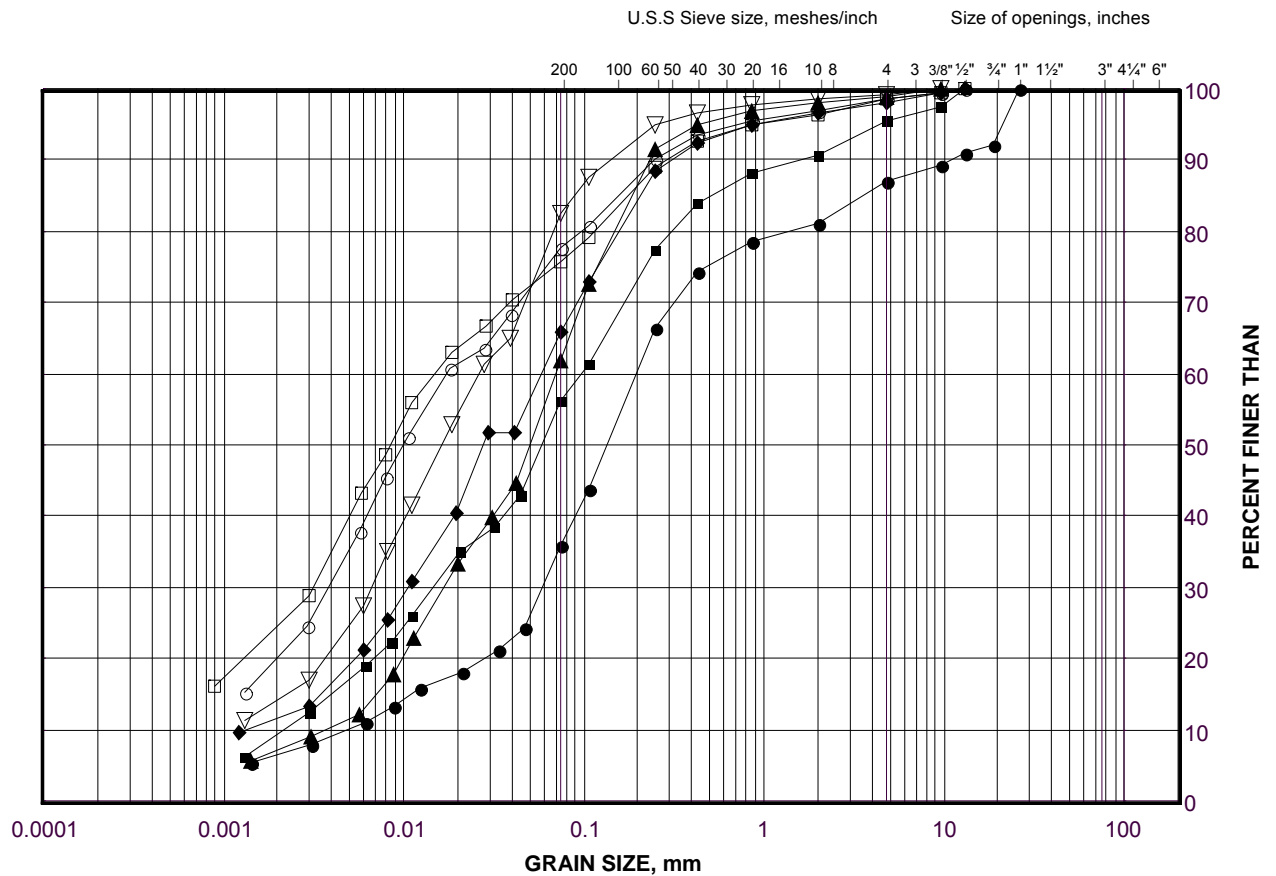
Golder Associates

Date: 31-Oct-13

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE F8D



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F5-1	6	273.0
■	F5-15	6	270.9
◆	F5-20	6	267.9
▲	F5-20	7	266.4
▽	F5-12	7	272.8
○	F5-6	7	271.1
□	F5-18	7	268.8

Project Number: 09-1111-0018

Checked By: TWB

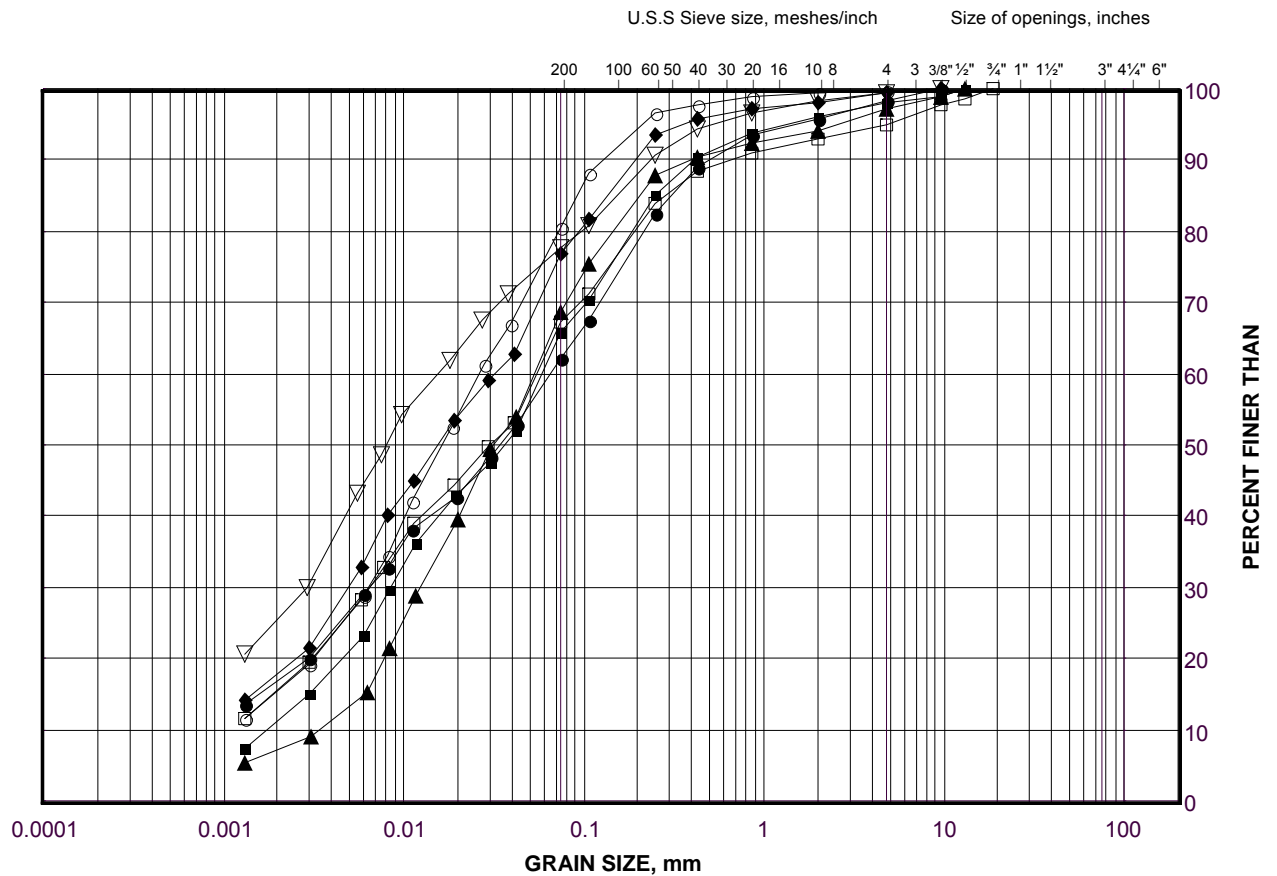
Golder Associates

Date: 31-Oct-13

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE F8E



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C41-4	7	274.7
■	F5-12	8	271.2
◆	F5-14	8	272.3
▲	F5-15	8	268.7
▽	F5-9	8	266.5
○	F5-13	8A	270.2
□	F5-2	9	272.6

Project Number: 09-1111-0018

Checked By: TWB

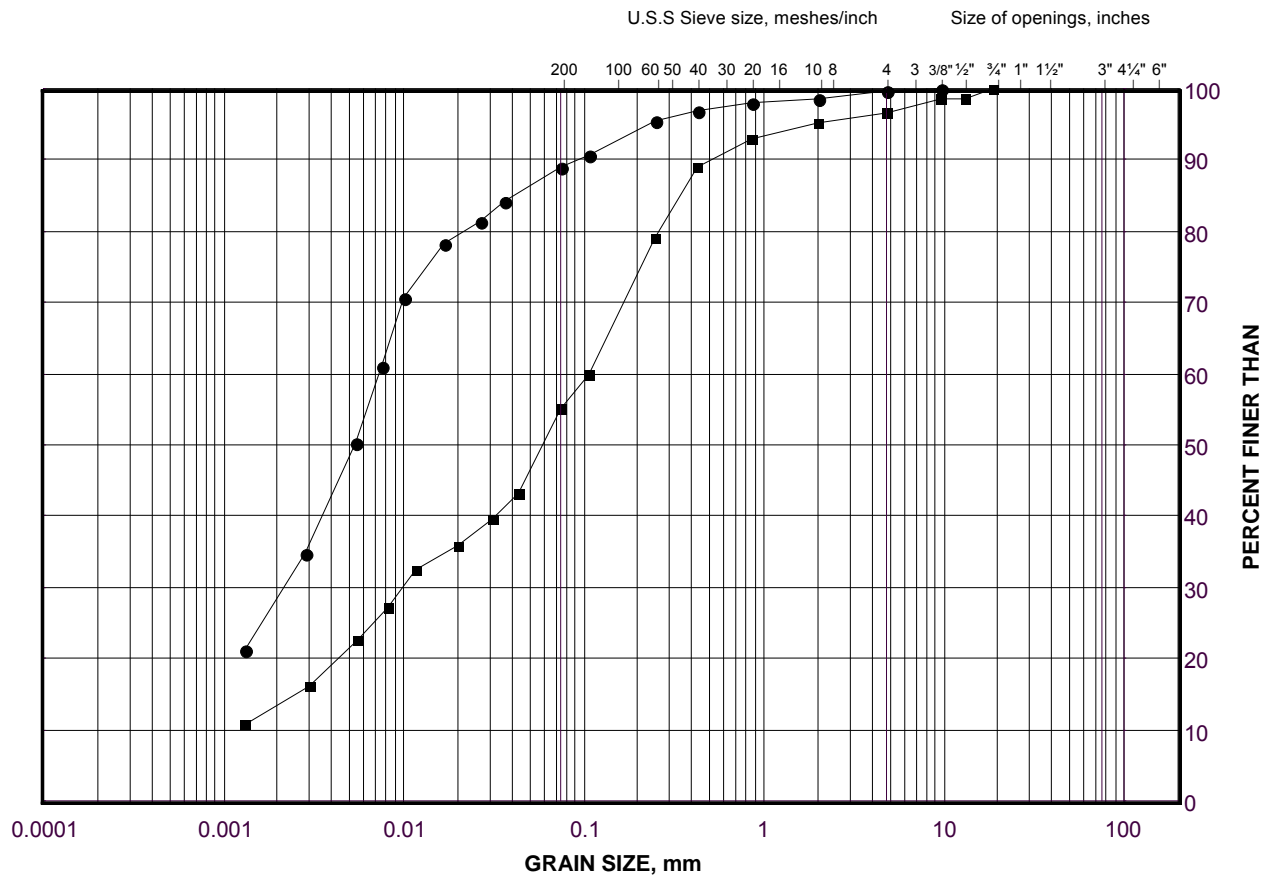
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Date: 31-Oct-13

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE F8F



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

LEGEND

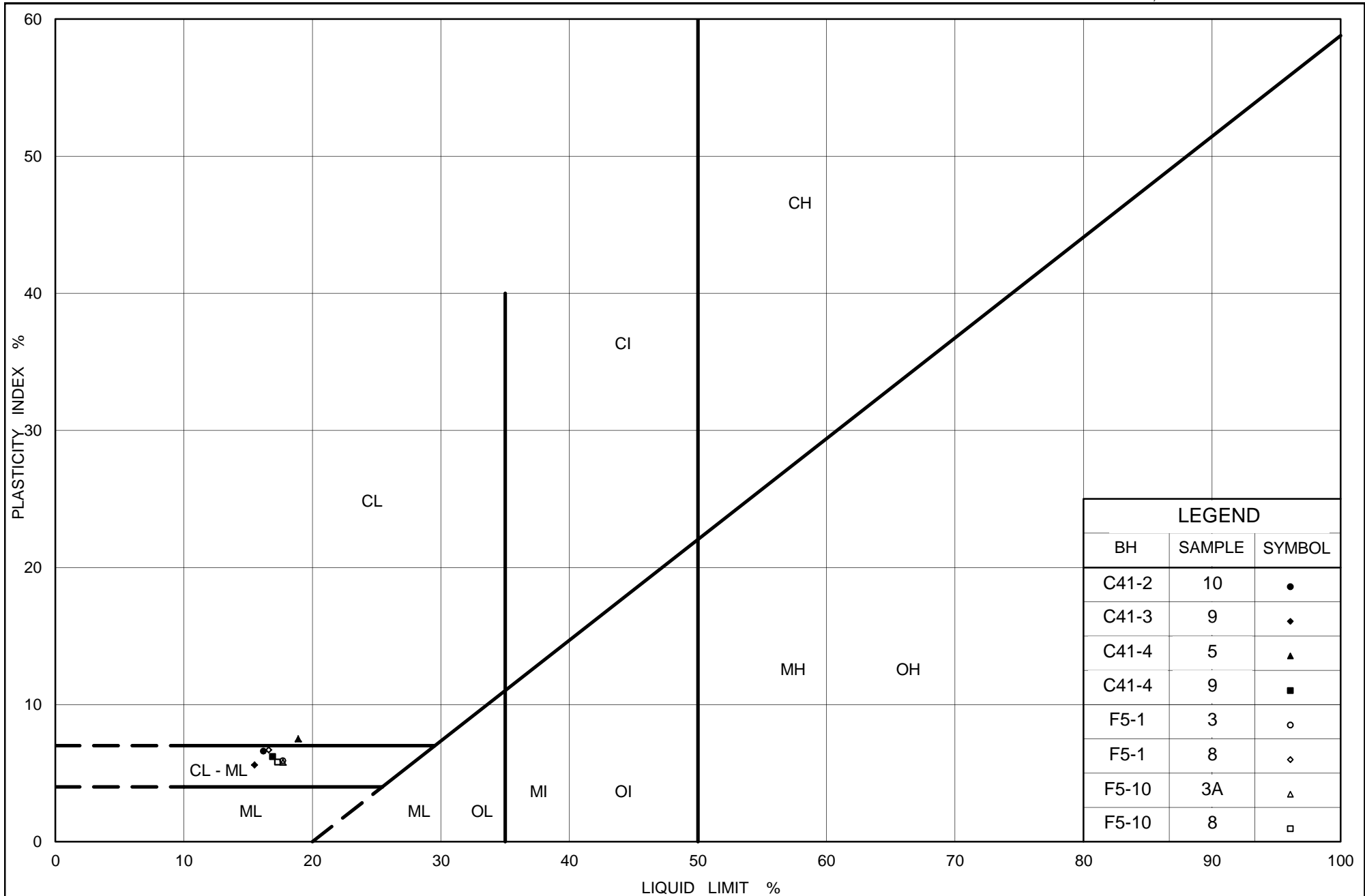
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F5-20	9	263.3
■	C41-3	9	275.5

Project Number: 09-1111-0018

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Date: 31-Oct-13



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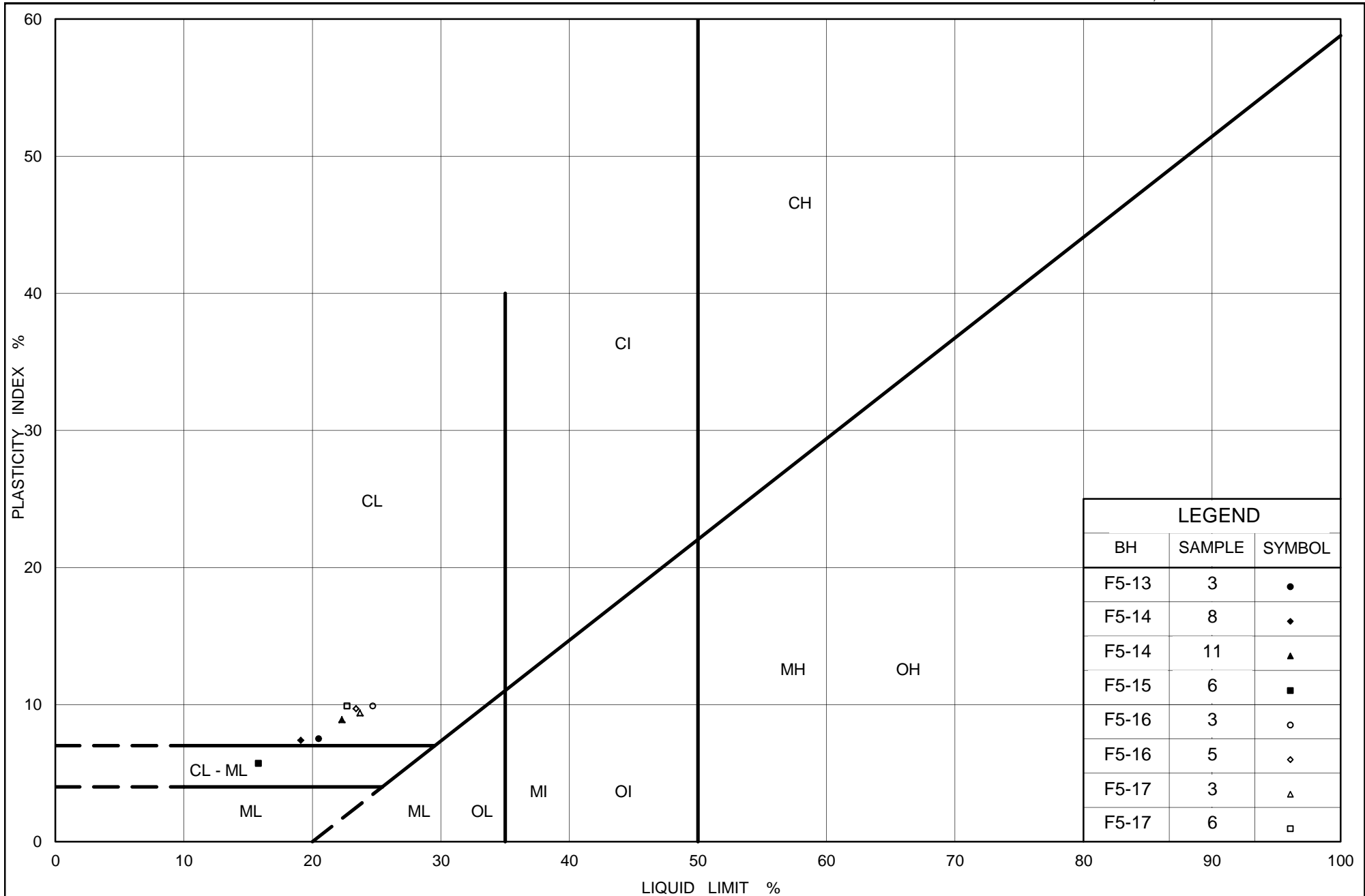
PLASTICITY CHART

Clayey Silt Till

Figure No. F9A

Project No. 09-1111-0018

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Ministry of Transportation

Ontario

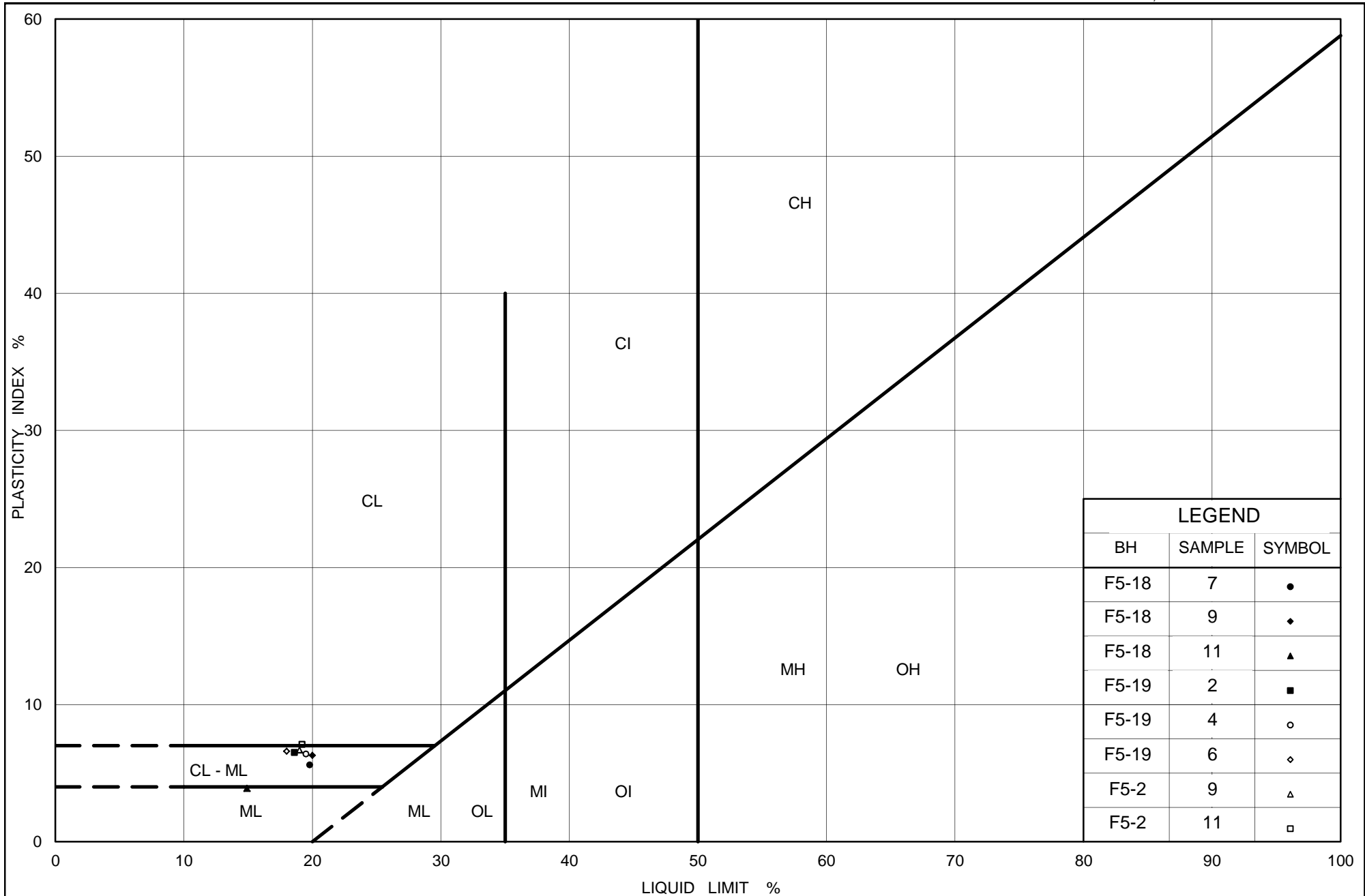
PLASTICITY CHART

Clayey Silt Till

Figure No. F9B

Project No. 09-1111-0018

Checked By: TWB



Ministry of Transportation

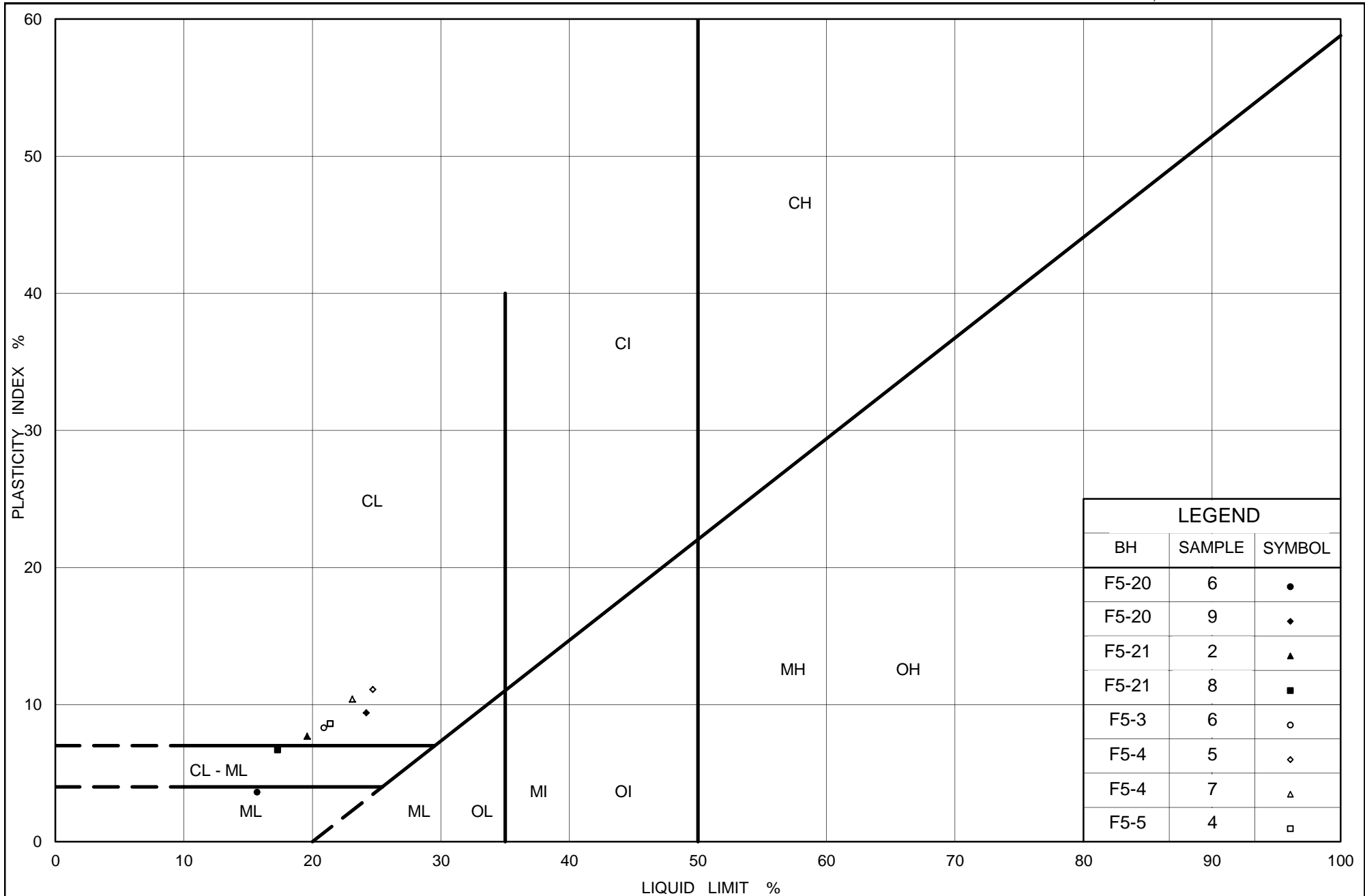
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PLASTICITY CHART Clayey Silt Till

Figure No. F9C

Project No. 09-1111-0018

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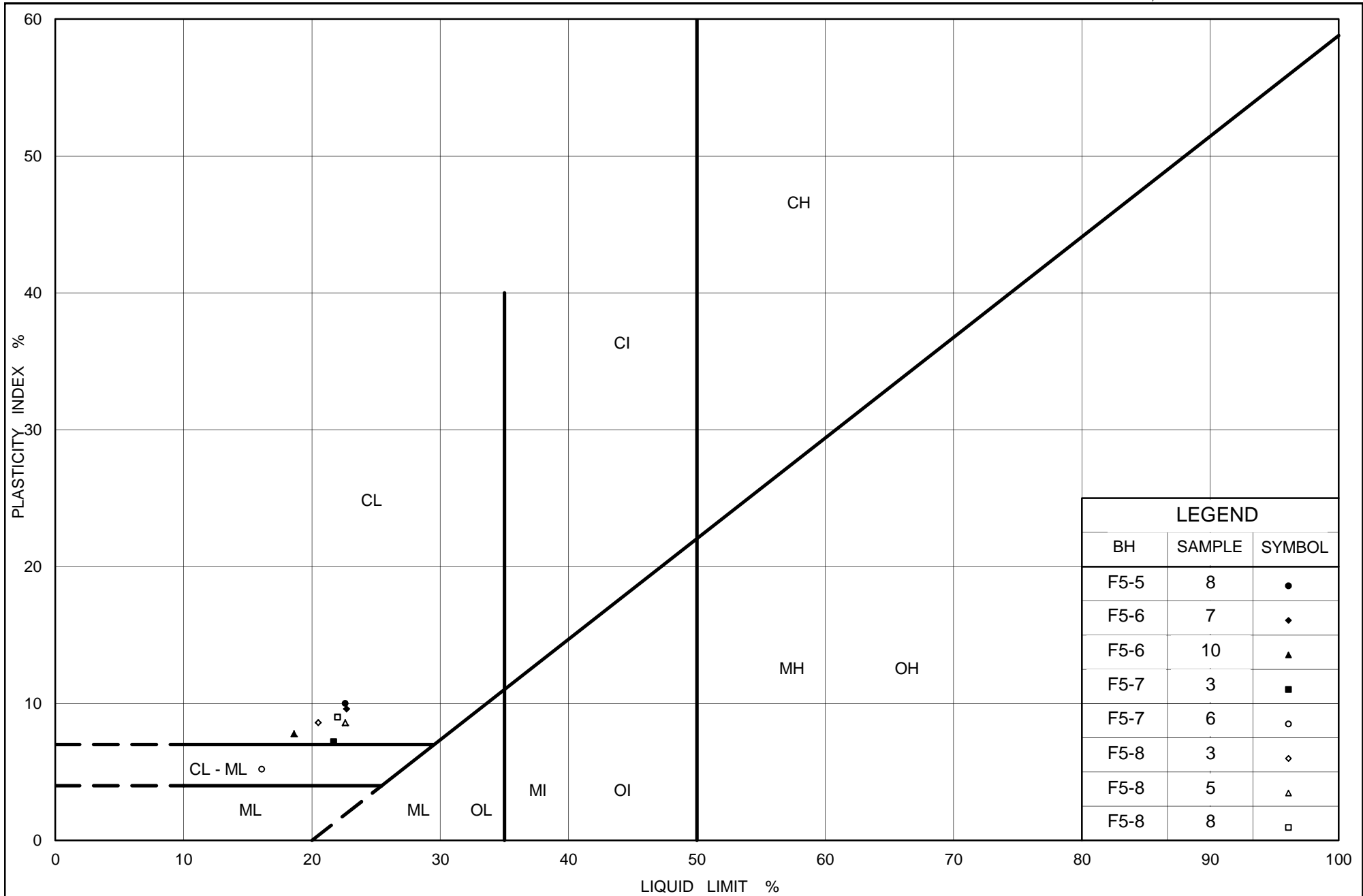
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PLASTICITY CHART Clayey Silt Till

Figure No. F9D

Project No. 09-1111-0018

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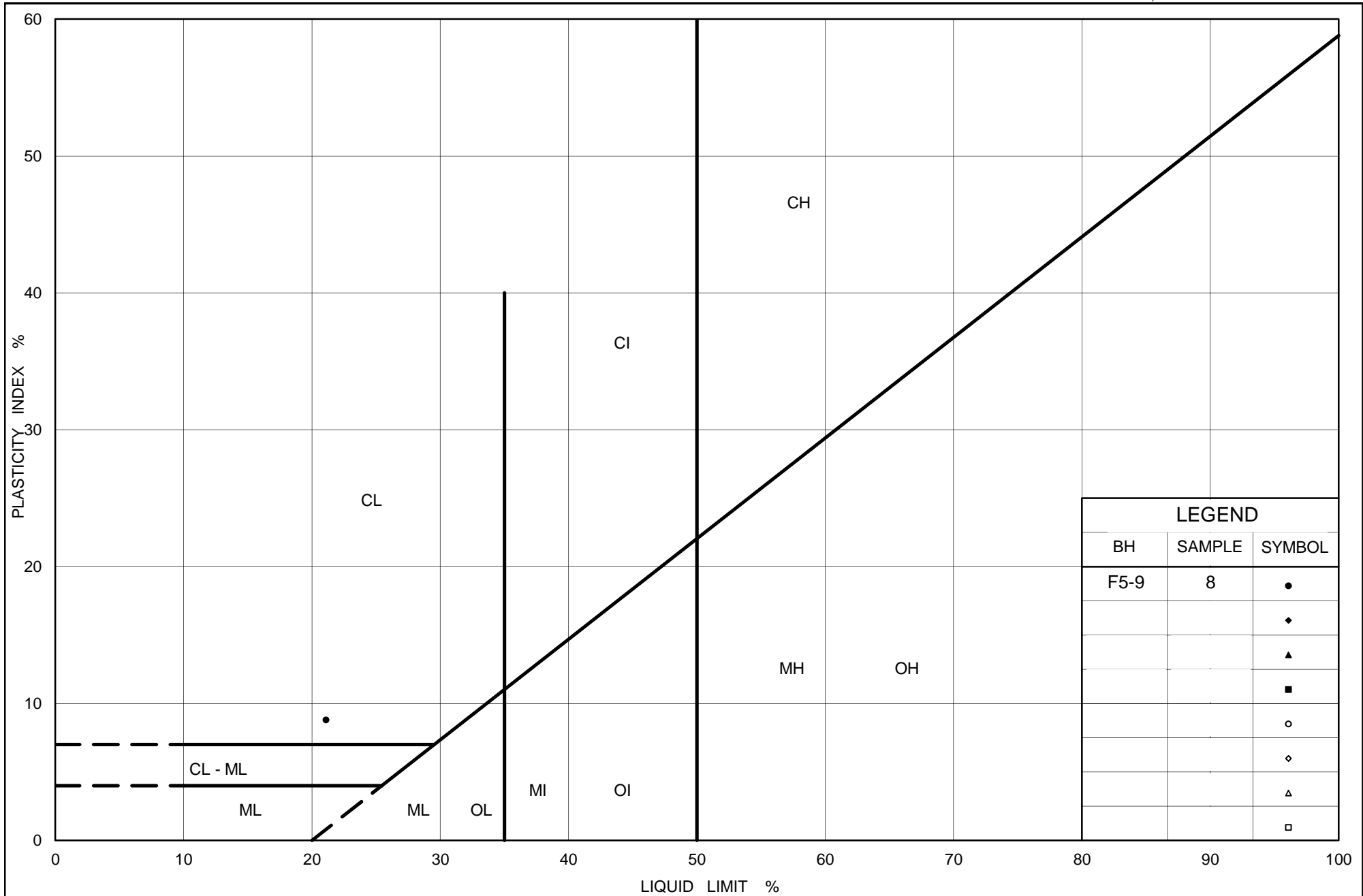
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PLASTICITY CHART Clayey Silt Till

Figure No. F9E

Project No. 09-1111-0018

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LEGEND		
BH	SAMPLE	SYMBOL
F5-9	8	•
		◆
		▲
		■
		○
		◇
		△
		□



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PLASTICITY CHART

Clayey Silt Till

Figure No. F9F

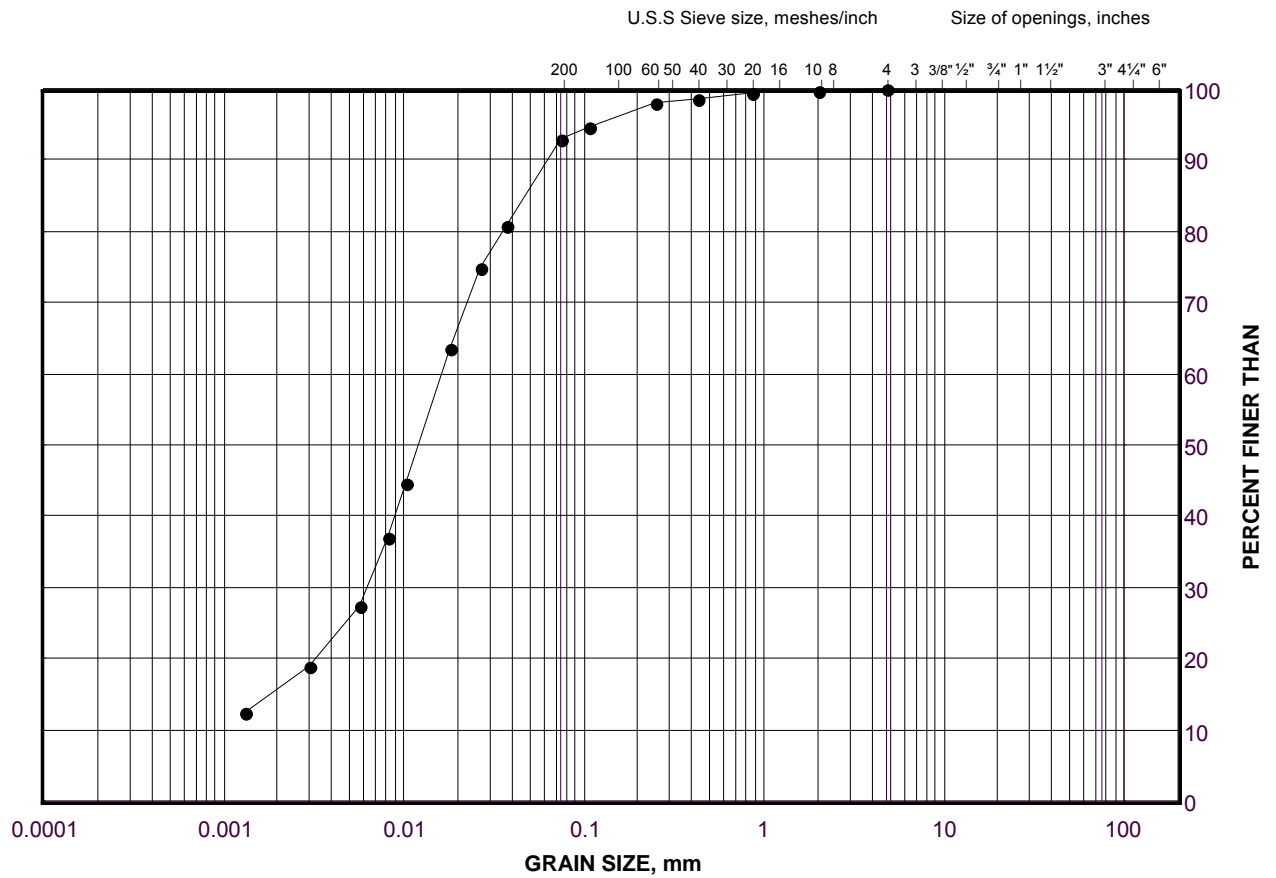
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Silt Interlayer

FIGURE F10



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

LEGEND

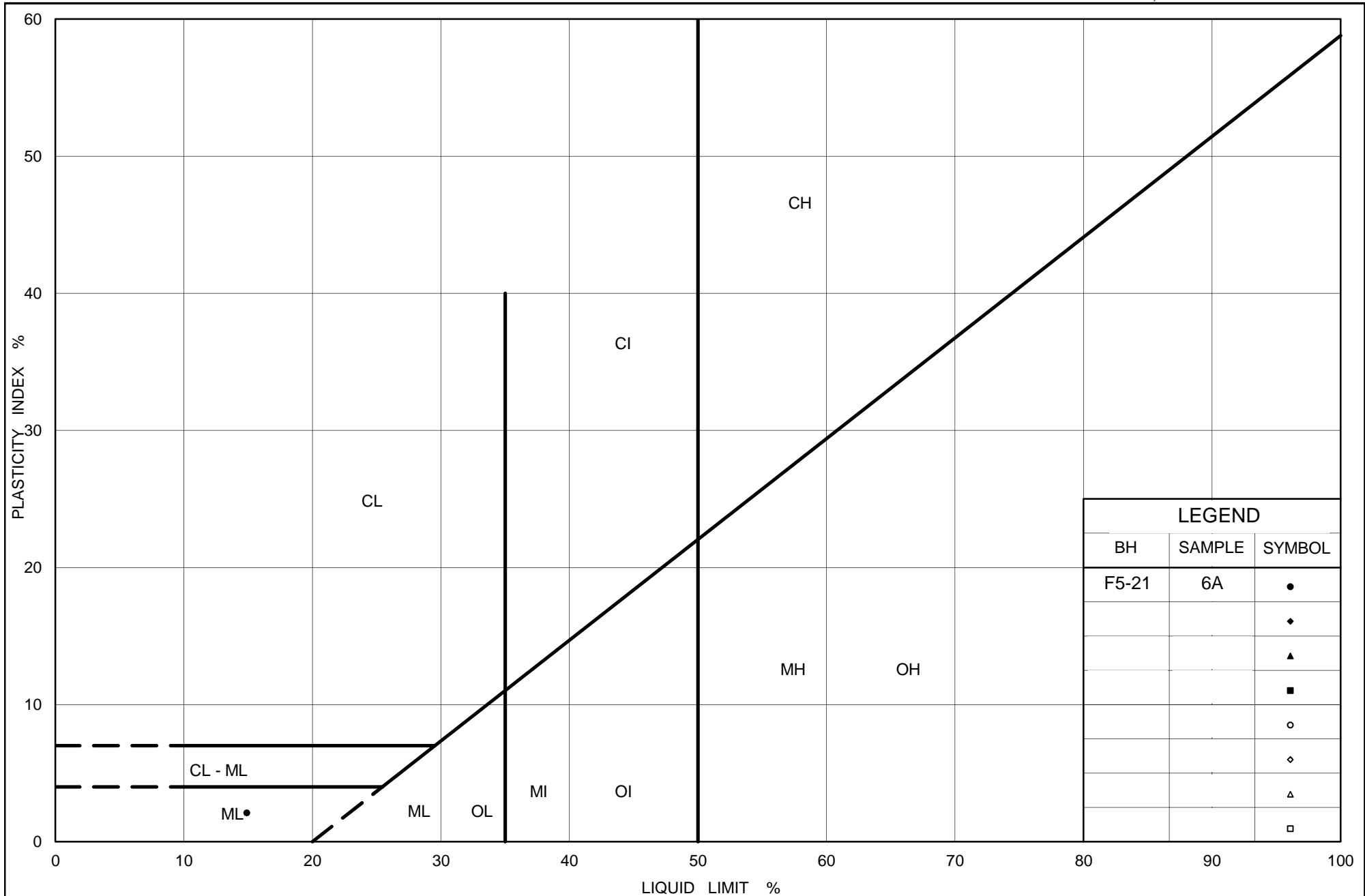
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F5-21	4	266.9

Project Number: 09-1111-0018

Checked By: TWB

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Date: 31-Oct-13



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PLASTICITY CHART Sand and Silt Till Interlayer

Figure No. F11

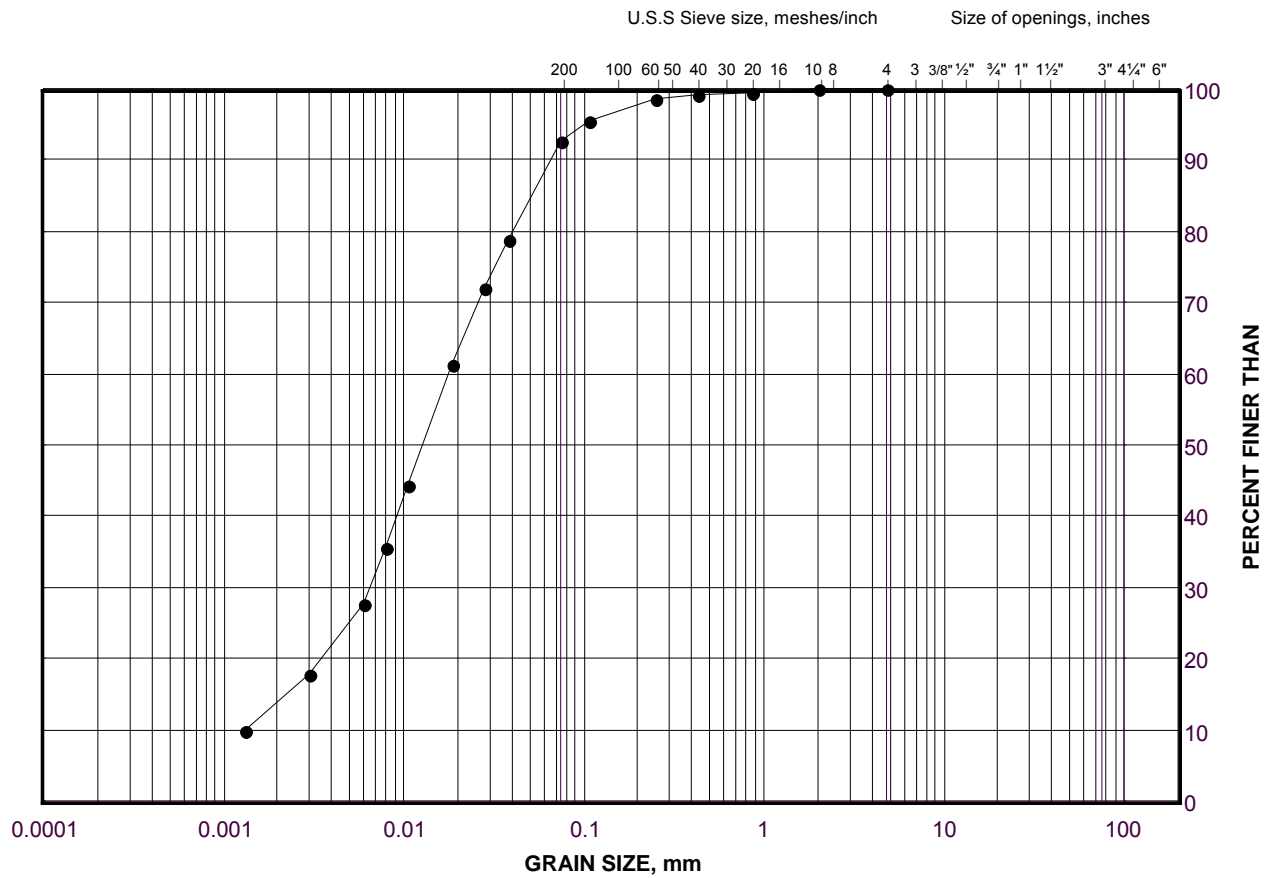
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Lower Clayey Silt

FIGURE F12



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

LEGEND

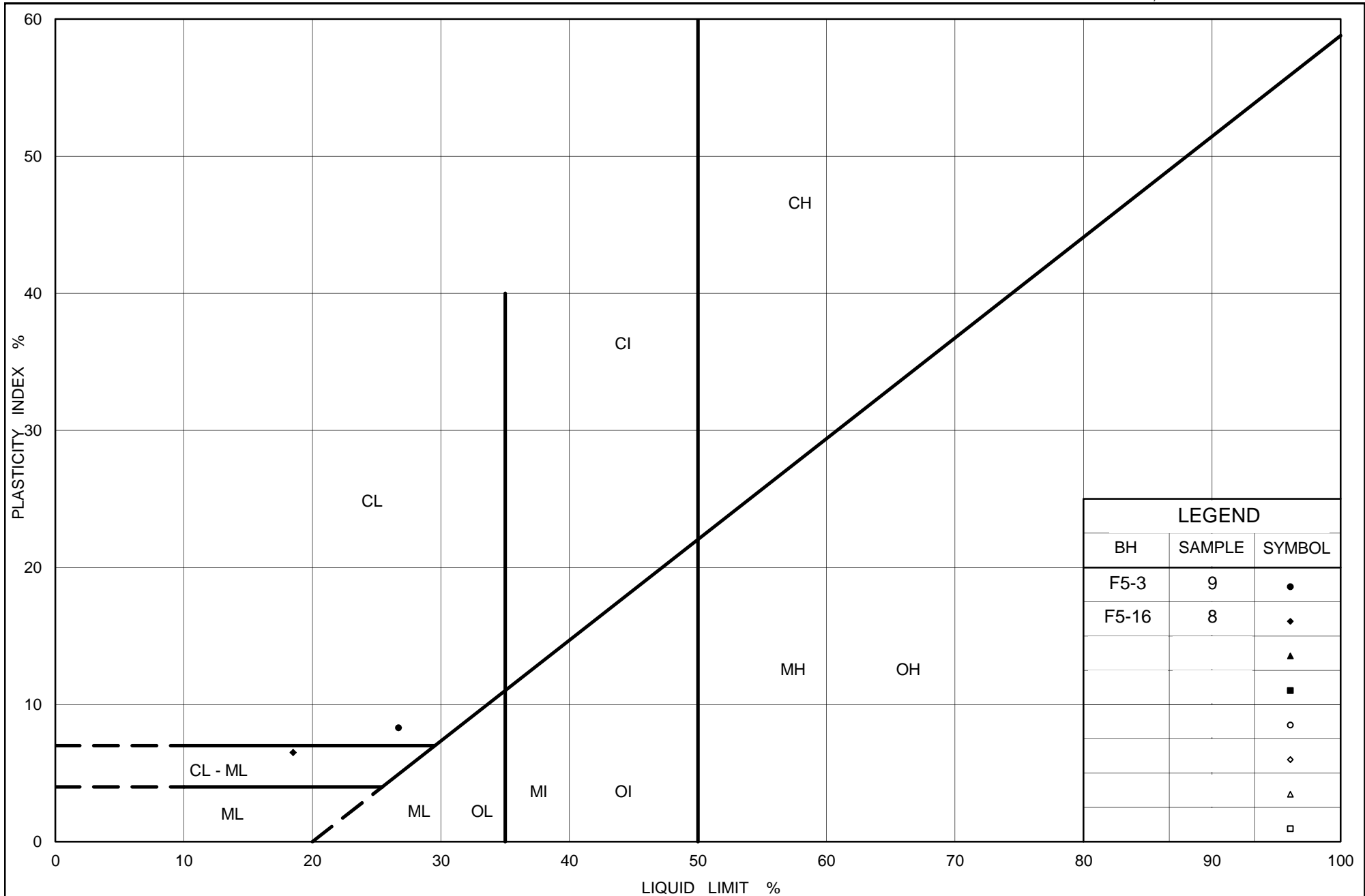
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F5-16	7B	268.9

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 31-Oct-13



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PLASTICITY CHART Lower Clayey Silt

Figure No. F13

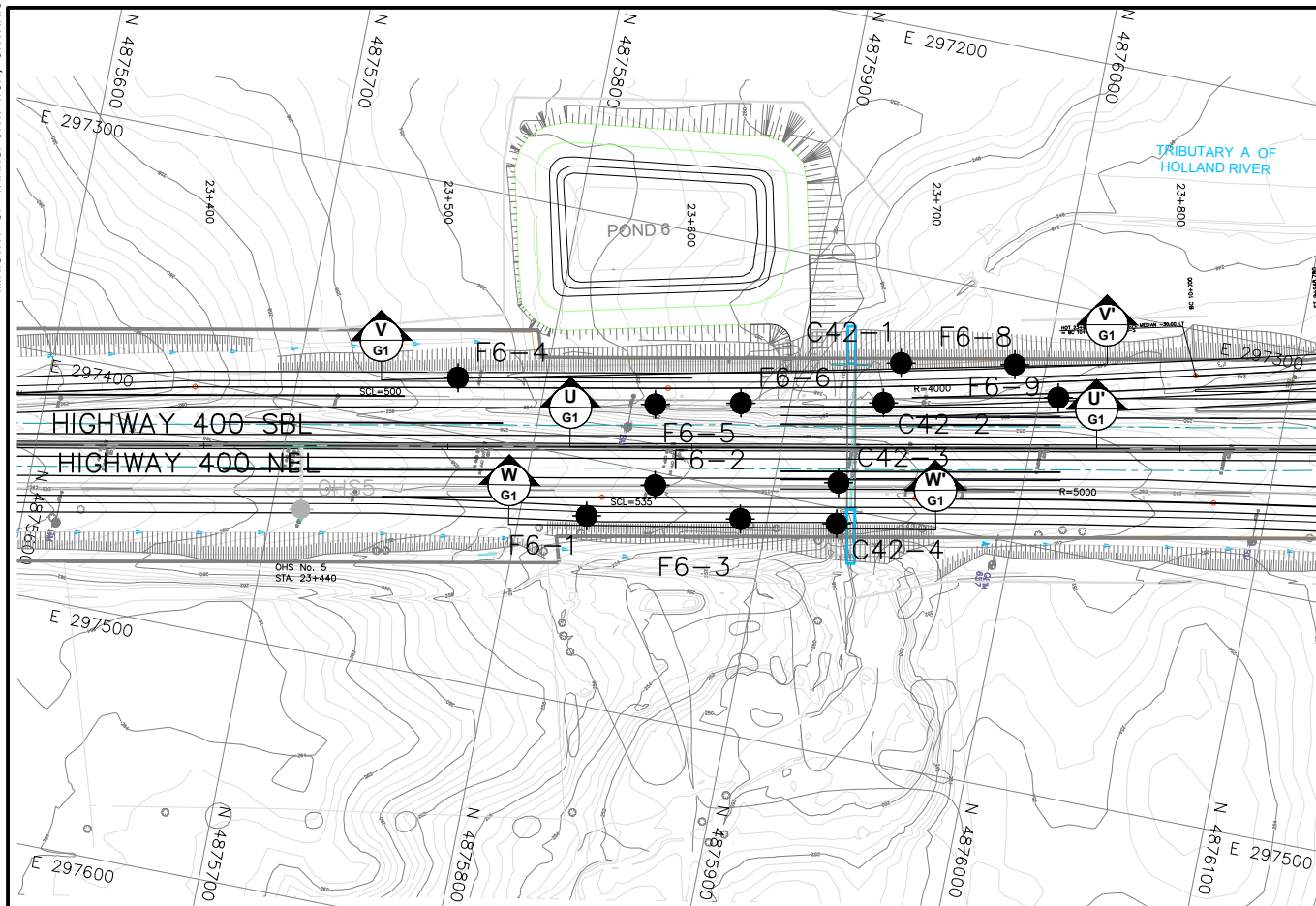
Project No. 09-1111-0018

Checked By: TWB



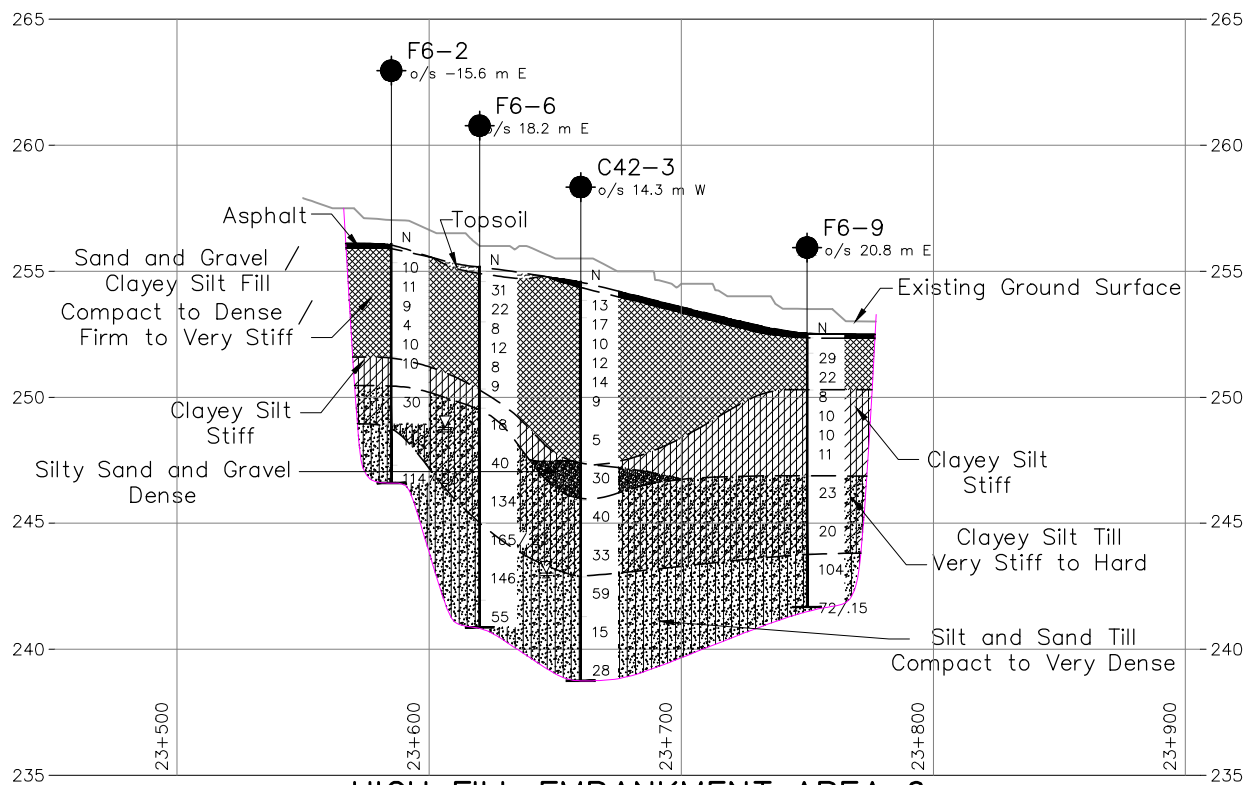
APPENDIX G

**HIGH FILL EMBANKMENT AREA 6 (Stations 23+450 to 23+650
NBL and Stations 23+450 to 23+750 SBL)**



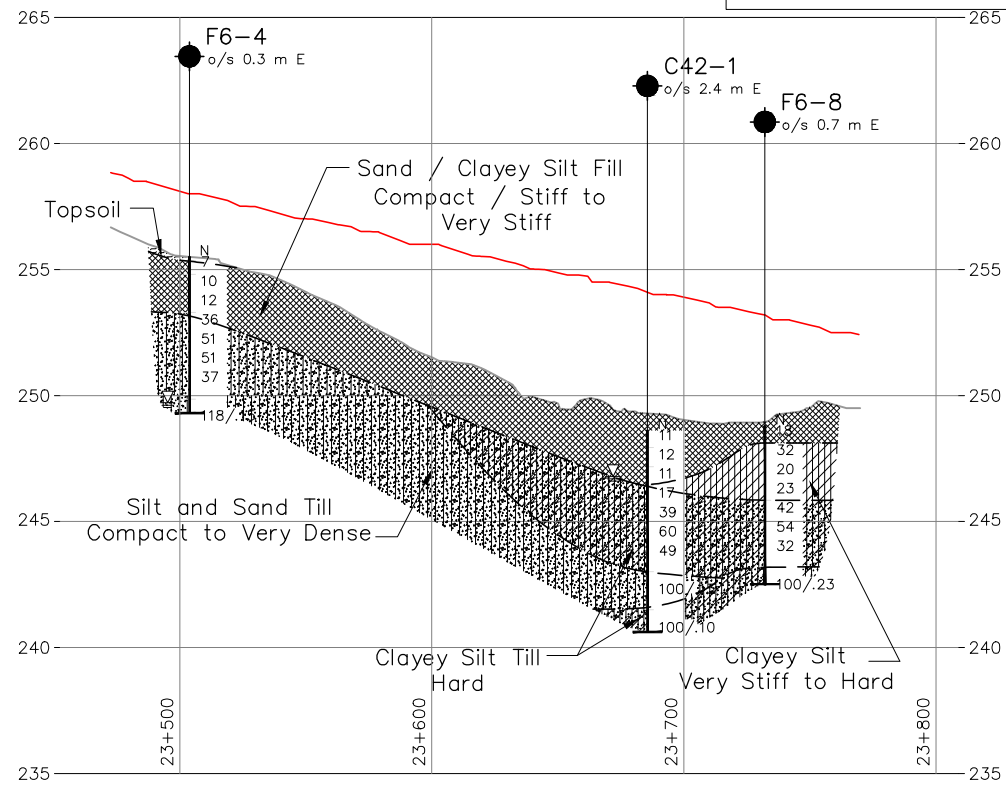
PLAN

SCALE
 0 30 60 m



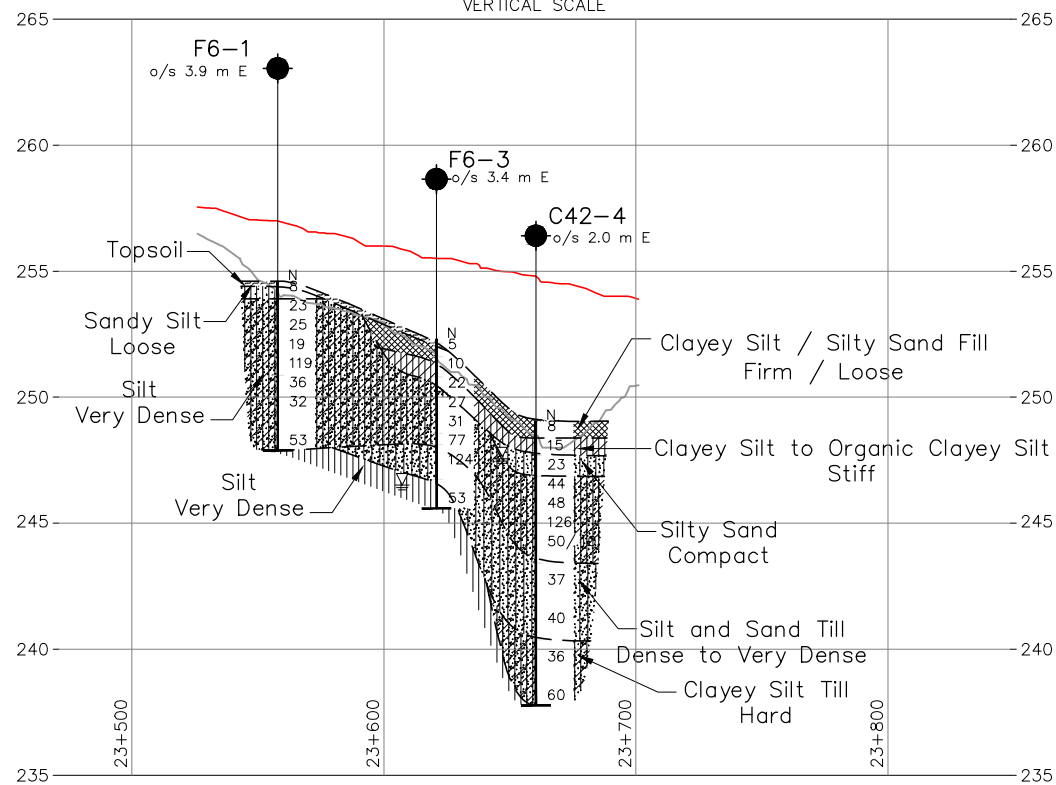
HIGH FILL EMBANKMENT AREA 6 -
 CENTRELINE PROFILE
 (STATION 23+450 to 23+750)

HORIZONTAL SCALE
 0 30 60 m
 VERTICAL SCALE
 3 6 m



HIGH FILL EMBANKMENT AREA 6 - SBL TOE PROFILE
 (STATION 23+450 to 23+750)

HORIZONTAL SCALE
 0 30 60 m
 VERTICAL SCALE
 3 6 m



HIGH FILL EMBANKMENT AREA 6 -
 NBL TOE PROFILE
 (STATION 23+450 to 23+650)

HORIZONTAL SCALE
 0 30 60 m
 VERTICAL SCALE
 3 6 m

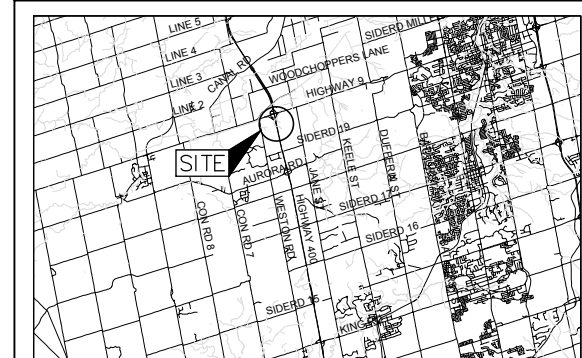
METRIC
 DIMENSIONS ARE IN METRES AND/OR
 MILLIMETRES UNLESS OTHERWISE SHOWN.
 STATIONS IN KILOMETRES + METRES.

CONT No.
 GWP No. 2835-02-00

HIGHWAY 400 HIGH FILL EMBANKMENTS
 STAT. 23+450 TO STA. 23+750 (SBL)
 STAT. 23+450 TO STA. 23+650 (NBL)
 BOREHOLE LOCATIONS AND SOIL STRATA



Golder Associates Ltd.
 MISSISSAUGA, ONTARIO, CANADA



KEY PLAN
 SCALE

0 4 8 km

LEGEND

- Borehole - Current Investigation
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated
 (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
C42-1	248.6	4875941.5	297336.7
C42-2	254.2	4875937.6	297354.1
C42-3	254.6	4875925.9	297389.8
C42-4	249.1	4875928.3	297406.4
F6-1	254.6	4875827.2	297423.0
F6-2	256.1	4875852.3	297405.4
F6-3	252.3	4875889.3	297412.2
F6-4	255.5	4875764.5	297377.7
F6-5	256.1	4875846.0	297372.8
F6-6	255.2	4875880.3	297365.5
F6-8	248.8	4875987.4	297328.4
F6-9	252.5	4876007.4	297338.2

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.

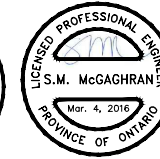
The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

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 plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

NO.	DATE	BY	REVISION
Geocres No. 30M13-217			
HWY. 400			PROJECT NO. 09-1111-0018
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	DIST. CENTRAL
DRAWN: JFC/MR	CHKD. SMM	APPD: JMAC	DWG. G1



PROJECT 09-1111-0018		RECORD OF BOREHOLE No C42-1		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4875941.5 ; E 297336.7		ORIGINATED BY TT			
DIST Central HWY 400		BOREHOLE TYPE CME-55 Track Mount, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY JC			
DATUM Geodetic		DATE July 25, 2011		CHECKED BY TVA/SMM			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)							
								20	40	60	80	100	W _p	W	W _L			GR	SA	SI
248.6	GROUND SURFACE																			
0.0	Sand, some gravel, trace silt, trace rootlets, trace organic (FILL)		1	SS	11															
247.9	Compact Brown Moist																			
0.7	Clayey silt, trace sand, trace organics (FILL)		2	SS	12															
247.2	Stiff Brown Moist																			
1.4	Silty sand, trace clay, trace gravel, trace rootlets (FILL)		3	SS	11															
246.4	Compact Brown Wet																			
2.2	CLAYEY SILT with SAND, some gravel (TILL) Very stiff to hard Grey Moist		4	SS	17															
			5	SS	39															
			6	SS	60															
			7	SS	49															
243.0																				
5.6	SILT and SAND, trace clay, trace to some gravel (TILL) Very dense Grey Moist		8	SS	100/13															
241.5	CLAYEY SILT with SAND, trace gravel (TILL) Hard Grey Moist																			
7.1																				
240.6			9	SS	100/.10															
8.0	END OF BOREHOLE																			
	NOTES: 1. Water level in open borehole at a depth of 1.8 m below ground surface (Elev. 246.8 m) upon completion of drilling. 2. Open borehole caved at a depth of 2.4 m below ground surface (Elev. 246.2 m) upon completion of drilling.																			

PROJECT	09-1111-0018	RECORD OF BOREHOLE		No C42-2	SHEET 1 OF 2	METRIC
G.W.P.	2835-02-00	LOCATION	N 4875929.7 ;E 297355.3		ORIGINATED BY	SB
DIST	Central	HWY	400		BOREHOLE TYPE	D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers
DATUM	Geodetic	DATE	December 16, 2010		COMPILED BY	TT
					CHECKED BY	TVA/SMM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
254.2	GROUND SURFACE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													

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

PROJECT 09-1111-0018		RECORD OF BOREHOLE No C42-2				SHEET 2 OF 2		METRIC													
G.W.P. 2835-02-00		LOCATION N 4875929.7 ; E 297355.3				ORIGINATED BY SB															
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers				COMPILED BY TT															
DATUM Geodetic		DATE December 16, 2010				CHECKED BY TVA/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 ---						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div>					<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 10 20 30 </div>									
	NOTE: 1. Water level in open borehole at a depth of 9.9 m below ground surface (Elev. 244.3 m) upon completion of drilling.																				

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PROJECT	09-1111-0018	RECORD OF BOREHOLE		No C42-3	SHEET 1 OF 2	METRIC
G.W.P.	2835-02-00	LOCATION	N 4875925.9 ;E 297389.8		ORIGINATED BY	AM
DIST	Central	HWY	400		BOREHOLE TYPE	D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers
DATUM	Geodetic	DATE	March 26, 2011		COMPILED BY	CS
					CHECKED BY	TVA/SMM

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

○ 3% STRAIN AT FAILURE

PROJECT 09-1111-0018				RECORD OF BOREHOLE No C42-3				SHEET 2 OF 2				METRIC						
G.W.P. 2835-02-00				LOCATION N 4875925.9 ; E 297389.8				ORIGINATED BY AM										
DIST Central HWY 400				BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Augers				COMPILED BY CS										
DATUM Geodetic				DATE March 26, 2011				CHECKED BY TVA/SMM										
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					WATER CONTENT (%)					
	--- CONTINUED FROM PREVIOUS PAGE ---						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED </div>					<div style="display: flex; justify-content: space-between;"> W_p W W_L </div>						
238.7	CLAYEY SILT with SAND, trace gravel (TILL) Very stiff Grey Moist		13	SS	28	239												
15.9	END OF BOREHOLE NOTE: 1. Water level at a depth of 11.6 m (Elev. 243.0 m) in open borehole upon completion of drilling.																	

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

PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F6-1		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4875827.2 ; E 297423.0</u>		ORIGINATED BY <u>AM/TT</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>MAS</u>			
DATUM <u>Geodetic</u>		DATE <u>December 3, 2010</u>		CHECKED BY _____			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								20	40	60	80	100	w _p	w	w _L		
254.6	GROUND SURFACE																
0.0	TOPSOIL																
0.2	Sandy SILT, trace clay, trace gravel, trace organics, trace rootlets		1	SS	8								○				
253.9	Loose Brown Moist																
0.7	Sandy CLAYEY SILT, trace gravel (TILL) Very stiff to hard Brown Moist Clay seams at a depth of 0.9 m		2	SS	23								○				
			3	SS	25								▬				2 26 53 19
			4	SS	19								○				
			5	SS	119								○				
250.9	CLAYEY SILT, trace to some sand, trace gravel, containing silt seams (TILL) Hard Grey Moist																
3.7			6	SS	36								○				0 8 53 39
			7	SS	32										○		
247.9	END OF BOREHOLE		8	SS	53								○				
6.7	NOTE: 1. Borehole dry upon completion of drilling.																

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F6-3		SHEET 1 OF 1		METRIC						
G.W.P.		2835-02-00		LOCATION		N 4875889.3 ; E 297412.2		ORIGINATED BY						
DIST		Central HWY 400		BOREHOLE TYPE		D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY						
DATUM		Geodetic		DATE		December 6, 2010		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						
252.3	GROUND SURFACE													
0.0	TOPSOIL													
0.2	Organic clayey silt, trace to some sand, zones of silty sand (FILL)		1	SS	5									
251.6	Firm													
0.7	Brown Moist		2	SS	10									
250.8	CLAYEY SILT, trace sand, trace gravel, trace rootlets													
1.5	Stiff Brown Moist		3	SS	22									
	CLAYEY SILT, trace to some sand, trace gravel, sand pockets (TILL)													
	Very stiff to hard Brown to grey Moist		4	SS	27									
			5	SS	31									
248.6	CLAYEY SILT with SAND, trace gravel (TILL)													
3.7	Hard Brown Moist		6A	SS	77									
248.1			6B	SS	77									
4.2	Gravelly SAND and SILT, trace to some clay (TILL)													
	Very dense Grey Moist		7	SS	124									
246.7														
5.6	SILT, trace clay, trace to some sand													
	Very dense Grey Moist													
			8	SS	53									
245.6														
6.7	END OF BOREHOLE													
NOTE: 1. Water level in open borehole at a depth of 5.8 m (Elev. 246.5 m) upon completion of drilling.														

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F6-4		SHEET 1 OF 1		METRIC					
G.W.P.		2835-02-00		LOCATION		N 4875764.5 ; E 297377.7		ORIGINATED BY					
DIST		Central HWY 400		BOREHOLE TYPE		D-25, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY					
DATUM		Geodetic		DATE		January 21, 2011		CHECKED BY					
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		W _p W W _L			
255.5	GROUND SURFACE												
0.0	TOPSOIL												
0.2	Organic silty sand, trace clay, trace gravel, zones of clayey silt (FILL)		1	SS	7								
254.8	Loose Brown Moist		2	SS	10								
0.7	Clayey silt, trace sand, trace gravel, trace organics, oxidation staining (FILL)		3	SS	12								
253.3	Stiff Brown Moist												
2.2	SILT and SAND, trace to some clay, trace gravel (TILL) Dense to very dense Brown Moist		4	SS	36								4 32 50 14
			5	SS	51								
			6	SS	51								6 37 50 7
	Clayey silt layer between depth of 4.8 m and 5.0 m		7	SS	37								
249.3	END OF BOREHOLE		8	SS	118/15								2 58 32 8
6.2	NOTE: 1. Water level in open borehole at a depth of 5.8 m below ground surface (Elev. 249.7m) upon completion of drilling.												

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PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F6-5		SHEET 1 OF 1		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4875846.0 ; E 297372.8</u>		ORIGINATED BY <u>SB</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>SKB</u>			
DATUM <u>Geodetic</u>		DATE <u>December 16, 2010</u>		CHECKED BY _____			

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		WATER CONTENT (%)					
								20 40 60 80 100	20 40 60 80 100	W _p W W _L					
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED									
256.1	GROUND SURFACE						256								
0.0	ASPHALT						255								
0.2	Sand and silt, trace to some clay, trace gravel (FILL) Loose to very dense Brown Moist		1	SS	59		254							2 42 47 9	
			2	SS	14										
			3	SS	9		253								
253.1	Organic CLAYEY SILT, trace to some sand Firm Brown to black Moist		4	SS	5		252								
252.4	CLAYEY SILT, trace to some sand, trace gravel (TILL) Stiff to hard Brown to grey Moist		5	SS	13		251								
			6	SS	36		250							6 36 46 12	
250.5	SILT and SAND, trace to some clay, trace to some gravel (TILL) Very dense Brown Moist		7	SS	57/15		249								
248.3	END OF BOREHOLE		8	SS	100/15										
7.8	NOTE: 1. Open borehole dry upon completion of drilling.														

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F6-6		SHEET 1 OF 2		METRIC	
G.W.P. 2835-02-00		LOCATION N 4875880.3 ; E 297365.5		ORIGINATED BY AM			
DIST Central HWY 400		BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY CS			
DATUM Geodetic		DATE April 1, 2011		CHECKED BY			

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					w _p	w	w _L						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED													
255.2	GROUND SURFACE						20	40	60	80	100							GR	SA	SI	CL
0.0	TOPSOIL																				
0.2	Silty sand and gravel (FILL)																				
254.6	Compact																				
0.6	Brown																				
	Moist																				
	Silty sand, trace gravel, trace clay (FILL)		1	SS	31																
	Compact to dense																				
	Brown to grey		2	SS	22																
	Moist																				
253.0	Clayey silt with sand, trace to some gravel (FILL)																				
2.2	Stiff																				
	Brown		3	SS	8																
	Moist																				
			4	SS	12																
			5	SS	8																
250.3	CLAYEY SILT with SAND, trace gravel, trace organics, trace rootlets		6A	SS	9																
4.9	Stiff		6B																		
249.6	Grey																				
5.6	Moist																				
	CLAYEY SILT, some sand, trace gravel (TILL)																				
	Stiff to hard		7	SS	18																
	Brown																				
	Moist																				
			8	SS	40																
			9	SS	134																
245.0	SAND and SILT, trace to some gravel, trace clay (TILL)																				
10.2	Very dense		10	SS	165/23																
	Brown																				
	Moist																				
			11	SS	146																
241.9	CLAYEY SILT, trace sand																				
13.3	Hard																				
	Grey																				
	Moist		12	SS	55																
240.9	END OF BOREHOLE																				
14.3																					

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

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PROJECT <u>09-1111-0018</u>		RECORD OF BOREHOLE No F6-6		SHEET 2 OF 2		METRIC	
G.W.P. <u>2835-02-00</u>		LOCATION <u>N 4875880.3 ; E 297365.5</u>		ORIGINATED BY <u>AM</u>			
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger</u>		COMPILED BY <u>CS</u>			
DATUM <u>Geodetic</u>		DATE <u>April 1, 2011</u>		CHECKED BY _____			

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 (%)				GR	SA	SI	CL		
								20	40	60	80	100	20	40	60		80	100	10	20	30	
	--- CONTINUED FROM PREVIOUS PAGE --- NOTE: 1. Water level in open borehole at a depth of 6.4 m below ground surface (Elev. 248.8 m) upon completion of drilling.																					

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PROJECT		RECORD OF BOREHOLE		No F6-8		SHEET 1 OF 1		METRIC									
G.W.P. 2835-02-00		LOCATION		N 4875987.4 ; E 297328.4		ORIGINATED BY		TT									
DIST Central HWY 400		BOREHOLE TYPE		CME-55 Track Mount, 108 mm Outside Diameter Solid and Hollow Stem Augers		COMPILED BY		JC									
DATUM Geodetic		DATE		July 25, 2011		CHECKED BY		TVA									
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									
245.3	GROUND SURFACE																
0.0	Sandy clayey silt, trace gravel, trace rootlets (FILL)		1	SS	18												
244.6	Very stiff Brown Moist																
0.7	CLAYEY SILT		2	SS	32												
	Very stiff to hard Brown Moist																
			3	SS	20												
			4	SS	23												
242.3	Sandy CLAYEY SILT, trace gravel, sand pockets (TILL)																
3.0	Hard Brown Moist		5	SS	42												
			6	SS	54												
	Becoming grey below 4.6m and zones of oxidation at a depth of 4.6 m		7	SS	32												
	trace sand below 5.6 m																
239.0	END OF BOREHOLE		8	SS	100/23												
6.3	NOTE: 1. Open borehole dry upon completion of drilling.																

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PROJECT		RECORD OF BOREHOLE		No F6-9		SHEET 1 OF 1		METRIC								
G.W.P. 09-1111-0018		LOCATION		N 4876007.4 ; E 297338.2		ORIGINATED BY		SB								
DIST Central HWY 400		BOREHOLE TYPE		D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Auger		COMPILED BY		MAS								
DATUM Geodetic		DATE		December 15, 2010		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								
252.5	GROUND SURFACE															
0.0	ASPHALT															
0.2	Silty sand, trace gravel (FILL) Brown Moist															
251.7	Clayey silt, some sand, trace gravel (FILL) Very stiff Brown Moist		1	SS	29											
0.8																
250.3			2	SS	22											
2.2	CLAYEY SILT, trace sand, trace gravel Stiff Brown Moist															
			3	SS	8											
			4	SS	10											
			5	SS	10											
			6	SS	11											
246.9	Sandy CLAYEY SILT, trace to some gravel (TILL) Very stiff Brown Moist															
5.6			7	SS	23											
			8	SS	20											
243.8	SILT and SAND trace clay, trace to some gravel (TILL) Very dense Grey Moist															
8.7			9	SS	104											
241.7	END OF BOREHOLE		10	SS	72/15											
10.8	NOTE: 1. Open borehole dry upon completion of drilling.															

Silt and Sand Fill

U.S.S Sieve size, meshes/inch

Size of openings, inches

PERCENT FINER THAN

GRAIN SIZE, mm

Grain Size (mm)	U.S.S Sieve Size (meshes/inch)	Opening Size (inches)	Percent Finer (Soil A - Circles)	Percent Finer (Soil B - Squares)
0.075	20	0.075	55	30
0.15	10	0.15	85	55
0.3	60	0.3	95	65
0.6	30	0.6	98	70
1.18	16	1.18	100	75
2.5	8	2.5	100	80
4.75	4	4.75	100	85
7.5	3	7.5	100	90
10	20	10	100	95
15	10	15	100	100

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

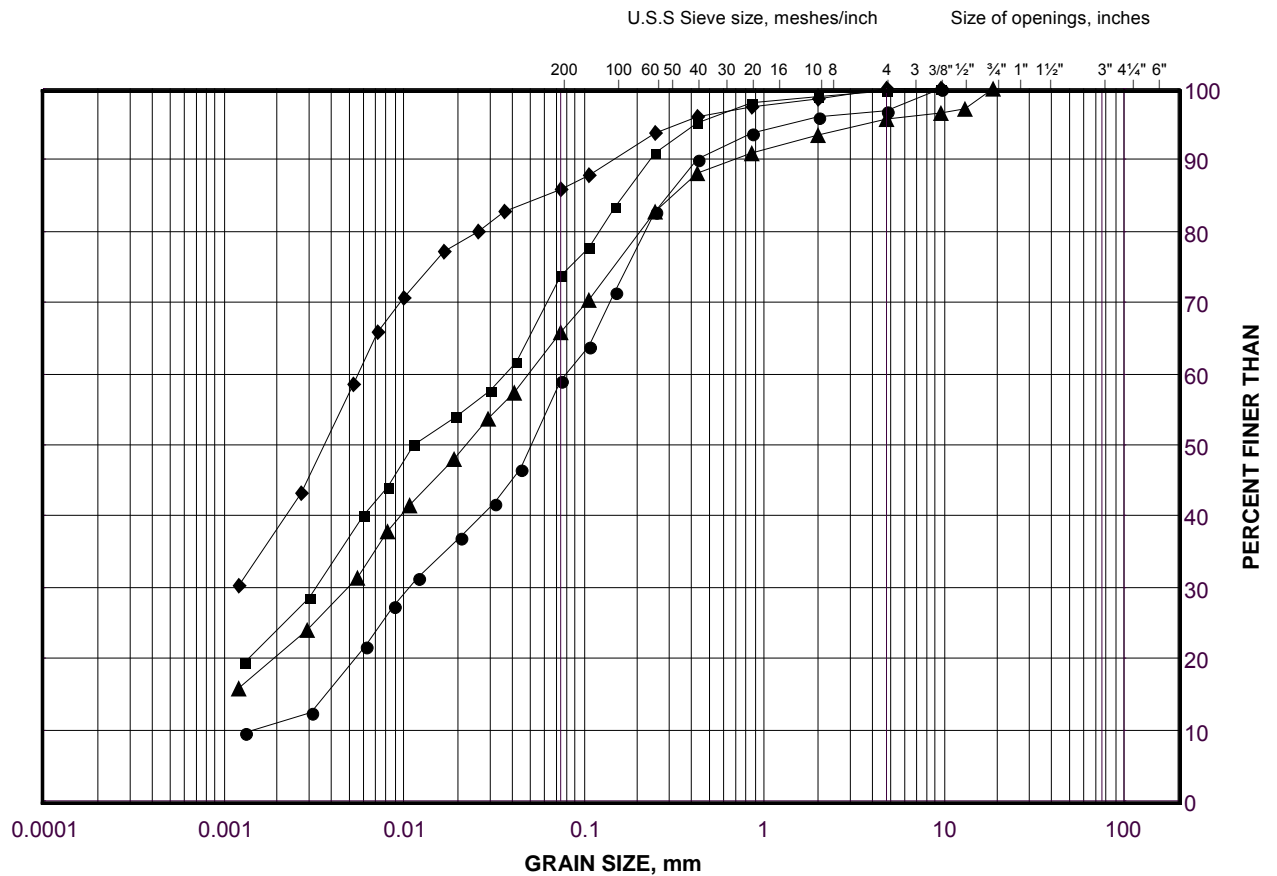
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F6-5	2	254.3
■	C42-2	3	251.6

Date: 18-Sep-13

GRAIN SIZE DISTRIBUTION

Clayey Silt Fill

FIGURE G2



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

LEGEND

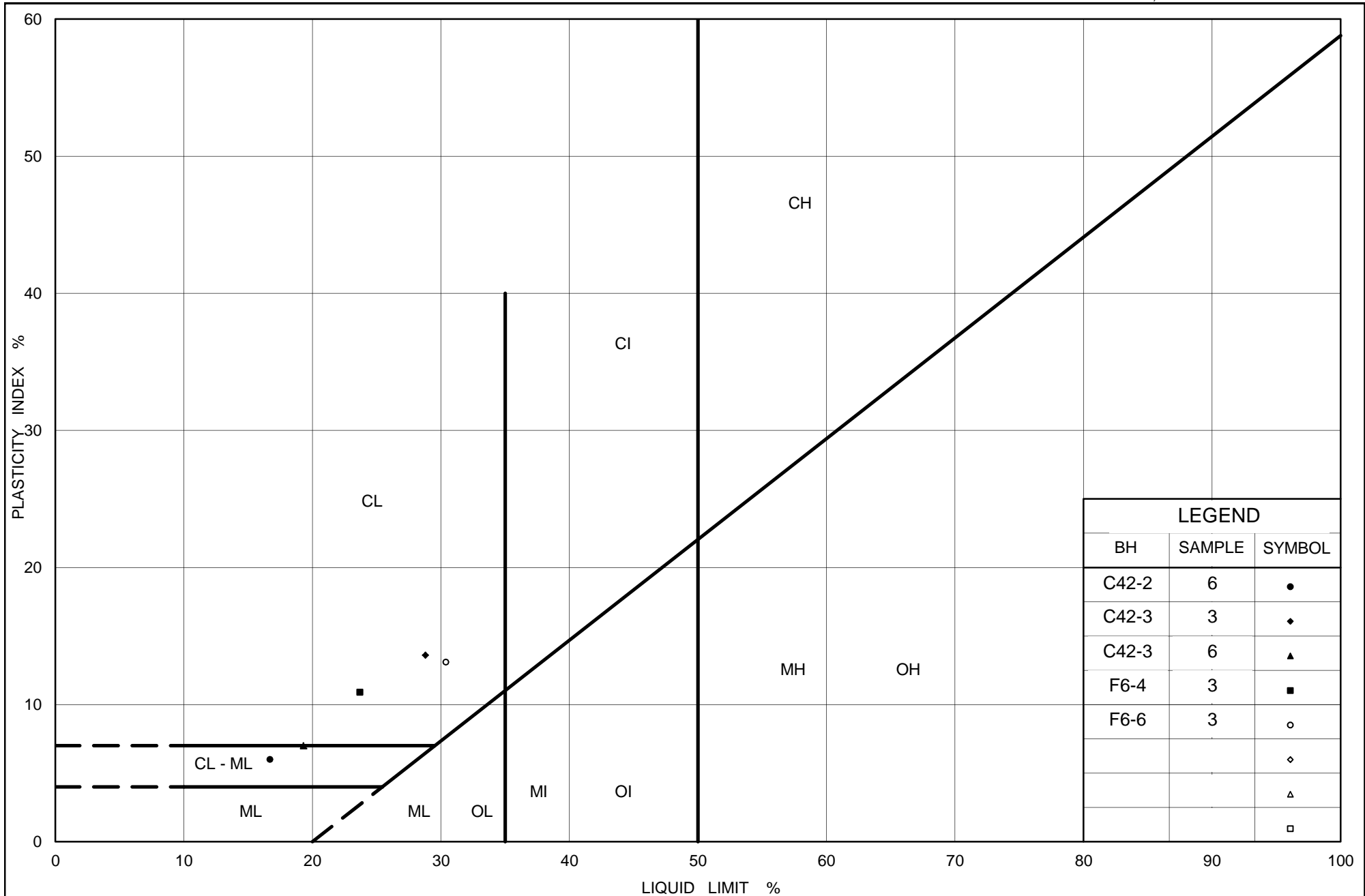
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F6-2	3	253.5
■	F6-6	3	252.7
◆	C42-3	3	252.0
▲	C42-3	6	249.8

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 18-Sep-13



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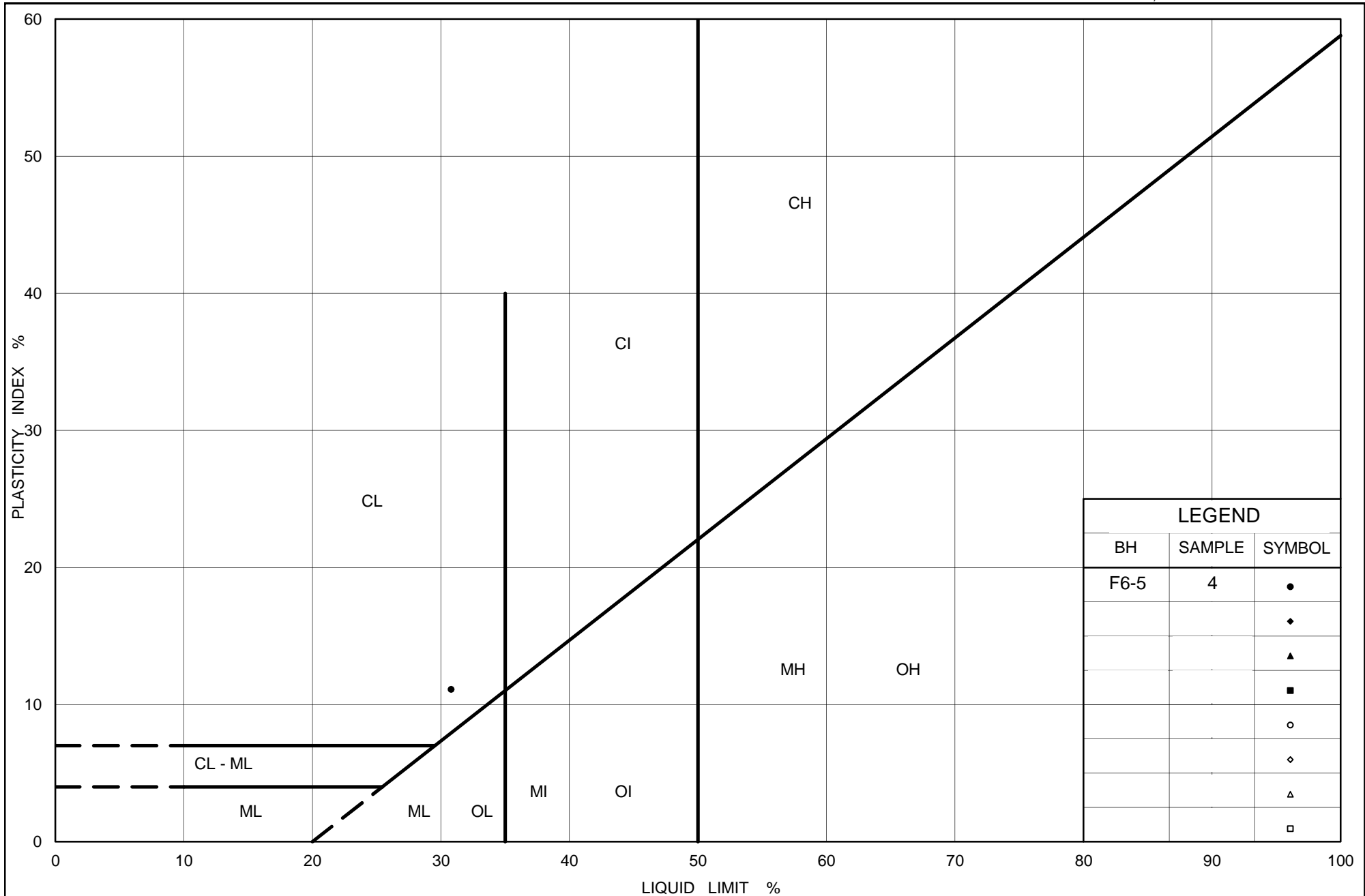
PLASTICITY CHART

Clayey Silt Fill

Figure No. G3

Project No. 09-1111-0018

Checked By:



Ministry of Transportation

Ontario

PLASTICITY CHART Organic Clayey Silt

Figure No. G4

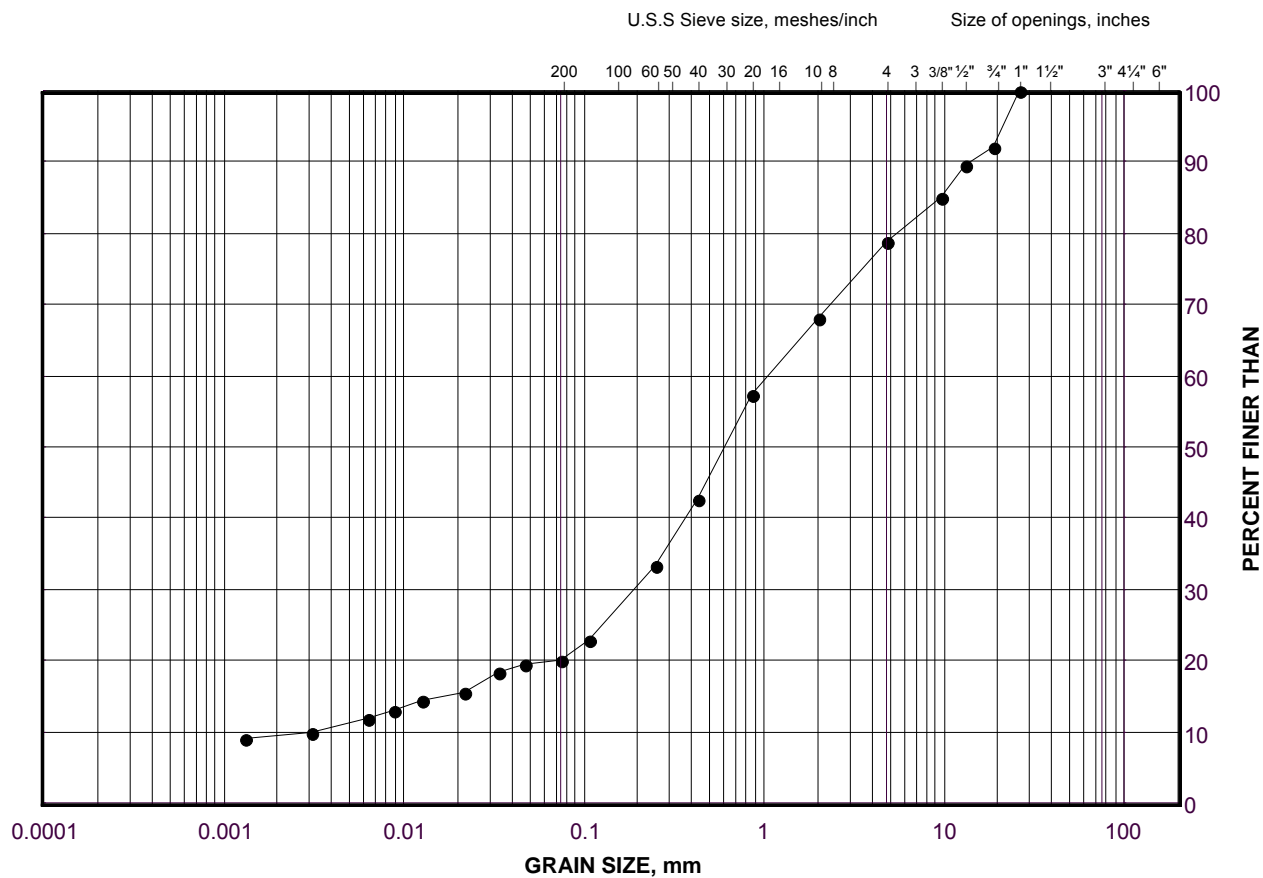
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Gravelly Sand

FIGURE G5



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	C42-2	8	246.3

Project Number: 09-1111-0018

Checked By: TWB

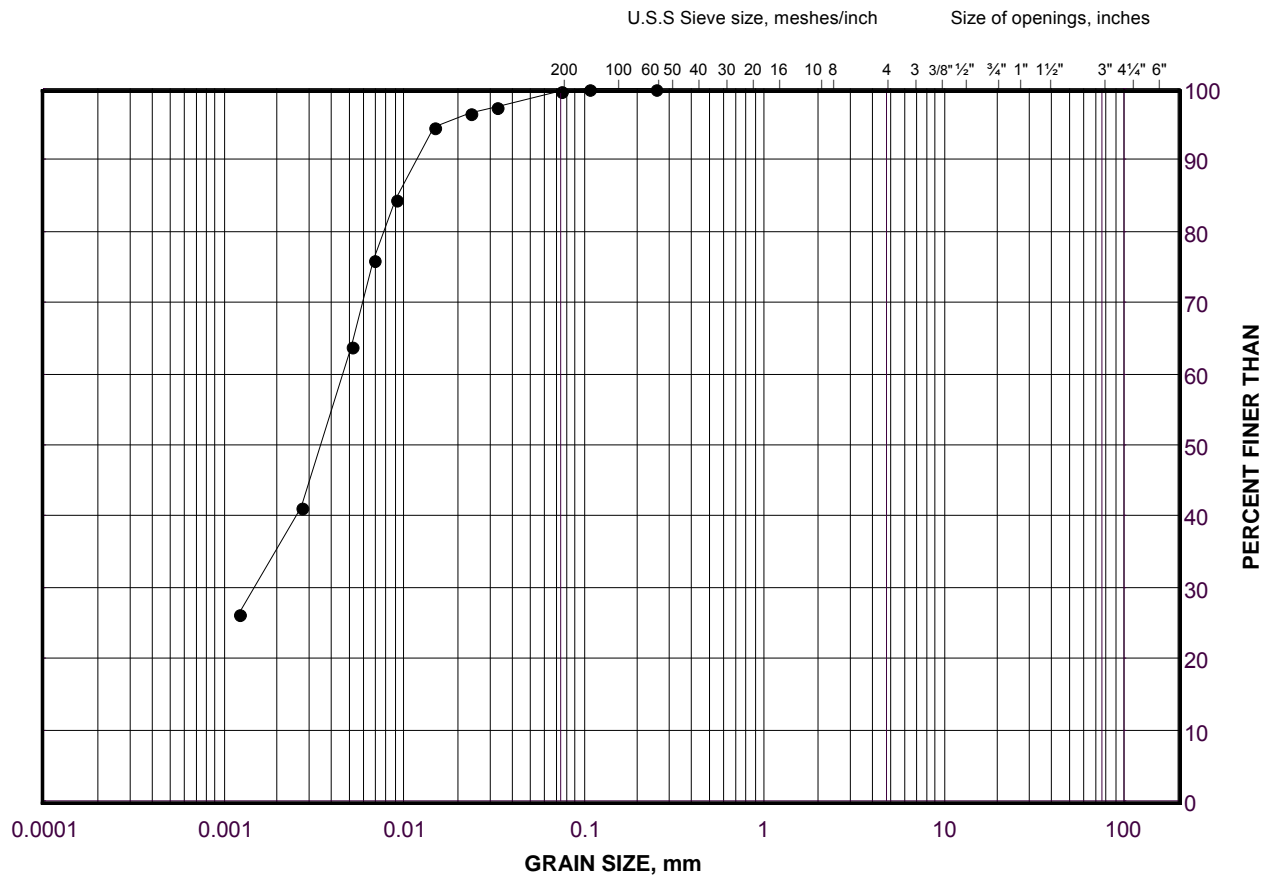
Golder Associates

Date: 18-Sep-13

GRAIN SIZE DISTRIBUTION

Upper Clayey Silt

FIGURE G6



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

LEGEND

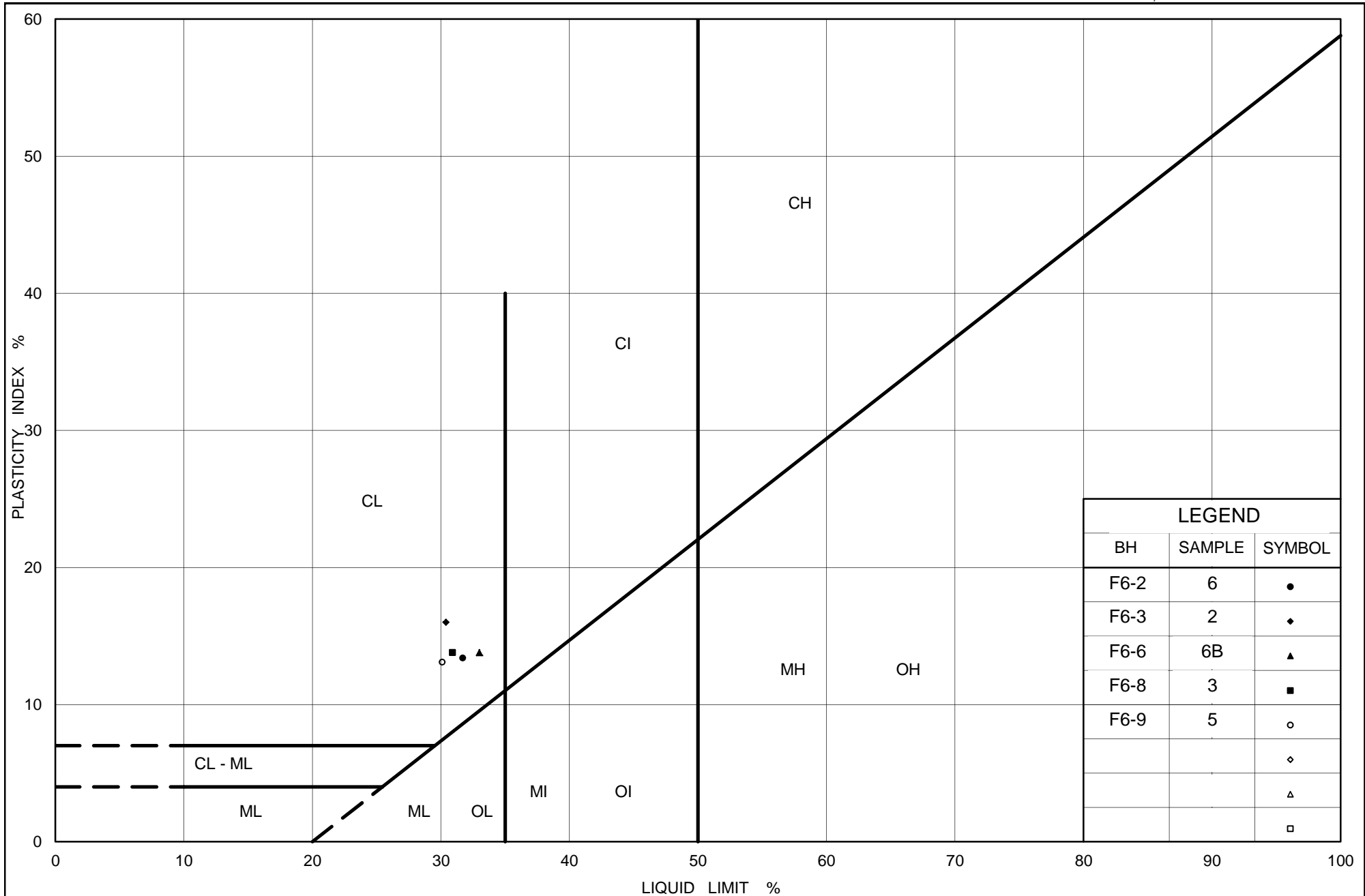
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F6-9	5	248.4

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 18-Sep-13



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PLASTICITY CHART

Upper Clayey Silt

Figure No. G7

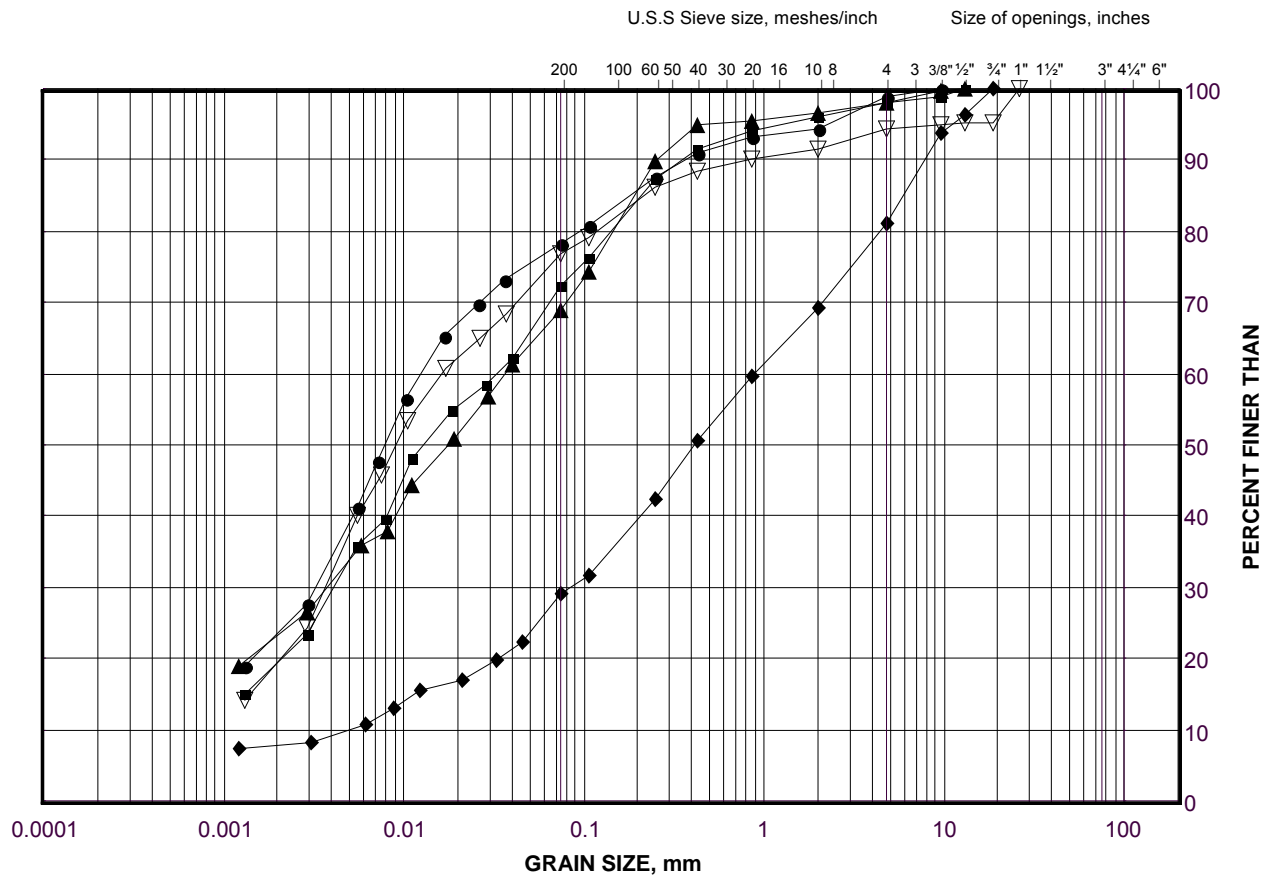
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE G8A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C42-2	10	243.3
■	F6-1	3	252.8
◆	C42-1	4	246.0
▲	F6-8	5	246.9
▽	C42-4	5	245.8

Project Number: 09-1111-0018

Checked By: TWB

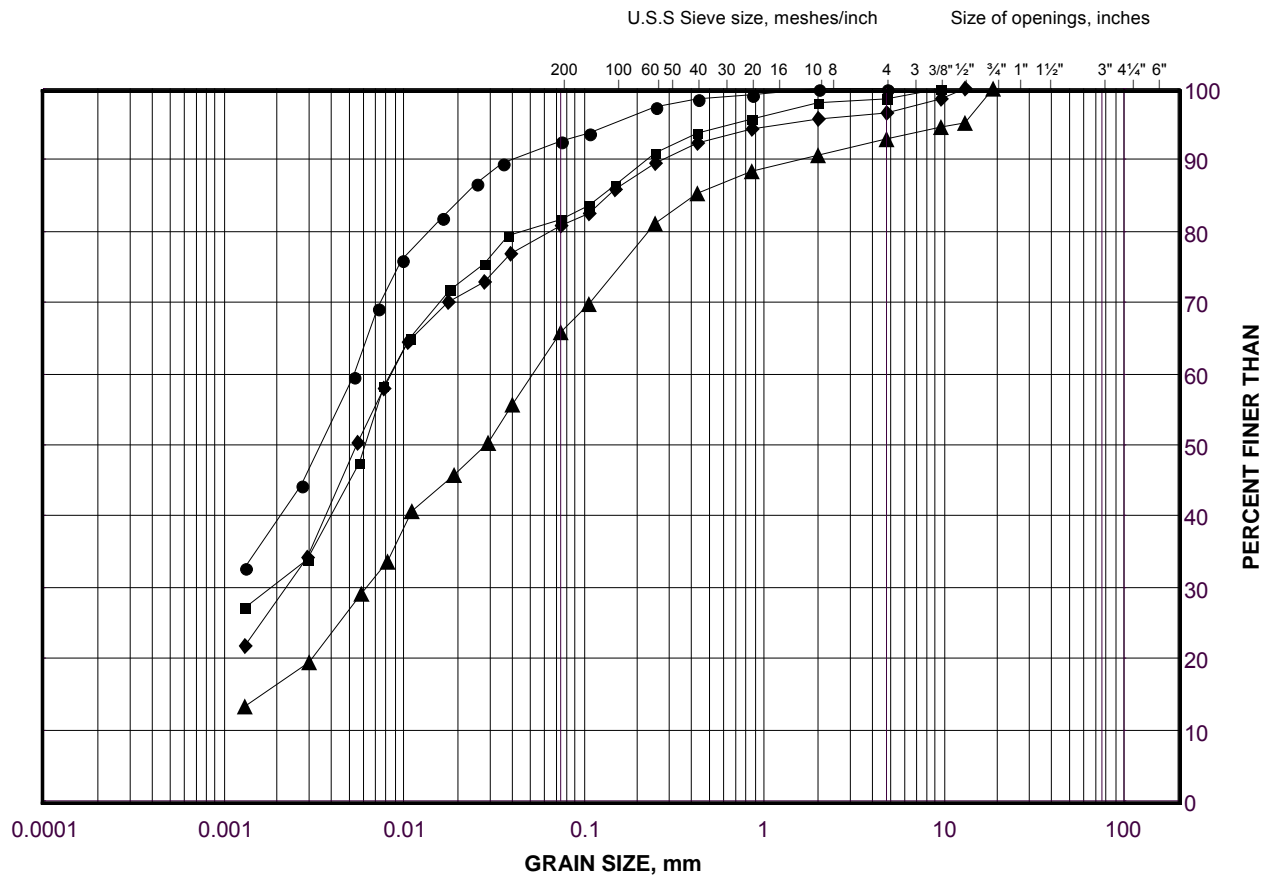
Golder Associates

Date: 18-Sep-13

GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE G8B



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

LEGEND

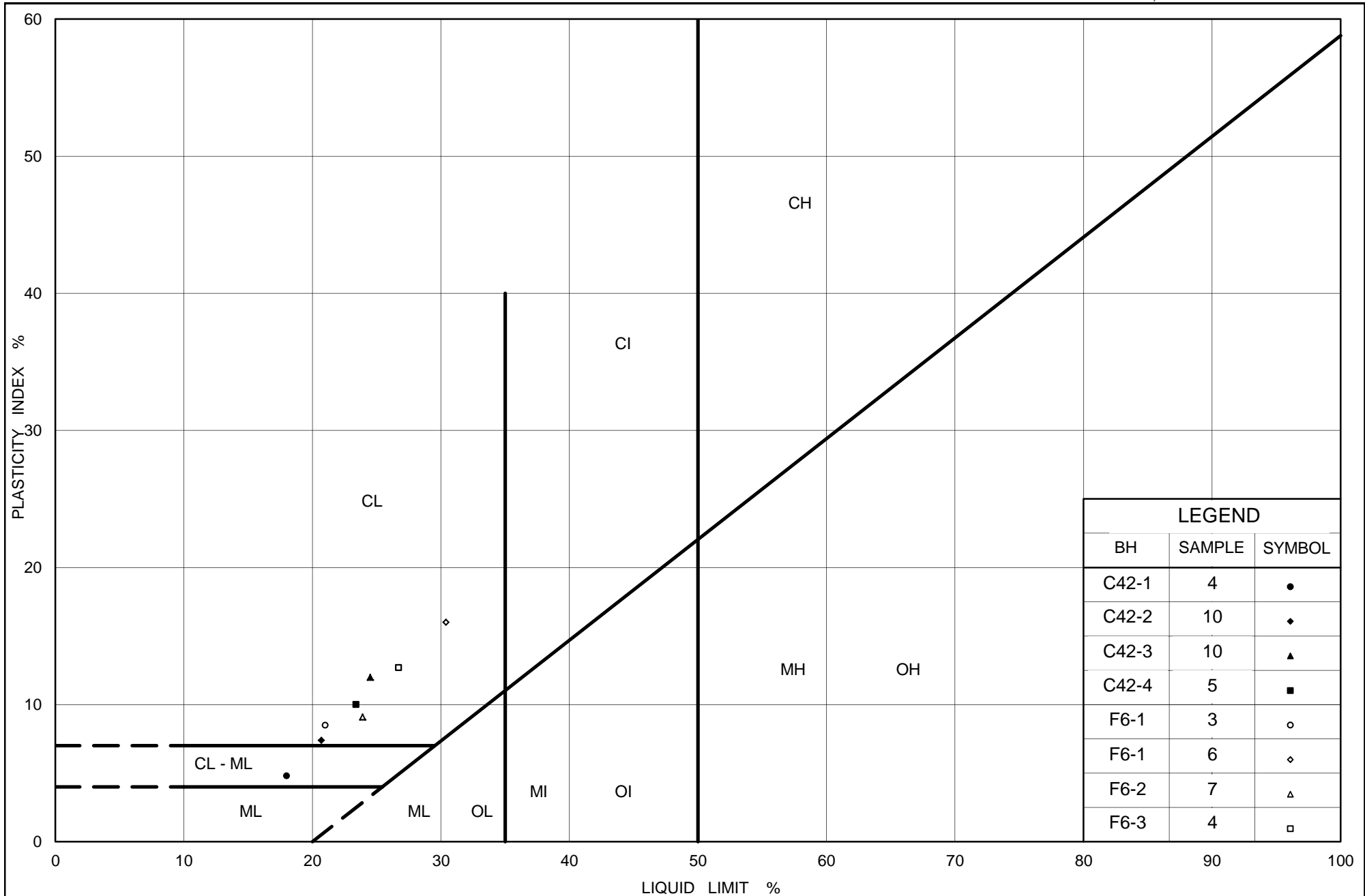
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F6-1	6	250.5
■	F6-2	7	249.7
◆	F6-6	8	247.3
▲	F6-9	8	244.6

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 18-Sep-13



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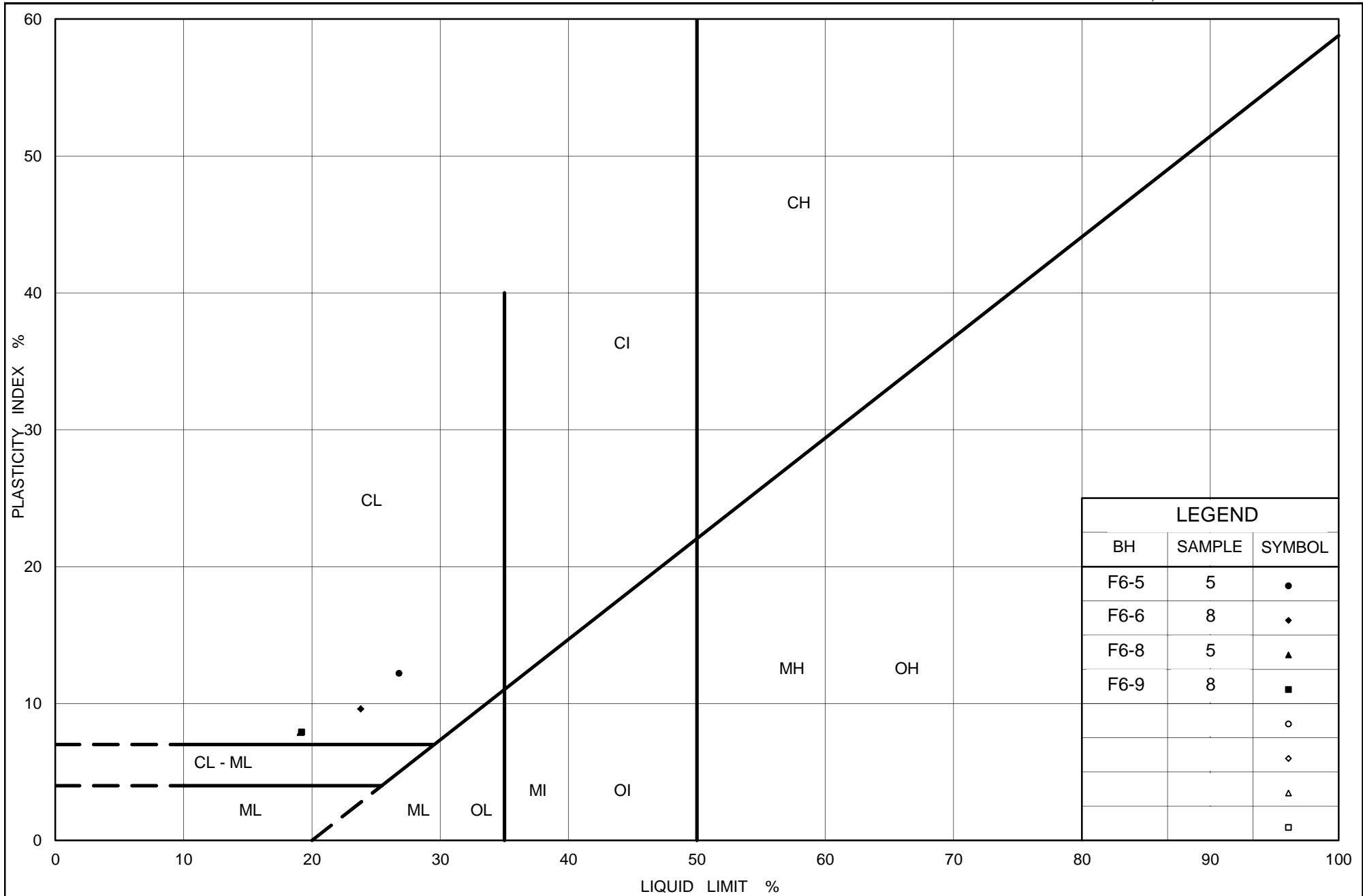
PLASTICITY CHART

Clayey Silt Till

Figure No. G9A

Project No. 09-1111-0018

Checked By: TWB



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PLASTICITY CHART Clayey Silt Till

Figure No. G9B

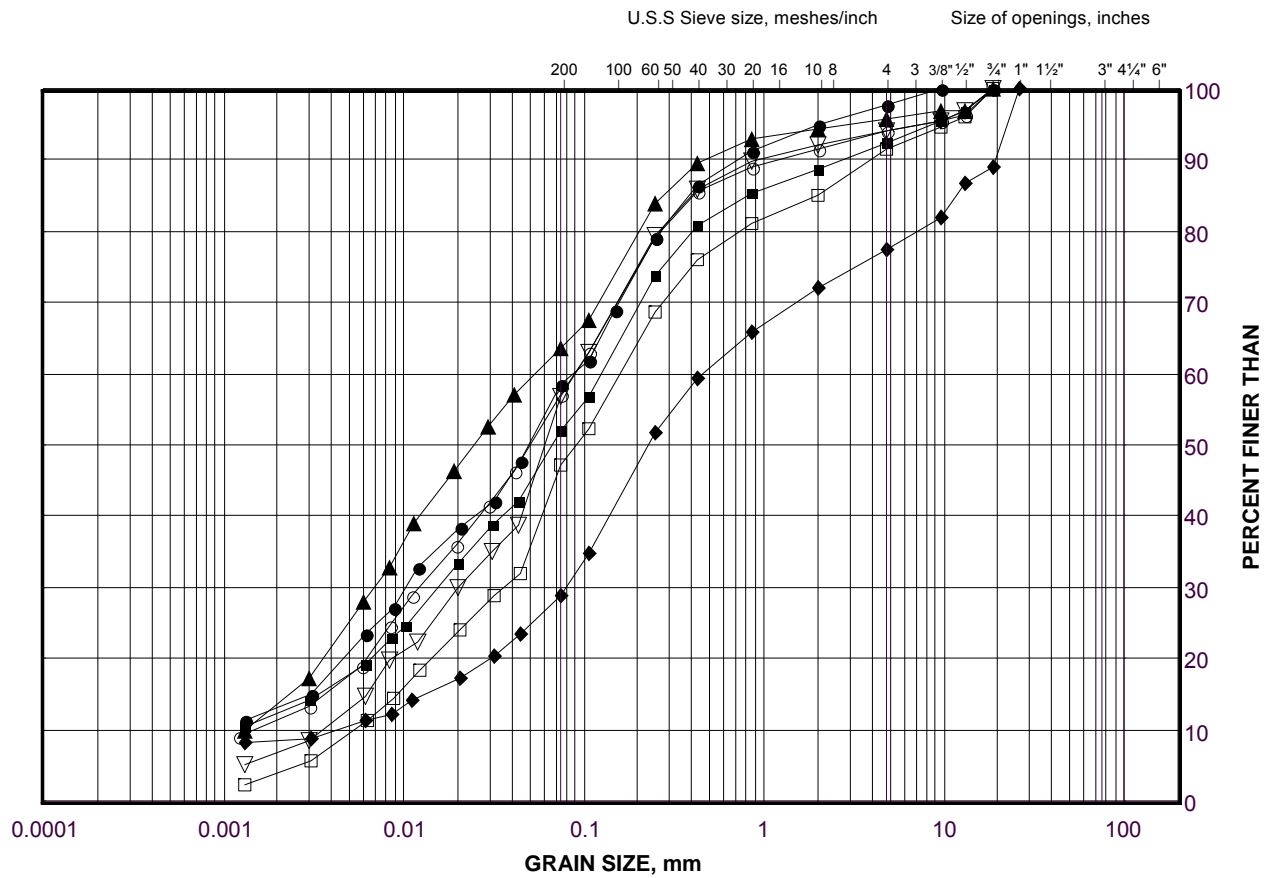
Project No. 09-1111-0018

Checked By: TWB

GRAIN SIZE DISTRIBUTION

Silt and Sand to Gravelly Sand Till

FIGURE G10A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F6-6	10	244.3
■	C42-3	11	242.1
◆	C42-2	11	241.9
▲	F6-4	4	252.9
▽	F6-4	6	251.4
○	F6-5	7	250.0
□	C42-1	8	242.5

Project Number: 09-1111-0018

Checked By: TWB

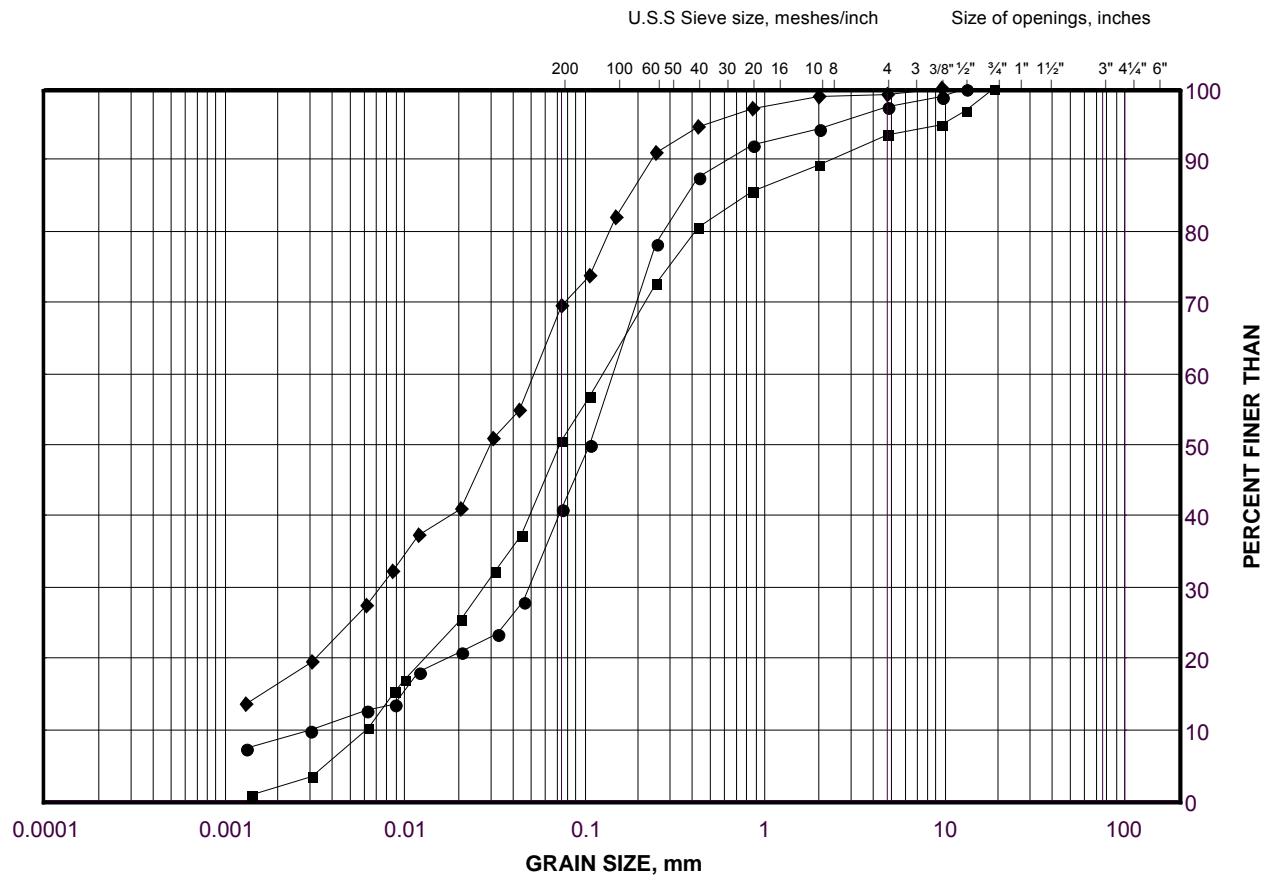
Golder Associates

Date: 18-Sep-13

GRAIN SIZE DISTRIBUTION

Silt and Sand Till

FIGURE G10B



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

LEGEND

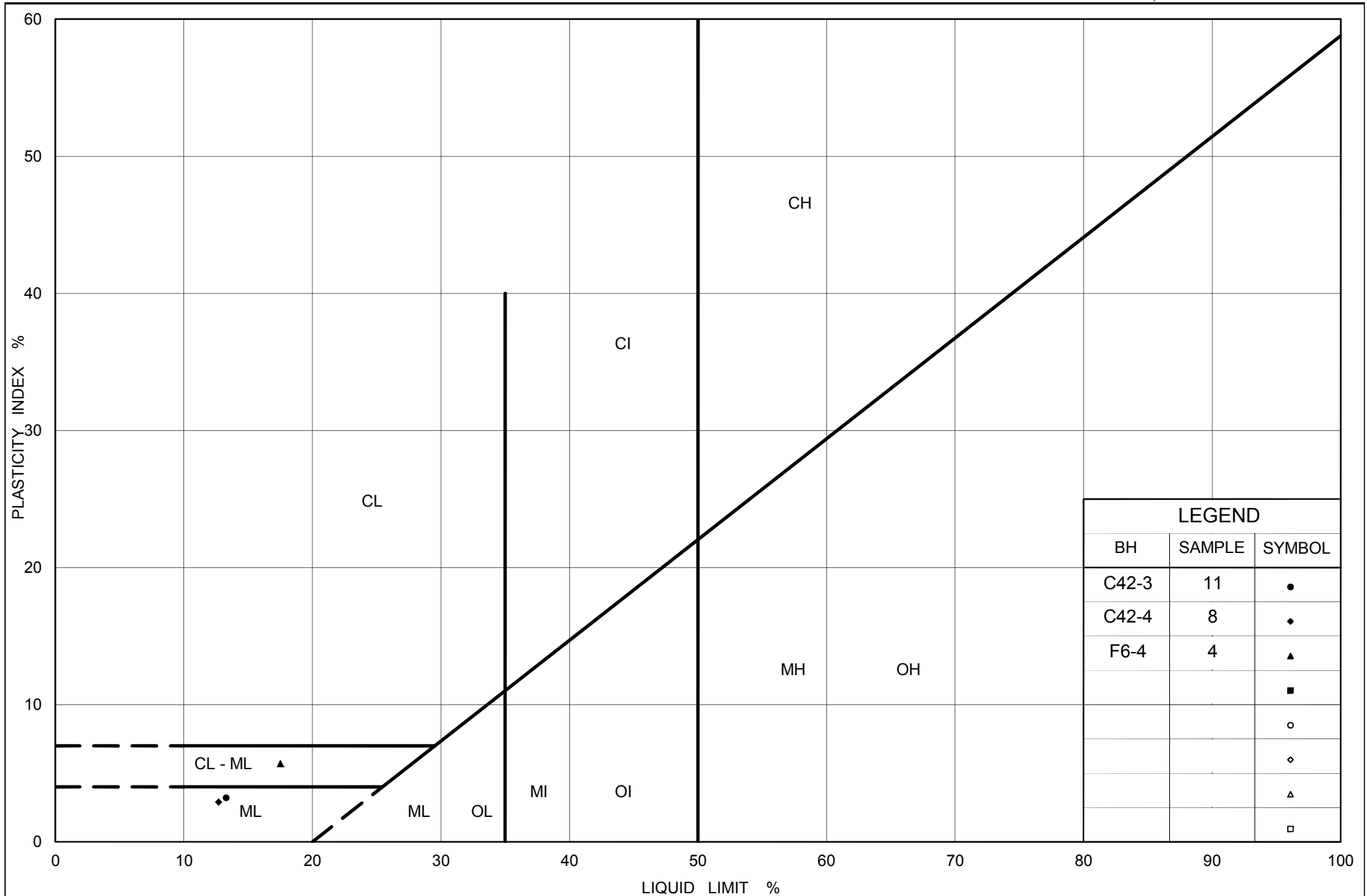
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F6-4	8	249.5
■	F6-9	9	243.2
◆	F6-2	9	249.7

Project Number: 09-1111-0018

Checked By: TWB

Golder Associates

Date: 20-Nov-15



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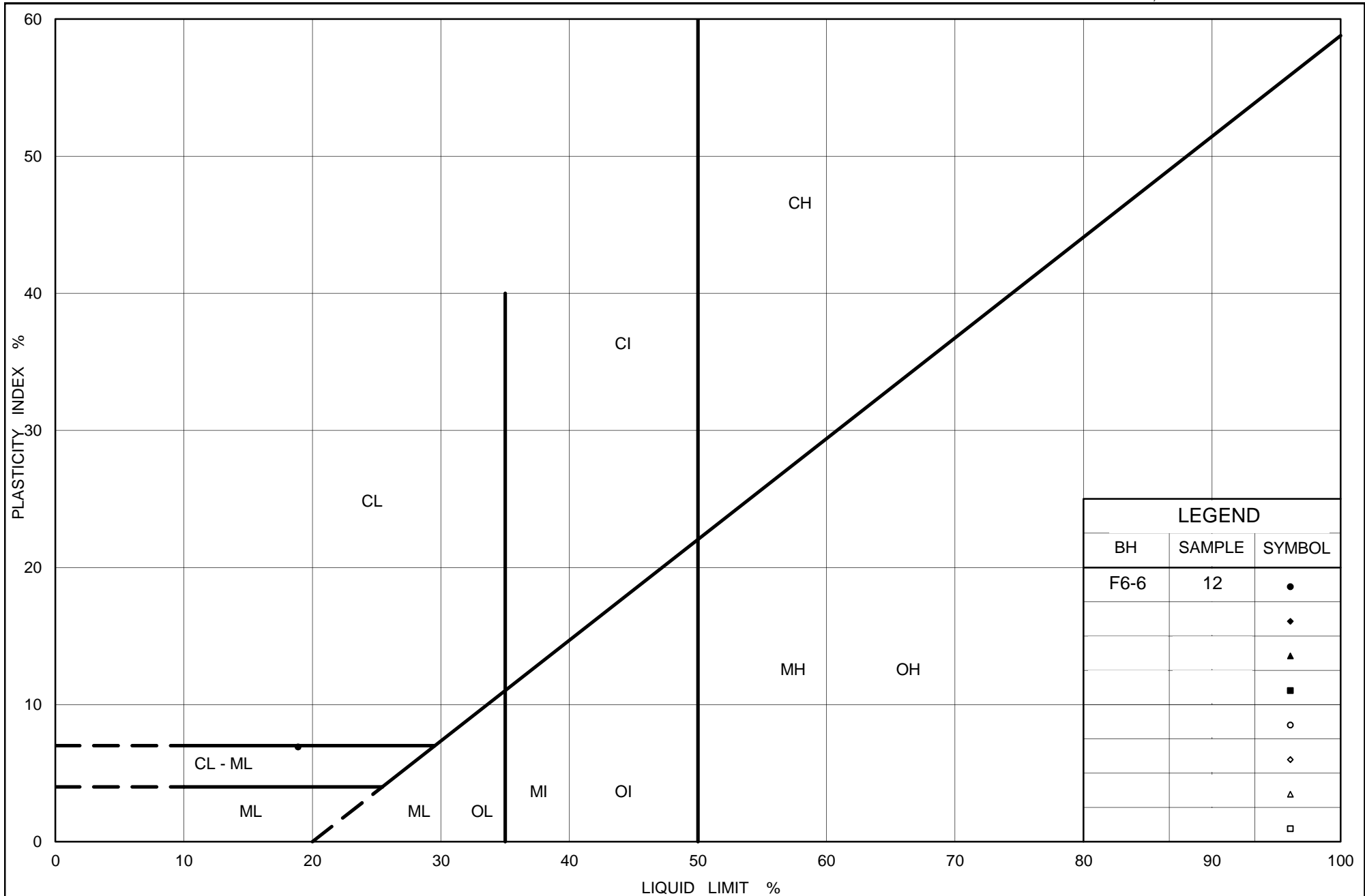
PLASTICITY CHART

Silt and Sand Till

Figure No. G11

Project No. 09-1111-0018

Checked By: TWB



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PLASTICITY CHART

Lower Clayey Silt

Figure No. G12

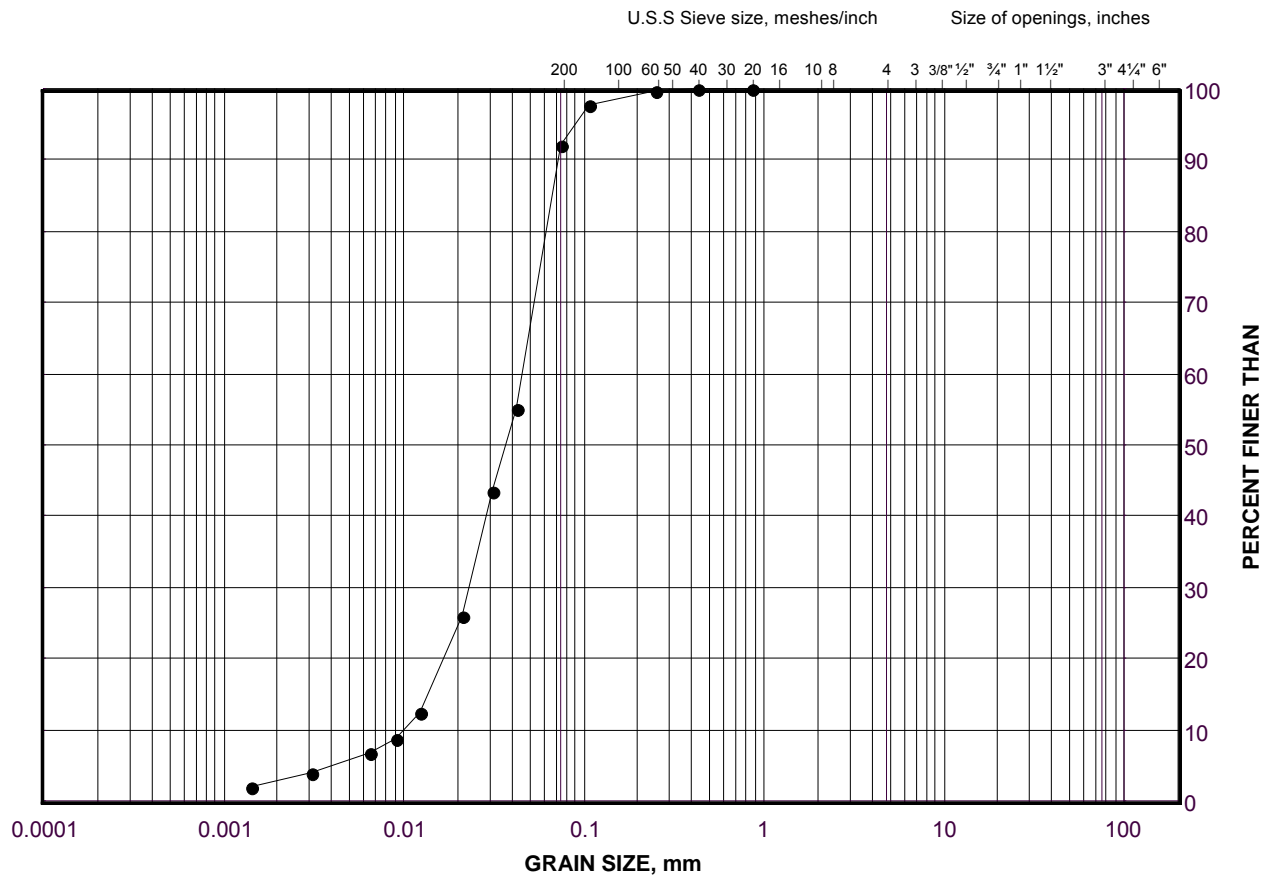
Project No. 09-1111-0018

Checked By:

GRAIN SIZE DISTRIBUTION

Silt

FIGURE G13



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	F6-3	8	245.9

Project Number: 09-1111-0018

Checked By: TWB

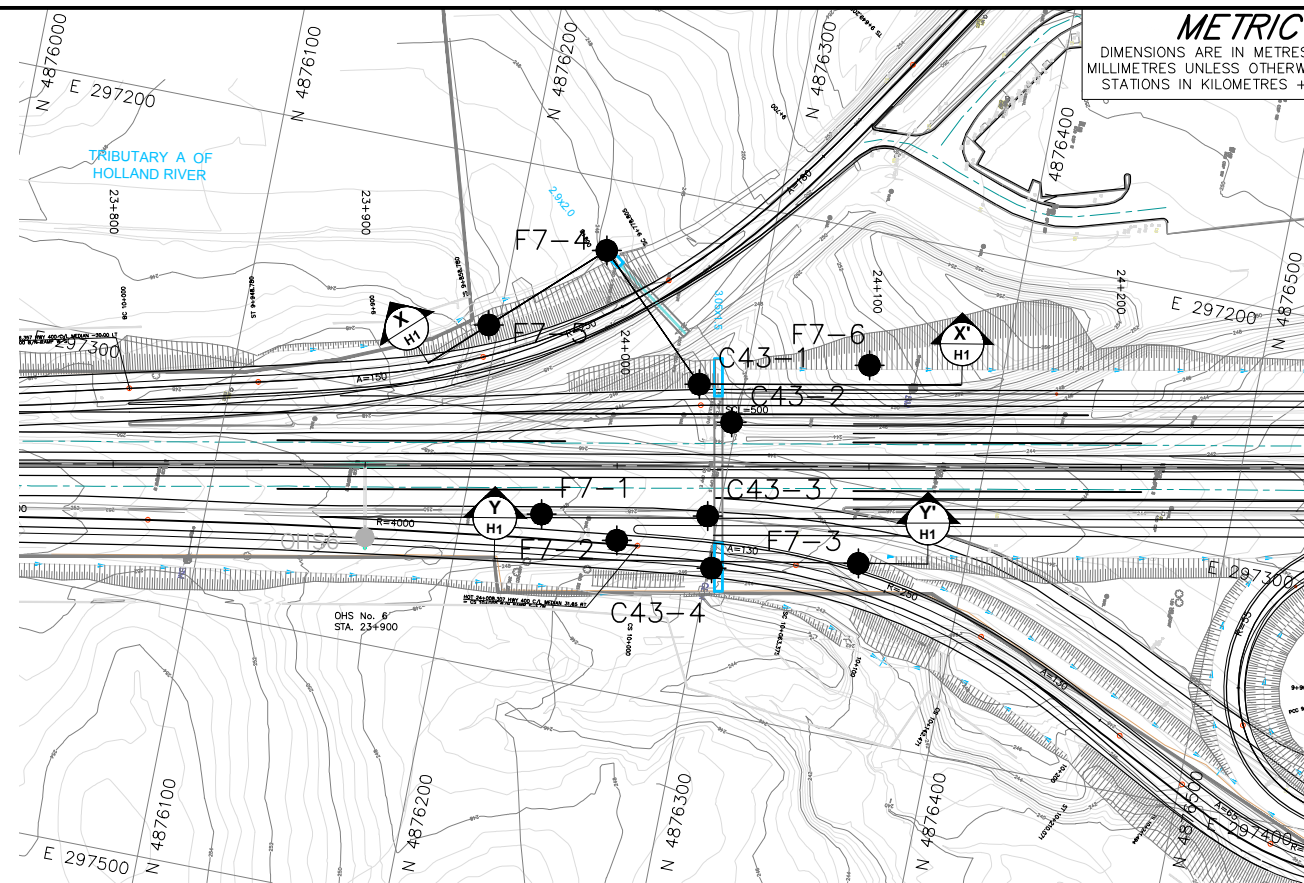
Golder Associates

Date: 18-Sep-13

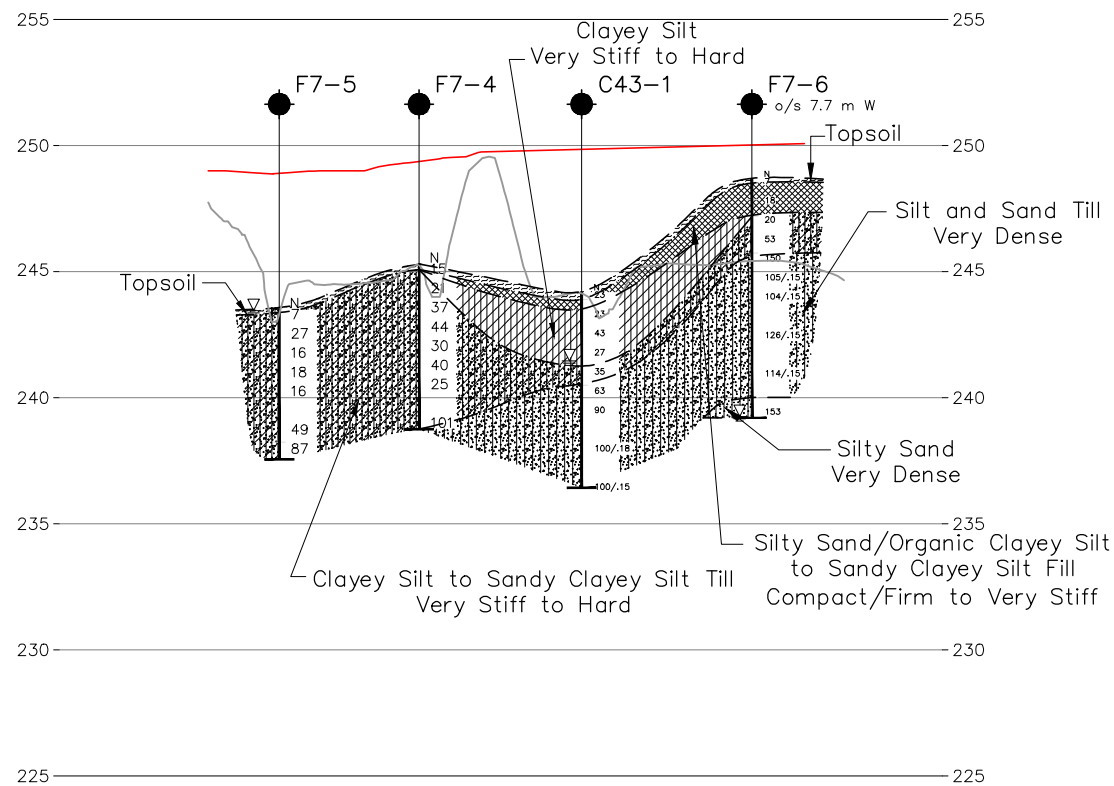
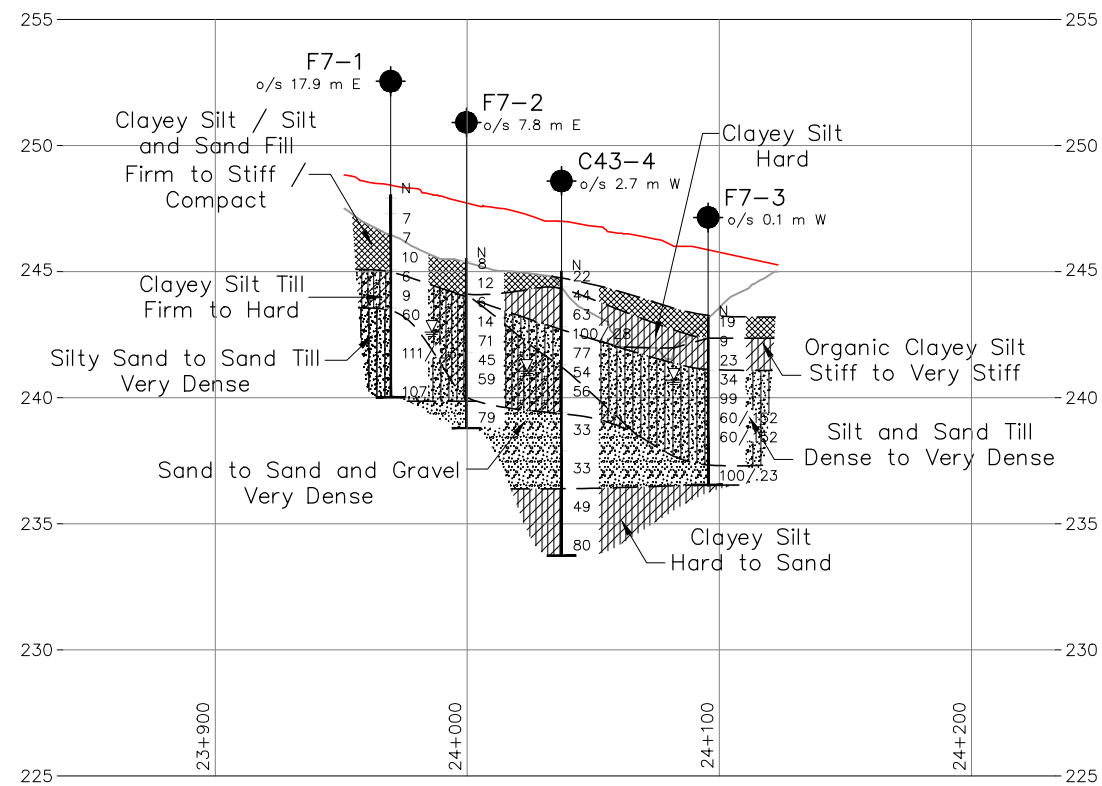


APPENDIX H

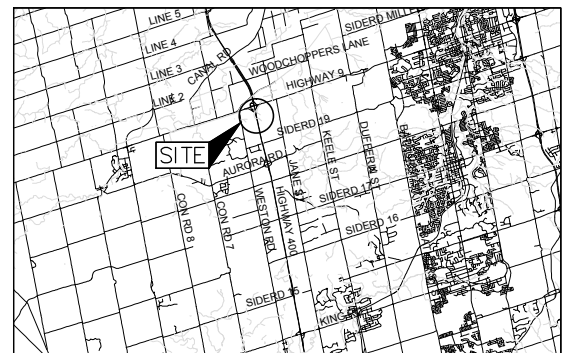
HIGH FILL EMBANKMENT AREA 7 (Stations 23+950 to 24+100 NBL and SBL)



PLAN

SCALE
30 0 30 60 mHIGH FILL EMBANKMENT AREA 7 –
HWY 9 – HWY 400 W-S RAMP PROFILE
–SBL– (STATION 23+950 to 24+100)HORIZONTAL SCALE
30 0 30 60 m
VERTICAL SCALE
3 0 3 6 mHIGH FILL EMBANKMENT AREA 7 –
HWY 400 – HWY 9 S-E/W RAMP TOE PROFILE
–NBL– (STATION 23+950 to 24+100)HORIZONTAL SCALE
30 0 30 60 m
VERTICAL SCALE
3 0 3 6 mCONT No.
GWP No. 2835-02-00HIGHWAY 400 HIGH FILL EMBANKMENTS
STAT. 23+950 TO STA. 24+100 (SBL)
STAT. 23+950 TO STA. 24+100 (NBL)
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

**Golder Associates Ltd.**
MISSISSAUGA, ONTARIO, CANADAKEY PLAN
SCALE

4 0 4 8 km

LEGEND

- Borehole – Current Investigation
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of or during drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
C43-1	244.2	4876282.5	297273.1
C43-2	246.7	4876298.0	297285.5
C43-3	246.8	4876295.9	297323.8
C43-4	245.0	4876301.4	297343.8
F7-1	248.1	4876231.1	297335.8
F7-2	245.5	4876262.4	297340.3
F7-3	243.2	4876358.2	297330.7
F7-4	245.3	4876236.3	297228.2
F7-5	243.5	4876196.0	297266.3
F7-6	248.7	4876347.4	297252.7

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 plans provided in digital format by URS, drawing files no. Hwy400_bgd.dwg and Hwy400_plan.dwg received October 17, 2011.

NO.	DATE	BY	REVISION
Geocres No. 30M13-217			
HWY. 400			PROJECT NO. 09-1111-0018
SUBM'D. AMT	CHKD. TWB	DATE: Mar. 2016	SITE:
DRAWN: JFC/MR	CHKD. SMM	APPD: JMAC	DWG:H1



PROJECT		RECORD OF BOREHOLE		No C43-1		SHEET 1 OF 1		METRIC								
G.W.P. 2835-02-00		LOCATION		N 4876282.5 ; E 297273.1		ORIGINATED BY		TT								
DIST Central HWY 400		BOREHOLE TYPE		Mobile B-57, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY		JC								
DATUM Geodetic		DATE		July 25, 2011		CHECKED BY		TVA/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								
244.2	GROUND SURFACE															
0.0	TOPSOIL															
243.9	Silty sand, trace gravel, trace clay (FILL)		1	SS	23											
243.5	Compact Brown Moist		2	SS	23											
0.7	CLAYEY SILT, trace to some sand, trace gravel, containing rootlets Very stiff to hard Brown and grey Moist		3	SS	43											
			4	SS	27											
241.2	CLAYEY SILT with SAND, trace to some gravel (TILL)		5	SS	35											
3.0	Hard Grey Moist		6	SS	63											
240.5	SILT and SAND, trace to some clay, trace to some gravel (TILL)		7	SS	90											
3.7	Very dense Grey Moist		8	SS	100/18											
			9	SS	100/15											
236.4	END OF BOREHOLE															
7.8	NOTE: 1. Water level in open borehole at a depth of 2.7 m below ground surface (Elev. 241.5 m) upon completion of drilling.															

PROJECT	09-1111-0018	RECORD OF BOREHOLE No C43-2		SHEET 1 OF 1	METRIC
G.W.P.	2835-02-00	LOCATION	N 4876298.0 ; E 297285.5	ORIGINATED BY	SB
DIST	Central	HWY	400	BOREHOLE TYPE	D-90 Truck Mount, 108 mm Outside Diameter Solid Stem Augers
DATUM	Geodetic	DATE	December 15, 2010	COMPILED BY	MAS
				CHECKED BY	TVA/SMM

[illegible]

PROJECT		RECORD OF BOREHOLE No C43-3		SHEET 1 OF 1		METRIC								
G.W.P. 09-1111-0018		LOCATION N 4876295.9 ; E 297323.8		ORIGINATED BY SB										
DIST Central HWY 400		BOREHOLE TYPE D-90 Truck Mount, 108 mm Inside Diameter Hollow Stem Augers		COMPILED BY CS										
DATUM Geodetic		DATE March 27, 2011		CHECKED BY TVA/SMM										
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		WATER CONTENT (%)				
246.8	GROUND SURFACE													
0.0	ASPHALT													
0.2	Sand, some silt, trace gravel (FILL) Compact Brown Moist		1	SS	14									
245.3														
1.5	Clayey silt, trace sand, trace gravel (FILL) Stiff Brown Moist		2	SS	12									
244.6														
2.2	Silty sand, trace to some gravel, trace clay (FILL) Loose Brown Moist		3	SS	4									
	Becoming grey and wet at a depth of 3.0 m		4	SS	4									10 64 23 3
			5	SS	10									
242.3														
4.5	CLAYEY SILT with SAND, trace gravel (TILL) Hard Brown Moist		6	SS	49									4 32 45 19
241.2														
5.6	SILT and SAND, trace to some gravel, trace to some clay (TILL) Very dense Brown Moist		7	SS	100/09									13 49 32 6
238.9			8	SS	60/15									
7.9	END OF BOREHOLE AUGER REFUSAL													
NOTES: 1. Borehole caved at a depth 4.0 m below ground surface (Elev. 242.8 m) upon completion of drilling. 2. Water level in open borehole encountered at ground surface (Elev. 246.8 m) in open borehole upon completion of drilling.														

PROJECT		09-1111-0018		RECORD OF BOREHOLE No C43-4		SHEET 1 OF 1		METRIC					
G.W.P.		2835-02-00		LOCATION		N 4876301.4 ; E 297343.8		ORIGINATED BY					
DIST		Central HWY 400		BOREHOLE TYPE		Mobile B-57, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY					
DATUM		Geodetic		DATE		July 20 and 21, 2011		CHECKED BY					
								TVA/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			20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)		
245.0	GROUND SURFACE												
0.0	Sand and silt, trace clay, containing rootlets, slightly organic (FILL)		1	SS	22								
244.4	Compact Brown Moist		2	SS	44								
0.6	CLAYEY SILT, trace to some sand, trace gravel, containing silt zones below a depth of 1.5 m		3	SS	63								
242.8	Hard Brown Moist												
2.2	SILT and SAND, some gravel, trace to some clay (TILL)		4	SS	100/28								
	Very dense Brown Moist												
	Becoming grey at a depth of 3.0 m		5	SS	77								
241.3	CLAYEY SILT, some sand, trace gravel (TILL)		6	SS	54								
3.7	Hard Grey Moist		7	SS	56								
239.4	SAND, some silt, some gravel												
5.6	Dense Grey Moist		8	SS	33								
237.9	SAND and GRAVEL, trace silt												
7.1	Dense Grey Wet		9	SS	33								
236.4	CLAYEY SILT, trace sand												
8.6	Hard Grey Moist		10	SS	49								
233.7													
11.3	END OF BOREHOLE		11	SS	80								
NOTE:													
1. Water level in open borehole at a depth of 4.0 m below ground surface (Elev. 241.0 m) upon completion of drilling.													

PROJECT 09-1111-0018			RECORD OF BOREHOLE No F7-1			SHEET 1 OF 1			METRIC																						
G.W.P. 2835-02-00			LOCATION N 4876231.1 ; E 297335.8			ORIGINATED BY AM																									
DIST Central HWY 400			BOREHOLE TYPE D-50 Track Mount, 108 mm Outside Diameter Solid Stem Auger			COMPILED BY CS																									
DATUM Geodetic			DATE March 25, 2011			CHECKED BY																									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			SHEAR STRENGTH kPa			WATER CONTENT (%)			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																										
248.1	GROUND SURFACE																														
0.0	ASPHALT																														
0.1	Silty sand and gravel (FILL)																														
247.3																															
0.8	Clayey silt, some sand, trace gravel(FILL) Firm to stiff Brown and grey Moist		1	SS	7																										
			2	SS	7																										
	Containing organics and containing rootlets at a depth of 2.4 m		3	SS	10																										
245.1																															
3.0	CLAYEY SILT, trace to some sand, trace gravel (TILL) Firm to stiff Brown and grey Moist		4	SS	6																										
			5	SS	9																										
243.6																															
4.5	SILTY SAND, trace to some gravel, trace clay (TILL) Very dense Brown and grey Moist		6	SS	60																										
			7	SS	111/23																										
240.1			8	SS	107																										
8.0	END OF BOREHOLE NOTE: 1. Open borehole dry upon completion of drilling.																														

GTA-MTO 001 T:\PROJECTS\2009\09-1111-0018 (URS, YORK REGION)\LOG\0911110018.GPJ GAL-GTA.GDT 19/11/15 SIB

PROJECT 09-1111-0018		RECORD OF BOREHOLE No F7-2		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4876262.4 ; E 297340.3		ORIGINATED BY AM			
DIST Central HWY 400		BOREHOLE TYPE D-25 Track Mount, 108 mm Inside Diameter Hollow Stem Auger		COMPILED BY TT			
DATUM Geodetic		DATE January 19, 2011		CHECKED BY			

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W _p	W	W _L		
								20	40	60	80	100	WATER CONTENT (%)				
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED											
245.5	GROUND SURFACE					▽										1 32 43 24	
0.1	TOPSOIL		1	SS	8												
	Organic clayey silt, some sand, trace gravel, containing rootlets and wood fragments (FILL)																
	Firm to stiff		2	SS	12										○		
	Brown to black																
	Moist																
244.0																	
1.5	CLAYEY SILT, trace to some sand, trace to some gravel (TILL)		3	SS	6									○			
	Stiff to hard																
	Brown		4	SS	14												
	Moist																
			5	SS	71												
241.8																	
3.7	CLAYEY SILT with sand, trace gravel (TILL)		6	SS	45									○			
	Hard																
	Brown to grey		7	SS	59												
	Moist																
	Containing zones of silty sand at a depth of 4.6 m																
239.9																	
5.6	SAND and GRAVEL, trace to some silt, trace clay		8	SS	79												
	Very dense																
	Grey																
	Moist																
	Containing silty clay lenses at 6.5 m																
238.8																	
6.7	END OF BOREHOLE																
NOTE: 1. Water level in open borehole at a depth of 2.9 m below ground surface (Elev. 242.6 m) upon completion of drilling.																	

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F7-3		SHEET 1 OF 1		METRIC								
G.W.P.		2835-02-00		LOCATION		N 4876358.2 ; E 297330.7		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		Mobile B-57, 108 mm Outside Diameter Solid Stem Augers		COMPILED BY								
DATUM		Geodetic		DATE		July 21, 2011		CHECKED BY								
								TVA								
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								
243.2	GROUND SURFACE															
0.0	Sand and silt, trace clay (FILL) Compact Brown Moist		1	SS	19											
242.4																
0.8	ORGANIC CLAYEY SILT, trace sand, containing rootlets and wood fragments Stiff to very stiff Brown and black Moist		2	SS	9											O.C. = 6.0%
241.1																
2.1	SILT and SAND, trace to some clay, trace to some gravel, containing black sand pockets (TILL) Dense to very dense Grey Moist		3	SS	23											
			4	SS	34											
			5	SS	99											15 47 30 8
			6	SS	60/152											
			7	SS	60/152											
237.3																
5.9	SILTY SAND, trace gravel Very dense Brown Moist		8	SS	100/23											
236.5																
6.7	END OF BOREHOLE															
	NOTE: 1. Water level in open borehole at a depth of 2.5 m below ground surface (Elev. 240.7 m) upon completion of drilling.															

PROJECT		09-1111-0018		RECORD OF BOREHOLE No F7-4		SHEET 1 OF 1		METRIC								
G.W.P.		2835-02-00		LOCATION		N 4876236.3 ; E 297228.2		ORIGINATED BY								
DIST		Central HWY 400		BOREHOLE TYPE		Marl Mini Mole Track Mount 108 mm Outside Diameter Solid Stem Augers		COMPILED BY								
DATUM		Geodetic		DATE		August 25, 2011		CHECKED BY								
								TVA/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								
245.3	GROUND SURFACE															
0.0	TOPSOIL (100 mm)															
	CLAYEY SILT, some sand to CLAYEY SILT with SAND, trace gravel, containing sand seams to a depth of 1.4 m (TILL) Very stiff to hard Brown Moist		1	SS	15											
			2	SS	21											
			3	SS	37											
	Becoming grey at a depth of 4.0 m		4	SS	44											
			5	SS	30											
			6	SS	40											
			7	SS	25											
			8	SS	101											
238.7	END OF BOREHOLE															
6.6	NOTE: 1. Open borehole dry upon completion of drilling.															

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PROJECT 09-1111-0018		RECORD OF BOREHOLE No F7-5		SHEET 1 OF 1		METRIC	
G.W.P. 2835-02-00		LOCATION N 4876196.0 ; E 297266.3		ORIGINATED BY TT			
DIST Central HWY 400		BOREHOLE TYPE Marl Mini Mole Track Mount 108 mm Outside Diameter Solid Stem Augers		COMPILED BY CS			
DATUM Geodetic		DATE August 25, 2011		CHECKED BY TVA			

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					WATER CONTENT (%)							
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					w _p w w _L							
243.5	GROUND SURFACE							20	40	60	80	100								
0.1	TOPSOIL																			
	CLAYEY SILT, trace to some sand to CLAYEY SILT with SAND, trace gravel (TILL) Very stiff to hard Brown Moist		1	SS	7															
			2	SS	27															
	becoming grey at a depth of 1.7 m		3	SS	16															
			4	SS	18															
			5	SS	16															
			6	SS	49															
238.2																				
5.3	SILT and SAND, trace to some clay, trace gravel (TILL) Very dense Grey Moist		7	SS	87															
237.6	END OF BOREHOLE																			
5.9	NOTE: 1. Water level in open borehole at a depth of 0.1 m below ground surface (Elev. 243.4 m) upon completion of drilling.																			

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PROJECT		09-1111-0018		RECORD OF BOREHOLE No F7-6		SHEET 1 OF 1		METRIC																
G.W.P.		2835-02-00		LOCATION		N 4876347.4 ; E 297252.7		ORIGINATED BY																
DIST		Central HWY 400		BOREHOLE TYPE		D-25 Track Mount, 108 mm Inside Diameter Hollow Stem Augers		COMPILED BY																
DATUM		Geodetic		DATE		January 21, 2011		CHECKED BY																
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV	DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES																		
248.7		GROUND SURFACE																						
0.0		TOPSOIL																						
0.2		Organic clayey silt, some sand, trace gravel, containing rootlets (FILL)		1	SS	7																		
247.9		Firm																						
0.8		Brown																						
		Moist		2	SS	18																		
247.2		Sandy clayey silt, trace gravel (FILL)																						
1.5		Very stiff																						
		Brown																						
		Moist		3	SS	20																		
		Sandy CLAYEY SILT, trace gravel (TILL)																						
		Very stiff to hard																						
		Brown																						
		Moist		4	SS	53																		
245.7		SILT and SAND, trace gravel, trace clay, silty clay layers (TILL)																						
3.0		Very dense																						
		Brown																						
		Moist to wet		5	SS	150																		
				6	SS	105/15																		
				7	SS	104/15																		
				8	SS	126/15																		
				9	SS	114/15																		
				10	SS	153																		
240.0		Silty SAND, some gravel																						
8.7		Very dense																						
		Brown																						
		Wet																						
239.2		END OF BOREHOLE																						
9.5																								
		NOTE:																						
		Water level at a depth of 9.4 m below ground surface (Elev. 239.3 m) in open borehole upon completion of drilling.																						

Silt and Sand to Silty Sand Fill

U.S.S Sieve size, meshes/inch

Size of openings, inches

200 100 60 50 40 30 20 16 10 8 4 3 3/8" 1/2" 3/4" 1" 1 1/2" 3" 4 1/4" 6"

PERCENT FINER THAN

100 90 80 70 60 50 40 30 20 10 0

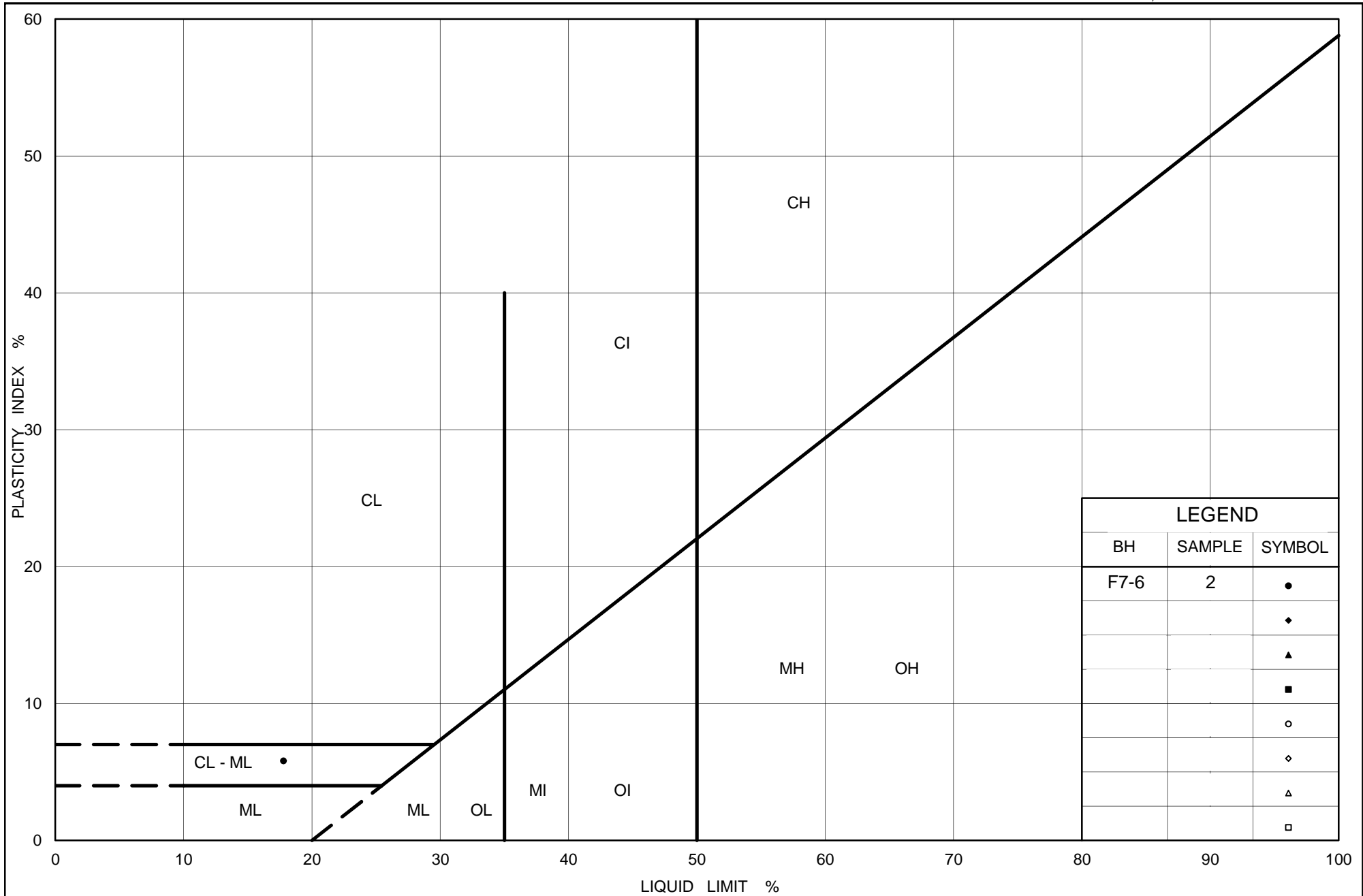
GRAIN SIZE, mm

0.0001 0.001 0.01 0.1 1 10 100

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

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C43-2	3	244.1
■	C43-3	4	243.5

Date: 18-Sep-13



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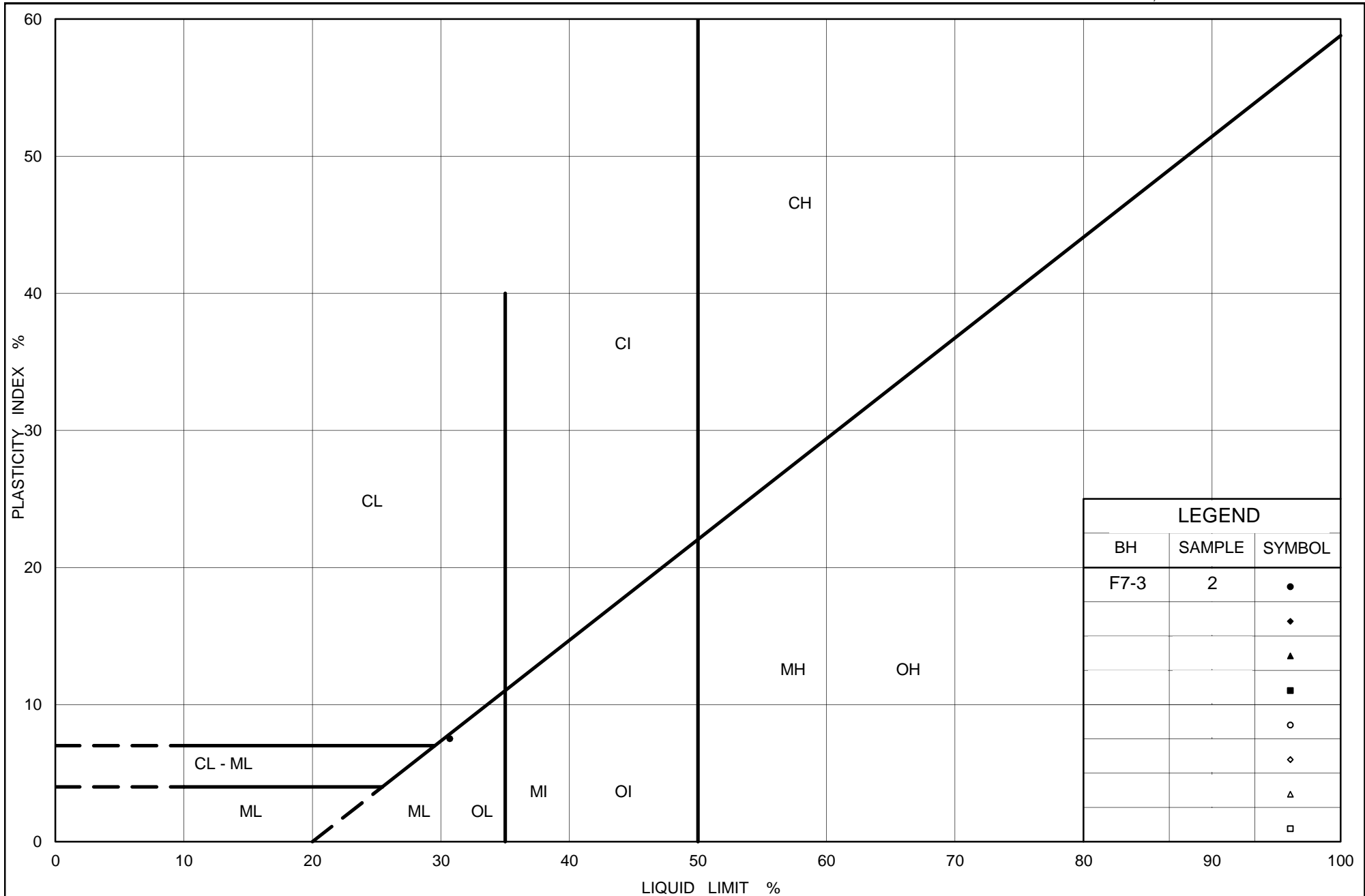
PLASTICITY CHART

Clayey Silt Fill

Figure No. H2

Project No. 09-1111-0018

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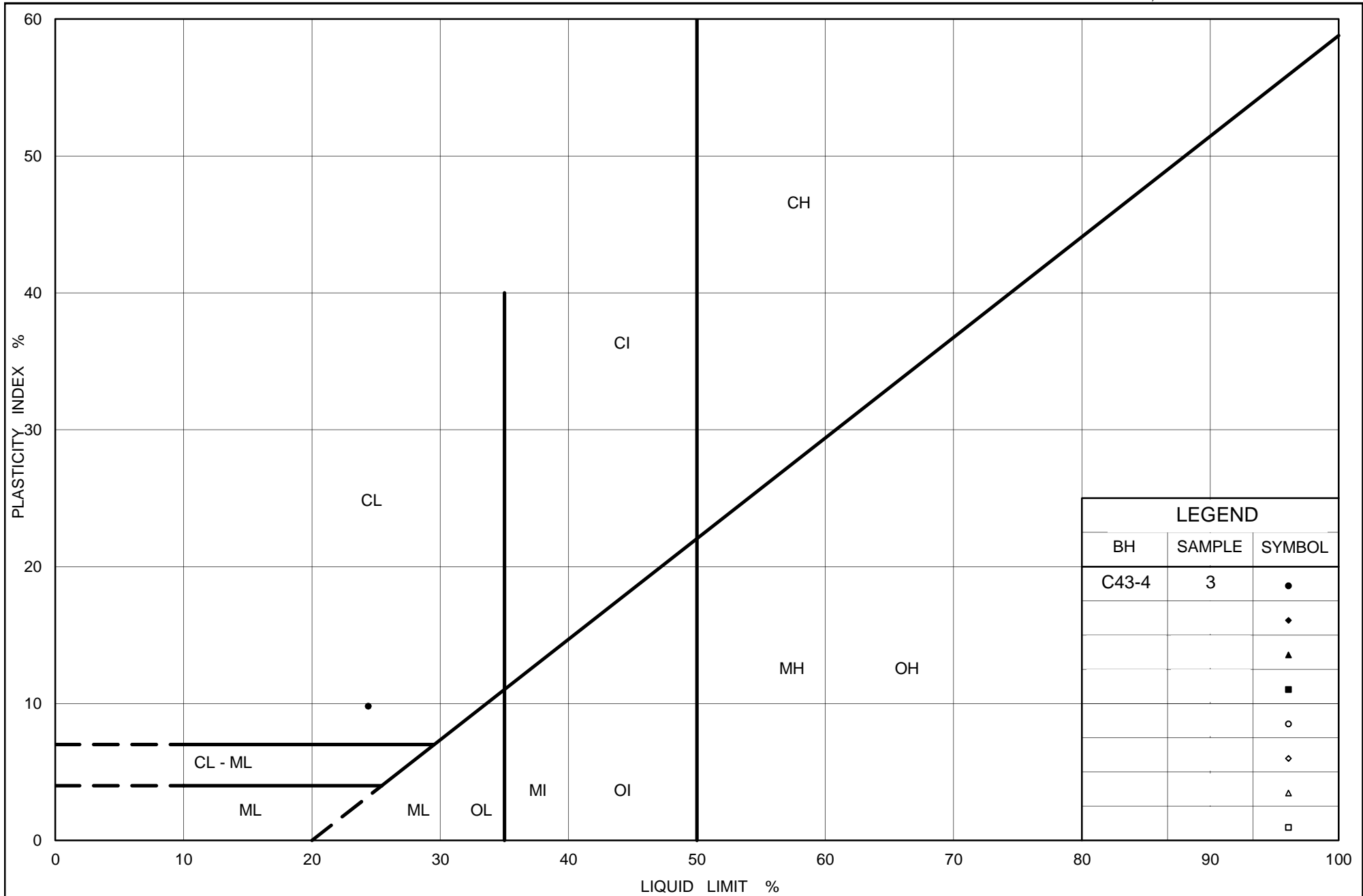
PLASTICITY CHART

Organic Clayey Silt

Figure No. H3

Project No. 09-1111-0018

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PLASTICITY CHART Upper Clayey Silt

Figure No. H4

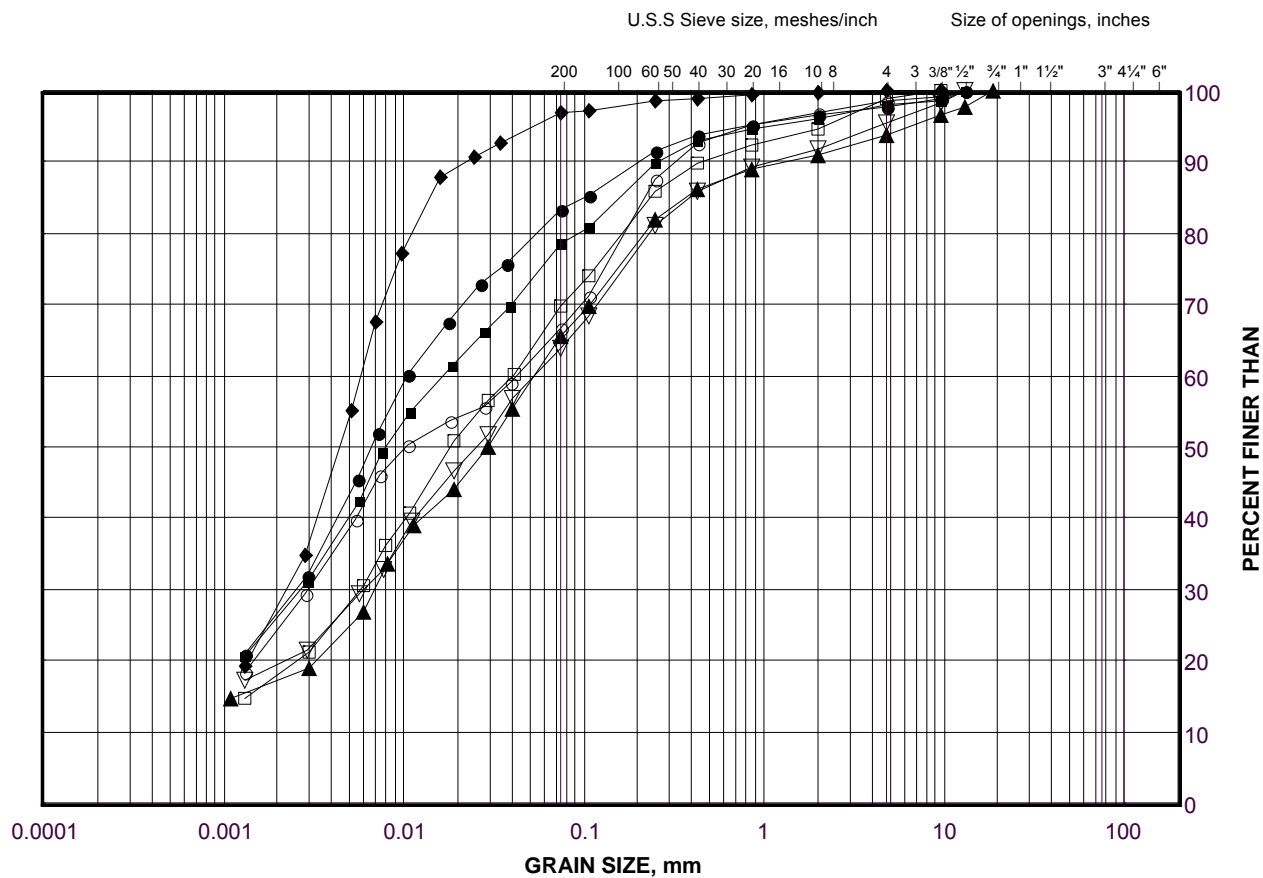
Project No. 09-1111-0018

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GRAIN SIZE DISTRIBUTION

Clayey Silt Till

FIGURE H5



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

LEGEND

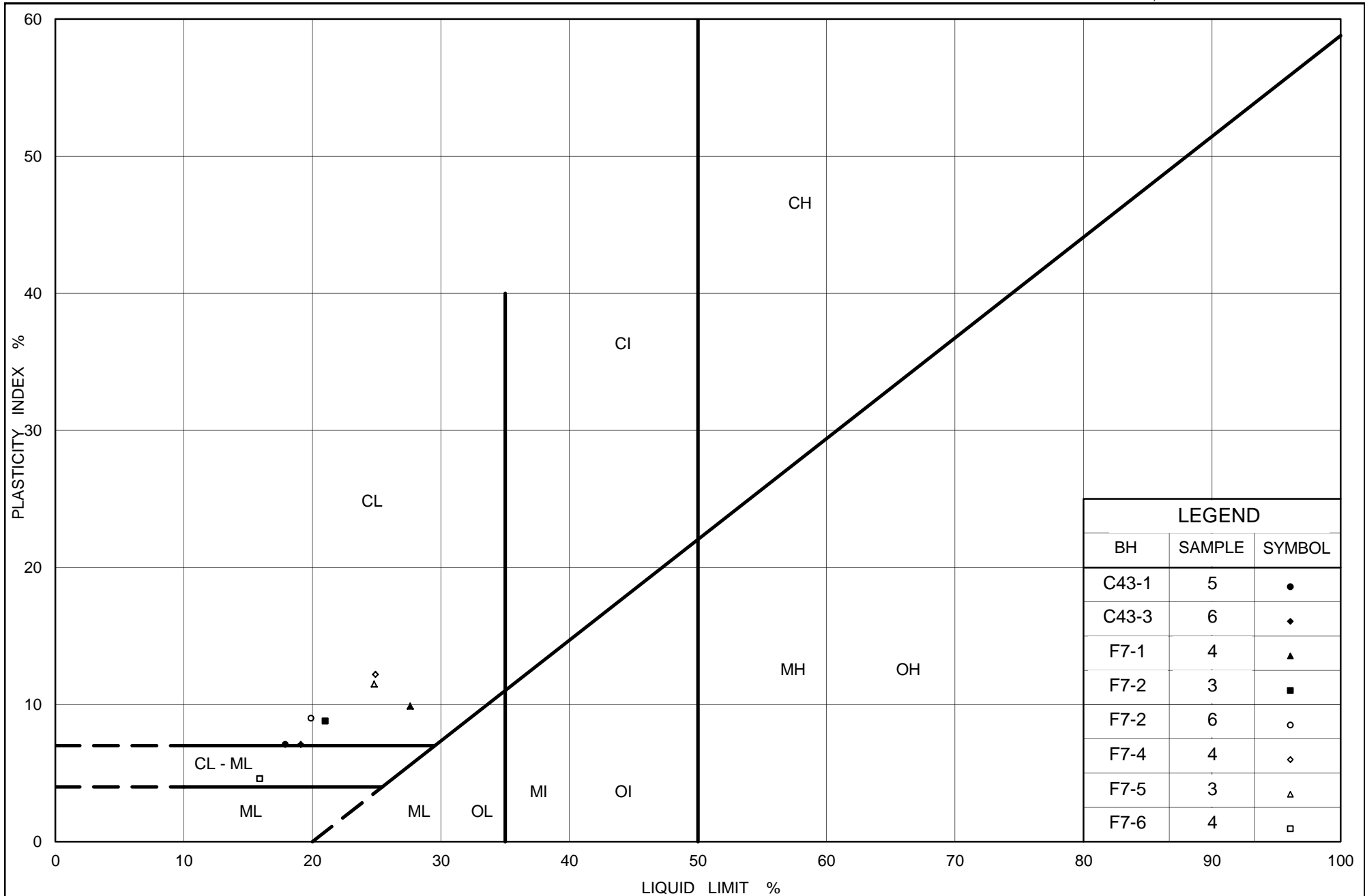
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F7-5	3	241.7
■	F7-4	4	242.7
◆	F7-1	4	244.7
▲	C43-1	5	240.9
▽	C43-3	6	241.9
○	F7-2	6	241.4
□	F7-4	8	239.0

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PLASTICITY CHART Clayey Silt Till

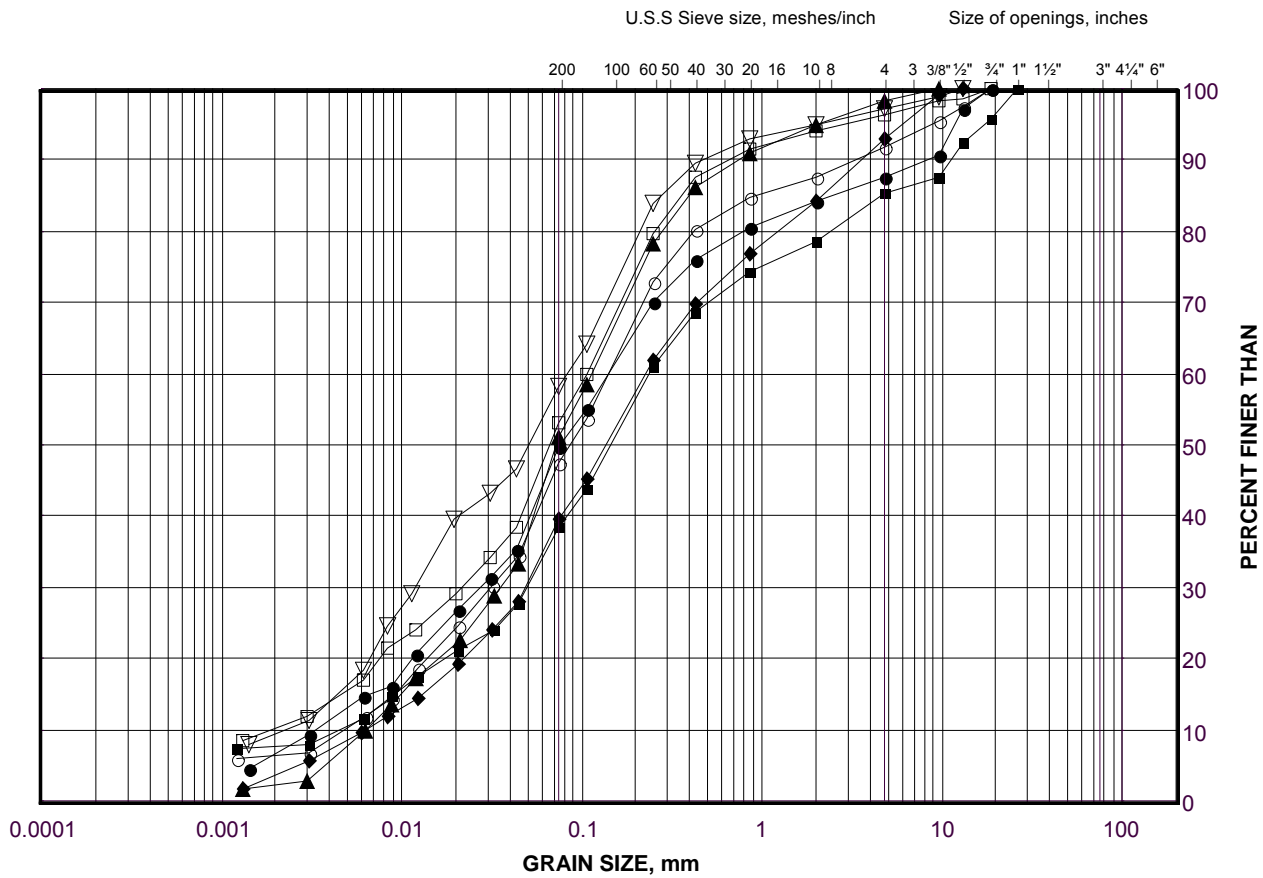
Figure No. H6

Project No. 09-1111-0018

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Silt and Sand to Silty Sand Till

FIGURE H7A



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C43-4	4	242.5
■	F7-3	5	240.0
◆	C43-2	6	241.9
▲	F7-6	6	244.8
▽	F7-5	7	237.9
○	C43-1	7	239.4
□	F7-1	7	241.8

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Gravelly Silt and Sand to Silty Sand Till

U.S.S Sieve size, meshes/inch

Size of openings, inches

PERCENT FINER THAN

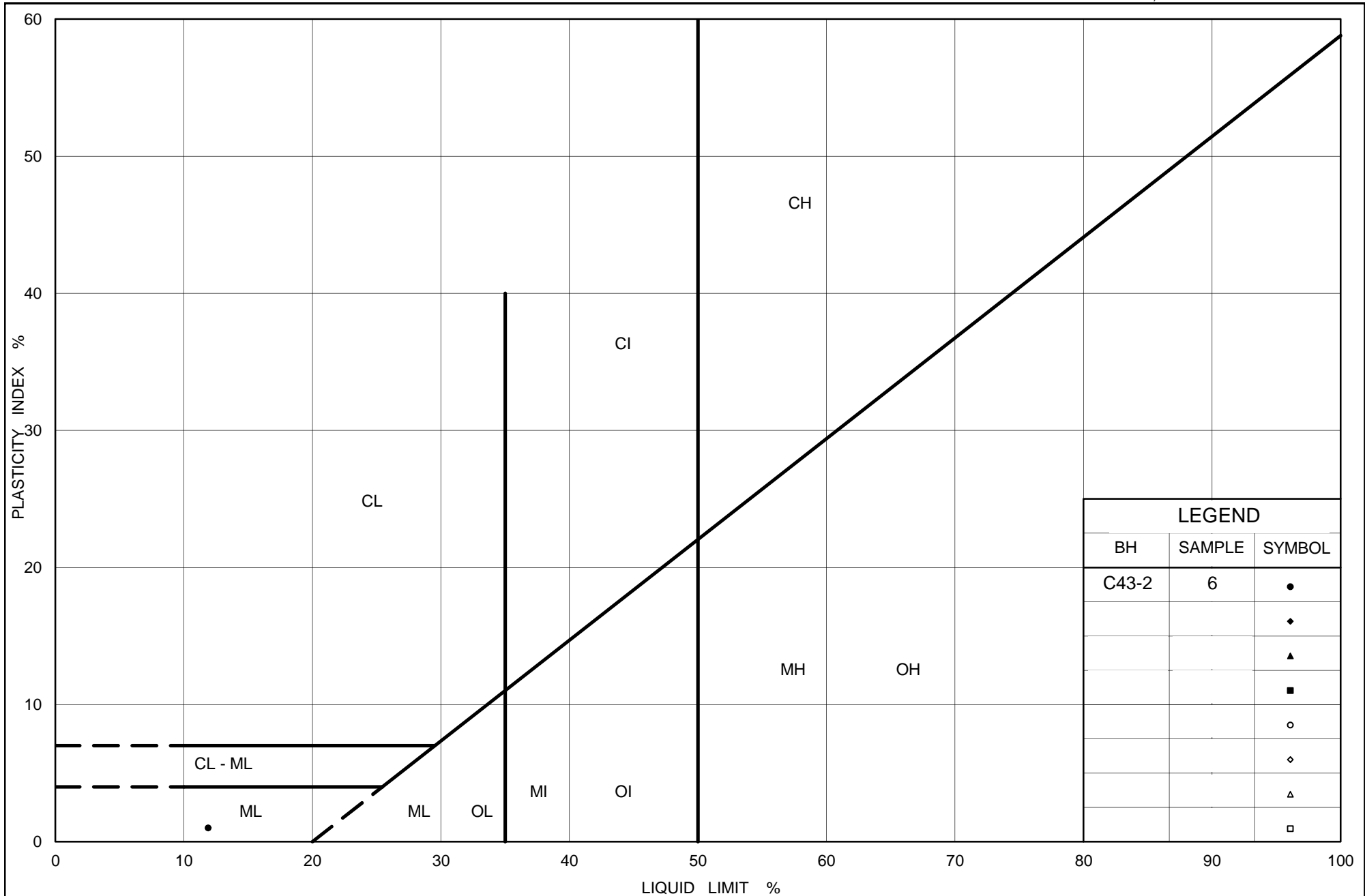
GRAIN SIZE, mm

Grain Size (mm)	Percent Finer (%) - Diamond	Percent Finer (%) - Circle	Percent Finer (%) - Square
0.075	45	35	30
0.15	70	55	45
0.3	85	75	55
0.6	90	85	65
1.2	95	90	75
2.5	98	95	85
5.0	100	98	90
10.0	100	100	95
20.0	100	100	100

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

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	C43-3	7	240.6
■	C43-2	8	239.0
◆	F7-6	8	242.5

Date: 18-Sep-13



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PLASTICITY CHART

Silt and Sand Till

Figure No. H8

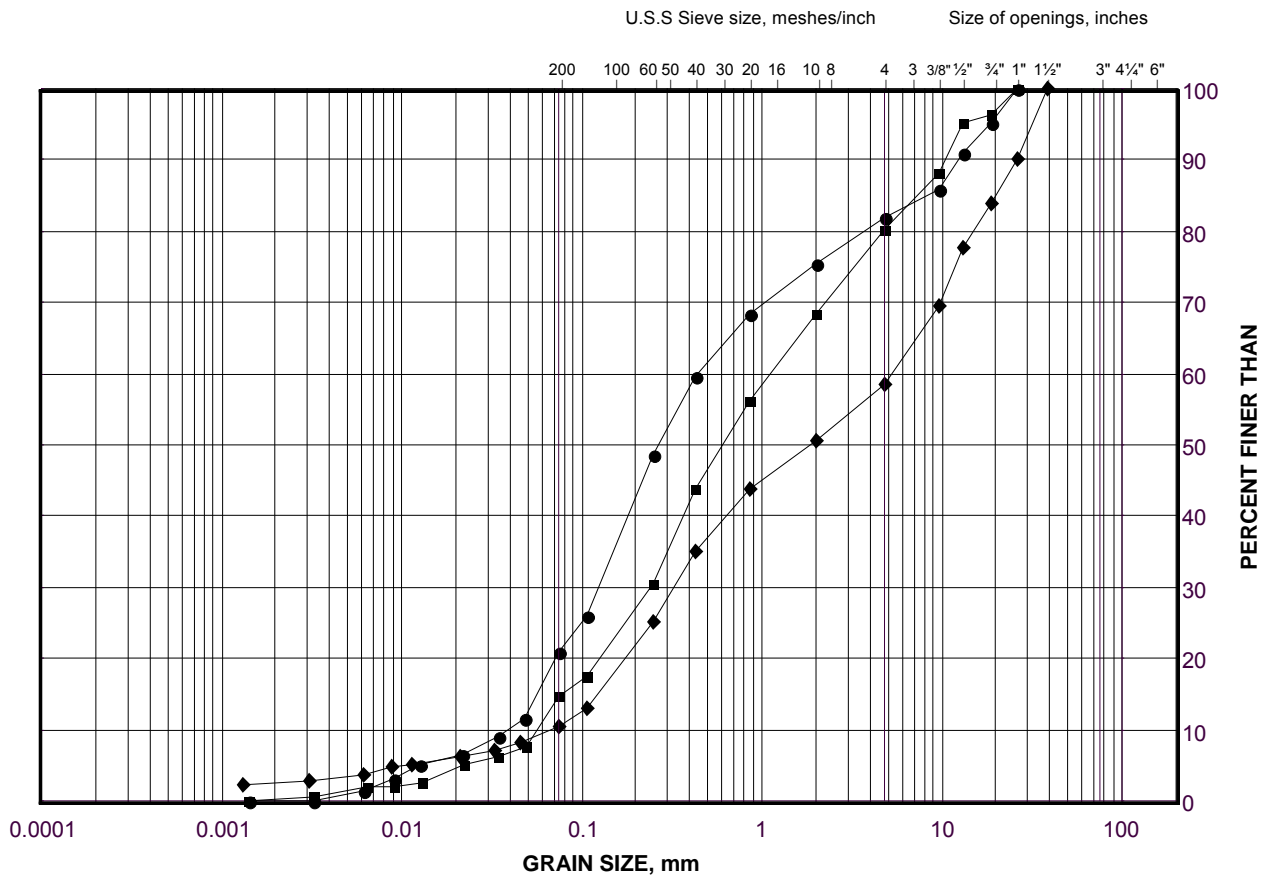
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GRAIN SIZE DISTRIBUTION

Silty Sand to Sand and Gravel

FIGURE H9



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

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	F7-6	10	239.4
■	C43-4	8	238.7
◆	F7-2	8	239.1

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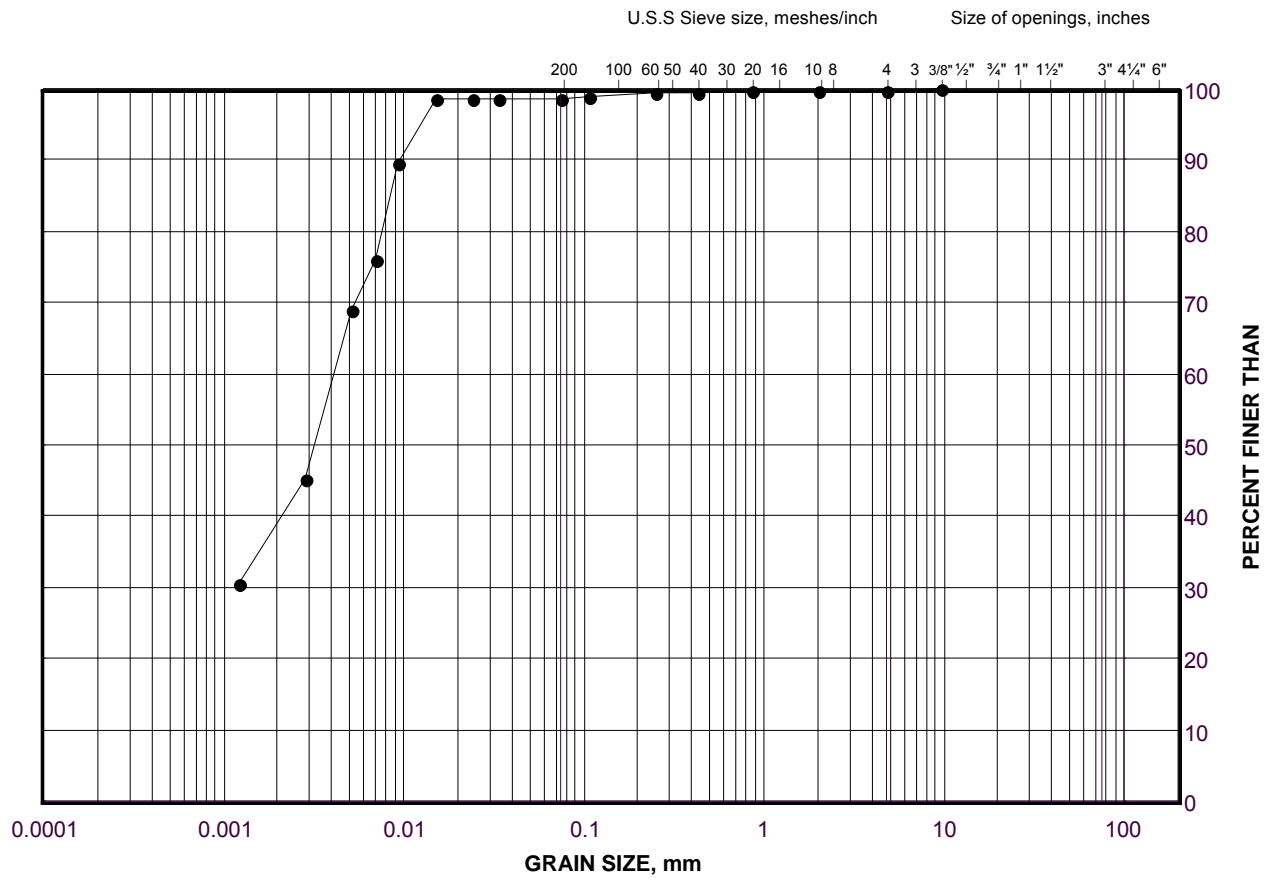
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GRAIN SIZE DISTRIBUTION

Lower Clayey Silt

FIGURE H10



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

LEGEND

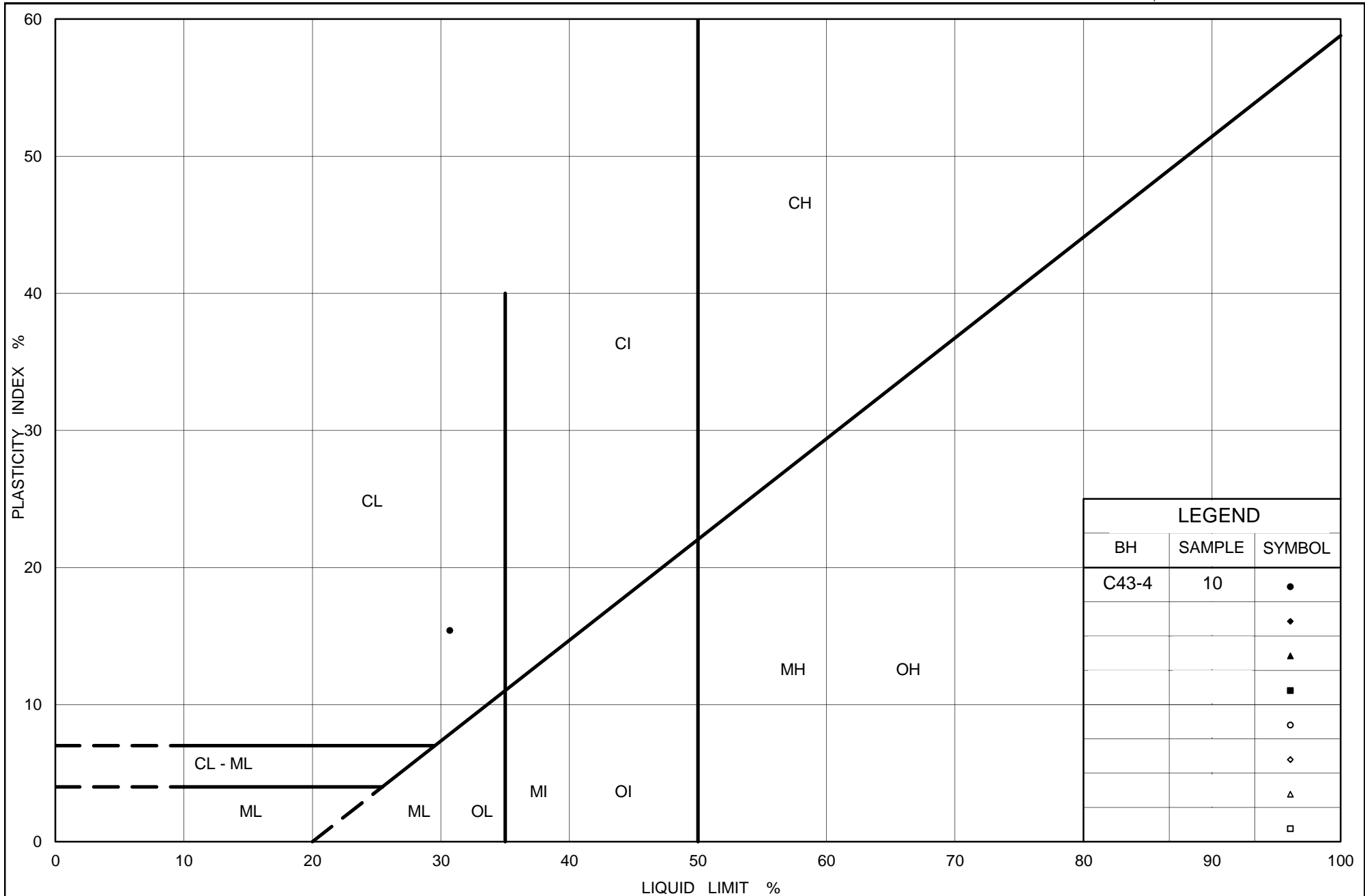
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	C43-4	10	235.6

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PLASTICITY CHART

Lower Clayey Silt

Figure No. H11

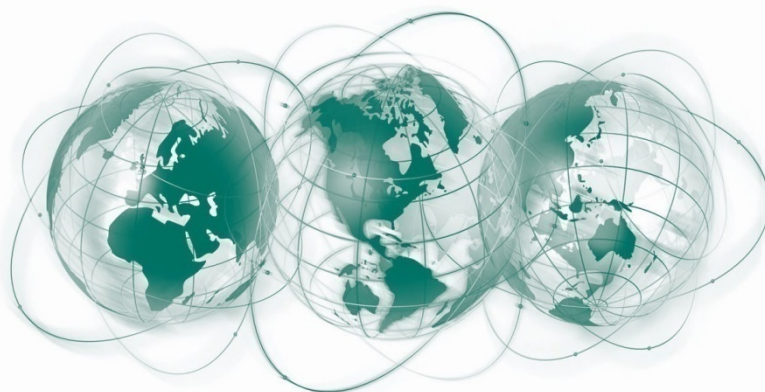
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