FOUNDATION INVESTIGATION REPORT
HIGHWAY 404 EXTENSION
FROM GREEN LANE TO QUEENSVILLE SIDEROAD
HIGH FILLS AND DEEP CUTS AT

27+775 – 27+875 **30+075 – 30+225**
30+975 – 31+100 **33+200 – 33+700**
QSR 9+550 – 9+750 **QSR 9+750 – 10+300**

REGION OF YORK
G.W.P. 2109-05-00

GEOCRES Number: 31D-492

Report to

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FOUNDATION INVESTIGATION REPORT
HIGH FILLS AND DEEP CUTS
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FROM GREEN LANE TO WOODBINE AVENUE/RAVENSHOE ROAD
ONTARIO
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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted at the locations of proposed high fills and deep cuts associated with the proposed extension of Highway 404 in the Regional Municipality of York, Ontario. The high fills and deep cuts included in this report are located between Green Lane and Queensville Sideroad (north side of Queensville Sideroad).

The purpose of this investigation was to explore the subsurface conditions at the site and, based on the data obtained, to provide a borehole location plan, records of boreholes, stratigraphic profile, laboratory test results and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained in the course of the present investigation.

Thurber carried out the investigation as a sub-consultant to Philips Engineering / Hatch Mott MacDonald Joint Venture under the Ministry of Transportation Ontario (MTO) Agreement Number 2007-E-0027.

In the preparation of this report and in addition to the boreholes drilled under the current assignment, reference has been made to information on subsurface conditions contained in other foundation reports. The titles of these reports are listed as follows:

- Preliminary Foundation Investigation Report, Queensville Sideroad Underpass, Highway 404 Extension from Green Lane to Highway 12/48, Agreement No. 2005-A-000585, dated October 2006, prepared by Golder Associates. Report Reference No. 04-1111-016-3 (Reference 1).

- Foundation Investigation and Design Report, Queensville Sideroad Underpass, Highway 404 Extension from Green Lane to Woodbine Avenue/Ravenshoe Road, Agreement No. 2007-E-0027, G.W.P. 2109-05-00, Geocres Number: 31D-449, dated August 27, 2009, prepared by Thurber. Report Reference No. 19-1605-96. (Reference 2).
- Foundation Investigation and Design Report, Doane Road Underpass, Highway 404 Extension from Green Lane to Woodbine Avenue/Ravenshoe Road, Agreement No. 2007-E-0027, G.W.P. 2109-05-00, Geocres Number: 31D-483, dated September 9, 2009, prepared by Thurber .Report Reference No. 19-1605-96. (Reference 3).
- Draft Foundation and Investigation Report, Culverts, Highway 404 Extension from Green Lane to Woodbine Avenue/Ravenshoe Road, Agreement No. 2007-E-0027, G.W.P. 2109-05-00, Report Reference No. 19-1605-96. (Reference 4).

2 SITE DESCRIPTION

2.1 High Fill - Highway 404 extension, South of Doane Road, Station 30+075 – 30+225, (Boreholes 08-06 to 08-09)

The site is located approximately 750 m south of Doane Road and approximately 450 m west of Woodbine Avenue (York Regional Road 8) in the Town of East Gwillimbury in the Regional Municipality of York.

The south side of the site is currently a sod farm and towards the north the area becomes wooded with mature trees, shrubs and long grass. Mount Albert creek is located within the site flowing southerly. A flooded area was observed approximately 200 m north of the site. The water is backed up from a pond located to the northeast of the site. The pond is approximately 250 m long and 25 m wide.

Photographs of the site included in Appendix A show the general nature of the surrounding lands.

2.2 Deep Cut - Highway 404 extension, South of Mount Albert Road, Station 27+775 – 27+875, (Boreholes 08-15A to 08-017A)

The site is located approximately 1 km south of Mount Albert Road and approximately 200 m east of Colonel Wayling Boulevard in the Town of East Gwillimbury in the Regional Municipality of York.

The lands are currently agricultural to the north, east and south of the site. A residential subdivision occupies the west side of the site.

Photographs of the site included in Appendix B show the general nature of the surrounding lands.

2.3 Deep Cut - Highway 404 extension, North of Doane Road Station 30+975 – 31+100, (Boreholes 08-18 to 08-21 and 08-48 to 08-55)

The site is located approximately 50 m north of the existing Doane Road and approximately 900 m west of the intersection of Doane Road and Woodbine Avenue (York Regional Road 8), in the Town of East Gwillimbury in the Regional Municipality of York.

The lands are generally undeveloped and/or agricultural. Vegetation consists mainly of tall grass, shrubs and a few mature trees. There are farmsteads to the north and south of Doane Road.

Photographs of the site included in Appendix C show the general nature of the surrounding lands.

2.4 Deep Cut - Highway 404 extension, North of Queensville Sideroad Station 33+200 – 33+700, (Boreholes 08-22 to 08-26)

The site is located approximately 200 m north of the existing Queensville Sideroad and approximately 750 m west of the intersection of Queensville Sideroad and Woodbine Avenue (York Regional Road 8, in the Town of East Gwillimbury in the Regional Municipality of York.

The lands around the site are generally undeveloped and/or agricultural. Vegetation consists mainly of tall grass, shrubs and a few mature trees. There are farmsteads to the north and south of Queensville Sideroad.

Photographs of the site included in Appendix D show the general nature of the surrounding lands.

2.5 High Fill and Deep Cut - Queensville Sideroad, Station 9+550 – 10+300 (Boreholes 08-33 to 08-38, 08-38A, 08-33A, 08-39 to 08-47, 08-61, QSR4-1 to QSR4-5 and 301 to 303)

The high fill and deep cut areas are located along the existing Queensville Sideroad, approximately 750 m west of the existing intersection of Queensville Road and Woodbine Avenue (York Regional Road 8), in the Town of East Gwillimbury, in the Regional Municipality of York.

Currently, the topography along Queensville Sideroad, within the site is a rolling/undulating terrain varying in elevation as follows:

Location	Station	Elevation	Grade (%)
West of site	9+350 to 9+625	270 to 284.9	5.4
	9+625 to 10+075	284.9 to 257.1	-6.2
Proposed Hwy 404 alignment & Queensville Sideroad intersection	10+000	259.1	-
East of site	10+075 to 10+280	257.1 to 264.5	3.6

The site is within a low point/valley and the natural ground surface within the valley has a relatively flat to gently rolling/undulating topography.

A small tributary of the Maskinonge River flows southerly through a CSP culvert under Queensville Sideroad.

The lands to the north and south of Queensville Sideroad are generally undeveloped and/or agricultural with a few farmsteads. Vegetation consists mainly of tall grass, shrubs and a few mature trees.

Photographs of the site included in Appendix E show the general nature of the surrounding lands.

The sites are located within the physiographic region known as The Peterborough Drumlin Field, characterized by drumlinized till. The till is typically sandy with shallow coverings of silt and fine sand.

3 SITE INVESTIGATION AND FIELD TESTING

During the present investigation, a total of twenty-nine (29) sampled boreholes were drilled for the proposed high fills and deep cuts identified within this section of the proposed Highway 404 extension. Twenty-two (22) boreholes drilled for proposed structures located in close proximity to the high fills and cuts have been incorporated in this report (References 1 to 4). A summary of the borehole designations employed at each site is provided in Table 3.1. The respective appendices including borehole logs, laboratory results, borehole location drawings, soil strata drawings and photographs are also provided in Table 3.1. The detailed subsurface soil and groundwater conditions encountered in the boreholes relevant to the high fill and deep cut locations included in References 1 to 4 are also included in the respective appendices. The coordinates and elevations of the boreholes are given on the drawings and on the individual Record of Borehole Sheets.

Table 3.1 – Borehole Designations

Location	Station	Fill or Cut	Borehole	Drilling date	Borehole Termination Depth (m)	Borehole Termination Elevation (m)	Appendix
(1) Hwy 404 extension/ Alignment (south of Doane Rd.)	30+075	F	08-06	August 25 and 26, 2009	5.2	254.7	A
	30+125		08-07		5.2	253.9	
	30+175		08-08		5.2	254.4	
	30+225		08-09		6.7	259.9	
(2) Hwy 404 extension/ Alignment (South of Mount Albert Rd.)	27+775	C	08-15A	July 30, 2009	10.8	279.7	B
	27+825		08-16A		10.8	278.8	
	27+875		08-17A		10.8	277.4	
(3) Hwy 404 extension/ Alignment (north of Doane Rd.)	30+975	C	08-18	January 29 and 30, 2009	7.7	259.3	C
	31+017		08-19		9.2	259.4	
	31+059		08-20		9.2	259.5	
	31+100		08-21		7.8	260.3	
Doane Road proposed underpass	30+950		08-48	October 20 to 24, 2008	7.9	257.8	
			08-49		9.3	256.8	
			08-50		9.4	255.0	
			08-51		12.3	251.3	
			08-52		9.5	252.8	
			08-53		10.8	251.4	
			08-54		12.3	248.7	
			08-55		9.3	252.4	
(4) Hwy 404 extension/ Alignment (north of Queensville Sideroad)	33+200	C	08-22	January 20 to 22, 2009	4.8	263.2	D
	33+250		08-23		13.9	260.1	
	33+300		08-24		16.8	259.5	
	33+350		08-25		19.9	258.0	
	33+400		08-26		19.8	258.4	

Table 3.1 – Borehole Designations (Cont'd)

Location	Station	Fill or Cut	Borehole	Drilling date	Borehole Termination Depth (m)	Borehole Termination Elevation (m)	Appendix
(5) Queensville Sideroad	9+550	C	08-61	July 15, 2008	15.3	269.6	E
	9+550		08-33	March 26, 2008	4.8	279.2	
	9+550		08-33A	July 14, 2008	15.3	270.9	
	9+700		08-34	March 25, 2008	6.4	275.0	
	9+750		08-35	March 26, 2008	6.3	271.3	
	9+800	F	08-36	March 25, 2008	7.8	265.7	
	9+840		08-37	March 24, 2008	9.2	260.9	
	9+880		08-38	March 24, 2008	10.8	256.1	
	10+100		08-38A	March 26, 2008	14.2	243.1	
	10+150		08-39	March 27, 2008	14.0	245.0	
	10+200		08-40	March 20, 2008	12.5	248.8	
	10+250		08-41	March 27, 2008	7.8	255.9	
	10+300		08-42	March 18, 2008	6.2	258.2	
Queensville Sideroad proposed underpass	33+000		08-43	March 28, 2008	4.7	259.2	
			08-44	March 28, 2008	12.3	246.8	
			08-45	April 3, 2008	21.4	236.9	
			08-46	March 18, 2008	23.1	233.6	
			08-47	March 12, 2008	27.7	229.7	
			301	June 11, 2004	15.7	241.8	
			301A	September 27 to 29, 2004	25.0	231.0	
			302		18.5	240.5	
			303		13.9	247.1	
Queensville Sideroad proposed culvert	10+088		QSR4-1	March 7, 2008	12.8	240.9	
	10+084		QSR4-2	March 7, 2008	11.3	243.6	
	10+080		QSR4-3	March 17, 2008	11.3	245.9	
	10+078		QSR4-4	February 25, 2009	11.3	244.2	
	10+075		QSR4-5		10.7	244.7	

The borehole locations were marked in the field and utility clearances were obtained prior to drilling.

Drilling was carried out using track mounted CME 75, CME 55 and D90 drill rigs. A combination of solid and hollow stem auger drilling techniques were used to advance the boreholes and samples were obtained at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT) in the overburden soils.

The drilling and sampling operations were supervised on a full time basis by a member of Thurber's technical staff. The supervisor logged the boreholes and processed the recovered soil samples for transport to Thurber's laboratory for further examination and testing.

Groundwater conditions in the open boreholes were observed throughout the drilling operations. Standpipe piezometers consisting of 19 mm PVC pipe with slotted screens were installed and enclosed in filter sand in selected boreholes to permit longer term groundwater level monitoring. Details of the piezometer installations and other borehole completion details are as shown in Table 3.2.

Table 3.2 – Borehole Completion Details

Location	Station	Borehole	Piezometer Tip Depth/ Elevation (m)	Completion Details
(1) Hwy 404 extension/ Alignment (south of Doane Rd.)	30+075	08-06	None installed	Borehole backfilled with holeplug to 0.9 m, then auger cuttings to 0.2 m and sod to the surface.
	30+125	08-07	5.2/253.9	Sand from 5.2 m to 3.3 m, holeplug from 3.3 m to 0.2 m, then sod to surface.
	30+175	08-08	None installed	Borehole backfilled with holeplug to surface.
	30+225	08-09	None installed	Borehole backfilled with holeplug to surface.
(2) Hwy 404 extension/ alignment (South of Mount Albert Rd.)	27+775	08-15A	None installed	Borehole backfilled with holeplug to 8.5 m, then auger cuttings to surface.
	27+825	08-16A	7.6/282.0	Sand from 7.6 m to 5.5 m, holeplug from 5.5 m to surface.
	27+875	08-17A	None installed	Borehole backfilled with holeplug to 8.7 m, then auger cuttings to surface.
(3) Hwy 404 extension/ Alignment (north of Doane Rd.)	30+975	08-18	None installed	Borehole backfilled with holeplug to 0.2 m, then auger cuttings to surface.
	31+017	08-19	9.1/259.5	Sand from 9.1 m to 7.3 m, holeplug from 7.3 m to 0.9 m, then auger cuttings surface.
	31+059	08-20	None installed	Borehole backfilled with holeplug to 1.5 m, then auger cuttings to surface.
	31+100	08-21	5.2/262.9	Sand from 5.2 m to 3.0 m, holeplug from 3.0 m to surface.
Doane Road proposed underpass	30+950	08-48	None installed	Borehole backfilled with holeplug to 0.07 m, then asphalt to surface.
		08-49	None installed	Borehole backfilled with holeplug to 0.05 m, then asphalt to surface.
		08-50	9.1/255.2	Sand from 9.1 m to 7.3 m, holeplug from 7.3 m to surface.
		08-51	8.1/255.5	Sand from 8.1 m to 5.8 m, holeplug from 5.8 m to 0.15 m, then concrete to surface.
		08-52	None installed	Borehole backfilled with holeplug to 3.0 m, then auger cuttings to surface.
		08-53	None installed	Borehole backfilled with holeplug to 0.07 m, then asphalt to surface.
		08-54	9.8/251.2	Sand from 9.8 m to 7.6 m, holeplug from 7.6 m to surface.
		08-55	None installed	Borehole backfilled with holeplug to 0.2 m, auger cuttings from 0.2 m to 0.05 m then asphalt to surface.

Table 3.2 – Borehole Completion Details (Cont'd)

Location	Station	Borehole	Piezometer Tip Depth/ Elevation (m)	Completion Details
(4) Hwy 404 extension/ Alignment (north of Queensville Sideroad)	33+200	08-22	None installed	Borehole backfilled with holeplug to 1.5 m, then auger cuttings to surface.
	33+250	08-23	13.7/260.2	Sand from 13.7 m to 11.9 m, holeplug from 11.9 m to surface.
	33+300	08-24	None installed	Borehole backfilled with holeplug to 2.4 m, then auger cuttings to surface.
	33+350	08-25	19.8/258.1	Sand from 19.8 m to 17.6 m, holeplug from 17.6 m to 3.0 m, then auger cuttings to surface.
	33+400	08-26	None installed	Borehole backfilled with holeplug to 2.7 m, then auger cuttings to surface.
(5) Queensville Sideroad	9+550	08-61	15.2/269.7	Sand from 15.2 m to 13.4 m, holeplug from 13.4 m to surface.
	9+550	08-33	None installed	Borehole backfilled with holeplug to surface.
	9+950	08-33A	15.2/271.0	Sand from 15.2 m to 13.4 m, holeplug from 13.4 m to surface.
	9+700	08-34	6.4/275.0	Sand from 6.4 m to 4.5 m, holeplug from 4.5 m to 0.6 m, then sand and gravel to 0.3 m, asphalt from 0.3 m surface.
	9+750	08-35	None installed	Borehole backfilled to surface with holeplug.
	9+800	08-36	7.8/265.7	Sand from 7.8 m to 5.9 m, holeplug from 5.9 m to 0.5 m, then sand and gravel to 0.3 m, asphalt from 0.3 m surface.
	9+840	08-37	None installed	Borehole backfilled with holeplug to surface.
	9+880	08-38	None installed	Borehole backfilled with holeplug to surface.
	10+100	08-38A	None installed	Borehole backfilled with holeplug to surface..
	10+150	08-39	14.0/245.0	Sand from 14.0 m to 12.1 m, holeplug from 12.1 m to 0.3 m, then flush mount installation.
	10+200	08-40	None installed	Holeplug to 0.1 m and then asphalt to surface.
	10+250	08-41	7.8/255.9	Sand from 7.8 m to 5.9 m, holeplug from 5.9 m to 0.3 m, asphalt from 0.3 m to surface.
	10+300	08-42	None installed	Borehole backfilled with holeplug to 0.1 m and then asphalt to surface.

Table 3.2 – Borehole Completion Details (Cont'd)

Location	Station	Borehole	Piezometer Tip Depth/ Elevation (m)	Completion Details
(5) Queensville Sideroad proposed underpass	33+000	08-43	None installed	Borehole backfilled to surface with holeplug.
		08-44	12.3/246.8	Sand from 12.3 m to 10.2 m. Borehole caved in from 10.2 m to 7.0 m, holeplug from 7.0 m to surface.
		08-45	21.4/236.9	Sand from 21.4 m to 19.6 m, holeplug from 19.6 m to 0.3 m then asphalt from 0.3 m to surface.
		08-46	None installed	Borehole backfilled with holeplug to surface.
		08-47	None installed	Borehole backfilled with holeplug to 0.2 m then asphalt to surface.
(5) Queensville Sideroad proposed culvert	10+088	QSR4-1	None installed	Borehole backfilled with holeplug to surface.
	10+084	QSR4-2	11.3/243.6	Sand from 11.3 m to 9.4 m, holeplug from 9.4 m to 0.6 then cuttings to surface.
	10+080	QSR4-3	None installed	Borehole backfilled with holeplug to 0.2 m then asphalt to surface.
	10+078	QSR4-4	10.7/244.7	Sand from 10.7 m to 8.5 m, holeplug from 9.4 m to surface.
	10+075	QSR4-5	None installed	Borehole backfilled with holeplug to 1.2 m then auger cuttings to surface.

4 LABORATORY TESTING

The recovered soil samples were subjected to Visual Identification (VI) and to natural moisture content determination. Selected samples were also subjected to grain size distribution analyses (sieve and hydrometer) and Atterberg Limits testing where appropriate. The results of this testing are shown on the Record of Borehole sheets in the appendices as indicated in Table 3.1. The results of this testing program are shown on the Record of Borehole sheets in the respective appendices.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets in Appendices A to E. Details of the encountered soil stratigraphy are presented in these sheets and on the "Borehole Locations and Soil Strata" and "Stratigraphic Sections" drawings in the respective appendices. An overall description

of the stratigraphy is given in the following paragraphs. However, the factual data presented in the Record of Borehole Sheets governs any interpretation of the site conditions.

5.1 High Fill - Highway 404 extension, South of Doane Road, Station 30+075 – 30+225, (Boreholes 08-06 to 08-09)

In general, the soil stratigraphy encountered within this section consists of topsoil overlying a native layer of silt underlain by a deposit of silty clay. More detailed descriptions of the individual strata are presented below.

5.1.1 Topsoil

Topsoil was identified at the ground surface in Boreholes 08-06 to 08-09. The topsoil thickness generally ranged from 100 mm to 150 mm. The topsoil thickness may vary between and beyond the borehole locations and the data is not intended for the purpose of estimating quantities.

5.1.2 Silt

A 700-mm thick layer of native brown silt containing some sand and trace gravel was contacted below the topsoil in Borehole 08-09.

The depth to the base of the silt was 0.8 m (Elevation 265.9).

An SPT N-value measured in the silt was 3 blows per 0.3 m of penetration, indicating a very loose relative density. The moisture content of a silt sample was 22%.

5.1.3 Silty Clay

Native brown to grey silty clay containing trace sand and occasional rootlets was contacted below the topsoil in Boreholes 08-06 to 08-08 and below the silt in Borehole 08-09.

The boreholes were terminated within the silty clay at depths ranging from 5.2 m to 6.7 m (Elevations 253.9 to 259.9).

SPT N-values measured in the silty clay ranged from 4 to 31 blows per 0.3 m of penetration, indicating a soft to hard consistency. The deposit is generally stiff to very stiff. Moisture content ranged from 19% to 27%.

Grain size distribution curves for silty clay samples tested are presented on the Record of Borehole sheet and on Figures A1 and A2 of Appendix A. Atterberg Limit test results are presented on Figures A3 and A4 of Appendix A. The results of the laboratory test are summarized as follows:

Soil Particles	Silty Clay (%)
Gravel	0
Sand	0 to 5
Silt	46 to 79
Clay	21 to 51

Index Property	
Liquid Limit	22 to 48
Plastic Limit	18 to 21

The above results show that the silty clay is typically of low to medium plasticity with group symbols of CL-ML and CL-CI..

5.1.4 Water Levels

Water levels were observed in the boreholes during and upon completion of drilling. A standpipe piezometer was installed in Borehole 08-07 to monitor water levels after completion of drilling. The water levels measured in the piezometer are summarized in Table 5.1, along with the measurements in the boreholes upon completion of drilling.

Table 5.1– Water Level Measurements

Borehole	Date (2009)	Water Level (m)		Comment
		Depth	Elevation	
08-06	August 25	5.0	254.9	Open borehole
08-07	August 25	3.9	255.2	Open borehole
	September 2	1.2	257.9	In piezometer
	September 21	1.2	257.9	In piezometer
08-09	August 26	5.5	261.1	Open borehole

The piezometric readings indicate that the groundwater level is near Elevation 257.9 m.

The above values are short-term readings and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

5.2 Deep Cut - Highway 404 extension, South of Mount Albert Road, Station 27+775 – 27+875, (Boreholes 08-15A to 08-17A)

In general, the soil stratigraphy encountered within this section consists of topsoil overlying a native layer of sand and an extensive deposit of sandy silt till. More detailed descriptions of the individual strata are presented below.

5.2.1 Topsoil

Topsoil was identified at ground surface in Boreholes 08-15A, 08-16A and 08-17A. The topsoil thickness generally ranged from 200 mm to 380 mm. The topsoil thickness may vary between and beyond the borehole locations and the data is not intended for the purpose of estimating quantities.

5.2.2 Sand

Native dark brown sand containing trace to some silt and occasional roots and rootlets was contacted below the topsoil in the boreholes. The thickness of the sand layer ranged between 120 mm and 200 mm.

The depth to the base of the sand ranged from 0.4 m to 0.5 m (Elevation 287.7 to 290.1).

SPT N-values recorded in the sand ranged from 5 to 7 blows per 0.3 m penetration indicating a loose relative density. Moisture content ranged from 21% to 28%.

5.2.3 Sandy Silt Till

An extensive deposit of brown to grey sandy silt till containing trace to some clay, trace gravel, occasional sand pockets and occasional cobbles was encountered below the sand layer at depths ranging from 0.4 m to 0.5 m (Elevation 287.7 to 290.1).

Boreholes were terminated within the sandy silt till at 10.8 m depth (Elevations 277.4 to 279.7).

SPT N-values ranged from 28 blows per 0.3 m of penetration to higher than 50 blows per 0.05 m of penetration, indicating a compact very dense relative density of the sandy silt till. The moisture content of samples from this deposit ranges from 8% to 18%.

Grain size distribution curves for sandy silt till samples tested are presented on the Record of Borehole sheet and on Figures B1 to B3 of Appendix B. The results of the laboratory test are summarized as follows:

Soil Particles	Sandy Silt Till (%)
Gravel	0 to 4
Sand	11 to 41
Silt	47 to 81
Clay	7 to 13

Glacial tills inherently contain cobbles and boulders which may account for some high blow counts.

5.2.4 Water Levels

Water levels were observed in the boreholes during and upon completion of drilling. A standpipe piezometer was installed in Borehole 08-16A to monitor water levels after completion of drilling. The water levels measured in the piezometer are summarized in Table 5.2, along with the measurements in the boreholes upon completion of drilling.

Table 5.2 – Water Level Measurements

Borehole	Date (2009)	Water Level (m)		Comment
		Depth	Elevation	
08-15A	May 4	6.8	283.7	Open borehole
	July 30	5.9	284.6	Open borehole
08-16A	May 4	2.9	286.7	Open borehole
	May 15	1.2	288.4	In piezometer
	June 5	1.4	288.2	In piezometer
	July 10	1.7	287.9	In piezometer
	July 30	6.0	283.6	Open borehole
	September 21	3.2	286.4	In piezometer
08-17A	May 4	2.7	285.5	Open borehole
	July 30	5.5	282.7	Open borehole

The piezometric readings indicate that the groundwater level varies from Elevations 286.4 to 288.4.

The above values are short-term readings and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

5.3 Deep Cut - Highway 404 extension, North of Doane Road Station 30+975 – 31+100, (Boreholes 08-18 to 08-21 and 08-48 to 08-55)

In general, the soil stratigraphy encountered within this section consists of topsoil or pavement structure overlying silty sand fill and native layers of sand, sand and gravel, silty clay and deposits of sand and silt till. Asphalt/pavement structure was encountered at the surface in boreholes drilled on Doane Road. Fill was only contacted below the asphalt in boreholes drilled on Doane Road lanes/shoulders. More detailed descriptions of the individual strata are presented below.

5.3.1 Topsoil

Topsoil was identified at ground surface in Boreholes 08-18 to 08-21, 08-50, 08-52 and 08-54. The topsoil thickness generally ranged from 430 mm to 600 mm in Boreholes 08-18 to 08-21 and 50 mm in Boreholes 08-50, 08-52 and 08-54. The topsoil thickness may vary between and beyond the borehole locations and the data is not intended for the purpose of estimating quantities.

5.3.2 Pavement Structure

Pavement structure consisting of approximately 25 mm to 50 mm of asphalt overlying granular (sand and gravel fill) road base was encountered in Boreholes 08-48, 08-49, 08-51, 08-53 and 08-55 drilled on existing Doane Road shoulders.

5.3.3 Fill

Fill was contacted below the pavement structure in Boreholes 08-48, 08-49, 08-51, 08-53 and 08-55. The fill generally consists of brown to dark brown sand and silty sand containing trace to some gravel, occasional cobbles and some silt. In Borehole 08-53, a layer of silty clay fill containing trace sand and occasional silt seams was contacted below the cohesionless fill at 0.8 m depth (Elevation 261.4). The thickness of the fill ranged from 0.55 m to 2.25 m.

The depth to the base of the fill varied from 0.6 to 2.3 (Elevations 260.4 to 265.5).

SPT N-values recorded in the cohesionless fill ranged from 13 to 37 blows per 0.3 m penetration indicating a loose to dense relative density. In Borehole 08-55, an SPT N-value of 73 blows per 0.3 m of penetration indicating a very dense relative density was measured below the asphalt layer.

In the silty clay fill layer, the SPT N-values were 7 and 12 blows per 0.3 m of penetration, indicating a firm to stiff consistency.

The moisture content of the fill ranged from 5% to 23%.

Grain size distribution curve for a sample of silty clay fill tested is presented on the Record of Borehole sheet and on Figure C1 of Appendix C. Atterberg Limit test results are presented on Figure C14 of Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	(%)
Gravel	0
Sand	4
Silt	68
Clay	28

Index Property	(%)
Liquid Limit	27
Plastic Limit	16

The above results show that the silty clay fill is typically of low plasticity with a group symbol of CL.

5.3.4 Silty Sand

A 200-mm thick layer of brown silty sand was contacted below the topsoil in Borehole 08-21.

An SPT N-value recorded in the silty sand was 8 blows per 0.3 m penetration indicating a loose relative density.

5.3.5 Sand and Gravel

A layer of brown sand and gravel containing trace clay, trace silt and occasional cobbles was contacted within the sand and silt till at 1.5 m depth in Borehole 08-18. The thickness of the sand and gravel layer was 1.1 m.

The depth to the base of the sand and gravel layer was 2.6 m (Elevation 264.4).

SPT N-values of 85 and 105 blows per 0.3 m of penetration were measured within the sand and gravel layer, indicating a very dense relative density. The moisture contents were 6% and 14%.

A grain size distribution curve for a sand and gravel sample tested is presented on the Record of Borehole sheet and on Figure C2 of Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	Sand and Gravel (%)
Gravel	41
Sand	47
Silt & Clay	12

5.3.6 Silty Clay

Brown silty clay containing trace sand and trace gravel was contacted below the silty sand at 0.6 m (Elevation 267.5) in Borehole 08-21. The thickness of the silty clay was 2.2 m.

The depth to the base of the silty clay was 2.8 m (Elevation 265.3).

SPT N-values ranged from 11 to 21 blows per 0.3 m of penetration, indicating a stiff to very stiff consistency. The moisture content of the silty clay samples ranged from 21% to 37%.

A grain size distribution curve for a silty clay sample tested is presented on the Record of Borehole sheet and on Figure C3 of Appendix C. Atterberg Limit test results are presented on Figure C15 of Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	Silty Clay (%)
Gravel	1
Sand	9
Silt	49
Clay	41

Index Property	
Liquid Limit	48
Plastic Limit	21

The above results show that the silty clay is typically of medium plasticity with a group symbol of CI.

5.3.7 Sand and Silt Till

Layers of native brown to grey sand and silt till containing trace to some clay, trace to some gravel and occasional cobbles were observed across the site in Boreholes 08-18 to 08-21 and 08-48 to 08-54 at depths and elevations as indicated in Table 5.3.

Table 5.3 – Locations of Native Sand and Silt Till

Borehole	Depth below existing ground surface (m)	Elevation (m)	Thickness (m)
08-18	0.6 to 1.5 2.6 to 7.7 (borehole termination depth)	266.5 to 265.5 264.4 to 259.3	0.9 At least 5.1
08-19	0.6 to 9.2 (borehole termination depth)	268.0 to 259.4	At least 8.6
08-20	0.5 to 9.2 (borehole termination depth)	268.2 to 259.5	At least 8.7
08-21	2.8 to 7.8	265.3 to 260.3	At least 5.0
08-48	0.8 to 2.4	264.9 to 263.2	1.6
08-49	0.6 to 3.0	265.5 to 263.0	2.4
08-50	0.05 to 2.1	264.3 to 262.2	2.1
08-51	2.3 to 12.3 (borehole termination depth)	261.4 to 251.3	At least 10.0
08-52	0.05 to 9.5 (borehole termination depth)	262.3 to 252.8	At least 9.5
08-53	1.8 to 10.8 (borehole termination depth)	260.4 to 251.4	At least 9.0
08-54	0.05 to 2.3 5.6 to 12.3 (borehole termination depth)	260.9 to 258.7 255.4 to 248.7	2.2 At least 6.7

An 800-mm thick layer of sand was contacted at 5.5 m depth (Elevation 261.5) in Borehole 08-18.

Clayey zones were observed within the sand and silt till in Boreholes 08-19 and 08-20 near elevation 266.0 to 267.0.

A layer of silt was contacted in Borehole 08-21 near elevation 265.0.

Standard Penetration tests in the sand and silt till deposit gave SPT N-values ranging from 5 to 58 blows per 0.3 m of penetration, indicating a loose to very dense relative density. In Boreholes 08-18 to 08-21, an SPT N-value of 125 blows per 0.3 m of penetration and SPT N-values higher than 100 blows per 0.1 m of penetration were measured below approximate Elevations 264.0 to 265.0. Higher SPT N-values ranging from 83 blows per 0.3 m of penetration to 100 blows per 0.075 m of penetration were measured below 2.3 m depth (Elevation 261.4) in Borehole 08-51, below 3.4 m and 4.6 m depth (Elevations 259.0 and 257.5) in Boreholes 08-52 and 08-53 and below 7.6 m depth (Elevation 253.4) in Borehole 08-54.

The moisture content of samples from the sand and silt till deposit varies between 8% and 22%.

Grain size distribution curves for sand and silt till samples tested are presented on the Record of Borehole sheet and on Figures C4 to C7 of Appendix C. Grain size distribution curve for the silt sample is presented on the Record of Borehole sheet and on Figure C8 of Appendix C. Atterberg Limit test results of the clayey zones are presented on Figure C16 of Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	Sand and Silt Till (%)	Silt (%)
Gravel	0 to 8	0
Sand	13 to 56	3
Silt	37 to 75	91
Clay	4 to 18	6

Index Property		
Liquid Limit	17 to 24	-
Plastic Limit	12 to 18	-

The above results show that the clayey zones in the sand and silt till are typically of low plasticity with group symbols of CL-ML.

Glacial tills inherently contain cobbles and boulders which may account for some high blow counts and resistance to augering.

5.3.8 Gravelly Sand

A layer of native brown gravelly sand containing some silt and clay was encountered in Borehole 08-48 at 2.4 m depth (Elevation 263.2). Cobbles were encountered within the gravelly sand layer at 3.5 m depth (Elevation 262.1). Thickness of the gravelly sand layer was 1.7 m.

The depth to the base of the gravelly sand was 4.1 m (Elevation 261.5).

SPT N-values measured in the gravelly sand were 35 and 50 blows per 0.3 m of penetration, indicating a dense relative density. Moisture contents ranged from 2% to 10%.

Grain size distribution curve for a gravelly sand sample tested is presented on the Record of Borehole sheets and on Figure C9 of Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	Gravelly Sand (%)
Gravel	23
Sand	64
Silt & Clay	13

5.3.9 Clayey Silt Till

Native brown to grey clayey silt till containing trace of sand was contacted at 2.3 m depth (Elevation 258.7) in Borehole 08-054. Thickness of the clayey silt layer was 3.3 m.

The depth to the base of the clayey silt till was 5.6 m (Elevation 255.4).

SPT N-values measured in the clayey silt till were 14 to 26 blows per 0.3 m of penetration, indicating a stiff to very stiff consistency. Moisture content ranged from 19% to 20%.

A grain size distribution curve for a clayey silt till sample tested is presented on the Record of Borehole sheet and on Figure C10 of Appendix C. Atterberg Limit test results are presented on Figure C17 of Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	Clayey Silt Till (%)
Gravel	0
Sand	1
Silt	77
Clay	22

Index Property	
Liquid Limit	26
Plastic Limit	19

The above results show that the clayey silt till is typically of low plasticity with group symbols of ML-CL.

5.3.10 Silt Till

Layers of native brown to grey silt till containing some sand to sandy, trace to some clay, trace to some gravel and occasional cobbles were observed in Boreholes 08-48 to 08-50 and 08-55 at depths and elevations as indicated in Table 5.4.

Table 5.4 – Locations of Native Silt Till

Borehole	Depth below existing ground surface (m)	Elevation (m)	Thickness (m)
08-48	4.1 to 7.9 (borehole termination depth)	261.5 to 257.8	At least 3.8
08-49	3.0 to 9.3 (borehole termination depth)	263.0 to 256.8	At least 6.3
08-50	2.1 to 9.4 (borehole termination depth)	262.2 to 255.0	At least 7.3
08-55	1.1 to 9.3 (borehole termination depth)	260.5 to 252.4	At least 8.2

Layers of sand and silty sand were contacted within the silt till at 4.1 m depth (Elevations 262.0 and 260.3) in Boreholes 08-49 and 08-50.

Standard Penetration tests in this deposit gave SPT N-values ranging from 24 to 92 blows per 0.3 m of penetration, indicating a compact to very dense relative density. Locally in Borehole 08-55, loose conditions were measured at 1.5 m depth (Elevation 260.2). SPT N-values higher than 100 blows per 0.3 m of penetration, indicating a very dense relative density, were measured generally below 4.0 m depth (approximate Elevation 261.0) in Boreholes 08-48 to 08-50 and at 7.5 m depth (Elevation 254.2.) in Borehole 08-55.

The moisture content of samples from the sand and silt till deposit varies between 3% and 22%.

Grain size distribution curves for the silt till samples tested are presented on the Record of Borehole sheet and on Figures C11 and C12 of Appendix C. Grain size distribution curve for the layer of silty sand tested is presented on the Record of Borehole sheet and on Figure C13 of Appendix C. A sample of silt till containing some clay was tested for Atterberg Limits and the test results are presented on Figure C18 of Appendix C.

The results of the laboratory tests are summarized as follows:

Soil Particles	Silt Till (%)	Silty Sand (%)
Gravel	0 to 6	1
Sand	2 to 42	68
Silt	55 to 81	26
Clay	5 to 17	5

Index Property	(%)	
Liquid Limit	18	-
Plastic Limit	12	-

The above results show that the clayey zones in the silt till are typically of low plasticity with group symbols of CL-ML.

Glacial tills inherently contain cobbles and boulders which may account for some high blow counts.

5.3.11 Water Levels

Water levels were observed in the boreholes during and upon completion of drilling. Five standpipe piezometers were installed to monitor water levels after completion of drilling. The water levels measured in the piezometers are summarized in Table 5.5, along with the measurements in the boreholes upon completion of drilling.

Table 5.5 – Water Level Measurements

Borehole	Date	Water Level (m)		Comment
		Depth	Elevation	
08-18	January 29, 2009	6.3	260.7	Open borehole
08-19**	January 29, 2009	6.4 -	262.2 -	Open borehole In piezometer
08-21**	January 30, 2009	-	-	In piezometer
08-48	October 22, 2008	6.5	259.1	Open borehole
08-49	October 22, 2008	7.1	259.0	Open borehole
08-50	October 20, 2008 October 24, 2008 November 28, 2008 February 6, 2009 February 20, 2009 March 20, 2009 April 22, 2009 September 2, 2009	5.0 4.4 4.9 0.1 0.2* 1.0 1.1 2.6	259.4 260.0 259.5 264.3 264.6 263.4 263.3 261.8	Open borehole In piezometer In piezometer In piezometer In piezometer In piezometer In piezometer In piezometer
08-51	November 28, 2008	4.1	259.5	In piezometer
08-52	October 21, 2008	4.6	257.8	Open borehole
08-53	October 23, 2008	3.0	259.1	Open borehole
08-54	October 24, 2008 November 28, 2008 February 6, 2009 February 20, 2009 March 20, 2009 April 22, 2009 September 2, 2009	2.1 3.7 Ground surface 0.4* 0.7* 0.6* 0.6	258.9 257.3 261.0 261.4 261.7 261.6 260.4	Open borehole In piezometer In piezometer In piezometer In piezometer In piezometer In piezometer
08-55	October 22, 2008	4.2	257.5	Open borehole

* Water level above ground surface (artesian condition)
** Water level readings in piezometers have not been taken due to site access restriction.

The piezometric readings of the current investigation indicate that the groundwater level at the site is high and the water level decreases from west to east from Elevations 264.6 to 261.7 along Doane Road.

Water levels were observed approximately 0.2 m to 0.7 m above the existing ground surface (artesian conditions) during the later winter/early spring season in Boreholes 08-50 and 08-054, near Elevations 264.6 and 261.7, respectively.

The above values are short-term readings and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

5.4 Deep Cut - Highway 404 extension, North of Queensville Sideroad Station 33+200 – 33+700, (Boreholes 08-22 to 08-32)

In general, the soil stratigraphy encountered within this section consists of topsoil overlying native layers of sandy silt and sand underlain by a deposit of sand and silt till. More detailed descriptions of the individual strata are presented below.

5.4.1 Topsoil

Topsoil was identified at ground surface in Boreholes 08-22 to 08-26, 08-31 and 08-32. The thickness of the topsoil ranged from 150 mm to 600 mm. The topsoil thickness may vary between and beyond the borehole locations and the data is not intended for the purpose of estimating quantities. Due to farming activities, the topsoil may have been mixed with native soils to depths deeper than 0.6 m as noted in Boreholes 08-24, 08-25 and 08-27 to 08-30.

5.4.2 Sandy Silt

Layers of native brown sandy silt mixed with topsoil were encountered below the topsoil in Boreholes 08-24 and 08-25. The sandy silt layers were 1.1 m and 0.3 m thick.

The depth to the base of the sandy silt was 1.5 m and 0.8 m (elevations 274.8 and 277.1) in Boreholes 08-24 and 08-25, respectively.

SPT N-values recorded in the sandy silt were 4 and 20 blows per 0.3 m penetration indicating a loose to compact relative density. Moisture contents were 12% to 18%.

5.4.3 Sandy Silt Till

Layers of native brown to grey sand and silt till containing some clay, trace gravel, sand pockets and occasional cobbles were encountered in the boreholes at depths and elevations as indicated in Table 5.6.

Table 5.6 – Locations of Native Sand and Silt Till

Borehole	Depth below existing ground surface (m)	Elevation (m)	Thickness (m)
08-22	0.6 to 4.8 (borehole termination depth)	267.4 to 263.2	At least 4.2

08-23	0.3 to 13.9 (borehole termination depth)	273.6 to 260.1	At least 13.6
08-24	1.5 to 13.1 15.2 to 16.8 (borehole termination depth)	274.8 to 263.2 261.1 to 259.5	11.6 At least 1.6
08-25	0.8 to 14.5 15.3 to 19.9 (borehole termination depth)	277.1 to 263.4 262.6 to 258.0	13.7 At least 4.6
08-26	0.8 to 19.8	277.4 to 258.4	19.0
08-27	0.4 to 12.3 (borehole termination depth)	273.4 to 261.5	At least 11.9
08-28	0.2 to 8.4 13.3 to 15.3 (borehole termination depth)	274.4 to 266.2 261.3 to 259.2	8.2 At least 2.0
08-29	8.5 to 13.8	264.9 to 259.7	At least 5.3
08-30	0.8 to 4.1 6.1 to 12.3	270.8 to 267.4 265.5 to 259.2	3.3 At least 6.2
08-31	1.1 to 1.6	267.4 to 267.0	0.5
08-32	0.8 to 1.9 2.7 to 3.2	265.5 to 264.4 263.5 to 263.0	1.1 0.5

Layers of sand and layers of silt were encountered within the sand and silt till.

Standard Penetration tests in the sand and silt till deposit gave SPT N-values ranging from 12 to 112 blows per 0.3 m of penetration, indicating a compact to very dense relative density. SPT N-values higher than 100 blows per 0.075 m of penetration, indicating a very dense relative density, were encountered below 4.0 m depth in Boreholes 08-22 to 08-29.

The moisture content of samples from the sand and silt till deposit varies from 8% to 19%.

Grain size distribution curves for sand and silt till samples tested are presented on the Record of Borehole sheet and on Figures D1 to D3 of Appendix D. Grain size distribution curves for the silt samples are presented on the Record of Borehole sheets and on Figure D4 of Appendix D. The results of the laboratory test are summarized as follows:

Soil Particles	Sand and Silt Till (%)
Gravel	0 to 5
Sand	1 to 65
Silt	61 to 90
Clay	4 to 14

Glacial tills inherently contain cobbles and boulders which may account for some high blow counts and resistance to augering.

5.4.4 Sand

A 300-mm thick layer of native brown sand was contacted below the topsoil in Borehole 08-26. The depth to the base of the sand layer was 0.8 m (Elevation 277.4). Grey sand layers containing some silt, trace clay and trace gravel were encountered within the sand and silt till in the boreholes at depths and elevations as indicated in Table 5.7.

Table 5.7 – Locations of Native Sand

Borehole	Depth below existing ground surface (m)	Elevation (m)	Thickness (m)
08-24	13.1 to 15.2	263.2 to 261.1	2.1
08-25	14.5 to 15.3	263.4 to 262.6	0.8
08-28	8.4 to 9.4 10.1 to 13.3	266.2 to 265.1 264.5 to 261.3	1.0 3.2
08-29	6.4 to 8.5	267.0 to 264.9	2.1
08-30	4.1 to 6.1	267.4 to 265.5	2.0
08-31	1.1 to 1.6	267.4 to 267.0	0.5
08-32	1.9 to 2.7 3.2 to 4.3	264.3 to 263.5 263.0 to 262.0	0.8 1.1

An SPT N-value recorded in the sand layer in Borehole 08-26 was 4 blows per 0.3 m penetration indicating a loose relative density. SPT N-values measured in the sand layer in Boreholes 08-24, 08-25, 08-28, 08-29, 08-30 were greater than 100 blows for less than 300 mm penetration indicating a very dense relative density. Moisture contents ranged from 8% to 19%.

5.4.5 Water Levels

Water levels were observed in the boreholes during and upon completion of drilling. Five standpipe piezometers were installed to monitor water levels after completion of drilling. The water levels measured in the piezometer are summarized in Table 5.8, along with the measurements in the boreholes upon completion of drilling.

Table 5.8 – Water Level Measurements

Borehole	Date	Water Level (m)		Comment
		Depth	Elevation	
08-22	January 22, 2009	2.9	265.1	Open borehole
08-23	January 20, 2009	11.9	262.0	Open borehole
	February 6, 2009	6.1	267.8	In piezometer
	February 20, 2009	5.7	268.2	In piezometer
	March 20, 2009	5.8	268.1	In piezometer
	April 22, 2009	5.4	268.5	In piezometer
	May 15, 2009	5.8	268.1	In piezometer
	June 5, 2009	6.0	267.9	In piezometer
	July 10, 2009	6.1	267.8	In piezometer
	September 2, 2009	8.9	265.0	In piezometer
	September 21, 2009	8.2	265.7	In piezometer
08-24	January 21, 2009	10.6	265.7	Open borehole
08-25	January 21, 2009	12.2	267.5	Open borehole
	February 6, 2009	6.9	271.0	In piezometer
	February 20, 2009	6.0	271.9	In piezometer
	March 20, 2009	6.0	271.9	In piezometer
	April 22, 2009	5.7	272.2	In piezometer
	May 15, 2009	5.9	272.0	In piezometer
	June 5, 2009	6.1	271.8	In piezometer
	July 10, 2009	6.4	271.5	In piezometer
	September 2, 2009	13.3	264.6	In piezometer
	September 21, 2009	13.4	264.5	In piezometer
08-26	January 22,2009	11.1	267.1	Open borehole
08-27	February 2, 2010	7.5	266.3	In piezometer
08-28	January 19, 2010	7.3	267.3	Open borehole
08-29	February 2, 2010	6.4	267.1	In piezometer
08-31	February 2, 2010	4.2	264.4	In piezometer

The piezometric readings indicate that the groundwater level varies from elevation 264.4 m to 272.2 m.

The above values are short-term readings and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

5.5 High Fill and Deep Cut, Queensville Sideroad, Station 9+550 – 10+300 (Boreholes 08-61, 08-33 to 08-38, 08-38A, 08-33A, 08-39 to 08-47, QSR4-1 to QSR4-5 and 301 to 303)

The soil stratigraphy encountered at the borehole locations typically consists of topsoil or pavement structure overlying fill of variable composition (silty clay/clayey silt, sand and gravel) overlying interbedded layers of native sand, clayey silt, and glacial till. Asphalt/pavement structure was encountered at the surface in boreholes drilled on the existing Queensville Sideroad lanes and shoulders. More detailed descriptions of the individual stratum are presented below.

5.5.1 Topsoil

Topsoil was identified at ground surface in Boreholes 08-33A and 08-61. The topsoil thickness was 150mm and 200 mm in Boreholes 08-33A and 08-61, respectively. The topsoil thickness may vary between and beyond the borehole locations and the data is not intended for the purpose of estimating quantities.

5.5.2 Pavement Structure

Pavement structure consisting of approximately 125 mm to 200 mm of asphalt overlying granular (sand and gravel fill) road base was encountered in boreholes drilled on the existing Queensville Sideroad lanes and shoulders.

5.5.3 Fill

Fill was contacted across the site in all the boreholes, except in Boreholes 08-61 and 08-33A. Fill was encountered below the pavement structure in Boreholes 08-33 to 08-42, 08-38A, 08-43, 08-45, 08-47 and QSR4-3 and surficially in Boreholes 08-44, 08-46, QSR4-1, QSR4-2, QSR4-4, QSR4-5 and 301 to 303.

The fill generally consists of intermixed layers of various soils:

- Dark brown silty clay/clayey silt containing trace sand, trace gravel, trace organics, topsoil and occasional rootlets.
- Dark brown gravelly sand.
- Brown sandy silt/silty sand containing trace to some clay, trace gravel and occasional organics.
- Brown sand and gravel containing trace to some silt.
- Brown silt containing some sand, some clay and trace gravel.
- Dark brown sand, containing some gravel and trace to some silt.

The thickness of the fill ranged from 0.6 m to 3.9 m.

The fill extended to depths ranging from 0.6 m to 4.2 m, Elevations 252.2 to 254.2 in Boreholes QSR41- to QSR4-5 and Elevations 253.0 to 282.5 in the remaining boreholes drilled along Queensville Sideroad.

SPT N-values recorded in the cohesionless fill ranged from 2 to 49 blows per 0.3 m penetration indicating a very loose to dense relative density. In general the fill is in a compact to dense state. In the clayey silt fill layer, the SPT N-values ranged from 1 to 16 blows per 0.3 m of penetration, indicating a very soft to very stiff consistency. The moisture content of the fill ranged from 2% to 39%.

Grain size distribution curves for the cohesionless fill samples tested are presented on the Record of Borehole sheets and on Figures E1 and E2 in Appendix E. The results of the laboratory tests are summarized as follows:

Soil	Gravelly Sand (%)	Silty Sand (%)	Sand (%)
Gravel	29 to 34	3 to 12	12
Sand	61 to 67	55 to 57	68
Silt	-	26 to 33	-
Clay	-	7	-
Silt & Clay	4 to 5	-	20

5.5.4 Sand

Layers of native brown sand were encountered below the fill and topsoil in Boreholes 08-36, 08-44 and 08-61 at 1.7 m, 2.2 m and 0.2 m depth (Elevations 271.8, 256.9 and 284.7). The thickness of the sand layer ranges from 0.6 m to 1.3 m.

The depths to the base of the sand were 2.3 m, 3.0 m and 1.5 m (Elevations 271.2, 256.0 and 283.4) in Boreholes 08-36, 08-44 and 08-61, respectively.

SPT N-values measured in the sand ranged from 10 to 34 blows per 0.3 m of penetration, indicating a loose to dense relative density. An SPT N-value of 108 blows per 0.3 m of penetration was measured in Borehole 08-36, indicating a very dense relative density. Moisture contents ranged from 3% to 17%.

Grain size distribution curves for sand samples tested are presented on the Record of Borehole sheets and on Figure E3 in Appendix E. The results of the laboratory tests are summarized as follows:

Soil Particles	Sand (%)
Gravel	10 to 20
Sand	62 to 76
Silt	8
Clay	3
Silt & Clay	18 to 24

5.5.5 Clayey Silt Till and Clayey Silt

Layers of native brown to grey clayey silt till and clayey silt containing trace sand to sandy and trace gravel were observed in the boreholes at depths and elevations as indicated in Table 5.9.

Table 5.9 – Locations of Native Clayey Silt Till and Clayey Silt

Borehole	Depth below existing ground surface (m)	Elevation (m)	Thickness (m)
08-38A	2.3 to 5.6 7.1 to 14.2 (borehole termination depth)	255.0 to 251.7 250.2 to 243.1	3.3 At least 7.1
08-39	2.3 to 7.0	256.7 to 251.9	4.7
08-40	3.0 to 8.4	258.3 to 252.9	5.4
08-41	2.3 to 4.0	261.4 to 259.7	1.7
08-42	1.1 to 4.1*	263.4 to 260.3*	3.0
08-46	7.2 to 10.3 11.8 to 23.1 (borehole termination depth)	249.5 to 246.4 244.9 to 233.6	3.1 At least 11.3
08-47	4.4 to 21.8	253.0 to 235.6	17.4
301	2.2 to 3.7 3.7 to 9.6 11.6 to 15.7 (borehole termination depth)	255.3 to 253.8 253.8 to 247.9 245.9 to 241.8	1.5 5.9 At least 4.1
301A	12.2 to 25.0 (borehole termination depth)	243.8 to 231.0	At least 12.8
302	1.5 to 3.0	257.5 to 256.0	1.5

*Clayey silt

SPT-N values measured in the clayey silt till and clayey silt layers ranged from 8 to 81 blows per 0.3 m of penetration, indicating a stiff to hard consistency. SPT N-values higher than 100 blows per 0.075 m of penetration, indicating a hard consistency were also measured within the clayey silt till. Moisture content ranged from 10% to 25%.

Grain size distribution curves for clayey silt till and clayey silt samples tested are presented on the Record of Borehole sheets and on Figures E4 to E7 in Appendix E. Atterberg Limit test results are presented on Figures E19 and E20 of Appendix E. Grain size distribution curves and Atterberg Limit tests results for clayey silt samples conducted during the

previous investigation are also presented in Appendix E. The results of the laboratory tests are summarized as follows:

Soil Particles	Clayey Silt Till and Clayey Silt (%)
Gravel	0 to 4
Sand	1 to 37
Silt	43 to 89
Clay	7 to 33

Index Property	(%)
Liquid Limit	18 to 28
Plastic Limit	10 to 19

The above results show that the clayey silt is typically of low plasticity with group symbols of ML-CL and CL.

Glacial tills inherently contain cobbles and boulders which may account for some high blow counts and resistance to augering.

5.5.6 Sand and Silt Till

Layers of native brown sand and silt till containing trace clay to clayey, trace to some gravel and occasional cobbles were observed in some boreholes at various depths and elevations as indicated in Table 5.10.

Table 5.10 – Locations of Native Sand and Silt Till

Borehole	Depth below existing ground surface (m)	Elevation (m)	Thickness (m)
08-61	1.5 to 8.7	283.4 to 276.2	7.2
08-33	1.5 to 4.8 (borehole termination depth)	282.5 to 279.2	At least 3.3
08-33A	0.2 to 4.1	286.0 to 282.1	3.9
08-34	1.5 to 6.4 (borehole termination depth)	279.8 to 275.0	At least 4.9
08-35	1.5 to 6.3 (borehole termination depth)	276.1 to 271.3	At least 4.8
08-36	2.3 to 7.8 (borehole termination depth)	271.2 to 265.7	At least 5.5
08-37	1.5 to 9.2 (borehole termination depth)	268.6 to 260.9	At least 7.7
08-38	1.5 to 10.8 (borehole termination depth)	265.3 to 256.1	At least 9.3
08-39	7.0 to 14.0 (borehole termination depth)	251.9 to 245.0	At least 7.0
08-40	8.4 to 12.5 (borehole termination depth)	252.9 to 248.8	At least 4.1
08-41	4.0 to 7.8 (borehole termination depth)	259.7 to 255.9	At least 3.8
08-42	4.1 to 6.2 (borehole termination depth)	260.3 to 258.2	At least 2.1
08-43	2.1 to 4.7 (borehole termination depth)	261.8 to 259.2	At least 2.6
08-44	3.0 to 12.3 (borehole termination depth)	256.0 to 246.8	At least 9.3
08-45	2.4 to 8.7 11.0 to 21.4 (borehole termination depth)	255.8 to 249.6 247.3 to 236.9	6.3 At least 10.4
08-46	2.9 to 7.2	253.8 to 249.5	4.3
302	3.0 to 18.5 (borehole termination depth)	256.0 to 240.5	At least 15.5

303	3.0 to 13.9 (borehole termination depth)	258.0 to 247.1	At least 10.9
QSR4-1	1.5 to 12.8 (borehole termination depth)	252.2 to 240.9	At least 11.3
QSR4-2	0.6 to 11.3 (borehole termination depth)	254.2 to 243.6	At least 10.7
QSR4-3	4.1 to 11.3 (borehole termination depth)	253.0 to 245.9	7.2
QSR4-4	2.1 to 11.3 (borehole termination depth)	253.3 to 244.2	9.2
QSR4-5	2.4 to 10.7 (borehole termination depth)	253.0 to 244.7	At least 8.3

Clayey zones and layers of silty sand were encountered within the sand and silt till.

In general, Standard Penetration tests in this deposit gave SPT N-values ranging from 30 blows per 0.3 m of penetration to greater than 100 blows for 0.10 m of penetration, indicating that the soil was in dense to very dense state. Occasional low SPT N-values were encountered in the deposit indicating loose to compact layers. The moisture content of samples from this deposit varies from 5% to 18%.

Grain size distribution curves for the samples tested are presented on the Record of Borehole sheet and on Figures E8 to E15 of Appendix E. Atterberg Limit test results are presented on Figures E21 and E22 of Appendix E. Laboratory test results of previous investigation are presented in Appendix E. The results of the laboratory tests are summarized as follows:

Soil Particles	**Sand and Silt Till**
Gravel	0 to 32
Sand	18 to 69
Silt	24 to 74
Clay	5 to 36

Index Property	
Liquid Limit	18 to 23
Plastic Limit	10 to 21

The above results show that the clayey zones in the sand and silt till are typically of low plasticity with group symbols of CL-ML and two samples had a group symbol of CL.

Glacial tills inherently contain cobbles and boulders which may account for some high blow counts and resistance to augering.

5.5.7 Silt Till

Layers of native brown to grey silt till containing trace to some sand, some clay and trace gravel were encountered in three boreholes at depths and elevations as indicated in Table 5.11.

Table 5.11 – Locations of Native Silt Till

Borehole	Depth below existing ground surface (m)	Elevation (m)	Thickness (m)
08-33A	4.1 to 15.3 (borehole termination depth)	282.1 to 270.9	At least 11.2
08-47	21.8 to 27.7 (borehole termination depth)	235.6 to 229.7	At least 5.9
08-61	8.7 to 15.3 (borehole termination depth)	276.2 to 269.6	At least 6.6

SPT-N values measured in the silt till are higher than 100 blows per 0.1 m of penetration, indicating a very dense relative density. Moisture content ranged from 8% to 22%.

Grain size distribution curves for silt till samples tested are presented on the Record of Borehole sheets and on Figure E16 in Appendix E. The results of the laboratory tests are summarized as follows:

Soil Particles	Silt Till (%)
Gravel	0
Sand	2 to 24
Silt	68 to 92
Clay	6 to 18

Glacial tills inherently contain cobbles and boulders which may account for some high blow counts.

5.5.8 Gravelly Sand

A layer of grey gravelly sand was contacted in Borehole 08-45 at 8.7 m depth (Elevation 249.6), within the sand and silt till deposit.

This layer was 2.3 m thick. The depth to the base of the gravelly sand layer was 11.0 m (Elevation 247.3).

SPT-N values measured in the gravelly sand layer were 49 blows per 0.3 m of penetration and 100 blows per 0.1 m of penetration, indicating a dense to very dense relative density. The moisture content ranged from 9% to 11%.

Grain size distribution curves for two gravelly sand samples tested are presented on the Record of Borehole sheets and on Figure E17 of Appendix E. The results of the laboratory test are summarized as follows:

Soil Particles	Gravelly Sand (%)
Gravel	16 to 22
Sand	62 to 71
Silt & Clay	7 to 22

5.5.9 Silty Sand

Layers of native brown to grey silty sand were encountered within clayey silt till in Boreholes 08-46 and 301 and below the clayey silt in Borehole 303. Thickness of the silty sand layers ranged from 0.8 m to 2.0 m.

The depths to the base of the silty sand were 3.0 m, 11.6 m and 11.8 m (Elevations 258.0, 245.9 and 244.9) in Boreholes 303, 301 and 08-46, respectively.

SPT-N values measured in the silty sand ranged from 10 to 33 blows per 0.3 m of penetration, indicating a compact to dense relative density. Moisture content ranged from 10% to 18%.

Grain size distribution curve for a silty sand sample tested is presented on the Record of Borehole sheet and on Figure E18 of Appendix E. The results of the laboratory test are summarized as follows:

Soil Particles	(%)
Gravel	0
Sand	64
Silt	31
Clay	5

5.5.10 Water Levels

Water levels were observed in the boreholes during and upon completion of drilling. Standpipe piezometers were installed in ten boreholes to monitor water levels after completion of drilling during the previous investigation. The water levels measured in the piezometers are summarized in Table 5.12, along with the measurements in the boreholes upon completion of drilling.

Table 5.12 – Water Level Measurements

Borehole	Station	Date	Water Level (m)		Comment
			Depth	Elevation	
08-61	9+550	July 16, 2008	9.6	275.3	In piezometer
		July 29, 2008	9.6	275.3	
		September 17, 2008	7.9	277.0	
		October 24, 2008	10.1	274.8	
		November 28, 2008	11.0	273.9	
		February 6, 2009	7.6	277.3	
		February 20, 2009	7.2	277.7	
		March 20, 2009	8.0	276.9	
		April 22, 2009	7.6	277.3	
		May 15, 2009	8.2	276.7	
		June 5, 2009	8.9	276.0	
		July 10, 2009	8.7	276.2	
		July 16, 2009	9.6	275.3	
		July 29, 2009	9.6	275.3	
		September 2, 2009	9.0	275.9	
		September 21, 2009	9.2	275.7	
08-33	9+550	March 26, 2008	Dry	-	Open borehole
08-33A	9+550	July, 16, 2008	8.6	277.6	In piezometer
		July 29, 2008	7.6	278.6	
		September 17, 2008	5.8	280.4	
		October 24, 2008	8.7	277.5	
		November 28, 2008	9.0	277.2	
		February 6, 2009	5.4	280.8	
		February 20, 2009	5.1	281.1	
		March 20, 2009	0.2*	286.4	
		April 22, 2009	4.8	281.4	
		May 15, 2009	5.3	280.9	
		June 5, 2009	6.0	280.2	
		July 10, 2009	5.8	280.4	
		July 16, 2009	8.5	277.7	
		July 29, 2009	7.6	278.6	
		September 2, 2009	6.9	279.3	
		September 21, 2009	7.2	279.0	
08-34	9+704	April 18, 2008	2.3	279.0	In piezometer
		April 21, 2008	2.2	279.1	
		June 30, 2008	2.0	279.3	
		July 29, 2008	1.6	279.7	
		September 17, 2008	1.4	279.9	
		November 28, 2008	1.7	279.6	
		July 29, 2009	1.6	279.7	
		September 21, 2009	3.7	277.6	
08-35	9+755	March 26, 2008	3.5	274.2	Open borehole

Table 5.12 – Water Level Measurements (Cont'd)

Borehole	Station	Date	Water Level (m)		Comment
			Depth	Elevation	
08-36	9+808	March 25, 2008	7.4	266.1	Open borehole
		April 18, 2008	3.4	270.1	In piezometer
		April 21, 2008	3.3	270.2	In piezometer
		June 30, 2008	1.7	271.8	In piezometer
		November 28, 2008	1.5	272.0	In piezometer
		July 29, 2009	1.3	272.2	In piezometer
		September 21, 2009	6.3	267.2	In piezometer
08-37	9+850	March 24, 2008	Dry	-	Open borehole
08-38	9+895	March 24, 2008	6.2	260.7	Open borehole
08-38-A	10+100	March 26, 2008	0.8	256.5	Open borehole
08-39	10+140	March 27, 2008	3.2	255.8	Open borehole
		April 18, 2008	2.0	257.0	In piezometer
		April 21, 2008	1.9	257.1	In piezometer
		June 30, 2008	2.8	256.2	In piezometer
		September 21, 2009	0.9	258.1	In piezometer
08-40	10+195	March 20, 2008	3.2	258.1	Open borehole

Table 5.12 – Water Level Measurements (Cont'd)

Borehole	Station	Date	Water Level (m)		Comment
			Depth	Elevation	
08-41	10+250	March 27, 2008	5.3	258.4	Open borehole
		April 18, 2008	3.3	260.4	In piezometer
		April 21, 2008	3.2	260.5	In piezometer
		June 30, 2008	2.1	261.6	In piezometer
		September 21, 2009	2.8	260.9	In piezometer
08-42	10+300	March 18, 2008	4.9	259.5	Open borehole
08-43	33+000	March 28, 2008	4.1	259.8	Open borehole
08-44		April 18, 2008	1.4	257.7	In piezometer
		June 30, 2008	2.1	257.0	
		July 29, 2008	1.9	257.2	
		October 24, 2008	1.1	258.0	
		March 20 , 2009	0.5*	259.6*	
		April 22, 2009	0.5*	259.6*	
		May 15, 2009	0.5*	259.6*	
		June 5, 2009	0.1	259.0	
		July 10, 2009	2.1	257.0	
		July 16, 2009	Ground surface	259.1	
		July 29, 2009	1.2	257.9	
		September 21, 2009	0.5	258.6	
08-45		April 18, 2008	2.4	255.9	In piezometer
		April 21, 2008	2.4	255.9	
		September 21, 2009	0.1	258.2	
08-46		March 18, 2008	0.9	255.8	Open borehole
08-47		March 11, 2008	2.6	254.8	Open borehole
301**		June 11, 2004	4.9	252.6	Open borehole
301A**		September 28, 2004	2.7	253.3	In piezometer
		October 7, 2004	0.7*	256.7*	
302**		September 29, 2004	10.7	248.3	In piezometer
303**		September 29, 2004	9.1	251.9	Open borehole
QSR4-1	10+088	March 7, 2008	1.1	252.6	Open borehole

Table 5.12 – Water Level Measurements (Cont'd)

Borehole	Station	Date	Water Level (m)		Comment
			Depth	Elevation	
QSR4-2	10+084	March 20, 2008	3.3	251.6	In piezometer
		April 18, 2008	2.5	252.4	In piezometer
		June 30, 2008	1.0	253.9	In piezometer
		July 29, 2008	0.8	254.1	In piezometer
		October 24, 208	0.9	254.0	In piezometer
		November 28, 2008	1.0	253.9	In piezometer
		February 6, 2009	0.9	254.0	In piezometer
		February 20, 2009	0.9	254.0	In piezometer
		March 20, 2009	0.8	254.1	In piezometer
		April 22, 2009	0.8	254.1	In piezometer
		May 15, 2009	0.9	254.0	In piezometer
		June 5, 2009	1.3	253.6	In piezometer
		July 29, 2009	0.1*	255.0	In piezometer
		August 5, 2009	1.0*	255.9	In piezometer
		September 2, 2009	0.5*	255.4	In piezometer
		September 21, 2009	0.3	254.6	In piezometer
QSR4-3	10+080	March 17, 2008	1.5	255.7	In open borehole
QSR4-4	10+078	February 25, 2008	0.8	254.6	In open borehole
		February 28, 2008	3.4	252.0	In piezometer
		March 7, 2008	3.0	252.4	In piezometer
		March 20, 2008	0.6	254.8	In piezometer
		April 18, 2008	Ground surface	255.4	In piezometer
		June 30, 2008	1.0	254.4	In piezometer
		July 10, 2009	0.8	254.6	In piezometer
		July 29, 2008	Ground surface	255.4	In piezometer
		August 5, 2009	0.8*	256.2	In piezometer
		September 2, 2009	0.9*	256.3	In piezometer
		September 21, 2009	0.8*	256.2	In piezometer
QSR4-5	10+075	February 25, 2008	0.8	254.6	In open borehole

* Water level above ground surface (artesian condition)
** Boreholes drilled during previous investigation, 2004.

The piezometric readings of the current investigation indicate that the groundwater level is high and the water level ranges from 248.3 to 286.4.

At the locations of Boreholes 08-33A, 08-44, QSR4-2 and QSR4-4 a relatively small artesian head was encountered at 0.2 m to 0.9m (Elevations 286.4 to 255.4) above the ground surface during late summer and spring.

Previous geotechnical investigation (Reference 1) indicates that a relatively low artesian head was encountered in Borehole 301A, where water level was measured at 0.7 m (Elevation 256.7) above the ground surface.

The above values are short-term readings and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

6 MISCELLANEOUS

Borehole locations were selected by Thurber Engineering Ltd. Surveyors from J. D. Barnes obtained the co-ordinates and the ground surface elevations at each borehole.

Thurber obtained utility clearances for the borehole locations prior to drilling.

DBW Drilling of Ajax, Ontario and Walker Drilling Ltd. from Utopia, Ontario supplied track mounted CME 75 and D90 drill rigs and conducted the drilling, sampling and in-situ testing operations.

The field program was supervised on a full time basis by Ms. Eckie Siu and Mr. George Azzopardi of Thurber.

Laboratory testing was carried out by Thurber Engineering Ltd.

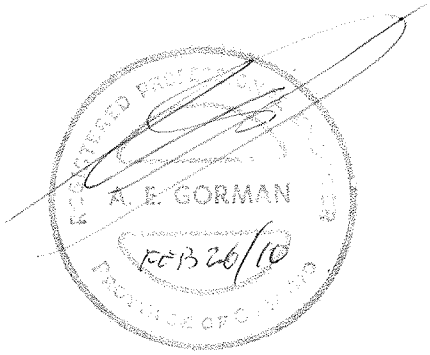
Overall supervision of the field program was conducted by Mr. Alastair E. Gorman, P.Eng., Mr. Weiss Medhawi, P.Eng. and Ms. R. Palomeque Reyna, P.Eng.

Interpretation of the data and preparation of the report were carried out by Mr. Alastair E. Gorman, P.Eng and Ms. R. Palomeque Reyna, P.Eng.

The report was reviewed by Dr. P.K. Chatterji, P.Eng. a Designated Principal Contact for MTO Foundations Projects.

Thurber Engineering Ltd.

Rocío Palomeque Reyna, P.Eng.
Geotechnical Engineer



Alastair E. Gorman, P.Eng.
Senior Foundations Engineer

P. K. Chatterji, P.Eng.
Review Principal

Appendix A

High Fills - Highway 404 extension, South of Doane Road,
Station 30+075 – 30+225
(Boreholes 08-06 to 08-09)

Record of Borehole Sheets
Laboratory Test Results
Site Photographs
Drawing titled "Borehole Locations and Soil Strata"

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

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

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

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

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

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

NOTE: Hierarchy of Soil Strength Prediction

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

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

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

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE

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

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

$\blacktriangledown$ Water Level

C_{pen} Shear Strength Determination by Pocket Penetrometer

(1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.

(2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

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

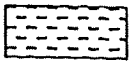
EXPLANATION OF ROCK LOGGING TERMS

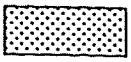
ROCK WEATHERING CLASSIFICATION

Fresh (FR)	No visible signs of weathering.
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.

SYMBOLS


CLAYSTONE


SILTSTONE


SANDSTONE


COAL


Bedrock (general)

DISCONTINUITY SPACING

Bedding	**Bedding Plane Spacing**
Very thickly bedded	Greater than 2m
Thickly bedded	0.6 to 2m
Medium bedded	0.2 to 0.6m
Thinly bedded	60mm to 0.2m
Very thinly bedded	20 to 60mm
Laminated	6 to 20mm
Thinly Laminated	Less than 6mm

TERMS

Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.

STRENGTH CLASSIFICATION

Rock Strength	**Approximate Uniaxial Compressive Strength (MPa)**	**(psi)**	**Field Estimation of Hardness***
Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

THURBER

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-06 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 886 409.42 E 310 829.42 ORIGINATED BY GA
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.08.25 - 2009.08.25 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.9											
0.0	TOPSOIL: (100mm)										
0.1	Silty CLAY, trace sand, occasional rootlets Soft to Hard Brown		1	SS	4						
			2	SS	23		259				0 3 46 51
			3	SS	30		258				
			4	SS	19						
			5	SS	21		257				0 0 58 42
							256				
	Grey		6	SS	31	▽	255				
254.7											0 0 75 25
5.2	END OF BOREHOLE AT 5.2m. BOREHOLE OPEN AND WATER LEVEL AT 5.0m. BOREHOLE BACKFILLED WITH HOLEPLUG TO 0.9m, THEN AUGER CUTTINGS TO 0.2m, AND SOD TO THE SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

20
15 ⊕ 5
10
(%) STRAIN AT FAILURE

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THURBER

RECORD OF BOREHOLE No 08-07 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 886 453.78 E 310 806.32 ORIGINATED BY GA
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.08.25 - 2009.08.25 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.1											
0.0	TOPSOIL: (125mm)										
0.1	Silty CLAY, trace sand, occasional iron oxide staining Firm to Very Stiff Brown		1	SS	5		259				
			2	SS	17	▼	258				
			3	SS	16						0 1 49 50
	Brown to Grey						257				
			4	SS	22						
			5	SS	20		256				0 0 62 38
							255				
253.9			6	SS	24						
5.2	END OF BOREHOLE AT 5.2m. BOREHOLE OPEN AND WATER LEVEL AT 3.9m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.09.02 1.2 257.9 2009.09.21 1.2 257.9						254				

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/23/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-08 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 886 497.64 E 310 782.46 ORIGINATED BY GA
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.08.26 - 2009.08.26 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (40 80 120 160 200) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
258.6											
0.0	**TOPSOIL:** (150mm)										
0.2	Silty **CLAY**, occasional rootlets Firm to Very Stiff Brown		1	SS	5		258				
			2	SS	6		257				
			3	SS	6						
			4	SS	23		256				0 0 52 48
			5	SS	19		255				0 0 52 48
253.4			6	SS	15		254				
5.2	END OF BOREHOLE AT 5.2m. BOREHOLE OPEN AND DRY. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

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Ontario

RECORD OF BOREHOLE No 08-09 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 886 542.54 E 310 753.11 ORIGINATED BY GA
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.08.26 - 2009.08.26 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.9											
0.0	TOPSOIL: (100mm)										
0.1	SILT, some sand, trace gravel Very Loose Brown		1	SS	3						
257.1	Damp										
0.8	Silty CLAY, trace sand, occasional iron oxide staining Stiff to Very Stiff Brown		2	SS	8		257				
			3	SS	29		256				0 5 54 41
			4	SS	17		255				
			5	SS	25						0 0 61 39
			6	SS	26	▽	254 253				0 0 79 21
	Grey		7	SS	18		252				
251.2											
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN AND WATER LEVEL AT 5.5m. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.										

+³, ×³: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

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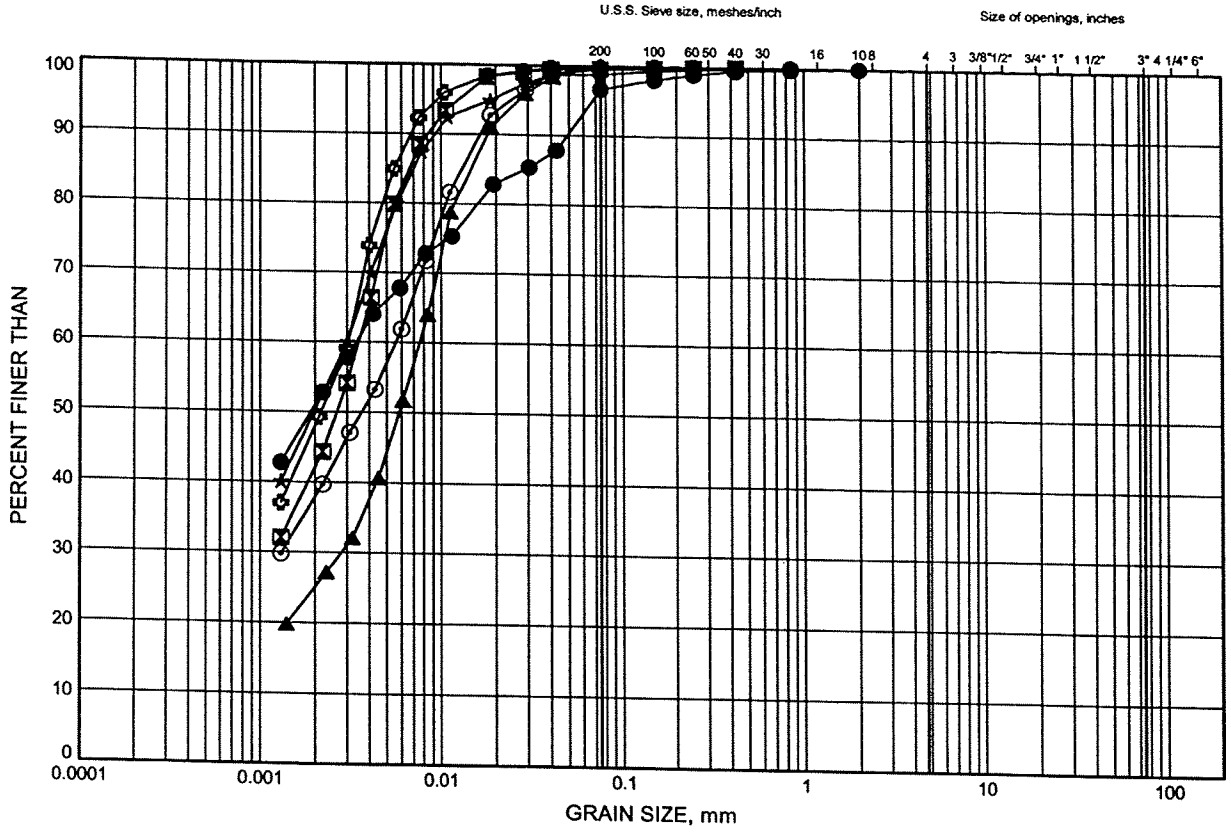
Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE A1

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-06	1.07	258.86
⊠	08-06	3.35	256.58
▲	08-06	4.88	255.05
★	08-07	1.83	257.25
⊙	08-07	3.35	255.73
✿	08-08	2.59	256.01

W.P.# 2109-05-00
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Checked By RPR

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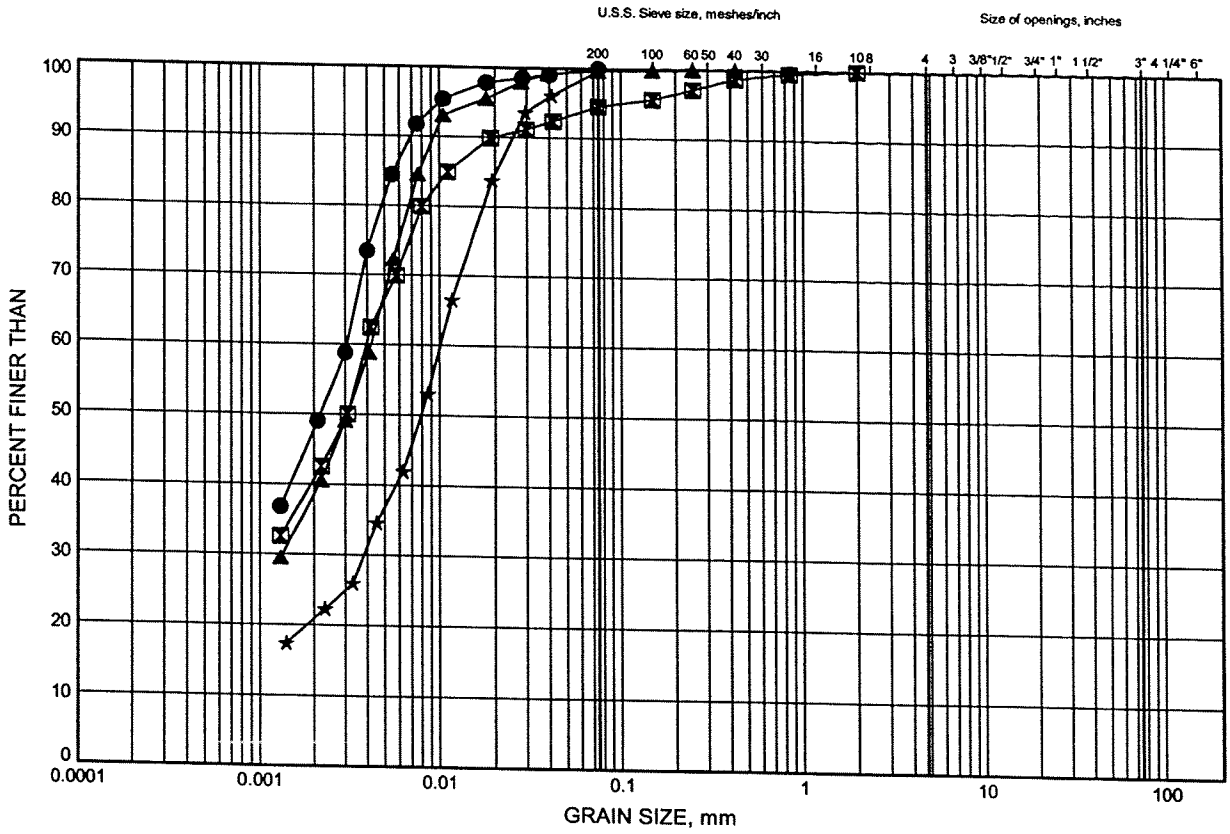
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 10/16/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE A2

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-08	3.35	255.25
⊠	08-09	1.83	256.07
▲	08-09	3.35	254.55
★	08-09	4.88	253.02

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

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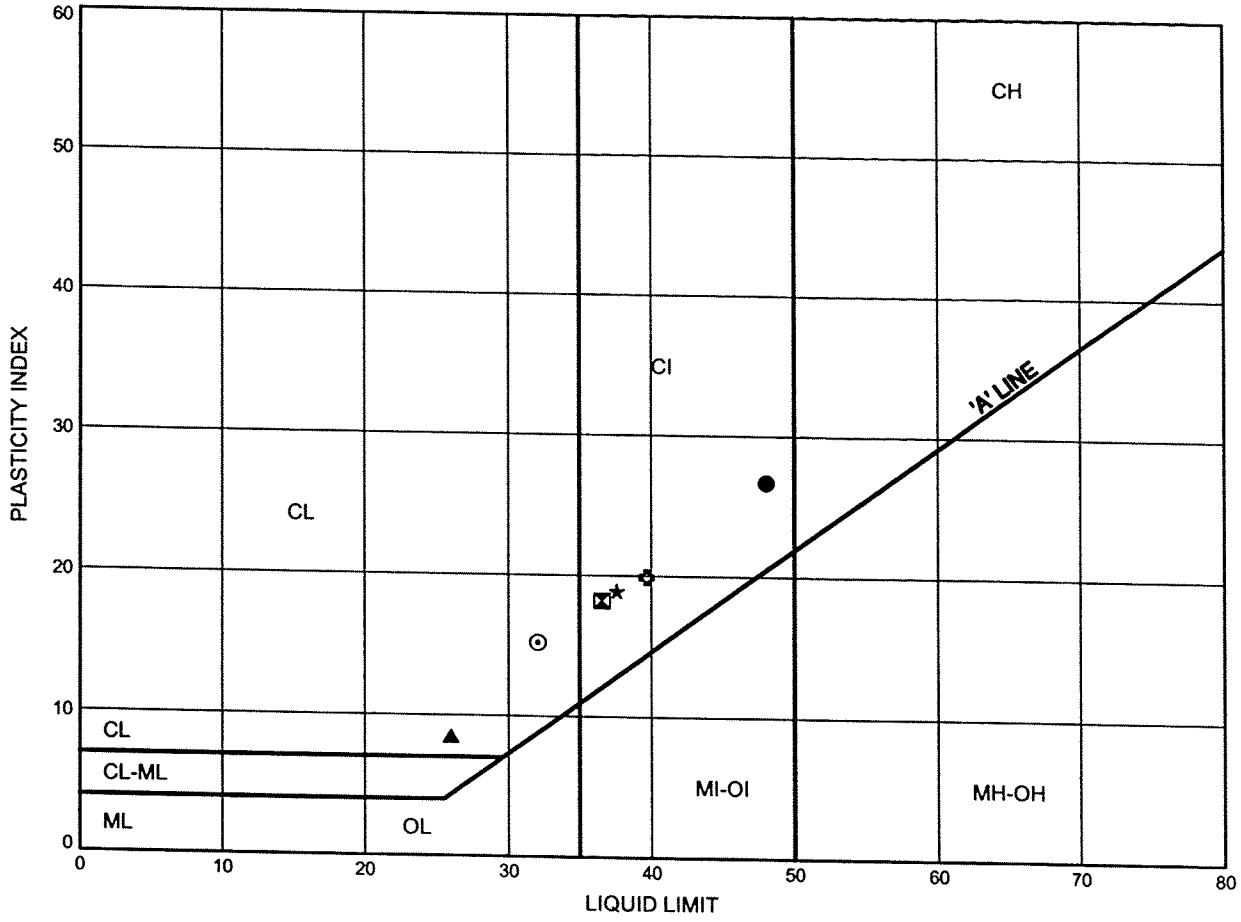
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 10/16/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE A3

SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-06	1.07	258.86
⊠	08-06	3.35	256.58
▲	08-06	4.88	255.05
★	08-07	1.83	257.25
⊙	08-07	3.35	255.73
✿	08-08	2.59	256.01

Date October 2009

Project 2109-05-00

THURBER

Prep'd AN

Chkd. RPR

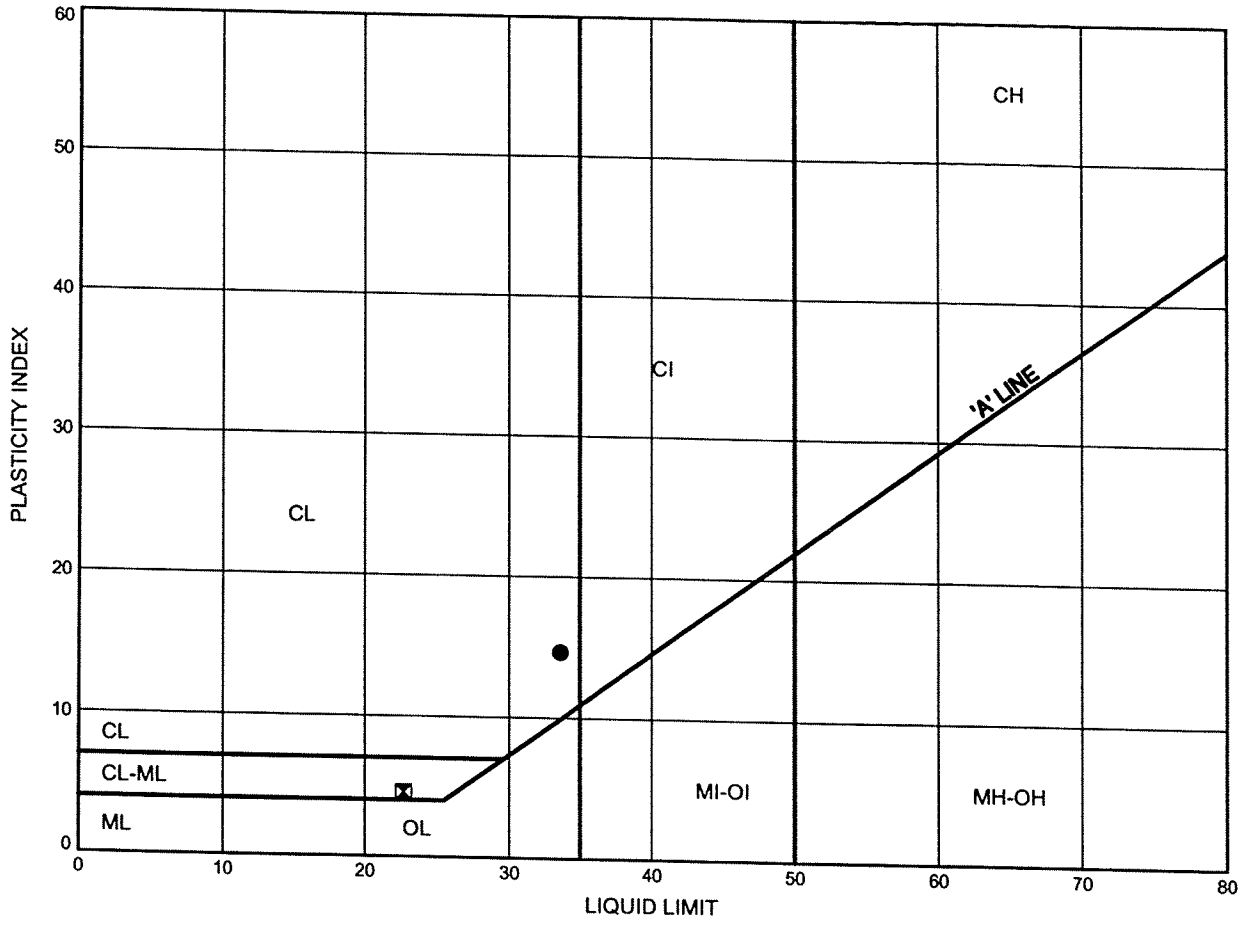
THURBALT 0596.GPJ 10/16/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE A4

SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-09	3.35	254.55
⊠	08-09	4.88	253.02

Date October 2009

Project 2109-05-00

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Prep'd AN

Chkd. RPR

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Photograph – View looking at Boreholes 08-06 and 08-07

Photograph – View looking at south side of the site, Borehole 08-06

Photograph – View looking north at Borehole 08-08

Photograph – View looking north at Borehole 08-09

MINISTRY OF TRANSPORTATION, ONTARIO

METRIC

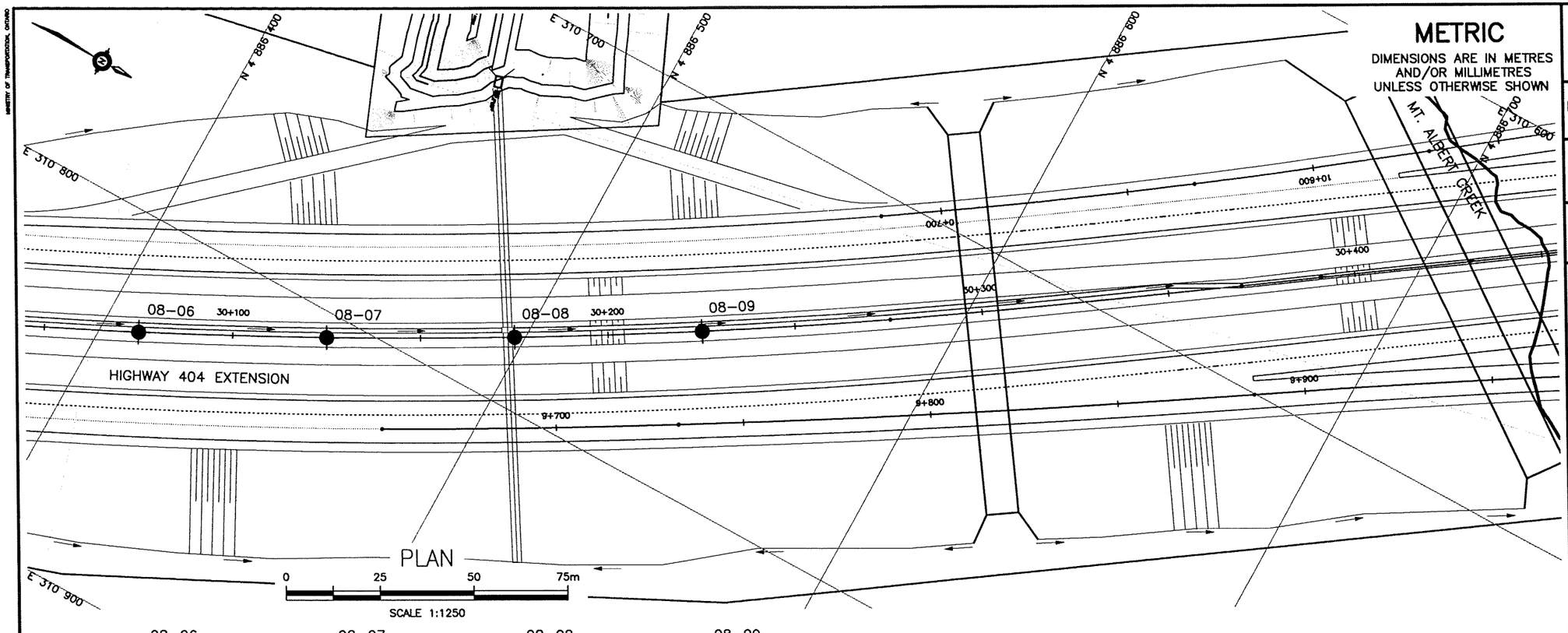
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 2109-05-00

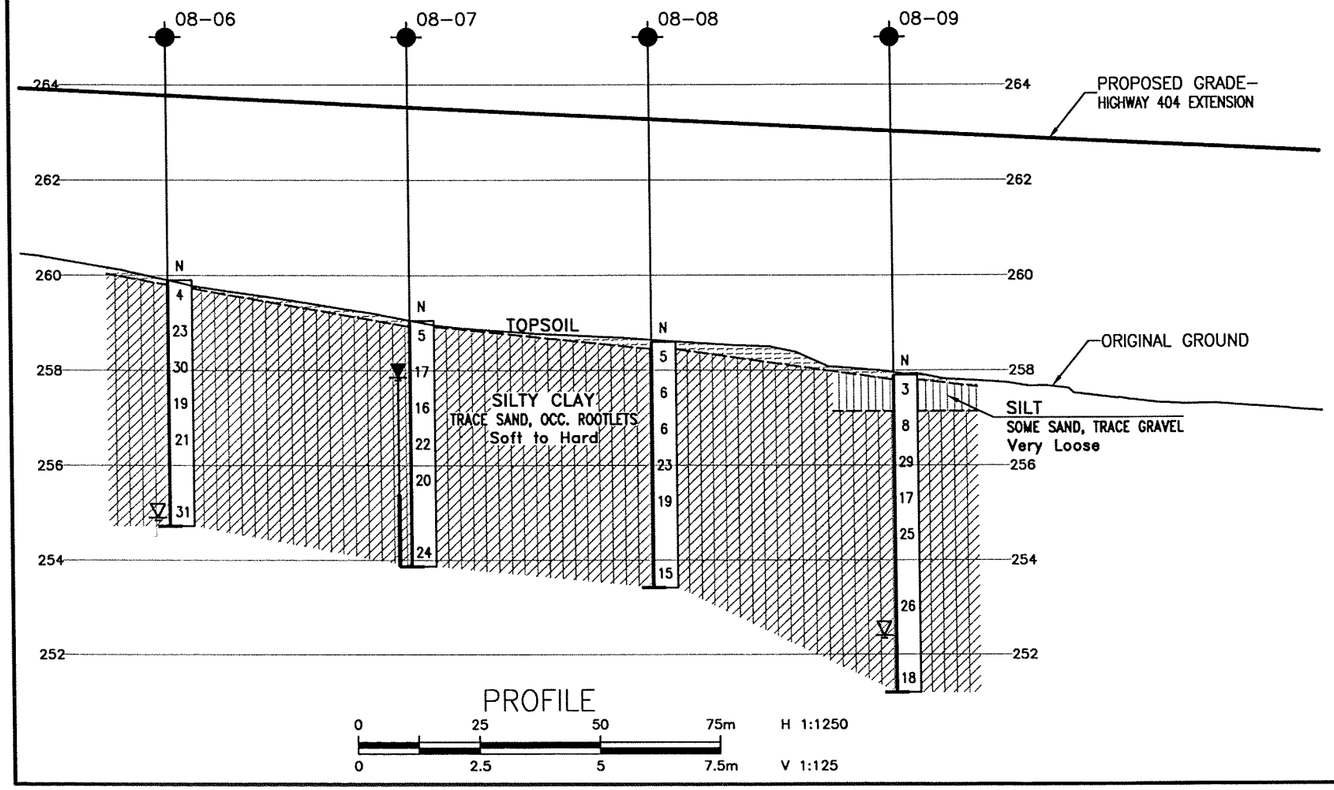
HIGHWAY 404 EXTENSION
HIGH FILL SOUTH OF DOANE ROAD
STATIONS 30+075 TO 30+225
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

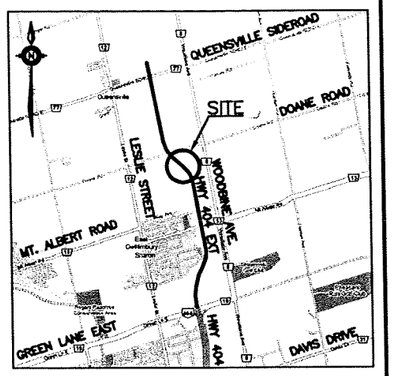
THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



PLAN



PROFILE



KEYPLAN

LICENSED PROFESSIONAL ENGINEER
G.A. BATTER
Feb 26/10
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Feb 26/10
PROVINCE OF ONTARIO

LEGEND

⊕	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▽	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-06	259.9	4 886 409.4	310 829.4
08-07	259.1	4 886 453.8	310 806.4
08-08	258.6	4 886 497.4	310 782.0
08-09	257.9	4 886 540.4	310 756.4

-NOTES-

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

GEOCRES No. 31D-492

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	RPR	CHK	PKC	CODE	LOAD	DATE	MAR. 2010
DRAWN	MFA	CHK	AEG	SITE	STRUCT	DWG	

FILENAME: D:\Drafting\19\1805\pt1\acd2548-HighFills(GH08to09).dwg
PLOTDATE: Mar 01, 2010 - 2:44pm

Appendix B

Deep Cut - Highway 404 extension, South of Mount Albert Road
Station 27+775 – 27+875
(Boreholes 08-15A to 08-17A)

Record of Borehole Sheets
Laboratory Test Results
Site Photographs
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-15A 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 884 166.95 E 311 038.81 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.07.30 - 2009.07.30 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
290.5											
0.0	**TOPSOIL:** (200mm)										
290.2 / 0.4	**SAND**, trace to some silt, occasional roots and rootlets Loose Dark Brown Damp		1	SS	6		290				
	Sandy **SILT**, trace gravel, trace clay, occasional sand pockets, occasional cobbles Dense to Very Dense Brown Damp (TILL)		2	SS	34						1 39 51 9
			3	SS	70		289				1 34 56 9
			4	SS	100/ 0.275		288				
	Occasional sand pockets		5	SS	50/ 0.125		287				1 39 51 9
			6	SS	50/ 0.100		286				2 31 58 9
	Light Brown to Grey Wet		7	SS	50/ 0.100	▽	285				3 36 52 9
							284				
	Occasional sand pockets		8	SS	100/ 0.075		283				4 29 58 9
							282				
	Grey		9	SS	105/ 0.150		281				

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

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Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-15A 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 884 166.95 E 311 038.81 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.07.30 - 2009.07.30 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
	Continued From Previous Page										
279.7	Sandy SILT, trace clay, trace gravel, occasional cobbles Very Dense Grey Wet						280				
10.8	(TILL)		10	SS	100/ 0.100				○		
	END OF BOREHOLE AT 10.8m. BOREHOLE OPEN TO 10.4m AND WATER LEVEL AT 6.8m UPON COMPLETION OF DRILLING IN MAY 2009. WATER LEVEL AT 5.9m UPON COMPLETION OF DRILLING IN JULY 2009. BOREHOLE BACKFILLED WITH HOLEPLUG TO 8.5m, THEN AUGER CUTTINGS TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

20
15 5
10
(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/20/09

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RECORD OF BOREHOLE No 08-16A 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 884 213.73 E 311 056.48 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.07.30 - 2009.07.30 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (UNCONFINED, FIELD VANE, QUICK TRIAXIAL, LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
289.6											
0.0	**TOPSOIL:** (380mm)										
289.2											
289.1	**SAND**, some silt, occasional roots		1	SS	7						
0.5	and rootlets Loose Dark Brown Moist						289				
	Sandy **SILT**, trace to some clay, trace gravel, occasional sand pockets, occasional cobbles Compact to Dense Brown Moist (TILL) Thin sand layer (250mm) Sand layer (450mm)		2	SS	28						3 38 50 9
			3	SS	33		288				0 22 71 7
			4	SS	89		287				3 37 50 10
	Occasional cobbles Very Dense Light Brown Damp		5	SS	100		286				
			6	SS	100/ 0.150		285				4 35 50 11 0 20 67 13
	Very Dense Damp		7	SS	50/ 0.075		284				
							283				
	Grey		8	SS	50/ 0.050		282				
							281				
	Wet		9	SS	100/ 0.125		280				0 20 73 7

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No 08-16A 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 884 213.73 E 311 056.48 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.07.30 - 2009.07.30 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 40 80 120 160 200 (O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
278.8	Sandy SILT, trace clay Very Dense Grey Damp (TILL)										
			10	SS	100/ 0.125		279		o		
10.8	END OF BOREHOLE AT 10.8m. BOREHOLE OPEN TO 10.1m AND WATER LEVEL AT 2.9m UPON COMPLETION OF DRILLING IN MAY 2009. WATER LEVEL AT 6.0m UPON COMPLETION OF DRILLING IN JULY 2009. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEVATION(m) 2009.05.15 1.2 288.4 2009.06.05 1.4 288.2 2009.07.10 1.7 287.9 2009.09.21 3.2 286.4										

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

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RECORD OF BOREHOLE No 08-17A 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 884 260.87 E 311 073.13 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.07.30 - 2009.07.30 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
288.2											
0.0 / 287.8	**TOPSOIL:** (380mm)										
287.4 / 0.5	**SAND**, some silt, occasional root and rootlets Loose Dark Brown Moist		1	SS	5		288				
	Sandy **SILT**, some clay, trace gravel, occasional sand pockets, occasional cobbles Very Dense to Dense Brown Moist (TILL)		2	SS	57						1 30 58 11
			3	SS	32		287				3 41 47 9
	Very Dense Damp		4	SS	71	▽	286				
			5	SS	79/ 0.275		285				1 20 70 9
			6	SS	50/ 0.125		284				
			7	SS	50/ 0.100		283				
	Grey Wet		8	SS	100/ 0.150		282				2 29 61 8
			9	SS	100/ 0.150		281				
							280				
							279				0 11 81 8

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

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THURBER

RECORD OF BOREHOLE No 08-17A 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 884 260.87 E 311 073.13 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.07.30 - 2009.07.30 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
277.4	Sandy SILT, trace gravel Very Dense Grey Damp (TILL)		10	SS	100/		278				
10.8	END OF BOREHOLE AT 10.8m. BOREHOLE OPEN TO 9.9m AND WATER LEVEL AT 2.7m UPON COMPLETION OF DRILLING IN MAY 2009. WATER LEVEL AT 5.5m UPON COMPLETION OF DRILLING IN JULY 2009. BOREHOLE BACKFILLED WITH HOLEPLUG TO 8.7m THEN AUGER CUTTINGS TO SURFACE.				0.125						

SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\frac{20}{15 \oplus 5}$ (%) STRAIN AT FAILURE

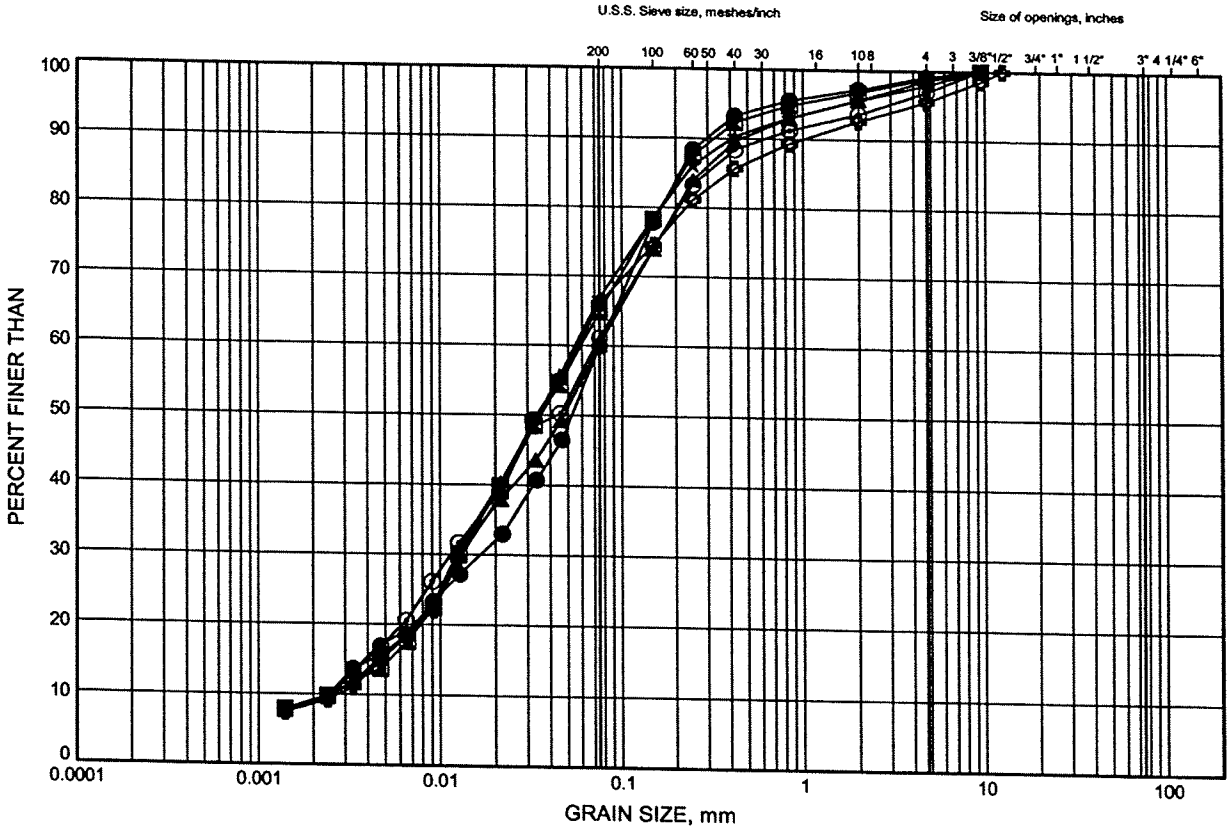
ONTMT4S 0596.GPJ 10/20/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE B1

SANDY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-15A	1.07	289.43
⊠	08-15A	1.75	288.75
▲	08-15A	3.26	287.24
★	08-15A	4.70	285.80
⊙	08-15A	6.17	284.33
✿	08-15A	7.66	282.84

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

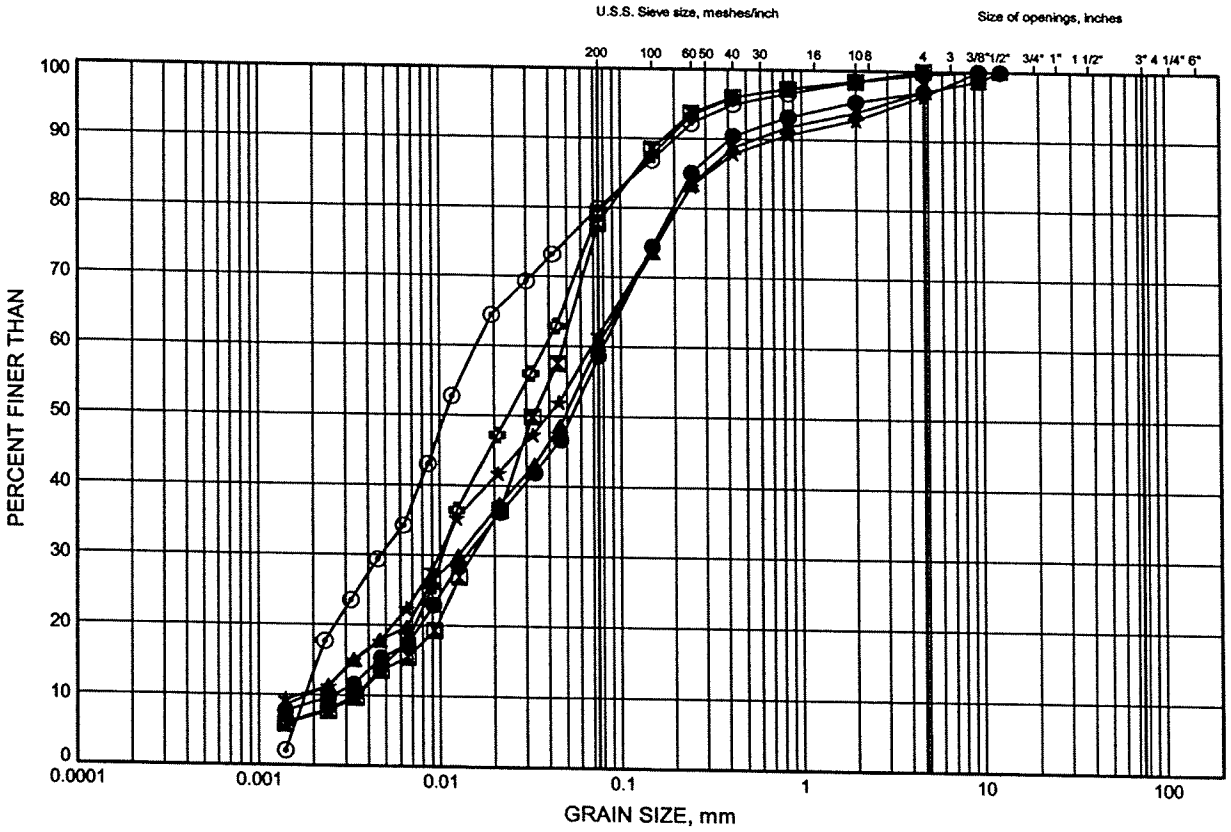
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 10/5/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE B2

SANDY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-16A	0.99	288.61
⊠	08-16A	1.83	287.77
▲	08-16A	2.59	287.01
★	08-16A	4.65	284.95
⊙	08-16A	4.76	284.84
✿	08-16A	9.21	280.39

W.P.# .2109-05-00.....
Prepared By .AN.....
Checked By .RPR.....

THURBER

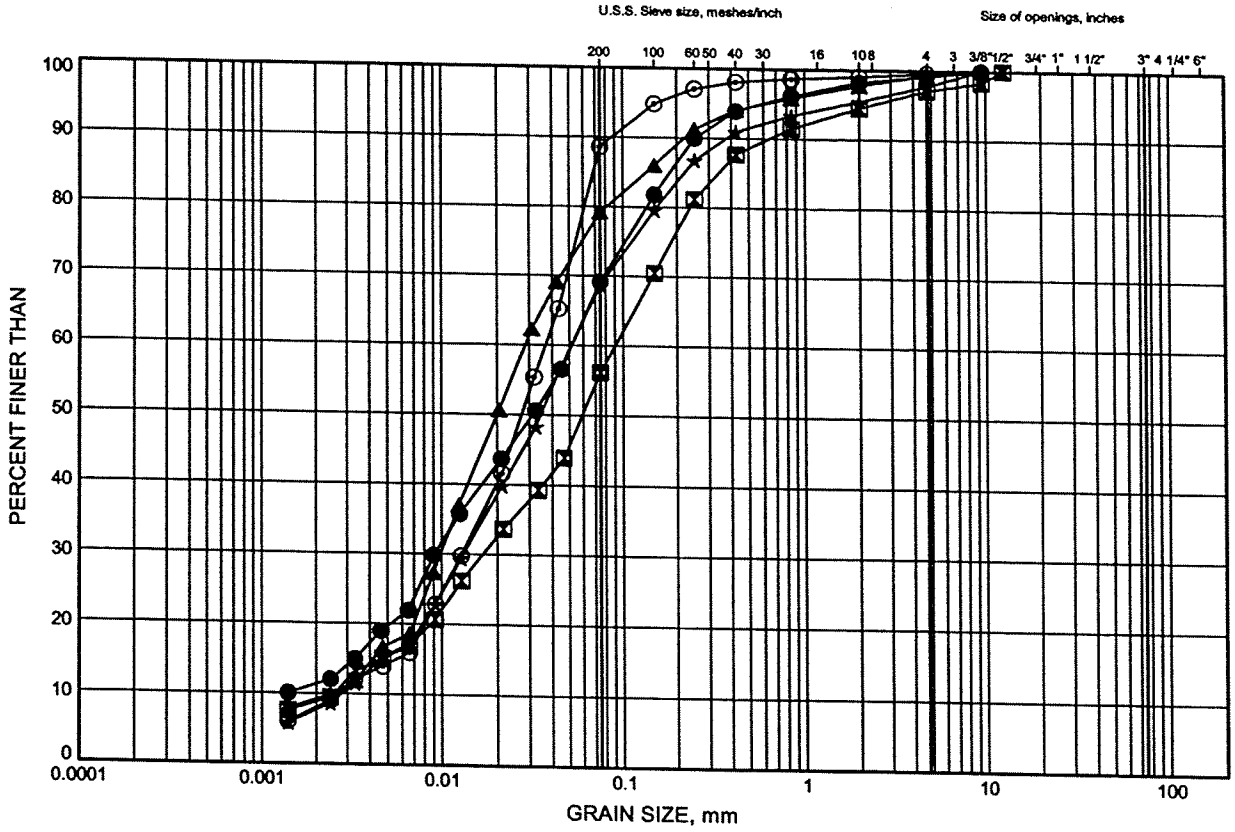
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 10/5/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE B3

SANDY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-17A	0.99	287.21
⊠	08-17A	1.83	286.37
▲	08-17A	3.35	284.85
★	08-17A	6.22	281.98
⊙	08-17A	9.22	278.98

W.P.# 2109-05-00
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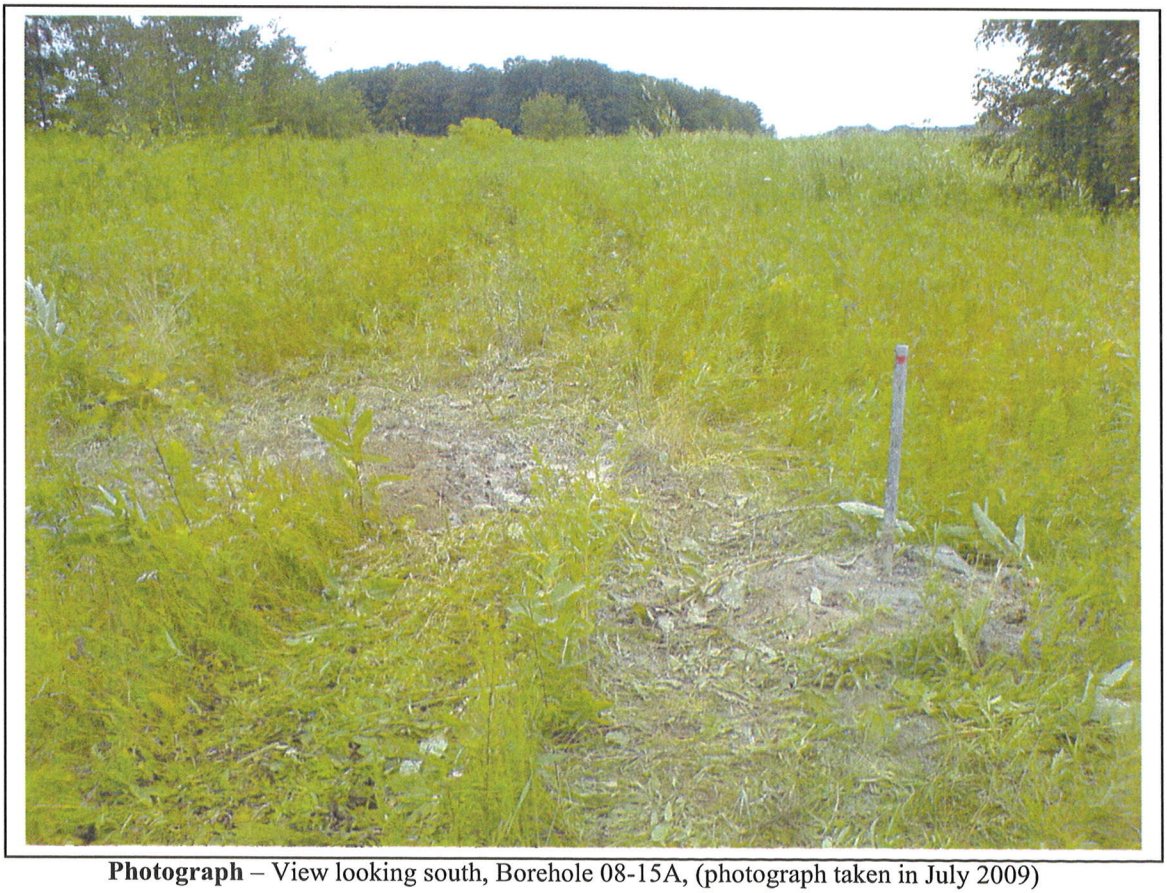
Checked By RPR

THURBER

GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 10/5/09

Photograph– View looking north, Borehole 08-15A (photograph taken in May 2009)



Photograph – View looking south, Borehole 08-15A, (photograph taken in July 2009)

Photograph – View looking south, Borehole 08-16A (photograph taken in May 2009)

Photograph – View looking south, Borehole 08-16A, (photograph taken in July 2009)

Photograph – View looking south, Borehole 08-17A, (photograph taken in July 2009)

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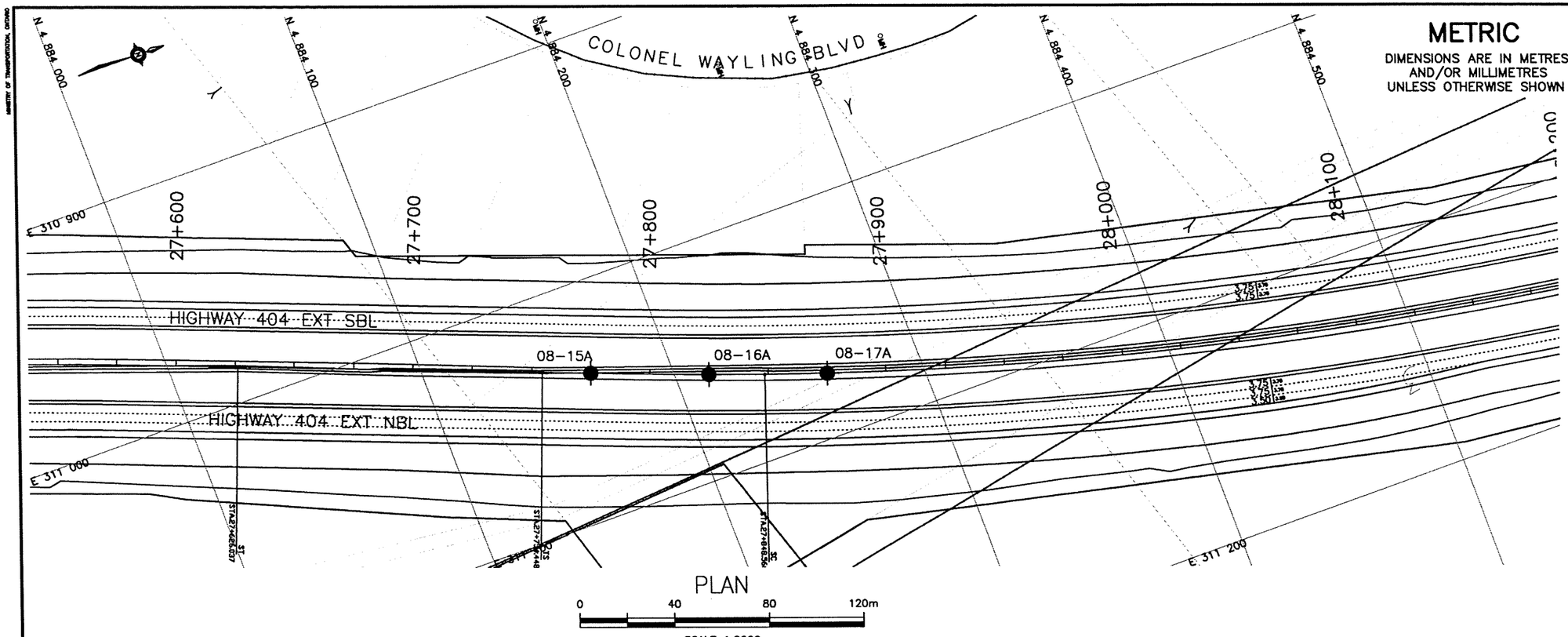
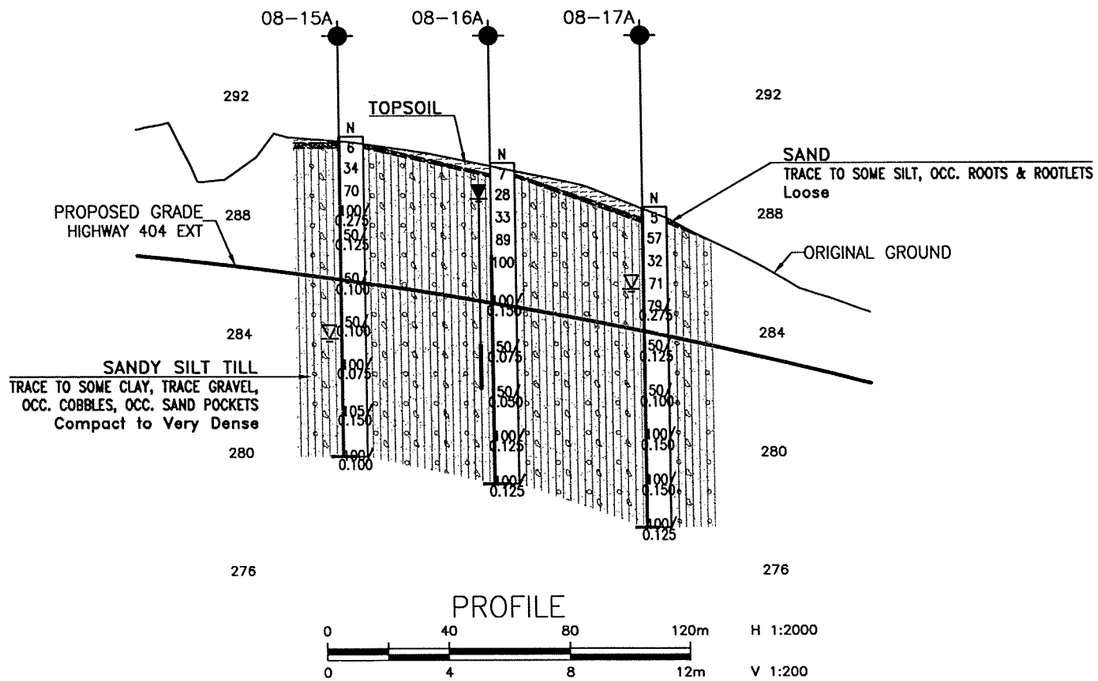


PLAN

0 40 80 120m

SCALE 1:2000



PROFILE

0 40 80 120m H 1:2000

0 4 8 12m V 1:200

METRIC

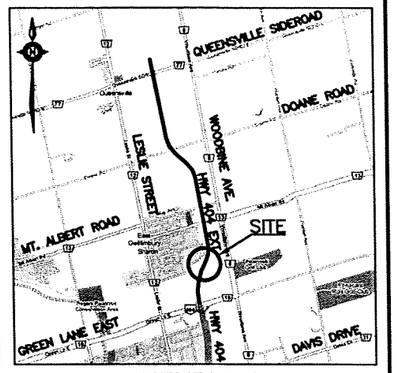
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 2109-05-00

HIGHWAY 404 EXTENSION
DEEP CUT N. OF GREEN LANE, S OF MT. ALBERT
STATIONS 27+775 TO 27+875
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



KEYPLAN

LEGEND

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

NO	ELEVATION	NORTHING	EASTING
08-15A	290.6	4 884 167.0	311 038.8
08-16A	289.7	4 884 213.7	311 056.5
08-17A	288.2	4 884 260.9	311 073.1

LICENSED PROFESSIONAL ENGINEER
S.M. SATHER
Feb 24/10
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Feb 26/10
PROVINCE OF ONTARIO

-NOTES-

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

GEOCRES No. 31D-492

REVISIONS			
	DATE	BY	DESCRIPTION

DESIGN	RPR	CHK	PKC	CODE		LOAD	DATE MAR. 2010
DRAWN	MFA	CHK	AEG	SITE		STRUCT	DWG

FILENAME: D:\Drafting\19\1905\86\ed2598-DeepCuts(BH15to47).dwg
PLOTDATE: Mar 01, 2010 - 2:32pm

Appendix C

Deep Cut - Highway 404 extension, North of Doane Road
Station 30+975 – 31+100
(Boreholes 08-18 to 08-21 and 08-48 to 08-55)

Record of Borehole Sheets
Laboratory Test Results
Site Photographs
Drawing titled "Borehole Locations and Soil Strata"

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Ontario

THURBER

RECORD OF BOREHOLE No 08-18 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 887 157.90 E 310 330.89 ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2009.01.29 - 2009.01.29 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
267.0							267				
0.0	**TOPSOIL**, trace sand, occasional roots Compact Dark Brown		1	SS	16						
266.5	(550mm)										
0.6	**SAND** and **SILT** Dense Brown Moist		2	SS	44		266				
265.5	(TILL)										
1.5	**SAND** and **GRAVEL**, trace silt, trace clay, occasional cobbles Very Dense Brown Moist		3	SS	105						41 47 12 (SI+CL)
264.4							265				
2.6	**SAND** and **SILT**, trace to some clay, trace gravel Very Dense Brown Moist (TILL) Occasional oxidized staining		4	SS	85						
			5	SS	115/ 0.225		264				
			6	SS	100/ 0.125		263				0 21 65 14
	Layer of sand (800mm)						262				
			7	SS	125	▽	261				2 56 37 5
259.3	Occasional grey sand seams						260				
7.7	END OF BOREHOLE AT 7.7m. BOREHOLE OPEN AND WATER LEVEL AT 6.3m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO 0.20m, THEN AUGER CUTTINGS TO SURFACE.		8	SS	100/ 0.100						3 37 51 9

+^{3}, ×^{3}: Numbers refer to Sensitivity

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

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THURBER

RECORD OF BOREHOLE No 08-19 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 887 193.45 E 310 308.52 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.29 - 2009.01.29 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
268.6											
0.0	**TOPSOIL**, trace sand, trace silt, occasional roots Compact Dark Brown (600mm)		1	SS	11				○		
268.0							268				
0.6	**SAND and SILT**, some clay, trace gravel, occasional oxidized staining Compact to Dense Brown Moist (TILL)		2	SS	16				○		
			3	SS	11		267		○		
	Clayey zone										
	Occasional cobbles		4	SS	36		266		●		0 21 61 18
	Very Dense		5	SS	105/ 0.275				○		
							265				
			6	SS	100/ 0.125		264		○		
							263				
			7	SS	100/ 0.075				○		3 45 40 12
							262				
			8	SS	100/ 0.100		261		○		
							260				
259.4											
9.2	END OF BOREHOLE AT 9.2m. BOREHOLE OPEN AND WATER LEVEL AT 6.4m UPON COMPLETION OF DRILLING. Piezometer installation consists of		9	SS	100/ 0.075				○		

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\frac{20}{15 \oplus 5}$ (%) STRAIN AT FAILURE

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THURBER

RECORD OF BOREHOLE No 08-19 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 887 193.45 E 310 308.52 ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2009.01.29 - 2009.01.29 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	Continued From Previous Page										
	24mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										
	WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m)										

$+^3$, $\times^3$: Numbers refer to Sensitivity

15 10 20 5 (%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No 08-20 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 887 229.37 E 310 286.75 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.29 - 2009.01.29 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
268.7											
0.0	**TOPSOIL**, trace sand, trace silt, occasional roots Loose Dark Brown (550mm)		1	SS	9						
268.2 0.5	**SAND** and **SILT**, some clay, trace gravel, occasional oxidized staining Compact to Dense Brown Moist (TILL)		2	SS	21		268				
			3	SS	20		267				0 13 75 12
	Clayey zone		4	SS	37		266				
			5	SS	30		265				1 27 58 14
	Very Dense		6	SS	108/ 0.275		264				
			7	SS	100/ 0.125		263				
			8	SS	100/ 0.125		262 261				6 38 45 11
259.5			9	SS	100/ 0.100		260				
9.2	END OF BOREHOLE AT 9.2m. BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO 1.5m, THEN AUGER										

Continued Next Page

+ 3 , × 3 : Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No 08-20 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 887 229.37 E 310 286.75 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.29 - 2009.01.29 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 40 80 120 160 200 (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
	Continued From Previous Page										
	CUTTINGS TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

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THURBER

RECORD OF BOREHOLE No 08-21 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 887 264.78 E 310 266.08 ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2009.01.30 - 2009.01.30 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
268.1											
0.0 / 267.7	**TOPSOIL**, trace silt, occasional roots Loose Dark Brown (430mm)		1	SS	8		268				
267.5											
0.6 / 265.3	Silty **SAND**, trace clay Loose Brown Moist		2	SS	12		267				1 9 49 41
	Silty **CLAY**, trace sand, trace gravel, occasional oxidized staining Stiff to Very Stiff Brown		3	SS	11						
			4	SS	21		266				
2.8 / 260.3	**SAND** and **SILT**, trace gravel, trace to some clay, occasional oxidized staining Compact to Very Dense Brown Damp to Moist (TILL) Layer of silt at 3.0m		5	SS	24		265				0 3 91 6
			6	SS	103/ 0.275		264				
			7	SS	100/ 0.150		263				
							262				0 34 56 10
							261				
7.8	END OF BOREHOLE AT 7.8m. BOREHOLE OPEN TO 5.2m UPON COMPLETION OF DRILLING. Piezometer installation consists of 24mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m)		8	SS	100/ 0.150						

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

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RECORD OF BOREHOLE No 08-48 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 867 093.56 E 310 301.81 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.22 - 2008.10.22 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
265.6											
0.0	ASPHALT (50mm)										
	SAND, some silt to silty, some gravel Compact Brown to Dark Brown Moist		1	SS	13				○		
264.9							265				
0.8	(FILL)										
	SAND and SILT, some clay, trace gravel, occasional oxide staining Loose to Compact Brown Moist (TILL)		2	SS	8				○		
			3	SS	13		264		○		1 36 52 11
263.2											
2.4	Gravelly SAND, some silt, some clay Dense Brown Moist		4	SS	35		263		○		0 46 50 4
			5	SS	50				○		23 64 13 (SI+CL)
	Coobles at 3.5m						262				
261.5											
4.1	SILT, some sand to sandy Very Dense Grey Wet (TILL)		6	SS	140		261		○		
			7	SS	180/.275	▽	260		○		0 28 63 9
							259				
257.8											
7.9	END OF BOREHOLE AT 7.9m. BOREHOLE OPEN AND WATER LEVEL AT 6.5m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO 0.07m THEN ASPHALT TO SURFACE.		8	SS	185/.250		258		○		

+ ³ . × ³ Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

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Ontario

RECORD OF BOREHOLE No 08-49 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 887 106.93 E 310 311.68 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.22 - 2008.10.22 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (20 40 60 80 100; 40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
266.1											
0.0	ASPHALT (25mm)										
265.5	SAND, some gravel Compact Brown Moist (FILL)		1	SS	23		266				
0.6	SAND and SILT, some clay, trace gravel, occasional oxidize staining Compact to Dense Brown Moist (TILL)		2	SS	25		265				1 35 52 12
			3	SS	28		264				
263.0			4	SS	33						
3.0	SILT, some sand, trace clay, occasional cobbles, occasional oxide staining Compact to Very Dense Brown Moist (TILL)		5	SS	24		263				0 2 81 17
	Layer of sand (800mm) Wet						262				
	Brown to Grey		6	SS	135		261				0 39 56 5
	Some sand		7	SS	188/.275	▽	260				0 19 73 8
			8	SS	100/.150		259				
256.8							258				
9.3	END OF BOREHOLE AT 9.3m. BOREHOLE OPEN TO 8.2m AND WATER LEVEL AT 7.1m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH		9	SS	100/.125		257				

Continued Next Page

$+^3$. $\times^3$: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 8/26/09

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Ontario

RECORD OF BOREHOLE No 08-49 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 867 106.93 E 310 311.68 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2006.10.22 - 2006.10.22 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
	Continued From Previous Page										
	HOLEPLUG TO 0.05m THEN ASPHALT TO SURFACE.										

$+^3$, $\times^3$ Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 8/26/09

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Ontario

RECORD OF BOREHOLE No 08-50 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 887 090.43 E 310 327.05 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.20 - 2008.10.20 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
264.4											
0.0	TOPSOIL (50mm)										
	SAND and SILT, trace clay, trace roots Compact Dark Brown to Brown Moist (TILL) Possible cobbles at 0.4m Layer of sand (200mm)		1	SS	10		264				
			2	SS	26		263				
	Occasional cobbles and boulders Very Dense		3	SS	58						
262.2											
2.1	SILT, some sand, trace to some clay Very Dense Brown Moist (TILL)		4	SS	77		262				0 15 73 12
			5	SS	92		261				
	Layer of silty sand (400mm)										
	Grey Wet		6	SS	100/ .200		260				1 68 26 5
			7	SS	100/ .225		259				
			8	SS	100/ .200		258				1 14 78 7
							257				
255.0			9	SS	180/ .225		256				
9.4	END OF BOREHOLE AT 9.4m. BOREHOLE OPEN AND WATER LEVEL AT 5.0m UPON COMPLETION OF DRILLING.										

Continued Next Page

+ ^{3}, × ^{3} Numbers refer to Sensitivity (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-50 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 887 090.43 E 310 327.05 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.20 - 2008.10.20 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										
	WATER LEVEL READINGS: DATE / DEPTH (m) / ELEV. (m) 2008.10.24 4.4 260.0 2008.11.28 4.9 259.5 2009.02.06 0.1 264.3 2009.02.20 0.2* 264.6 2009.03.20 1.0 263.4 2009.04.22 1.1 263.3 2009.09.02 2.6 261.8										
	* (above ground surface)										

SHEAR STRENGTH kPa: O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE

$+^3$. $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/8/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-51

1 OF 2

METRIC

G.W.P. 2109-05-00 | LOCATION Doane Rd. N 4 887 113.65 E 310 353.28 | ORIGINATED BY ES

HWY 404 | BOREHOLE TYPE Solid Stem Augers | COMPILED BY AN

DATUM Geodetic | DATE 2008.10.23 - 2008.10.23 | CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
263.6											
0.0	ASPHALT (25mm)										
	Silty SAND, trace to some gravel Compact Brown Moist (FILL) Occasional cobbles at 0.9m		1	SS	27		263				
			2	SS	15						
			3	SS	37		262				
261.4											
2.3	SAND and SILT, trace to some clay, trace gravel, occasional oxide staining Very Dense Brown Moist (TILL)		4	SS	116		261				3 34 51 12
			5	SS	115						
							260				
	Layer of fine sand (1.2m)		6	SS	133		259				0 56 38 6
	Brown to Grey										
			7	SS	100/ .150		258				
	Layer of fine sand (0.9m)						257				0 32 56 11
			8	SS	83		256				
							255				
			9	SS	100/ .75						4 43 46 7
	Hard augering, auger grinding						254				

Continued Next Page

+ ³ . × ³ Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 8/26/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-51 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 887 113.65 E 310 353.28 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.23 - 2008.10.23 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (40 80 120 160 200) O UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and SILT, trace gravel, occasional sand pockets Very Dense Grey (TILL)		10	SS	100/ .75		253 252		o		
251.3											
12.3	END OF BOREHOLE AT 12.3m. BOREHOLE OPEN TO 8.1m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2008.11.28 4.1 259.5		11	SS	100/ .100				o		

$+^3$ $\times^3$ Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 8/26/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-52 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 887 100.05 E 310 368.44 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.20 - 2008.10.21 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (40 80 120 160 200) O UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
262.4											
0.0	TOPSOIL (50mm)										
	SAND and SILT, trace to some clay, trace gravel, occasional rootlets, occasional oxide staining Loose Dark Brown to Brown Moist (TILL)		1	SS	10		262				
			2	SS	5						3 34 51 13
	Compact Grey		3	SS	12		261				
	Dense Brown to Grey Wet		4	SS	41		260				0 48 48 5
	Occasional cobbles Very Dense		5	SS	96		259				
	Brown to Grey		6	SS	100/ .125	▽	258				
			7	SS	100/ .125		257				
			8	SS	100/ .125		256				
							255				
							254				
252.8			9	SS	175/ 250		253				
9.5	END OF BOREHOLE AT 9.5m. WATER LEVEL AT 4.6m UPON COMPLETION OF DRILLING.										1 33 57 9

Continued Next Page

$+^3$ $\times^3$ Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 8/26/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-52 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 887 100.05 E 310 368.44 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.20 - 2008.10.21 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	Continued From Previous Page										
	BOREHOLE BACKFILLED WITH HOLEPLUG TO 3.0m THEN AUGER CUTTINGS TO SURFACE.										

$+^3$ $\times^3$ Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 8/26/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-53

1 OF 2

METRIC

G.W.P. 2109-05-00 | LOCATION Doane Rd. N 4 887 127.36 E 310 398.80 | ORIGINATED BY ES
HWY 404 | BOREHOLE TYPE Solid Stem Augers | COMPILED BY AN
DATUM Geodetic | DATE 2008.10.23 - 2008.10.23 | CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
262.1									
0.0	ASPHALT (50mm)								
	SAND, some gravel, some silt to silty Compact Brown to Dark Brown Moist (FILL)		1	SS	25		262		
261.4 0.8									
	Silty CLAY, trace sand, occasional silt seams, occasional oxide staining Firm to Stiff Brown (FILL)		2	SS	12		261		
260.4 1.8									
	SAND and SILT, trace to some clay, trace gravel, occasional sand seams Loose to Compact Brown to Grey Moist (TILL)		3	SS	7				0 4 68 28
			4	SS	10		260		
			5	SS	14	▽	259		6 36 45 13
	Very Dense		6	SS	97		258		
							257		
	Occasional sand pockets		7	SS	100/ .175		256		4 33 53 9
	Layer of fine sand (500mm) Occasional cobbles						255		
	Grey		8	SS	178/ .225		254		
			9	SS	100/ .100		253		4 40 48 8

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 40 80 120 160 200

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 20 40 60

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE: 20, 15, 5, 10

ONTMT4S 0596.GPJ 8/26/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-53

2 OF 2

METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 687 127.36 E 310 398.80 ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2008.10.23 - 2008.10.23 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (20 40 60 80 100; 40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)						252				
251.4 10.8			10	SS	100/ .100				o		
	END OF BOREHOLE AT 10.8m. BOREHOLE OPEN TO 4.8m AND WATER LEVEL AT 3.0m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO 0.07m THEN ASPHALT TO SURFACE.										

+ 3 × 3 Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 8/26/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-54 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 887 112.68 E 310 413.77 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.21 - 2008.10.24 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
261.0							261			
0.0 / 0.0	TOPSOIL (50mm)									
	SAND and SILT, trace clay, occasional oxide staining Loose Dark Brown to Brown Moist (TILL)		1	SS	8					
			2	SS	9		260			
			3	SS	7					
258.7							259			
2.3	Clayey SILT, trace sand Stiff to Very Stiff Brown to Grey (TILL)		4	SS	14					0 1 77 22
			5	SS	26		258			
			6	SS	14		257			
255.4							256			
5.6	SAND and SILT, trace gravel, trace clay Dense to Very Dense Grey Moist (TILL)		7	SS	34		255			
	Possible boulder at 7.3m. Layer of fine sand (400mm).		8	SS	158/.125		254			8 41 44 7
			9	SS	100/.150		253			
							252			

Continued Next Page

+³ ×³ Numbers refer to Sensitivity (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/9/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-54 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 887 112.68 E 310 413.77 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.21 - 2008.10.24 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SILT, some sand, some clay, trace gravel Very Dense Grey Moist (TILL)		10	SS	100/ .100		251 250		o		3 17 65 15
248.7							249				
12.3	END OF BOREHOLE AT 12.3m. BOREHOLE OPEN TO 9.7m AND WATER LEVEL AT 2.1m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		11	SS	100/ .100				o		

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.11.28	3.7	257.3
2009.02.06	0.0	261.0
2009.02.20	0.4*	261.4
2009.03.20	0.7*	261.7
2009.04.22	0.6*	261.6
2009.09.02	0.6	260.4

* (above ground surface)

+ ^{3}, × ^{3} Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/8/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-55 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 887 131.71 E 310 424.00 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.22 - 2008.10.22 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
261.7											
0.0	ASPHALT (50mm)										
	SAND, some gravel, some silt to silty, occasional oxide staining, Compact to Very Dense, Brown, Moist, (FILL)		1	SS	73						
260.5			2	SS	19		261				
1.1	SILT, some clay, some sand, occasional oxide staining, Loose to Compact, Brown, Moist, (TILL)		3	SS	8		260				0 13 74 13
	Occasional coarse sand pockets		4	SS	15		259				1 42 45 12
			5	SS	18		258				
						▽					
			6	SS	18		257				
	Sandy, Grey		7	SS	19		256				6 25 55 15
							255				
	Occasional cobbles, Very Dense		8	SS	118		254				
252.4							253				
9.3	END OF BOREHOLE AT 9.3m. BOREHOLE OPEN AND WATER LEVEL AT 4.2m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH		9	SS	100/ .150						

Continued Next Page

+ ^{3} , × ^{3} Numbers refer to Sensitivity (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 8/26/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-55 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION Doane Rd. N 4 867 131.71 E 310 424.00 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.22 - 2008.10.22 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
	Continued From Previous Page										
	HOLEPLUG TO 0.2m, AUGER CUTTINGS TO 0.05m THEN ASPHALT TO SURFACE.										

$+^{3}$ $\times^{3}$ Numbers refer to Sensitivity

20
15 ⊕ 5
10 (%) STRAIN AT FAILURE

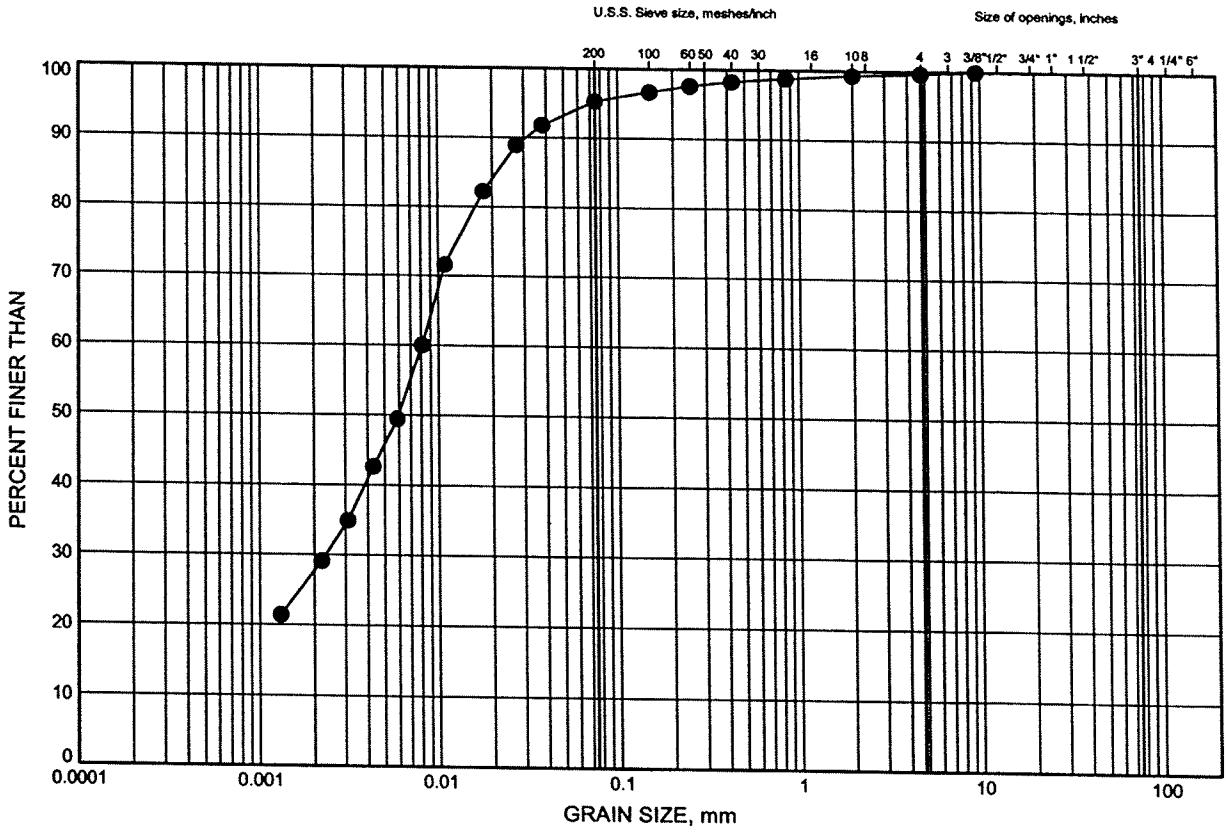
ONTMT4S 0596.GPJ 8/26/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C1

SILTY CLAY FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-53	1.83	260.31

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

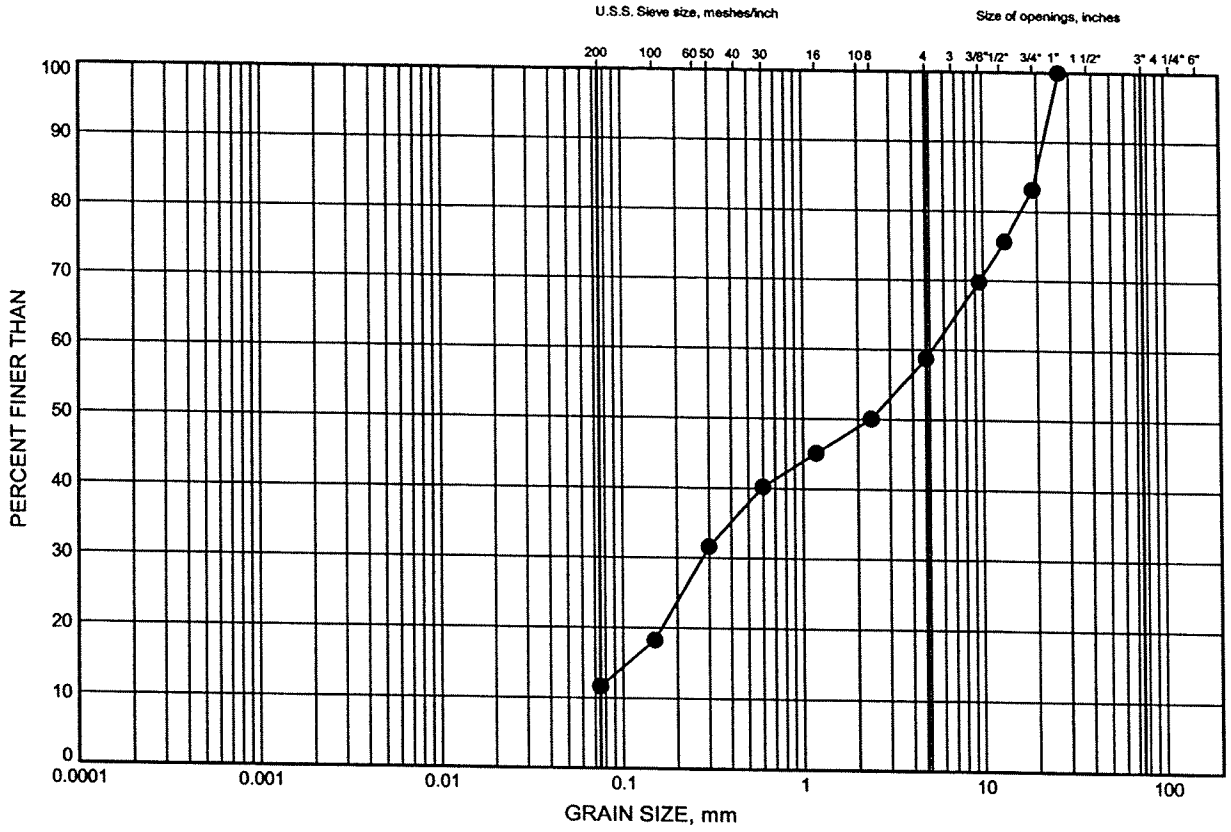
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C2

SAND & GRAVEL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-18	1.68	265.33

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

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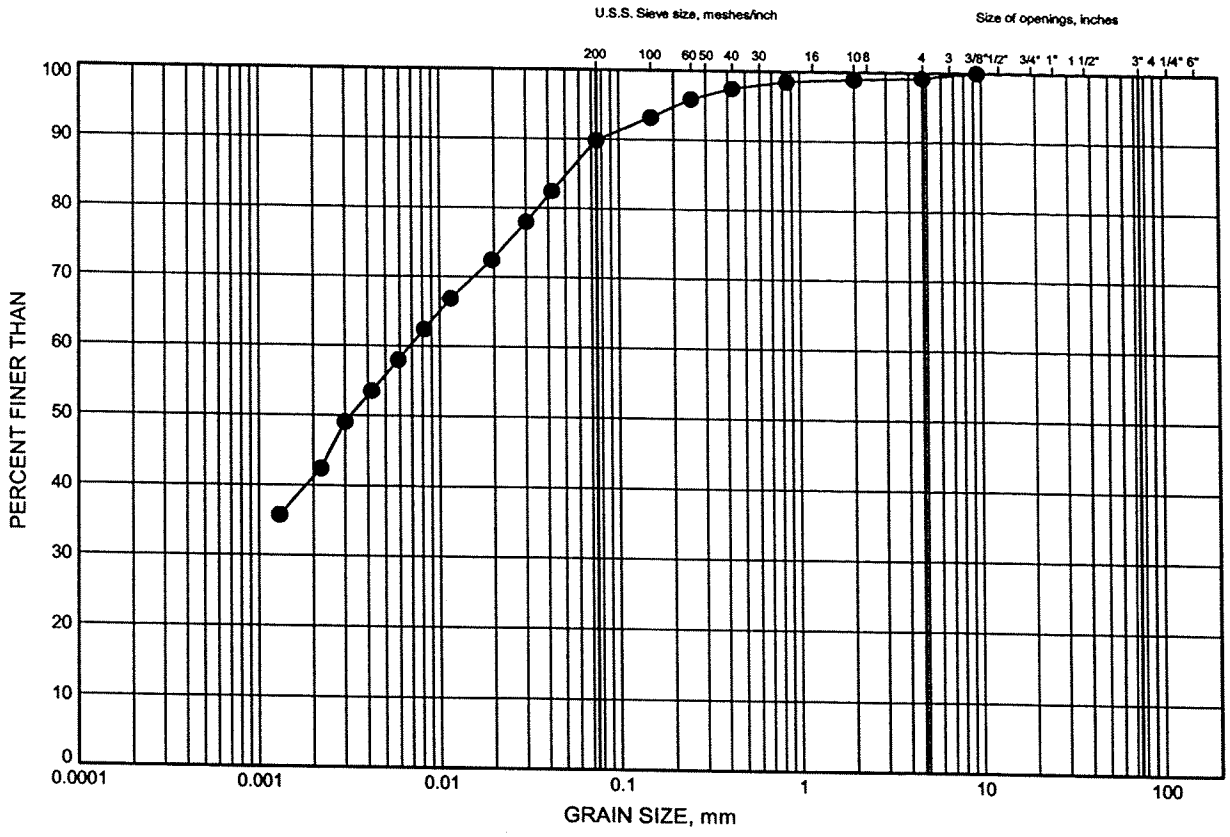
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C3

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-21	1.07	267.03

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

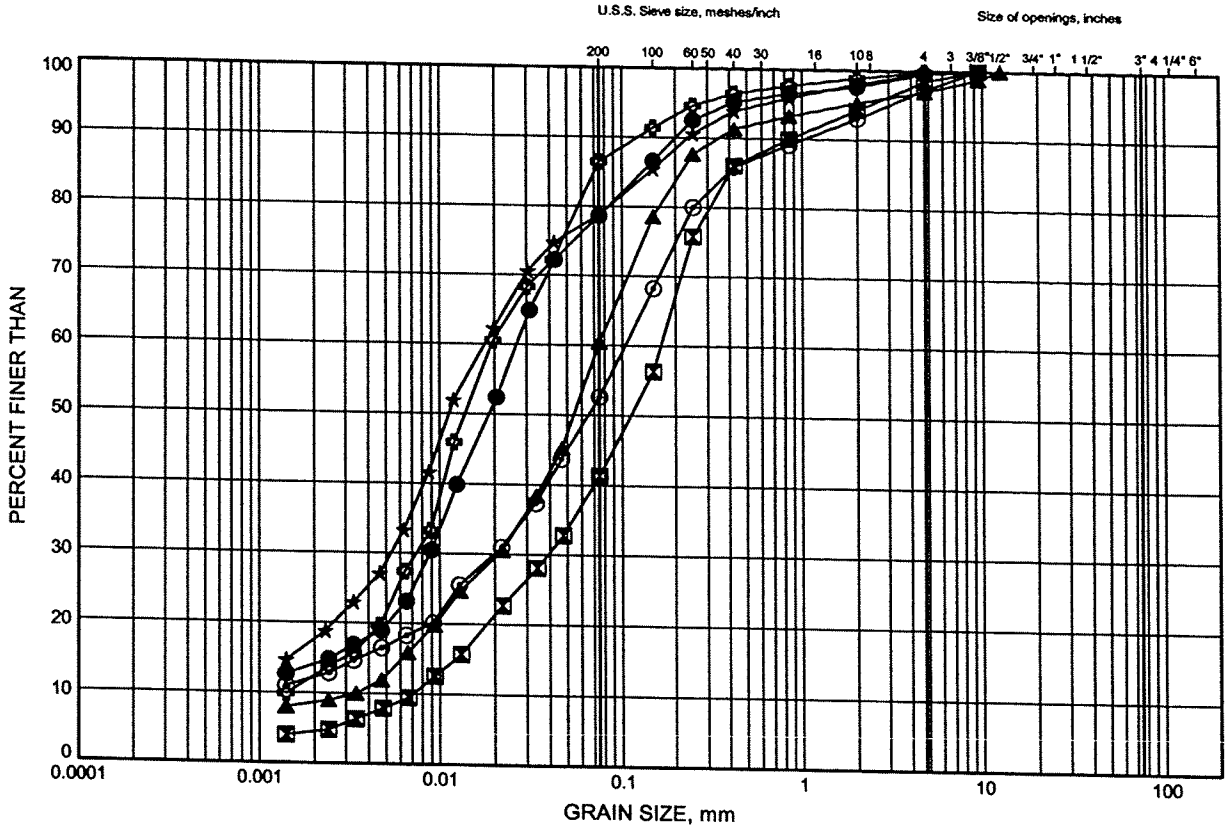
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C4

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-18	4.64	262.37
⊠	08-18	6.22	260.79
▲	08-18	7.67	259.34
★	08-19	2.51	266.09
⊙	08-19	6.13	262.47
✿	08-20	1.75	266.95

W.P.# .2109-05-00.....
Prepared By .AN.....
Checked By .RPR.....

THURBER

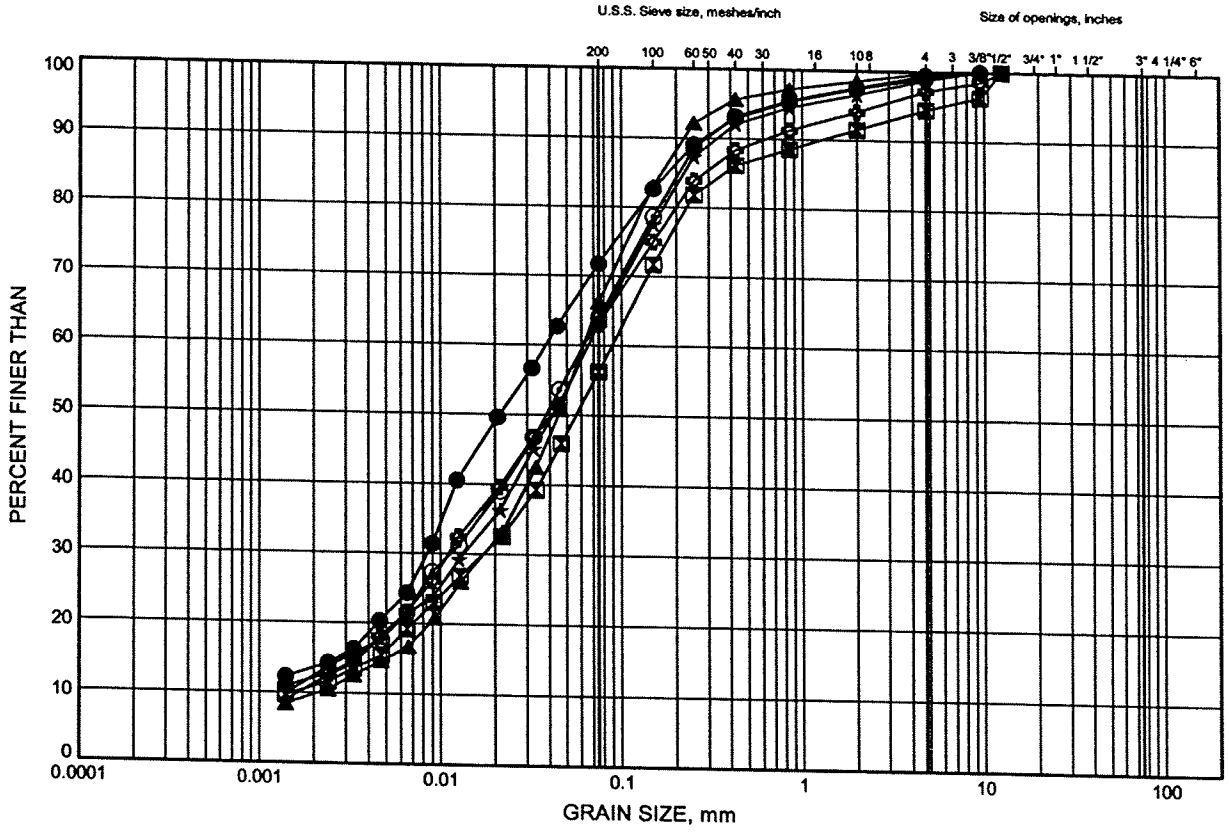
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C5

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-20	3.28	265.42
⊠	08-20	7.68	261.02
▲	08-21	6.17	261.93
★	08-48	1.83	263.80
⊙	08-49	1.07	265.02
✿	08-51	2.59	261.05

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

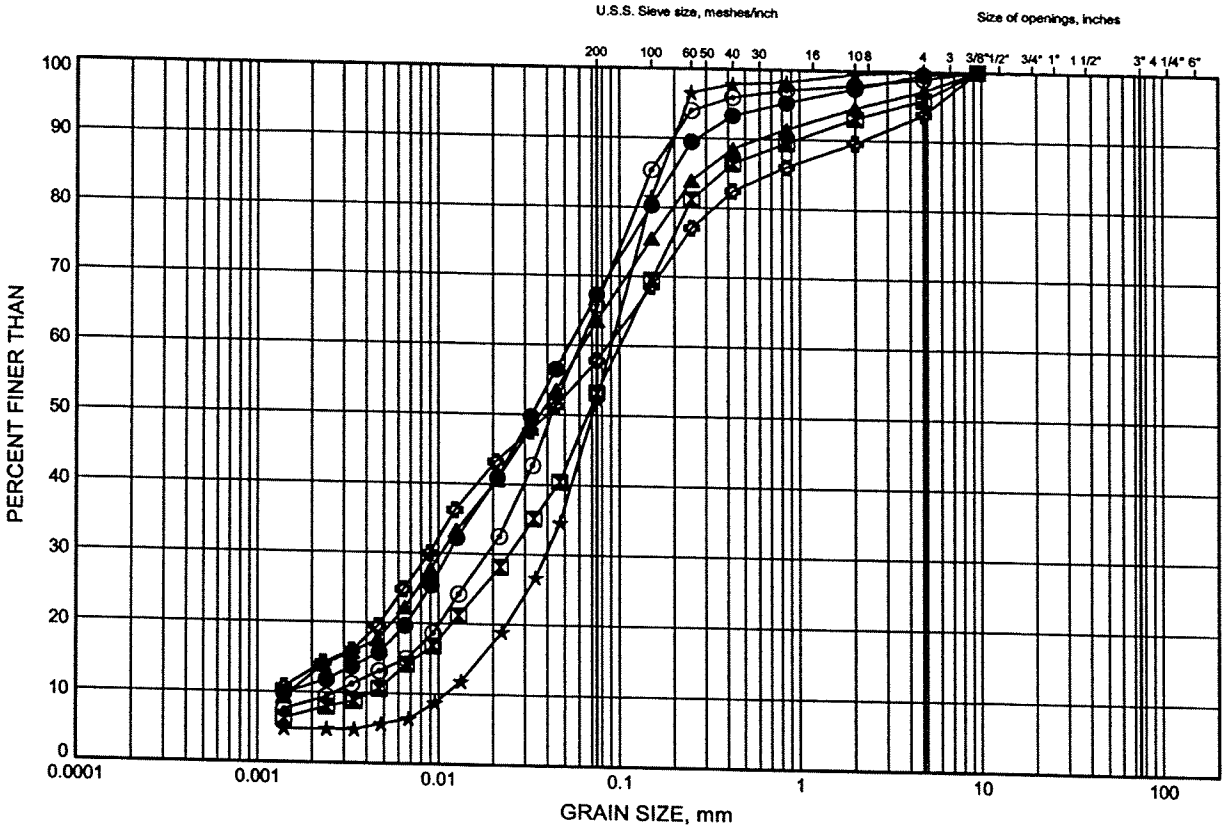
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C6

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-51	6.17	257.47
⊠	08-51	9.18	254.46
▲	08-52	1.07	261.31
★	08-52	2.59	259.79
⊙	08-52	9.35	253.03
✿	08-53	3.47	258.67

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

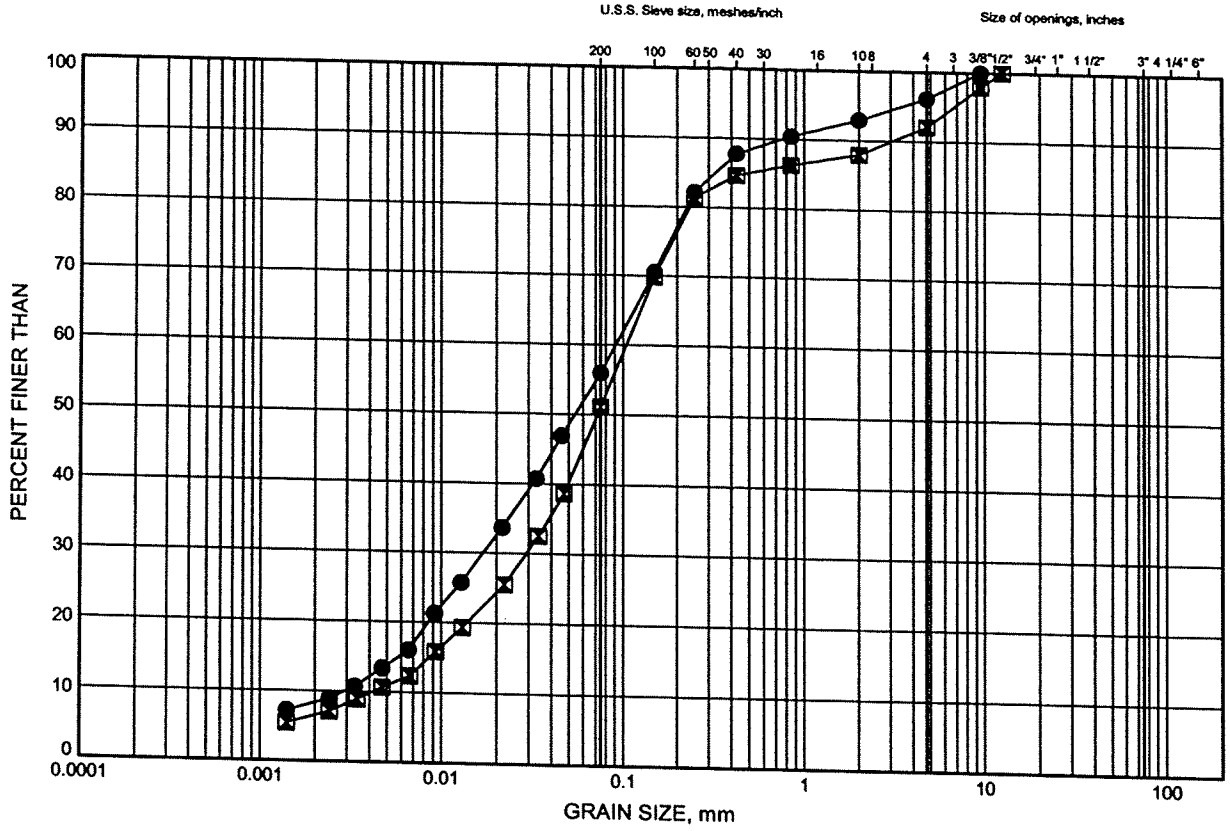
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C7

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-53	9.26	252.88
⊠	08-54	7.83	253.17

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

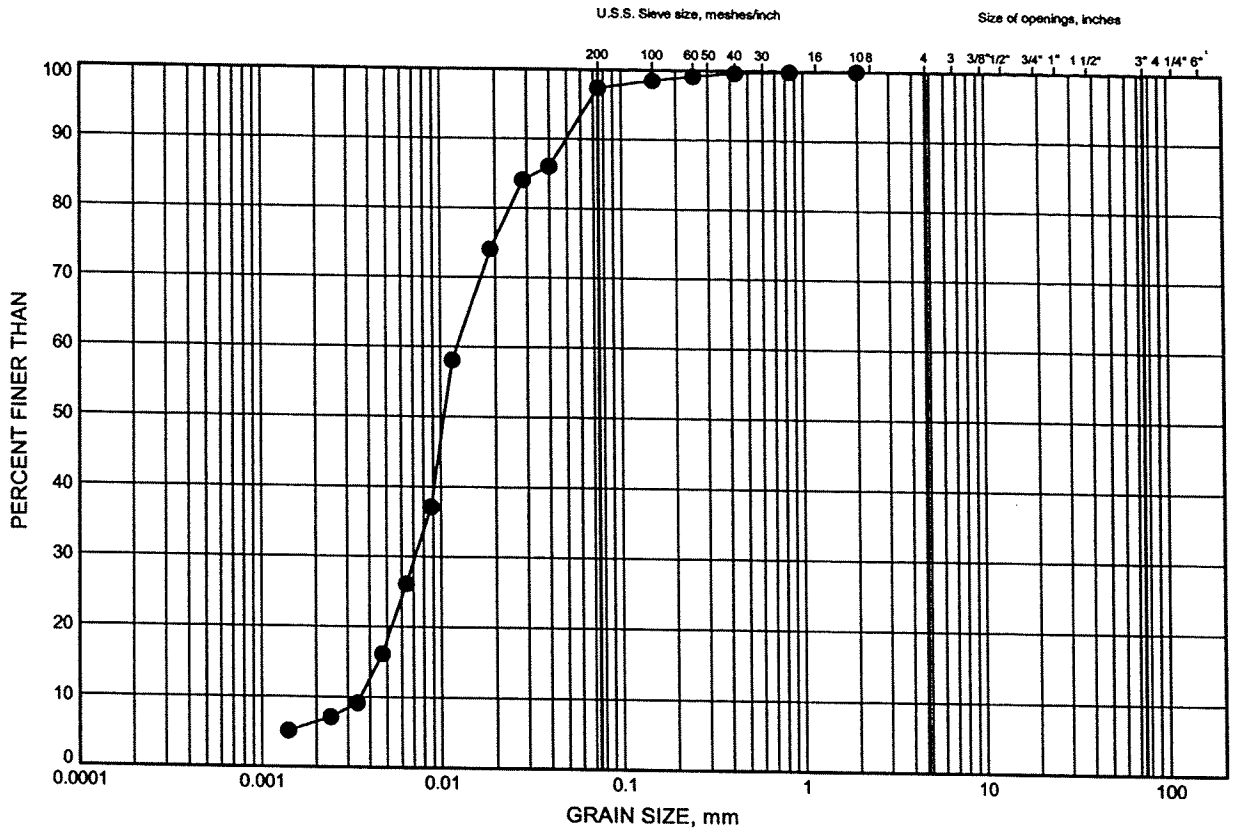
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C8

SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-21	3.28	264.82

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

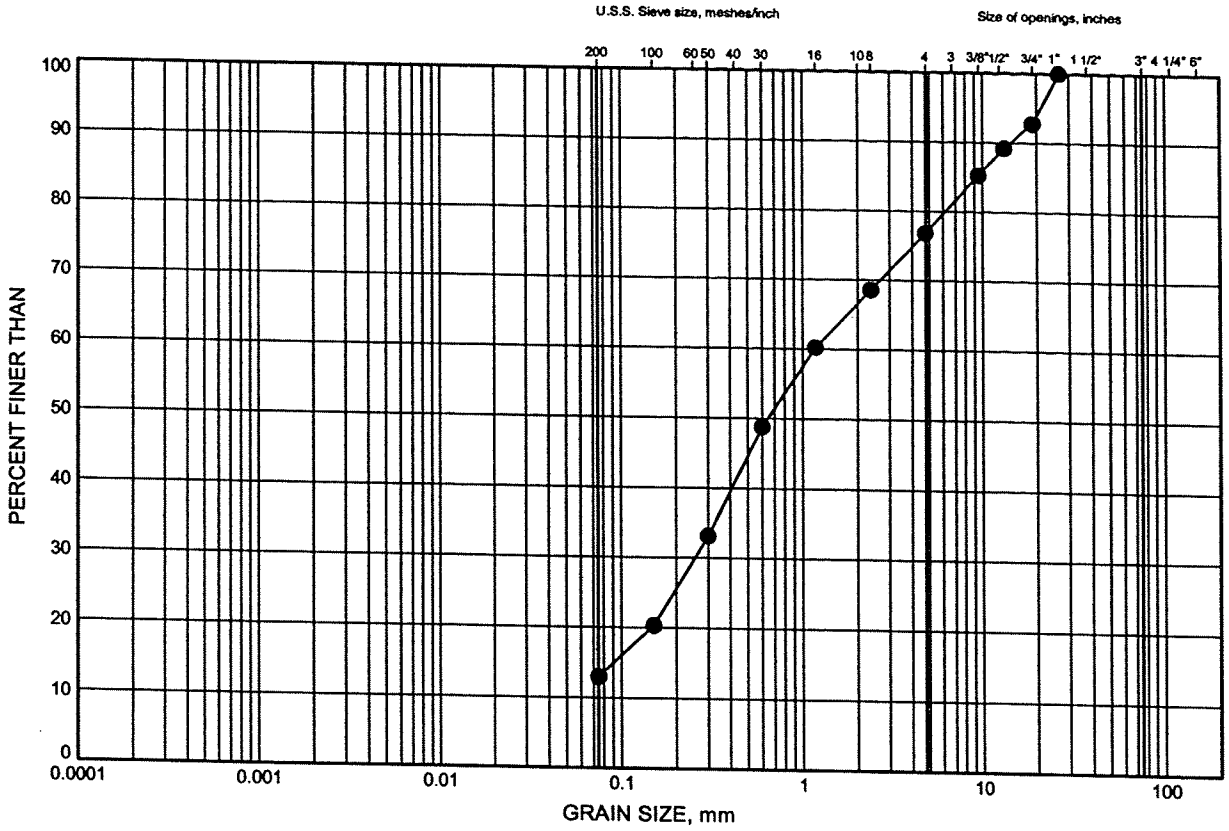
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C9

GRAVELLY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-48	3.35	262.28

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

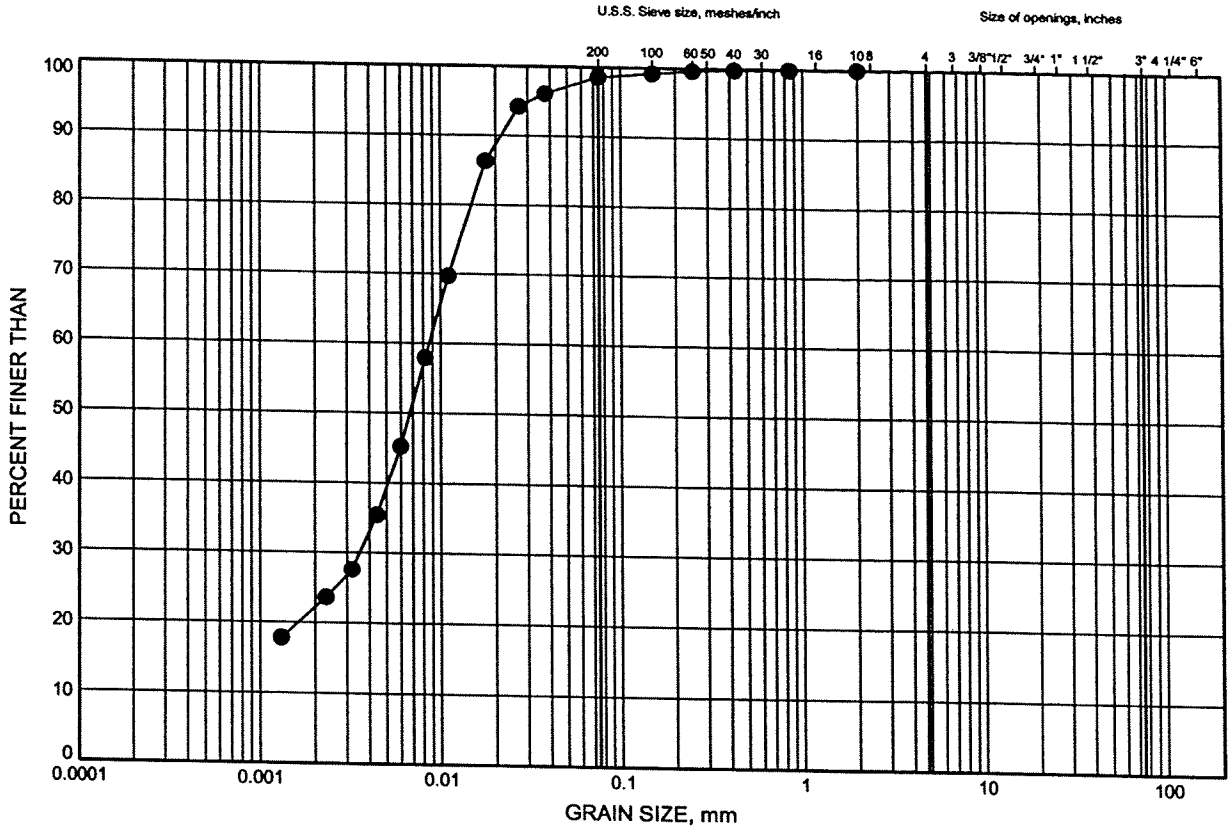
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C10

CLAYEY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-54	2.59	258.41

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

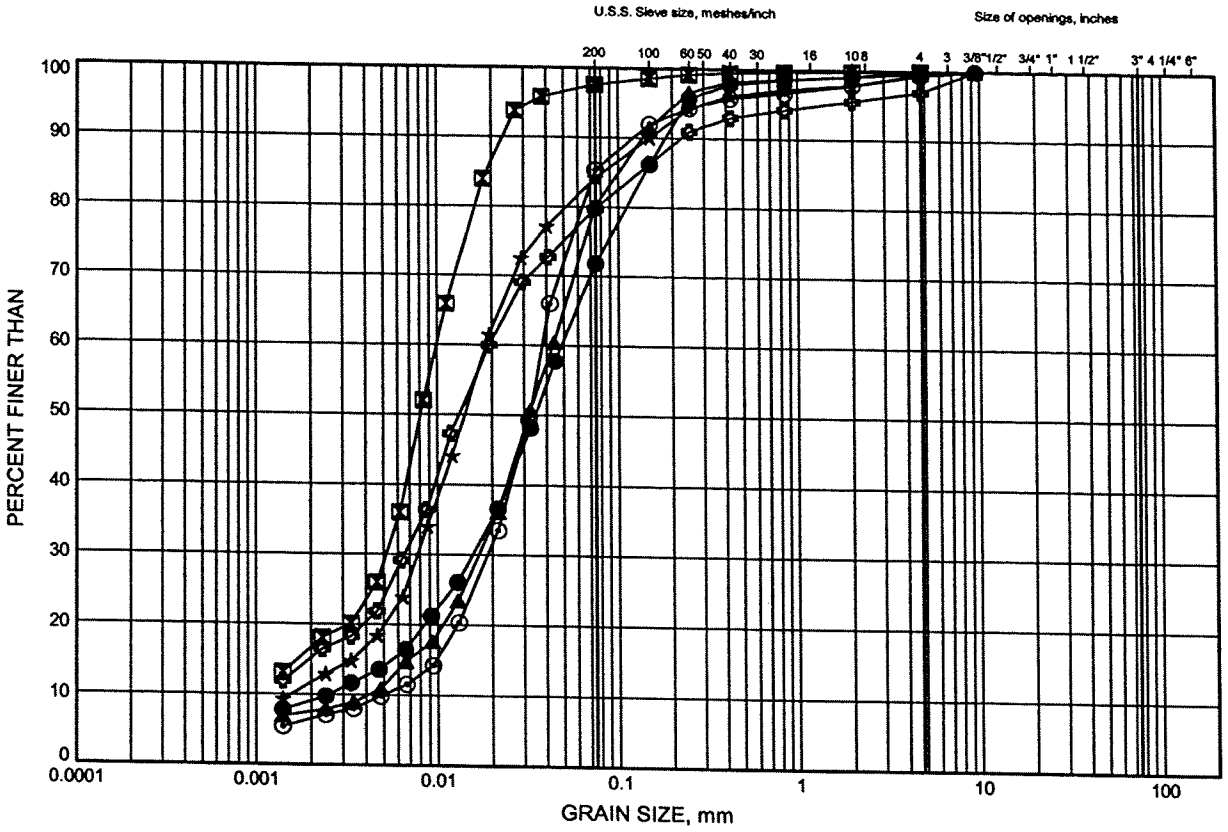
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C11

SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-48	6.23	259.40
⊠	08-49	3.35	262.74
▲	08-49	6.40	259.69
★	08-50	2.59	261.79
⊙	08-50	6.29	258.09
✿	08-54	10.72	250.28

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

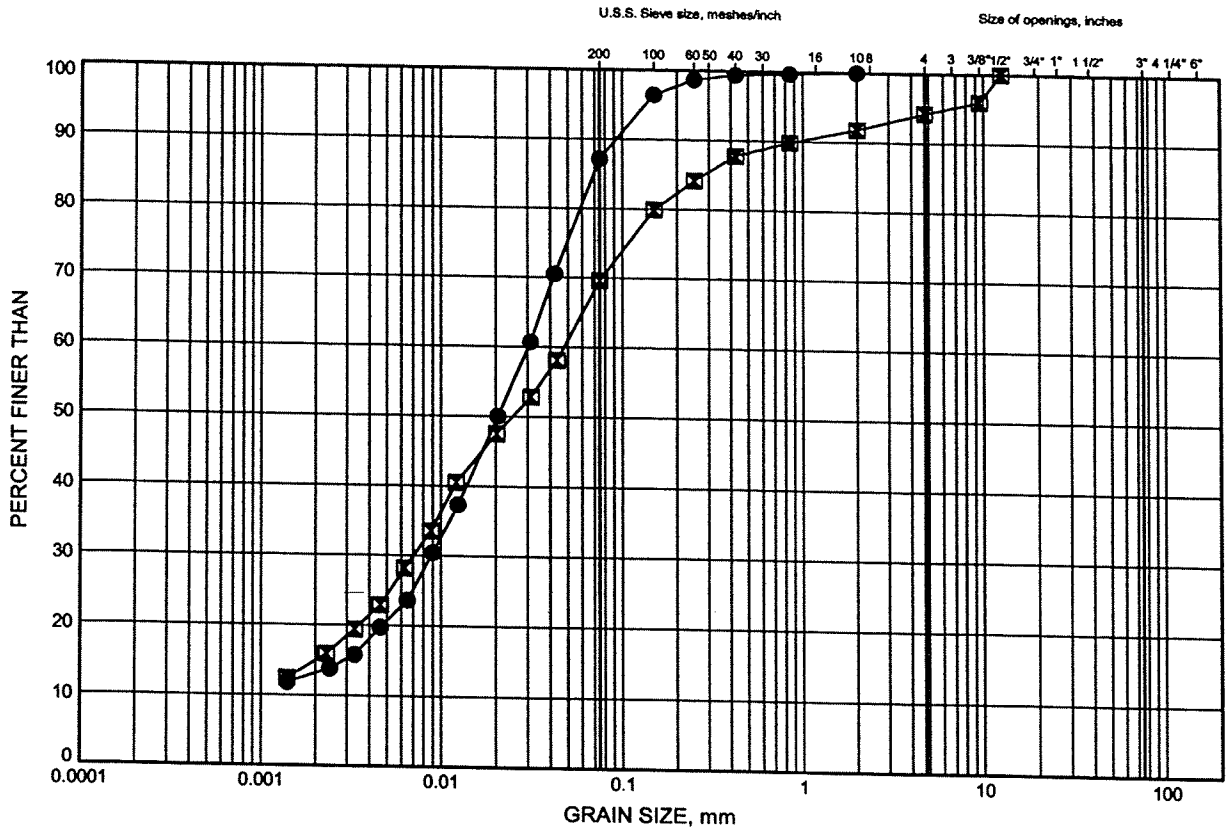
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C12

SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-55	1.83	259.84
⊠	08-55	6.40	255.27

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

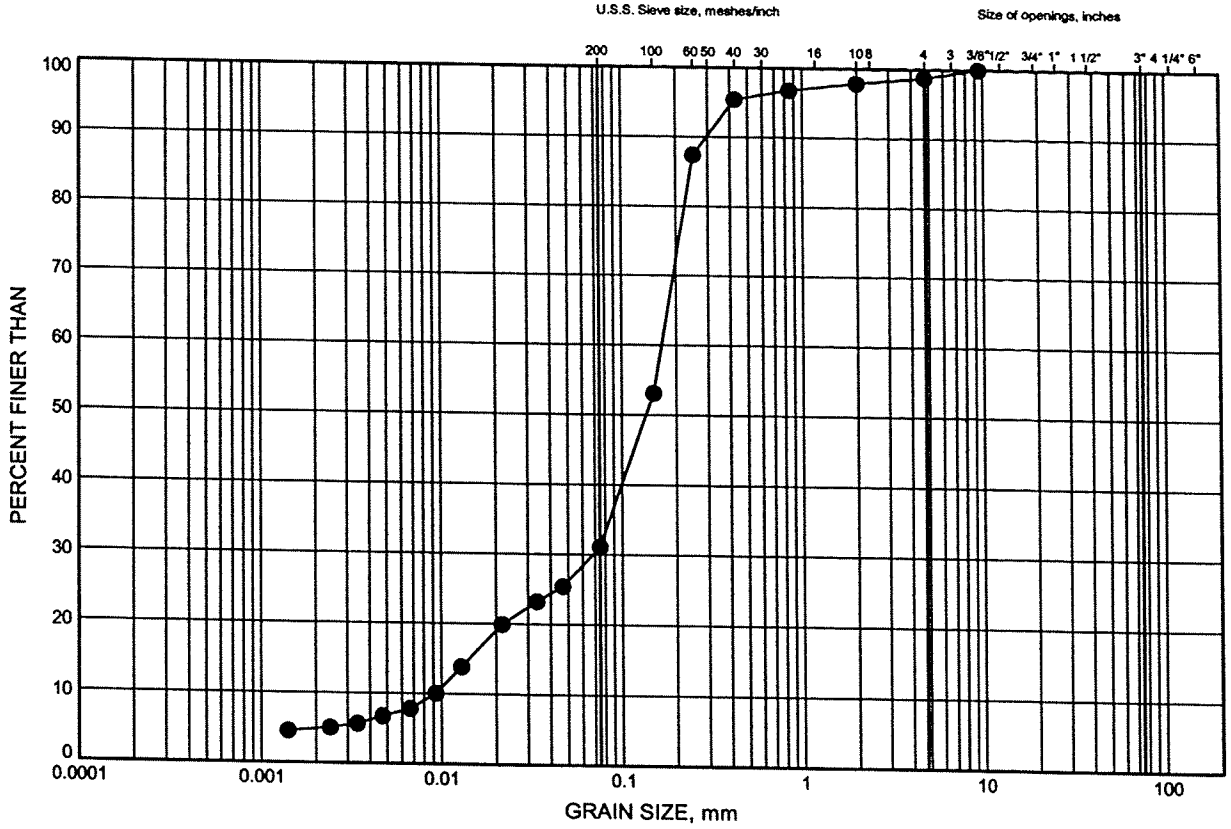
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE C13

SILTY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-50	4.62	259.76

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

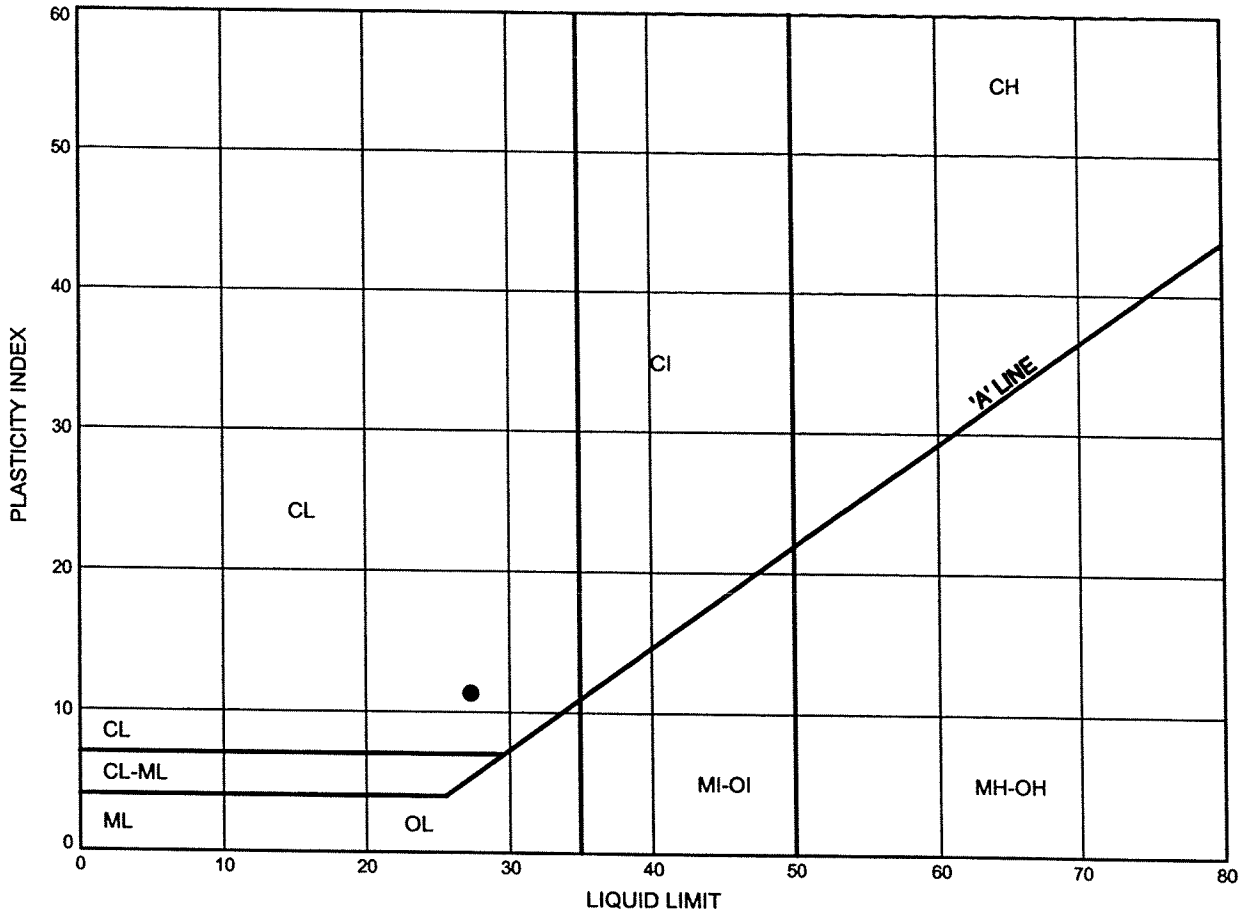
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE C14

SILTY CLAY FILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-53	1.83	260.31

Date September 2009

Project 2109-05-00

THURBER

Prep'd AN

Chkd. RPR

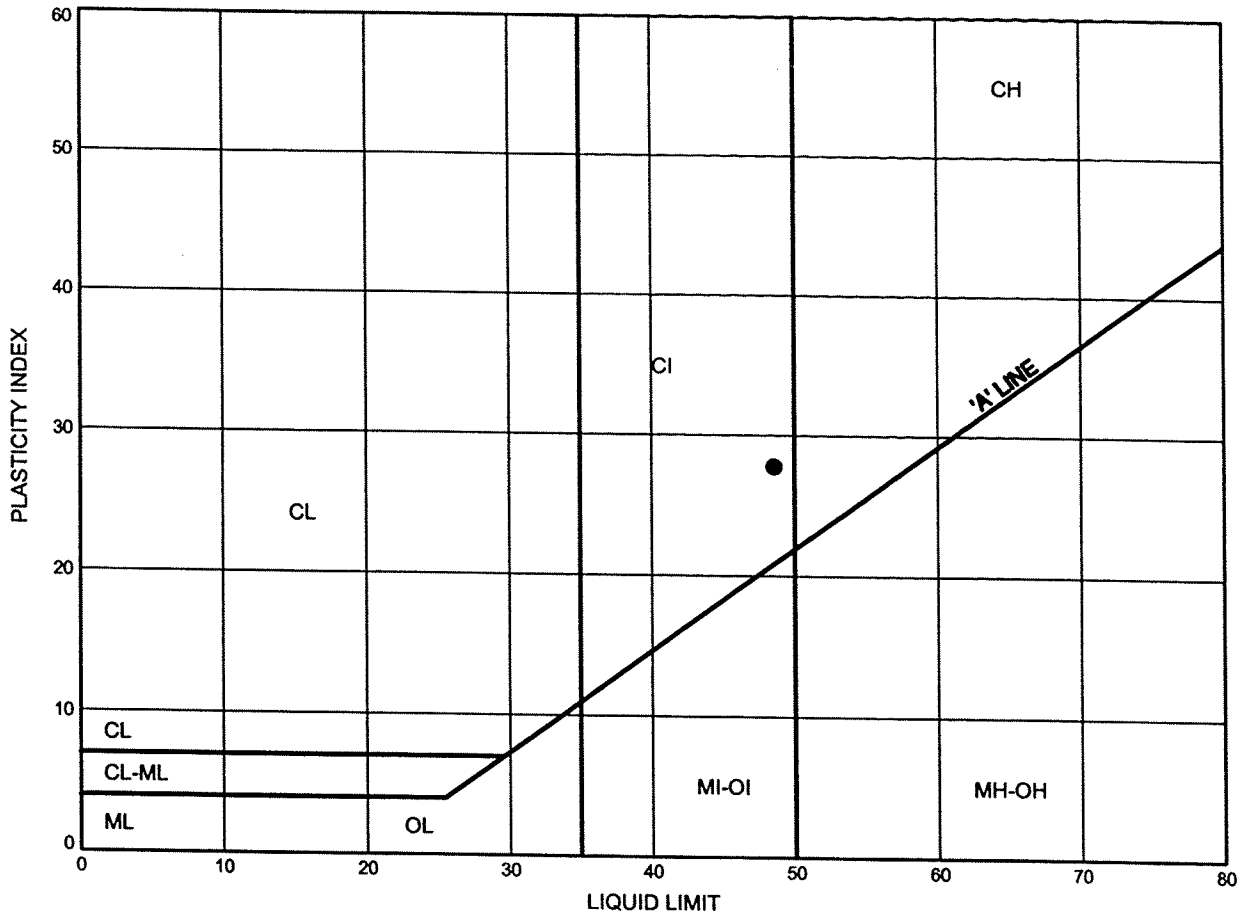
THURBALT 0596.GPJ 9/24/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE C15

SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-21	1.07	267.03

Date September 2009

Project 2109-05-00

THURBER

Prep'd AN

Chkd. RPR

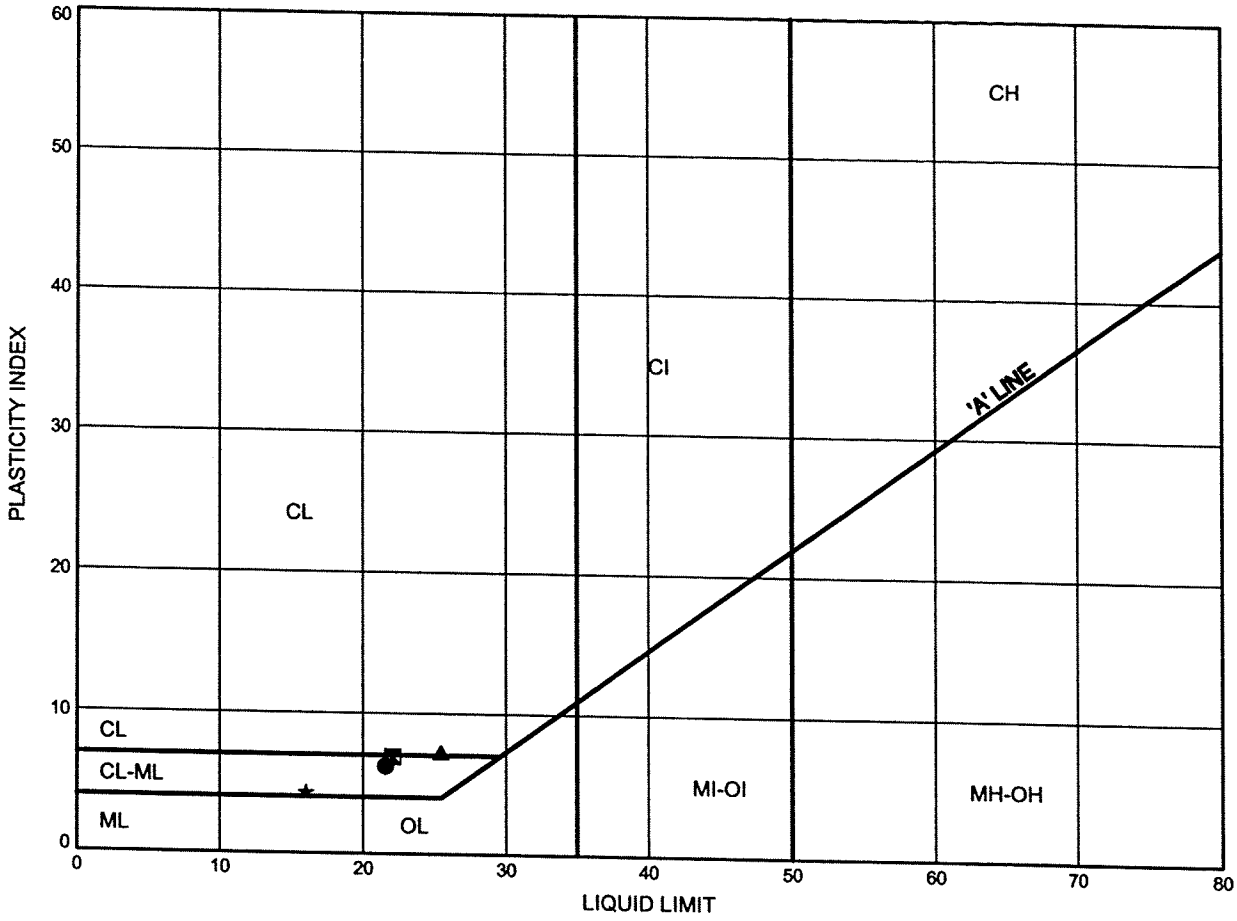
THURBALT 0596.GPJ 9/24/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE C16

SAND & SILT TILL (Clayey Zones)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-19	2.51	266.09
⊠	08-20	1.75	266.95
▲	08-21	3.28	264.82
★	08-53	3.54	258.60

Date September 2009

Project 2109-05-00

THURBER

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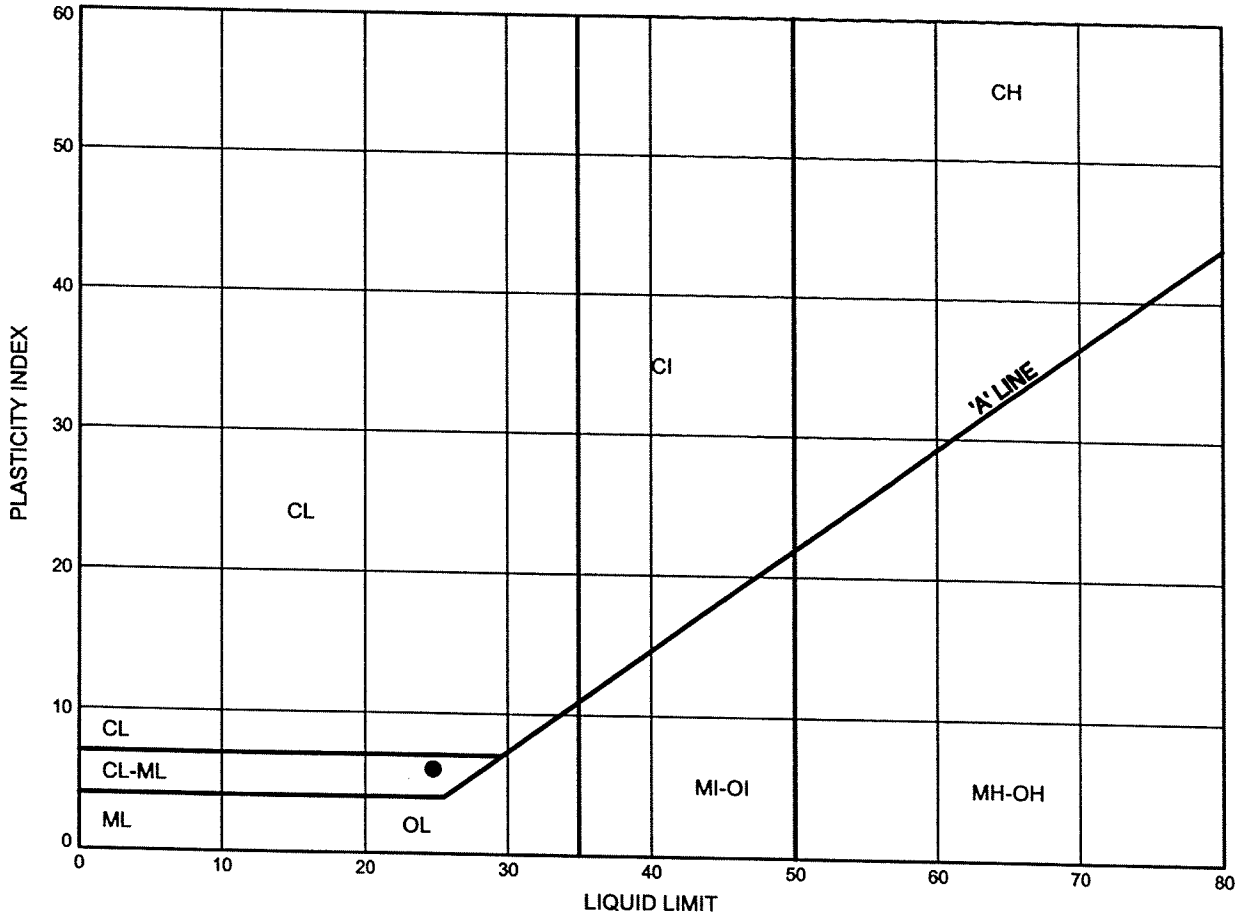
THURBALT 0596.GPJ 9/24/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE C17

CLAYEY SILT TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-54	2.59	258.41

Date October 2009

Project 2109-05-00

THURBER

Prep'd AN

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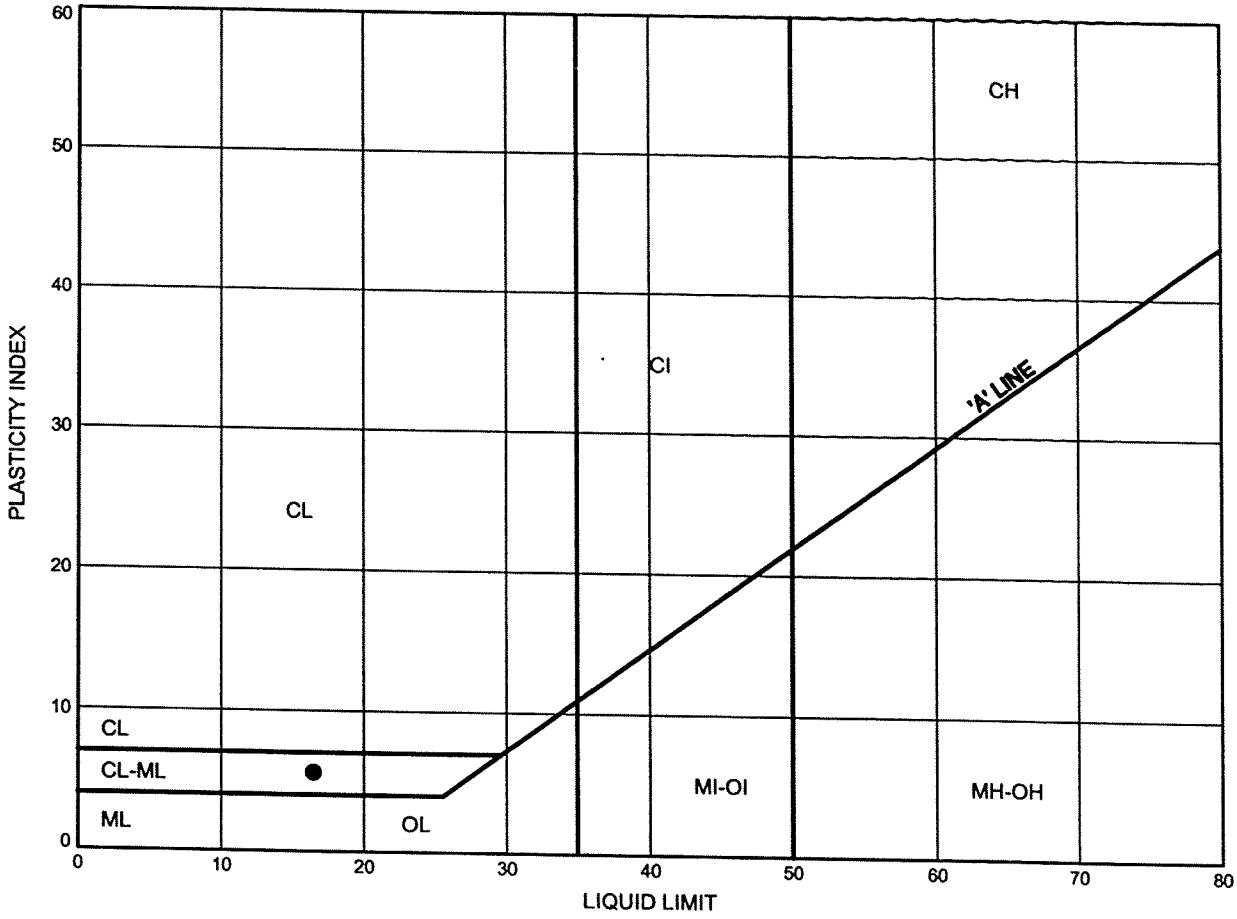
THURBALT 0596.GPJ 10/5/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE C18

SILT TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-55	6.40	255.27

Date October 2009

Project 2109-05-00

THURBER

Prep'd AN

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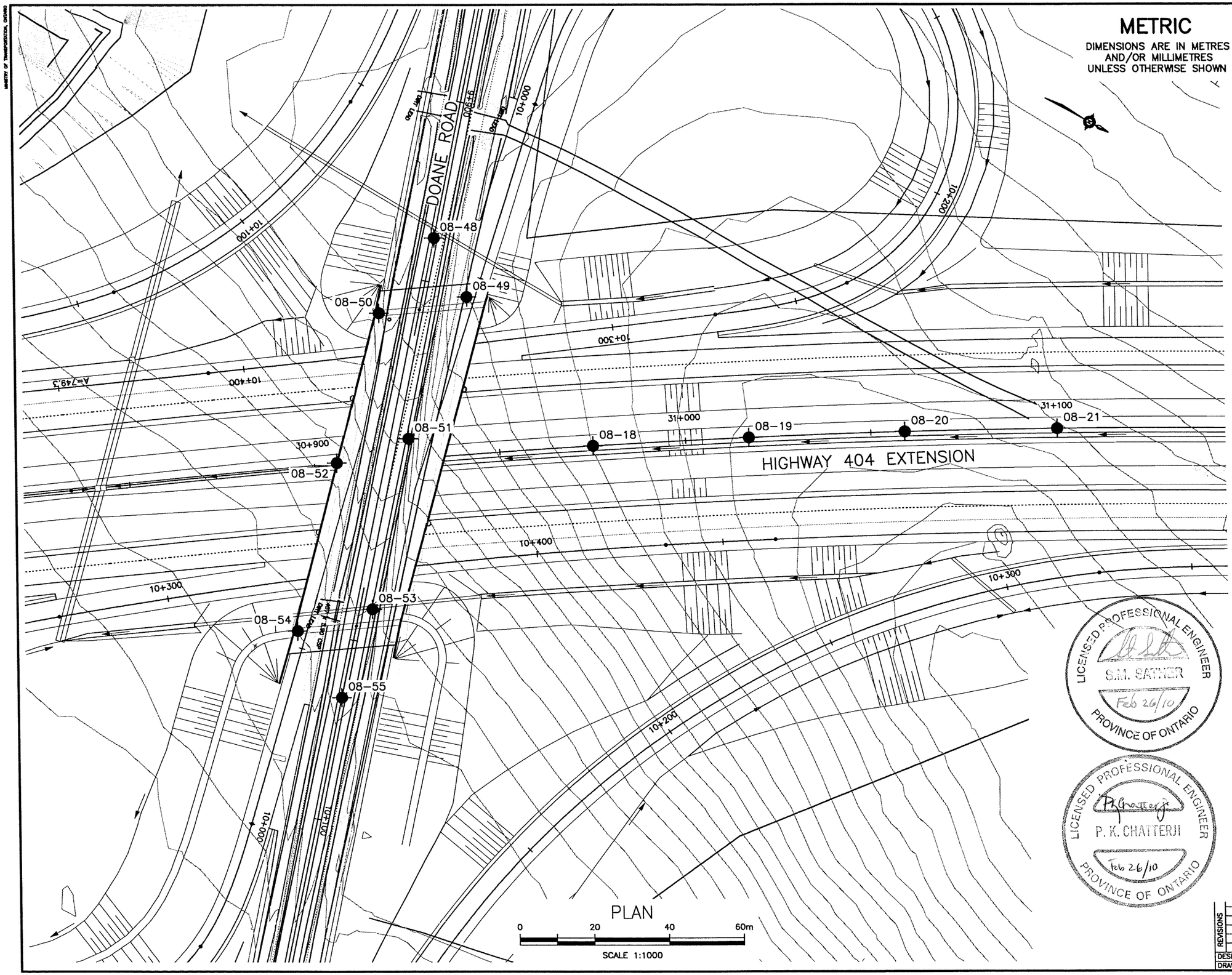
THURBALT 0596.GPJ 10/5/09

Photograph 1 – View looking north of Doane Road

MINISTRY OF TRANSPORTATION, ONTARIO

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN



CONT No
GWP No 2109-05-00

HIGHWAY 404 EXTENSION
DEEP CUT NORTH OF DOANE ROAD
STATIONS 30+975 TO 31+100
BOREHOLE LOCATIONS

SHEET

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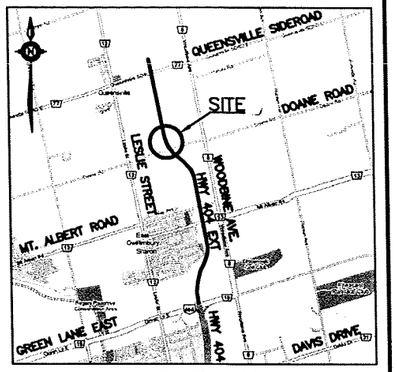


KEYPLAN

LEGEND

⊕	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▽	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-18	267.0	4 887 157.9	310 330.9
08-19	268.6	4 887 193.4	310 308.5
08-20	268.7	4 887 229.4	310 286.7
08-21	268.1	4 887 264.8	310 266.1
08-48	265.6	4 887 093.6	310 301.8
08-49	266.1	4 887 108.9	310 311.7
08-50	264.4	4 887 090.4	310 327.1
08-51	263.6	4 887 113.7	310 353.3
08-52	262.4	4 887 100.1	310 368.4
08-53	262.1	4 887 127.4	310 398.8
08-54	261.0	4 887 112.7	310 413.8
08-55	261.7	4 887 131.7	310 424.0

-NOTES-

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

GEOCRES No. 31D-492

LICENSED PROFESSIONAL ENGINEER
S.M. SATHER
Feb 26/10
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Feb 26/10
PROVINCE OF ONTARIO

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN RPR	CHK PKC	CODE	LOAD	DATE MAR. 2010
DRAWN MFA	CHK AEG	SITE	STRUCT	DWG

FILENAME: D:\Drafting\10P\1853\98\Ltr0598-BoreholePlan.dwg
PLOTDATE: Mar 01, 2010 - 3:28pm

PLOT SCALE 1:1
PA-D-707
MINISTRY OF TRANSPORTATION, ONTARIO

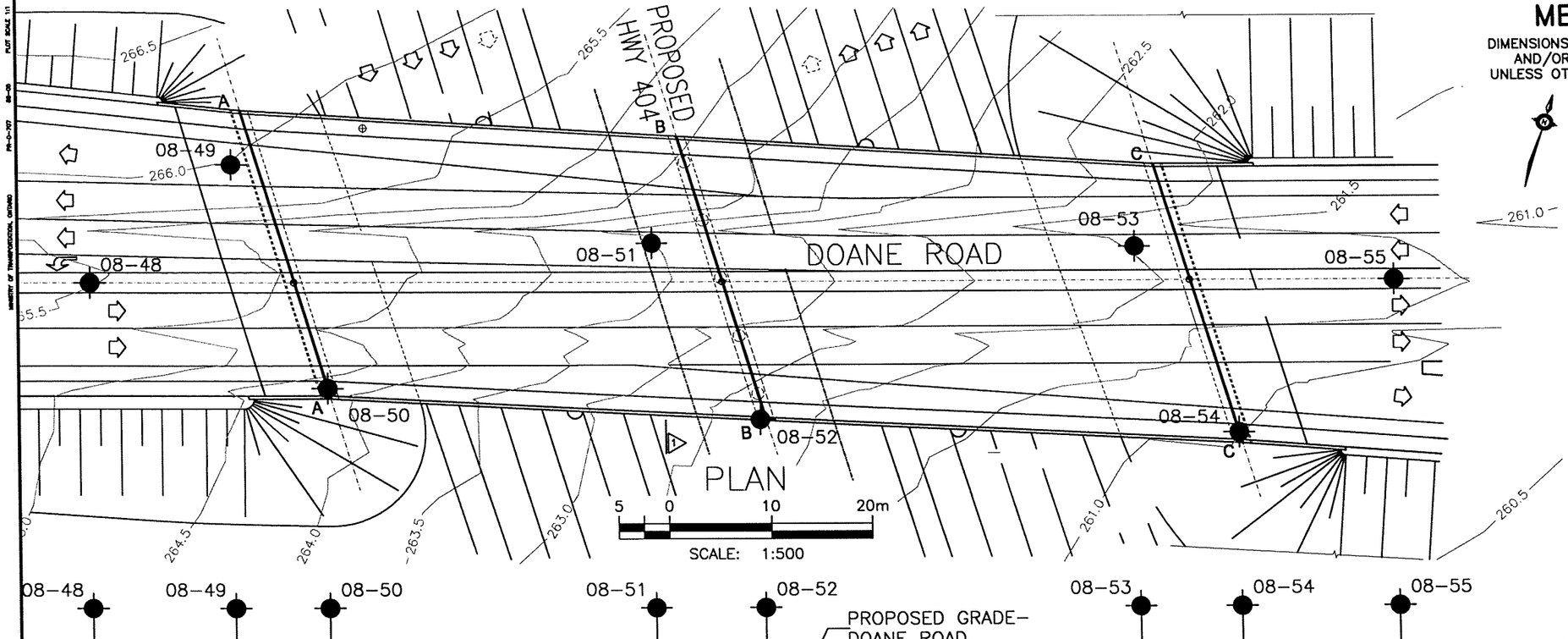
METRIC

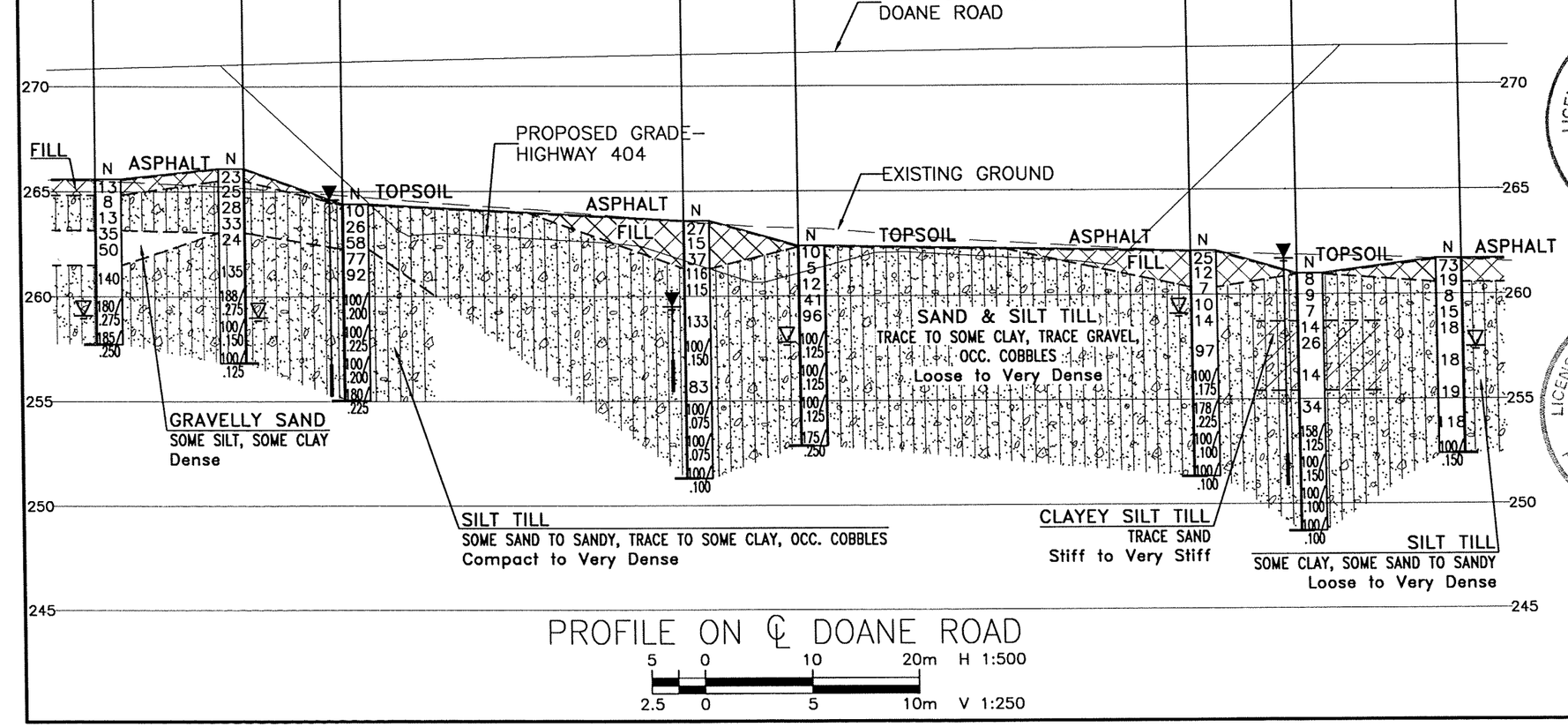
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 2109-05-00

HIGHWAY 404 EXTENSION
BRIDGE FOUNDATIONS
DOANE ROAD UNDERPASS
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET





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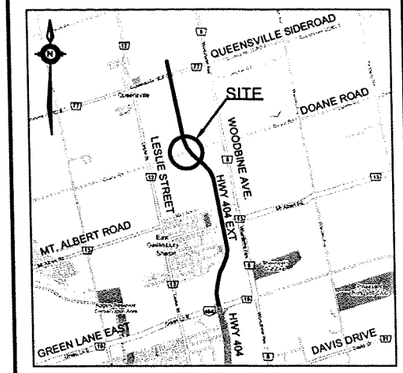

KEYPLAN

LEGEND

✦	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▽	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-48	265.6	4 887 093.6	310 301.8
08-49	266.1	4 887 108.9	310 311.7
08-50	264.4	4 887 090.4	310 327.1
08-51	263.6	4 887 113.7	310 353.3
08-52	262.4	4 887 100.1	310 368.4
08-53	262.1	4 887 127.4	310 398.8
08-54	261.0	4 887 112.7	310 413.8
08-55	261.7	4 887 131.7	310 424.0

LICENSED PROFESSIONAL ENGINEER
S.M. SATHER
Feb 26/10
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Feb 26/10
PROVINCE OF ONTARIO

-NOTES-

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GEOCRES No. 31D-492

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	RPR	CHK	PKC	CODE	LOAD
DRAWN	MFA	CHK	AEG	SITE	STRUCT

DATE MAR. 2010
DWG

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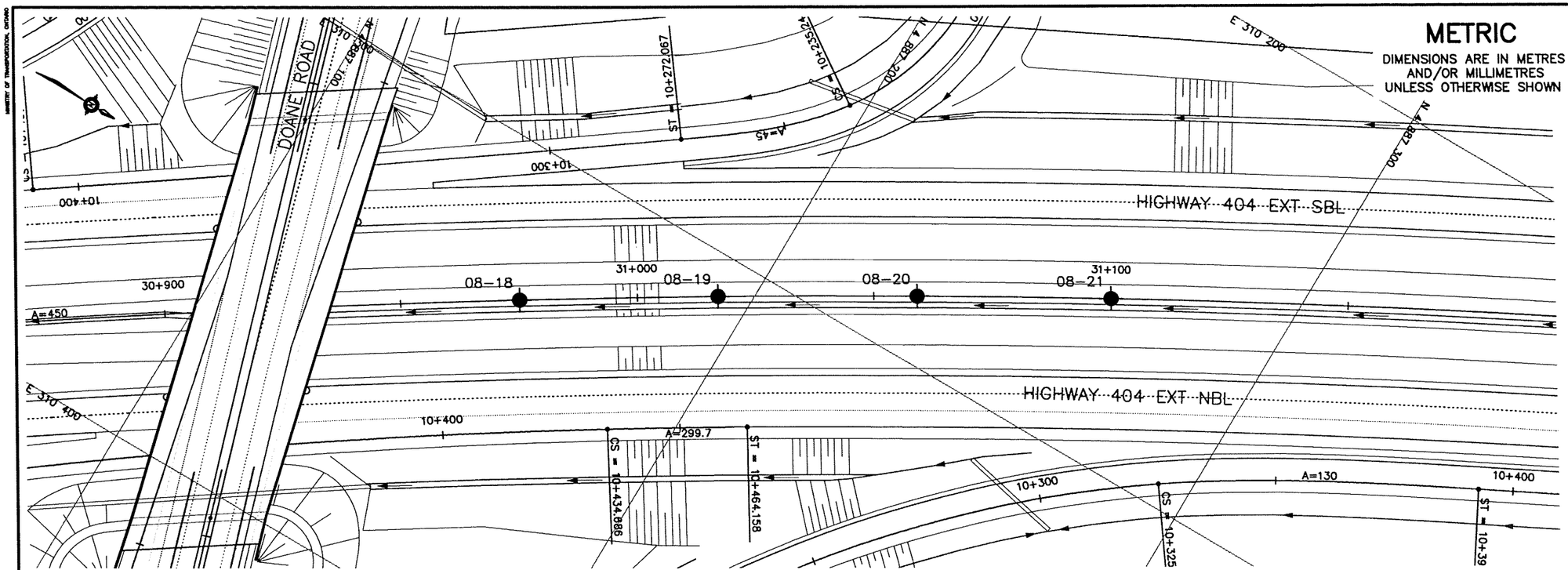
PLOTDATE: Mar 01, 2010 - 3:33pm

METRIC

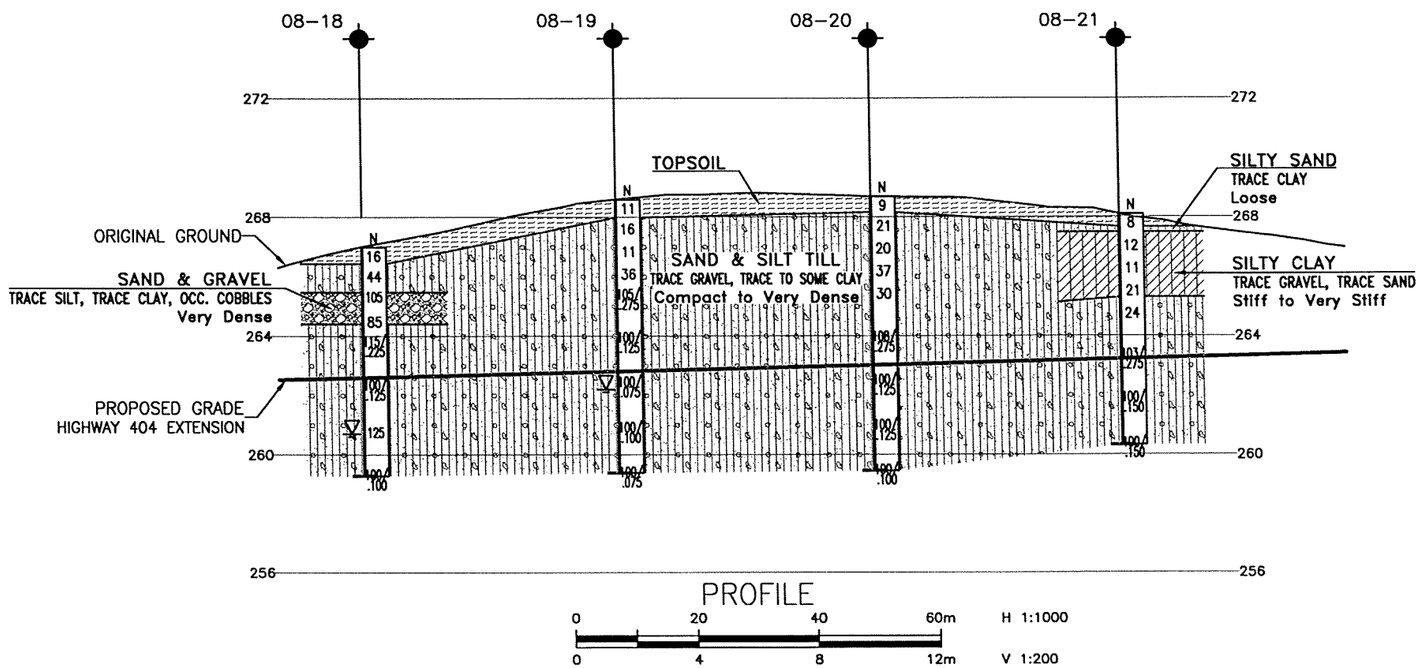
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN



PLAN

0 20 40 60m

SCALE 1:1000



PROFILE

0 20 40 60m H 1:1000

0 4 8 12m V 1:200

CONT No
GWP No 2109-05-00

HIGHWAY 404 EXTENSION
DEEP CUT NORTH OF DOANE ROAD
STATIONS 30+975 TO 31+100
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

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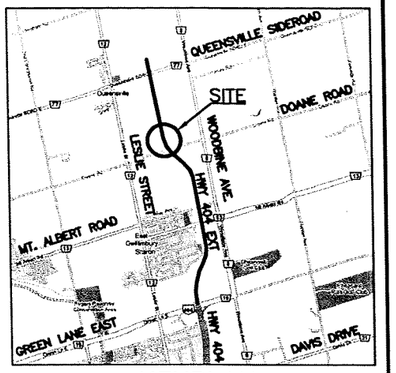

KEYPLAN

LEGEND

⊕	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-18	267.0	4 887 157.9	310 330.9
08-19	268.6	4 887 193.4	310 308.5
08-20	268.7	4 887 229.4	310 286.7
08-21	268.1	4 887 264.8	310 266.1

LICENSED PROFESSIONAL ENGINEER
S.M. SATHER
Feb 26/10
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Feb 26/10
PROVINCE OF ONTARIO

-NOTES-

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2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31D-492

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN RPR	CHK PKC	CODE	LOAD DATE MAR. 2010
DRAWN MFA	CHK AEG	SITE	STRUCT DWG

FILENAME: D:\Drafting\19\1025\86\wd0586-DeepCuts(BH15to17).dwg
PLOTDATE: Mar 01, 2010 - 3:36pm

Appendix D

Deep Cut - Highway 404 extension, North of Queensville Sideroad
Station 33+200 – 33+700
(Boreholes 08-22 to 08-32)

Record of Borehole Sheets
Laboratory Test Results
Site Photographs
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-22 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 288.21 E 309 746.91 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.22 - 2009.01.22 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	TOPSOIL, occasional roots and organics Dark Brown (600mm)		1	SS	6		268				
267.4											
0.6	SAND and SILT, trace gravel, trace clay Brown Compact Wet (TILL)		2	SS	17		267				
			3	SS	21		266				
	sand pockets		4	SS	28	▽					5 53 37 5
	Very Dense		5	SS	102/ 0.250		265				0 39 53 8
	Layer of fine sand (600mm)		6	SS	100/ 0.150		264				0 40 53 7
263.2	Grey		7	SS	137/ 0.200						
4.8	END OF BOREHOLE AT 4.8m. BOREHOLE OPEN AND WATER LEVEL AT 2.9m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO 1.5m, THEN AUGER CUTTINGS TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 10/5/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-23 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 337.37 E 309 737.75 ORIGINATED BY GA
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.01.20 - 2009.01.20 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
273.9											
0.0 / 273.6	TOPSOIL (300mm)										
0.3	SAND and SILT, some clay, trace gravel Compact to Very Dense Brown Moist (TILL)		1	SS	14		274		○		
			2	SS	31		273		○		
			3	SS	43		272		○		1 36 52 11
			4	SS	55				○		
			5	SS	51		271		○		
			6	SS	100/ 0.150		270		○		5 38 46 11
	Occasional oxidized staining		7	SS	100/ 0.150	▼	269		○		
			8	SS	107/ 0.150		268		○		0 34 55 11
	Moist to Wet		9	SS	115/ 0.150		267		○		
							266				
							265		○		

Continued Next Page

+^{3}, ×^{3}: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0598.GPJ 9/23/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-23 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 337.37 E 309 737.75 ORIGINATED BY GA
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.01.20 - 2009.01.20 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page						264				
	SAND and SILT, trace to some clay, trace gravel Very Dense Brown Wet (TILL)		10	SS	152/ 0.150		263		o		
							262				
			11	SS	107/ 0.150				o		0 61 34 5
260.1							261				
13.9	END OF BOREHOLE AT 13.9m. BOREHOLE OPEN AND WATER LEVEL AT 11.9m UPON COMPLETION OF DRILLING. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		12	SS	126/ 0.150				o		

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2009.02.06	6.1	267.8
2009.02.20	5.7	268.2
2009.03.20	5.8	268.1
2009.04.22	5.4	268.5
2009.05.15	5.8	268.1
2009.06.05	6.0	267.9
2009.07.10	6.1	267.8
2009.09.02	8.9	265.0
2009.09.21	8.2	265.7

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0598.GPJ 9/23/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-24 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 386.52 E 309 728.60 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.21 - 2009.01.21 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
276.3								
0.0 / 275.9	**TOPSOIL** (430mm)	1	SS	4		276		
0.4 / 274.8	Sandy **SILT**, mixed with topsoil Loose to Compact Brown Moist	2	SS	20		275		
1.5	**SAND** and **SILT**, some clay, trace gravel Compact to Very Dense Brown Moist (TILL)	3	SS	27				
	occasional cobbles Moist	4	SS	65		274		2 44 43 11
	occasional sand pockets	5	SS	83/ 0.250		273		3 40 46 11
		6	SS	100/ 0.150		272		
		7	SS	100/ 0.125		271		
		8	SS	144/ 0.250		270		1 33 52 14
		9	SS	100/ 0.125		269		
						268		
						267		

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa 40 80 120 160 200
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

Continued Next Page

+³, ×³: Numbers refer to Sensitivity

20 15 5 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/16/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-24 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 386.52 E 309 728.60 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.21 - 2009.01.21 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page							20 40 60 80 100 / 40 80 120 160 200	20 40 60		
	SAND and **SILT**, some clay, trace gravel Compact to Very Dense Brown Moist (TILL)		10	SS	100/ 0.100	▽	268		○		1 33 53 13
							265				
			11	SS	100/ 0.100		264		○		
263.2											
13.1	**SAND**, fine grained Very Dense Grey Moist		12	SS	100/ 0.075		263		○		1 83 16 (SI+CL)
261.1							262				
15.2	**SAND** and **SILT**, some clay, trace gravel, occasional sand pockets Very Dense Grey Moist (TILL)		13	SS	100/ 0.075		261		○		
259.5							260				
16.8	END OF BOREHOLE AT 16.8m. BOREHOLE OPEN TO 16.2m AND WATER LEVEL AT 10.6m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO 2.4m, THEN AUGER CUTTINGS TO SURFACE.		14	SS	100/ 0.050				○		

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 10/16/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-25 1 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 435.67 E 309 719.44 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.21 - 2009.01.21 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
277.9							
0.0	**TOPSOIL**, organics, trace roots Loose Dark Brown	1	SS	4			
277.4	(500mm)						
0.5							
277.1	Sandy **SILT**, mixed with topsoil						
0.8	Loose Brown Moist	2	SS	41	277		2 46 41 11
	SAND and **SILT**, some clay, trace gravel, occasional sand pockets Dense to Very Dense Brown Moist (TILL)	3	SS	42	276		
		4	SS	66			
	Occasional sand seams, occasional silt seams	5	SS	61	275		1 40 48 11
		6	SS	100/ 0.125	274		
		7	SS	100/ 0.100	273		
					272 ▼		
	Occasional oxidized staining Brown to Grey	8	SS	100/ 0.100	271		
					270		
	Layer of silt	9	SS	100/ 0.100	269		0 17 70 13
					268		

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE: 40 80 120 160 200
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 20 40 60

GROUND WATER CONDITIONS

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/16/09

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RECORD OF BOREHOLE No 08-25 2 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 435.67 E 309 719.44 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.21 - 2009.01.21 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, some clay, trace gravel Very Dense Grey Moist (TILL)		10	SS	100/ 0.075		267		○		
			11	SS	100/ 0.050		266		○		
			12	SS	100/ 0.125		265		○		0 65 31 4
263.4							264				
14.5	**SAND**, fine grained, some silt, trace gravel, trace clay Very Dense Grey Moist						263				
262.6			13	SS	100/ 0.125				○ ○		2 86 12 (SI+CL)
15.3	**SAND** and **SILT**, some clay, trace gravel Very Dense Grey Moist (TILL)						262				
			14	SS	100/ 0.075		261		○		
			15	SS	100/ 0.100		260		○		
							259				
258.0											
19.9			16	SS	100/						

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/16/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-25 3 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 435.67 E 309 719.44 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.21 - 2009.01.21 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	END OF BOREHOLE AT 19.9m. BOREHOLE OPEN AND WATER LEVEL AT 12.2m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.				0.050						

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2009.02.06	6.9	271.0
2009.02.20	6.0	271.9
2009.03.20	6.0	271.9
2009.04.22	5.7	272.2
2009.05.15	5.9	272.0
2009.06.05	6.1	271.8
2009.07.10	6.4	271.5
2009.09.02	13.3	264.6
2009.09.21	13.4	264.5

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 10/16/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-26 1 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 484.83 E 309 710.29 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.22 - 2009.01.22 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
278.2									
0.0 / 277.7	**TOPSOIL**, organics Loose Dark Brown (450mm)		1	SS	4		278		
0.5 / 277.4	**SAND**, trace gravel Loose Brown Moist		2	SS	33		277		
0.8	**SAND** and **SILT**, some clay, trace gravel, occasional cobbles Dense to Compact Brown Moist (TILL) Very Dense		3	SS	21				3 34 52 11
			4	SS	52		276		
			5	SS	112		275		
			6	SS	100/ 0.075		274		
	Layer of silt Very Dense		7	SS	100/ 0.150		273		0 18 78 4
	Layer of sand (600mm)		8	SS	115/ 0.225		272		1 67 28 6
	Layer of silt Occasional clay seams, occasional oxidized staining Brown to Grey		9	SS	100/ 0.125		271 270 269		0 5 82 13

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
SHEAR STRENGTH kPa 40 80 120 160 200
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

Continued Next Page

+³, ×³: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No 08-26 2 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 484.83 E 309 710.29 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.22 - 2009.01.22 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, some clay, trace gravel, occasional oxidized staining Very Dense Brown to Grey Moist		10	SS	100/ 0.100	▽	268		○		
							267				
	Layer of sand		11	SS	100/ 0.100		266		○		
							265				
			12	SS	100/ 0.100				○		0 57 39 4
	Grey						264				
			13	SS	100/ 0.075		263		○		
							262				
			14	SS	100/ 0.075				○		
							261				
			15	SS	100/ 0.050		260		○		0 39 50 11
							259				
258.4											
19.8	END OF BOREHOLE AT 19.8m.		16	SS	100/				○		

Continued Next Page

+^{3}, ×^{3}: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/16/09

Ministry of Transportation
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THURBER

RECORD OF BOREHOLE No 08-26 3 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 484.83 E 309 710.29 ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2009.01.22 - 2009.01.22 CHECKED BY RPR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	BOREHOLE OPEN AND WATER LEVEL AT 11.1m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO 2.7m, THEN AUGER CUTTINGS TO SURFACE.				0.025						

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 10/16/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-27 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 534.0 E 309 701.1, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2010.01.18 - 2010.01.18 CHECKED BY TH

ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
273.8								
0.0	**ORGANICS**, some clay, trace silt							
	Loose	1	SS	4				
273.4	Dark Brown							
0.4	Damp							
	SAND and **SILT**, trace clay, trace gravel					273		
	Loose to Very Dense	2	SS	8				1 35 55 9
	Brown							
	Damp							
	(TILL)	3	SS	26		272		
	Occasional cobble	4	SS	43				0 40 53 7
						271		
		5	SS	104/ 0.250				
						270		
		6	SS	50/ 0.125				
						269		
		7	SS	100/ 0.125				
						268		
						267		
		8	SS	100/ 0.225				0 42 53 5
						266		
						265		
		9	SS	100/ 0.125				
						264		

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

20 15 5 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 2/3/10

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-27 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 534.0 E 309 701.1, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2010.01.18 - 2010.01.18 CHECKED BY TH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, trace clay, trace gravel Very Dense Grey Damp (TILL)		10	SS	100/ 0.100		263		o		
261.5							262				
			11	SS	100/ 0.075				o		
12.3	END OF BOREHOLE AT 12.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2010.02.02 7.5 266.3										

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 2/3/10

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-28 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 583.1 E 309 692.0, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2010.01.19 - 2010.01.19 CHECKED BY TH

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
274.6											
0.0	**ORGANICS** Loose Dark Brown Damp (225mm)		1	SS	5		274				
0.2	**SAND** and **SILT**, trace clay Loose to Very Dense Brown Damp (TILL)		2	SS	32						0 40 53 7
			3	SS	34		273				
			4	SS	62		272				0 26 67 7
			5	SS	105/ 0.275		271				
			6	SS	101		270				
			7	SS	112/ 0.250	▽	269				
			8	SS	116/ 0.225		268				
266.2							267				
8.4	**SAND**, some gravel Very Dense Brown Moist		9	SS	124		266				10 82 8 (SI+CL)
265.1							265				
9.4	**SAND** and **SILT**, trace gravel Very Dense Brown										

Continued Next Page

+ 3 , × 3 : Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 2/3/10

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-28 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 583.1 E 309 692.0, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2010.01.19 - 2010.01.19 CHECKED BY TH

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
264.5	Continued From Previous Page										
10.1	Moist (TILL)										
	SAND, some silt, trace gravel Very Dense Brown Moist		10	SS	105/ 0.250		264		○		
							263				
			11	SS	100/ 0.125				○		
261.3							262				
13.3	**SAND** and **SILT**, trace gravel Very Dense Grey Damp (TILL)		12	SS	100/ 0.150		261		○		
							260				
259.2			13	SS	100/ 0.100				○		
15.3	END OF BOREHOLE AT 15.3m. BOREHOLE OPEN AND WATER LEVEL AT 7.3m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO 11.8m, THEN CUTTINGS TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 2/3/10

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-29 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 632.3 E 309 682.8, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2010.01.19 - 2010.01.19 CHECKED BY TH

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
273.5											
0.0	**ORGANICS** Loose Dark Brown Damp		1	SS	4		273				
273.1											
0.4	Sandy **SILT**, trace clay Compact to Very Dense Brown Damp (TILL)		2	SS	21		272				
			3	SS	23						0 1 90 9
			4	SS	75		271				
			5	SS	122						0 24 67 9
							270				
			6	SS	100/ 0.150		269				
							268				
267.0			7	SS	104/ 0.250	▼	267				
6.4	**SAND**, some silt, trace gravel Very Dense Brown Moist										
			8	SS	129/ 0.225		266				
264.9											
8.5	**SAND** and **SILT**, trace clay, trace gravel Very Dense Grey Damp (TILL)		9	SS	100/ 0.125		265				
							264				

ONTMT4S 0596.GPJ 2/3/10

Continued Next Page

+ ³, × ³ : Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-29 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 632.3 E 309 682.8, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2010.01.19 - 2010.01.19 CHECKED BY TH

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, trace clay, trace gravel Very Dense Grey Damp (TILL)		10	SS	100/ 0.100		263		○		
			11	SS	100/ 0.075		262		○		
259.7							261				
13.8	END OF BOREHOLE AT 13.8m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2010.02.02 6.4 267.1						260		○		

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 2/3/10

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-30 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 681.4 E 309 673.3, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2010.01.19 - 2010.01.19 CHECKED BY TH

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
271.6											
0.0 / 271.1	**ORGANICS** Loose Dark Brown Damp		1	SS	5						
0.4 / 270.8	**SAND** and **SILT**, trace clay, trace roots and rootlets Loose Brown Damp		2	SS	12						
0.8	**SAND** and **SILT**, trace clay, trace gravel Compact to Dense Brown Damp (TILL) Sand pockets		3	SS	32						0 27 66 7
	Very Dense		4	SS	69						
267.4			5	SS	121/ 0.225						
4.1	**SAND**, fine grained, trace gravel Very Dense Brown Moist		6	SS	107						1 83 16 (SI+CL)
265.5											
6.1	**SAND** and **SILT**, trace clay, trace gravel Very Dense Brown Damp (TILL)		7	SS	100/ 0.125						
			8	SS	100/ 0.100						
			9	SS	100/ 0.125						

ONTMT4S 0596.GPJ 2/3/10

Continued Next Page

+^{3}, ×^{3}: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-30 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 681.4 E 309 673.3, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2010.01.19 - 2010.01.19 CHECKED BY TH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	Continued From Previous Page										
	SAND and **SILT**, trace clay, trace gravel Very Dense Grey Damp (TILL)						261		○		
			10	SS	100/ 0.125		260				
259.2			11	SS	100/ 0.125				○		
12.3	END OF BOREHOLE AT 12.3m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 11.8m, THEN CUTTINGS TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 2/3/10

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-31 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 730.6 E 309 664.5, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2010.01.20 - 2010.01.20 CHECKED BY TH

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
268.6											
0.0	**TOPSOIL:** (150mm)										
0.2	**SAND** AND **SILT**, some clay, trace roots and rootlets Very Loose Dark Brown Damp		1	SS	3		268				
267.4			2	SS	11						
1.1	**SAND**, fine grained, trace gravel Compact Brown										
267.0							267				
1.6	Damp Sandy **SILT**, trace clay, trace gravel Compact to Very Dense Brown Damp (TILL)		3	SS	24						
			4	SS	26		266				0 23 68 9
			5	SS	117/ 0.250		265				
			6	SS	100/ 0.150		264				1 31 61 7
			7	SS	100/ 0.150		263				
							262				
260.8			8	SS	100/		261				
7.7	END OF BOREHOLE AT 7.7m. BOREHOLE OPEN AND WATER LEVEL AT 5.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2010.02.02 4.2 264.4				0.125						

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 2/3/10

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-32 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 779.6 E 309 655.4, DEEP CUT NORTH OF QUEENVILLE SIDE RD. ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2010.01.20 - 2010.01.20 CHECKED BY TH

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
266.2											
0.0	**TOPSOIL:** (175mm)										
0.2 / 265.5	**SAND** and **SILT**, some clay, trace roots and rootlets Loose Dark Brown Damp		1	SS	4		266				
0.8 / 264.3	**SAND** and **SILT**, trace clay, trace gravel Compact to Dense Brown Damp (TILL)		2	SS	22		265				
			3	SS	49						
1.9 / 263.5	**SAND**, fine grained Dense Brown Damp		4	SS	36		264				
2.7 / 263.0	**SAND** and **SILT**, trace clay, trace gravel Dense Brown Damp (TILL)		5	SS	80		263				
3.2 / 262.0	**SAND**, fine grained, trace gravel Very Dense Brown Damp										
4.3	Sandy **SILT**, trace clay, trace gravel Very Dense Brown Damp (TILL)		6	SS	107/ 0.250		262				
260.0			7	SS	100/ 0.150		261				
6.2	END OF BOREHOLE AT 6.2m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO 4.3m, THEN CUTTINGS TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\frac{20}{15 \oplus 5}$ (%) STRAIN AT FAILURE

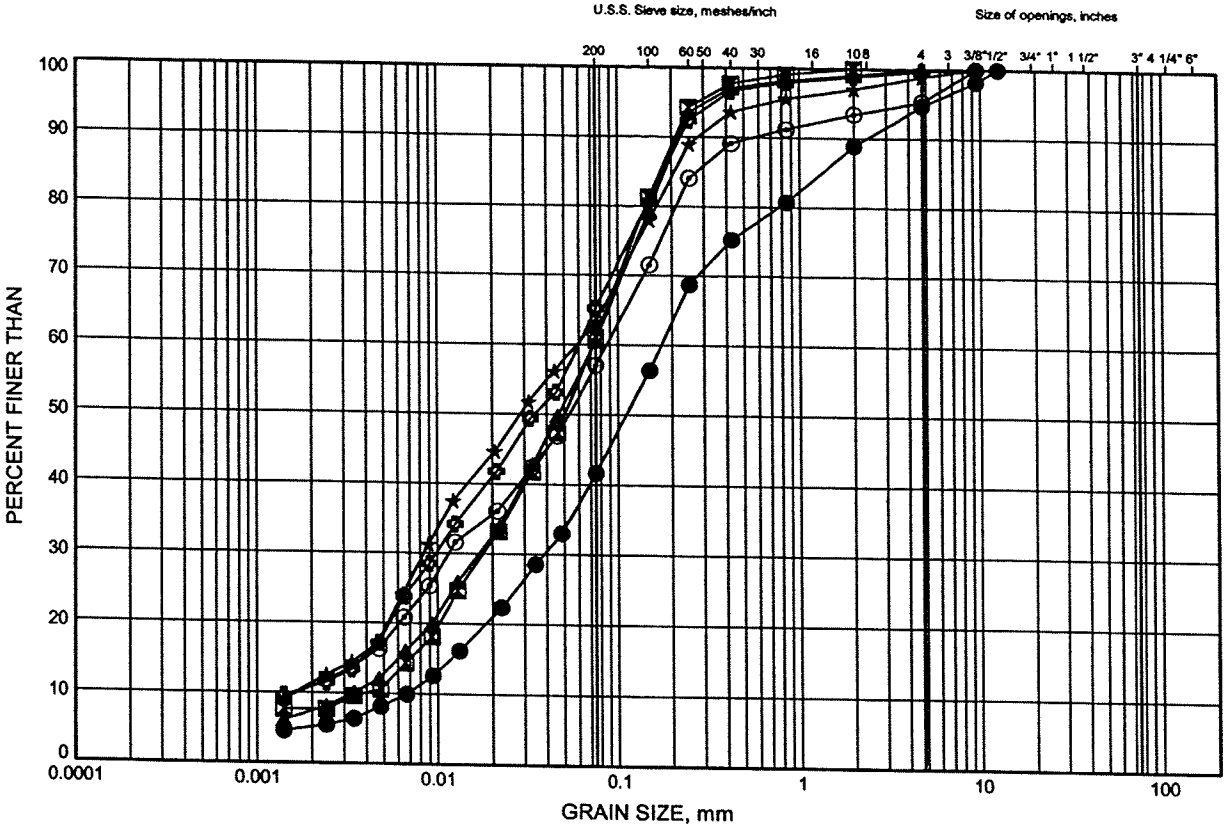
ONTMT4S 0596.GPJ 2/3/10

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE D1

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-22	2.51	265.50
⊠	08-22	3.25	264.76
▲	08-22	3.89	264.12
★	08-23	1.83	272.11
⊙	08-23	4.65	269.29
✿	08-23	7.70	266.24

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

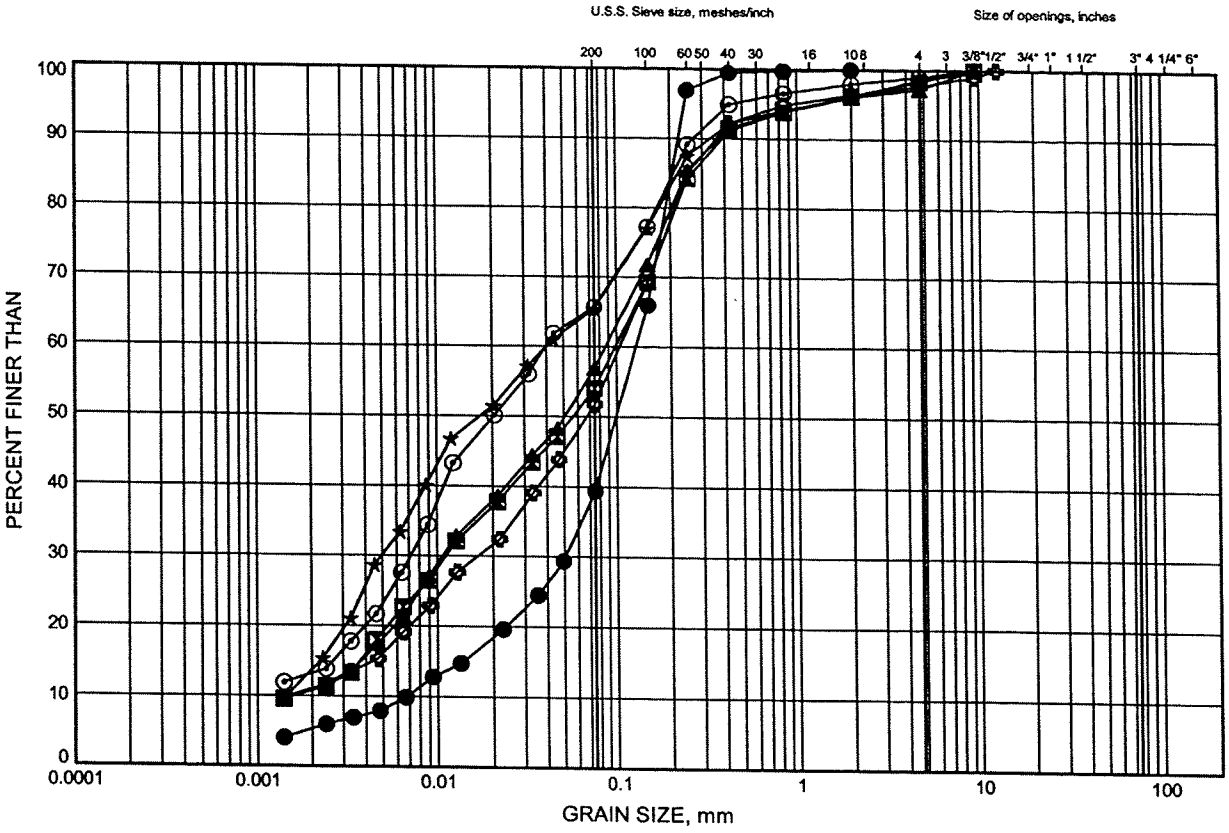
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/23/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE D2

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-23	12.27	261.67
⊠	08-24	2.51	273.79
▲	08-24	3.25	273.05
★	08-24	6.16	270.14
⊙	08-24	10.72	265.58
✿	08-25	0.99	276.91

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

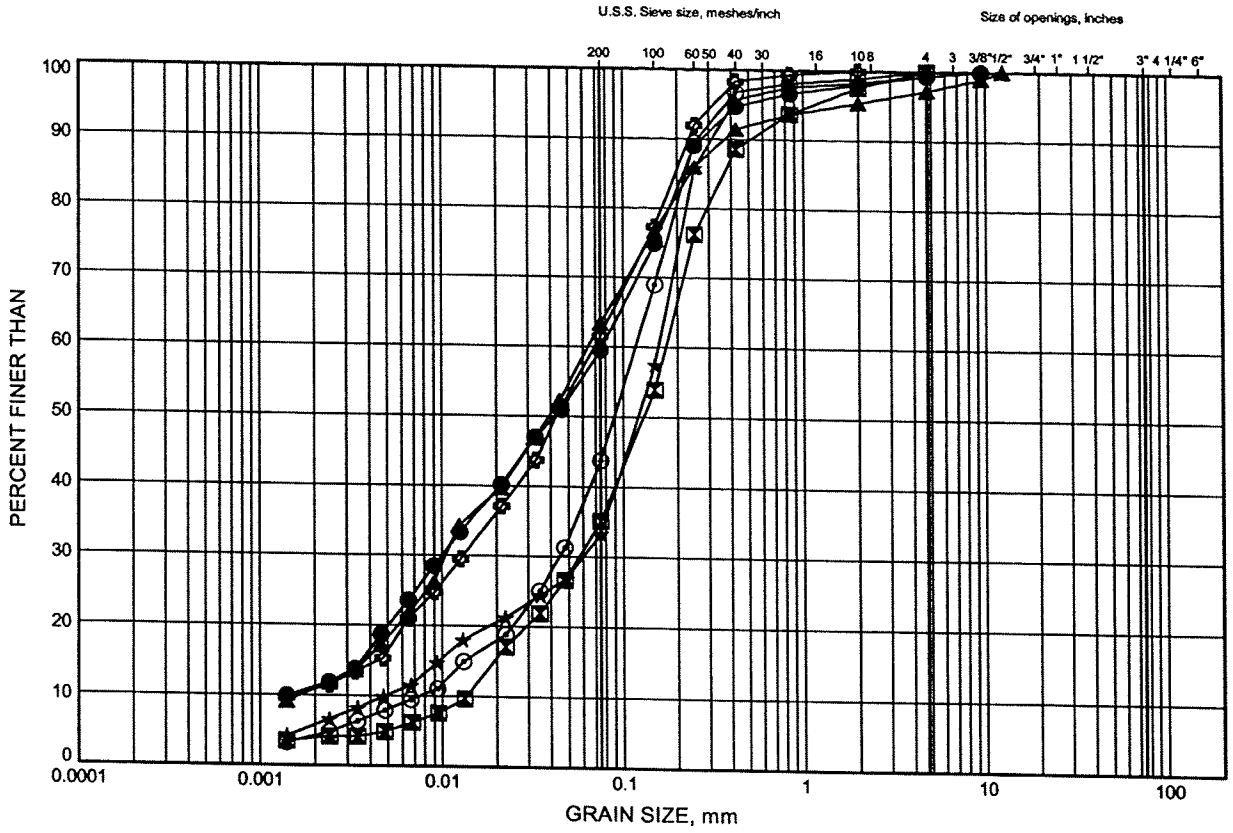
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 10/16/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE D3

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-25	3.28	274.62
⊠	08-25	13.78	264.12
▲	08-26	1.75	276.45
★	08-26	7.70	270.50
⊙	08-26	13.76	264.44
✿	08-26	18.31	259.89

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

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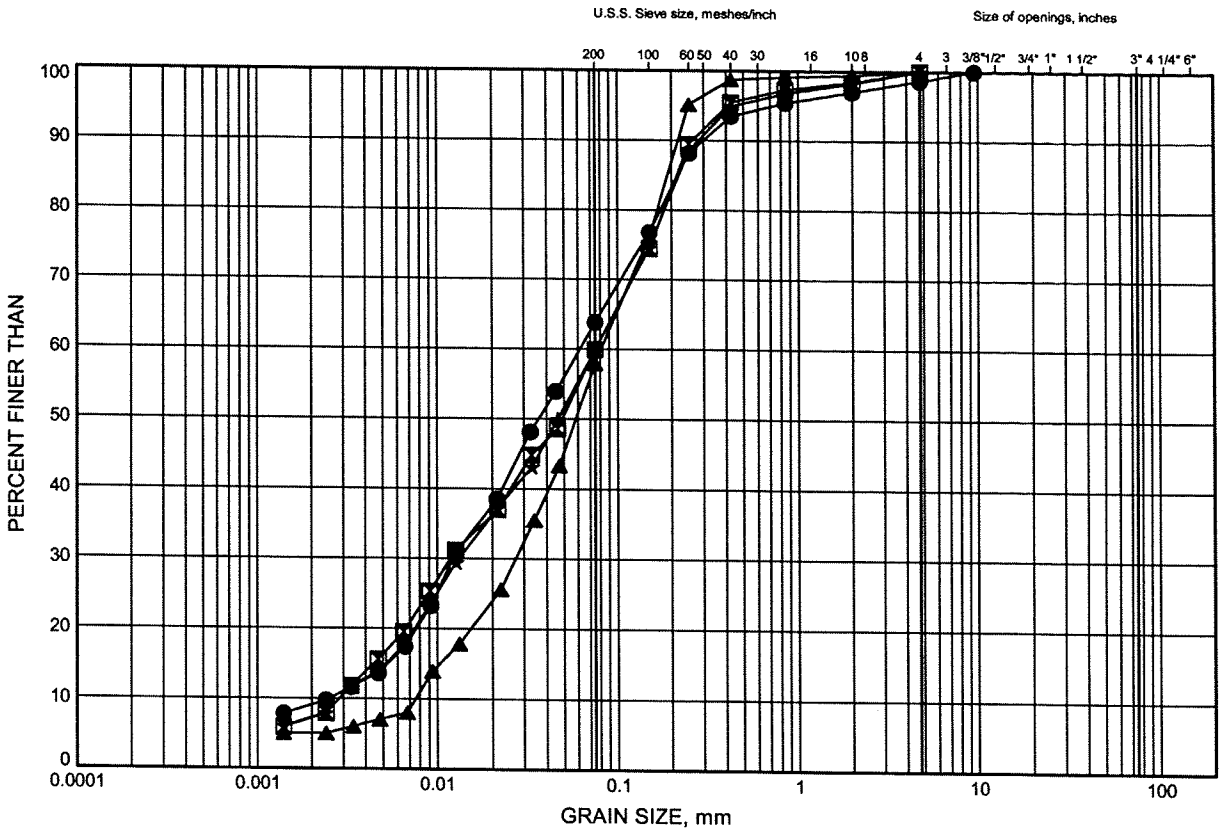
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 10/16/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE D4

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-27	1.07	272.72
⊠	08-27	2.59	271.20
▲	08-27	7.74	266.05
★	08-28	1.07	273.50

W.P.# 2109-05-00
Prepared By AN
Checked By TH

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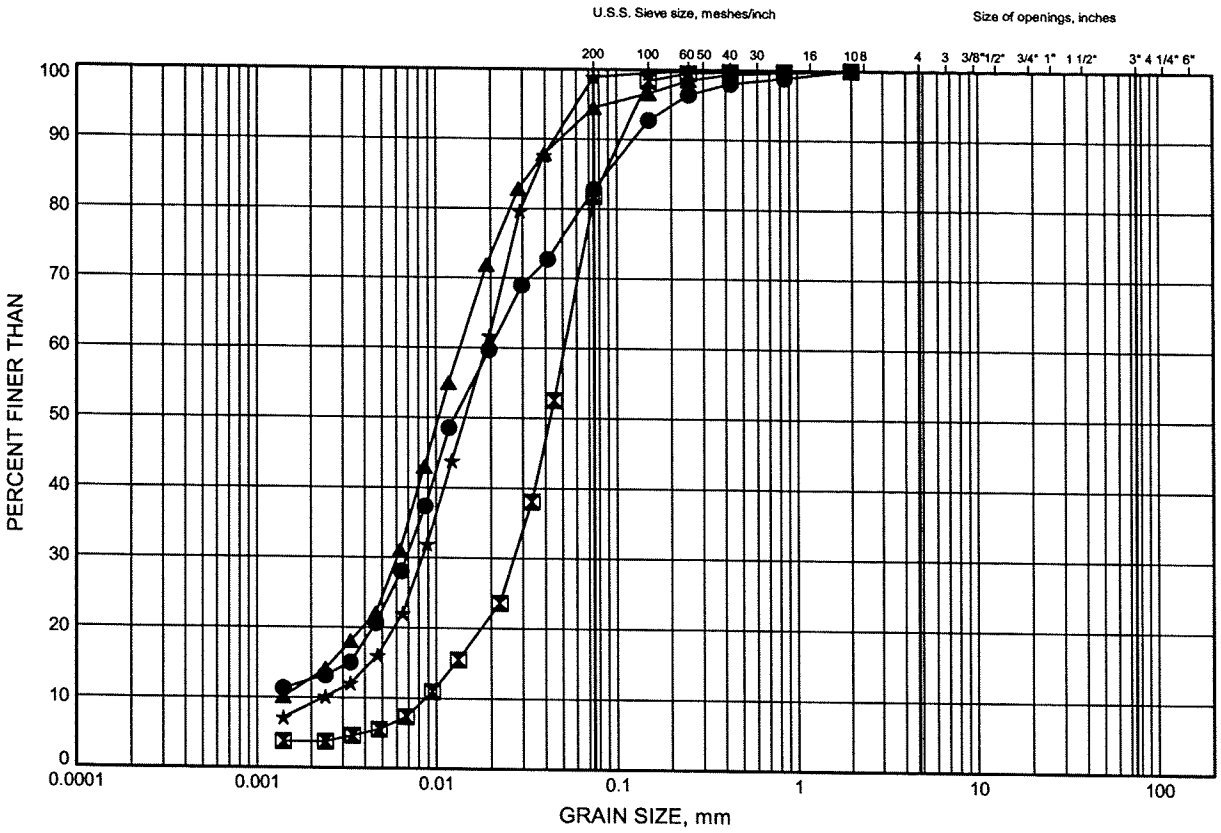
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 2/5/10

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE D5

SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-25	9.19	268.71
⊠	08-26	6.17	272.03
▲	08-26	9.21	268.99
★	08-29	1.83	271.64

W.P.# 2109-05-00
Prepared By AN
Checked By TH

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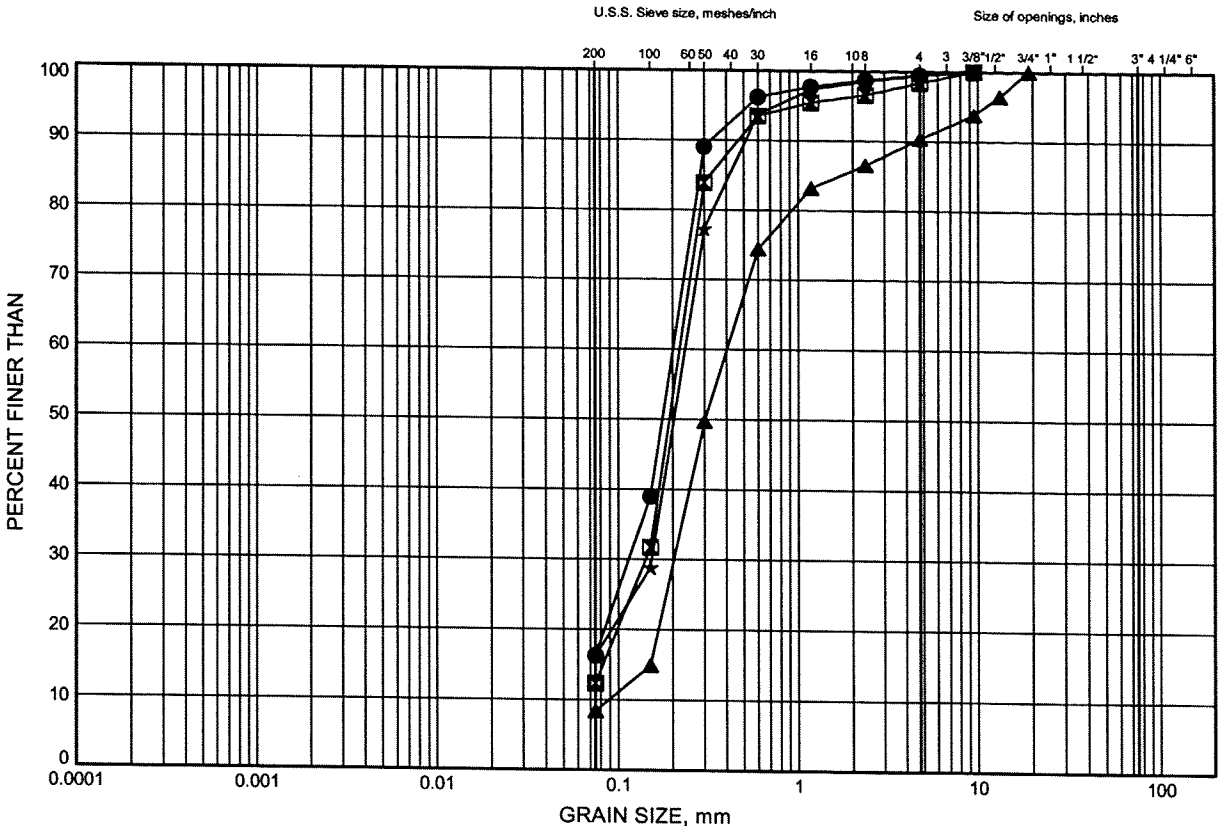
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 2/5/10

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE D6

SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-24	13.75	262.55
⊠	08-25	15.28	262.62
▲	08-28	9.30	265.27
★	08-30	4.80	266.76

W.P.# 2109-05-00
Prepared By AN
Checked By TH

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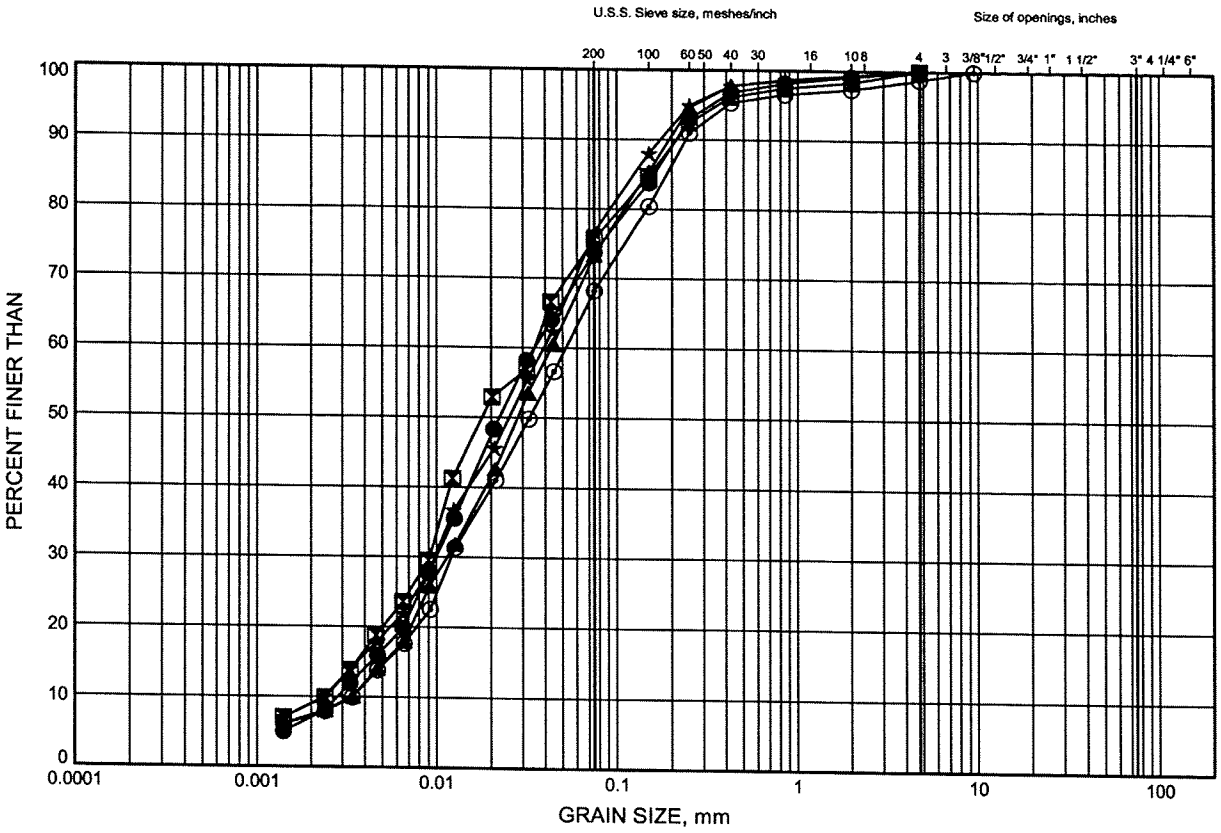
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 2/5/10

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE D7

SANDY SILT TILL



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

LEGEND

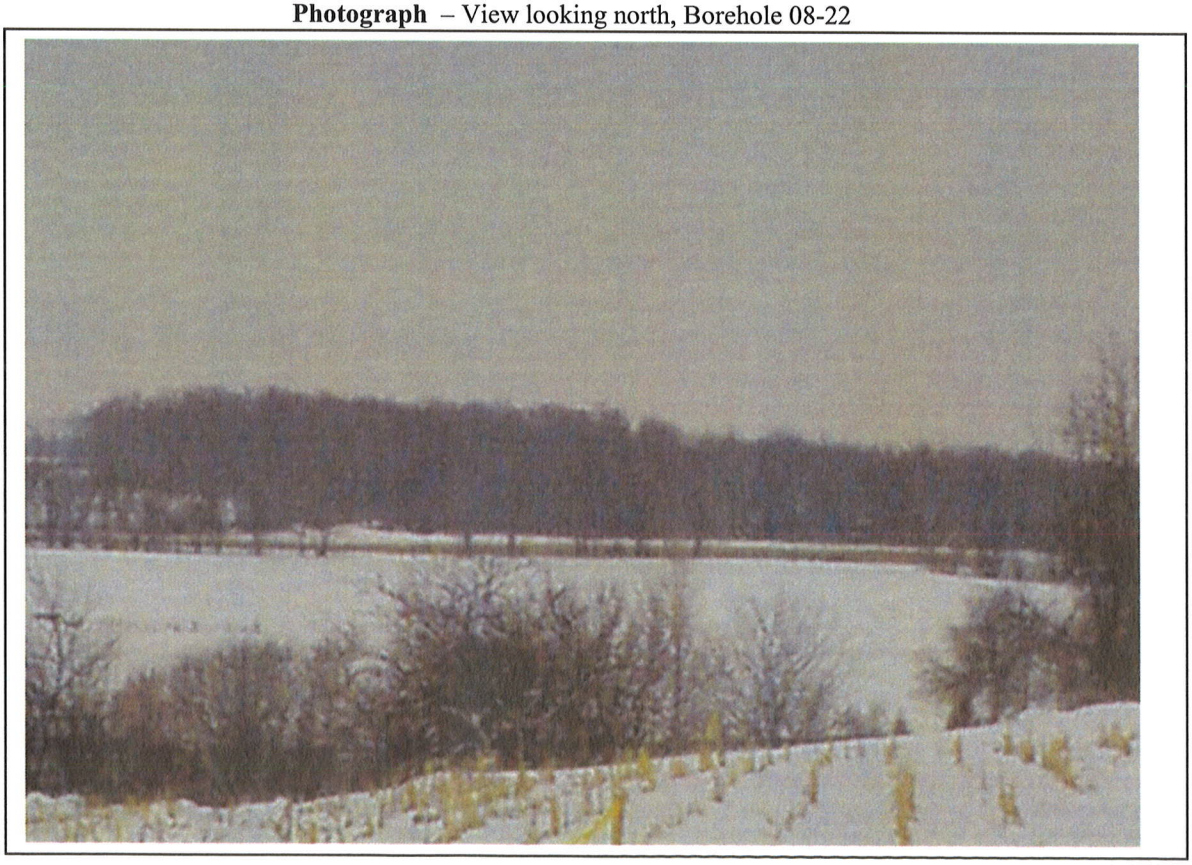
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-28	2.59	271.98
⊠	08-29	3.28	270.19
▲	08-30	1.83	269.73
★	08-31	2.59	266.00
⊙	08-31	4.65	263.94

W.P.# 2109-05-00
Prepared By AN
Checked By TH

THURBER

GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 2/5/10

Photograph – View looking north, Borehole 08-22



Photograph – View looking south, Borehole 08-24

Photograph – View looking north, Borehole 08-25

Photograph – View looking north, Borehole 08-26

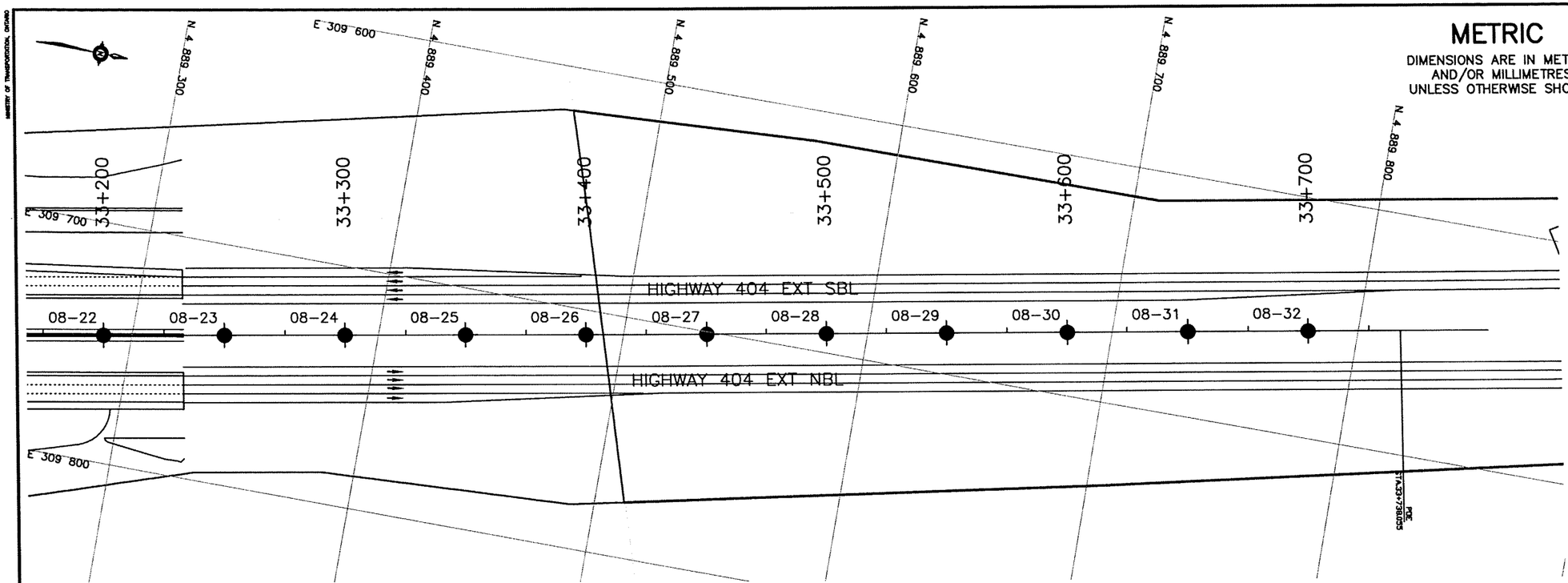
MINISTRY OF TRANSPORTATION, ONTARIO

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No	
GWP No 2109-05-00	SHEET
HIGHWAY 404 EXTENSION DEEP CUT NORTH OF QUEENSVILLE SIDEROAD STATIONS 33+200 TO 33+700 BOREHOLE LOCATIONS AND SOIL STRATA	

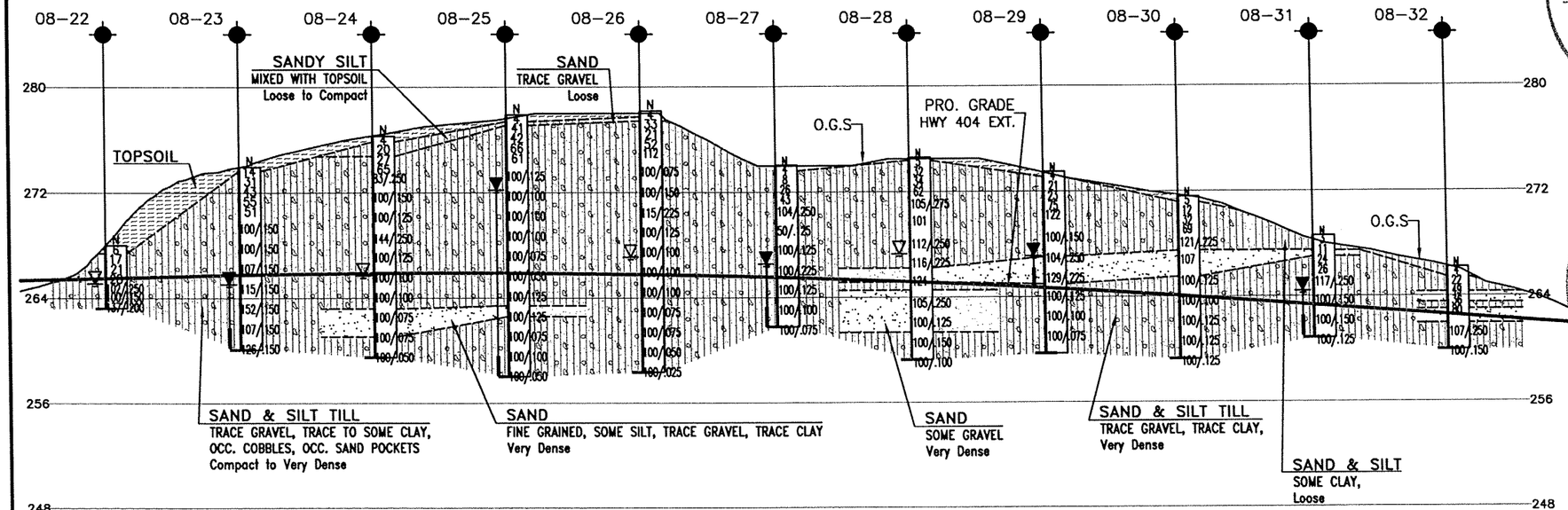
THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



PLAN

0 40 80 120m

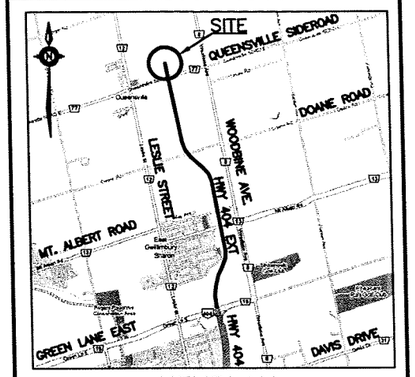
SCALE 1:2000



PROFILE

0 40 80 120m H 1:2000

0 8 16 24m V 1:400



KEYPLAN

LEGEND

⊕	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-22	268.0	4 889 288.2	309 746.9
08-23	273.9	4 889 337.4	309 737.8
08-24	276.3	4 889 386.5	309 728.6
08-25	277.9	4 889 435.7	309 719.4
08-26	278.2	4 889 484.8	309 710.3
08-27	273.8	4 889 534.0	309 701.1
08-28	274.6	4 889 583.1	309 692.0
08-29	273.5	4 889 632.3	309 682.8
08-30	271.6	4 889 681.4	309 673.7
08-31	286.6	4 889 730.6	309 664.5
08-32	266.2	4 889 779.6	309 655.4

LICENSED PROFESSIONAL ENGINEER
S.M. SATHER
Feb 26/10
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Feb 26/10
PROVINCE OF ONTARIO

-NOTES-

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

GEOCRES No. 31D-492

REVISIONS	DATE	BY	DESCRIPTION

DESIGN	RPR	CHK	PKC	CODE	LOAD	DATE	MAR. 2010
DRAWN	MFA	CHK	AEG	SITE	STRUCT	DWG	

FILENAME: G:\Drafting\19\1403\95\ed0598-DeepCuts(GH15or47).dwg
PLOTDATE: Mar 01, 2010 - 3:34pm

Appendix E

High Fill and Deep Cut - Queensville Sideroad, Station 9+550 – 10+300 (Boreholes 08-61, 08-33 to 08-38, 08-38A, 08-33A, 08-39 to 08-47, QSR4-1 to QSR4-5 and 301 to 303)

Record of Borehole Sheets
Laboratory Test Results
Site Photographs
Drawing titled "Borehole Locations and Soil Strata"

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-61

1 OF 2

METRIC

G.W.P. 2109-05-00 | LOCATION N 4 888 955.8 E 309 342.6 | ORIGINATED BY GA
HWY 404 | BOREHOLE TYPE Solid Stem Augers | COMPILED BY WM
DATUM Geodetic | DATE 2008.07.15 - 2008.07.15 | CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
284.9											
0.0	**TOPSOIL:** (200mm)										
0.2	**SAND**, some gravel, trace silt, trace clay Loose to Compact Brown Moist		1	SS	10				o		
			2	SS	20		284		o		13 76 8 3
283.4											
1.5	**SAND** and **SILT**, trace gravel, trace to some clay Very Dense Brown Moist (TILL)		3	SS	50/.150		283		o		
			4	SS	111				o		4 45 36 15
	Fine grained sand layer		5	SS	102/.150		282		o		
			6	SS	132		281		o		
			7	SS	107		280		o		
			8	SS	103/.150		279		o		2 49 38 10
276.2							278				
8.7	**SILT**, some sand, trace clay Very Dense Brown to grey Wet (TILL)		9	SS	100/.150	▼	277		o		
							276				0 24 68 8
							275				

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/08

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-61 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 888 955.8 E 309 342.6 ORIGINATED BY GA
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.07.15 - 2008.07.15 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SILT, trace sand, some clay, occasional iron oxide staining Very Dense Brown to grey Moist (TILL)		10	SS	111/ .150		274				0 2 80 18
			11	SS	114/ .150		273				
			12	SS	126/ .150		272				
269.6			13	SS	50/ .075		271				
15.3	END OF BOREHOLE AT 15.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.						270				

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
2008.07.16	9.6	275.3
2008.07.29	9.6	275.3
2008.09.17	7.9	277.0
2008.10.24	10.1	274.8
2008.11.28	11.0	273.9
2009.02.06	7.6	277.3
2009.02.20	7.2	277.7
2009.03.20	8.0	276.9
2009.04.22	7.6	277.3
2009.05.15	8.2	276.7
2009.06.05	8.9	276.0
2009.07.10	8.7	276.2
2009.07.16	9.6	275.3
2009.07.29	9.6	275.3
2009.09.02	9.0	275.9
2009.09.21	9.2	275.7

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/20/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-33 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 888 970.79 E 309 452.49, Station 9+650, Right Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.26 - 2008.03.26 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
284.0											
0.0	**ASPHALT:** (175mm)						284				
0.2	**SAND and GRAVEL**, some silt Brown Moist (FILL)								o		
283.1											
0.9	Silty **SAND**, trace gravel, trace clay Dense Brown Moist (FILL)		1	SS	46		283		o		
282.5											
1.5	**SAND and SILT**, fine grained, trace gravel, trace clay Dense to Very Dense Brown Moist (TILL)		2	SS	33				o		1 55 35 9
			3	SS	45		282		o		
	Auger grinding from 3.3m to 3.6m		4	SS	175		281		o		
							280				
279.2			5	SS	100/				o		0 44 48 8
4.8	END OF BOREHOLE AT 4.8m. BOREHOLE OPEN TO 4.8m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.				0.150						

$+^3$, $\times^3$: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-33A 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 888 987.30 E 309 440.20, Station 9+650 ORIGINATED BY GA

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM

DATUM Geodetic DATE 2008.07.14 - 2008.07.14 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
286.2											
0.0	TOPSOIL: (150mm)										
0.2	**SAND** and **SILT**, trace gravel, trace to some clay Loose to Very Dense Brown Moist (TILL)		1	SS	8		286				
			2	SS	45		285				
			3	SS	58						3 54 33 10
			4	SS	92		284				
			5	SS	152		283				0 50 39 11
282.1							282				
4.1	**SILT**, some sand, some clay, trace gravel Very Dense Brown Moist to Wet (TILL)		6	SS	135/.150		281				
			7	SS	126/.150		280				0 19 70 11
			8	SS	100/.150		279				
			9	SS	124/.150		278				
							277				

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-33A 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 888 987.30 E 309 440.20, Station 9+650 ORIGINATED BY GA
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.07.14 - 2008.07.14 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (40 80 120 160 200) O UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SILT, some clay, trace sand Very Dense Brown Moist to Wet (TILL)		10	SS	113/.150		276				0 9 74 17
			11	SS	114/.150		274				
			12	SS	121/.150		273				0 8 77 15
270.9			13	SS	100/.100		271				
15.3	END OF BOREHOLE AT 15.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
2008.07.16	8.6	277.6
2008.07.29	7.6	278.6
2008.09.17	5.8	280.4
2008.10.24	8.7	277.5
2008.11.28	9.0	277.2
2009.02.06	5.4	280.8
2009.02.20	5.1	281.1
2009.03.20	0.2*	286.4
2009.04.22	4.8	281.4
2009.05.15	5.3	280.9
2009.06.05	6.0	280.2
2009.07.10	5.8	280.4
2009.07.16	8.5	277.7
2009.07.29	7.6	278.6
2009.09.02	6.9	279.3
2009.09.21	7.2	279.0

* (above ground surface)

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-34 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 888 985.68 E 309 500.23, Station 9+700, Left Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.25 - 2008.03.25 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
281.3											
0.0	**ASPHALT:** (125mm)										
0.1	**SAND and GRAVEL,** trace silt Brown Moist (FILL)										
280.6											
0.8	Silty **SAND,** trace to some gravel Compact Brown Moist (FILL)		1	SS	27						
279.8											
1.5	**SAND and SILT,** some clay, trace gravel Dense to Very Dense Brown Moist (TILL)		2	SS	36		280				
			3	SS	82		279				2 47 41 10
			4	SS	120		278				
			5	SS	100/ .150		277				1 33 53 13
275.0			6	SS	100/ .125		276				
6.4	END OF BOREHOLE AT 6.4m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.04.18	2.3	279.0
2008.04.21	2.2	279.1
2008.06.30	2.0	279.3
2008.07.29	1.6	279.7
2008.09.17	1.4	279.9
2008.11.28	1.7	279.6
2009.07.29	1.6	279.7
2009.09.21	3.7	277.6

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-35 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 000.56 E 309 547.96, Station 9+750, Right Shoulder ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM

DATUM Geodetic DATE 2008.03.26 - 2008.03.26 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
277.7											
0.0	**ASPHALT:** (175mm)										
0.2	Gravelly **SAND**, trace silt Dark Brown Moist (FILL)										34 61 5 (SI+CL)
276.9							277				
0.8	**SILT**, some sand, some clay, trace gravel Compact Brown Moist (FILL)		1	SS	20						
276.1							276				
1.5	**SAND** and **SILT**, some to trace clay Very Dense Brown Moist (TILL)		2	SS	55						
			3	SS	88		275				0 31 56 13
			4	SS	102	▽					
			5	SS	100/ .125		274				
							273				0 20 74 6
							272				
271.3			6	SS	100/ .100						
6.3	END OF BOREHOLE AT 6.4m. BOREHOLE OPEN TO 6.4m AND WATER LEVEL AT 3.5m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-36 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 015.45 E 309 595.69, Station 9+800, Left Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.25 - 2008.03.25 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GR	SA	SI	CL
273.5								
0.0	**ASPHALT:** (125mm)							
0.1	**SAND and GRAVEL**, trace silt Brown Moist (FILL)							
272.7								
0.8	Sandy **SILT**, trace gravel, trace clay Compact Brown Moist (FILL)	1	SS	30				
271.8								
1.7	**SAND**, fine grained, trace gravel, some silt, some clay Very Dense Brown	2	SS	108	10	66	24	(SI+CL)
271.2								
2.3	Moist **SAND and SILT**, trace to some clay Very Dense Brown Moist (TILL) Auger grinding from 2.6m to 2.8m	3	SS	100/ .100				
		4	SS	100/ .150	0	21	72	7
		5	SS	100/ .125				
	Auger grinding from 5.3m to 5.4m	6	SS	100/ .100	0	26	61	13
265.7	becoming grey	7	SS	100/ .150				
7.8	END OF BOREHOLE AT 7.8m. BOREHOLE OPEN TO 7.8m AND WATER LEVEL AT 7.4m ON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.							

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV.(m)
2008.04.18	3.4	270.1
2008.04.21	3.3	270.2
2008.06.30	1.7	271.8
2008.11.28	1.5	272.0
2009.07.29	1.3	272.2
2009.09.21	6.3	267.2

ELEVATION SCALE: 273, 272, 271, 270, 269, 268, 267, 266

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH kPa: O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE; 40 80 120 160 200
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%): 20 40 60
UNIT WEIGHT γ kN/m^3

$+^3$, $\times^3$: Numbers refer to Sensitivity
(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-37 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 027.35 E 309 633.88, Station 9+840, Right Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.24 - 2008.03.24 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
270.1											
0.0	**ASPHALT:** (125mm)						270				
0.1	**SAND and GRAVEL**, trace silt Brown Moist (FILL)										
269.4											
0.8	Silty **SAND**, trace clay, trace gravel Dense Brown Moist (FILL)		1	SS	34		269				
268.6											
1.5	**SAND and SILT**, trace gravel, trace to some clay Dense to Very Dense Brown Moist (TILL) Cobbles at 1.9m Auger grinding at 2.1m to 2.3m		2	SS	92		268				
			3	SS	38						2 44 45 9
			4	SS	100/ .075		267				2 31 56 11
			5	SS	100/ .125		266				
	Auger grinding between 5.6m and 5.7m						265				
			6	SS	100/ .100		264				1 32 55 12
			7	SS	100/ .125		263				
260.9							262				
9.2	END OF BOREHOLE AT 9.2m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLE PLUG TO SURFACE.		8	SS	100/ .125		261				

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

THUNDER

RECORD OF BOREHOLE No 08-38 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 039.26 E 309 672.07, Station 9+880, Left Shoulder ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM

DATUM Geodetic DATE 2008.03.24 - 2008.03.24 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
266.9											
0.0	**ASPHALT**: (125mm)										
0.1	**SAND and GRAVEL**, trace to some silt Dense Brown Moist (FILL)		1	SS	49		266				
265.3											
1.5	**SAND** and **SILT**, some clay, trace gravel Very Dense Brown Moist (TILL)		2	SS	103		265				
			3	SS	100/.150						0 19 69 12
			4	SS	100/.125		264				
			5	SS	100/.125		263				
			6	SS	100/.125	▽	262				
			7	SS	100/.100		261				
	Auger grinding at 8.0m to 8.1m						260				
			8	SS	100/.075		259				
							258				
							257				

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+^{3}, ×^{3}: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/20/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-38 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 039.26 E 309 672.07, Station 9+880, Left Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.24 - 2008.03.24 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (40 80 120 160 200) O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, some clay, trace gravel Very Dense Brown Moist										
256.1	(TILL)		9	SS	100/				o		1 29 57 13
10.8	END OF BOREHOLE AT 10.8m. BOREHOLE OPEN TO 10.4m AND WATER LEVEL AT 6.2m ON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.				.100		256				

$+^3$, $\times^3$: Numbers refer to Sensitivity

20
15 5
10
(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-38A 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 109.70 E 309 883.40, Station 10+100, Left Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.26 - 2008.03.26 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.3								20 40 60 80 100 / 40 80 120 160 200	20 40 60		
0.0	**ASPHALT**: (200mm)										
0.2	**SAND**, some gravel, trace silt Dark Brown Moist (FILL)					▽	257				
256.4			1	SS	6						
0.9	Silty **CLAY**, trace sand, trace gravel, occasional oxide lenses Firm Brown (FILL)		2	SS	6		256				
255.0											
2.3	Clayey **SILT**, trace to some sand, trace gravel Very Stiff to Hard Brown (TILL)		3	SS	26		255				0 5 66 29
			4	SS	36		254				
			5	SS	20		253				0 11 65 24
251.7							252				
5.6	Sandy **SILT**, some clay, trace gravel Compact Grey Wet Auger grinding at 5.9m to 6.1m		6	SS	17		251				
250.2											
7.1	Clayey **SILT**, sandy, trace gravel Very Stiff Grey (TILL)		7	SS	25		250				
							249				
			8	SS	27		248				0 28 54 18

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+^{3}, ×^{3}: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 10/20/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-38A 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 109.70 E 309 883.40, Station 10+100, Left Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.26 - 2008.03.26 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 40 80 120 160 200 (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Clayey SILT, sandy, trace gravel Very Stiff to Stiff Grey (TILL)						247				
			9	SS	12				o		
							246				
			10	SS	17		245		o		
							244				
243.1	Becoming Hard		11	SS	32				⊢		0 31 53 16
14.2	END OF BOREHOLE AT 14.2m. BOREHOLE OPEN TO 3.1m AND WATER LEVEL AT 0.8m ON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-39 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 119.64 E 309 929.82, Station 10+150, Right Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.27 - 2008.03.27 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.0							259				
0.0	**ASPHALT:** (200mm)										
0.2	**SAND**, some gravel, trace to some silt Dark Brown Moist (FILL)										
257.9			1	SS	17		258				
1.0	**SILT**, some clay, trace sand, trace gravel Compact Brown Moist (FILL)		2	SS	15		257				
256.7											
2.3	Clayey **SILT**, some sand to sandy, trace gravel, occasional oxide lenses Very Stiff to Hard Brown (TILL)		3	SS	23						1 18 61 20
			4	SS	26		256				
			5	SS	20		255				
			6	SS	25		254				
251.9							253				1 28 52 19
7.0	**SAND** and **SILT**, some clay, trace gravel Compact to Very Dense Grey Moist (TILL)		7	SS	36		252				
							251				
			8	SS	100/ .125		250				1 35 52 12

Continued Next Page

+³, ×³: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/20/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-39 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 119.64 E 309 929.82, Station 10+150, Right Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.27 - 2008.03.27 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page						249				
	SAND and **SILT**, some clay, trace gravel Very Dense Grey Moist (TILL) Layer of very loose silty sand (1.0m)		9	SS	2		248				1 69 24 6
			10	SS	100/ .125		247				
245.0			11	SS	100/ .100		246				
14.0	END OF BOREHOLE AT 14.1m. WATER LEVEL AT 3.2m ON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.04.18	2.0	257.0
2008.04.21	1.9	257.1
2008.06.30	2.8	256.2
2009.09.21	0.9	258.1

$+^3$, $\times^3$: Numbers refer to Sensitivity

20
15 5
10
(%) STRAIN AT FAILURE

ONTMT4S 0586.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-40 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 134.53 E 309 977.56, Station 10+200, Left Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.20 - 2008.03.20 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
261.3									
0.0	**ASPHALT**: (125mm)								
0.1	**SAND and GRAVEL**, trace to some silt Brown Moist								
260.4	(FILL)								
0.9	**SILT**, some clay, trace to some sand, trace gravel Loose to Compact Brown Moist (FILL)		1	SS	20				
			2	SS	8				
258.7			3	SS	9				
2.6	**SAND**, some gravel, trace silt Loose Brown								
258.3									
3.0	Moist (FILL)								
	Clayey **SILT**, sandy, trace gravel Very Stiff to Hard Grey (TILL)		4	SS	26	▽			2 37 51 10
			5	SS	23				
			6	SS	27				1 29 54 16
			7	SS	100/ .075				
252.9									
8.4	**SAND and SILT**, trace clay, trace gravel Very Dense Grey Moist (TILL)		8	SS	100/ .075				

SOIL PROFILE | SAMPLES | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) | SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (40 80 120 160 200) | PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L | WATER CONTENT (%) (20 40 60) | UNIT WEIGHT | REMARKS & GRAIN SIZE DISTRIBUTION (%)

ELEVATION SCALE: 261, 260, 259, 258, 257, 256, 255, 254, 253, 252

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/20/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-40 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 134.53 E 309 977.56, Station 10+200, Left Shoulder ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM

DATUM Geodetic DATE 2008.03.20 - 2008.03.20 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE; 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, trace clay, trace gravel Very Dense Grey Moist (TILL)		9	SS	100/ .050		251 250		o		2 43 46 9
248.8			10	SS	100/ .125		249		o		
12.5	END OF BOREHOLE AT 12.5m. BOREHOLE OPEN TO 11.3m AND WATER LEVEL AT 3.2m ON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO 0.1m, THEN ASPHALT TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\frac{20}{15}\oplus\frac{5}{10}$ (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-41 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 149.41 E 310 025.29, Station 10+250, Right Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.27 - 2008.03.27 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE; 40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
263.7											
0.0	**ASPHALT:** (150mm)										
0.2 / 262.9	Gravelly **SAND**, trace silt Dark Brown Moist (FILL)										29 67 4 (SI+CL)
0.8 / 261.4	Clayey **SILT**, some sand, trace gravel Stiff to Very Stiff Brown (FILL)		1	SS	16		263				
			2	SS	9		262				
2.3 / 259.7	Clayey **SILT**, sandy, trace gravel, occasional oxide staining Very Stiff Brown (TILL)		3	SS	20		261				1 24 56 19
			4	SS	29		260				
4.0 / 255.9	**SAND** and **SILT**, trace gravel, trace clay, occasional oxide staining Very Dense Brown Moist (TILL)		5	SS	100/ .150		259				
			6	SS	100/ .125		258				1 41 50 8
			7	SS	100/ .150		257				
7.8 / 256	END OF BOREHOLE AT 7.8m. BOREHOLE OPEN AND WATER LEVEL AT 5.3m ON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.04.18	3.3	260.40
2008.04.21	3.2	260.50
2008.06.30	2.1	261.60
2009.09.21	2.8	260.90

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/20/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-42 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 164.30 E 310 073.02, Station 10+300, Left Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.18 - 2008.03.18 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 40 80 120 160 200 (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
264.4											
0.0	**ASPHALT** (125mm)										
0.1	**SAND and GRAVEL**, trace silt Compact Brown Moist (FILL)						264				
263.4											
1.1	Clayey **SILT**, sandy, trace gravel, trace rootlets, occasional black staining Stiff to Very Stiff Brown		1	SS	29				○		12 68 20 (SI+CL)
			2	SS	13		263		○		0 32 52 16
			3	SS	8		262		○		
			4	SS	10		261		○		
260.3	Auger grinding on possible cobble at 3.56 to 3.66m										
4.1	**SAND** and **SILT**, trace clay Very Dense Brown Moist (TILL)		5	SS	141/.300	▽	260		○		0 47 45 8
258.2							259				
			6	SS	100/.125				○		
6.2	END OF BOREHOLE AT 6.2m BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 4.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO 0.1m THEN ASPHALT TO SURFACE.										

+^{3}, ×^{3}: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 10/20/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-43 1 OF 1 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 051.2 E 309 710.3, Station 9+920, Left Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.28 - 2008.03.28 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
263.9											
0.0	**ASPHALT:** (200mm)										
0.2 / 263.1	**SAND**, some gravel, trace to some silt Dark Brown Moist (FILL)										
0.8	Silty **SAND**, some gravel, trace clay Dense to Compact Brown Moist (FILL)		1	SS	41		263				12 55 26 7
261.8			2	SS	16		262				
2.1	**SAND and SILT**, trace gravel, trace clay Compact to Very Dense Brown Moist (TILL)		3	SS	24		261				
			4	SS	37	▽	260				1 40 51 8
259.2			5	SS	100/ .125						
4.7	END OF BOREHOLE AT 4.7m. BOREHOLE OPEN AND WATER LEVEL AT 4.1m ON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.										

+^{3} . ×^{3} : Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-44 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 053.5 E 309 751.4, Station 9+960, 10m Rt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.28 - 2008.04.02 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 40 80 120 160 200 (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.1											
0.0 / 258.6	Clayey **SILT**, mixed with topsoil, trace sand, trace rootlets Soft Dark Brown (FILL)		1	SS	2		259				
0.5	Silty **SAND**, trace clay, trace gravel, occasional oxides staining Compact Brown Moist (FILL)		2	SS	15		258				
			3	SS	13		257				
256.9											
2.2	**SAND**, trace silt, trace gravel Dense Brown Moist		4	SS	34						20 62 18 (SI+CL)
256.0							256				
3.0	**SAND and SILT**, trace clay, trace gravel Dense Brown Moist (TILL)		5	SS	33						
			6	SS	41		255				1 44 47 8
							254				
			7	SS	31		253				
	Very Dense Grey		8	SS	57		252				3 50 42 5
							251				
			9	SS	164		250				

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+ ^{3}, × ^{3}: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/09

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RECORD OF BOREHOLE No 08-44 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 053.5 E 309 751.4, Station 9+960, 10m Rt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.28 - 2008.04.02 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and SILT, trace clay Very Dense Grey (TILL)						249				
			10	SS	100/ .125				o		0 42 49 9
							248				
246.8							247				
			11	SS	100/ .100				o		
12.3	END OF BOREHOLE AT 12.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.04.18	1.4	257.7
2008.06.30	2.1	257.0
2008.07.29	1.9	257.2
2008.10.24	1.1	258.0
2009.03.20	0.5*	259.6
2009.04.22	0.5*	259.6
2009.05.15	0.5*	259.6
2009.06.05	0.1	259.0
2009.07.10	2.1	257.0
2009.07.16	Ground surface	259.1
2009.07.29	1.2	257.9
2009.09.21	0.5	258.6

* (above ground surface)

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-45 1 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 070.2 E 309 788.1, Station 10+000, 5m Rt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.04.03 - 2008.04.03 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
258.3											
0.0	**ASPHALT**: (125mm)										
0.1	**SAND**, some gravel, trace to some silt Dark Brown to Brown Compact Moist (FILL)		1	SS	25		258				
	fine grained Loose		2	SS	6		257				
255.8											
2.4	**SAND** and **SILT**, some clay, occasional oxide staining Loose Brown (TILL)		3	SS	9		256				
			4	SS	9		255				0 41 46 13
	Compact Grey		5	SS	16		254				
							253				
			6	SS	21		252				
							251				
	Very Dense		7	SS	58		250				0 33 52 15
249.6											
8.7	Gravelly **SAND**, medium to coarse grained, trace silt, trace clay Very Dense Grey Wet		8	SS	100/ .100		249				16 62 22 (SI+CL)

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-45 2 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 070.2 E 309 788.1, Station 10+000, 5m Rt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.04.03 - 2008.04.03 CHECKED BY AEG

SOIL PROFILE ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Gravelly **SAND**, medium to coarse grained, trace silt, trace clay Dense Grey Wet										
247.3			9	SS	49		248		○ ○		22 71 7 (SI+CL)
11.0	**SAND** and **SILT**, trace gravel, trace to some clay Compact to Very Dense Grey Moist (TILL)		10	SS	30		247		○		
			11	SS	61		246		○		
			12	SS	22		245		⊢●		0 29 54 17
			13	SS	14		244		○		
	occasional cobbles Very Dense		14	SS	84		243		○		
			15	SS	100/		242		○		2 47 39 12
							241				
							240				
							239				

Continued Next Page

+³, ×³: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0586.GPJ 9/24/09

Ministry of Transportation
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THURBER

RECORD OF BOREHOLE No 08-45 3 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 070.2 E 309 788.1, Station 10+000, 5m Rt ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM

DATUM Geodetic DATE 2008.04.03 - 2008.04.03 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page							O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE			
	SAND and SILT, some clay, trace gravel, occasional cobbles Very Dense Grey Moist (TILL)				.125		238				
236.9			16	SS	100/ .125		237				
21.4	END OF BOREHOLE AT 21.4m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.04.18	2.4	255.9
2008.04.21	2.4	255.9
2009.09.21	0.1	258.2

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 10/5/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-46 1 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 096.4 E 309 821.8, Station 10+060, 10m Rt ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Solid Stem Augers / Hollow Stem Augers COMPILED BY WM

DATUM Geodetic DATE 2008.03.17 - 2008.03.18 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
256.7											
0.0	**SAND**, medium to coarse grained, some gravel, some silt, trace rootlets Loose to Compact Dark Brown Moist (FILL)		1	SS	5				○		
			2	SS	19	▽	256		○		
254.7			3	SS	6		255		○		
2.0	Silty **SAND**, some gravel, occasional wood fibres Loose Brown Moist (FILL)		4	SS	7				○		
253.8							254				
2.9	**SAND and SILT**, some clay, trace gravel, occasional oxide staining Compact Brown to Grey Moist (TILL)		5	SS	10		253		○		
			6	SS	22		252		○		2 45 41 11
	Dense to Very Dense		7	SS	120		251		○		
249.5							250				
7.2	Clayey **SILT**, sandy Hard Grey (TILL)		8	SS	77		249		○		0 19 64 17
							248				
			9	SS	45		247		○		

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+³, ×³: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
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RECORD OF BOREHOLE No 08-46 2 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 096.4 E 309 821.8, Station 10+060, 10m Rt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers / Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.17 - 2008.03.18 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
246.4	Clayey SILT, sandy										
10.3	Hard										
	Grey										
	(TILL)										
	Silty SAND, trace clay										
	Compact										
	Brown										
	Moist		10	SS	10		246				0 64 31 5
244.9											
11.8	Clayey SILT, sandy, trace gravel										
	Very Stiff to Hard										
	Grey										
	(TILL)		11	SS	46		245				
							244				
			12	SS	49		243				1 35 48 16
							242				
			13	SS	20		241				
			14	SS	27		240				0 31 50 19
							239				
			15	SS	46		238				3 35 47 15
							237				

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
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RECORD OF BOREHOLE No 08-46 3 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 096.4 E 309 821.8, Station 10+060, 10m Rt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Solid Stem Augers / Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.17 - 2008.03.18 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (40 80 120 160 200) O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Clayey SILT, sandy, trace gravel Hard Grey (TILL)		16	SS	35		236 235 234		o		1 36 48 15
233.6			17	SS	149/.275				o		
23.1	END OF BOREHOLE AT 23.1m. BOREHOLE OPEN TO 5.2m AND WATER LEVEL AT 0.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

20
15 5
10
(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 08-47 1 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 092.8 E 309 843.9, Station 10+040, Right Shoulder ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM

DATUM Geodetic DATE 2008.03.11 - 2008.03.12 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (40 80 120 160 200) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.4											
0.0	**ASPHALT:** (150mm)										
0.2	**SAND** and **GRAVEL**, some silt Compact to Dense Dark brown Moist (FILL)		1	SS	41		257				
			2	SS	18		256				
255.2			3	SS	10						
2.1	Silty **SAND**, trace gravel, trace clay Compact Brown Moist (FILL)		4	SS	19	▽	255				3 57 33 7
254.1											
3.3	**SAND** and **GRAVEL**, trace clay, occasional cobbles Compact Brown Moist (FILL)		5	SS	21		254				
253.0											
4.4	Clayey **SILT**, sandy, trace gravel, oxide staining Very Stiff Brown (TILL)		6	SS	18		253				
							252				
	Hard Grey		7	SS	160/275		251				1 30 52 17
							250				
			8	SS	55						4 25 53 18
							249				
			9	SS	59		248				

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-47 2 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 092.8 E 309 843.9, Station 10+040, Right Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.11 - 2008.03.12 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 40 80 120 160 200 (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Clayey SILT, sandy, trace gravel Hard Grey (TILL)						247				
			10	SS	50		246		○		
	Auger grinding at 11.6 to 11.9m										
			11	SS	59		245		○		1 13 63 23
			12	SS	65		244		○		
							243				
			13	SS	64		242		○		
							241				
			14	SS	73		240		○		1 34 48 17
							239		○		
			15	SS	37		238				

Continued Next Page

+^{3}, ×^{3}: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 08-47 3 OF 3 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 092.8 E 309 843.9, Station 10+040, Right Shoulder ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.11 - 2008.03.12 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	Clayey SILT, trace to some sand Hard Grey (TILL)		16	SS	36		237 236		o H		0 11 70 19
235.6 21.8	SILT, trace sand, trace gravel, trace clay Very Dense Grey Moist (TILL)		17	SS	100/ .100		235 234		o		
			18	SS	100/ .100		233 232		o		0 2 92 6
			19	SS	100/ .140		231		o		
229.7			20	SS	100/ .100		230		o		
27.7	END OF BOREHOLE AT 27.7m. BOREHOLE OPEN AND WATER LEVEL AT 2.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO 0.2m THEN ASPHALT TO SURFACE.										

+ ³, × ³: Numbers refer to Sensitivity

20
15 ⊕ 5
10
(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No QSR4-1 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 148.9 E 309 855.8, Station 10+088, 50m Lt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.07 - 2008.03.07 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
253.7								
0.0	Silty CLAY, trace sand, trace gravel, trace organics and topsoil Firm Dark Brown (FILL)		1	SS	4			
			2	SS	5	▽	253	
252.2								
1.5	SAND and SILT, some clay to clayey, trace gravel, occasional oxide staining Loose to Dense Brown Moist (TILL)		3	SS	8		252	
			4	SS	16		251	1 25 54 20
			5	SS	42		250	
	Grey		6	SS	34		249	
			7	SS	25		248	
							247	1 40 44 15
	Wet		8	SS	24		246	
							245	
	Very Dense Moist		9	SS	73		244	

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
SHEAR STRENGTH kPa 40 80 120 160 200
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60
UNIT WEIGHT γ kN/m^3

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

20 15 5 10 (%) STRAIN AT FAILURE

ONTMT4S 0598.GPJ 9/24/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No QSR4-1 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 148.9 E 309 855.8, Station 10+088, 50m Lt ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM

DATUM Geodetic DATE 2008.03.07 - 2008.03.07 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, some clay, trace gravel Very Dense Grey Moist (TILL)										
			10	SS	100/ .150		243		o		1 22 60 17
							242				
240.9			11	SS	82				o		
12.8	END OF BOREHOLE AT 12.8m. BOREHOLE OPEN TO 12.8m AND WATER LEVEL AT 1.1m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 10/5/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No QSR4-2 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 123.9 E 309 859.4, Station 10+084, 25m Lt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.07 - 2008.03.07 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
254.9									
0.0	Silty CLAY, trace sand, trace gravel, some topsoil, occasional rootlets Firm Dark Brown (FILL)		1	SS	6				
254.2 0.6	SAND and SILT, some clay, trace gravel, occasional oxide staining Loose to Compact Brown Moist (TILL)		2	SS	9		254		
			3	SS	20		253		
	Dense to Compact		4	SS	50		252		1 29 52 18
			5	SS	25				
	Grey Wet						251		
			6	SS	26		250		
							249		
			7	SS	31				1 26 56 17
							248		
			8	SS	27		247		
	Moist						246		
			9	SS	42				2 35 52 11
							245		

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
40 80 120 160 200

PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

Continued Next Page

+³, ×³: Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

ONTMT4S 0598.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No QSR4-2 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 123.9 E 309 859.4, Station 10+084, 25m Lt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.07 - 2008.03.07 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, some clay, trace gravel Dense to Very Dense Grey Moist (TILL)										
			10	SS	50		244		o		
243.6											
11.3	END OF BOREHOLE AT 11.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)	ELEV. (m)
2008.03.20	3.3	251.6
2008.04.18	2.5	252.4
2008.06.30	1.0	253.9
2008.07.29	0.8	254.1
2008.10.24	0.9	254.0
2008.11.28	1.0	253.9
2009.02.06	0.9	254.0
2009.02.20	0.9	254.0
2009.03.20	0.8	254.1
2009.04.22	0.8	254.1
2009.05.15	0.9	254.0
2009.06.05	1.3	253.6
2009.07.29	0.1*	255.0
2009.08.05	1.0*	255.9
2009.09.02	0.5*	255.4
2009.09.21	0.3	254.6

* (above ground surface)

$+^3$, $\times^3$: Numbers refer to Sensitivity

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

ONTMT4S 0596.GPJ 11/26/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No QSR4-3 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 098.8 E 309 863.0, Station 10+080, centreline ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.17 - 2008.03.17 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.2									
0.0	**ASPHALT:** (150mm)								
0.2	Gravelly **SAND** Dense Dark Brown Dry (FILL)		1	SS	46		257		
256.1			2	SS	19		256		
1.1	Sandy **SILT**, some clay, trace gravel Very Loose to Compact Brown Wet (FILL)		3a	SS	2	▽			
255.3			3b	SS			255		
1.8	Silty **CLAY**, some sand, trace gravel, some organics and topsoil Soft to Firm Brown (FILL)		4	SS	4				
	occasional wood fibres		5	SS	6		254		
253.0									
4.1	**SAND** and **SILT**, some clay to clayey, trace gravel, occasional oxide staining Compact Grey Moist (TILL)		6	SS	11		253		1 23 55 21
							252		
			7	SS	19		251		
	Very Dense						250		
			8	SS	74		249		7 48 35 10
							248		
			9	SS	84				

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
SHEAR STRENGTH kPa 40 80 120 160 200
○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity
15 20 10 5 (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No QSR4-3 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 098.8 E 309 863.0, Station 10+080, centreline ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.03.17 - 2008.03.17 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, some clay, trace gravel Dense Grey (TILL)						247				
245.9			10	SS	38		246				1 33 48 18
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 6.7m AND WATER LEVEL AT 1.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO 0.2m THEN ASPHALT TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

15 10 20 5 (%) STRAIN AT FAILURE

ONTMT4S 0598.GPJ 10/5/09

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No QSR4-4 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 074.3 E 309 868.5, Station 10+078, 25m Rt ORIGINATED BY ES

HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM

DATUM Geodetic DATE 2008.02.25 - 2008.02.25 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
255.4											
0.0	Silty CLAY, mixed with topsoil, trace sand, occasional rootlets Very soft to firm Brown Moist (FILL)		1	SS	1						
			2	SS	4						
	occasional wood fibres		3	SS	4						
253.3											
2.1	SAND and SILT, some clay, trace gravel Compact to Dense Grey Moist (TILL)		4	SS	32						
			5	SS	15						0 32 50 18
			6	SS	18						
			7	SS	37						
			8	SS	26						0 23 56 21
			9	SS	14						

Continued Next Page

+³, ×³: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No QSR4-4 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 074.3 E 309 868.5, Station 10+078, 25m Rt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.02.25 - 2008.02.25 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and **SILT**, some clay, trace gravel Compact Grey Moist (TILL)						245				
244.2			10	SS	27						2 31 49 18
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 10.7m AND WATER LEVEL AT 0.8m UPON COMPLETION. Piezometer installation consists of 19mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2008.02.28 3.4 252.0 2008.03.07 3.0 252.4 2008.03.20 0.6 254.8 2008.04.18 Ground surface 255.4 2008.06.30 1.0 254.4 2008.07.10 0.8 254.6 2008.07.29 Ground surface 255.4 2008.08.05 0.8* 256.2 2008.09.02 0.9* 256.3 2008.09.21 0.8* 256.2 * (above ground surface)										

$+^3$, $\times^3$: Numbers refer to Sensitivity (%) STRAIN AT FAILURE

ONTMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No QSR4-5 1 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 049.6 E 309 873.1, Station 10+075, 50m Rt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.02.25 - 2008.02.25 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 40 80 120 160 200	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
255.4											
0.0	Clayey SILT, mixed with topsoil, trace sand, occasional rootlets Soft to Stiff Brown (FILL)		1	SS	2		255		○		
254.8											
0.6	Sandy SILT, some clay Loose to Compact Brown Moist (FILL)		2	SS	4	▽	254		○		
			3	SS	8				○		
253.0							253				
2.4	SAND and SILT, some clay to clayey, trace gravel, occasional oxide staining Compact Grey (TILL)		4	SS	20				○		
			5	SS	11		252		⊢●		0 20 58 22
			6	SS	12		251		⊢○		2 18 44 36
			7	SS	17		250		○		
			8	SS	14		249		○		
			9	SS	15		248		○		
							247				
							246		⊢●		2 31 49 18

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ON TMT4S 0596.GPJ 9/24/09

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No QSR4-5 2 OF 2 METRIC

G.W.P. 2109-05-00 LOCATION N 4 889 049.6 E 309 873.1, Station 10+075, 50m Rt ORIGINATED BY ES
HWY 404 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM
DATUM Geodetic DATE 2008.02.25 - 2008.02.25 CHECKED BY AEG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE) (40 80 120 160 200)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)						245				
244.7 10.7			10	SS	100/ .075				○		
	END OF BOREHOLE AT 10.7m. BOREHOLE OPEN AND WATER LEVEL AT 0.8m UPON COMPLETION. BOREHOLE BACKFILLED WITH HOLEPLUG TO 1.2m THEN AUGER CUTTINGS TO SURFACE.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

20
15 ⊕ 5 (%) STRAIN AT FAILURE
10

ONTMT4S 0596.GPJ 9/24/09

PROJECT 04-1111-016

RECORD OF BOREHOLE No BH 301

1 OF 2 METRIC

W.P.

LOCATION N 4889092.6 ;E 309821.8

ORIGINATED BY PKS

DIST Central HWY 404

BOREHOLE TYPE 108 mm Diameter Solid Stem Augers

COMPILED BY DD

DATUM Geodetic

DATE JUNE 11, 2004

CHECKED BY LCC

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.5	GROUND SURFACE											
0.0 / 256.9	Sand and gravel (FILL) Compact Brown Moist		1	SS	14		257					
0.6 / 255.3	Silty sand, some gravel, trace clay (FILL) Compact to loose Brown Moist		2	SS	14							
			3	SS	7		256					
2.2 / 253.8	Clayey Silt with sand, trace gravel Firm to stiff Brown Wet		4	SS	5		255					
			5	SS	8							0 28 65 7
3.7	Clayey Silt, some sand, trace gravel (TILL) Stiff to hard Brown Wet		6	SS	11		254					
			7	SS	15	▽	253					
			8	SS	40		252					
	Becoming grey below 7.6 m depth		9	SS	56		251					1 15 68 16
247.9							250					
9.6 / 245.9	Silty Sand, trace gravel Compact Grey Wet		10	SS	45		249					
			11	SS	14		248					
11.6	Clayey Silt, some sand, trace gravel (TILL) Hard Grey Moist		12	SS	33		247					
			13	SS	39		246					
							245					
							244					
							243					

Continued Next Page

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

PROJECT 04-1111-016

RECORD OF BOREHOLE No BH 301

2 OF 2 METRIC

W.P.

LOCATION N 4889092.6 ;E 309821.8

ORIGINATED BY PKS

DIST Central HWY 404

BOREHOLE TYPE 108 mm Diameter Solid Stem Augers

COMPILED BY DO

DATUM Geodetic

DATE JUNE 11, 2004

CHECKED BY LCC

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (20 40 60 80 100): O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × REMOULDED	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	--- CONTINUED FROM PREVIOUS PAGE ---										
241.8			14	SS	32		242				
15.7	End of Borehole										
	Note:										
	Water level at 4.9 m depth (Elevation 252.6 m) upon completion of drilling										

$+^3, \times^3$: Numbers refer to Sensitivity

$O^{3\%}$ STRAIN AT FAILURE

PROJECT 04-1111-016

RECORD OF BOREHOLE No BH 301A

1 OF 2 METRIC

W.P.

LOCATION N 4889107.0 ;E 309821.9

ORIGINATED BY PKS

DIST Central HWY 404

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers

COMPILED BY DD

DATUM Geodetic

DATE SEPTEMBER 27, 28, 2004

CHECKED BY LCC

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × REMOULDED) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
256.0	GROUND SURFACE										
0.0	Augered from 0.0 m to 12.2 m depth without sampling. Refer to Record of Borehole 301 for subsurface conditions over this interval.					▽	255				
							254				
							253				
							252				
							251				
							250				
							249				
							248				
							247				
							246				
							245				
243.8							244				
12.2	Clayey Silt, some sand, trace gravel (TILL) Stiff to hard Grey Moist to wet		1	SS	32						
							243				
			2	SS	11		242				1 29 57 13

Continued Next Page

+ 3 , × 3 : Numbers refer to Sensitivity

O 3% STRAIN AT FAILURE

PROJECT 04-1111-016

W.P.

DIST Central HWY 404

DATUM Geodetic

RECORD OF BOREHOLE No BH 301A

2 OF 2 METRIC

LOCATION N 4889107.0 ;E 309821.9

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers

DATE SEPTEMBER 27, 28, 2004

ORIGINATED BY PKS

COMPILED BY DD

CHECKED BY LCC

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED; 20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	--- CONTINUED FROM PREVIOUS PAGE ---										
	Clayey Silt, some sand, trace gravel (TILL) Stiff to hard Grey Moist to wet		3	SS	12		240				
238.9											
17.1	Interlayered Clayey Silt, trace sand, and Silt, trace clay and sand, containing clay seams Hard/Very dense Grey Moist to wet		4	SS	59		239				
			5	SS	100		238				
			6	SS	121		237				
			7	SS	108		236				0 1 89 10
			8	SS	100/.18		235				
							234				
							233				
231.0							232				
25.0	End of Borehole		9	SS	76						

Notes:

1. Water level in piezometer measured at 2.7 m depth (Elevation 253.3 m) on September 28, 2004 and at 0.7m above ground surface. (Elevation 256.7m) on October 7, 2004.

$+^3, \times^3$: Numbers refer to Sensitivity

$O^{3\%}$ STRAIN AT FAILURE

PROJECT 04-1111-016

W.P.

DIST Central HWY 404

DATUM Geodetic

RECORD OF BOREHOLE No BH 302

1 OF 2 METRIC

LOCATION N 4889084.1 ;E 309781.5

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers

DATE SEPTEMBER 28, 2004

ORIGINATED BY PKS

COMPILED BY DD

CHECKED BY LCC

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.0	GROUND SURFACE							
0.0	Topsoil							
0.1	Silty sand (FILL) Loose Brown Moist		1	SS	6			
258.3								
0.7	Clayey silt, some sand, trace gravel, trace asphalt fragments (FILL) Firm Dark brown Moist		2	SS	6			
257.5								
1.5	Clayey Silt, some sand, trace gravel Stiff Mottled brown Moist		3	SS	10			3 21 43 33
			4	SS	9			
256.0								
3.0	Sand and Silt, trace gravel, trace clay, containing lenses/interlayers of sand and gravel (TILL) Compact to very dense Brown to grey Moist		5	SS	14			
			6	SS	23			
			7	SS	23			
			8	SS	32			
			9	SS	38			2 38 53 7
			10	SS	39			
			11	SS	39	▽		
			12	SS	74			
			13	SS	81			

ELEVATION SCALE: 258, 257, 256, 255, 254, 253, 252, 251, 250, 249, 248, 247, 246, 245

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa 20 40 60 80 100
O UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × REMOULDED

PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L

WATER CONTENT (%) 10 20 30

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

$O^{3\%}$ STRAIN AT FAILURE

PROJECT 04-1111-016

RECORD OF BOREHOLE No BH 302

2 OF 2 METRIC

W.P.

LOCATION N 4889084.1 ;E 309781.5

ORIGINATED BY PKS

DIST Central HWY 404

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers

COMPILED BY DD

DATUM Geodetic

DATE SEPTEMBER 28, 2004

CHECKED BY LCC

ELEV / DEPTH	SOIL PROFILE: DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (20 40 60 80 100): O UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × REMOULDED	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	-- CONTINUED FROM PREVIOUS PAGE --										
	Sand and Silt, trace gravel, trace clay, containing lenses/interlayers of sand and gravel (TILL) Compact to very dense Brown to grey Moist		14	SS	102		243		cH		1 34 54 11
			15	SS	100/.23		242				
240.5							241				
18.5	End of Borehole		16	SS	100/.18						

Note:

Water level in piezometer measured at 10.7 m depth (Elevation 248.3 m) on September 29, 2004.

$+^{3}$, $\times^{3}$: Numbers refer to Sensitivity

$O^{3\%}$ STRAIN AT FAILURE

PROJECT 04-1111-016

W.P.

DIST Central HWY 404

DATUM Geodetic

RECORD OF BOREHOLE No BH 303

1 OF 1 **METRIC**

LOCATION N 4889071.0 ;E 309743.7

BOREHOLE TYPE 108 mm I.D. Hollow Stem Augers

DATE SEPTEMBER 29, 2004

ORIGINATED BY PKS

COMPILED BY DD

CHECKED BY LCC

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × REMOULDED) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
261.0	GROUND SURFACE										
0.0	Silty Sand, some organics (FILL) Very loose to loose Brown Moist		1	SS	4						
259.5			2	SS	6		260				
1.5	Clayey Silt, some sand, trace gravel, trace organics Stiff		3	SS	11						
258.8	Brown Moist						259				
2.2	Silty Sand, trace clay, trace gravel, trace organics Dense		4	SS	33						
258.0	Brown Moist						258				
3.0	Sand and Silt, trace clay, some gravel (TILL) Dense to very dense Brown, becoming grey below 9.1 m depth Moist to wet below 3.7 m depth		5	SS	36						
			6	SS	33		257				
			7	SS	40		256				32 28 35 5
			8	SS	67		255				
			9	SS	100/.23		254				
			10	SS	100/.23	▽	253				
			11	SS	100/.13		252				
			12	SS	100/.18		251				
							250				
247.1							249				
13.9	End of Borehole		13	SS	100/.15		248				

Note:
Water level at 9.1 m depth (Elevation 250.9 m) upon completion of drilling.

$+^3, \times^3$: Numbers refer to Sensitivity

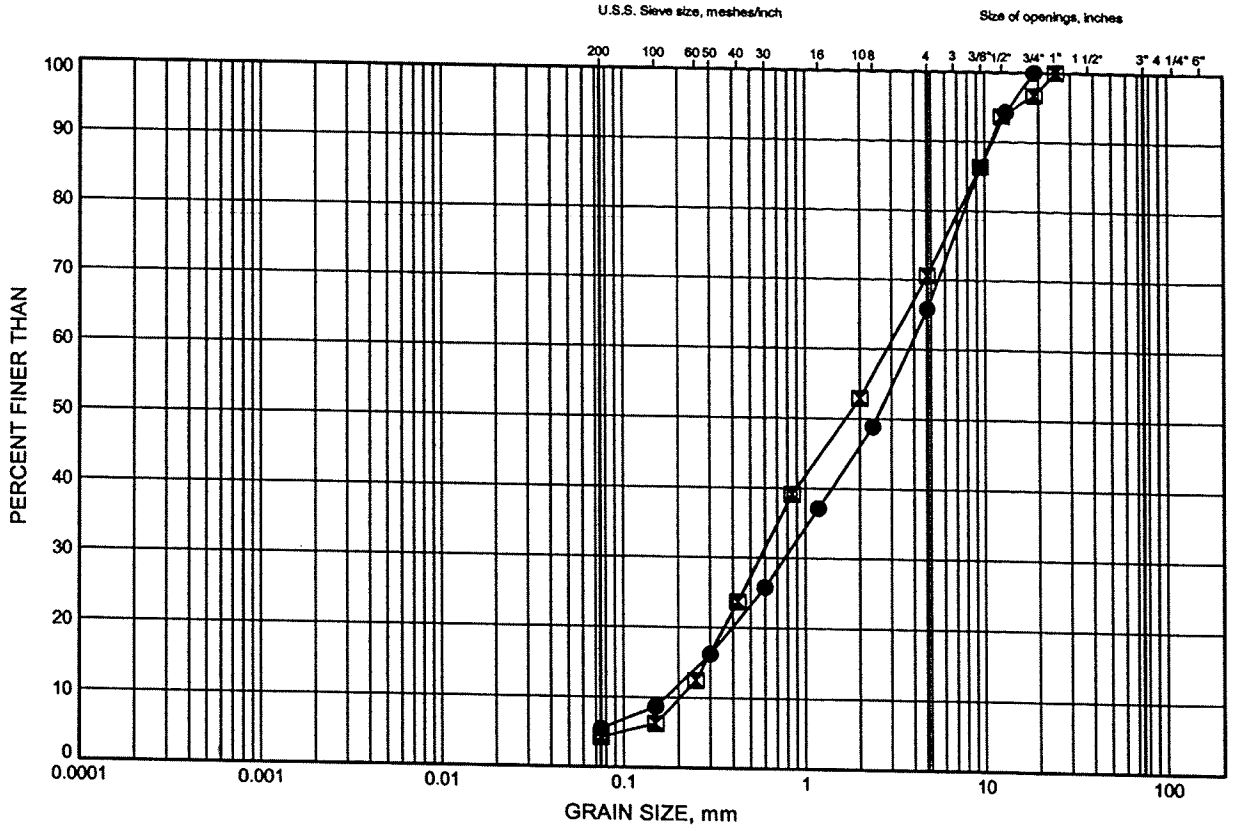
$O^{3\%}$ STRAIN AT FAILURE

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E1

GRAVELLY SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-35	0.46	277.19
⊠	08-41	0.46	263.24

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

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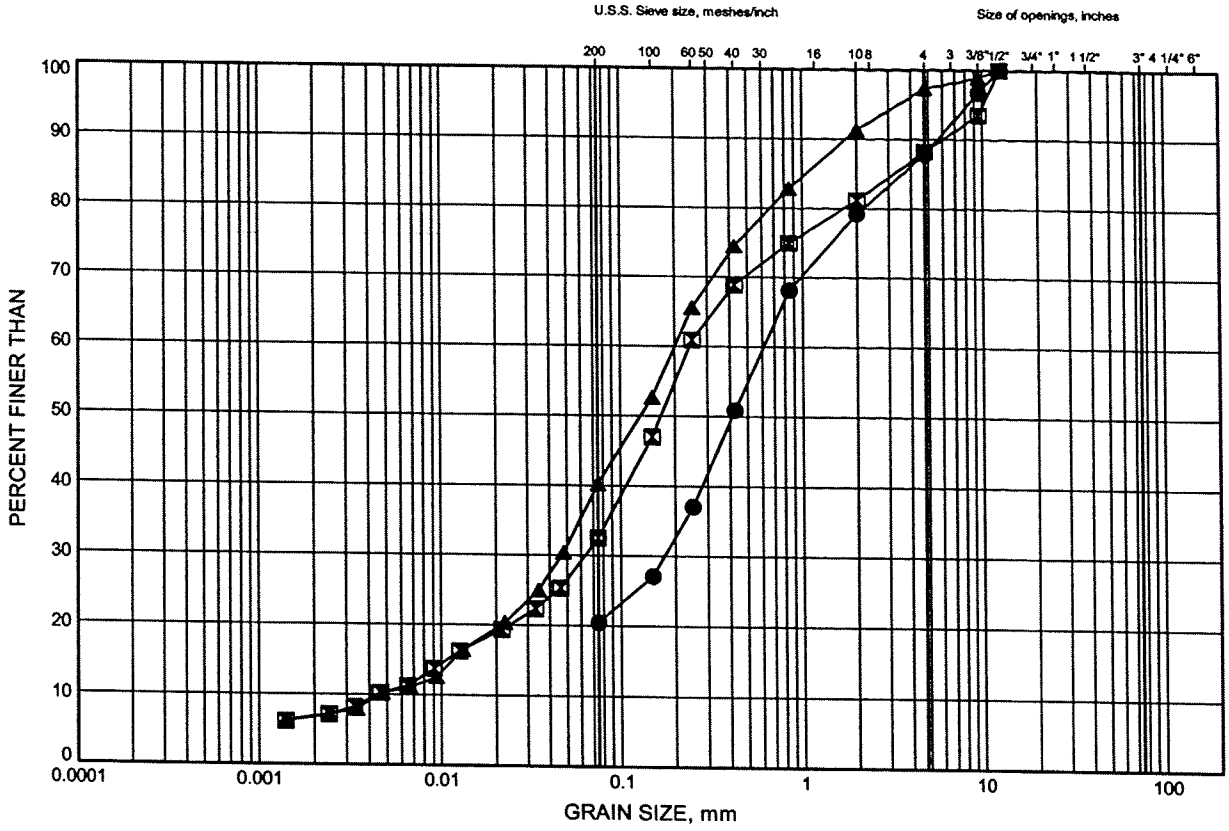
Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E2

SILTY SAND FILL & SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-42	0.91	263.53
⊠	08-43	0.99	262.87
▲	08-47	2.82	254.56

W.P.# 2109-05-00
Prepared By AN
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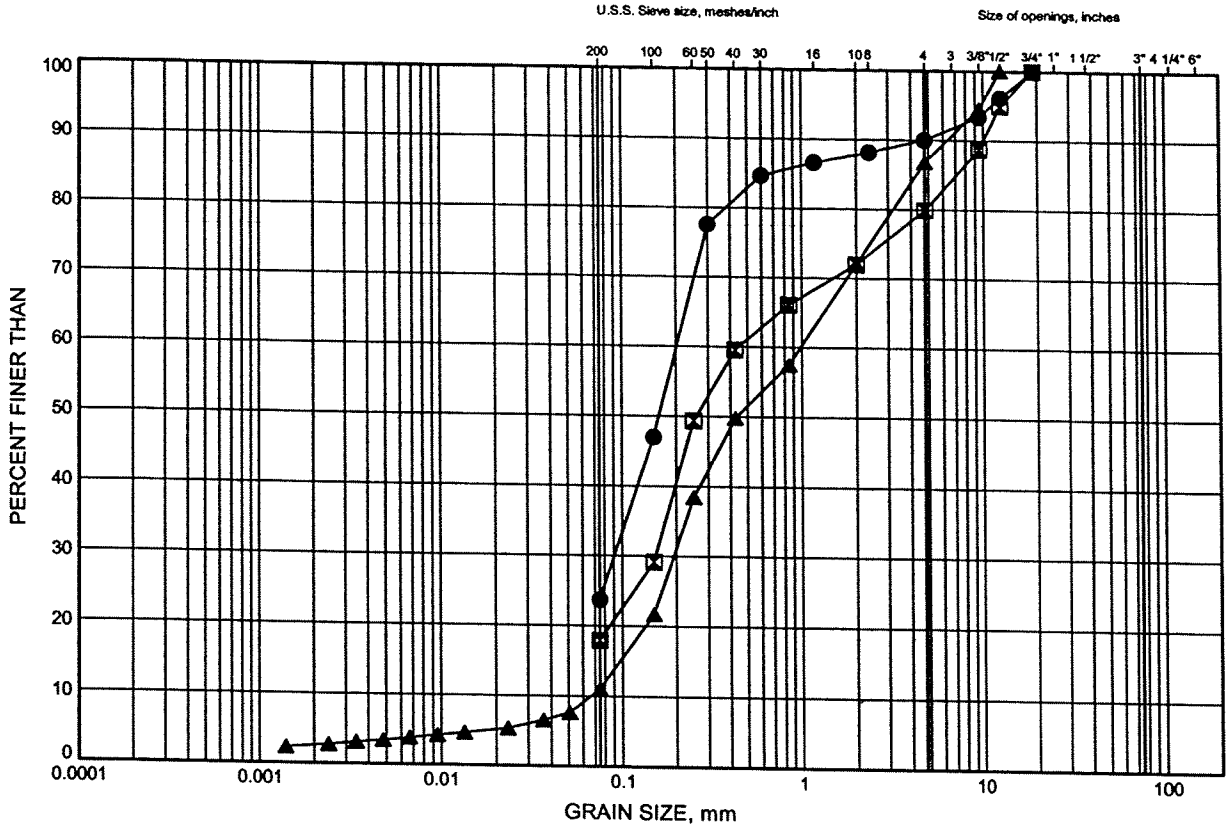
FIGURE E3

SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-36	1.75	271.73
⊠	08-44	2.51	256.58
▲	08-61	1.07	283.83

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

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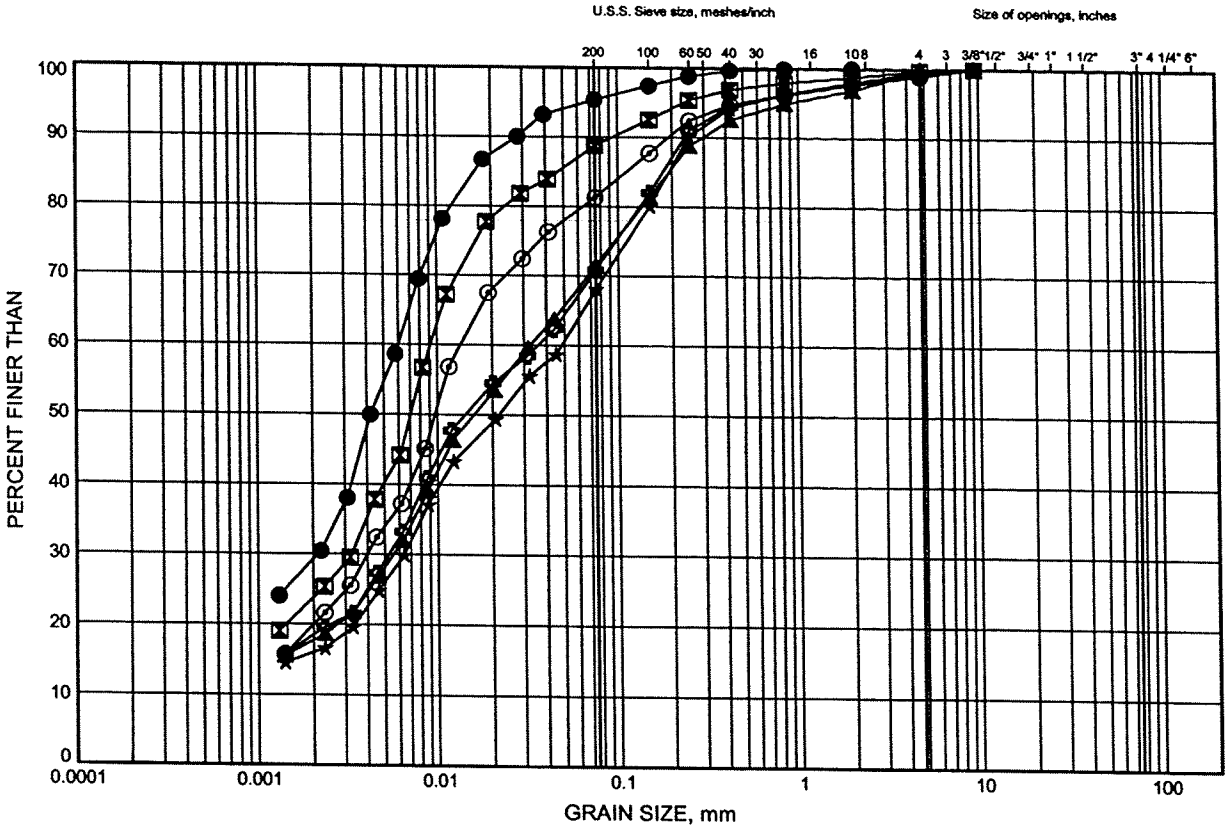
GRAIN SIZE DISTRIBUTION

FIGURE E4

CLAYEY SILT & CLAYEY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-38A	2.51	254.79
⊠	08-38A	4.80	252.50
▲	08-38A	9.37	247.93
★	08-38A	13.94	243.36
⊙	08-39	2.51	256.44
✿	08-39	6.32	252.63

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

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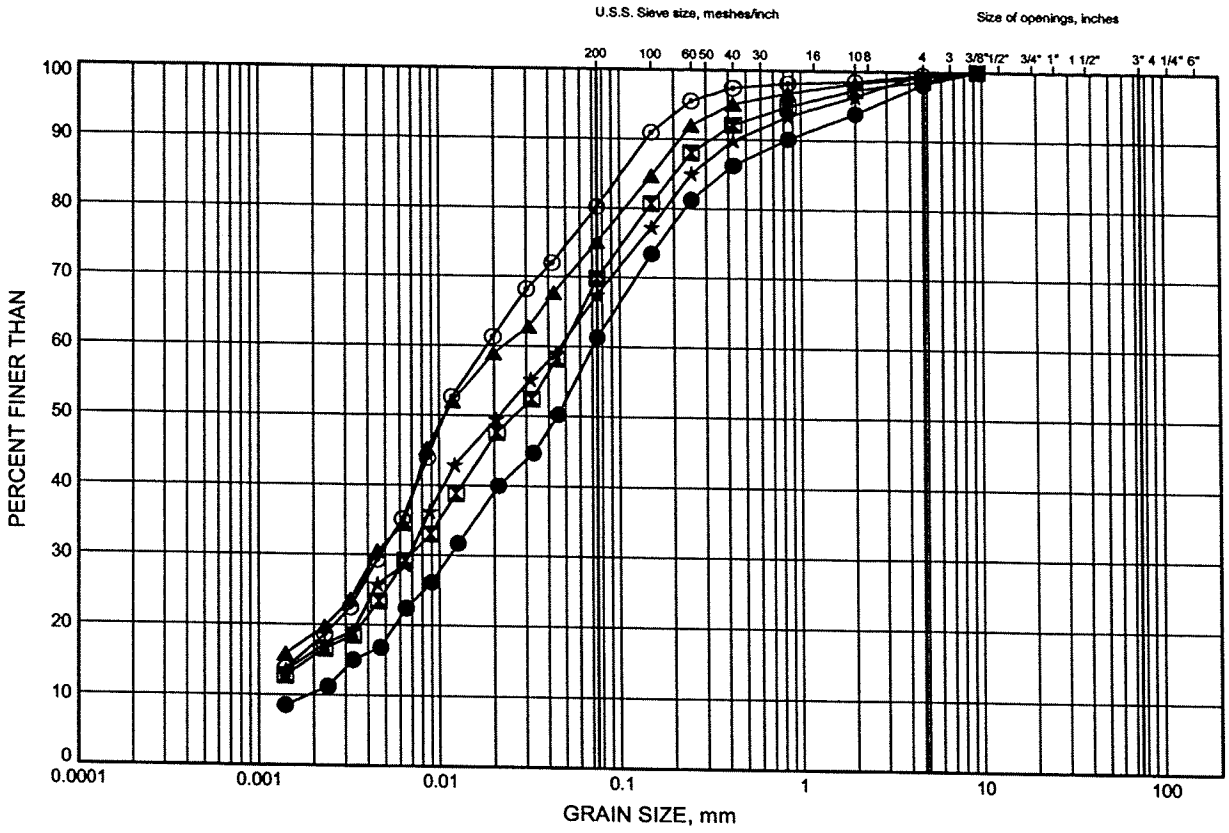
GRAIN SIZE DISTRIBUTION

FIGURE E5

CLAYEY SILT & CLAYEY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-40	3.28	258.03
⊠	08-40	6.40	254.91
▲	08-41	2.51	261.19
★	08-42	1.83	262.61
⊙	08-46	7.92	248.78

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

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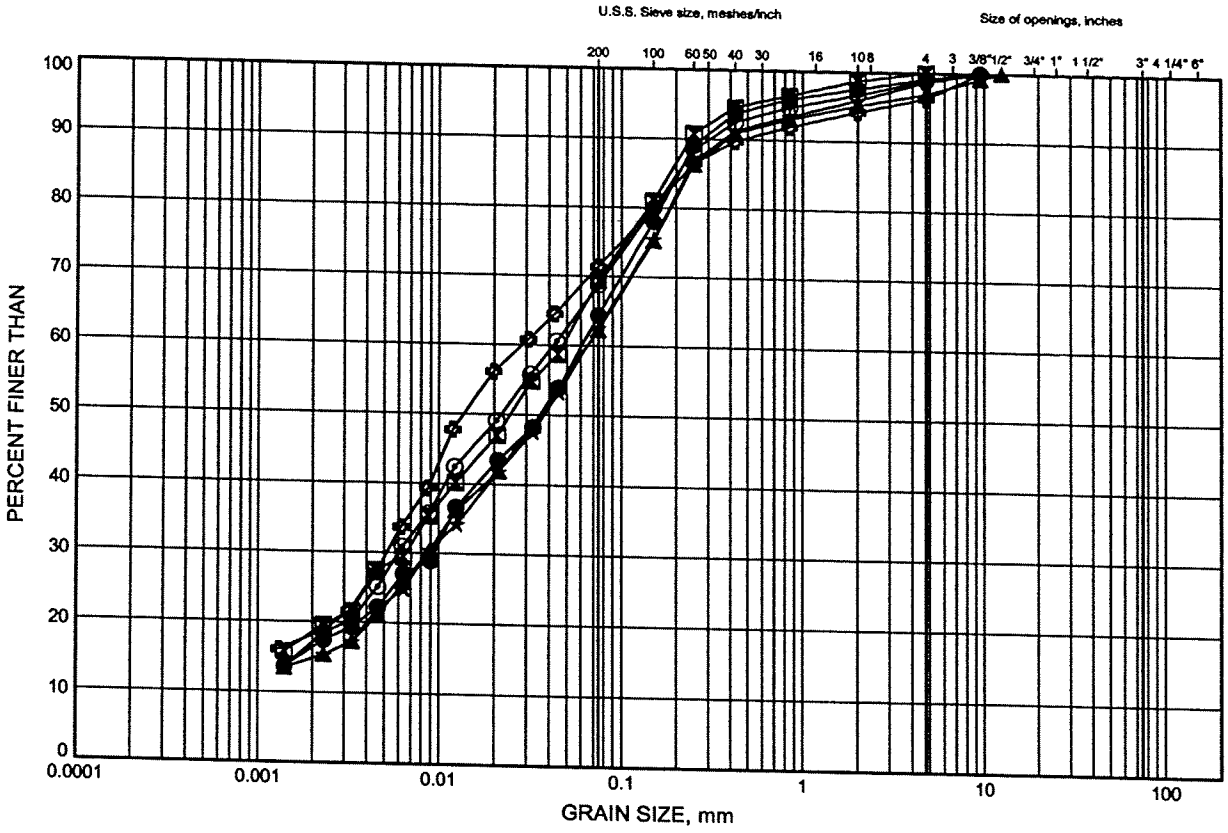
GRAIN SIZE DISTRIBUTION

FIGURE E6

CLAYEY SILT & CLAYEY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-46	14.02	242.68
⊠	08-46	17.07	239.63
▲	08-46	18.52	238.18
★	08-46	20.12	236.58
⊙	08-47	6.32	251.06
✿	08-47	7.92	249.46

W.P.# .2109-05-00.....
Prepared By .AN.....
Checked By .RPR.....

THURBER

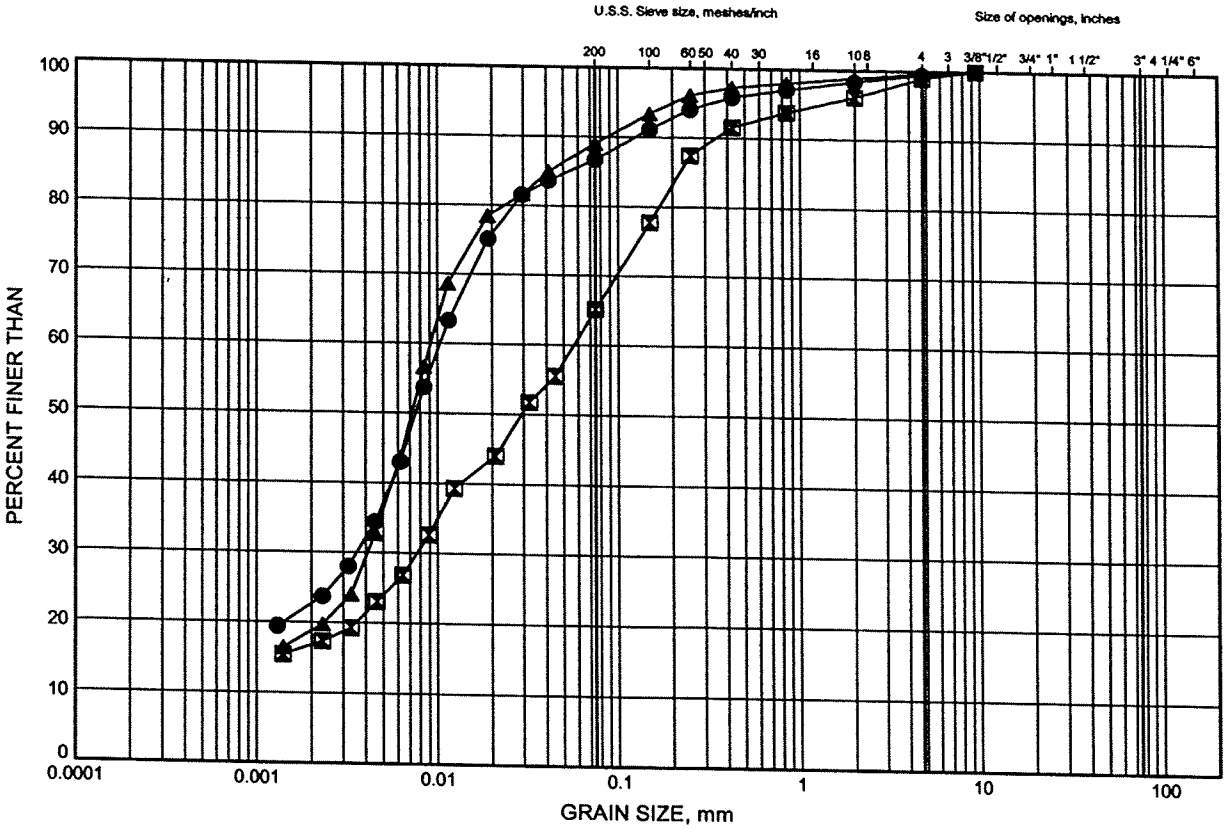
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E7

CLAYEY SILT & CLAYEY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-47	12.50	244.88
⊠	08-47	17.07	240.31
▲	08-47	20.12	237.26

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

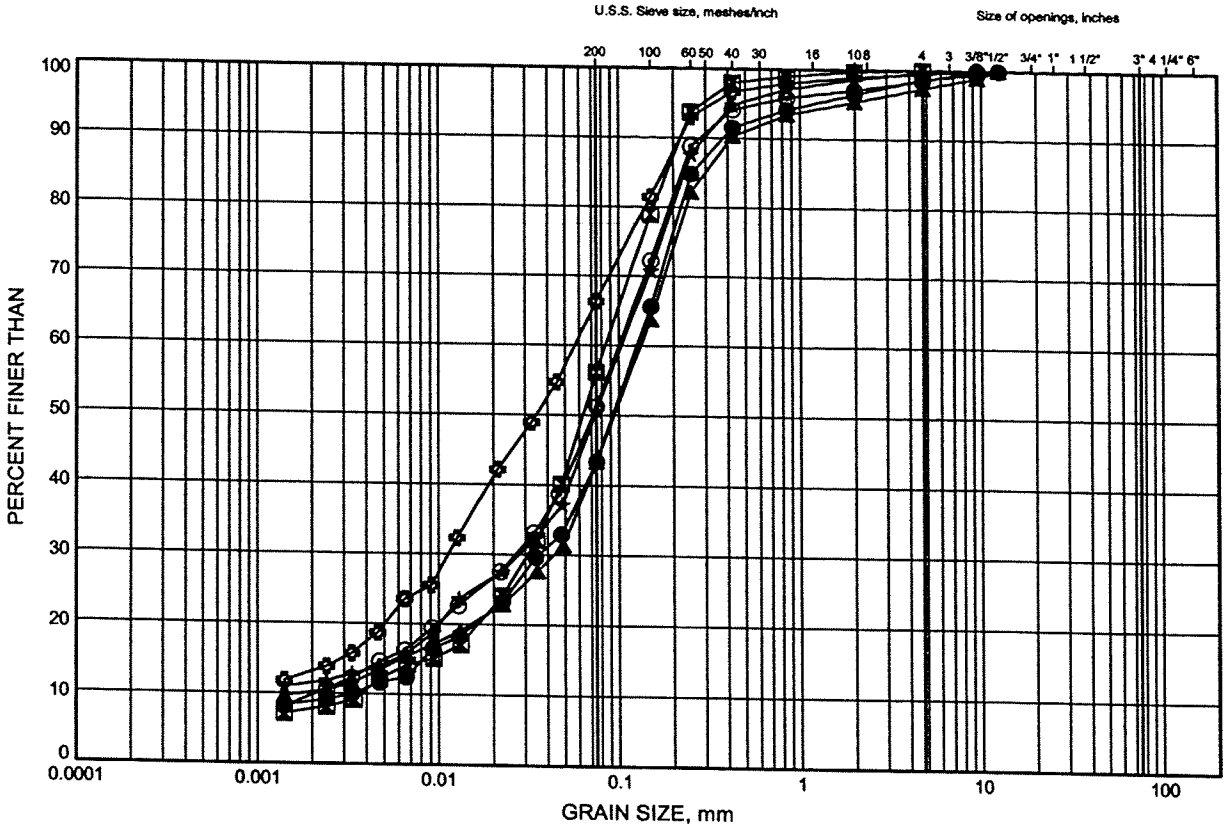
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E8

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-33	1.75	282.27
⊠	08-33	4.62	279.40
▲	08-33A	1.83	284.37
★	08-33A	3.35	282.85
⊙	08-34	2.51	278.82
✿	08-34	4.80	276.53

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

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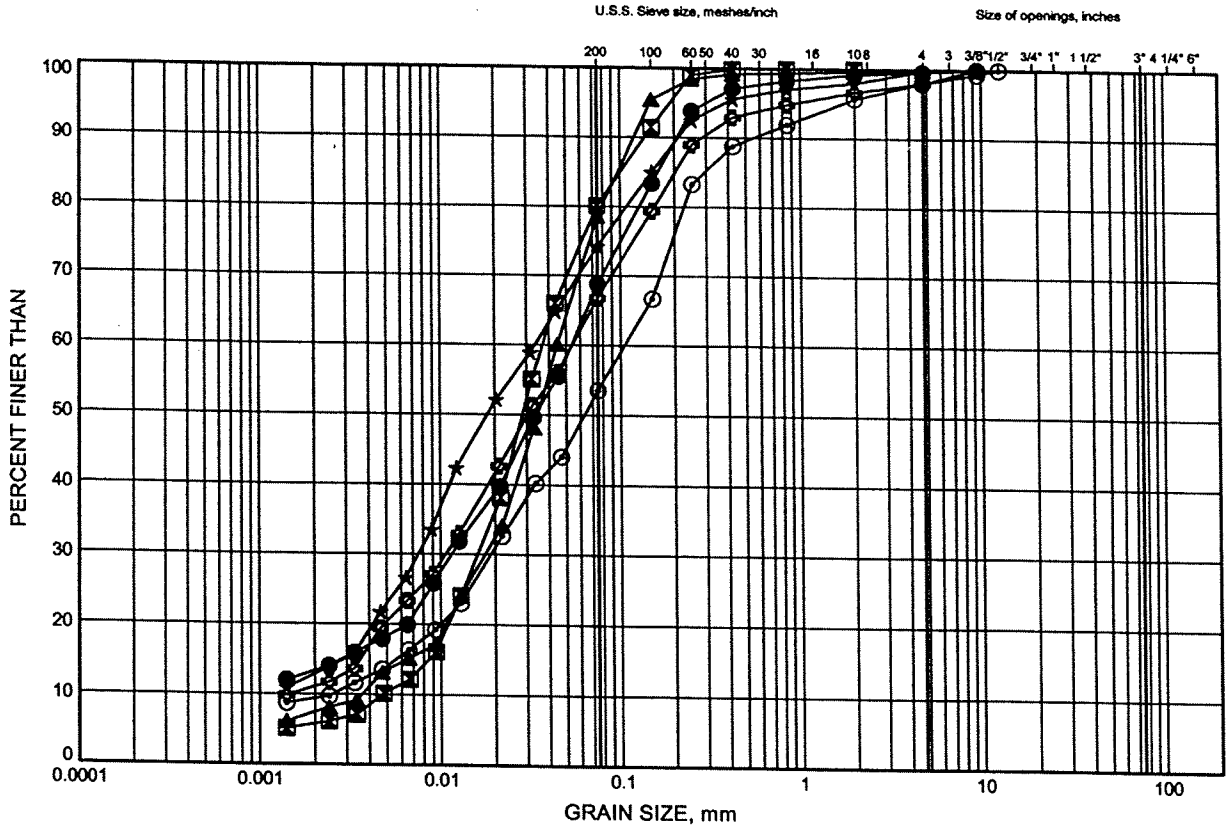
Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E9

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-35	2.51	275.14
⊠	08-35	4.71	272.94
▲	08-36	3.12	270.36
★	08-36	6.14	267.34
⊙	08-37	2.51	267.62
✪	08-37	3.26	266.87

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

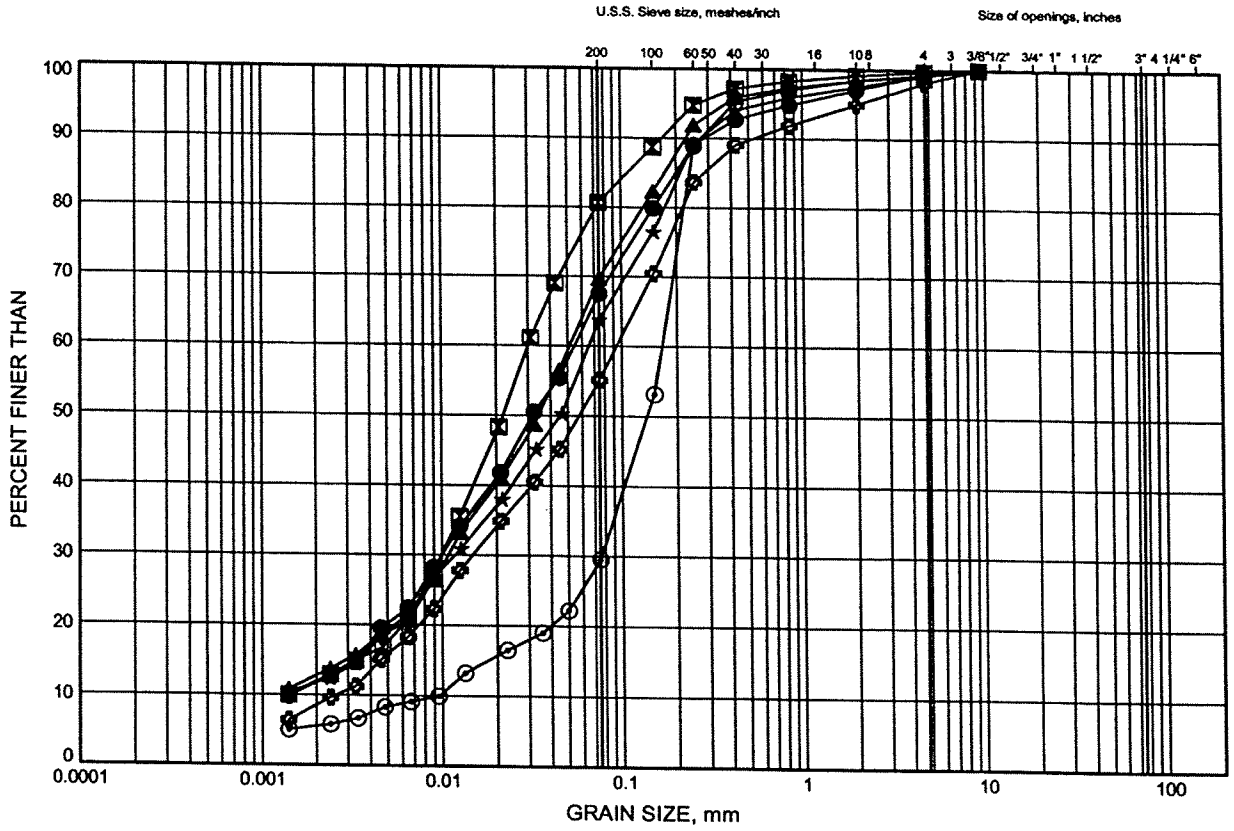
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E10

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-37	6.14	263.99
⊠	08-38	2.51	264.34
▲	08-38	10.71	256.14
★	08-39	9.28	249.67
⊙	08-39	10.97	247.98
✿	08-40	10.69	250.62

W.P.# .2109-05-00.....
Prepared By .AN.....
Checked By .RPR.....

THURBER

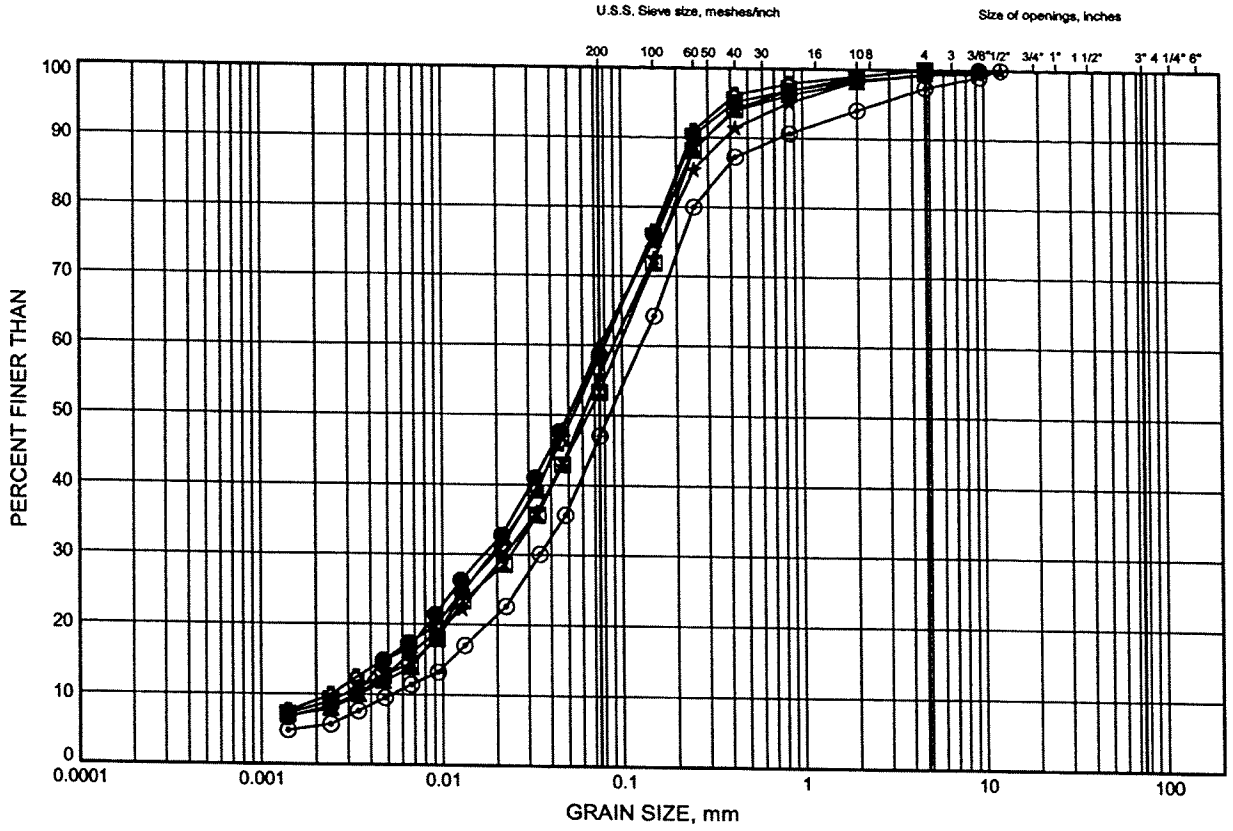
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E11

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-41	6.16	257.54
⊠	08-42	4.72	259.72
▲	08-43	3.28	260.58
★	08-44	4.80	254.29
⊙	08-44	7.85	251.24
✿	08-44	10.73	248.36

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

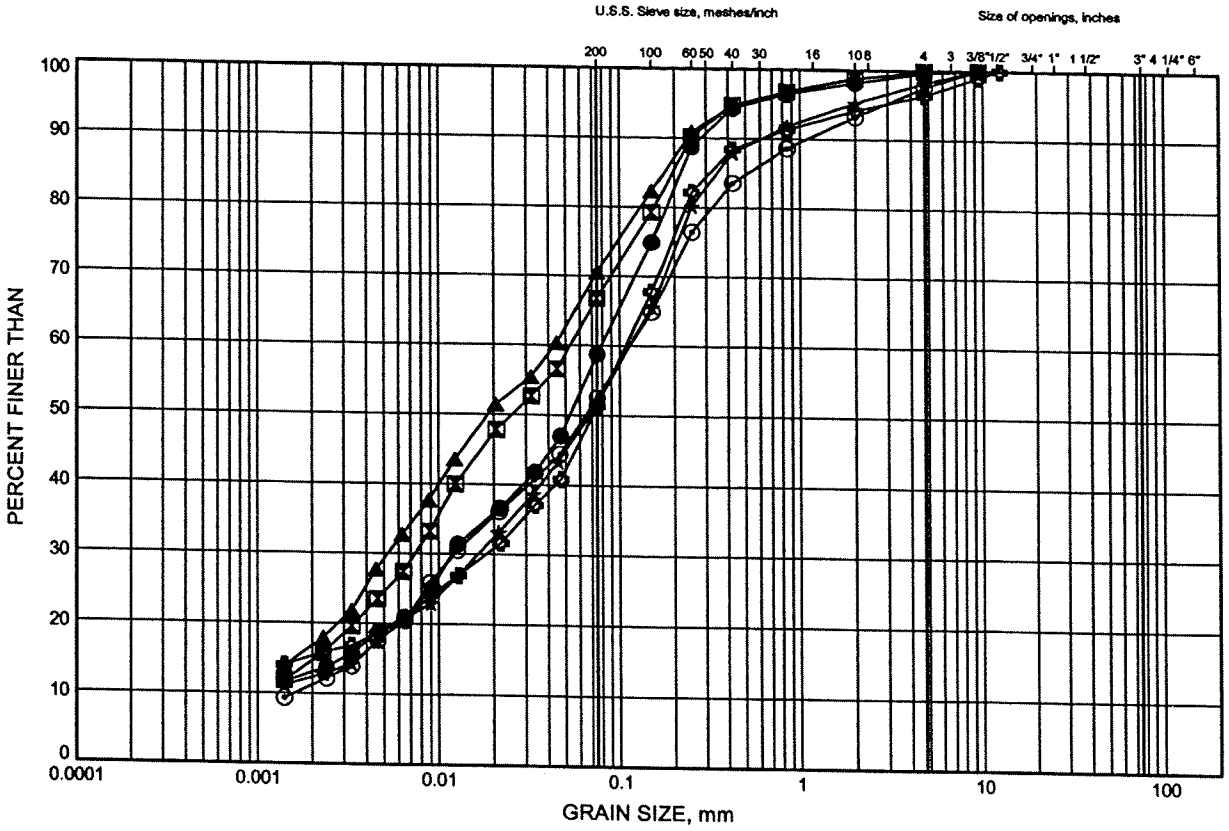
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E12

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-45	3.28	254.99
⊠	08-45	7.85	250.42
▲	08-45	15.47	242.80
★	08-45	19.87	238.40
⊙	08-46	4.88	251.82
✿	08-61	2.44	282.46

W.P.# 2109-05-00
Prepared By AN
Checked By RPR

THURBER

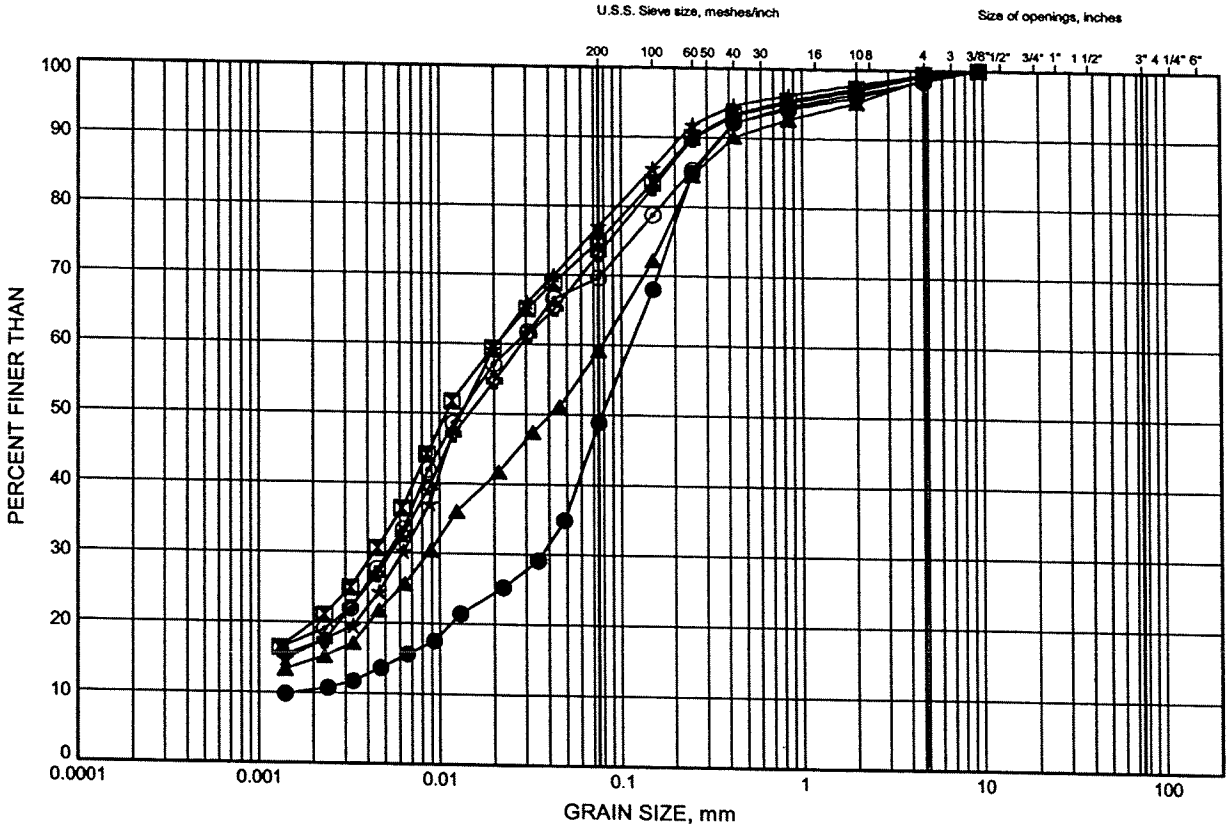
GRAIN SIZE DISTRIBUTION - THURBER 0596.GPJ 9/24/09

Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E13

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-61	6.40	278.50
⊠	QSR4-1	2.59	251.15
▲	QSR4-1	6.40	247.34
★	QSR4-1	10.90	242.84
⊙	QSR4-2	2.59	252.26
✿	QSR4-2	6.40	248.45

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Prepared By AN
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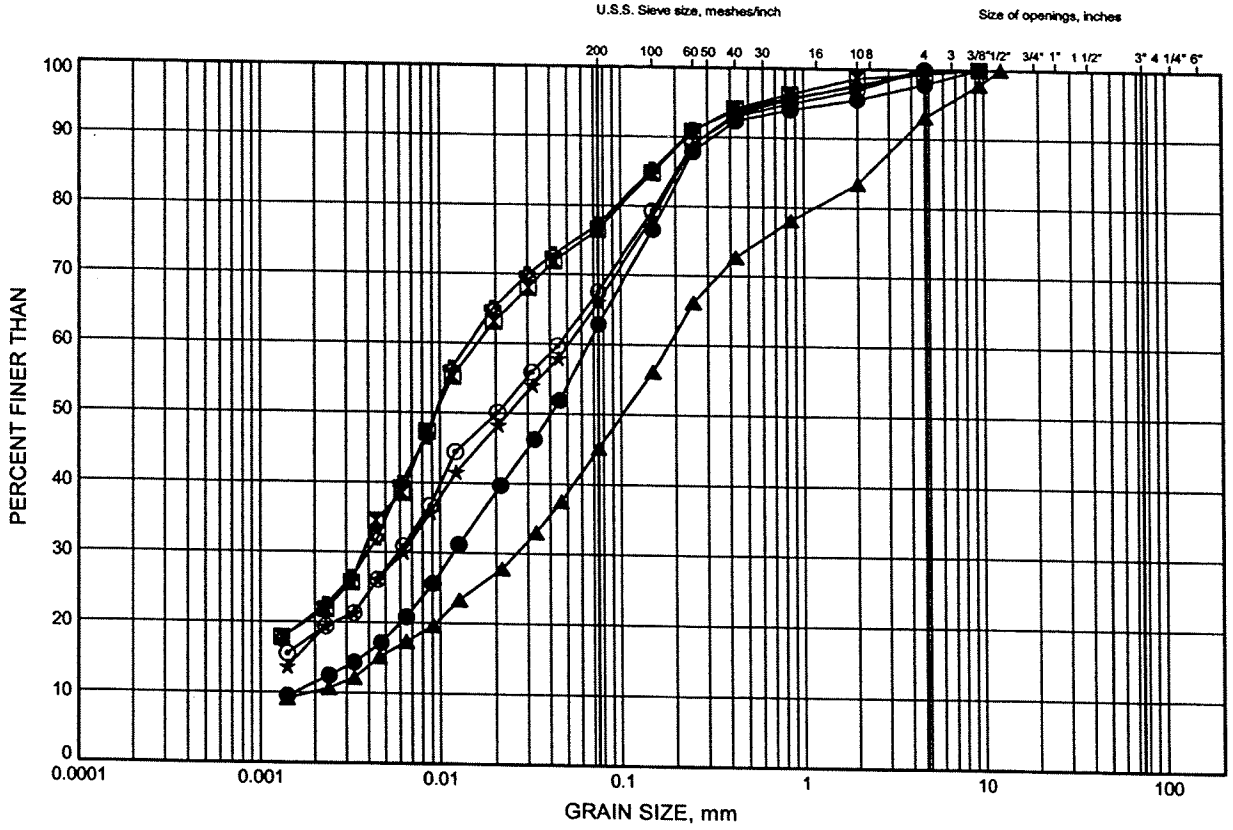
Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E14

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	QSR4-2	9.45	245.40
⊠	QSR4-3	4.88	252.27
▲	QSR4-3	7.92	249.23
★	QSR4-3	10.97	246.18
⊙	QSR4-4	3.35	252.08
✿	QSR4-4	7.92	247.51

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Prepared By AN
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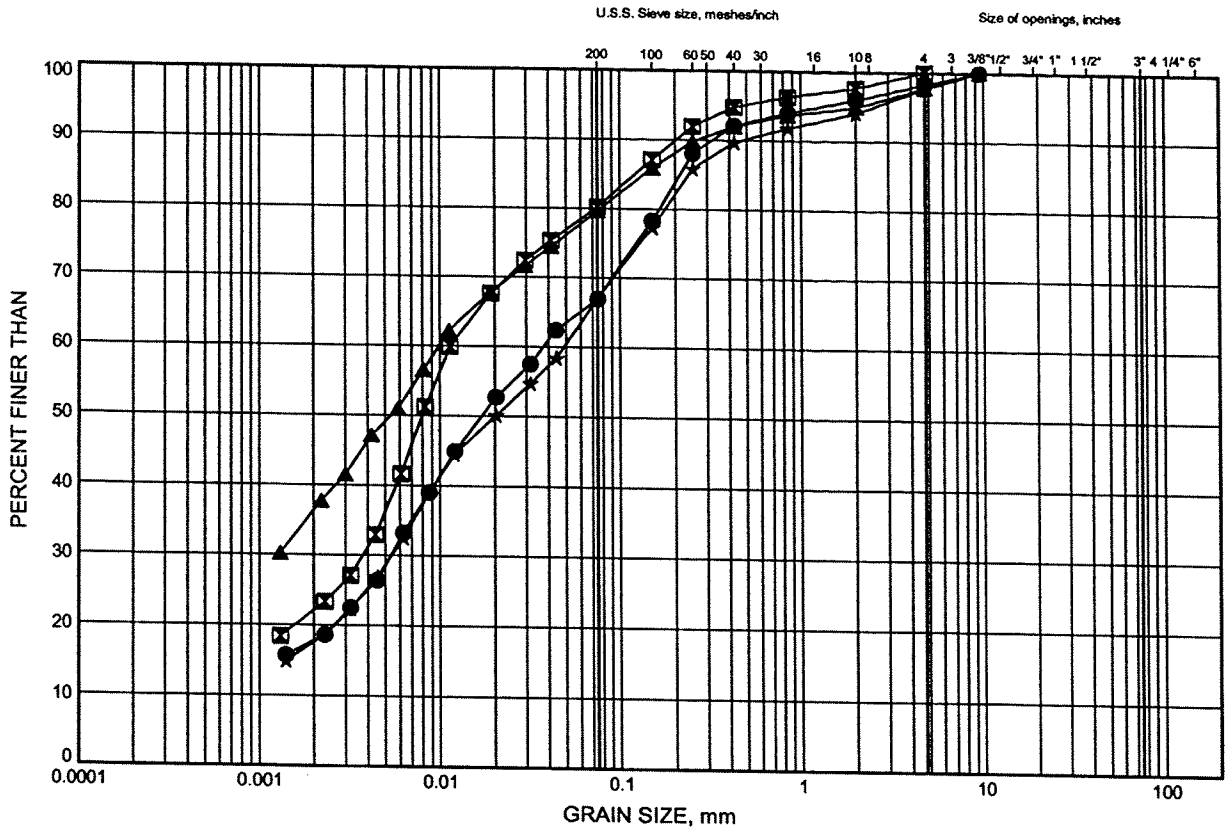
Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E15

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	QSR4-4	10.97	244.46
⊠	QSR4-5	3.35	252.08
▲	QSR4-5	4.88	250.55
★	QSR4-5	9.45	245.98

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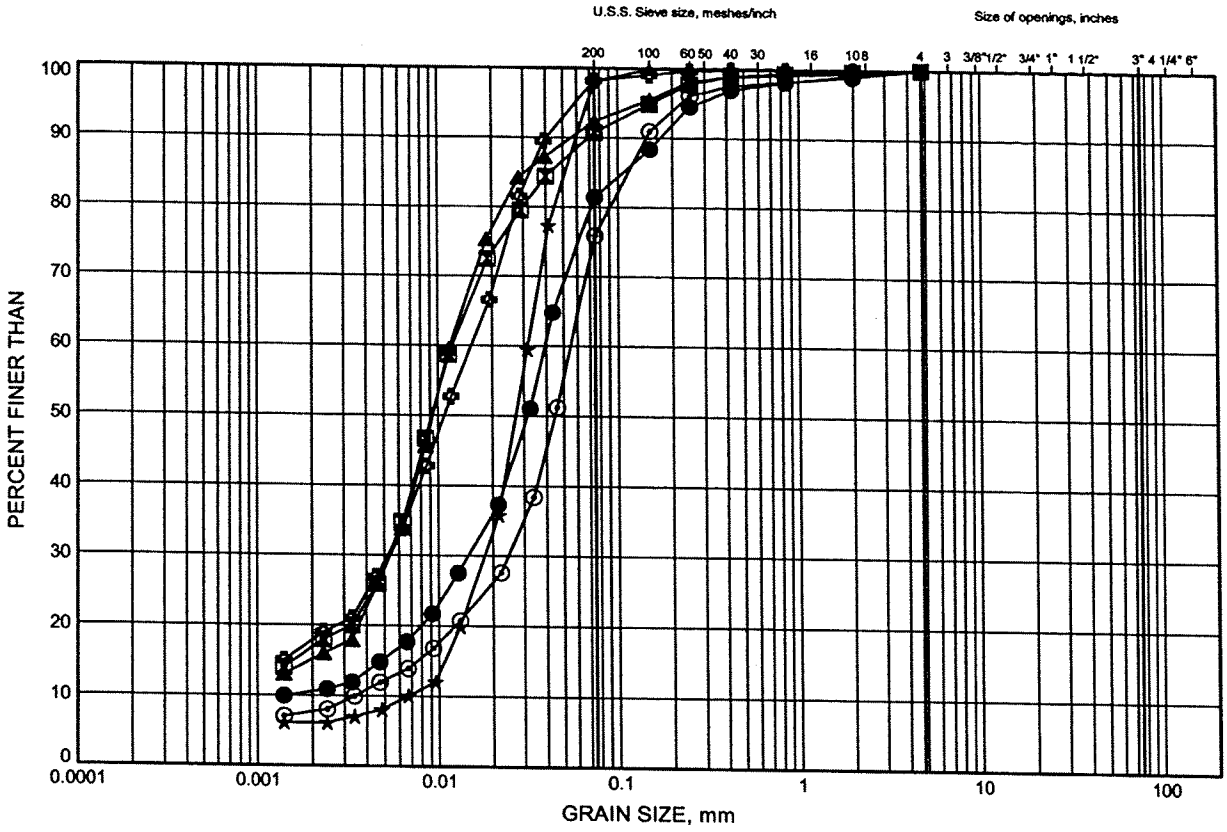
GRAIN SIZE DISTRIBUTION

FIGURE E16

SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-33A	6.40	279.80
⊠	08-33A	10.97	275.23
▲	08-33A	14.02	272.18
★	08-47	24.52	232.86
⊙	08-61	9.45	275.45
✿	08-61	10.97	273.93

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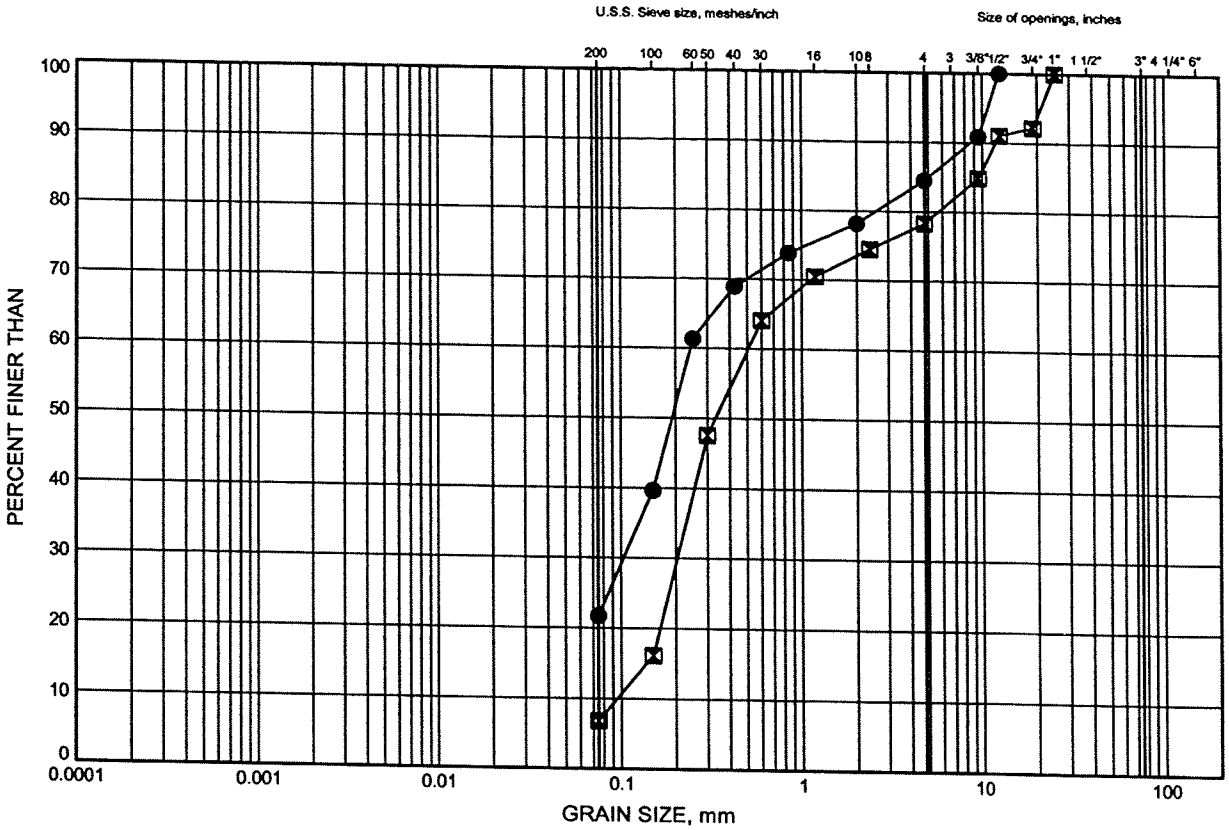
GRAIN SIZE DISTRIBUTION

FIGURE E17

GRAVELLY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-45	9.27	249.00
⊠	08-45	10.79	247.48

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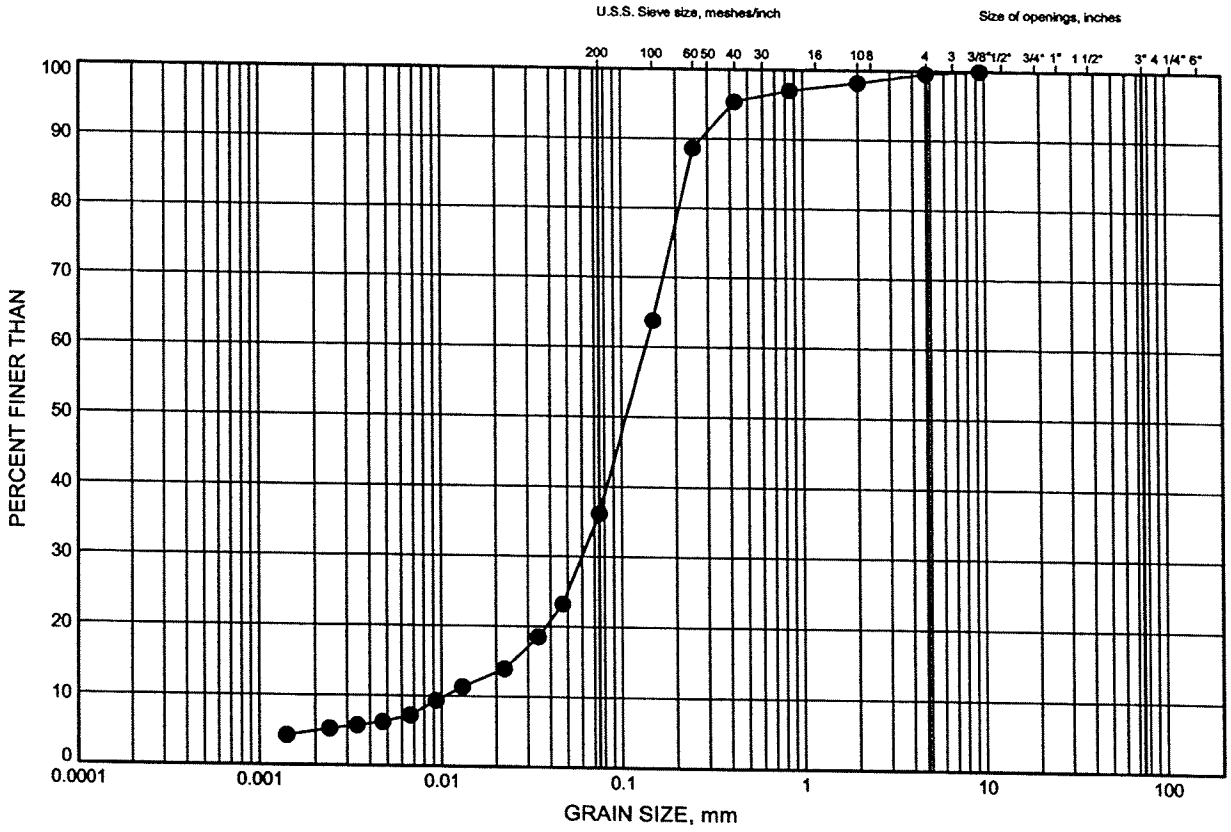
Hwy 404 Extension

GRAIN SIZE DISTRIBUTION

FIGURE E18

SILTY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-46	10.97	245.73

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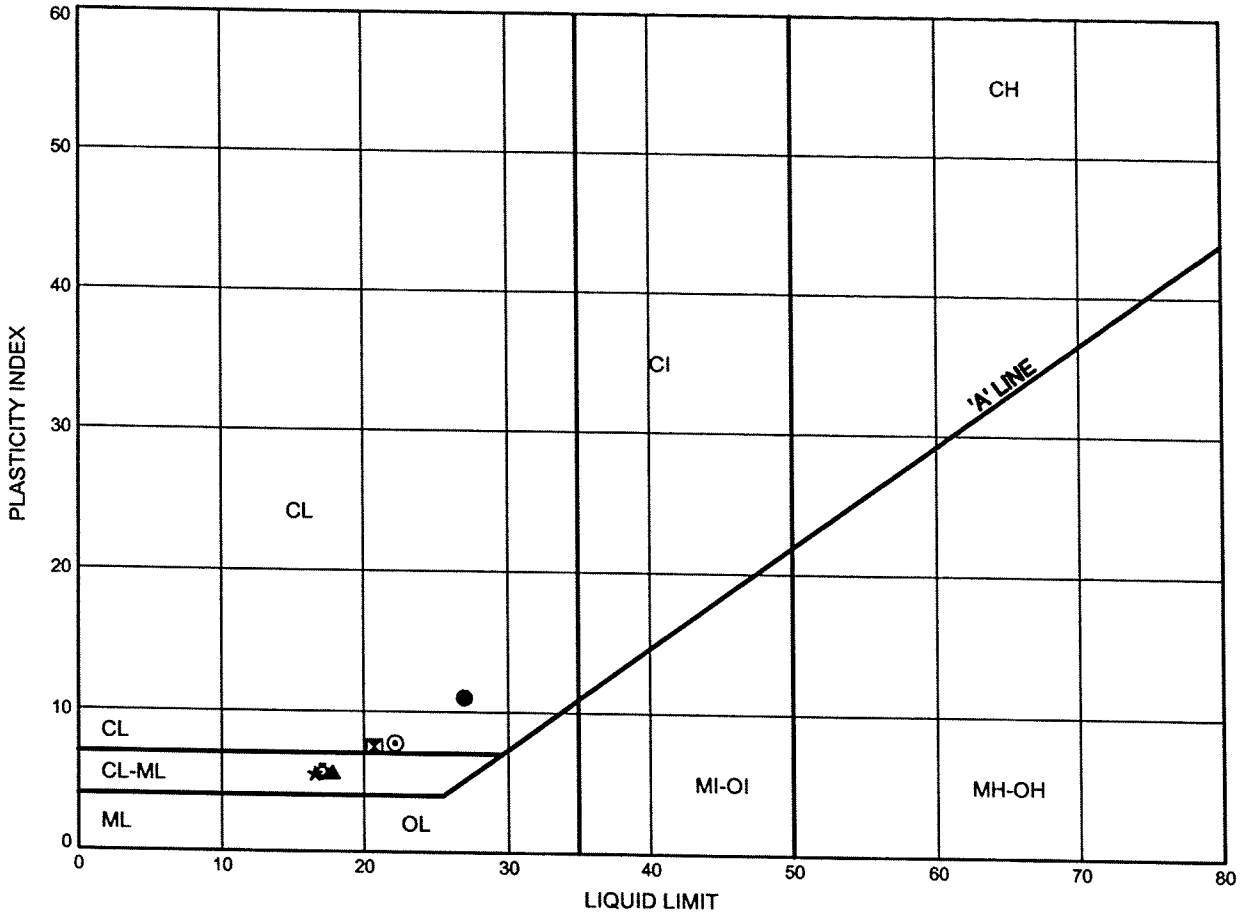
Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE E19

CLAYEY SILT & CLAYEY SILT TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-38A	2.51	254.79
⊠	08-38A	4.80	252.50
▲	08-38A	9.37	247.93
★	08-38A	13.94	243.36
⊙	08-39	2.51	256.44
✿	08-39	6.32	252.63

Date October 2009

Project 2109-05-00

THURBER

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Chkd. RPR

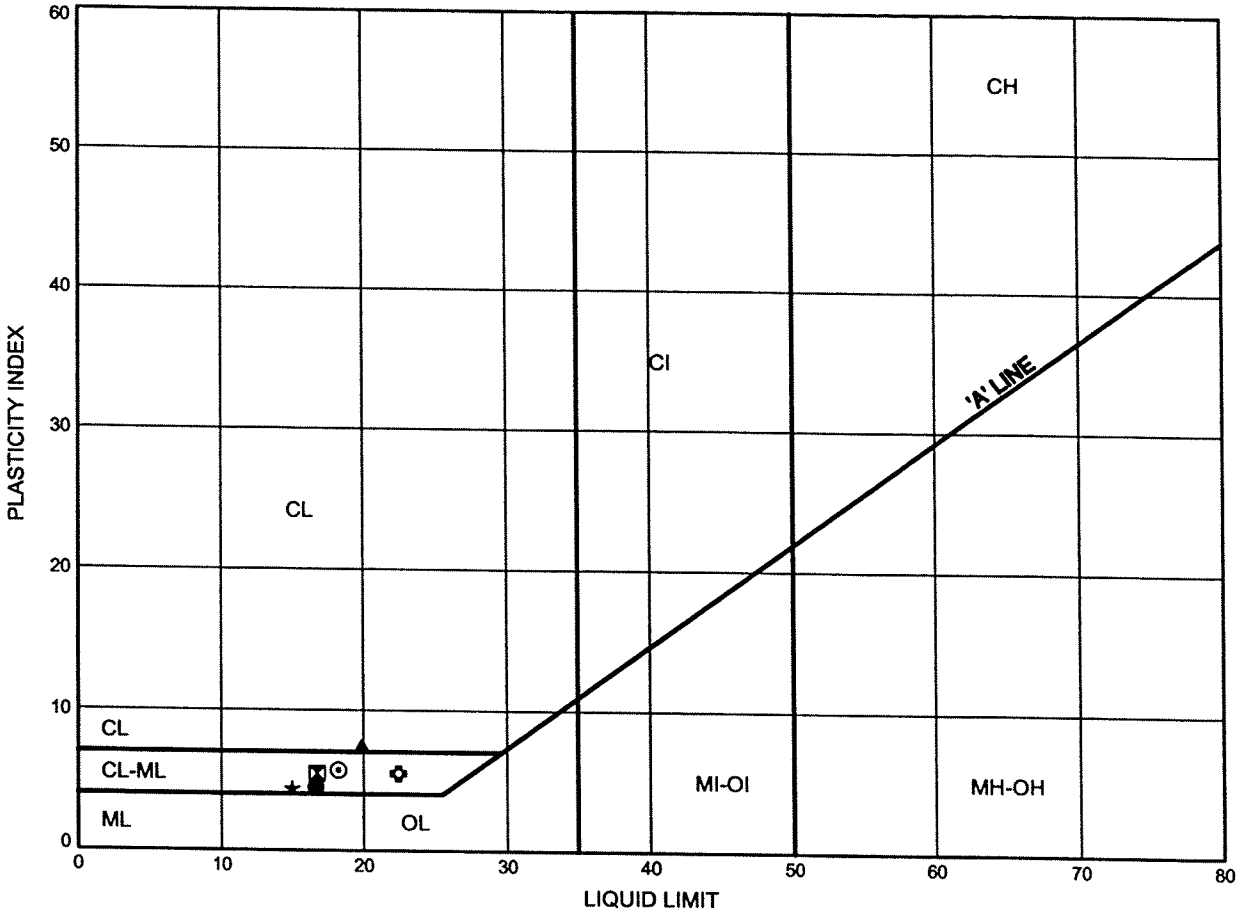
THURBALT 0596.GPJ 10/5/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE E20

CLAYEY SILT & CLAYEY SILT TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-40	3.28	258.03
⊠	08-40	6.40	254.91
▲	08-41	2.51	261.19
★	08-46	17.07	239.63
⊙	08-47	7.92	249.46
✿	08-47	20.12	237.26

Date September 2009

Project 2109-05-00

THURBER

Prep'd AN

Chkd. RPR

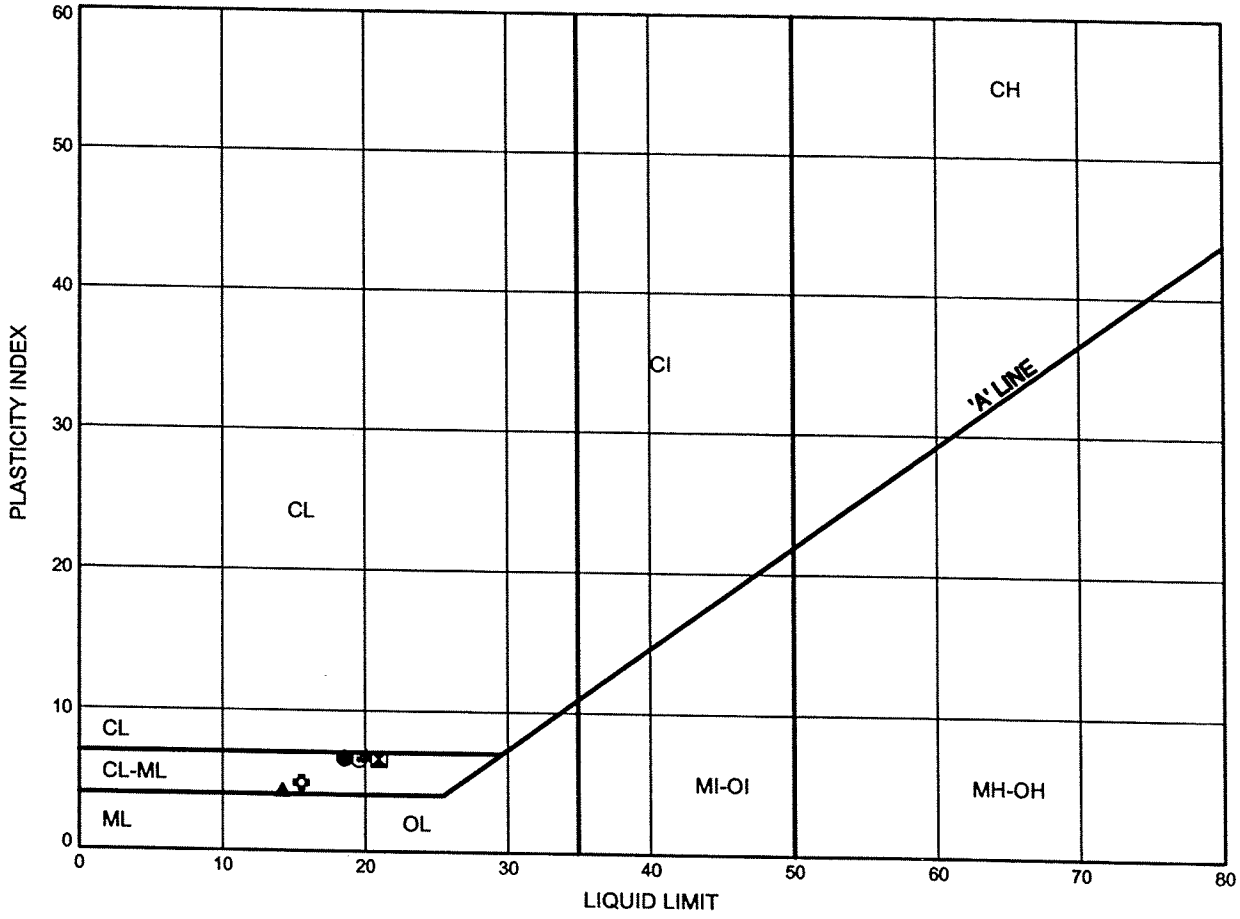
THURBALT 0596.GPJ 9/24/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE E21

SAND & SILT TILL (Clayey Zones)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	08-45	15.47	242.80
⊠	QSR4-1	2.59	251.15
▲	QSR4-1	6.40	247.34
★	QSR4-2	2.59	252.26
⊙	QSR4-3	4.88	252.27
✿	QSR4-3	10.97	246.18

Date October 2009

Project 2109-05-00

THURBER

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Chkd. RPR

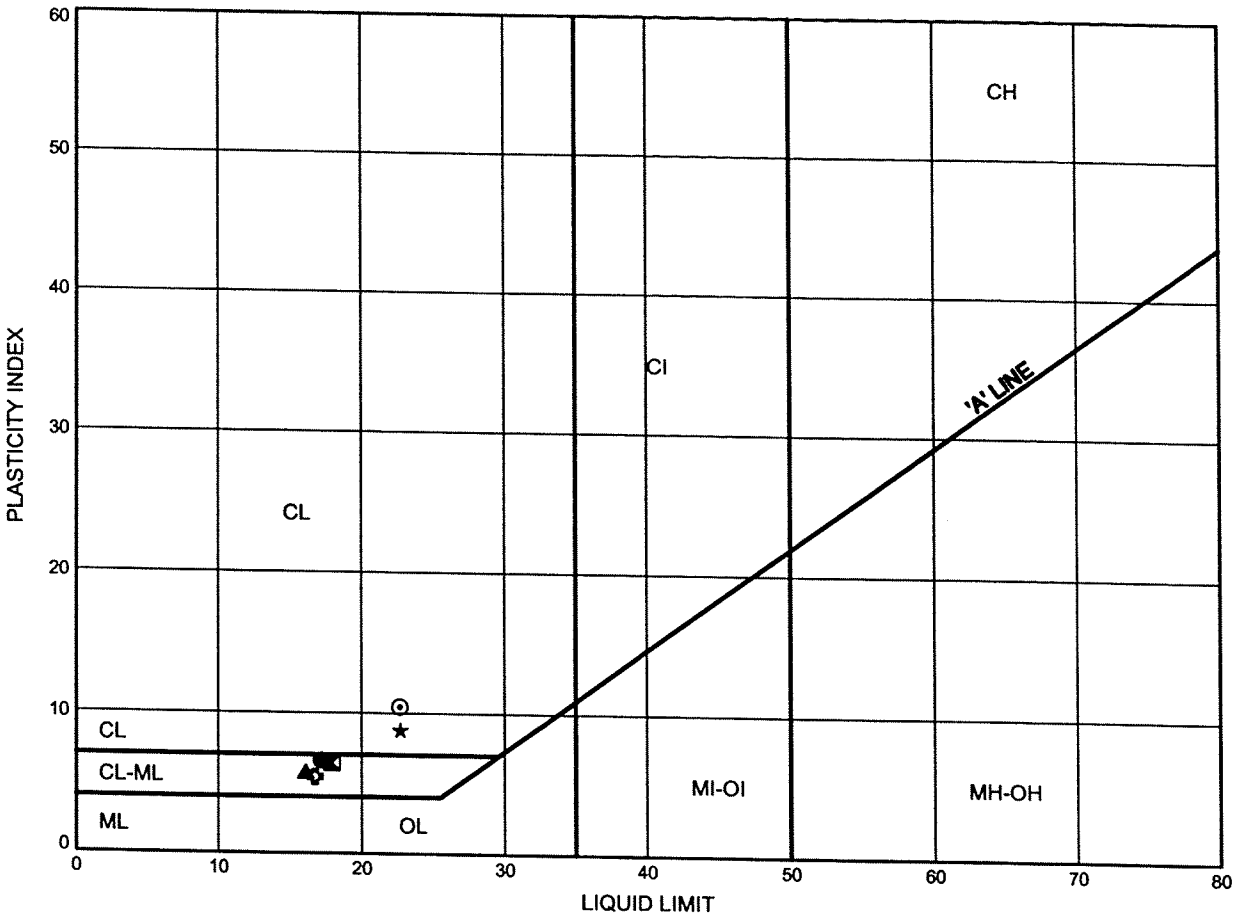
THURBALT 0596.GPJ 10/5/09

Hwy 404 Extension

ATTERBERG LIMITS TEST RESULTS

FIGURE E22

SAND & SILT TILL (Clayey Zones)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	QSR4-4	3.35	252.08
⊠	QSR4-4	7.92	247.51
▲	QSR4-4	10.97	244.46
★	QSR4-5	3.35	252.08
⊙	QSR4-5	4.88	250.55
✿	QSR4-5	9.45	245.98

Date October 2009

Project 2109-05-00

THURBER

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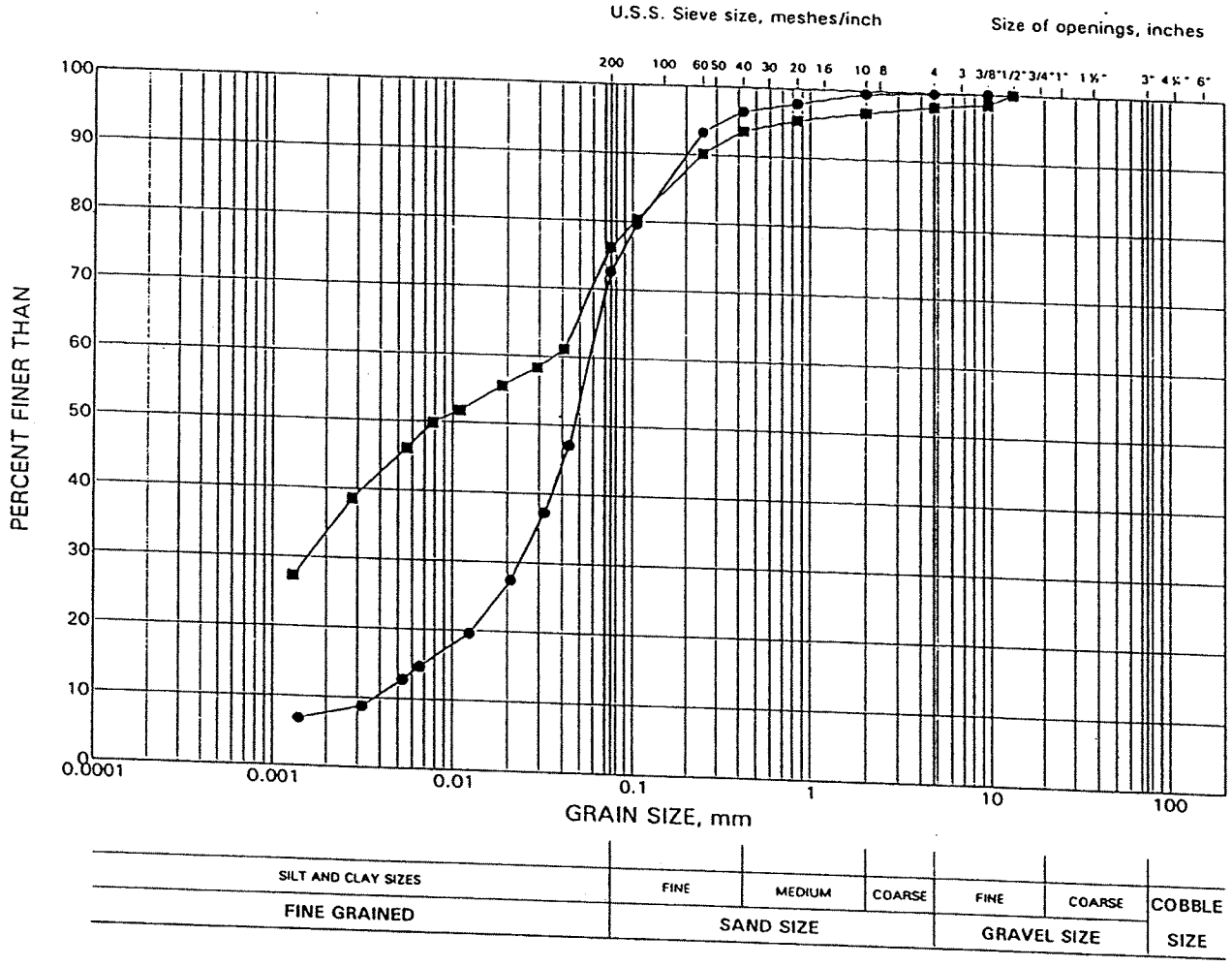
THURBALT 0596.GPJ 10/5/09

GRAIN SIZE DISTRIBUTION TEST RESULTS
Surficial Clayey Silt

FIGURE 1



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION (m)
●	301	5	254.3
■	302	3	257.2

Date 11/2/2004

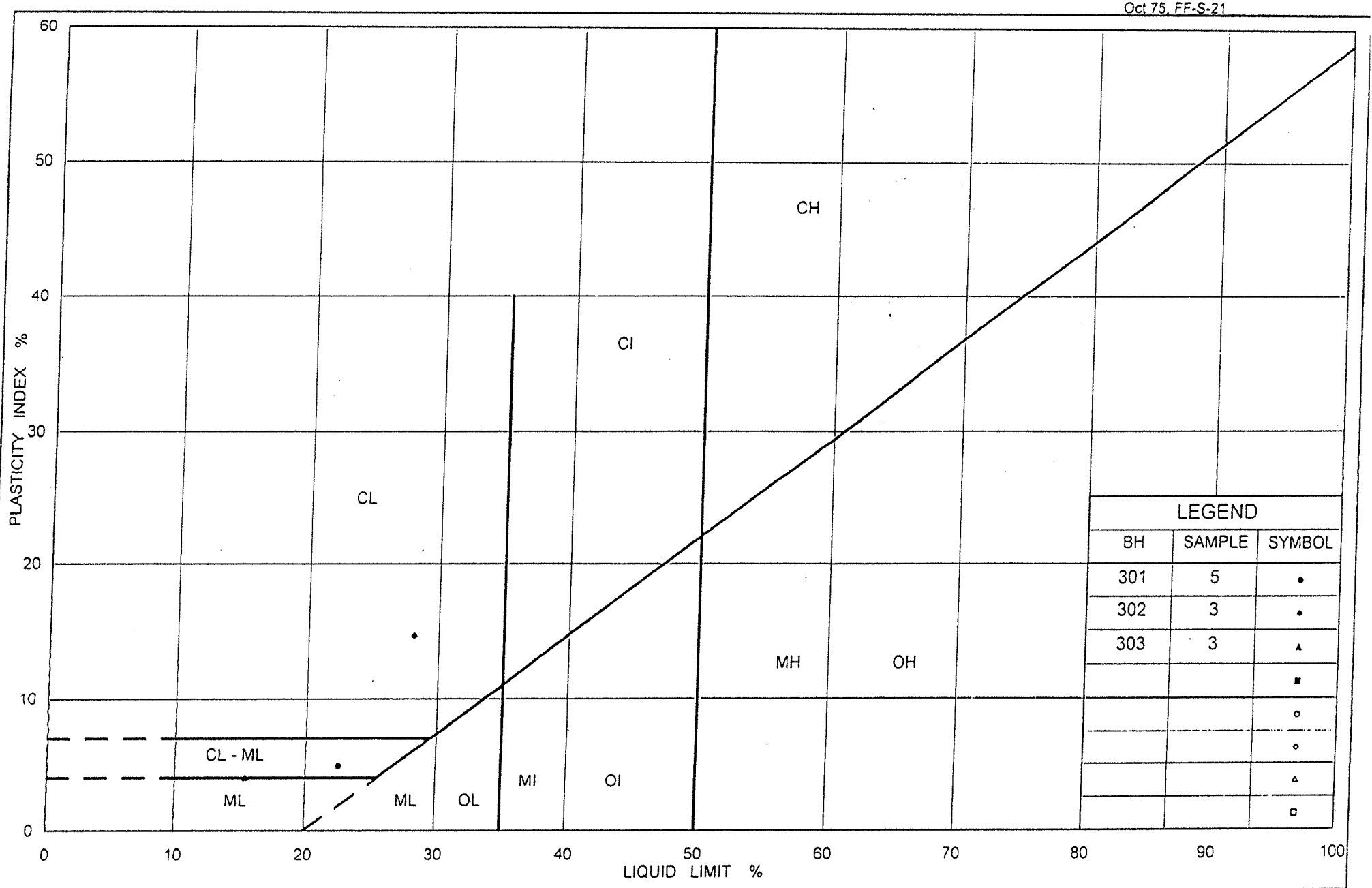
Project 04-1111-016

Golder Associates

Prepared by LG

Checked by

Oct 75, FF-S-21



Ministry of Transportation

Ontario

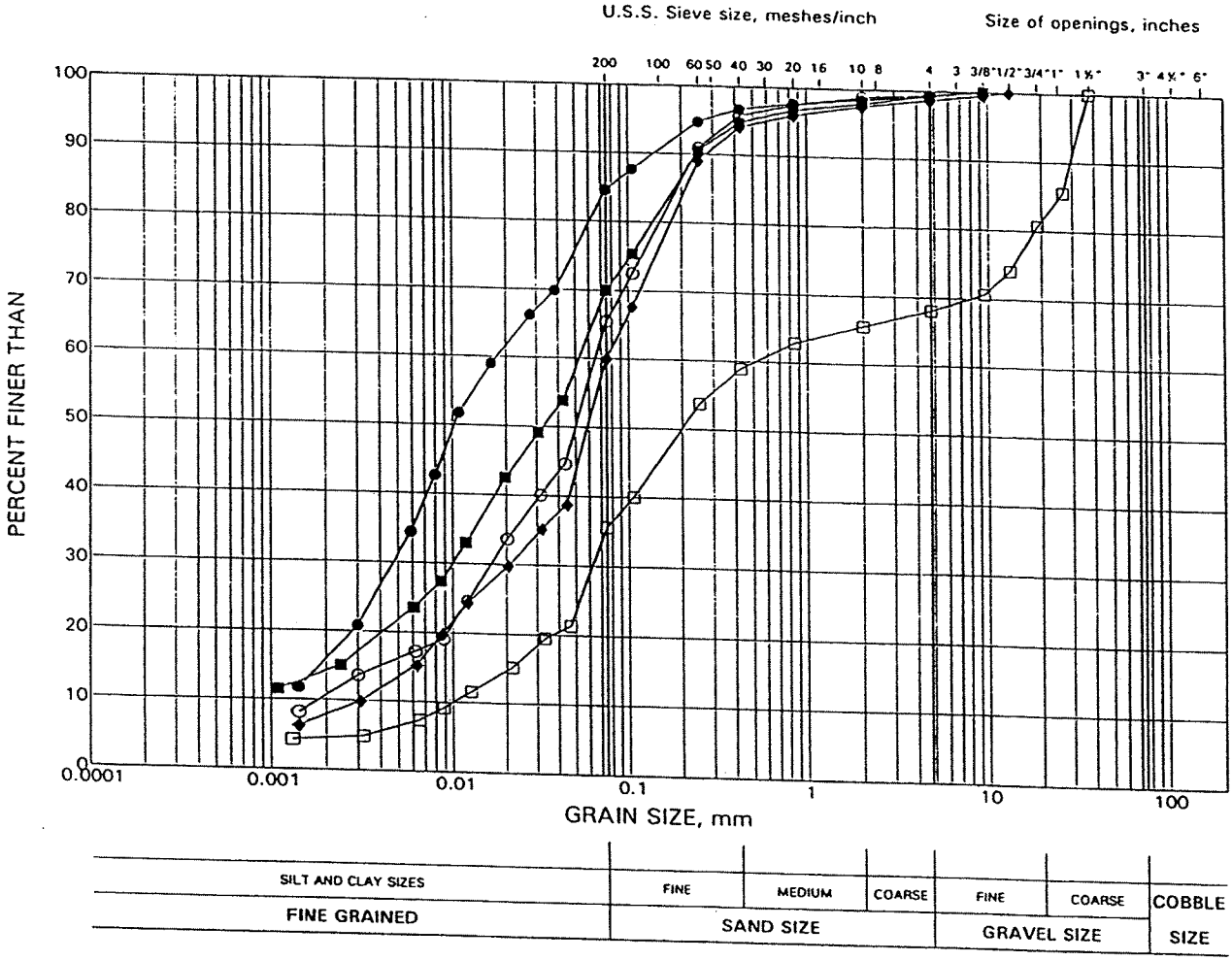
PLASTICITY CHART
Surficial Clayey Silt

FIG No. 2

Project No. 04-1111-016

GRAIN SIZE DISTRIBUTION TEST RESULTS
Clayey Silt Till / Sand and Silt Till

FIGURE 3



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION (m)
●	301	9	249.6
■	301A	2	242.0
◆	302	9	251.1
○	302	14	243.5
□	303	7	256.2

Date 11/2/2004

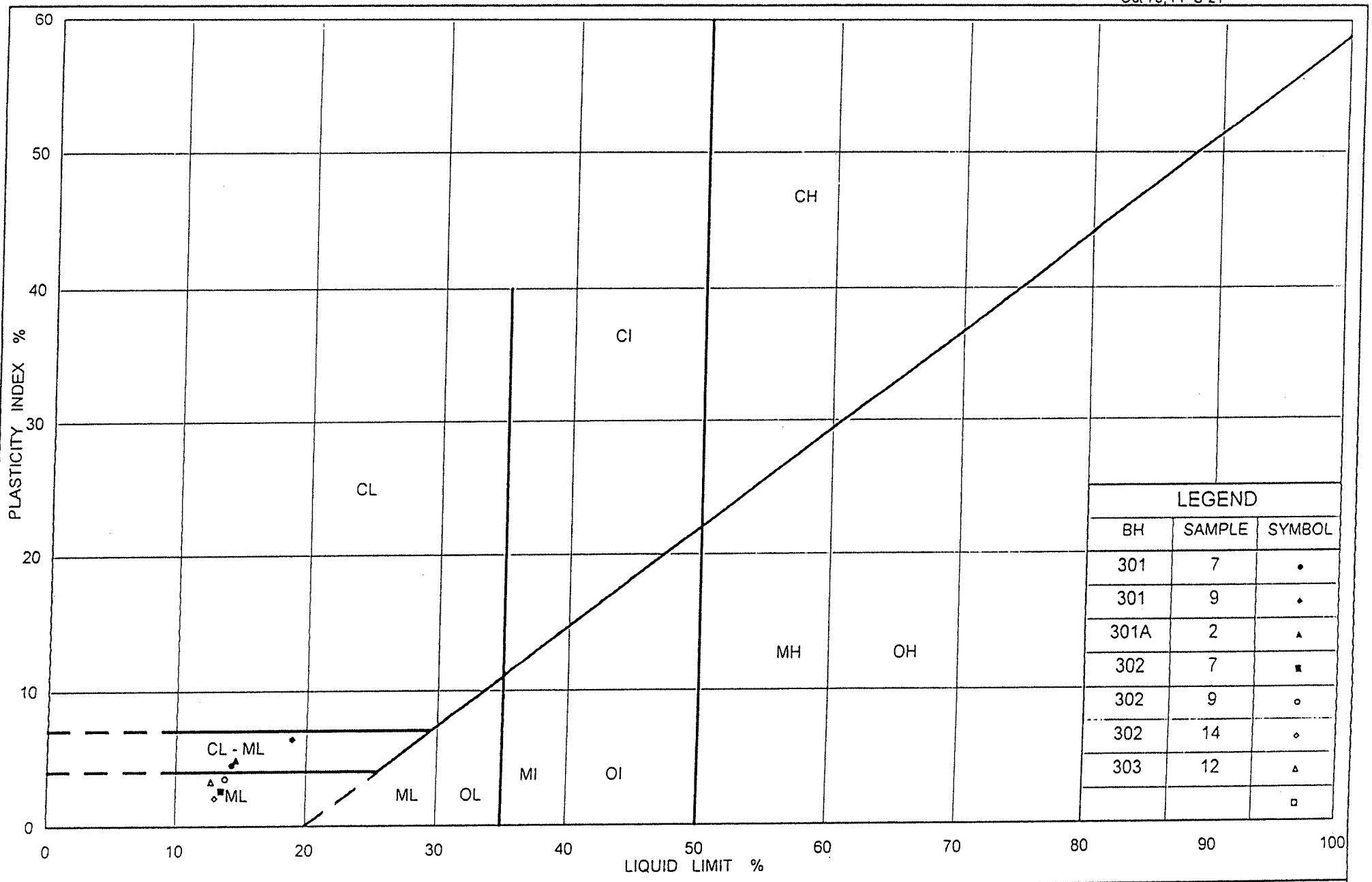
Project 04-1111-016

Golder Associates

Prepared by LG

Checked by

Oct 75, FF-S-21



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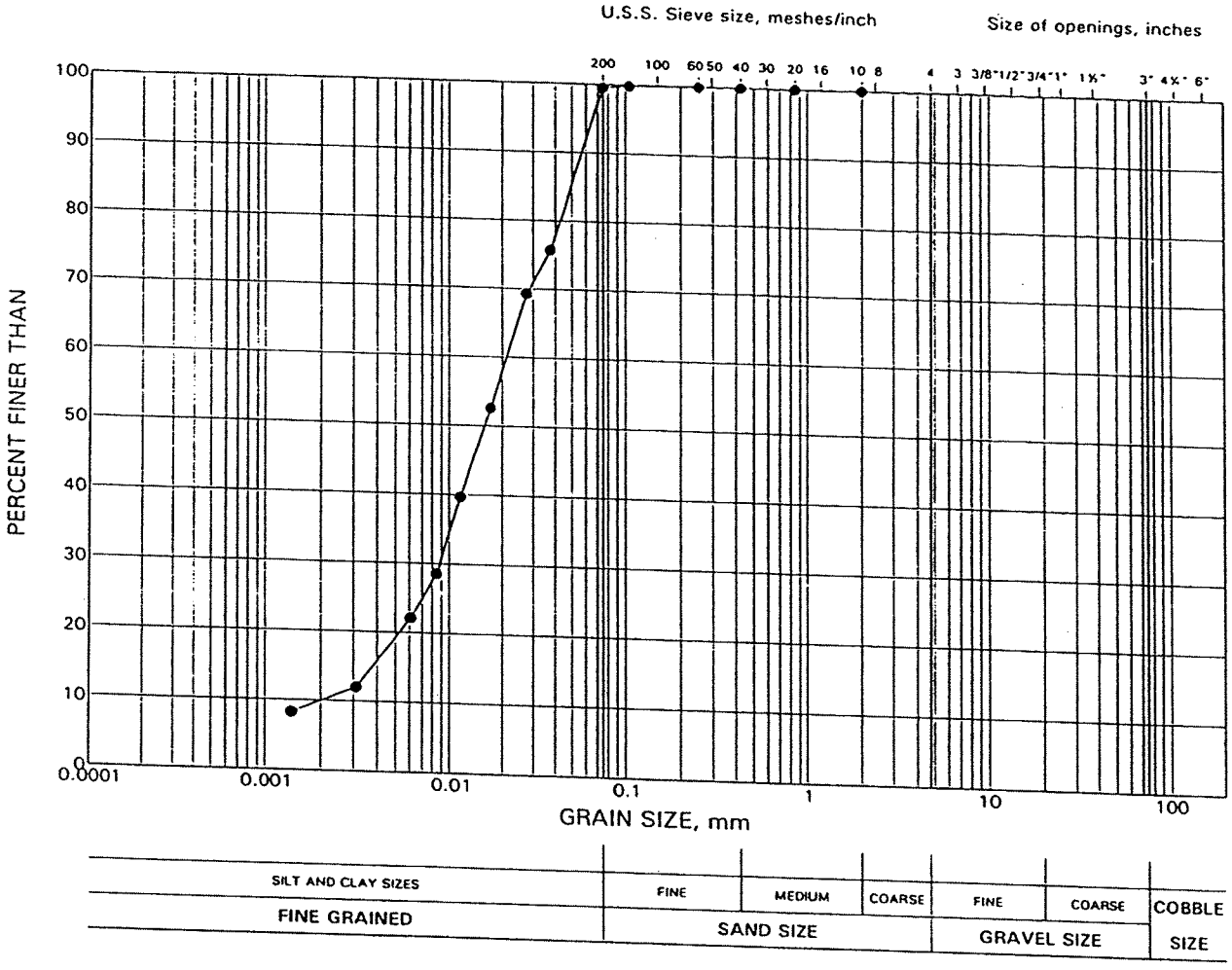
PLASTICITY CHART
Clayey Silt Till / Sand and Silt Till

FIG No. 4

Project No. 04-1111-016

GRAIN SIZE DISTRIBUTION TEST RESULT
Interlayered Clayey Silt and Silt

FIGURE 5



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION (m)
●	301A	7	234.5

Date 11/2/2004

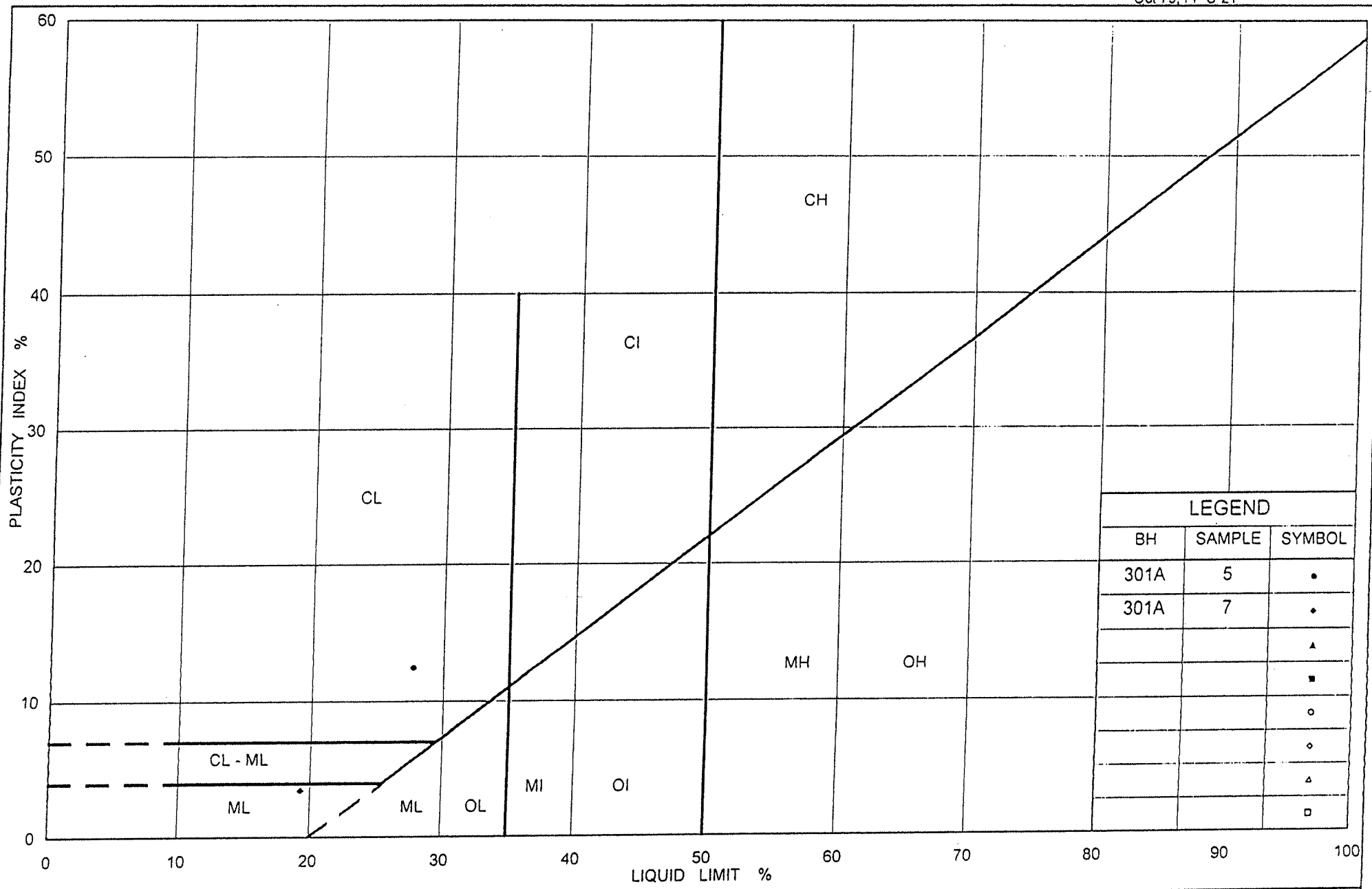
Project 04-1111-016

Golder Associates

Prepared by LG

Checked by

Oct 75, FF-S-21



Ministry of Transportation

PLASTICITY CHART
Interlayered Clayey Silt and Silt

FIG No. 6

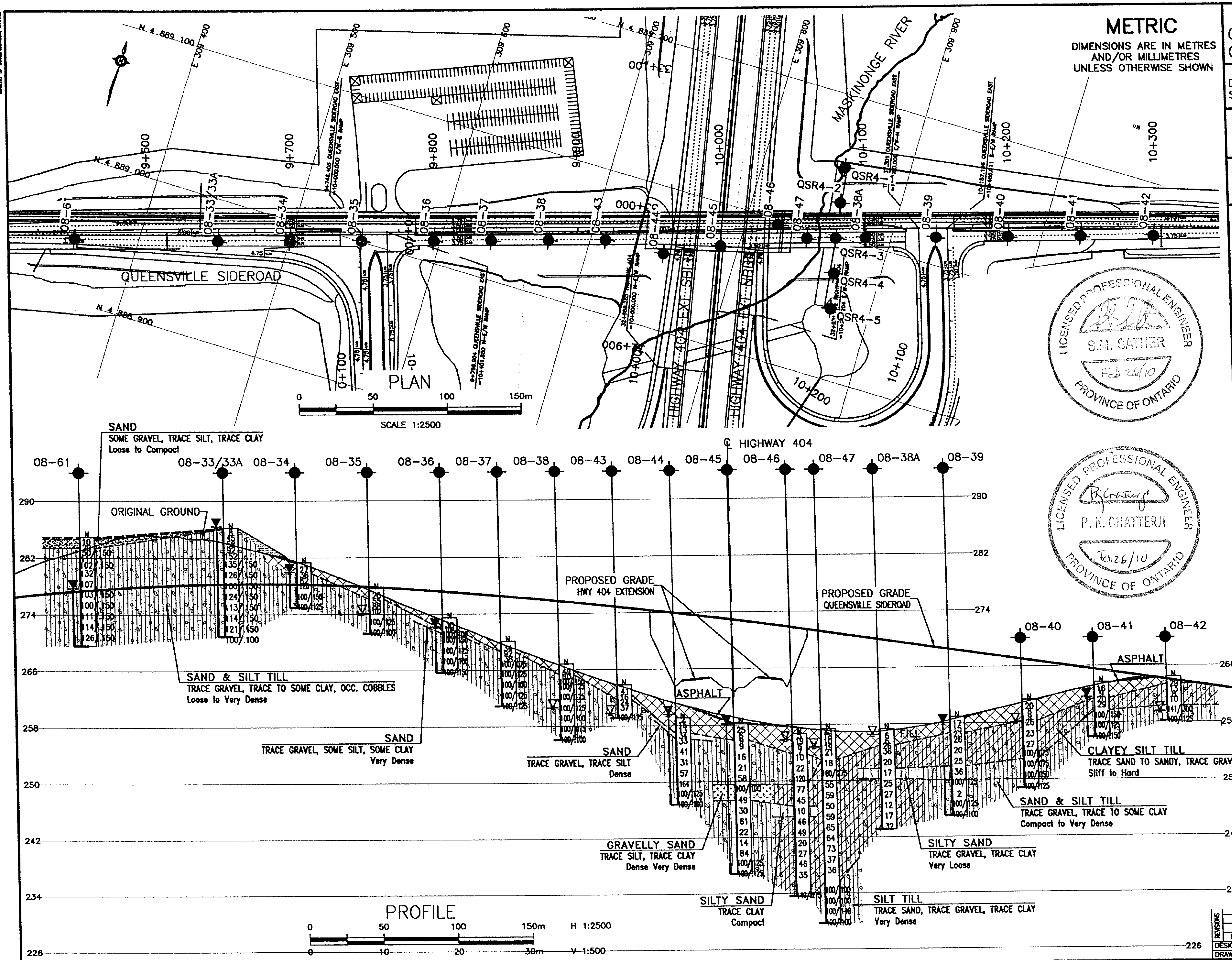
Project No. 04-1111-016

Photograph – View of the site looking north of Queensville Sideroad

Photograph – View of the site looking northwest of Queensville Sideroad

Photograph –Looking south of Queensville Sideroad

Photograph – Looking east along Queensville Sideroad



METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

LICENSED PROFESSIONAL ENGINEER — S.M. SATHER — Feb 26/10 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — P. K. CHATTERJI — Feb 26/10 — PROVINCE OF ONTARIO

CONT No
GWP No 2109-05-00

HIGHWAY 404 EXTENSION
DEEP CUT ALONG QUEENSVILLE SIDEROAD
STATIONS 9+550 TO 10+300
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

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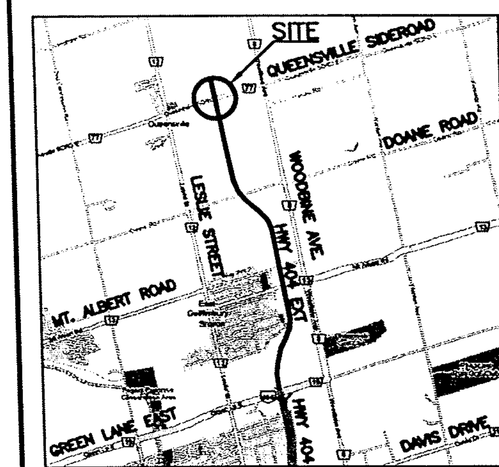

KEYPLAN

LEGEND

●	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
08-33/33A	284.0	4 888 970.8	309 452.5
08-34	281.3	4 888 985.7	309 500.2
08-35	277.7	4 889 000.6	309 548.0
08-36	273.5	4 889 015.4	309 595.7
08-37	270.1	4 889 027.4	309 633.9
08-38	266.9	4 889 039.3	309 672.1
08-38A	257.3	4 889 105.0	309 882.8
08-39	259.0	4 889 119.6	309 929.8
08-40	261.3	4 889 134.5	309 977.6
08-41	263.7	4 889 149.4	310 025.3
08-42	264.4	4 889 164.3	310 073.0
08-43	263.9	4 889 051.2	309 710.3
08-44	259.1	4 889 053.5	309 751.4
08-45	258.3	4 889 070.2	309 788.1
08-46	256.7	4 889 096.4	309 821.8
08-47	257.4	4 889 092.8	309 843.9
08-61	284.9	4 888 943.1	309 357.2

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31D-492

REVISIONS	DATE	BY	DESCRIPTION		
DESIGN RPR	CHK PKC	CODE	LOAD	DATE	MAR. 2010
DRAWN MFA	CHK AEG	SITE	STRUCT	DWG	