Jacques Whitford

Engineering, Scientific, Planning and Management Consultants

2781 Lancaster Road
Suite 200
Ottawa Ontario
Canada K1B 1A7

Bus 613 738 0708
Fax 613 738 0721

www.jacqueswhitford.com

FINAL PRELIMINARY REPORT

FOUNDATION INVESTIGATION
AND DESIGN
W.P. 69-99-00
HIGHWAY 7/35
SCUGOG RIVER BRIDGE
WIDENING

Giffels Associates Limited

PROJECT NO. ONO11378
GEOCRES NO. 31D-412

PROJECT NO. ONO11378

FINAL PRELIMINARY REPORT –
FOUNDATION INVESTIGATION AND DESIGN

TO

Giffels Associates Limited
30 International Boulevard
Toronto, Ontario
M9W 5P3

ON

W.P. 69-99-00
Highway 7/35 – Scugog River Bridge Widening
Victoria County
District 43, Bancroft
Ministry of Transportation Ontario
Geocres No. 31D-412

March 2006

Jacques Whitford
2781 Lancaster Road
Suite 200
Ottawa, Ontario
K1B 1A7

Phone: 613-738-0708
Fax: 613-738-0721
www.jacqueswhitford.com

Jacques Whitford

FINAL REPORT

PRELIMINARY FOUNDATION INVESTIGATION REPORT

for

W.P. 69-99-00
Highway 7/35 – Scugog River Bridge
County of Victoria
District 43, Bancroft

1.0 INTRODUCTION

This report was prepared in conjunction with the Preliminary Foundation Investigation and Design Study–Highway 7/35; Structural Culvert Replacement 32-181, CNR Retaining Wall, CPR Bridge Replacement, Structural Culvert Extension 32-211, and Culvert Replacement Dew Drop Inn Road; W.P. 69-99-00.

This report presents the results of a preliminary foundation investigation carried out for the proposed widening of the existing Scugog River Bridge on Highway 7/35, in Lindsay Ontario.

The preliminary foundation investigation was carried out in general accordance with our proposal number ONO11378 dated February 25, 2005. Authorization to proceed was provided by the Ministry of Transportation of Ontario (MTO) under an agreement with Giffels Associates Limited, the Prime Consultant for this project.

This report has been prepared specifically and solely for the project described herein. It contains factual information pertaining to the subsurface conditions which was obtained as part of this investigation.

2.0 SITE DESCRIPTION AND GEOLOGY

The subject site is within the limits of MTO project W.P. 69-99-00 (Highway 7/35). The site location is shown on the Key Plan inset to Drawing No. NO11378-1 provided in Appendix A. It is noted that for project orientation purposes, Highway 7/35 will be assumed to run east-west at the Scugog River Bridge, with chainage increasing from west to east.

Physiographically, the Scugog River bridge is located within the Peterborough Drumlin Field. This region, in the area of Lindsay, is characterized by poorly developed, low, elongated swells in the till plan with wide swampy valleys. The bedrock is generally shallow, however, the depth to bedrock varies greatly over short distances.

Scugog River forms part of the Trent-Seven Waterway and flows from north to south connecting Lake Scugog and Stergeon Lake. At the location of the bridge the river is approximately 60 m wide. The depth of water was estimated to be 2.1 m at the time of the investigation. The surveyed water level at the time of the investigation was 250. 1 m Geodetic.

The existing roadway embankments are approximately 5 m high at both the east and west abutments. The existing embankments include 2H:1V (approx.) side slopes extending toward the north and south. The embankment slopes are vegetated with grass and are generally in a fair condition, no evidence of erosion or differential settlement of the embankments was observed. The Scugog River bridge structure is a three span concrete structure. No evidence of foundation related structural damage was observed while performing the geotechnical field investigation.

The water level in Scugog River was approximately 5.1 m below the top of the west bridge abutment at the time of the investigation. The banks of the river were vegetated with grass and several mature trees. Cattails are also present along the shoreline. Drainage in the area consisted of overland flow directed towards the river.

A plan view and cross sections are shown on Drawing No. NO11378-1, provided in Appendix A.

3.0 PROCEDURE

3.1 Field Investigation

The site soil conditions were investigated with a borehole drilling investigation and laboratory testing program. The drilling was carried out using a combination of a track-mounted CME-75 drill rig and portable drilling equipment supported on a barge. The barge was secured at the borehole locations using a series of anchors and spring lines secured to the bridge. The drilling investigation was carried out between April 18 and August 22, 2005.

A total of six (6) boreholes, designated as 05-1 through 05-6, were put down during the field investigation. Boreholes 05-2 through 05-5 were located within the Scugog River in the footprint of the proposed foundation elements along the proposed new alignment. Boreholes 05-1 and 05-6 were drilled at the base of the existing embankments.

Borehole 05-1 was advanced through the overburden using hollow stem augers to a depth of approximately 7.2 m. Boreholes 05-2 through 05-6 were drilled by advancing casing with portable drilling equipment. The subsurface conditions were identified in the field by Jacques Whitford Limited (JW) personnel from samples obtained while carrying out Standard Penetration Tests (SPT) (ASTM D1586) at regular intervals. Within Borehole 05-1 SPT's were carried out at 0.76 m intervals. Within the remaining boreholes, drilled with portable equipment, continuous SPT's were carried out where possible. Occasionally the density and granular nature of the subsurface deposits caused the equipment to block resulting in gaps between samples. The boreholes at the foundation units were advanced beyond SPT refusal (defined as 50 blows for 150 mm). In some instances blows greater than 50 were carried out to collect additional soil samples. Boreholes were terminated at refusal of the drilling equipment in very dense material. A standpipe was installed in Borehole 05-1.

The recovered soil samples were stored in moisture proof containers and returned to our laboratory. The grain size distribution test results are provided on Figure No. 1 to 4 in Appendix B. The subsurface conditions encountered are described in detail in the Borehole Records presented in Appendix B.

Prior to completing the investigation, the boreholes were backfilled with auger cuttings and grouted with a cement/bentonite mix in accordance with MOE Regulation 903.

3.2 Survey

Borehole locations were established in the field by measurement by Jacques Whitford personnel relative to existing site features such as the existing bridge structure. The ground surface elevations at the borehole locations were surveyed relative to the top of the north east corner of the west bridge abutment. The top of the abutment at this location was assigned a Geodetic elevation of 255.19 m as shown on a plan provided by Giffels Associates Limited.

3.3 Laboratory Testing

All samples returned to the laboratory were subjected to detailed visual classification by a geotechnical engineer. Routine testing, consisting of moisture content testing, Atterberg limits, and grain size distribution analysis was carried out on representative samples. Two representative soil samples were submitted for pH, sulphate and resistivity testing to assess the potential for corrosion of buried steel and the potential for sulphate attack on buried concrete.

No complex testing was deemed to be necessary based on the soil conditions.

All soil samples will be stored for a period of one year after issuance of the final version of the preliminary foundation investigation report. Unless otherwise directed, the stored samples will be disposed of after this period.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Profile

The subsurface conditions observed in the boreholes are presented in detail on the Borehole Records provided in Appendix B. An explanation of the symbols and terms used to describe the Borehole Records is also provided. In general, the subsurface profile beneath the proposed new alignment (Boreholes 05-2 to 05-5) consists of water over a silty clay deposit over a silty sand to sand and gravel till deposit with varying amounts of silt and clay. Within the boreholes drilled near the abutment approaches (Boreholes 05-1 and 05-6), the subsurface profile consists of the topsoil overlying sand fill, over native soils consisting of silt with clay over a deposit of till with varying amounts of gravel, sand, silt and clay.

Borehole location plans and stratigraphic sections of the soils encountered within the boreholes are provided on Drawing NO11378-1 in Appendix A.

Historical records including soil boring data from the 1956 contract package for the Scugog River Bridge are provided in Appendix C.

4.1.1 Fill: Sand, Some Organics, to Silty Sand, Some Organics

Fill was encountered beneath the surficial topsoil layer within Boreholes 05-1 and 05-6. The encountered fill consists of sand with some organic material and silty sand with some organic material within Boreholes 05-1 and 05-6, respectively. The thickness of the fill was 0.6 m and 1.2 m, within Boreholes 05-1 and 05-6, respectively. The underside of the fill was observed at elevation 250.9 m and 250.3 m Geodetic. The moisture content of the 2 samples of fill tested was 14%. The SPT 'N' values ranged from 2 to 29 with an average value of 16 indicating that the fill was generally compact.

A 100 mm thick layer of topsoil was observed at surface within Boreholes 05-1 and 05-6. A 300 mm thick buried layer of topsoil was observed beneath the fill in Borehole 05-6.

4.1.2 Silty Clay

A layer of silty clay, trace gravel, trace sand was observed in Boreholes 05-1, 05-2, 05-3 and 05-5. The thickness of this layer ranged from 0.6 m to 2.6 m with an average of 1.5 m. The base of the unit varied from elevation 247.1 m to 249.1 m Geodetic. SPT 'N' values ranged from 2 to 18 and averaged 10, suggesting a generally firm to stiff state. The moisture content of the five samples tested was 16% to 42% with an average of 22%. Grain size analysis of the one sample tested indicated that it contained 2% gravel, 8% sand, 65% silt and 25% clay sized particles. The results of the grain size distribution tests is shown on the Figure No. 2 in Appendix B. Atterberg Limits testing was carried out on a sample from BH 05-5. The results are presented on Figure No. 5 in Appendix B and indicate a Liquid Limit of 39 and a Plastic Limit of 20.

4.1.3 Sand, With Silt, Trace Gravel

A layer of sand with silt, trace gravel was observed in Boreholes 05-2. The thickness of this deposit was 1.9 m. The base of the unit was observed at elevation 246.1 m Geodetic. SPT 'N' values ranged from 29 to 70 and averaged 55, suggesting a generally very dense state. The moisture content of the three samples tested ranged from 10% to 13% with an average of 12%. Grain size analysis of one sample indicated that the sample contained 7% gravel, 67% sand and 26% silt and clay sized particles. The results of the grain size distribution tests is shown on Figure No. 1 in Appendix B.

4.1.4 Silty Sand, Some Gravel, Trace Clay to Sand and Gravel, Some Silt (TILL)

A deposit of till was encountered within all the boreholes. The till consists of silty sand, some gravel, and trace clay overlying a coarser till consisting of sandy gravel, trace silt, trace clay to a sand and gravel, some silt. The coarse till deposit was encountered in Boreholes 05-2 to 05-6. Occasional boulders were noted in the till deposit. All the boreholes were terminated upon SPT refusal within the till deposit at depths ranging from 7.2 m to 5.1 m below existing grade. The SPT refusal also corresponds to the depth of refusal for the drilling equipment and methods utilized. SPT 'N' values ranged from 29 to 160 and averaged 75 (a SPT 'N' of 100 was assigned to the locations where refusal was encountered to calculate the average SPT 'N'), suggesting a generally very dense state. The moisture content of the 24 samples tested ranged from 2% to 35% with an average of 11%. Grain size analysis of seven samples indicated that this deposit contained 13% to 52% gravel, 39% to 60% sand and 7% to 34% silt and clay sized particles. The results of the grain size distribution testing are shown on the Figures No. 3 and 4 in Appendix B.

4.1.5 Bedrock

Bedrock was not encountered within the depth of investigation in any of the boreholes carried out by Jacques Whitford.

Borehole records shown on Drawing No. D-3725-2 titled "Soil Boring Data" indicate bedrock to be 7.3 m below the water level of the Scugog River. A copy of the above noted drawing is provided in Appendix C.

4.2 Groundwater

Groundwater levels were measured in the standpipe in BH05-1 on August 23, 2005. The water level was measured at elevation 250.6 m Geodetic which corresponds to 0.9 m below ground surface. The water level in Scugog River on August 18, 2005, was surveyed to be at elevation 250.1 m Geodetic.

Fluctuations in the groundwater level due to seasonal variations or in response to a particular precipitation event should be anticipated.

5.0 CLOSURE

A subsurface investigation is a limited sampling of a site. The subsurface conditions given herein are based on information gathered at the specific borehole locations. Should any conditions at the site be encountered which differ from those at the borehole locations, we request that we be notified immediately in order to assess the additional information.

Yours very truly,

JACQUES WHITFORD LIMITED

Christopher McGrath, B.Eng.

J.G.A. Raymond Haché, M.Sc., P.Eng., PMP
Principal and Senior Service Director,
Geotechnical and Materials Engineering

Fred J. Griffiths, Ph.D., P.Eng.
Principal and Group Leader,
Designated Principal MTO Foundation Contact

Cement Type and Corrosion Protection

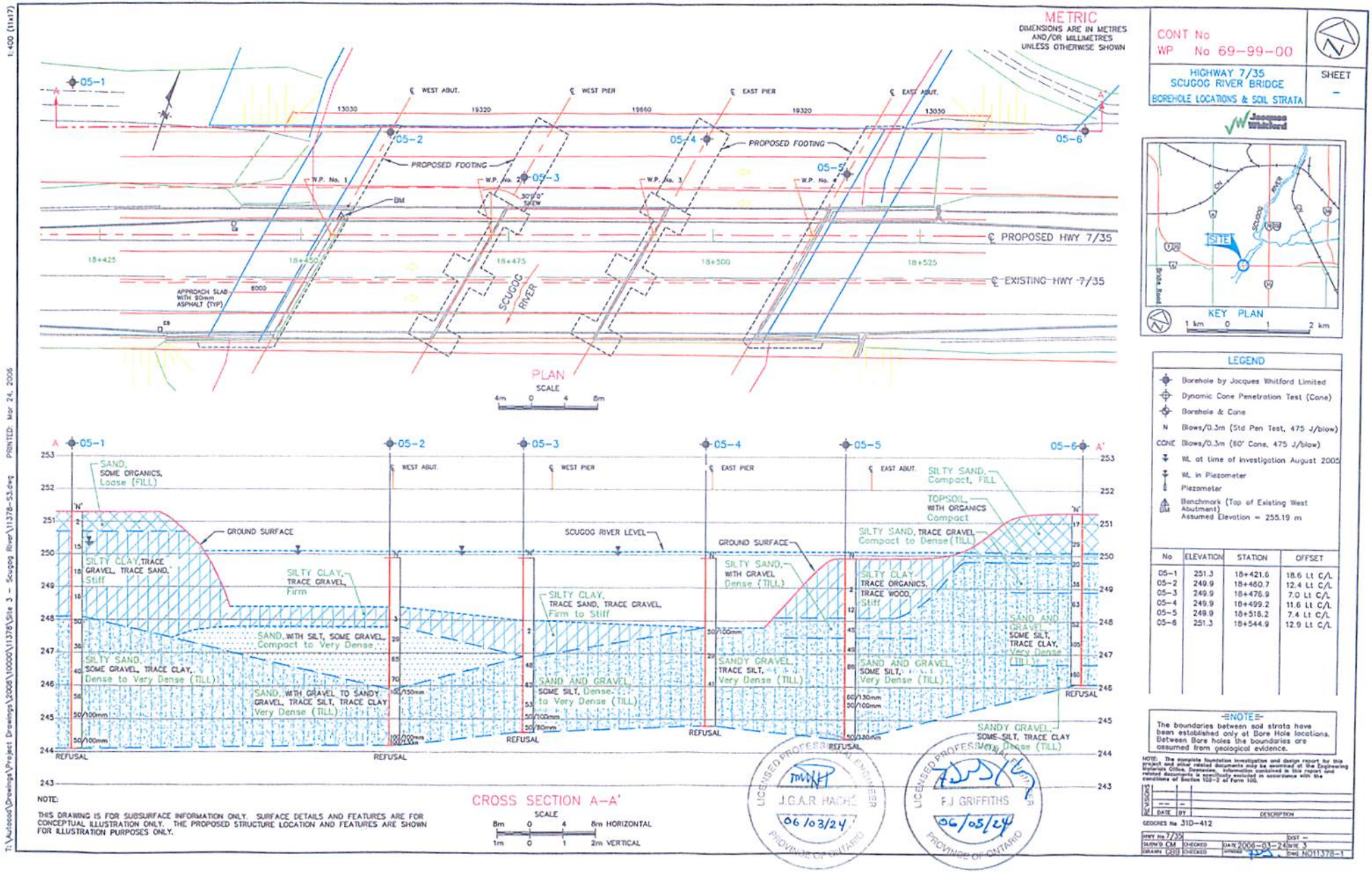
Two representative soil samples were submitted to Paracel Laboratories in Ottawa, Ontario, for analysis of pH, resistivity, chloride and water soluble sulphate, in order to determine cement type and reinforcing steel protection requirements. The results are presented in the Table 6.7.

Table 6.11: Chemical Analysis Results

Location	Borehole	Sample	pH	Resistivity	Soluble Sulphate	Chloride
New Alignment West Abutment	05-2	SS-4	8.86	12,000 ohm.cm	10 µg/g	5 µg/g
Existing Alignment East Abutment	05-5	SS-6	8.72	2,100 ohm.cm	80 µg/g	150 µg/g

APPENDIX A

Borehole Location Plans and Profile Plots



No	ELEVATION	STATION	OFFSET
05-1	251.3	18+421.6	18.6 Lt C/L
05-2	249.9	18+460.7	12.4 Lt C/L
05-3	249.9	18+476.9	7.0 Lt C/L
05-4	249.9	18+499.2	11.6 Lt C/L
05-5	249.9	18+518.2	7.4 Lt C/L
05-6	251.3	18+544.9	12.9 Lt C/L

REVISIONS		
NO	DATE	BY
-	-	-

DESCRIPTION

APPENDIX B

Symbols and Terms Used on Borehole Records
Borehole Records
Grain Size Distribution Test Results
Atterberg Limit Test Results

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil	-	mixture of soil and humus capable of supporting good vegetative growth
Peat	-	fibrous aggregate of visible and invisible fragments of decayed organic matter
Till	-	unstratified glacial deposit which may range from clay to boulders
Fill	-	any materials below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	-	having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure
Varved	-	composed of regular alternating layers of silt and clay
Stratified	-	composed of alternating successions of different soil types, e.g. silt and sand
Layer	-	>75 mm
Seam	-	2 mm to 75 mm
Parting	-	< 2 mm
Well Graded	-	having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded	-	predominantly of one grain size

Terminology describing soils on the basis of grain size and plasticity is based on the Unified Soil Classification System (USCS) (ASTM D-2488). The classification excludes particles larger than 76 mm (3 inches). This system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%

The standard terminology to describe cohesionless soils includes the compactness (formerly "relative density"), as determined by laboratory test or by the Standard Penetration Test 'N' - value.

Relative Density	'N' Value	Compactness %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests, or occasionally by standard penetration tests.

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Consistency	Undrained Shear Strength		'N' Value
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

ROCK DESCRIPTION

Rock Quality Designation (RQD)

The classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on NW core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from in situ fractures.

RQD	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

Terminology describing rock mass:

Spacing (mm)	Bedding, Laminations, Bands	Discontinuities
2000-6000	*Very Thick*	*Very Wide*
600-2000	*Thick*	*Wide*
200-600	*Medium*	*Moderate*
60-200	*Thin*	*Close*
20-60	*Very Thin*	*Very Close*
<20	*Laminated*	*Extremely Close*
<6	*Thinly Laminated*	

Strength Classification	Uniaxial Compressive Strength (MPa)
Very Low	1-25
Low	25-50
Medium	50-100
High	100-200
Very High	>200

Terminology describing weathering:

Slight - Weathering limited to the surface of major discontinuities. Typically iron stained.

Moderate - Weathering extends throughout rock mass. Rock is not friable.

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High - Weathering extends throughout rock mass. Rock is friable.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:

Boulders, Cobbles, Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Metamorphic Bedrock | Sedimentary Bedrock

WATER LEVEL MEASUREMENT

Borehole or Standpipe

Piezometer

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
PS	Piston sample
BS	Bulk sample
WS	Wash sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond drilling bits.

N - VALUE

Numbers in this column are the results of the Standard Penetration Test: the number of blows of a 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and 'N' values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75).

OTHER TESTS

S	Sieve analysis
G_s	Specific gravity of soil particles
k	Permeability (cm/sec)
	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer
H	Hydrometer analysis
γ	Unit weight
C	Consolidation
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct shear
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$; the index corrected to a reference diameter of 50 mm)

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CONT. 2009-4015

Foundation Design

RECORD OF BOREHOLE No BH 05-1

1 OF 1

METRIC

W.P. ONO11378 LOCATION Highway 7, Lindsay, 18+421.6 18.6 Lt C/L ORIGINATED BY SG

DIST Lindsay HWY 7 BOREHOLE TYPE Hollow Stem Augers with Split Spoons COMPILED BY SG

DATUM Geodetic DATE 18.04.05 - 18.04.05 CHECKED BY CM

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 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
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
251.5	Grass										
251.4 / 0.1	TOPSOIL										
	Sand, with some organics, loose, brown (FILL)		1	SS	2						
250.9 / 0.6	SILTY CLAY, trace gravel, trace sand, stiff, brown		2	SS	15	▽	251				
			3	SS	18		250				5 5 65 25
			4	SS	16		249				
248.3 / 3.2	Silty sand, some gravel, trace clay, dense to very dense, brown (TILL)		5	SS	50		248				
			6	SS	36						
			7	SS	40		247				
			8	SS	56		246				13 53 (34)
			9	SS	50/ 100mm						
			10	SS	50/ 50mm		245				
244.3 / 7.2	End of Borehole										
	Monitoring Well Installed										

MTO 11378 - SCUGOG.GPJ ON_MOT.GDT 24/03/06

+3, x3; Numbers refer to Sensitivity ε3% STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH 05-2 1 OF 1 METRIC

W.P. ONO11378 LOCATION Highway 7, Lindsay, 18+460.7 12.4 Lt C/L ORIGINATED BY SG

DIST Lindsay HWY 7 BOREHOLE TYPE Portable, Casing with Split Spoons COMPILED BY SG

DATUM Geodetic DATE 17.08.05 - 17.08.05 CHECKED BY CM

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 (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
250.1 Water							250				
0.0	Water (Scugog River)										
248.6							249				
1.5	Silty CLAY, trace gravel, firm, grey		1	SS	3						
247.9							248				
2.1	SAND, with silt, trace gravel, compact to very dense, brown to grey		2	SS	29						
			3	SS	65		247				7 67 (26)
246.1			4	SS	70						
4.0	Sand with gravel to sandy gravel, trace silt, trace clay, very dense, grey (TILL)		5	SS	100/ 150 mm		246				20 60 (20)
			6	SS	100/ 100 mm		245				
244.4			7	SS	100/ 130 mm						
5.7	End of Borehole										

MTD 11378 - SCUGOG.GPJ ON MOT.GDT 28/10/05

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

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RECORD OF BOREHOLE No BH 05-3

1 OF 1 **METRIC**

W.P. ONO11378 LOCATION Highway 7, Lindsay, 18+476.9 7.0 Lt C/L ORIGINATED BY SG

DIST Lindsay HWY 7 BOREHOLE TYPE Portable, Casing with Split Spoons COMPILED BY SG

DATUM Geodetic DATE 18.08.05 - 18.08.05 CHECKED BY CM

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 (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
250.1	Water											
0.0	Water (Scugog River)						250					
							249					
248.2												
1.9	Silty CLAY, trace sand, trace gravel, firm to stiff, grey		1	SS	2		248					
			2	SS								
247.1												
3.0	Sand and gravel, some silt, dense to very dense, grey (TILL)		3	SS	48		247					
			4	SS	62							
			5	SS	53		246					42 46 (12)
			6	SS	50/100 mm							47 41 (12)
244.7			7	SS	50/80 mm		245					
5.3	End of Borehole											

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

MTO 11378 - SCUGOG.GPJ ON_MOT.GDT 24/03/06

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Ontario

Foundation Design

RECORD OF BOREHOLE No BH 05-4 1 OF 1 METRIC

W.P. ONO11378 LOCATION Highway 7, Lindsay, 18+499.2 11.6 Lt C/L ORIGINATED BY SG

DIST Lindsay HWY 7 BOREHOLE TYPE Portable, Casing with Split Spoons COMPILED BY SG

DATUM Geodetic DATE 19.08.05 - 19.08.05 CHECKED BY CM

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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
250.1 Water											
0.0	Water (Scugog River)						250				
							249				
248.0											
2.1	Sandy gravel, trace silt, very dense, grey (TILL)		1	SS	50/ 100 mm		248		○		
			2	SS	29 100/		247		○		
			3	SS	300 mm				○		
			4	SS	41 100/				○		50 39 (11)
			5	SS	300 mm		246		○		51 41 (8)
245.0											
5.1	End of Borehole										

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

MTO 11378 - SCUGOG.GPJ ON MOT.GDT 28/10/05

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RECORD OF BOREHOLE No BH 05-5 1 OF 1 METRIC

W.P. ONO11378 LOCATION Highway 7, Lindsay, 18+516.2 7.4 Lt C/L ORIGINATED BY SG

DIST Lindsay HWY 7 BOREHOLE TYPE Portable, Casing with Split Spoons COMPILED BY SG

DATUM Geodetic DATE 22.08.05 - 22.08.05 CHECKED BY CM

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)	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
250.1	Water with cattails										
0.0	Silty CLAY, trace organics, trace wood, stiff, grey		1	SS	1		250				
			2	SS	2						
							249				
			3	SS	12				42.1		
248.2											
1.8	Silty sand, with gravel, dense, grey (TILL)		4	SS	45		248				
247.6											
2.4	Sand and gravel, some silt, dense to very dense, grey (TILL)		5	SS	49						37 47 (16)
	Boulder		6	SS	86		247				
			7	SS	60/ 130 mm		246				45 49 (6)
			8	SS	50/ 100 mm						
	Boulder		9	SS			245				
244.6			10	SS	50/ 130 mm						
5.5	End of Borehole										

+3, x3, Numbers refer to Sensitivity ε 3% STRAIN AT FAILURE

MTO 11378 - SCUGOG.GPJ ON MOT.GDT 28/10/05

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Foundation Design

RECORD OF BOREHOLE No BH 05-6 1 OF 1 METRIC

W.P. ONO11378 LOCATION Highway 7, Lindsay, 18+544.9 12.9 Lt C/L ORIGINATED BY SG

DIST Lindsay HWY 7 BOREHOLE TYPE Portable, Casing with Split Spoons COMPILED BY SG

DATUM Geodetic DATE 22.08.05 - 23.08.05 CHECKED BY CH

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 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
251.5 Grass											
251.3 0.2	TOPSOIL with organics, loose, dark brown										
	Silty sand, compact, light brown (FILL)		1	SS	17		251		○		
			2	SS	29				○		
250.3 1.2	TOPSOIL, with organics, compact, dark brown										
250.0 1.5	Silty sand, trace gravel, compact to dense, light brown (TILL)		3	SS	20		250		○		
			4	SS	36				○		
249.1 2.4	Sand and gravel, some silt, trace clay, very dense, grey (TILL)		5	SS	63		249		◇		
			6	SS	52				○		
			7	SS	105		248				
248.9 4.6	Sandy gravel, some silt, trace clay, very dense, grey		8	SS	160		247		○		
246.3 5.2	End of Borehole										

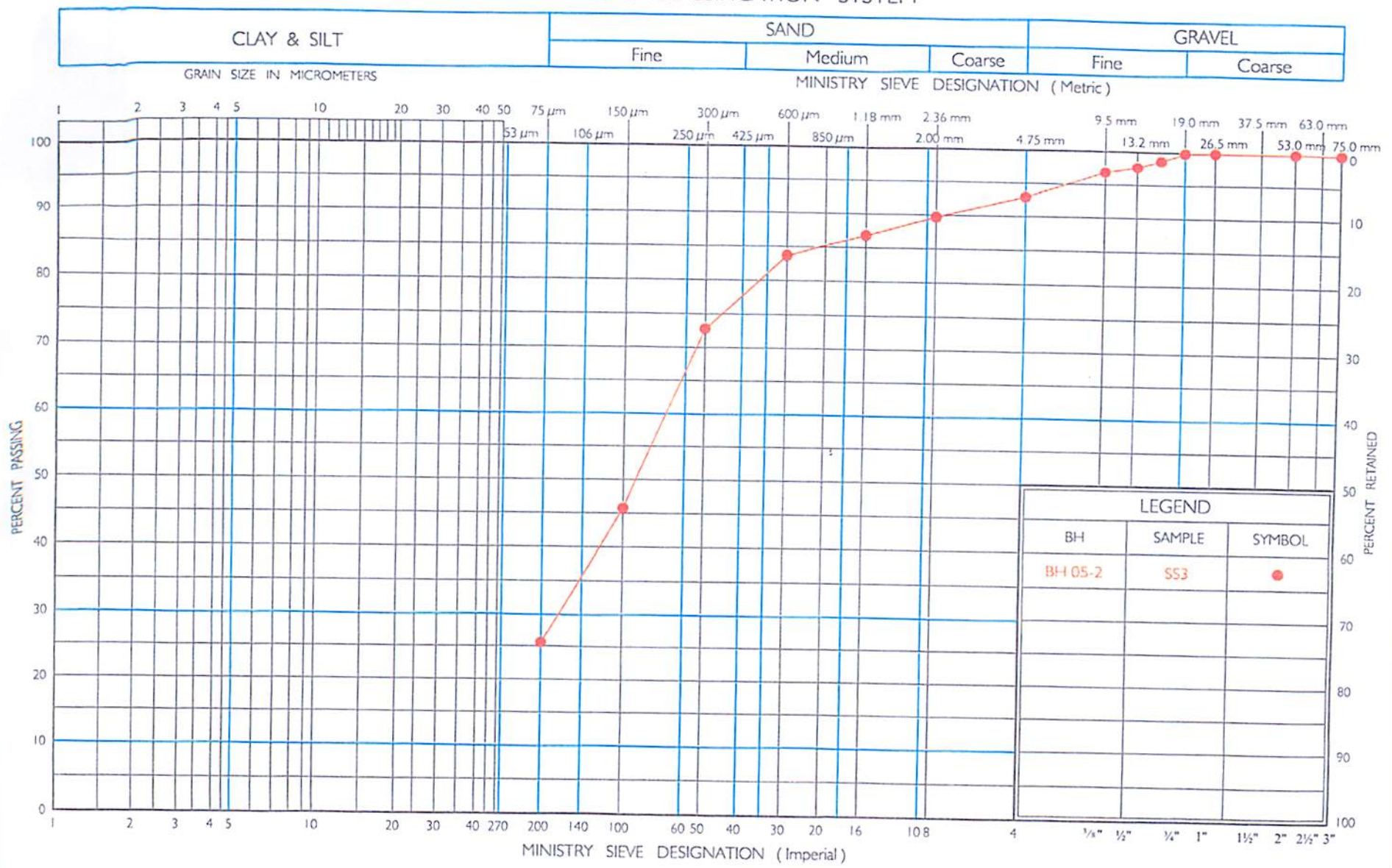
+ 3 × 3 : Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

MTO 11378 - SCUGOG.GPJ ON_MOT.GDT 28/10/05

FILENAME: 11378-S3-F1

MTO-GSD JAN 2005

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of Transportation

GRAIN SIZE DISTRIBUTION

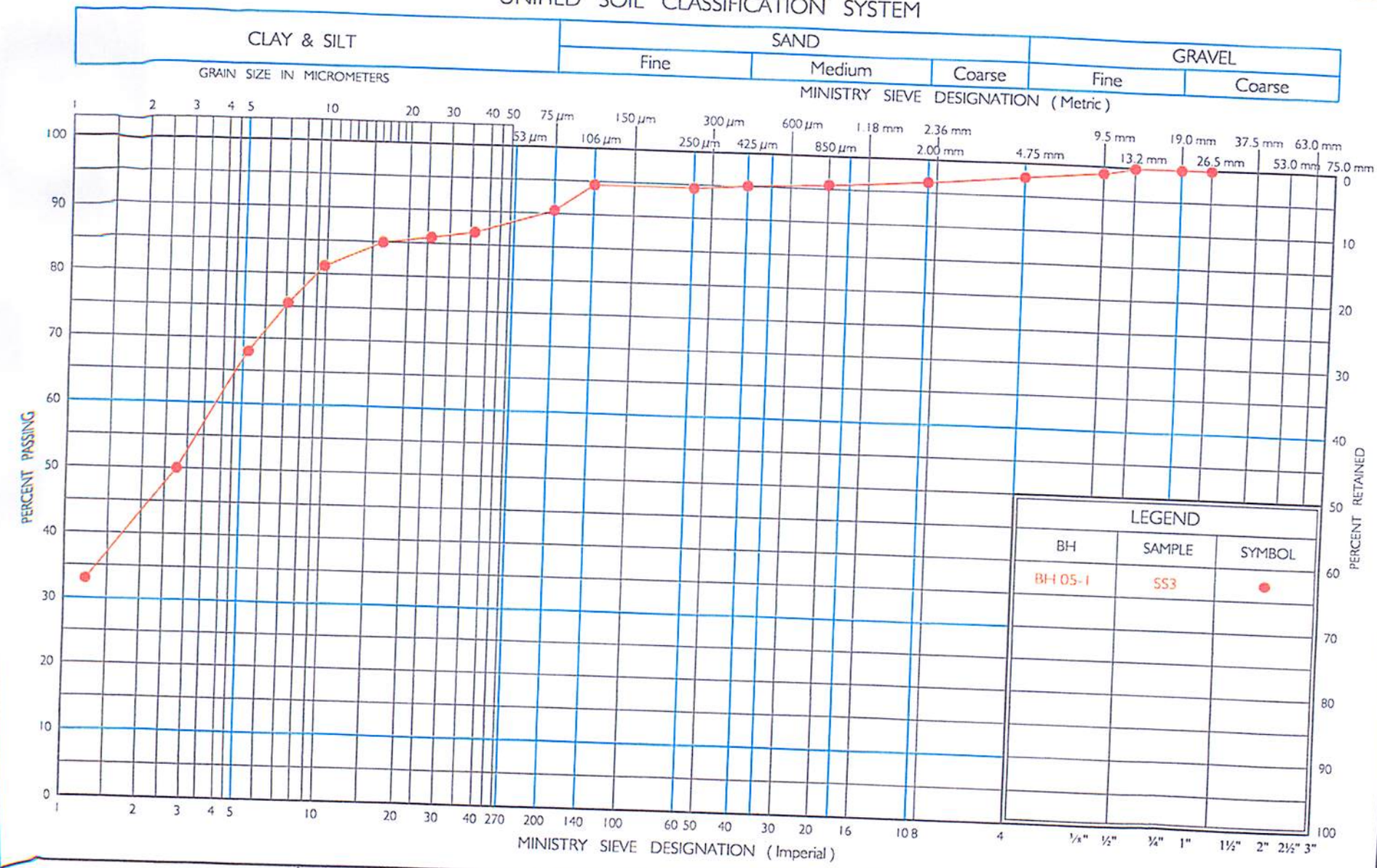
SAND, WITH SILT, TRACE GRAVEL

FIG No 1

W P 69-99-00

CONT. 2009-4015

UNIFIED SOIL CLASSIFICATION SYSTEM



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GRAIN SIZE DISTRIBUTION

SILT, WITH CLAY, TRACE GRAVEL, TRACE SAND

FIG No 2

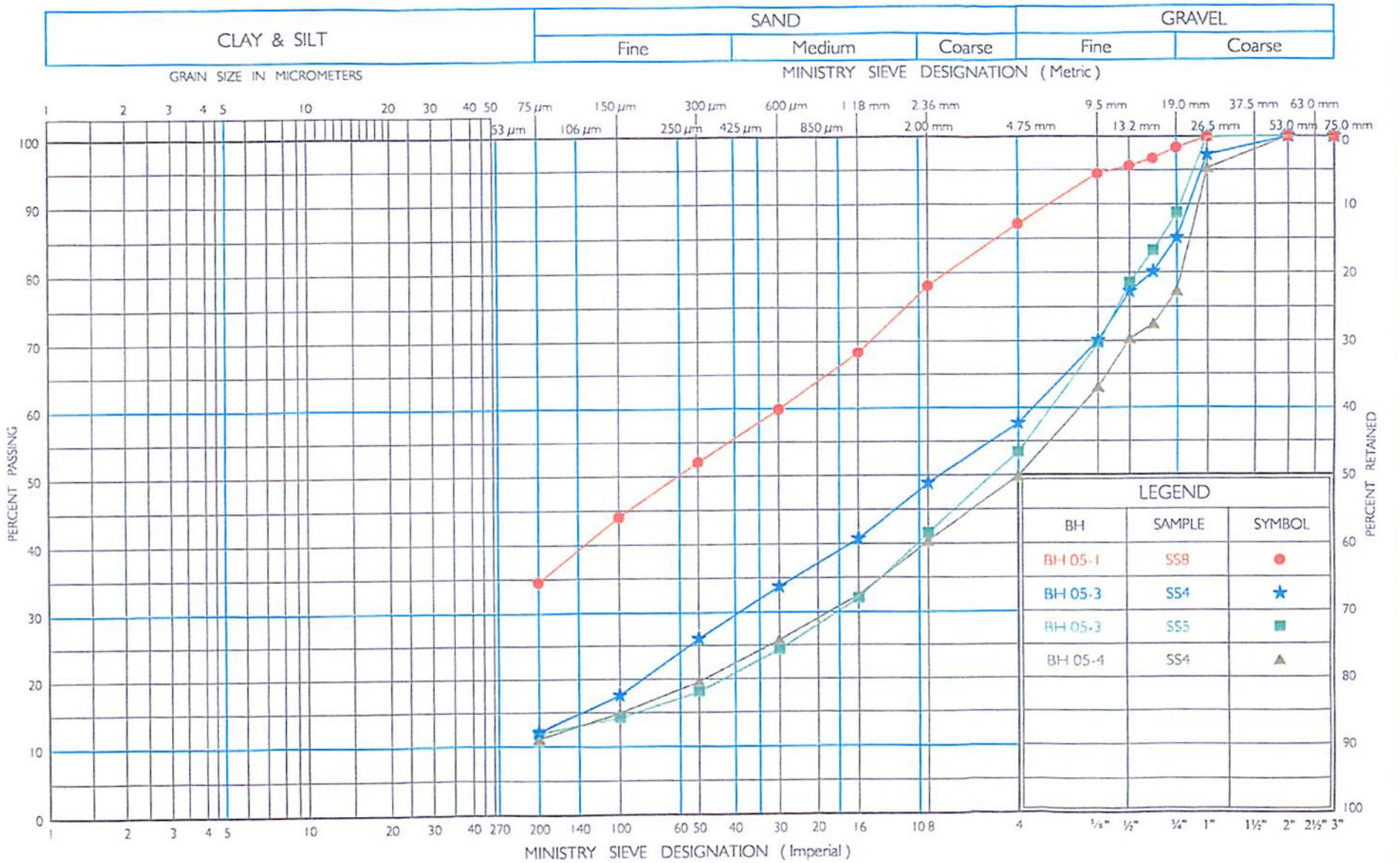
W P 69-99-00

CONT. 2009-4015

FILENAME: 11378-S3-F1

MTO-GSD JAN 2005

UNIFIED SOIL CLASSIFICATION SYSTEM



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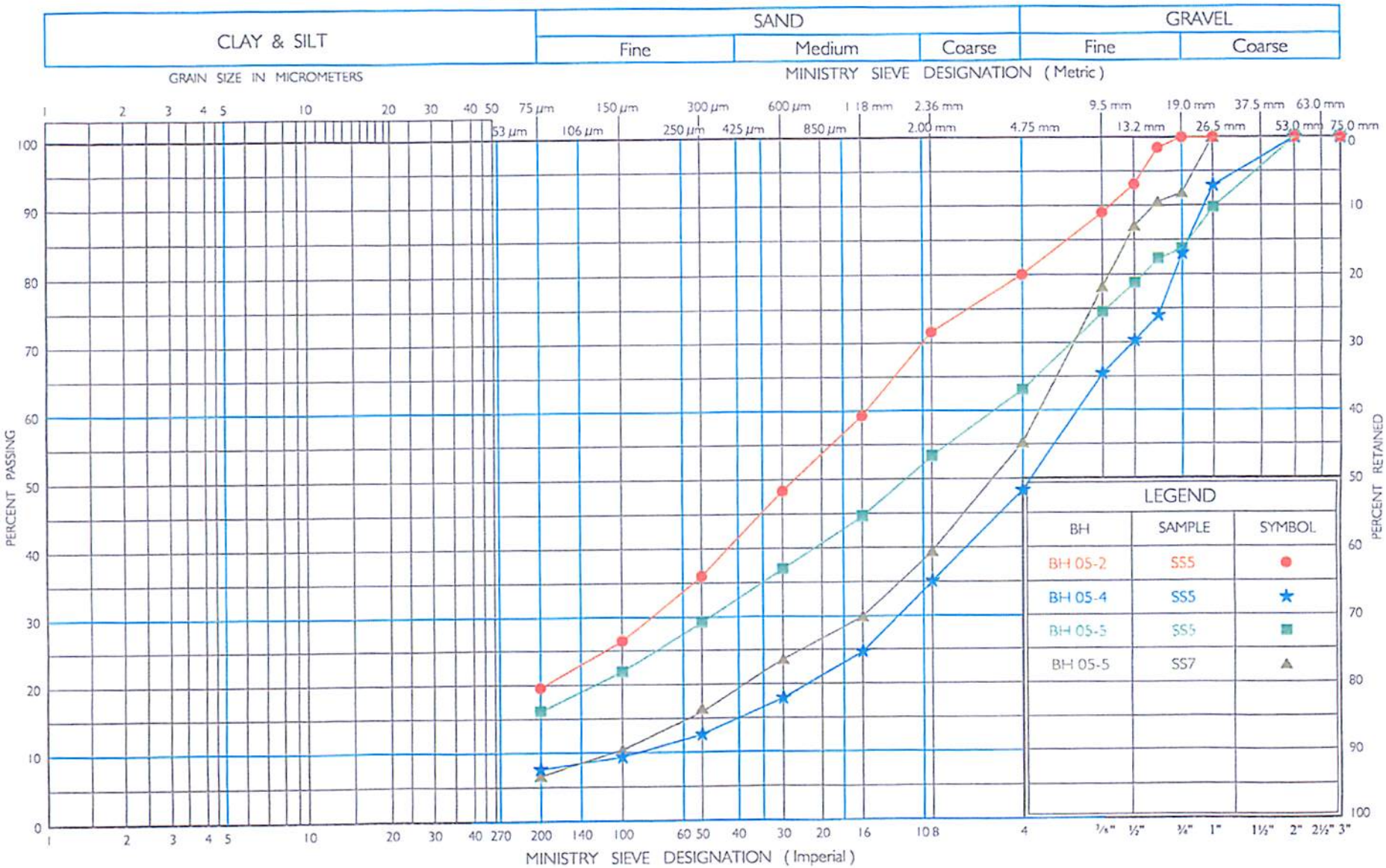
GRAIN SIZE DISTRIBUTION

SILTY SAND, SOME GRAVEL, TRACE CLAY TO SAND AND GRAVEL, SOME SILT (TILL)

FIG No 3

W P 69-99-00

UNIFIED SOIL CLASSIFICATION SYSTEM



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GRAIN SIZE DISTRIBUTION

SILTY SAND, SOME GRAVEL, TRACE CLAY TO SAND AND GRAVEL, SOME SILT (TILL)

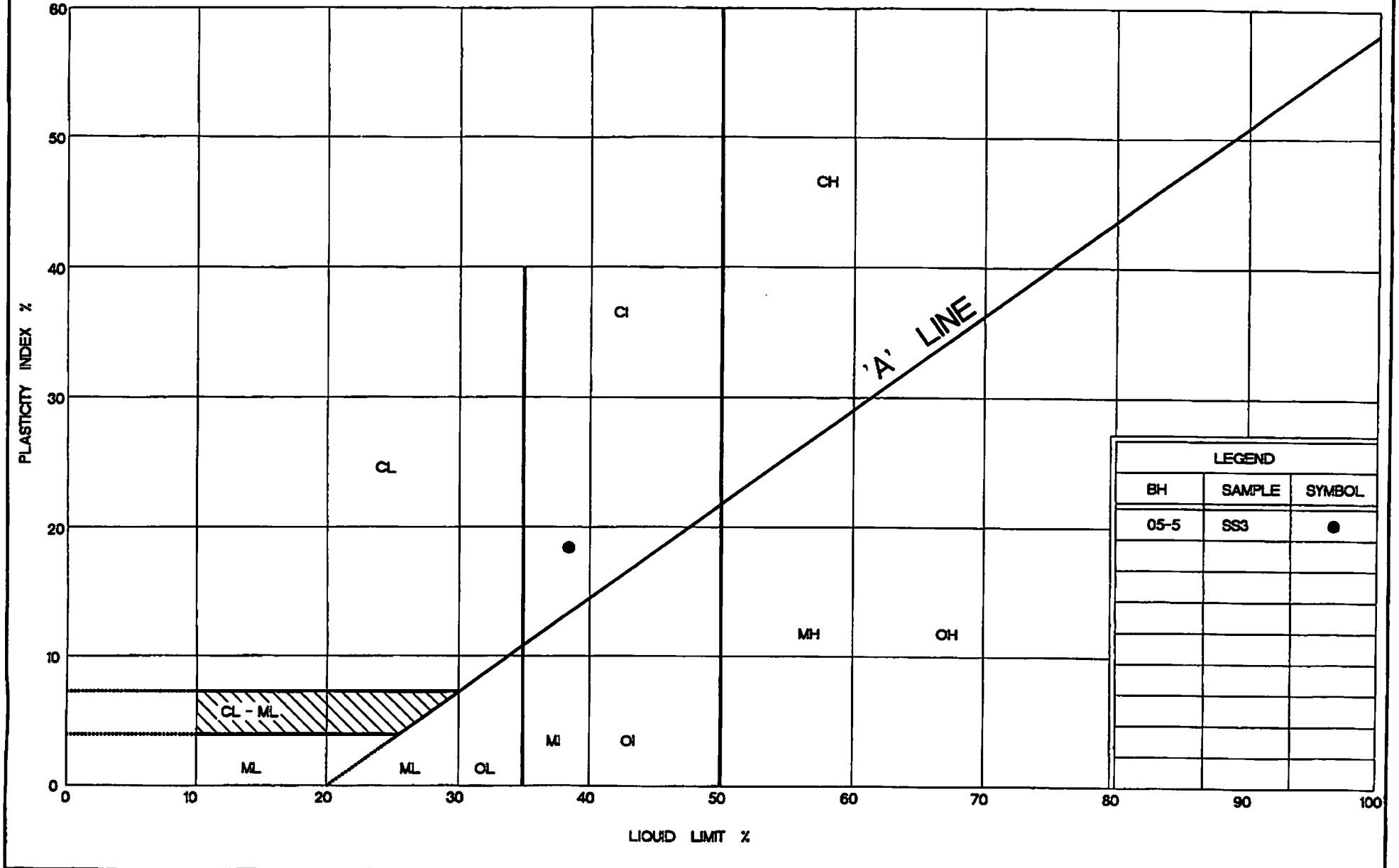
FIG No 4

W P 69-99-00

CONT. 2009-4015

T:\Autocad\Drawings\Project Drawings\2006\10000\11378\Site 3 - Scugog River\11378-S3-F5.dwg PRINTED: Mar 15, 2006

MTO-PLASTICITY CHART MARCH 16, 2004



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PLASTICITY CHART

SILTY CLAY

FIG No 5

W P 69-99-00

CONT. 2009-4015