



FOUNDATION INVESTIGATION REPORT

for

**WILDLIFE CULVERTS ON FOURTEEN MILE ISLAND
AT STATIONS 20+350, 20+460, 20+540 AND 20+630
MOWAT TOWNSHIP
HIGHWAY 69 FOUR-LANING
FROM 3.5 KM NORTH OF HWY 522
TO 10.7 KM NORTH OF HWY 522
W.P. 5203-06-00 (PART OF G.W.P. 5378-02-00)
SUDBURY AREA, ONTARIO**

PHASE 3: STA. 13+100 TO 21+500 (TOWNSHIP OF MOWAT)

PETO MacCALLUM LTD.
165 CARTWRIGHT AVENUE
TORONTO, ONTARIO
M6A 1V5
Phone: (416) 785-5110
Fax: (416) 785-5120
Email: toronto@petomaccallum.com

Distribution:

- 3 cc: McCormick Rankin Corporation for
distribution to MTO, Project Manager
+ one digital copy
- 1 cc: McCormick Rankin Corporation for
distribution to MTO, Pavements and
Foundations Section + one digital copy
- 2 cc: McCormick Rankin Corporation
+ one digital copy
- 1 cc: PML Toronto
- 1 cc: PML Barrie

PML Ref.: 06TF035C-1
Index No.: 1999FIR
GEOCRES No.: 41I-252
February 22, 2010

TABLE OF CONTENTS

1. INTRODUCTION	1
2. SITE DESCRIPTION AND GEOLOGY	2
3. INVESTIGATION PROCEDURES.....	2
4. SUMMARIZED SUBSURFACE CONDITIONS.....	4
4.1 Culvert S1 at Sta. 20+350, Mowat Township	4
4.1.1 Upper Sand	5
4.1.2 Silty Clay	5
4.1.3 Silt	6
4.1.4 Lower Sand	6
4.1.5 Bedrock	6
4.1.6 Groundwater	7
4.2 Culvert S2 at Sta. 20+460, Mowat Township	8
4.2.1 Peat	8
4.2.2 Silty Sand	8
4.2.3 Silty Clay	8
4.2.4 Clayey Silt	9
4.2.5 Bedrock	9
4.2.6 Groundwater	10
4.3 Culvert S3 at Sta. 20+540, Mowat Township	11
4.3.1 Peat	11
4.3.2 Silty Clay	11
4.3.3 Clayey Silt	12
4.3.4 Sand	12
4.3.5 Bedrock	12
4.3.6 Groundwater	13

4.4	Culvert S4 at Sta. 20+630, Mowat Township	14
4.4.1	Peat.....	14
4.4.2	Silty Sand	14
4.4.3	Clayey Silt	15
4.4.4	Sand and Gravel	15
4.4.5	Bedrock	15
4.4.6	Groundwater	16
5.	CLOSURE.....	17

Table A – Rock Core Descriptions

Explanation of Terms Used in Report

Figures and Drawings:

Culvert S1 at Sta. 20+350, Mowat Township
Figures PC-S1-1 to PC-S1-2 - Plasticity Charts
Figures GS-S1-1 to GS-S1-2 - Grain Size Distribution Charts
Record of Borehole Sheets
Drawing S1-1 – Borehole Locations and Soil Strata

Culvert S2 at Sta. 20+460, Mowat Township
Figures PC-S2-1 to PC-S2-2 - Plasticity Charts
Figures GS-S2-1 to GS-S2-2 - Grain Size Distribution Charts
Record of Borehole Sheets
Drawing S2-1 – Borehole Locations and Soil Strata

Culvert S3 at Sta. 20+540, Mowat Township
Figures PC-S3-1 to PC-S3-2 - Plasticity Charts
Figures GS-S3-1 to GS-S3-2 - Grain Size Distribution Charts
Record of Borehole Sheets
Drawing S3-1 – Borehole Locations and Soil Strata

Culvert S4 at Sta. 20+630, Mowat Township
Figure PC-S4-1 - Plasticity Chart
Figure GS-S4-1 - Grain Size Distribution Chart
Record of Borehole Sheets
Drawing S4-1 – Borehole Locations and Soil Strata

Appendix A – Rock Core Photographs

Appendix B – Data from Geotechnical Pavement Investigation (PML Ref.: 06TF034C)

FOUNDATION INVESTIGATION REPORT
for
Wildlife Culverts on Fourteen Mile Island
At Stations 20+350, 20+460, 20+540 and 20+630
Mowat Township
Highway 69 Four-Laning
From 3.5 km North of Hwy 522
To 10.7 km North of Hwy 522
W.P. 5203-06-00 (Part of G.W.P. 5378-02-00)
Sudbury Area, Ontario

PHASE 3: Sta. 13+100 to 21+500 (Township of Mowat)

1. INTRODUCTION

Four wildlife culverts are planned within the phase 3 of the four-laning of a 7.2 km long section of Highway 69 that extends from 3.5 km north of Highway 522 to 10.7 km north of Highway 522, about 70 km south of Sudbury. Peto MacCallum Ltd. (PML) prepared this foundation investigation report for McCormick Rankin Corporation (MRC) on behalf of the Ministry of Transportation of Ontario (MTO).

The four proposed wildlife culvert sites are located on 14 Mile Island between the Pickerel River and Ojibway Canyon. The results of the foundation investigations for other culvers in the same grading contract have been reported under separate cover.

For the purpose of this report, these wildlife culverts will be referenced as culvert S1 at Sta. 20+350, culvert S2 at Sta. 20+460, culvert S3 at Sta. 20+540 and culvert S4 at Sta. 20+630, Mowat Township.

This report summarizes the results of the subsurface investigation conducted at the four wildlife culvert locations.

All elevations in the report are expressed in metres.



2. SITE DESCRIPTION AND GEOLOGY

The section of the existing Highway 69 to be realigned and four-laned is situated about 70 km south of Sudbury in a wooded region between the Pickerel River and the Ojibway Canyon.

Land use of the study section comprises the existing Highway 69 transportation corridor and tourism and recreation industries near Bucke Lake and Pickerel River. The tourist establishments include fishing and hunting lodges, camps, marinas and hotels along the alignment. Local cottages also exist within the new highway alignment.

The study area is located in the Precambrian Laurentian Peneplane. The topography of study area is irregular with shallow bedrock sections and deep swamp deposits, particularly near Bucke Lake. Pleistocene lacustrine/fluvial deposits and recent swamp sediments have been laid down in depressions and are probably associated with the Nipissing post-glacial stage of the Great Lakes. The ground cover comprises grasses and typical swamp vegetation, bushes and stands of trees.

Metasedimentary rocks of the Huronian Supergroup and gneisses of the Grenville Province underlie the alignment. The area has undergone considerable folding, intrusive activity, regional metamorphism and faulting. The bedrock outcrops at many locations throughout the project section.

3. INVESTIGATION PROCEDURES

The field work for the four wildlife culvert sites included in this study was carried out during the period of March 30 to April 3, 2009. A total of 12 sampled boreholes and 1 auger probe were conducted for the study. The boreholes and the auger probe were drilled to depths of 1.1 to 6.9 m, elevations 199.1 to 207.3. All of the boreholes were extended by coring 2.9 to 3.3 m into bedrock to a total depth of 4.1 to 9.9 m, elevations 196.1 to 204.3. Bedrock was contacted at the surface at one borehole location.



The locations of the test holes put down along each of the culvert sites are shown on the attached Drawings S1-1, S2-1, S3-1 and S4-1.

The borehole locations were established in accordance with the MTO requirements indicated in the RFP and in general accordance with the requirements of the MTO Northeastern Region Pavement Design Practices and Guidelines (May 20, 1997). Callon Dietz Inc., Ontario Land Surveyors laid out the reference lines of the new highway in the field and these lines were used by PML to select the borehole locations. The ground surface elevations at the boreholes were provided by Callon Dietz Inc., Ontario Land Surveyors.

The boreholes were advanced using continuous flight hollow and solid stem augers, powered by a track-mounted D-50 drill rig. The equipment was supplied and operated by a specialist drilling contractor working under the full-time supervision of members of PML engineering staff. The culvert boreholes were extended 2.9 to 3.3 m into the underlying and surficial bedrock using rotary diamond drilling methods.

Representative soil samples were recovered at frequent depth intervals using a conventional split spoon sampler during drilling. Standard penetration tests were conducted simultaneously with the sampling operation to assess the strength characteristics of the substrata. Penetrometer and in-situ vane shear testing (using the MTO 'N' vane) was also performed to further assess the shear strength of the cohesive soils encountered. The penetrometer test results are typically less than the actual values due to sample disturbance. The results of the field tests and observations are reported on the appended Record of Borehole sheets.

The groundwater conditions at the borehole locations were assessed during drilling by visual examination of the soil, the sampler and drill rods as the samples were retrieved and, when appropriate, by measurement of the water level in the open borehole. Upon completion of drilling, all the boreholes were backfilled with a bentonite/cement mixture in accordance with the MTO and MOE Reg. 903 guidelines for borehole abandonment procedures.

Soils were identified in the field in accordance with the MTO Soil Classification procedures. The recovered samples were returned to our laboratory for detailed visual examination and



classification. The laboratory testing programme consisted of moisture content determinations (47), Atterberg plasticity limits tests (12) and grain size distribution analyses (12) conducted on select soil samples.

The results of the laboratory Atterberg plasticity limits and grain size distribution analyses are presented on the appended plasticity charts and grain size distribution figures, which were identified with the respective codes PC and GS.

4. SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Record of Borehole sheets for details of the subsurface conditions including soil classifications, inferred stratigraphy, soil boundary elevations, standard penetration resistance values, in-situ vane shear and penetrometer test data and groundwater observations. The results of laboratory Atterberg plasticity limits testing, grain size distribution analyses and moisture content determinations are also shown on the Record of Borehole sheets.

The borehole locations are shown on Drawings S1-1, S2-1, S3-1 and S4-1. The boundaries between soil strata have been established at the borehole locations only. Between and beyond the boreholes, the boundaries are assumed and may vary.

A description of the subsurface stratigraphy at each culvert location is summarised in the following subsections of the report.

4.1 Culvert S1 at Sta. 20+350, Mowat Township

Three boreholes and one auger probe were drilled along the alignment of culvert S1. The subsurface stratigraphy revealed in the test holes comprised a surficial sand layer, underlain by silty clay and silt, locally over a thin sand deposit. Bedrock/probable bedrock was contacted at depths of 4.1 to 6.9 m, elevations 199.1 to 201.7. Groundwater was observed at the surface in all of the boreholes during the field investigation.



4.1.1 Upper Sand

A surficial sand layer measuring 100 to 300 mm in thickness was encountered in all the boreholes and at the auger probe location. The sand layer was very loose to loose and was penetrated at elevations 205.3 to 205.9. The water content of a representative sample of the upper sand was 17%.

4.1.2 Silty Clay

Underlying the thin surficial layer of sand at 0.1 to 0.3 m depth was a deposit of cohesive silty clay. The silty clay was 1.9 to 3.9 m thick and was firm to stiff in consistency. The N values ranged from 2 to 10. Penetrometer testing on samples of the silty clay indicated a range of shear strength from 12.5 to 80 kPa. In-situ vane testing conducted in borehole S1-3 indicated a shear strength of 40 kPa. As stated previously the lower shear strength value measured from the penetrometer test may be due to sample disturbance. The deposit was penetrated at depths of 2.1 to 4.2 m, elevations 201.4 to 203.7.

The results of Atterberg plasticity limits testing and grain size distribution analyses conducted on representative samples of the cohesive silty clay deposit is presented in Figures PC-S1-1 and GS-S1-1, respectively.

The liquid limits of the deposit were 35 and 49 and plastic limits were 20 and 22 with plasticity index values of 15 and 27. The water contents of 28 to 48% were determined on representative samples.



4.1.3 Silt

Beneath the silty clay at 2.1 to 4.2 m depth, elevations 201.4 to 203.7, a non-plastic silt deposit was contacted. The silt deposit was 1.6 to 3.0 m thick, comprising some clay, trace sand. The relative density of the silt was loose to compact. The N values of the silt ranged from 5 to 10. Hydrostatic disturbances within the silt deposit resulted in lower N values of 1 and 2 in boreholes S1-1 and S1-3. The deposit mantled the underlying bedrock/probably bedrock at 4.1 to 6.9 m depths, elevations 199.1 to 201.7, in boreholes S1-1, S1-2 and auger probe S1-4. The silt deposit was penetrated at 5.8 m depth, elevation 199.8 in borehole S1-3.

The results of Atterberg plasticity limits testing and grain size distribution analyses conducted on representative samples of the silt deposit is presented in Figures PC-S1-2 and GS-S1-2, respectively.

The liquid limits of the deposit were 22 and 24 and plastic limits were 21 and 20 with plasticity index values of 1 and 4, indicating non plasticity. The water contents of 27 to 32% were determined on representative samples.

4.1.4 Lower Sand

Overlain by silt at 5.8 m depth, elevation 199.8, a cohesionless sand deposit was contacted in borehole S1-3. The deposit was 300 mm thick, comprised some silt and mantled the underlying bedrock at 6.1 m depth, elevation 199.5.

4.1.5 Bedrock

Bedrock/probable bedrock was contacted at depths of 4.1 to 6.9 m, with the bedrock surface elevation decreasing from elevation 201.7 at the centerline median to elevation 199.1 at the west end of the proposed southbound culvert and to elevation 199.5 at the east end of the proposed northbound culvert. Bedrock was proven upon contact by coring 3.0 to 3.1 m into the rock to 7.2 to 9.9 m depth, elevations 196.1 to 198.6, in all of the boreholes.



The bedrock comprised light grey Granitic Gneiss at the west end of the proposed southbound culvert, dark green to black Gabbro at the centreline median and light grey, becoming predominately dark grey to black Migmatite at the east end of the proposed northbound culvert. The bedrock exhibited medium strength at the centreline median and high strength in the other borehole locations. A detailed description of the rock cores retrieved from boreholes S1-1, S1-2 and S1-3 is given in Table A, appended.

The measured core recovery was 98 to 100%. The RQD determined from the rock cores was in a range of 98 to 100%, thus indicating excellent quality rock.

For additional bedrock depths reference is made to the geotechnical pavement investigation test pits conducted along this alignment (PML Ref.: 06TF034C). At Sta. 20+350, at 7.0 and 19.0 m right of the centreline median, bedrock was contacted at 4.5 and 5.4 m depth, elevations 201.4 and 200.3, respectively. At Sta. 20+350, at 7.0 m left of the centerline median bedrock was contacted at 5.4 m depth, elevation 200.5, and was not contacted at 19.0 m left of the centreline median within the 6.2 m depth of exploration.

4.1.6 Groundwater

Groundwater was observed in all of the boreholes during the course of the field work. As mentioned previously the investigation was conducted in early spring, between March 30 and April 3, 2009. A combination of heavy precipitation and warmer temperatures during the investigation resulted in the melting of the surrounding snow. Accordingly, perched and ponded water was present at all borehole locations, which in turn affected groundwater level measurements. A series of test pits was conducted along the proposed alignment as part of the geotechnical pavement investigation (PML Ref.: 06TF034C). Reviewing the test pit data, groundwater seepage was observed at 5.2 m depth, elevation 200.7 in one of the eight test pit locations during the investigation in August of 2007. The groundwater levels at the site are subject to seasonal fluctuations and precipitation patterns.



4.2 Culvert S2 at Sta. 20+460, Mowat Township

Three boreholes were drilled along the alignment of culvert S2. The subsurface stratigraphy revealed in the boreholes comprised a surficial peat or silty sand layer, underlain by silty clay and clayey silt. Bedrock was contacted at depths of 3.8 to 6.4 m, elevations 199.5 to 202.0. Groundwater was observed at, or just below the surface in all of the boreholes during the field investigation.

4.2.1 Peat

Peat was present surficially in boreholes S2-1 and S2-3 at the west and east ends of the proposed southbound and northbound culverts. The fine fibrous peat was 200 mm thick and was penetrated at elevations 205.7 and 205.9 in boreholes S2-1 and S2-3, respectively. The peat was frozen in borehole S2-3.

4.2.2 Silty Sand

A surficial silty sand layer measuring 600 mm in thickness was encountered in the centreline median borehole, S2-2. The silty sand layer was loose and was penetrated at elevation 205.2. The water content of a representative sample of the silty sand was 16%.

4.2.3 Silty Clay

Underlying the surficial peat or silty sand layer at 0.2 to 0.6 m depth was a deposit of cohesive silty clay. The silty clay was 1.9 to 3.9 m thick and was firm to stiff in consistency, locally soft at depth. The N values ranged from 0 (penetration due to the weight of rods and hammer) to 13. A penetrometer test conducted on a sample of the silty clay indicated a shear strength of 75 kPa. The deposit was penetrated at depths of 2.1 to 4.1 m, elevations 201.8 to 204.0.

The results of Atterberg plasticity limits testing and grain size distribution analysis conducted on a sample of the silty clay are presented in respective Figures PC-S2-1 and GS-S2-1.



The liquid limit and plastic limit of the silty clay was 37 and 19, respectively, with a plasticity index value 18. The water contents of 26 to 59% were determined on representative samples.

4.2.4 Clayey Silt

Beneath the silty clay at 2.1 to 4.1 m depth, elevations 201.8 to 204.0, a low plasticity clayey silt deposit was contacted. The clayey silt deposit was 0.9 to 3.6 m thick, comprising trace to some sand, locally becoming sandy with trace gravel and cobbles at depth in borehole S2-3. The consistency of the deposit was firm. The N values of the clayey silt ranged from 1 (refusing on the underlying bedrock after 0.15 m penetration) to 7. The deposit mantled the underlying bedrock at 3.8 to 6.4 m depths, elevations 199.5 to 202.0 in all of the boreholes.

The results of Atterberg plasticity limits testing and grain size distribution analyses conducted on representative samples of the clayey silt deposit is presented in Figures PC-S2-2 and GS-S2-2, respectively.

The liquid limits of the deposit were 20 and 26 and plastic limits were 16 and 20 with plasticity index values of 4 and 6, indicating clayey silt of low plasticity. The water contents of 25 to 29% were determined on representative samples

4.2.5 Bedrock

Bedrock was contacted at depths of 3.8 to 6.4 m, with the bedrock surface elevation decreasing from elevation 202.0 at the centerline median to elevation 199.5 at the west end of the proposed southbound culvert and to elevation 200.4 at the east end of the proposed northbound culvert. Bedrock was proven upon contact by coring 2.9 to 3.2 m into the rock to 7.0 to 9.5 m depth, elevations 196.4 to 198.8, in all of the boreholes.



The bedrock comprised black Migmatite at the west end of the proposed southbound culvert and pink and grey Granitic Gneiss at the centreline median and east end of the proposed northbound culvert. The bedrock exhibited high strength in all of the borehole locations. A detailed description of the rock cores retrieved from boreholes S2-1, S2-2 and S2-3 is given in Table A, appended.

The measured core recovery was 100%. The RQD determined from the rock cores was in a range of 90 to 100%, thus indicating excellent quality rock.

For additional bedrock depths reference is made to the geotechnical pavement investigation test pits conducted 10 m south and north of this alignment (PML Ref.: 06TF034C). For the proposed southbound culvert, test pits conducted at Sta. 20+450 at 7.0 m left and at Sta. 20+470 at 7.0 and 19.0 m left of the centreline median did not contact bedrock within the 5.1 to 5.5 m depth of exploration. Accordingly, bedrock was beyond elevations of 200.0 to 201.0. At Sta. 20+450 at 19.0 m left of the centreline median, bedrock was contacted at 6.9 m depth, around elevation 199.0. For the proposed northbound culvert, test pits conducted at Sta. 20+450 at 7.0 m right and at Sta. 20+470 at 7.0 and 19.0 m right of the centreline median, contacted bedrock at 4.1 to 5.0 m depth, around elevations 201.0 to 202.0. At Sta. 20+450 at 19.0 m right of the centerline median, bedrock was not contacted within the 5.0 m depth of exploration, beyond elevation 201.0.

4.2.6 Groundwater

Groundwater was observed in all of the boreholes during the course of the field work. As mentioned previously the investigation was conducted in early spring, between March 30 and April 3, 2009. A combination of heavy precipitation and warmer temperatures during the investigation resulted in the melting of the surrounding snow. Accordingly, perched and ponded water was present at all borehole locations, which in turn affected groundwater level measurements.

A series of test pits was conducted 10 m south and north of the proposed culvert alignment in August of 2007 at Sta. 20+450 and Sta. 20+470 as part of the geotechnical pavement



investigation (PML Ref.: 06TF034C). Groundwater was not observed in any of the sixteen test pit locations during this investigation. The groundwater levels at the site are subject to seasonal fluctuations and precipitation patterns.

4.3 Culvert S3 at Sta. 20+540, Mowat Township

Three boreholes were drilled along the alignment of culvert S3. The subsurface stratigraphy revealed in the boreholes comprised a surficial layer of peat, underlain by silty clay and/or clayey silt, locally over a thin sand deposit. Bedrock was contacted at depths of 2.0 to 3.3 m, elevations 202.9 to 204.2. Groundwater was observed at the surface to 1.0 m below the surface in all of the boreholes during the field investigation.

4.3.1 Peat

Peat was present surficially in all of the boreholes. The coarse to fine fibrous peat was 100 to 200 mm in thickness and was penetrated at elevations 205.9 to 206.1. The water content of a representative sample of the peat was 92%.

4.3.2 Silty Clay

Underlying the surficial peat layer at 0.1 and 0.2 m depth in boreholes S3-1 and S3-2 was a deposit of cohesive silty clay. The silty clay was 1.2 to 1.3 m thick and was firm to stiff in consistency. The N values ranged from 6 to 9. The deposit was penetrated at depths of 1.4 m, elevations 204.7 and 204.8.

The results of Atterberg plasticity limits testing and grain size distribution analysis conducted on a sample of the silty clay are presented in respective Figures PC-S3-1 and GS-S3-1.

The liquid limit and plastic limit of the silty clay was 45 and 22, respectively, with a plasticity index value 23. The water contents of 29 to 32% were determined on representative samples.



4.3.3 Clayey Silt

Beneath the silty clay at 1.4 m depth, elevations 204.7 and 204.8 in boreholes S3-1 and S3-2 and beneath the peat at 0.2 m depth, elevation 206.0 in borehole S3-2, a clayey silt deposit of low plasticity was contacted. The clayey silt deposit was 1.5 to 1.8 m thick, comprised trace to some sand and was firm to stiff in consistency. The N values of the clayey silt ranged from 3 to 9. The deposit mantled the underlying bedrock at 2.0 and 3.2 m depths, elevations 202.9 and 204.2, in boreholes S3-1 and S3-3. The clayey silt deposit was penetrated at 2.9 m depth, elevation 203.3 in borehole S3-2.

The results of Atterberg plasticity limits testing and grain size distribution analyses conducted on representative samples of the clayey silt deposit is presented in Figures PC-S3-2 and GS-S3-2, respectively.

The liquid limits of the deposit were 24 and plastic limits were 18 and 20 with plasticity index values of 4 and 6, indicating clayey silt of low plasticity. The water contents of 23 to 30% were determined on representative samples.

4.3.4 Sand

Overlain by clayey silt at 2.9 m depth, elevation 203.3, a cohesionless sand deposit was contacted in borehole S3-2. The deposit was 400 mm thick and comprised some silt. The relative density of the sand was compact. An N value of 24 blows for 10 cm sample penetration was recorded with the sampler bouncing on the underlying bedrock at 3.3 m depth, elevation 202.9.

4.3.5 Bedrock

Bedrock was contacted at depths of 2.0 to 3.3 m, with the bedrock surface elevation increasing from elevation 202.9 at the west end of the proposed southbound culvert and the centreline median to elevation 204.2 at the east end of the proposed northbound culvert. Bedrock was proven upon contact by coring 3.0 to 3.1 m into the rock to 5.0 to 6.4 m depth, elevations 199.8 to 201.2, in all of the boreholes.



The bedrock comprised pink and grey to grey becoming pink and black Granitic Gneiss in all of the borehole locations. Locally, in borehole S3-1 at the west end of the proposed southbound culvert the Granitic Gneiss was underlain by pink and light grey Migmatite and Arkose bedrock. The bedrock exhibited medium to high strengths. A detailed description of the rock cores retrieved from boreholes S3-1, S3-2 and S3-3 is given in Table A, appended.

The measured core recovery ranged from 91 to 100%. The RQD determined from the rock cores was in a range of 82 to 100%. The Granitic Gneiss and Migmatite bedrock were of good to excellent quality. Locally, beyond 5.4 m depth, elevation 200.7 to 6.2 m depth, elevation 199.1, the termination depth in borehole S3-1, the Arkose bedrock was of poor quality, as characterized by an RQD value of only 35%.

For additional bedrock depths reference is made to the geotechnical pavement investigation test pits conducted 10 m south and north of this alignment (PML Ref.: 06TF034C). For the proposed southbound culvert, test pits conducted at Sta. 20+530 at 7.0 m and 14.0 m left of the centreline median did not contact bedrock within the 4.5 and 4.6 m depth of exploration, bedrock was beyond elevation around 202.0. At Sta. 20+550 at 7.0 and 19.0 m left bedrock was contacted at 1.8 and 3.0 m depth, around elevations 203.5 and 204.5. For the proposed northbound culvert, test pits conducted at Sta. 20+530 and 20+550 at 7.0 m right of the centreline median did not contact bedrock within the 4.4 and 3.4 m depth of exploration, bedrock was beyond elevations around 202.0 and 203.0, respectively. At Sta. 20+530 and 20+550 at 19.0 m right of the centreline median bedrock was contacted at 2.6 and 4.1 m depth, around elevations 203.5 and 202.0, respectively.

4.3.6 Groundwater

Groundwater was observed in all of the boreholes during the course of the field work. As mentioned previously the investigation was conducted in early spring, between March 30 and April 3, 2009. A combination of heavy precipitation and warmer temperatures during the investigation resulted in the melting of the surrounding snow. Accordingly, perched and ponded water was present at all borehole locations, which in turn affected groundwater level measurements. A series of test pits was conducted 10 m south and north of the proposed culvert



alignment in August of 2007 at Sta. 20+530 and Sta. 20+550 as part of the geotechnical pavement investigation (PML Ref.: 06TF034C). Groundwater seepage was observed at 2.5 to 3.8 m depth, around elevations 202.5 to 204.0, in three of the sixteen test pits locations during this investigation. The groundwater levels at the site are subject to seasonal fluctuations and precipitation patterns.

4.4 Culvert S4 at Sta. 20+630, Mowat Township

Three boreholes were drilled along the alignment of culvert S4. Bedrock was encountered at the surface at the centerline median, elevation 206.5. The subsurface stratigraphy revealed at the west end of the proposed southbound culvert comprised a surficial layer of peat, underlain by a relatively thin deposit of silty sand. At the east end of the proposed northbound culvert the stratigraphy revealed a surficial layer of peat, underlain by deposits of clayey silt and sand and gravel. Bedrock was contacted at depths of 1.1 and 5.3 m, elevations 207.3 and 201.1, in boreholes S4-1 and S4-2, respectively. Groundwater was observed at the surface during the field investigation.

4.4.1 Peat

Peat was present surficially in boreholes S4-1 and S4-3. The fine fibrous peat was 100 to 200 mm in thickness and was penetrated at elevations 206.3 and 208.2.

4.4.2 Silty Sand

Underlying the peat in borehole S4-1 at 0.2 m depth, elevation 208.2, a deposit of silty sand was contacted. The silty sand comprised some gravel and mantled the underlying bedrock at 1.1 m depth, elevation 207.3.



4.4.3 Clayey Silt

Underlying the peat at 0.1 m depth in borehole S4-3 was a low plasticity clayey silt deposit. The clayey silt was 2.8 m thick and was firm to stiff in consistency. The N values ranged from 5 to 9. The deposit was penetrated at 2.9 m depth, elevation 203.5.

The results of Atterberg plasticity limits testing and grain size distribution analyses conducted on representative samples of the clayey silt deposit is presented in Figures PC-S4-1 and GS-S4-1, respectively.

The liquid limits of the deposit were 26 and 27 and plastic limits were 19 and 21 with plasticity index values of 6 and 7, indicating clayey silt of low plasticity. The water contents of 29 to 30% were determined on representative samples.

4.4.4 Sand and Gravel

Overlain by clayey silt at 2.9 m depth, elevation 203.5, a cohesionless sand and gravel deposit was contacted in borehole S4-3. The deposit was 2.4 m thick and comprised trace silt with cobbles and boulders contacted at 4.2 m depth, elevation 202.2. The relative density of the sand and gravel was compact. An N value of 18 was recorded within the upper portion of the deposit with the sampler refusing on cobbles and boulders at 4.2 m depth, elevation 202.2. The deposit mantled bedrock at 5.3 m depth, elevation 201.1.

4.4.5 Bedrock

Bedrock was encountered at the surface at the centerline median, elevation 206.5 in borehole S4-2 and at depths of 1.1 and 5.3 m, elevations of 207.3 and 201.1 in boreholes S4-1 and S4-3, respectively. Accordingly, the bedrock is sloping downwards from the west to the east. Bedrock was proven upon contact by coring 3.0 m into the rock to 3.0 to 8.3 m depth, elevations 198.1 to 204.3 in all of the boreholes.



The bedrock comprised pink/black and grey/light grey Migmatite in all of the borehole locations. The bedrock exhibited medium to high strengths. A detailed description of the rock cores retrieved from boreholes S4-1, S4-2 and S4-3 is given in Table A, appended.

The measured core recovery ranged from 95 to 100%. The RQD determined from the rock cores was in a range of 83 to 100%, thus indicating good to excellent quality rock.

For additional bedrock depths reference is made to the geotechnical pavement investigation test pits data conducted along this alignment (PML Ref.: 06TF034C). At Sta. 20+630 at 7.0 and 19.0 m left of the centerline median, bedrock was contacted near the surface at 0.5 and 0.3 m depth, elevations 206.1 to 206.4. At Sta. 20+630 at 7.0 right of the centreline median bedrock was contacted at 2.7 m depth, elevation 203.7, at 19.0 m right of the centreline median, bedrock was not contacted within the 3.8 m depth of exploration, accordingly bedrock was beyond elevation 202.6.

4.4.6 Groundwater

Groundwater was observed in all of the boreholes during the course of the field work. As mentioned previously the investigation was conducted in early spring, between March 30 and April 3, 2009. A combination of heavy precipitation and warmer temperatures during the investigation resulted in the melting of the surrounding snow. Accordingly, perched and ponded water was present at all borehole locations, which in turn affected groundwater level measurements. A series of test pits was conducted along the proposed culvert alignment in August of 2007 as part of the geotechnical pavement investigation (PML Ref.: 06TF034C). Groundwater seepage was observed at 3.0 to 3.2 m depth, elevations 203.1 to 203.4, in three of the eight test pits locations conducted along the proposed culvert alignment during the investigation. The seepage was observed in test pits conducted east of the centreline median (northbound lanes) just below the interface of the clayey silt and sand and gravel deposits. The groundwater levels at the site are subject to seasonal fluctuations and precipitation patterns.



5. CLOSURE

The field work was carried out under the supervision of Mr. M. Rapsey and the direction of Mr. M.J. Narduzzi, BEng. Walker Drilling Ltd. supplied the drilling equipment. The laboratory work was carried out in the PML laboratory in Toronto.

This report was prepared by Mr. C.M.P. Nascimento, P.Eng., with the assistance of Mr. M.J. Narduzzi, BEng., and was independently reviewed by Mr. B. R. Gray, MEng, P.Eng., MTO Designated Principal Contact.

Yours very truly

Peto MacCallum Ltd.



Carlos M. P. Nascimento, P.Eng.
Senior Project Engineer



Brian R. Gray, MEng, P.Eng.
MTO Designated Principal Contact



TABLE A
ROCK CORE DESCRIPTIONS

LOCATION (BH)	CORE RECOVERY				CORE DESCRIPTION	
	RC	DEPTH (m)	REC (%)	RQD (%)	DEPTH (m)	DESCRIPTION
S1-1 <i>Culvert S1</i>	8	6.9 – 7.6	100	98	6.9 – 9.9	GRANITIC GNEISS: Light grey, with dipping bands, fine to medium crystalline with occasional coarse crystalline inclusions, high strength, unweathered, moderate to wide spaced flat cross joints, rough planar, tight, excellent quality.
	9	7.6 – 9.1	98	98		
	10	9.1 – 9.9	100	100		
S1-2 <i>Culvert S1</i>	6	4.1 – 5.1	100	100	4.1 – 7.2	GABBRO: Dark green to black, medium to coarse crystalline, medium strength, slightly weathered to unweathered, moderate to wide spaced flat cross joints, rough planar, tight to slightly altered with red oxidation on parting, excellent quality.
	7	5.1 – 6.5	100	100		
	8	6.5 – 7.2	100	100		
S1-3 <i>Culvert S1</i>	7	6.1 – 7.6	100	100	6.1 – 9.2	MIGMATITE: Light grey, becoming predominantly dark grey to black with thin white layers, than change to predominantly white with irregular black biotite concentrations, medium crystalline with occasional coarse crystalline inclusions, high strength, slightly weathered to unweathered, moderate to wide spaced flat to dipping cross joints, rough planar, slightly altered with scale on partings to tight, occasionally separates on biotite concentrations, excellent quality.
	8	7.6 – 9.2	100	100		

RQD = Rock Quality Designation

Originated: JFW
 Compiled: FP
 Checked: MN / CN



TABLE A
ROCK CORE DESCRIPTIONS

LOCATION (BH)	CORE RECOVERY				CORE DESCRIPTION	
	RC	DEPTH (m)	REC (%)	RQD (%)	DEPTH (m)	DESCRIPTION
S2-1 <i>Culvert S2</i>	7	6.4 – 8.0	100	100	6.4 – 9.5	MIGMATITE: Black, fine to medium crystalline, with irregular white layers and inclusions, high strength, unweathered, wide spaced dipping cross joints, rough planar, tight, excellent quality.
	8	8.0 – 9.5	100	100		
S2-2 <i>Culvert S2</i>	6	3.8 – 4.8	100	100	3.8 – 7.0	GRANITIC GNEISS: Pink and grey, medium to coarse crystalline, garnetiferous, high strength, unweathered, wide (locally close) spaced flat cross joints, rough planar, tight, excellent quality.
	7	4.8 – 6.3	100	100		
	8	6.3 – 7.0	100	100		
S2-3 <i>Culvert S2</i>	8	5.7 – 6.4	100	90	5.7 – 8.6	GRANITIC GNEISS: Pink and grey, with dipping bands, medium to coarse crystalline, garnetiferous, high strength, slightly weathered to unweathered, wide (locally close) spaced flat cross joints, rough planar, tight, with occasional vertical fissure, with scale and silt, excellent quality.
	9	6.4 – 7.9	100	100		
	10	7.9 – 8.6	100	100		

RQD = Rock Quality Designation

Originated: JFW
 Compiled: FP
 Checked: MN / CN



TABLE A
ROCK CORE DESCRIPTIONS

LOCATION (BH)	CORE RECOVERY				CORE DESCRIPTION	
	RC	DEPTH (m)	REC (%)	RQD (%)	DEPTH (m)	DESCRIPTION
S3-1 <i>Culvert S3</i>	5	3.2 – 4.7	100	82	3.2 – 4.7	GRANITIC GNEISS: Pink and grey with black biotite inclusions, fine to medium crystalline, medium to high strength, slightly to moderately weathered, very close to close flat to dipping cross joints, rough planar, slightly altered with silt or thin friable layer at parting, good quality.
	6	4.7 – 5.4	100	100		
	6	5.4 – 6.2	91	35		
					4.7 – 5.4	MIGMATITE: Pink and light grey, becoming predominantly grey with black biotite layers, dioritic appearance at depth, fine to medium crystalline, high strength, slightly weathered, very close to close spaced flat to dipping cross joints, rough planar, occasional slickensides, slightly altered with oxidation or silt on some parting surfaces, excellent quality.
					5.4 – 6.2	ARKOSE: Light grey, fine crystalline, with veinlets of green serpentine, medium to high strength, slightly weathered, very close to close spaced, flat to dipping partings, smooth to rough planar, slightly altered with yellow oxidation or scale on some partings, poor quality.
S3-2 <i>Culvert S3</i>	6	3.3 – 4.9	94	85	3.3 – 6.4	GRANITIC GNEISS: Pink and grey with slight banding, garnetiferous, fine to medium crystalline, high strength, slightly weathered to unweathered, close to moderate becoming wide spaced flat to dipping cross joints, rough planar, slightly altered with oxidation, scale and/or silt on partings, occasionally separates on biotite layers, good to excellent quality.
	7	4.9 – 6.4	97	97		

RQD = Rock Quality Designation

Originated: JFW
 Compiled: FP
 Checked: MN / CN



TABLE A
ROCK CORE DESCRIPTIONS

LOCATION (BH)	CORE RECOVERY				CORE DESCRIPTION	
	RC	DEPTH (m)	REC (%)	RQD (%)	DEPTH (m)	DESCRIPTION
S3-3 <i>Culvert S3</i>	4	2.0 – 3.4	100	91	2.0 – 5.0	GRANITIC GNEISS: Grey becoming pink and black with slight banding, dioritic appearance with irregular black biotite inclusions, fine to medium, occasional coarse crystalline, high strength, slightly weathered to unweathered, close becoming moderate to wide spaced flat to dipping cross joints, rough planar, tight to slightly altered with silt on partings, occasionally separates on biotite layers, excellent quality.
	5	3.4 – 5.0	98	97		
S4-1 <i>Culvert S4</i>	1	1.1 – 1.9	100	91	1.1 – 4.1	MIGMATITE: Pink to light grey and black, garnetiferous, fine to medium, occasional coarse crystalline, high strength, unweathered, close to wide spaced flat cross joints, rough planar, tight, occasionally separates on biotite layers, excellent quality.
	2	1.9 – 3.4	100	100		
	3	3.4 – 4.1	100	100		
S4-2 <i>Culvert S4</i>	1	0.0 – 1.5	100	100	0.0 – 3.0	MIGMATITE: Pink and grey, fine to medium, occasional coarse crystalline, speckled becoming banded, garnetiferous, high strength, slightly weathered to unweathered, moderate to wide spaced flat cross joints, rough planar, tight, with isolated vertical parting, slightly altered with yellow oxidation on parting surface, good to excellent quality.
	2	1.5 – 3.0	95	83		
S4-3 <i>Culvert S4</i>	7	4.9 – 5.3	-	-	4.9 – 5.3	COBBLES and BOULDERS:
	7	5.3 – 6.4	100	100	5.3 – 8.3	MIGMATITE: Black and light grey, medium crystalline, garnetiferous, medium to high strength, unweathered, close to moderate spaced flat to dipping cross joints, rough planar, tight, separates readily on biotite concentrations, excellent quality.
	8	6.4 – 7.9	100	100		
	9	7.9 – 8.3	97	98		

RQD = Rock Quality Designation

Originated: JFW
 Compiled: FP
 Checked: MN / CN

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE
F V	FIELD VANE		

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES	n	1, %	POROSITY	e_{\max}	1, %	VOID RATIO IN LOOSEST STATE
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES	w	1, %	WATER CONTENT	e_{\min}	1, %	VOID RATIO IN DENSEST STATE
ρ_w	kg/m^3	DENSITY OF WATER	S_r	%	DEGREE OF SATURATION	I_D	1	DENSITY INDEX = $\frac{e_{\max} - e}{e_{\max} - e_{\min}}$
γ_w	kN/m^3	UNIT WEIGHT OF WATER	w_L	%	LIQUID LIMIT	D	mm	GRAIN DIAMETER
ρ	kg/m^3	DENSITY OF SOIL	w_p	%	PLASTIC LIMIT	D_n	mm	n PERCENT - DIAMETER
γ	kN/m^3	UNIT WEIGHT OF SOIL	w_s	%	SHRINKAGE LIMIT	C_u	1	UNIFORMITY COEFFICIENT
ρ_d	kg/m^3	DENSITY OF DRY SOIL	I_p	%	PLASTICITY INDEX = $w_L - w_p$	h	m	HYDRAULIC HEAD OR POTENTIAL
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	q	m^3/s	RATE OF DISCHARGE
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	v	m/s	DISCHARGE VELOCITY
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL	DTPL		DRIER THAN PLASTIC LIMIT	i	1	HYDRAULIC GRADIENT
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL	APL		ABOUT PLASTIC LIMIT	k	m/s	HYDRAULIC CONDUCTIVITY
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL	WTPL		WETTER THAN PLASTIC LIMIT	j	kN/m^2	SEEPAGE FORCE
e	1, %	VOID RATIO						

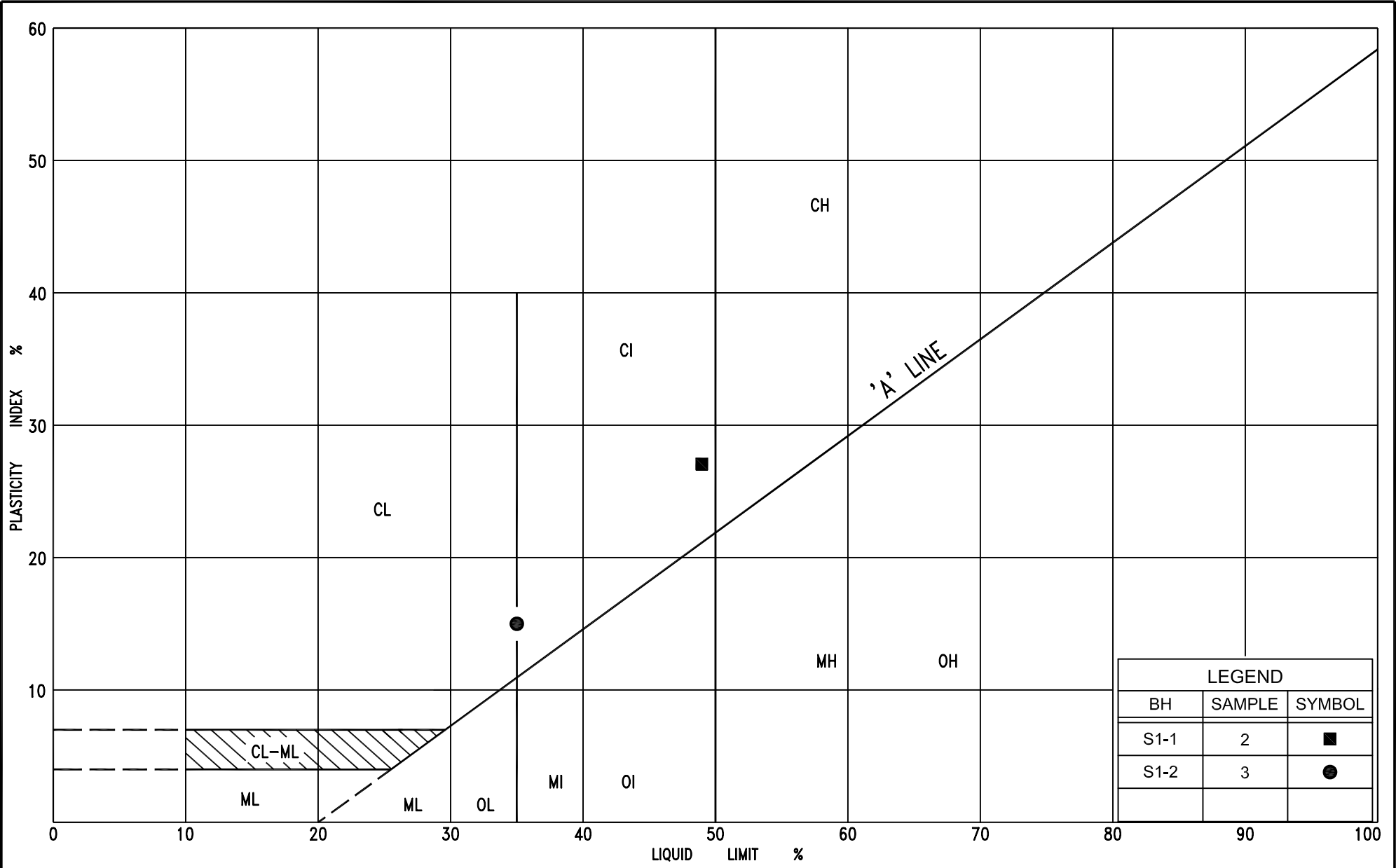
Culvert S1 at Sta. 20+350, Mowat Township

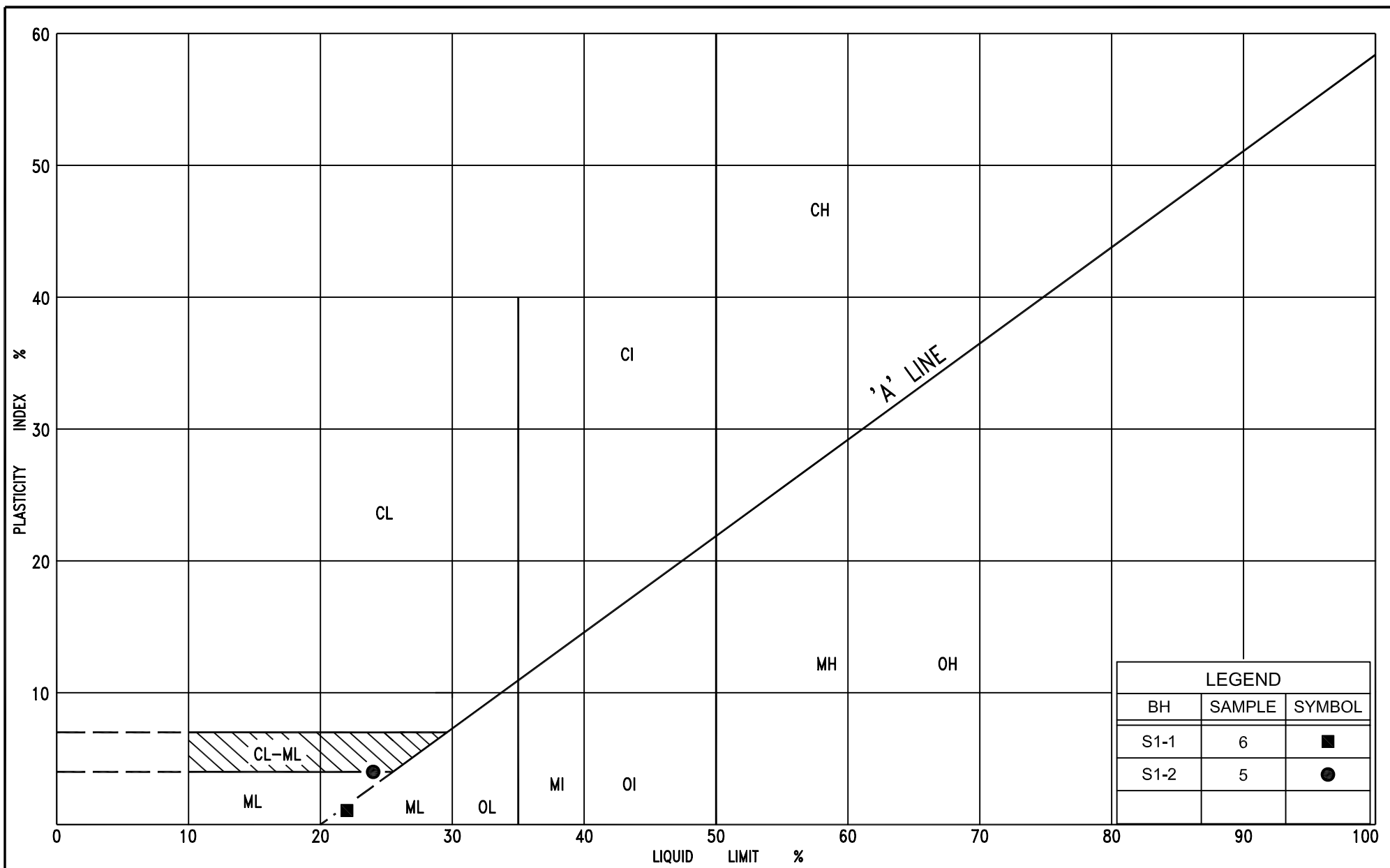
Figures PC-S1-1 to PC-S1-2 - Plasticity Charts

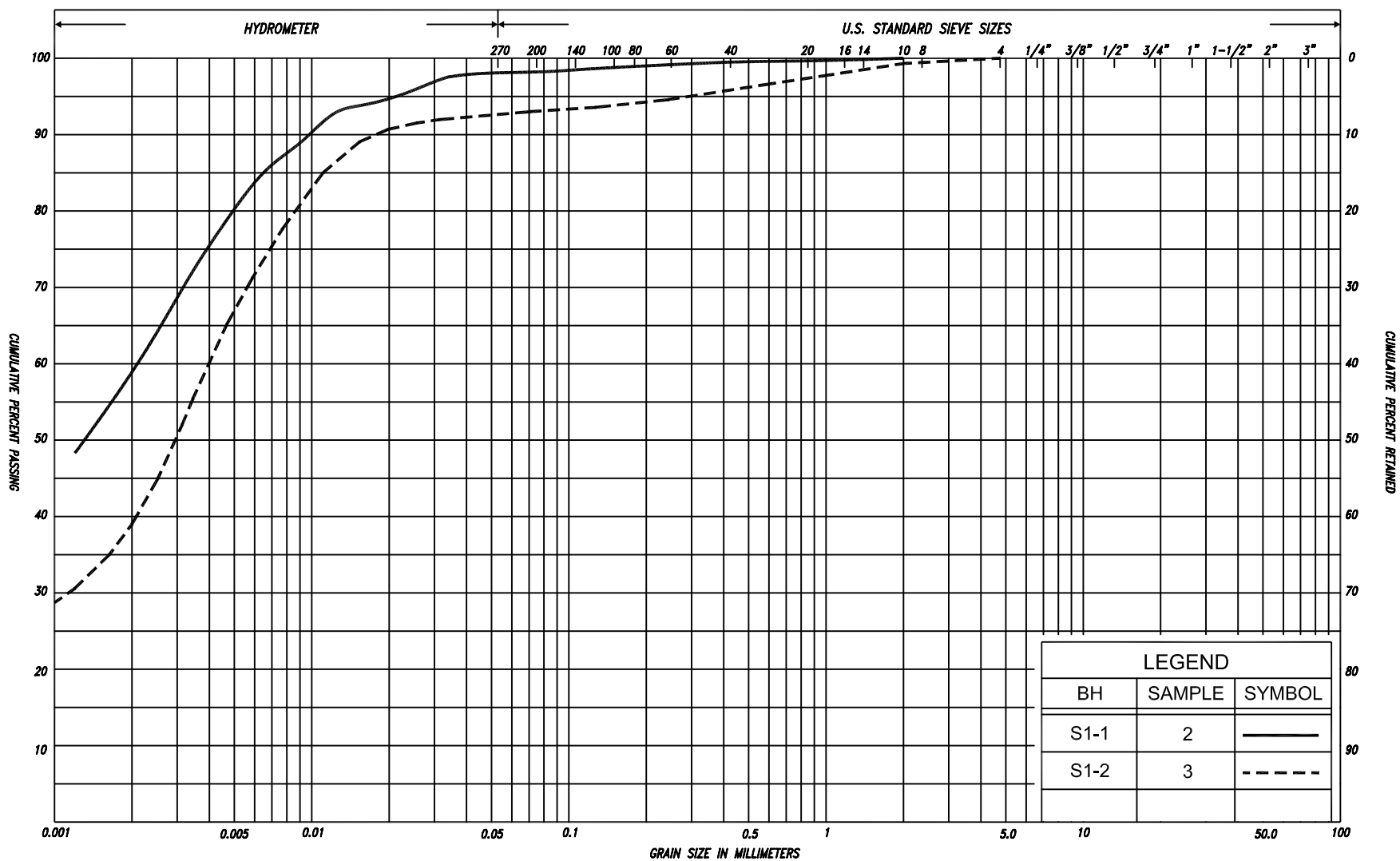
Figures GS-S1-1 to GS-S1-2 - Grain Size Distribution Charts

Record of Borehole Sheets

Drawing S1-1 – Borehole Locations and Soil Strata







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

GRAIN SIZE DISTRIBUTION

SILTY CLAY, trace sand

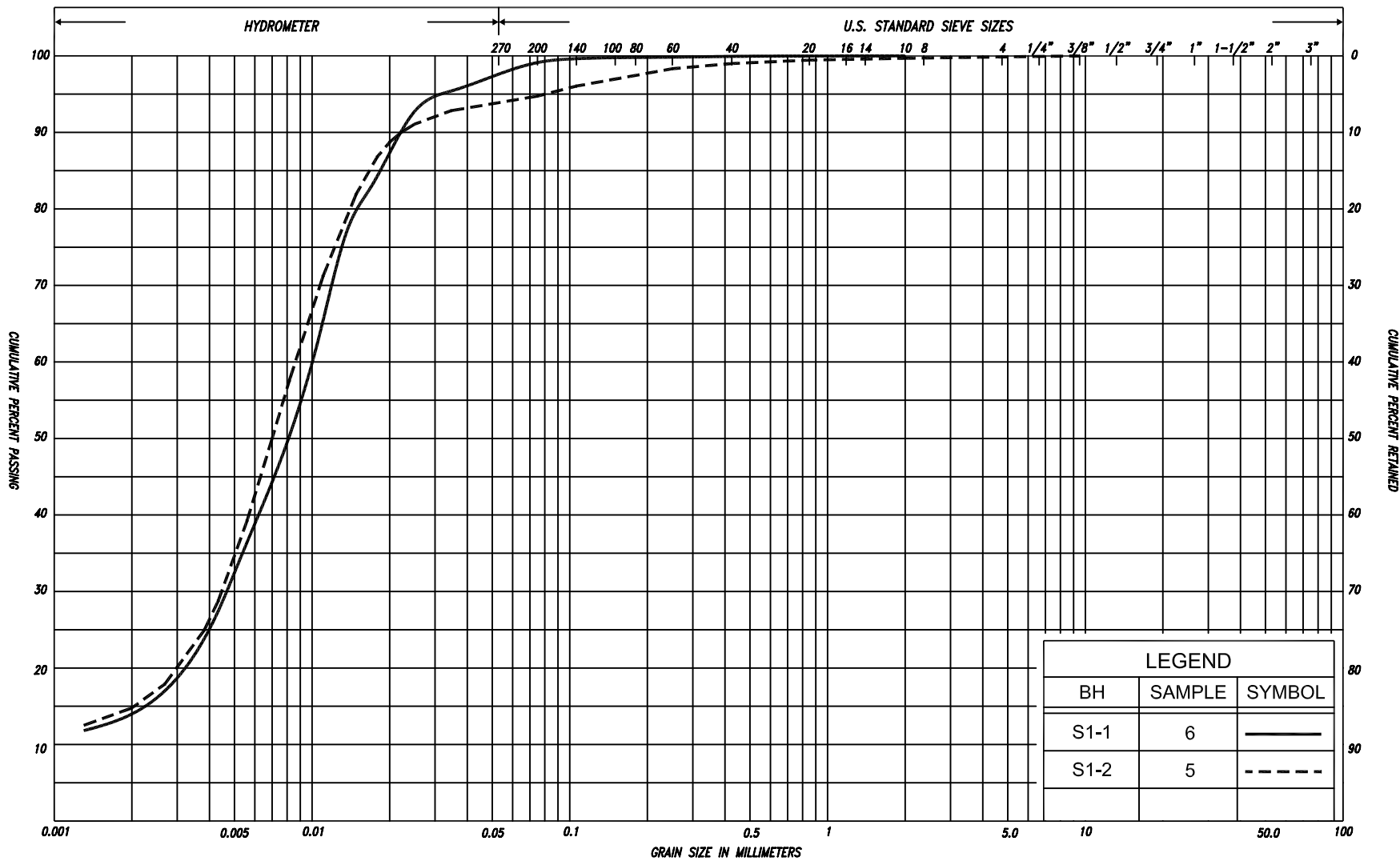
FIG No. GS-S1-1

HWY: 69

G.W.P. No. 5203-06-00



Ministry of
Transportation
Ontario



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



Ministry of
Transportation
Ontario

GRAIN SIZE DISTRIBUTION

SILT, some clay, trace sand

FIG No. GS-S1-2

HWY: 69

















G.W.P. No. 5203-06-00

RECORD OF BOREHOLE No S1-1

1 of 1

METRIC

G.W.P. 5203-06-00 LOCATION Coords: 5 096 286.7 N; 221 601.6 E
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Drilling ORIGINATED BY M.R.
DATUM Geodetic DATE March 31, 2009 COMPILED BY M.N.
CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED	● QUICK TRIAXIAL	✕ LAB VANE	✚ FIELD VANE									
206.0 0.0	Ground Surface																			
205.9 0.1	Sand, some silt		1	SS	5			205									0 2 39 59			
	Very loose Brown Wet																			
	Silty clay, trace sand																			
	Firm to stiff Brown Moist to wet		2	SS	9															
			3	SS	7															
			4	SS	2															
			5	SS	2															
202.0 4.0	Silt some clay, trace sand							202												
	Loose Grey Wet																			
			6	SS	5															
			7	SS	1															
199.1 6.9	Granitic Gneiss Bedrock										199									
	Unweathered																			
	High strength																			
	Excellent quality		8	RC NQ	REC 100%														RQD 98%	
			9	RC NQ	REC 98%												RQD 98%			
			10	RC NQ	REC 100%												RQD 100%			
196.1 9.9	End of borehole																			
	Sample 7: N values affected by hydraulic disturbance.																			
	* 2009 02 31																			
	 Water level observed during drilling																			
	 Water level measured after drilling																			
	 Penetrometer test																			
	C. F. H. S. A. denotes Continuous Flight Hollow Stem Augers																			

RECORD OF BOREHOLE No S1-2 1 of 1 METRIC																
G.W.P. 5203-06-00		LOCATION		Coords: 5 096 290.0 N; 221 629.5 E Hwy 69 (New), Sta. 20+350 CL Med.				ORIGINATED BY M.R.								
DIST 54 HWY 69		BOREHOLE TYPE		C.F.H.S.A. and Rotary Diamond Coring				COMPILED BY M.N.								
DATUM Geodetic		DATE		March 31, 2009				CHECKED BY C.N.								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		SHEAR STRENGTH kPa									
205.8 0.0	Ground Surface	••					20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%) 20 40 60				
205.6 0.2	Sand, some silt		1	SS	7											
	Loose Brown Wet															
	Silty clay, trace sand															
	Firm to stiff Brown Moist to wet		2	SS	10											
			3	SS	6											
203.7 2.1	Silt some clay, trace sand															
	Loose Grey Wet to compact															
			4	SS	10											
			5	SS	9											
201.7 4.1	Gabbro Bedrock															
	Slightly weathered to unweathered															
	Medium strength															
	Excellent Quality															
			6	RC NQ	REC 100%											
			7	RC NQ	REC 100%											
			8	RC NQ	REC 100%											
198.6 7.2	End of borehole															
<div style="display: flex; justify-content: space-between;"> <div> <p>* 2009 03 31</p> <p>▽ Water level observed during drilling</p> <p>▽ Water level measured after drilling</p> <p>C. F. H. S. A. denotes Continuous Flight Hollow Stem Augers</p> </div> <div> <p>20</p> <p>15 — 5</p> <p>10</p> </div> </div>																

RECORD OF BOREHOLE No S1-3

1 of 1

METRIC

G.W.P. 5203-06-00 LOCATION Coords: 5 096 293.2 N; 221 657.3 E
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Coring
DATUM Geodetic DATE April 01, 2009

ORIGINATED BY M.R.
COMPILED BY M.N.
CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	*N VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED		+ FIELD VANE		● QUICK TRIAXIAL					
205.6	Ground Surface						20	40	60	80	100						
0.0	Sand, some silt																
205.3	Very loose Brown Wet		1	SS	7												
0.3	Silty clay, trace sand																
	Firm to Brown Moist stiff to wet		2	SS	9												
			3	SS	8												
			4	SS	3												
			5	SS	2												
				FV													
201.4	Silt some clay, trace sand																
4.2	Loose Grey Wet		6	SS	2												
199.8	Sand, some silt																
5.8	Brown Wet																
199.5																	
6.1	Migmatite Bedrock																
	Slightly weathered to unweathered		7	RC NQ	REC 100%											RQD 100%	
	High strength																
	Excellent quality																
			8	RC NQ	REC 100%											RQD 100%	
196.4	End of borehole																
9.2																	
	Sample 6: N value affected by hydraulic disturbance																
	 * 2009 03 01																
	 ▽ Water level observed during drilling																
	 ▼ Water level measured after drilling																
	 C. F. H. S. A. denotes Continuous Flight Hollow Stem Augers																

RECORD OF BOREHOLE No S1-4

1 of 1

METRIC

G.W.P. 5203-06-00

LOCATION

Coords: 5 096 288.4 N; 221 615.6 E

Hwy 69 (New), Sta. 20+350, o/s 14.0m Lt CL Med.

ORIGINATED BY M.R.

DIST 54HWY 69

BOREHOLE

Continuous Flight Solid Stem Augers

COMPILED BY M.N.

DATUM Geodetic

DATE _____

April 01, 2009

— CHECKED BY C.N.

SOIL PROFILE			SAMPLES		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
205.8 0.0	Ground Surface	• •			
205.6 0.2	Sand, some silt				
	Brown				
	Silty clay, trace sand				
	Brown				
202.2 3.6	Silt some clay, trace sand				
	Grey				
199.2 6.6	End of borehole Refusal on probable bedrock				
<div>* 2009 04 01</div> <div>▽ Water level observed during drilling</div> <div>▼ Water level measured after drilling</div>					

CONT No
GWP No 5203-06-00

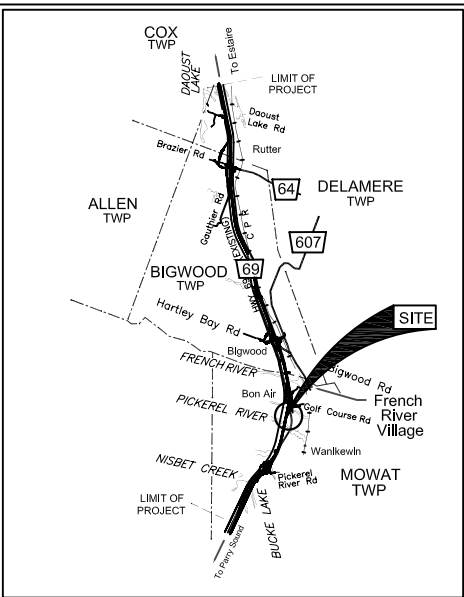
CULVERTS 1 AND 2 (S1)

HIGHWAY 69 FOUR-LANING
STA. 20+350 MOWAT TWP

BOREHOLE LOCATIONS AND SOIL STRATA



SHEET



KEY PLAN

SCALE
0 2 4 6 km

LEGEND

- Borehole
- Dynamic Cone Penetration Test (Cone)
- Borehole & Cone
- N Blows/0.3m (Std. Pen Test, 475 J/blow)
- CONE Blows/0.3m (60' Cone, 475 J/blow)
- W L at time of investigation
March & April 2009
- Head
ARTESIAN WATER
Encountered
- PIEZOMETER

BH No	ELEVATION	CO-ORDS	
		NORTHING	EASTING
S1-1	206.0	N 5 096 286.7	E 221 601.6
S1-2	205.8	N 5 096 290.0	E 221 629.5
S1-3	205.6	N 5 096 293.2	E 221 657.3
S1-4	205.8	N 5 096 288.4	E 221 615.6

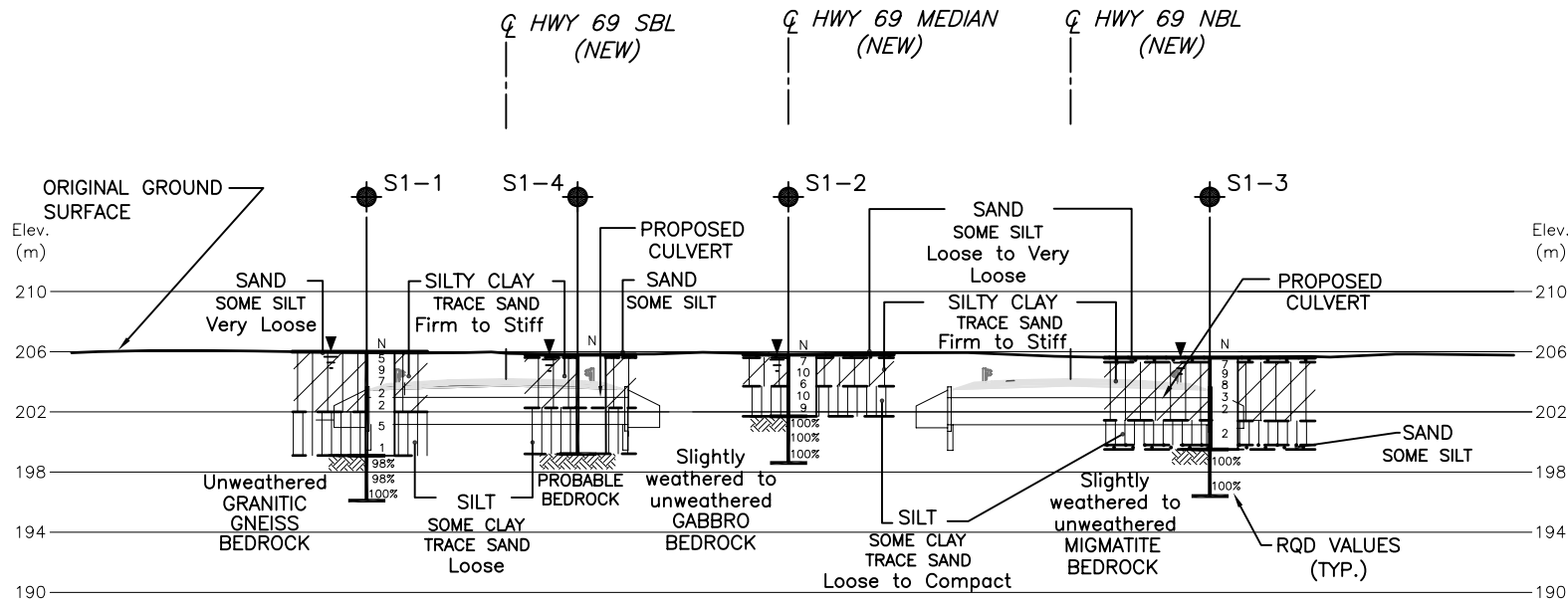
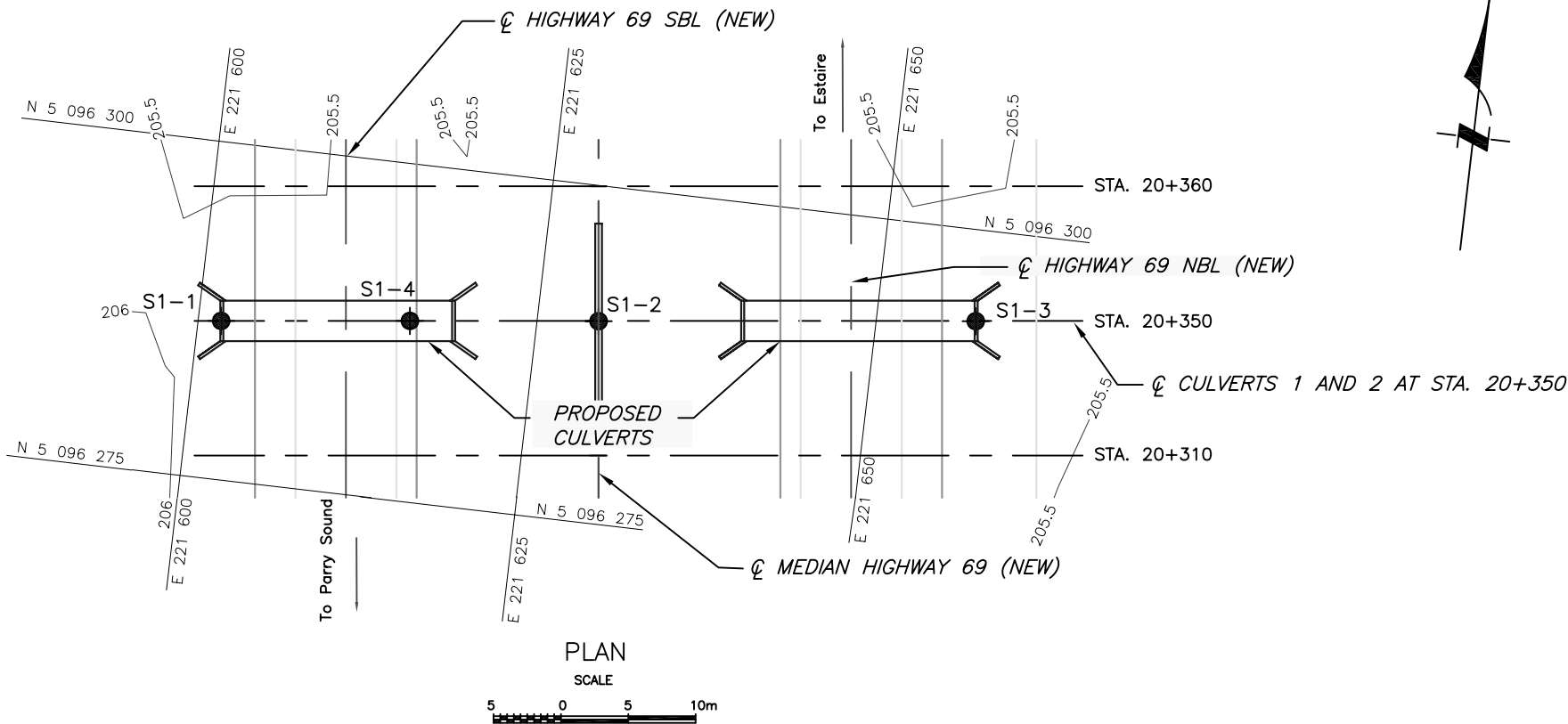
NOTE

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

REVISIONS	DATE	BY	DESCRIPTION

Geocres No. 411-252

HWY No	69	DIST	54
SUBM'D	MN	CHECKED	MN
DATE	FEB. 10, 2010	SITE	---
DRAWN	NA	CHECKED	CN
APPROVED	BRG	DWG	S1-1



PROFILE Q CULVERTS 1 AND 2 AT STA. 20+350

NOTES:

- DRAWING S1-1 SHOULD BE READ IN CONJUNCTION WITH THE TEXT AND THE RECORD OF BOREHOLE LOGS.
- CULVERTS 1 AND 2 AT STA. 20+350 WERE DESIGNATED AS CULVERT S1 FOR THE INVESTIGATION.
- THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
- DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.



REF.: MRC DRAWINGS
H6454_PHASE3_XA01.dwg; H6454_PHASE3_XN01.dwg;
Plan View of Culverts - 090629.dwg; Phase 3 -
Snake Culverts Cross Sections - 090714.dwg

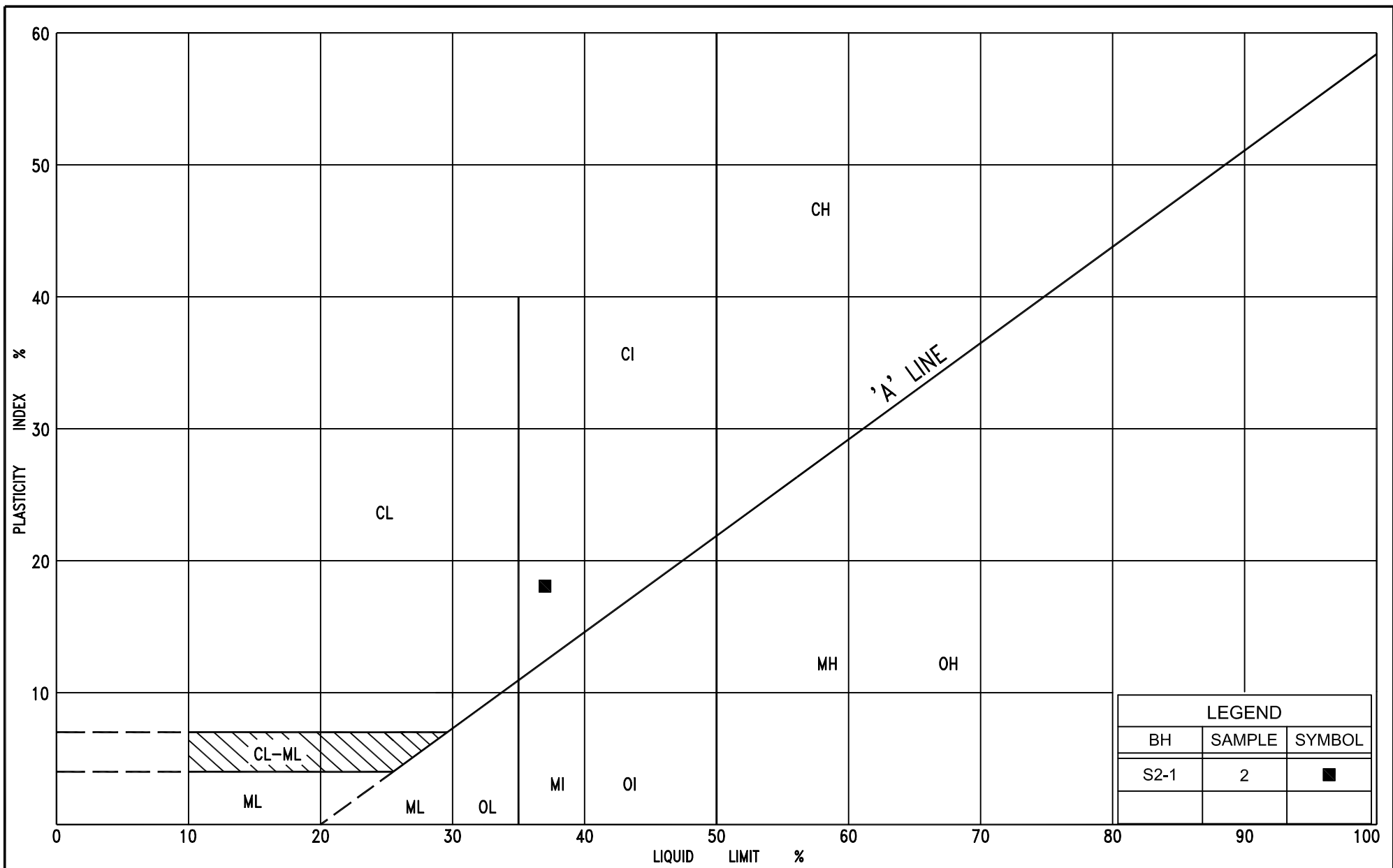
Culvert S2 at Sta. 20+460, Mowat Township

Figures PC-S2-1 to PC-S2-2 - Plasticity Charts

Figures GS-S2-1 to GS-S2-2 - Grain Size Distribution Charts

Record of Borehole Sheets

Drawing S2-1 – Borehole Locations and Soil Strata



Ministry of
Transportation
Ontario

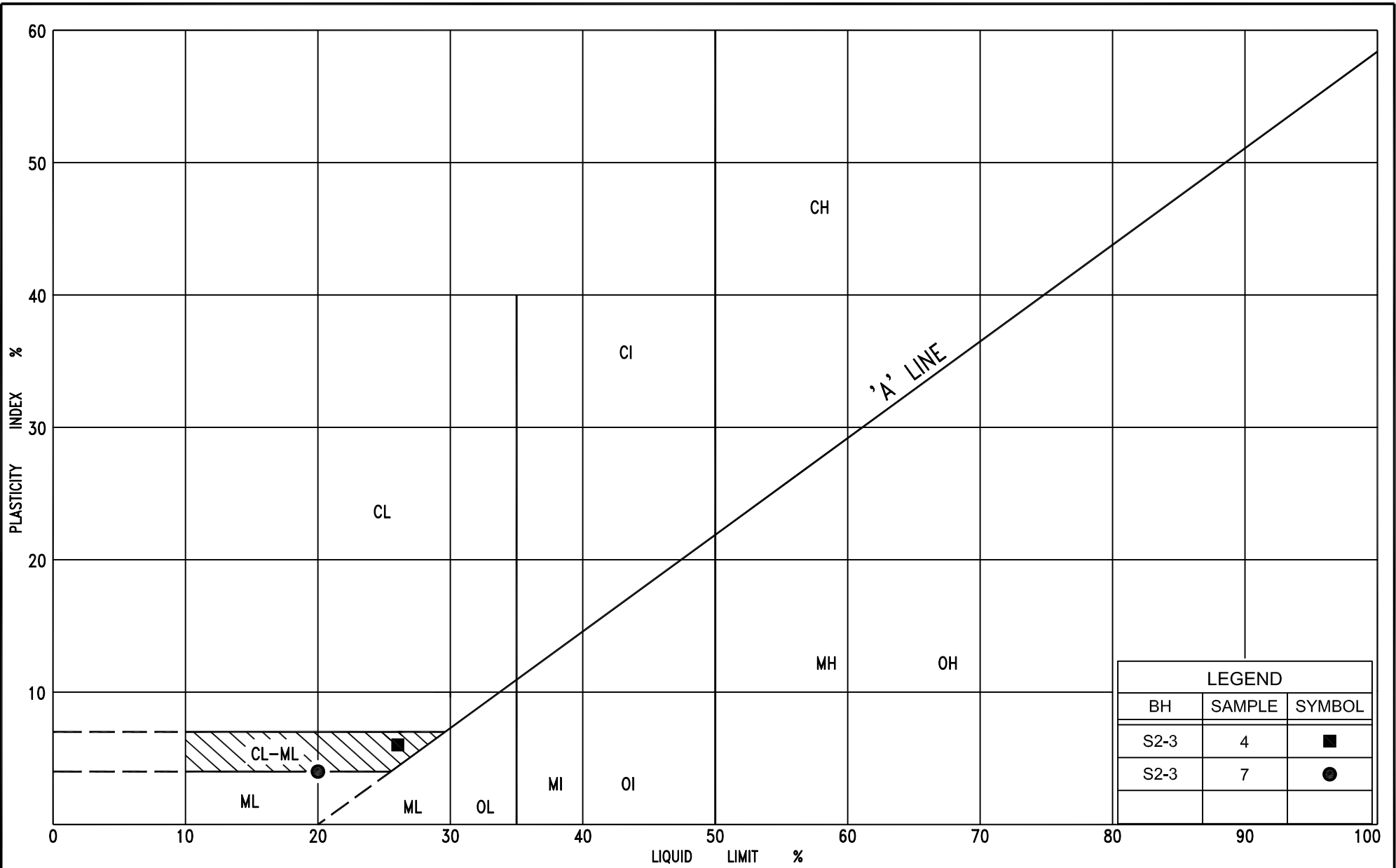
PLASTICITY CHART

SILTY CLAY, trace sand

FIG No. PC-S2-1

HWY: 69

G.W.P. No. 5203-06-00



Ministry of
Transportation
Ontario

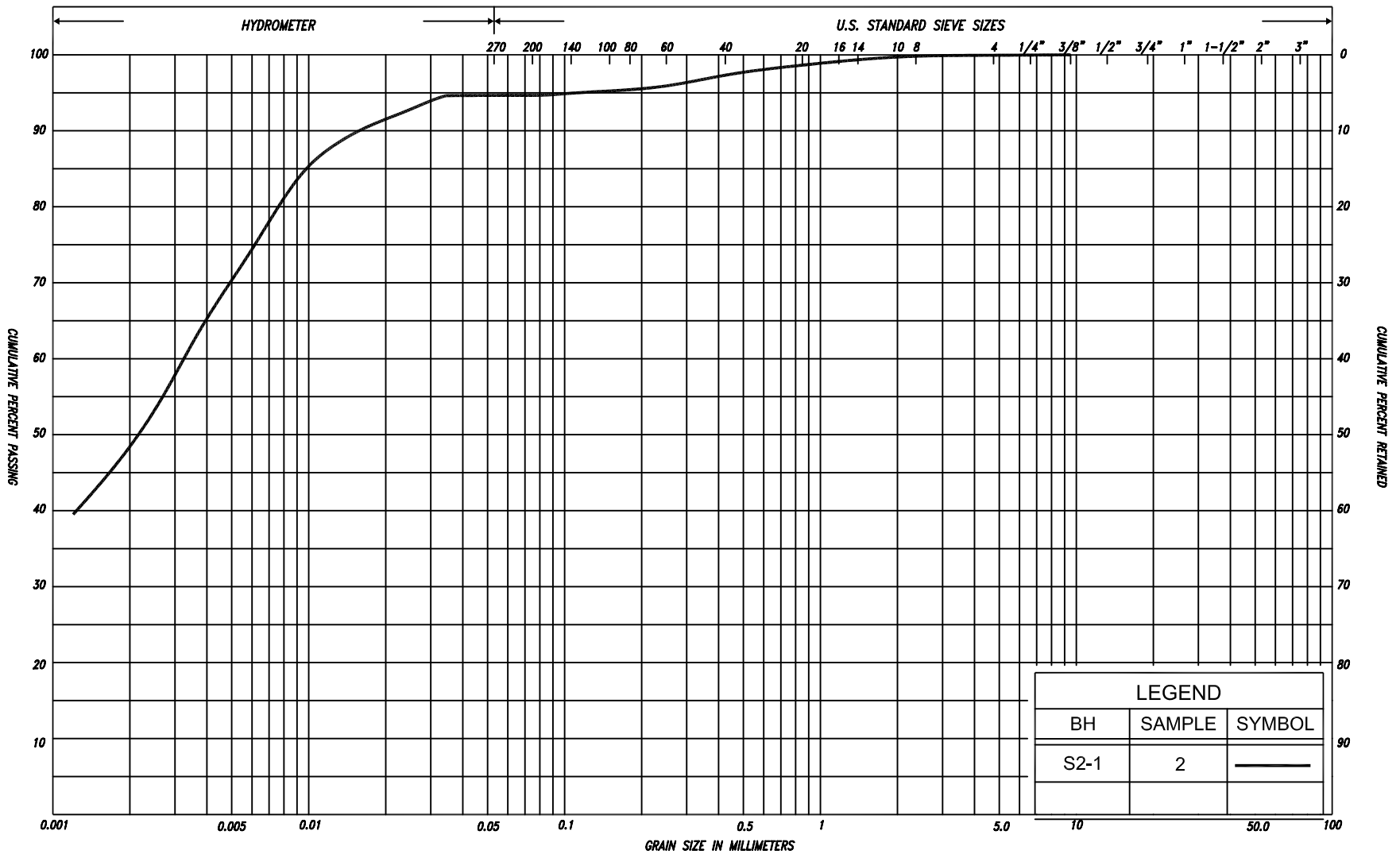
PLASTICITY CHART

CLAYEY SILT, trace sand / sandy, trace gravel

FIG No. PC-S2-2

HWY: 69

G.W.P. No. 5203-06-00



LEGEND		
BH	SAMPLE	SYMBOL
S2-1	2	—

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

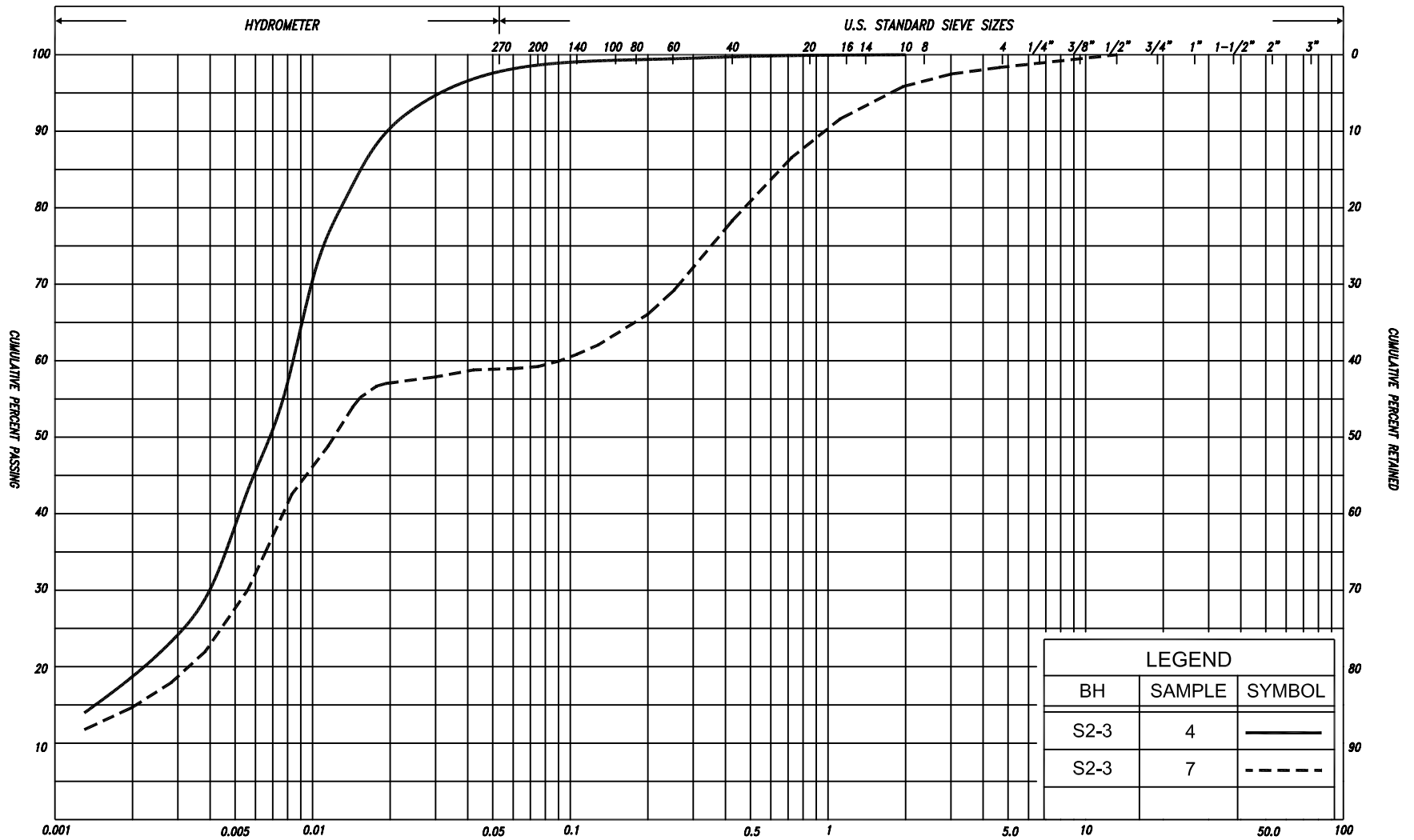
GRAIN SIZE DISTRIBUTION

SILTY CLAY, trace sand

FIG No. GS-S2-1

HWY: 69

G.W.P. No. 5203-06-00



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

RECORD OF BOREHOLE No S2-1

1 of 1

METRIC

G.W.P. 5203-06-00 LOCATION Coords: 5 096 396.0 N; 221 589.0 E
Hwy 69 (New), Sta. 20+460, o/s 28.0m Lt CL Med. ORIGINATED BY M.R.
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Coring COMPILED BY M.N.
DATUM Geodetic DATE April 01, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
205.9	Ground Surface																
0.0	Peat, fine fibrous																
205.7	Dark brown																
0.2	Silty clay, trace sand silt layers																
	Firm Brown Moist to wet		1	SS	6		205										
			2	SS	5		204									0 5 47 48	
	Grey																
			3	SS	3		203										
			4	SS	2		202										
201.8	Clayey silt, trace sand																
4.1	Firm Grey Wet																
			5	SS	5		201										
							200										
199.5	Migmatite Bedrock		6	SS	1/15cm												
6.4	Unweathered																
	High Strength		7	RC NQ	REC 100%		199									RQD 100%	
	Excellent quality						198										
			8	RC NQ	REC 100%		197									RQD 100%	
196.4	End of borehole																
9.5																	
	Sample 6: Sampler bouncing.																
	* 2009 04 01																
	▽ Water level observed during drilling																
	▼ Water level measured after drilling																
	C. F. H. S. A. denotes Continuous Flight Hollow Stem Augers																

RECORD OF BOREHOLE No S2-2

1 of 1

METRIC

G.W.P. 5203-06-00 LOCATION Coords: 5 096 399.3 N; 221 616.8 E
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Coring
DATUM Geodetic DATE March 30 and 31, 2009

ORIGINATED BY M.R.

COMPILED BY M.N.

CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	*N* VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED		+ FIELD VANE		● QUICK TRIAXIAL					
205.8 0.0	Ground Surface Silty sand		1	SS	8												
205.2 0.6	Loose Grey/ Wet dark brown		2	SS	13												
	Silty clay, trace sand						205										
	Stiff Brown Moist to firm to wet																
	Soft Grey		3	SS	4		204										
			4	SS	WH**		203										
202.9 2.9	Clayey silt, some sand																
	Firm Grey Wet		5	SS	3												
202.0 3.8	Granitic Gneiss Bedrock						202										
	Unweathered		6	RC	REC											RQD 100%	
	High strength			NQ	100%		201										
	Excellent quality		7	RC	REC		200									RQD 100%	
				NQ	100%												
			8	RC	REC											RQD 100%	
				NQ	100%		199										
198.8 7.0	End of borehole																
						</											

METRIC

Hwy 69 (New), Sta. 20+460, o/s 28.0m Rt CL Med.

ORIGINATED BY M.R.

COMPILED BY M.N.

CHECKED BY C.N.

+⁷, ×⁵: Numbers refer to Sensitivity

20
15 — ○ — 5
10

(%) STRAIN AT FAILURE

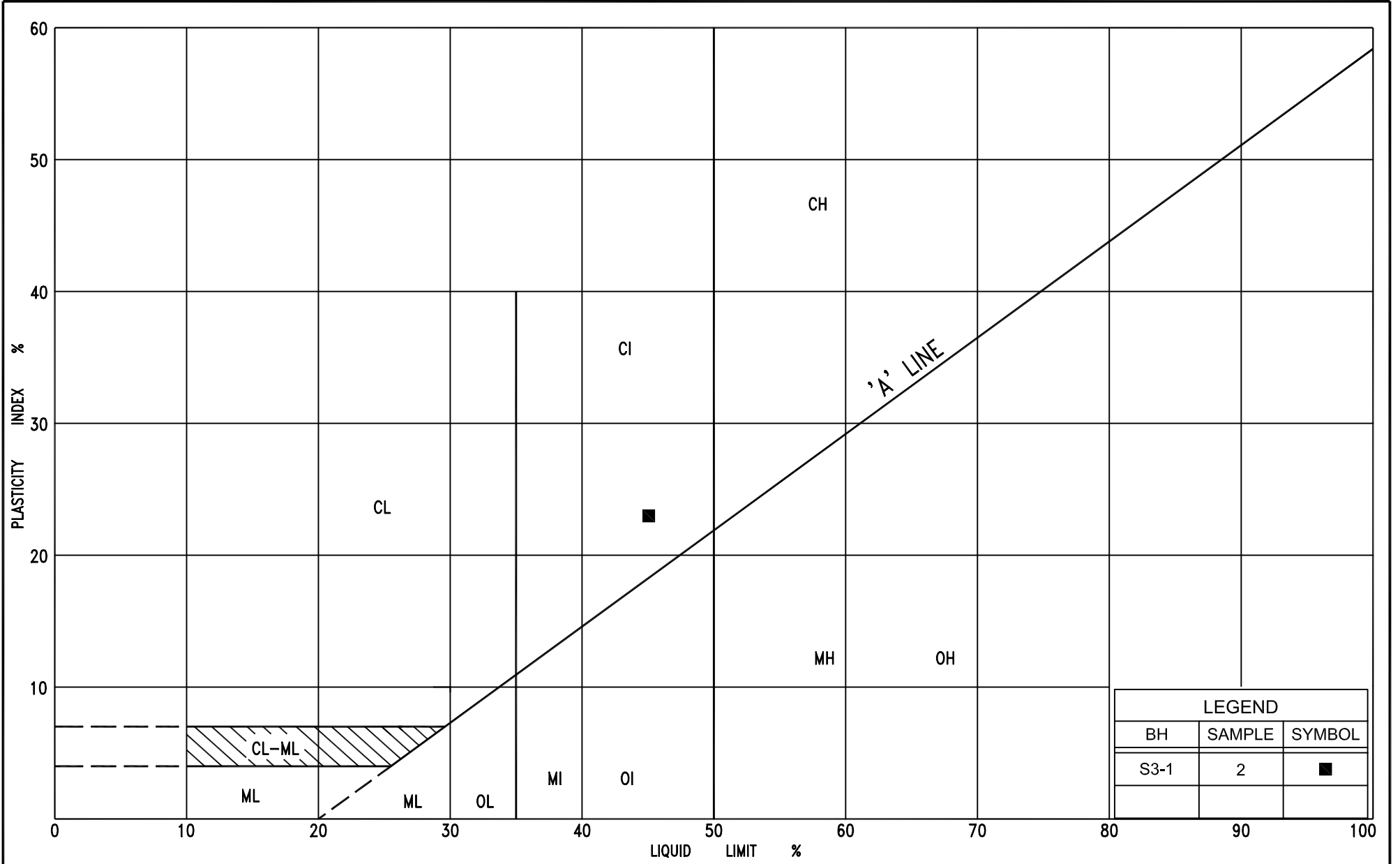
Culvert S3 at Sta. 20+540, Mowat Township

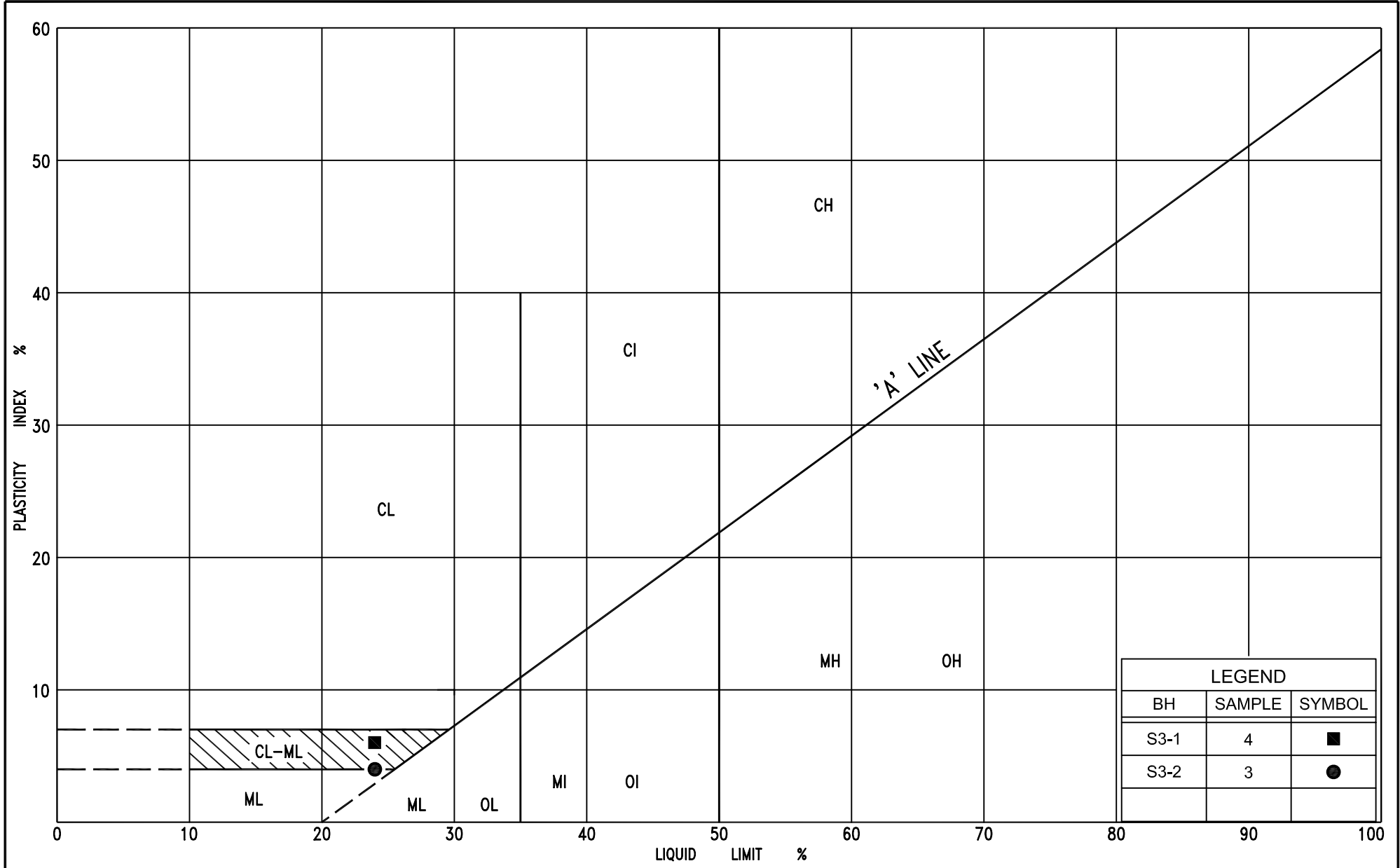
Figures PC-S3-1 to PC-S3-2 - Plasticity Charts

Figures GS-S3-1 to GS-S3-2 - Grain Size Distribution Charts

Record of Borehole Sheets

Drawing S3-1 – Borehole Locations and Soil Strata





Ministry of
Transportation
Ontario

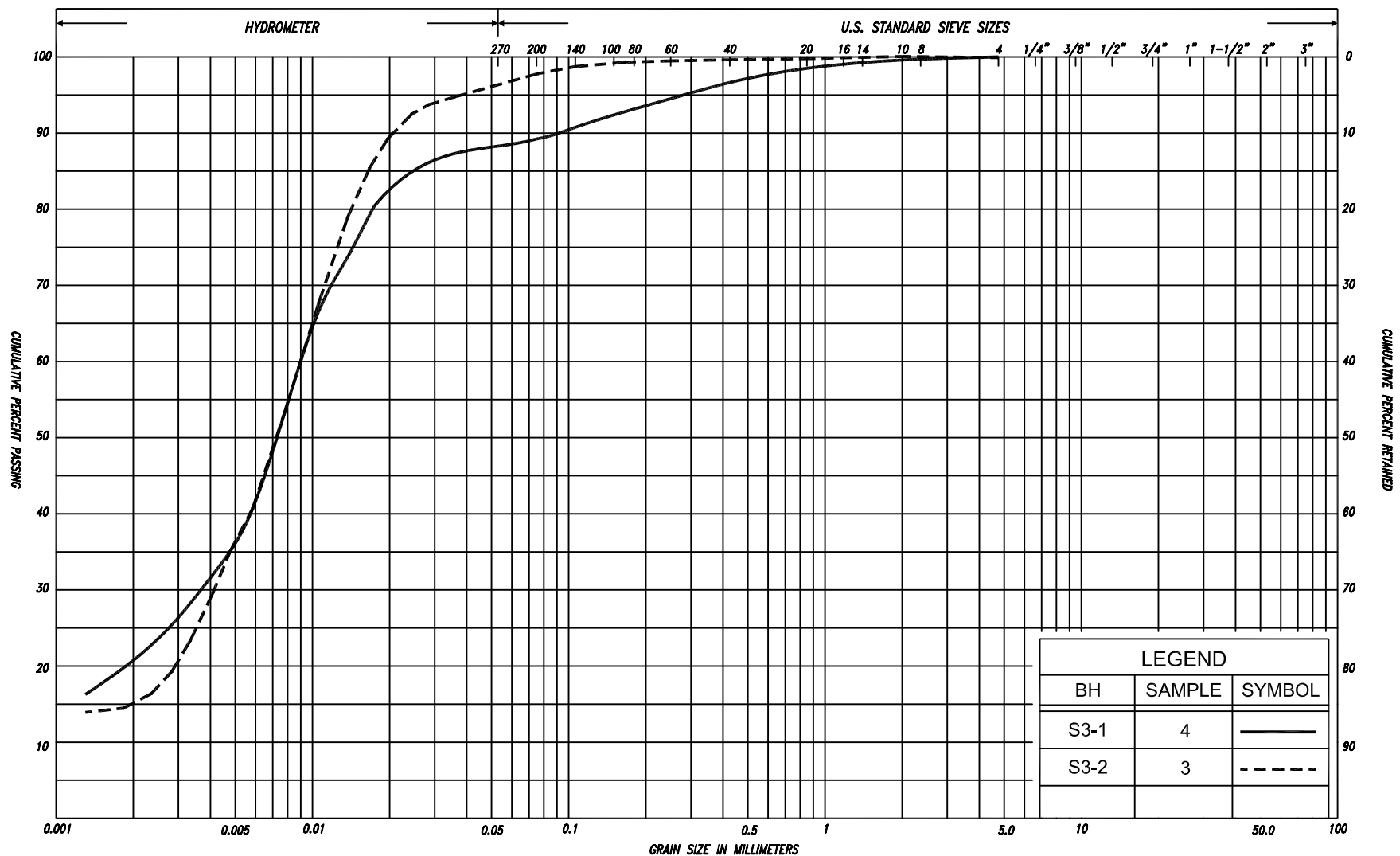
PLASTICITY CHART

CLAYEY SILT, trace to some sand

FIG No. PC-S3-2

HWY: 69

G.W.P. No. 5203-06-00



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

GRAIN SIZE DISTRIBUTION

CLAYEY SILT, trace to some sand

FIG No. GS-S3-2

HWY: 69

G.W.P. No. 5203-06-00

RECORD OF BOREHOLE No S3-1

1 of 1

METRIC

Coords: 5 096 475.5 N; 221 579.7 E

G.W.P. 5203-06-00 LOCATION Hwy 69 (New), Sta. 20+540, o/s 28.0m Lt CL Med. ORIGINATED BY M.R.
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Coring COMPILED BY M.N.
DATUM Geodetic DATE April 02, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)					
								○ UNCONFINED + FIELD VANE					w _p w w _L					
								● QUICK TRIAXIAL × LAB VANE										
206.1	Ground Surface						20	40	60	80	100							
0.0	Peat, coarse fibrous		1	SS	25	▽*										92	GR SA SI CL	
205.9	Dark brown																	○
0.2	Silty clay, trace sand silt layers		2	SS	6													
	Stiff Brown Moist to firm																	
204.7	Clayey silt, trace to some sand		3	SS	6													
1.4	Firm Mottled Wet brown/ grey																	
			4	SS	4													
202.9	Granitic Gneiss Bedrock		5	RC NQ	REC 100%												RQD 82%	
3.2	Slightly to moderately weathered																	
	Medium to high strength																	
	Good quality																	
201.4	Migmatite Bedrock		6	RC NQ	REC 100%												RQD 100%	
4.7	Slightly weathered																	
	High strength																	
200.7	Excellent quality		6	RC NQ	REC 91%												RQD 35%	
5.4	Arkose Bedrock																	
	Slightly weathered																	
199.9	Medium to high strength																	
6.2	Poor quality																	
	End of borehole																	
* 2009 04 02																		
▽ Water level observed during drilling																		
▼ Water level measured after drilling																		
C. F. H. S. A. denotes Continuous Flight Hollow Stem Augers																		

* 2009 04 02

▽ Water level observed
during drilling

▼ Water level measured
after drilling

C. F. H. S. A. denotes
Continuous Flight Hollow
Stem Augers

RECORD OF BOREHOLE No S3-2

1 of 1

METRIC

G.W.P. 5203-06-00 LOCATION Coords: 5 096 478.7 N; 221 607.5 E
Hwy 69 (New), Sta. 20+540 CL Med. ORIGINATED BY M.R.
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Coring COMPILED BY M.N.
DATUM Geodetic DATE March 30, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	+ FIELD VANE								
206.2 0.0	Ground Surface					● QUICK TRIAXIAL	x LAB VANE				WATER CONTENT (%)						
206.1 0.1	Peat, fine fibrous Dark brown		1	SS	8		20	40	60	80	100	20	40	60		GR SA SI CL	
	Silty clay, trace sand silt layers																
	Stiff Brown Moist		2	SS	9												
204.8 1.4	Clayey silt, trace sand																
	Stiff to Grey Wet firm		3	SS	9												
203.3 2.9	Sand, some silt																
202.9 3.3	Compact Brown Wet Granitic Gneiss Bedrock		5	SS	24/10cm												
	Slightly weathered to unweathered		6	RC NQ	REC 94%											RQD 85%	
	High strength																
	Good to excellent quality		7	RC NQ	REC 97%											RQD 97%	
199.8 6.4	End of borehole																
	Sample 5: Sampler bouncing																
			</														

METRIC

Hwy 69 (New), Sta. 20+540, o/s 28.0m Rt CL Med.

ORIGINATED BY M.R.

COMPILED BY M.N.

 CHECKED BY C.N.

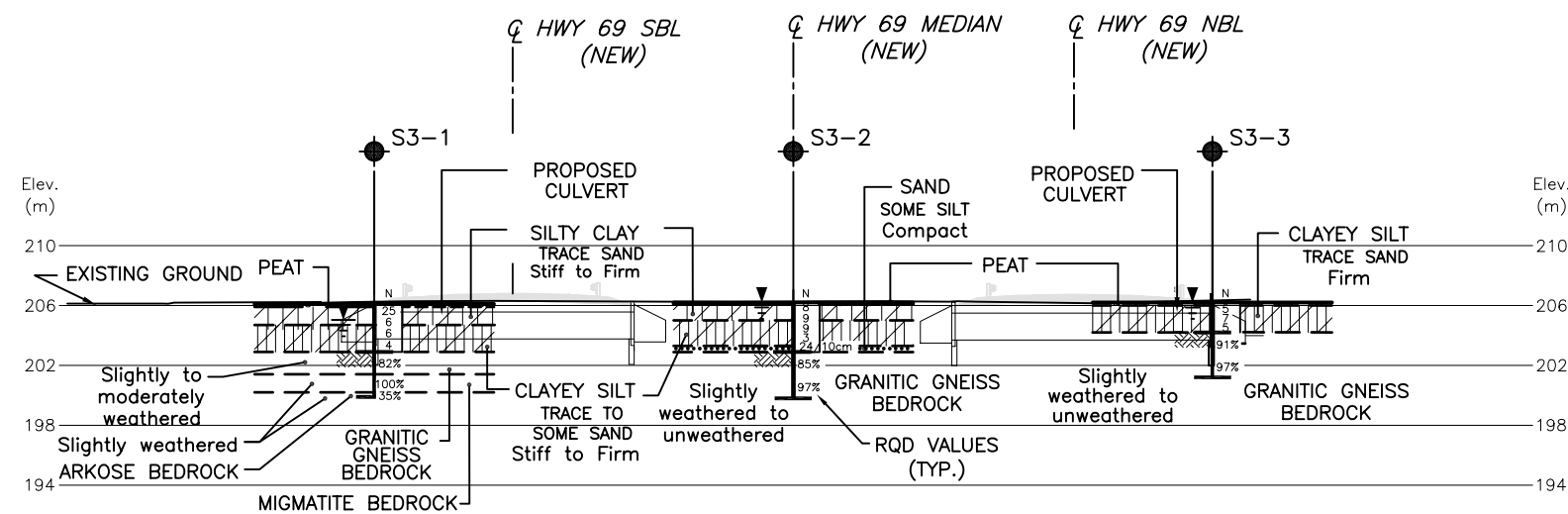
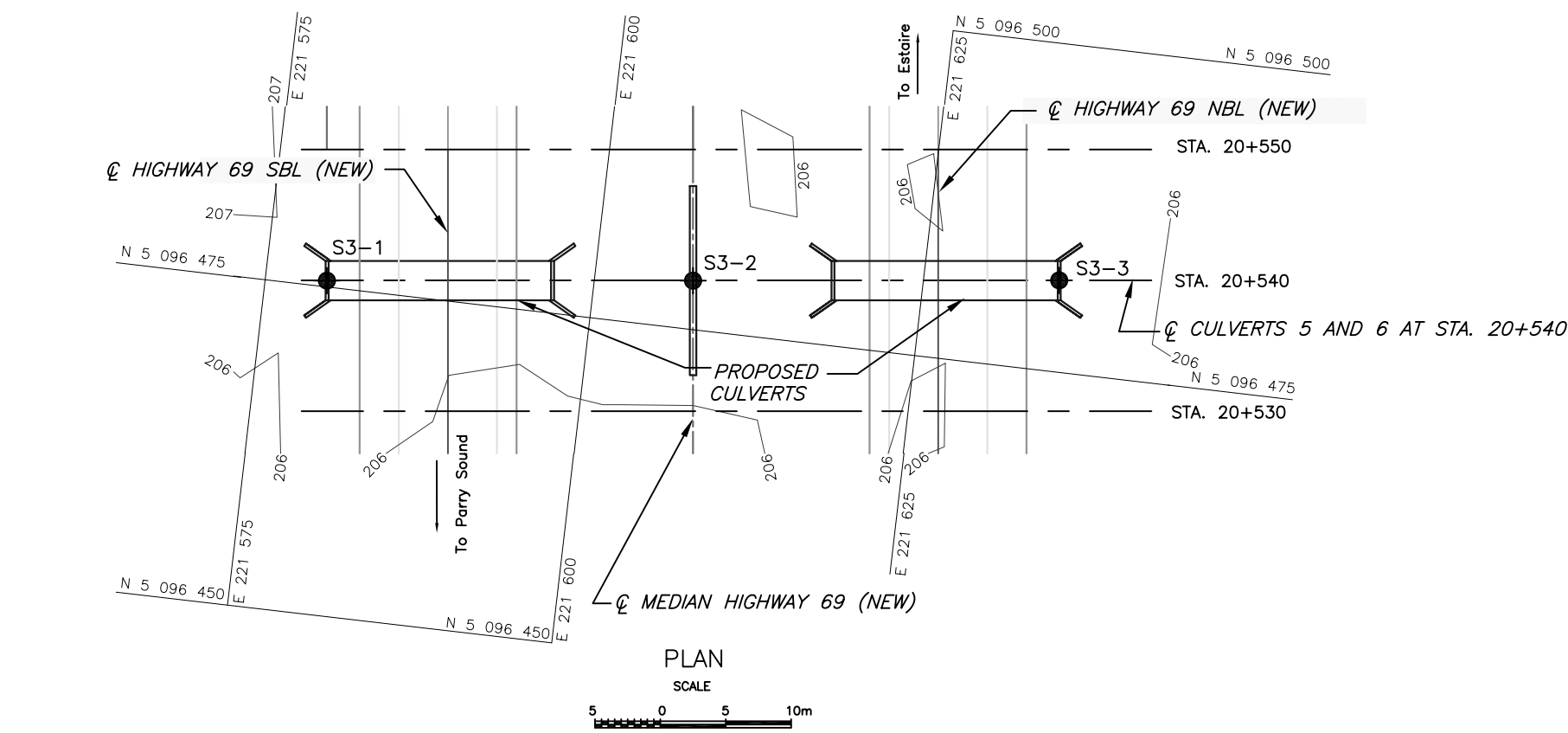
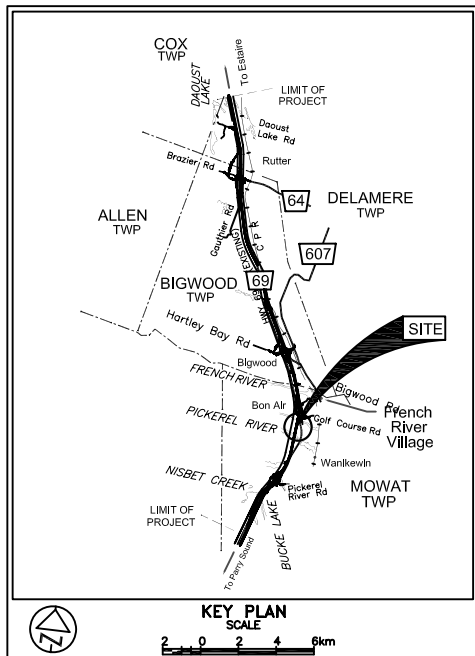
(%) STRAIN AT FAILURE

CONT No
GWP No 5203-06-00

CULVERTS 5 AND 6 (S3)
HIGHWAY 69 FOUR-LANING
STA. 20+540 - MOWAT TWP
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET



PROFILE Q CULVERTS 5 AND 6 AT STA. 20+540

LEGEND

- Borehole
- Dynamic Cone Penetration Test (Cone)
- Borehole & Cone
- N Blows/0.3m (Std. Pen Test, 475 J/blow)
- CONE Blows/0.3m (60 Cone, 475 J/blow)
- WH Penetration due to weight of hammer and rods
- W L at time of investigation March & April 2009
- Head ARTESIAN WATER Encountered
- PIEZOMETER

BH No	ELEVATION	CO-ORDS	
		NORTHING	EASTING
S3-1	206.1	N 5 096 475.5	E 221 579.7
S3-2	206.2	N 5 096 478.7	E 221 607.5
S3-3	206.2	N 5 096 482.0	E 221 635.3

— NOTE —
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.



REF.: MRC DRAWINGS
H6454_PHASE3_XA01.dwg; H6454_PHASE3_XN01.dwg;
Plan View of Culverts - 090629.dwg; Phase 3 -
Snake Culverts Cross Sections - 090714.dwg

REVISIONS	DATE	BY	DESCRIPTION

Geocres No. 411-252	HWY No 69	DIST 54
SUBM'D MN	CHECKED MN	DATE FEB. 10, 2010
DRAWN NA	CHECKED CN	APPROVED BRG
DWG S3-1		

- NOTES:
- DRAWING S3-1 SHOULD BE READ IN CONJUNCTION WITH THE TEXT AND RECORD OF BOREHOLE LOGS.
 - CULVERTS 5 AND 6 AT STA. 20+540 WERE DESIGNATED AS CULVERT S3 FOR THE INVESTIGATION.
 - THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
 - DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.

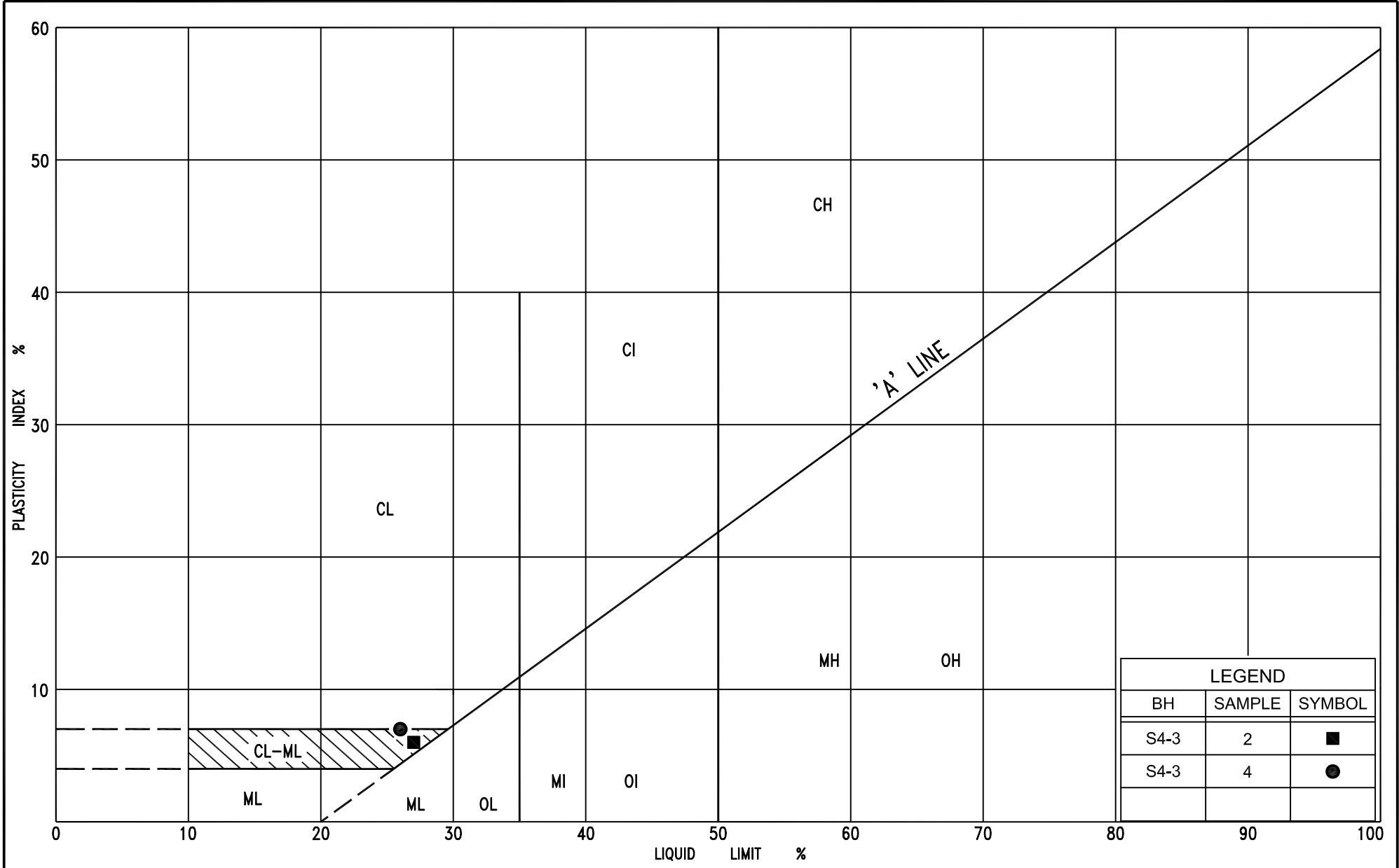
Culvert S4 at Sta. 20+630, Mowat Township

Figure PC-S4-1 - Plasticity Chart

Figure GS-S4-1 - Grain Size Distribution Chart

Record of Borehole Sheets

Drawing S4-1 – Borehole Locations and Soil Strata



Ministry of
Transportation
Ontario

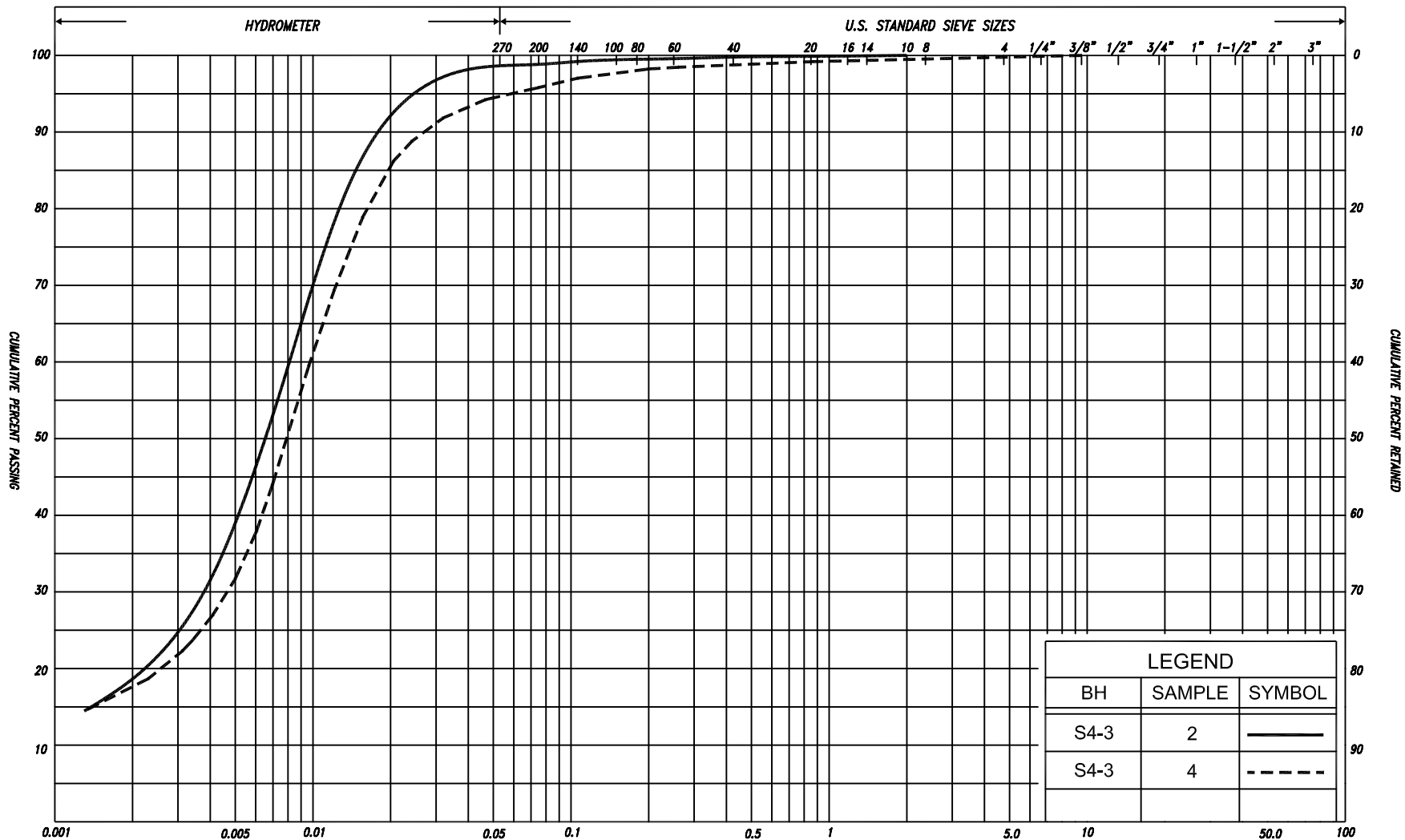
PLASTICITY CHART

CLAYEY SILT, trace sand

FIG No. PC-S4-1

HWY: 69

G.W.P. No. 5203-06-00



SILT & CLAY				GRAIN SIZE IN MILLIMETERS			COBBLES		UNIFIED
				FINE	MEDIUM	COARSE	GRAVEL		
CLAY	SAND					GRAVEL	COBBLES	M.I.T.	
	FINE	MEDIUM	COARSE	FINE	MEDIUM				COARSE
SILT				SAND					GRAVEL
				V. FINE	FINE	MED.	COARSE		
CLAY		SILT		SAND			GRAVEL		U.S. BUREAU

GRAIN SIZE DISTRIBUTION

CLAYEY SILT, trace sand

FIG No. GS-S4-1

HWY: 69

G.W.P. No. 5203-06-00

RECORD OF BOREHOLE No S4-1

1 of 1

METRIC

Coords: 5 096 564.9 N; 221 569.3 E

G.W.P. 5203-06-00 LOCATION Hwy 69 (New), Sta. 20+630, o/s 28.0m Lt CL Med. ORIGINATED BY M.R.
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Coring COMPILED BY M.N.
DATUM Geodetic DATE April 03, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
208.4	Ground Surface																
0.0	Peat, fine fibrous																
208.2	Dark brown						208										
0.2	Silty sand, some gravel																
207.3	Brown Wet																
1.1	Migmatite Bedrock																
	Unweathered		1	RC NQ	REC 100%		207									RQD 91%	
	High Strength																
	Excellent quality		2	RC NQ	REC 100%		206									RQD 100%	
			3	RC NQ	REC 100%		205									RQD 100%	
204.3	End of borehole																
4.1																	

* 2009 04 03

▽ Water level observed
during drilling

▼ Water level measured
after drilling

C. F. H. S. A. denotes
Continuous Flight Hollow
Stem Augers




RECORD OF BOREHOLE No S4-2 1 of 1 METRIC																	
G.W.P. 5203-06-00		LOCATION		Coords: 5 096 568.1 N; 221 597.1 E Hwy 69 (New), Sta. 20+630 CL Med.				ORIGINATED BY M.R.									
DIST 54 HWY 69		BOREHOLE TYPE		C.F.H.S.A. and Rotary Diamond Coring				COMPILED BY M.N.									
DATUM Geodetic		DATE		April 03, 2009				CHECKED BY C.N.									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS *	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		SHEAR STRENGTH kPa										
206.5	Ground Surface						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%) 20 40 60					
0.0	Migmatite Bedrock		1	RC NQ	REC 100%		206										RQD 100%
	Slightly weathered to unweathered						205										
	High strength						204										
203.5	End of borehole																
3.0																	
	* Borehole charged with drilling water																

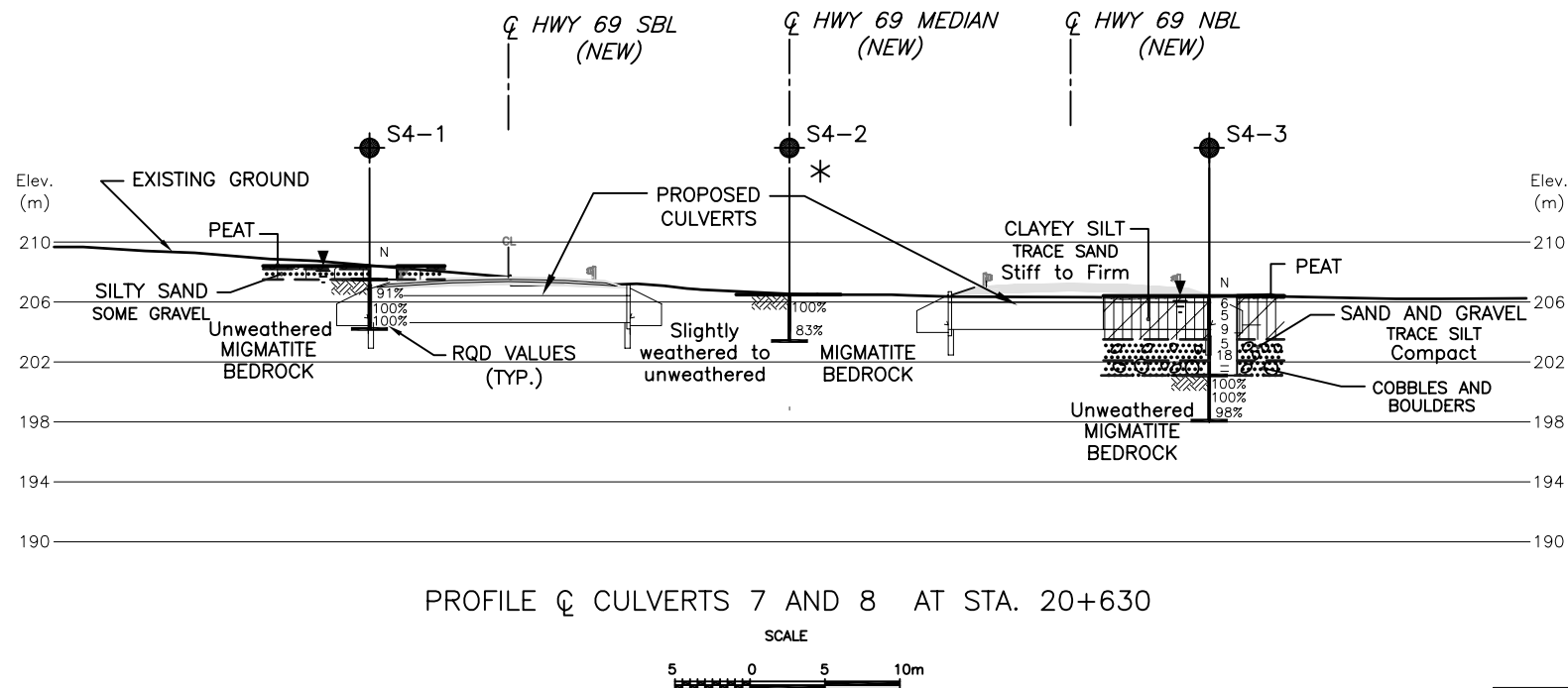
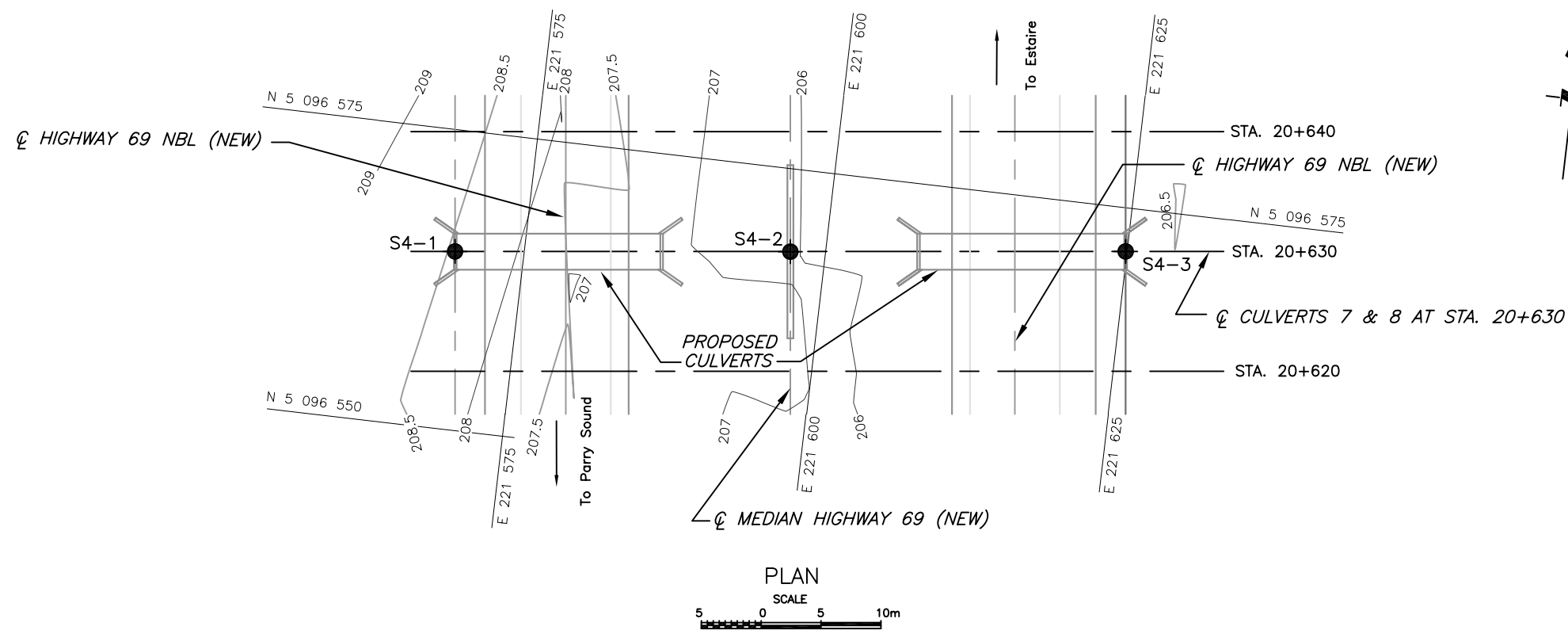
RECORD OF BOREHOLE No S4-3

1 of 1

METRIC

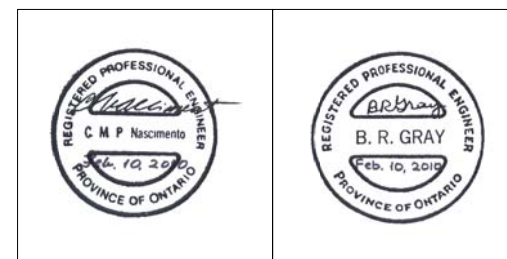
G.W.P. 5203-06-00 LOCATION Coords: 5 096 571.4 N; 221 624.9 E
Hwy 69 (New), Sta. 20+630, o/s 28.0m Rt CL Med. ORIGINATED BY M.R.
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Coring COMPILED BY M.N.
DATUM Geodetic DATE April 02, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID LIMIT CONTENT LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								○ UNCONFINED		+ FIELD VANE			w _p w w _L				
						● QUICK TRIAXIAL	x LAB VANE										
206.4 0.0	Ground Surface						20	40	60	80	100	20	40	60	GR SA SI CL		
206.3 0.1	Peat, fine fibrous		1	SS	6								o		0 1 81 18		
	Dark brown																
	Clayey silt, trace sand																
	Stiff Brown Wet																
	to firm																
			2	SS	5								H				
			3	SS	9								o				
			4	SS	5								H	o	0 4 79 17		
203.5 2.9	Sand and gravel, trace silt																
	Compact Brown Wet		5	SS	18												
	Cobbles and boulders		6	RC NQ	-												
			7	RC NQ	-										-		
201.1 5.3	Migmatite Bedrock																
	Unweathered		7	RC NQ	REC 100%												
	Medium to high strength																
	Excellent quality		8	RC NQ	REC 100%												
			9	RC NQ	REC 97%										RQD 100%		
198.1 8.3	End of borehole														RQD 98%		



NOTES:

- DRAWING S4-1 SHOULD BE READ IN CONJUNCTION WITH THE TEXT AND RECORD OF BOREHOLE LOGS.
- CULVERTS 7 AND 8 AT STA. 20+630 WERE DESIGNATED AS CULVERT S4 FOR THE INVESTIGATION.
- THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
- DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.

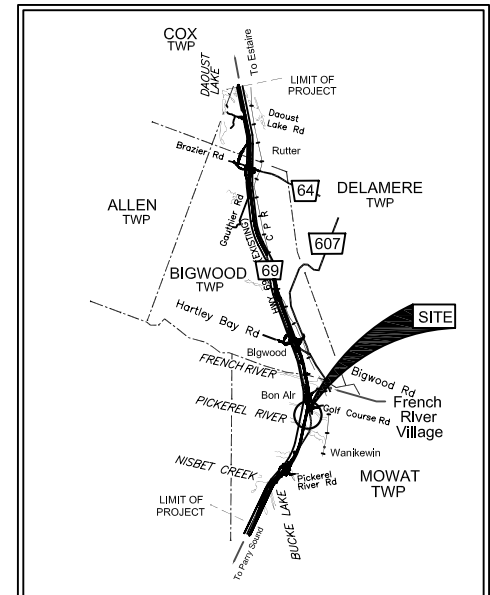


REF.: MRC DRAWINGS
H6454_PHASE3_XA01.dwg; H6454_PHASE3_XN01.dwg;
Plan View of Culverts - 090629.dwg; Phase 3 -
Snake Culverts Cross Sections - 090714.dwg

CONT No
GWP No 5203-06-00

CULVERTS 7 AND 8 (S4)
HIGHWAY 69 FOUR-LANING
STA. 20+630 - MOWAT TWP
BOREHOLE LOCATIONS AND SOIL STRATA

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS



KEY PLAN
SCALE

2 0 2 4 6 km

LEGEND

- Borehole
- Dynamic Cone Penetration Test (Cone)
- Borehole & Cone
- N Blows/0.3m (Std. Pen Test, 475 J/blow)
- CONE Blows/0.3m (60' Cone, 475 J/blow)
- * Water level not established
- W L at time of investigation April 2009
- Head
- ARTESIAN WATER Encountered
- PIEZOMETER

BH No	ELEVATION	CO-ORDS	
		NORTHING	EASTING
S4-1	208.4	N 5 096 564.9	E 221 569.3
S4-2	206.5	N 5 096 568.1	E 221 597.1
S4-3	206.4	N 5 096 571.4	E 221 624.9

NOTE

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

REVISIONS	DATE	BY	DESCRIPTION

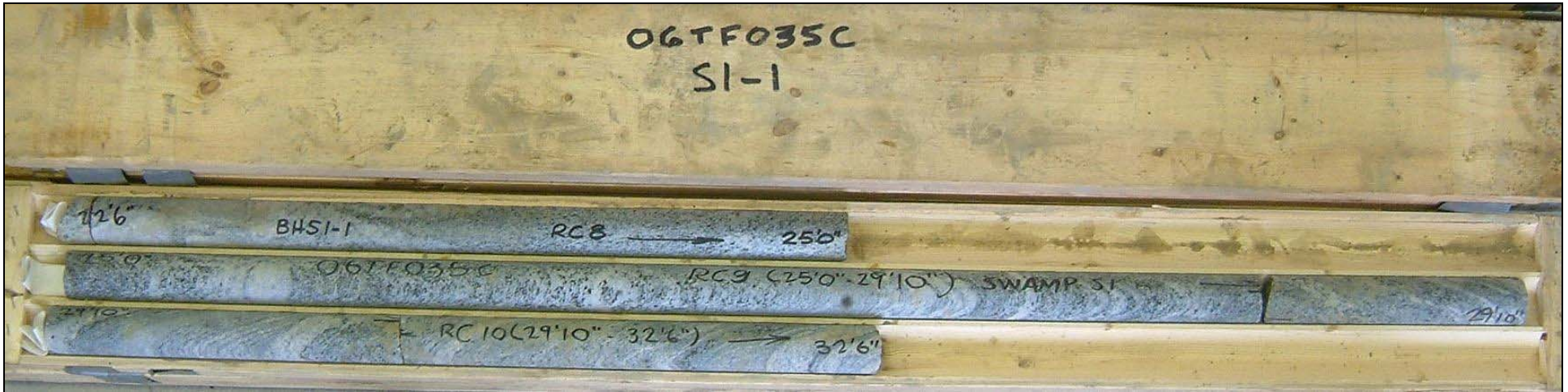
Geocres No. 411-252

HWY No	69	DIST	54
SUBM'D	MN	CHECKED	MN
DATE	FEB. 10, 2010	SITE	--
DRAWN	NA	CHECKED	CN
APPROVED	BRG	DWG	S4-1



APPENDIX A

Rock Core Photographs



Photograph 1: Culvert S1, borehole S1-1, samples RC-8 to RC-10 from 6.9 to 9.9 m depth. The RQD values ranged from 98 to 100%, indicating excellent quality bedrock.



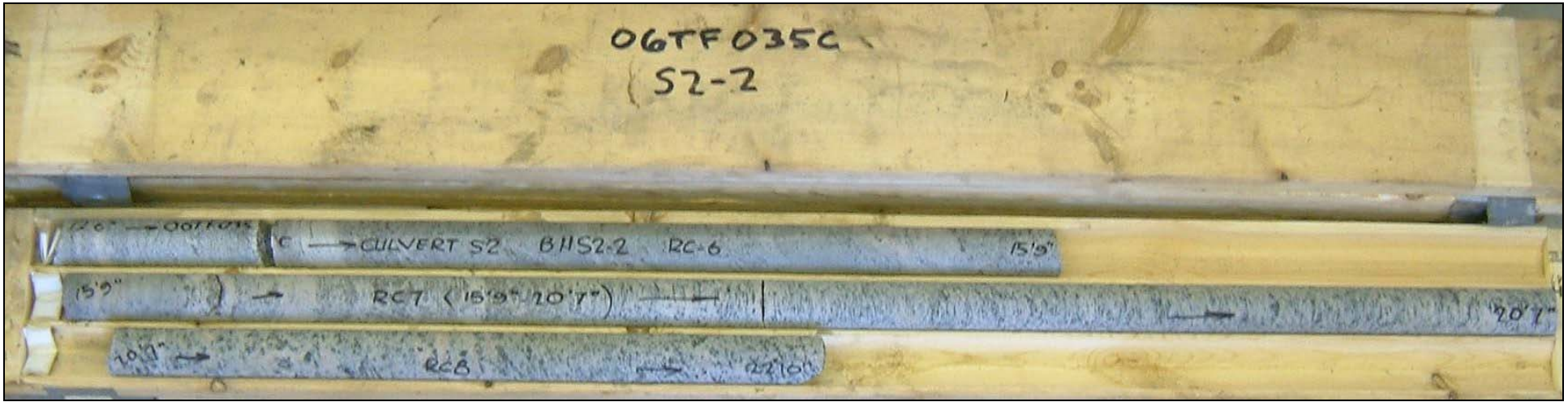
Photograph 2: Culvert S1, borehole S1-2, samples RC-6 to RC-8 from 4.1 to 7.2 m depth. The RQD values were 100%, indicating excellent quality bedrock.



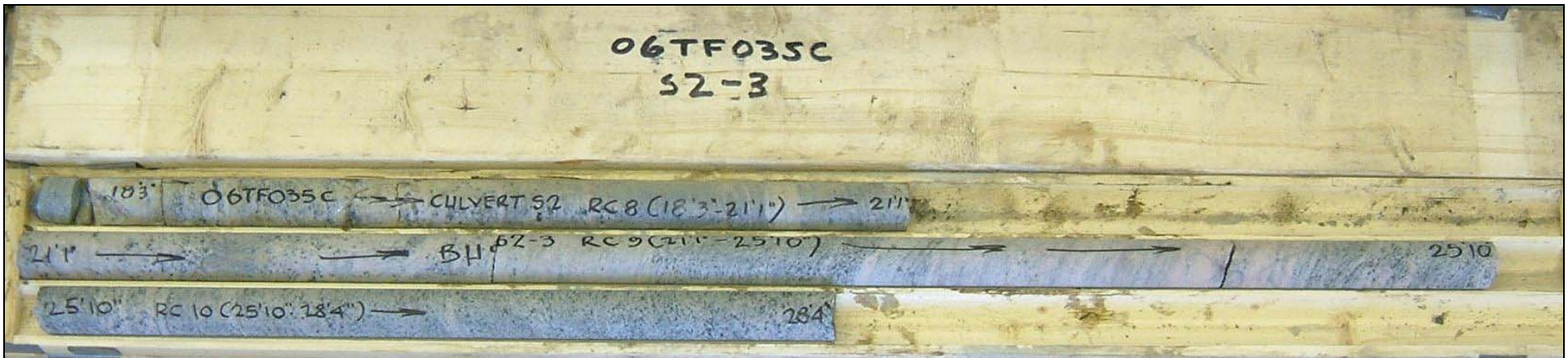
Photograph 3: Culvert S1, borehole S1-3, samples RC-7 and RC-8 from 6.1 to 9.2 m depth. The RQD values were 100%, indicating excellent quality bedrock.



Photograph 4: Culvert S2, borehole S2-1, samples RC-7 and RC-8 from 6.4 to 9.5 m depth. The RQD values were 100%, indicating excellent quality bedrock.



Photograph 5: Culvert S2, borehole S2-2, samples RC-6 to RC-8 from 3.8 to 7.0 m depth. The RQD values were 100%, indicating excellent quality bedrock.



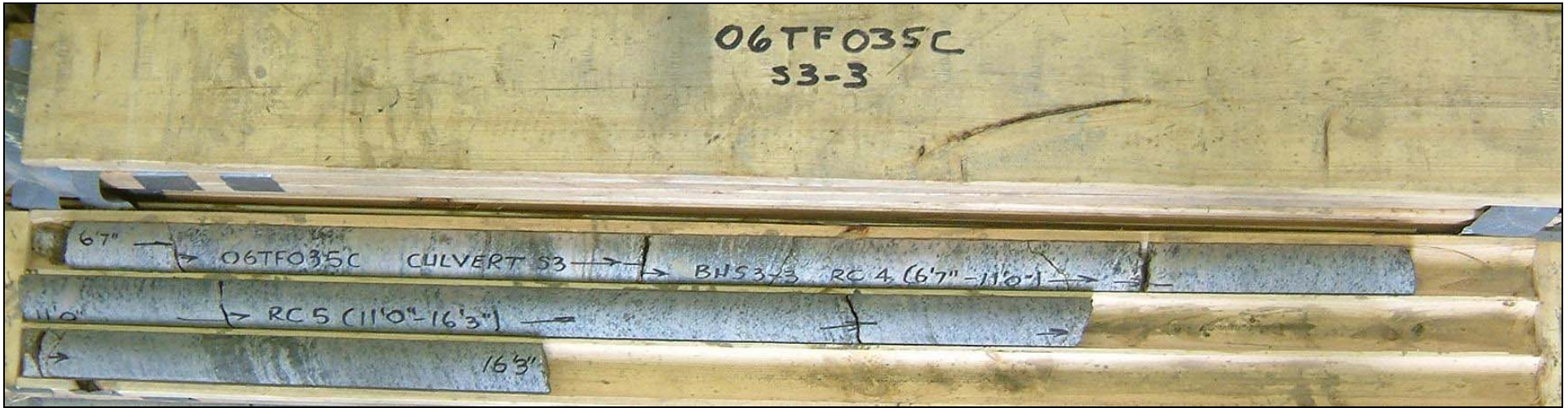
Photograph 6: Culvert S2, borehole S2-3, samples RC-8 to RC-10 from 5.7 to 8.6 m depth. The RQD values ranged from 90 to 100%, indicating excellent quality bedrock.



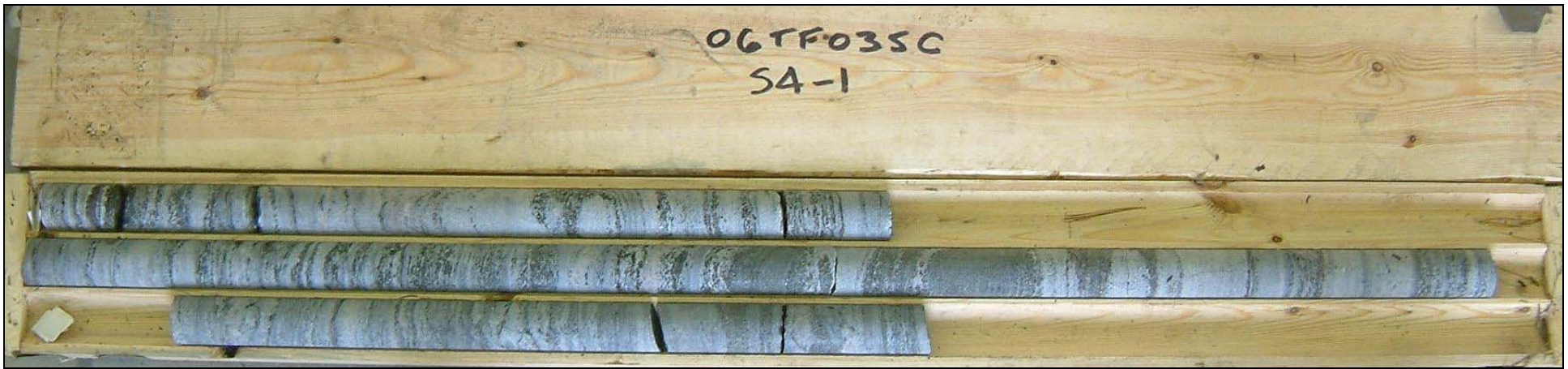
Photograph 7: Culvert S3, borehole S3-1, samples RC-5 and RC-6 from 3.2 to 6.2 m depth. The RQD values ranged from 35 to 100%. The Granitic Gneiss bedrock contacted from 3.2 to 4.7 m depth was good quality, the Migmatite bedrock contacted from 4.7 to 5.4 m depth was excellent quality and the Arkose bedrock contacted at 5.4 to 6.2 m depth was poor quality.



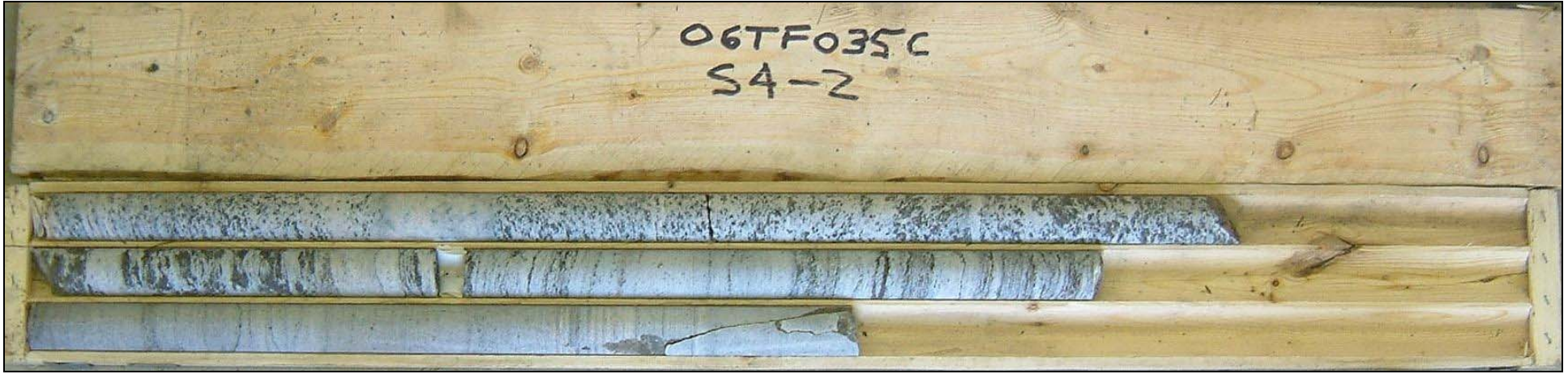
Photograph 8: Culvert S3, borehole S3-2, samples RC-6 and RC-7 from 3.3 to 6.4 m depth. The RQD values ranged from 85 to 97%, indicating good to excellent quality bedrock.



Photograph 9: Culvert S3, borehole S3-3, samples RC-4 and RC-5 from 2.0 to 5.0 m depth. The RQD values ranged from 91 to 97%, indicating excellent quality bedrock.



Photograph 10: Culvert S4, borehole S4-1, samples RC-1 to RC-3 from 1.1 to 4.1 m depth. The RQD values ranged from 91 to 100%, indicating excellent quality bedrock.



Photograph 11: Culvert S4, borehole S4-2, samples RC-1 and RC-2 from the surface to 3.0 m depth. The RQD values ranged from 83 to 100%, indicating good to excellent quality bedrock.



Photograph 12: Culvert S4, borehole S4-3, samples RC-6 to RC-9 from 4.2 to 8.3 m depth. The RQD values ranged from 98 to 100%, indicating excellent quality bedrock. Cobbles and boulders were contacted to 5.3 m depth.



APPENDIX B

Data from Geotechnical Pavement Investigation (PML Ref.: 06TF034C)



Proposed Hwy 69 SBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+330.	19.0	Lt C/L	D+/-0	CHD	20+350.	38.0	Lt C/L	D+0.4	TP	
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist			
200 - 3.7		Br Si(y) Cl Tr Sa Wet			200 - 1.2		Br/Gry Si Tr Cl Moist			
3.7 - 7.5		Gry Si(y) Cl Tr Sa Wet			1.2 - 4.0		Gry/Br Cl(y) Si Moist			
7.5		NFP BR			4.0		NFP BR			
		Depth	USS	RSS	St					
		4.90-5.35	56	11	5					
		6.40-6.85	28	10	3					
20+330.	33.0	Lt C/L	D+0.1	TP	20+370.	7.0	Lt C/L	D+/-0	TP	
0 - 200		Dk Br/Br Sa(y) Si Tps W Gr W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist			
200 - 1.8		Br/Gry Si Tr Cl Num Cob Occ Blds Moist			200 - 600		Br/Gry Si Tr Cl Moist			
1.8		NFP BR			600 - 4.7		Gry/Br Cl(y) Si Moist			
					4.7		NFP BR			
20+330.	38.0	Lt C/L	D+0.2	TP	20+370.	19.0	Lt C/L	D-0.1	CHD	
0 - 300		Dk Br/Br Sa(y) Si Tps W Gr W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist			
300 - 1.5		Br/Gry Si Tr Cl Num Cob Occ Blds Moist			200 - 4.0		Br Si(y) Cl Tr Sa Moist			
1.5		NFP BR			4.0 - 6.7		Gry Si(y) Cl Tr Sa Wet			
					6.7 - 6.9		Gry Si(y) Cl Tr Gr Tr Sa Wet			
					6.9		NFP BR			
							Depth	USS	RSS	St
							3.40-3.85	44	6	7
							4.90-5.35	40	11	4
							6.40-6.85	52	10	5
20+350.	7.0	Lt C/L	D+0.1	TP	20+370.	33.0	Lt C/L	D-0.1	TP	
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist			
200 - 600		Br/Gry F Sa Tr Gr Tr Si Moist			200 - 3.8		Br/Gry Cl(y) Si Moist			
600 - 4.1		Gry/Br Cl(y) Si Moist			3.8 - 5.5		Dk Gry/Lt Br Si(y) Cl Moist			
4.1 - 5.2		Dk Gry/Lt Br Si(y) Cl Moist								
5.2 - 5.4		Blk/Gry Gr And Sa Tr Si Wet								
5.4		NFP BR								
		Seepage @ 5.2								
20+350.	19.0	Lt C/L	D-0.1	TP	20+370.	38.0	Lt C/L	D-0.1	TP	
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist			
200 - 400		Br/Gry F Sa Tr Gr Tr Si Moist			200 - 3.7		Br/Gry Cl(y) Si Moist			
400 - 1.5		Br/Gry Si Tr Cl Moist			3.7 - 5.3		Dk Gry/Lt Br Si(y) Cl Moist			
1.5 - 4.2		Gry/Br Cl(y) Si Moist								
4.2 - 6.2		Dk Gry/Lt Br Si(y) Cl Moist			20+390.	7.0	Lt C/L	D+0.4	TP	
		cu @ 5.5 = 75 kPa (Pocket Penetrometer)			0 - 200		Dk Br/Blk Si Tps W Roots Moist			
20+350.	33.0	Lt C/L	D-0.3	TP	200 - 400		Br/Gry F Sa Tr Gr Tr Si Moist			
0 - 200		Dk Br/Blk Si Tps W Roots Moist			400 - 3.9		Br/Gry Cl(y) Si Moist			
200 - 1.3		Br/Gry Si Tr Cl Moist			3.9 - 5.3		Dk Gry/Lt Br Si(y) Cl Moist			
1.3 - 4.3		Gry/Br Cl(y) Si Moist								
4.3		NFP BR								



Proposed Hwy 69 SBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+390.	19.0	Lt C/L	D+0.2	TP	20+410.	38.0	Lt C/L	D+0.5	TP
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
200 - 1.2		Br/Gry Si Tr Cl Moist			200 - 2.1		Br/Gry Si Tr Sa Tr Cl Occ Cob Moist		
1.2 - 3.7		Gry/Br Cl(y) Si Moist			2.1 - 3.5		Gry/Br Cl(y) Si Tr Gr Moist		
3.7 - 4.8		Dk Gry/Lt Br Si(y) Cl Moist			3.5 - 5.8		Dk Gry/Lt Br Si(y) Cl Moist		
		cu @ 4.5 = 50 kPa (Pocket Penetrometer)							
20+390.	33.0	Lt C/L	D+0.1	TP	20+430.	7.0	Lt C/L	D+0.2	TP
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
200 - 1.0		Br/Gry Si Tr Cl Moist			200 - 600		Gry/Br F Sa Tr Si Moist		
1.0 - 5.0		Gry/Br Cl(y) Si Moist			600 - 1.4		Br/Gry Si Tr Cl Moist		
		cu @ 4.5 = 50 kPa (Pocket Penetrometer)			1.4 - 2.7		Gry/Br Cl(y) Si Tr Gr Moist		
					2.7 - 5.6		Dk Gry/Br Si(y) Cl Moist		
20+390.	38.0	Lt C/L	D+0.2	TP	20+430.	19.0	Lt C/L	D+0.2	TP
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 300		Dk Br/Br Sa(y) Si Tps W Roots Moist		
200 - 1.1		Br/Gry Si Tr Cl Moist			300 - 2.2		Gry/Br Si Tr Cl Moist		
1.1 - 4.8		Gry/Br Cl(y) Si Moist			2.2 - 5.6		Gry/Br Cl(y) Si Moist		
20+410.	7.0	Lt C/L	D+0.2	TP	20+430.	33.0	Lt C/L	D+0.1	TP
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 300		Dk Br/Br Si(y) Sa Tps W Roots Moist		
200 - 600		Br/Gry F Sa Tr Gr Tr Si Moist			300 - 2.0		Br/Gry Cl(y) Si Moist		
600 - 1.1		Br/Gry Si Tr Cl Moist			2.0 - 5.4		Dk Gry/Br Si(y) Cl Moist		
1.1 - 3.7		Gry/Br Cl(y) Si Moist			20+430.	38.0	Lt C/L	D+0.1	TP
3.7 - 5.5		Dk Gry/Lt Br Si(y) Cl Moist			0 - 300		Dk Br/Br Si(y) Sa Tps W Roots Moist		
20+410.	19.0	Lt C/L	D+0.5	HD	300 - 2.1		Br/Gry Cl(y) Si Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			2.1 - 5.5		Dk Gry/Br Si(y) Cl Moist		
200 - 1.2		Gry Cl(y) Si Tr Sa Tr Org Wet			20+450.	7.0	Lt C/L	D-0.2	TP
1.2 - 3.7		Br Si(y) Cl Till Tr Gr Tr Sa Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
3.7 - 4.0		Br Si(y) Cl Tr Sa Wet			200 - 300		Gry/Br F Sa Tr Si Moist		
4.0 - 6.7		Gry Si(y) Cl Tr Sa Wet			300 - 1.8		Gry/Br Si Tr Cl Moist		
	6.7	NFP BR			1.8 - 5.5		Dk Gr/Lt Br Si(y) Cl Moist		
		Depth	USS	RSS	St		cu @ 5.0 = 50 kPa (Pocket Penetrometer)		
		3.25-3.70	84	17	5				
		5.00-5.45	68	8	9				
		6.10-6.55	64	19	3				
20+410.	33.0	Lt C/L	D+0.7	TP					
0 - 200		Dk Br/Blk Si Tps W Roots Moist							
200 - 1.9		Br/Gry Si Tr Sa Tr Cl Occ Cob Moist							
1.9 - 3.3		Gry/Br Cl(y) Si Tr Gr Moist							
3.3 - 6.0		Dk Gry/Lt Br Si(y) Cl Moist							
		cu @ 5.0 = 75 kPa (Pocket Penetrometer)							



Proposed Hwy 69 SBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+450.	19.0	Lt C/L	D+0.1	HD		20+470.	38.0	Lt C/L	D+0.2	TP	
0 - 200		Dk Br/Blk Si Tps W Roots Moist				0 - 200		Blk/Dk Br Si Tps W Roots Moist			
200 - 1.5		Gry/Br Si(y) Cl Tr Sa Tr Org Wet				200 - 1.4		Gry/Br Cl(y) Si Occ Blds Moist			
1.5 - 2.4		Gry/Br Si(y) Cl Tr Sa Wet				1.4 - 5.2		Dk Gry/Lt Br Si(y) Cl Moist			
2.4 - 6.1		Gry Si(y) Cl Tr Gr Tr Sa Wet						cu @ 3.5 = 50 kPa (Pocket Penetrometer)			
6.1 - 6.9		Gry Cl(y) Si Tr Gr Tr Sa Wet				20+490.	7.0	Lt C/L	D+/-0	TP	
6.9		NFP BR				0 - 200		Dk Br/Blk Si Tps W Roots Moist			
		Depth	USS	RSS	St	200 - 900		Gry/Br Cl(y) Si Moist			
		3.25-3.70	44	7	6	900 - 4.9		Dk Gry/Lt Br Si(y) Cl Moist			
		5.00-5.45	56	10	6			cu @ 4.0 = 75 kPa (Pocket Penetrometer)			
		6.10-6.55	72	14	5						
20+450.	33.0	Lt C/L	D+/-0	TP		20+490.	19.0	Lt C/L	D+0.1	CHD	
0 - 100		Dk Br/Blk Si Tps W Roots Moist				0 - 1.8		Br Cl(y) Si Tr Sa Tr Org Moist			
100 - 400		Gry F Sa Tr Si Moist				1.8 - 5.7		Gry Si(y) Cl Tr Sa Wet-Sat			
400 - 1.7		Gry/Br Cl(y) Si Moist				5.7 - 6.7		Gry Si Some Gr Tr Sa Tr Cl Occ Cob Occ			
1.7 - 5.3		Dk Gry/Lt Br Si(y) Cl Wet						Blds-Sat			
		cu @ 4.5 = 25 kPa (Pocket Penetrometer)				6.7		NFP BR			
20+450.	38.0	Lt C/L	D+/-0	TP				Seepage @ 2.7			
0 - 200		Dk Br/Blk Si Tps W Roots Moist						Fr Wat @ 5.7			
200 - 400		Gry F Sa Tr Si Moist						Depth	USS	RSS	St
400 - 1.8		Gry/Br Cl(y) Si Moist						3.05-3.50	36	5	7
1.8 - 5.4		Dk Gry/Lt Br Si(y) Cl Moist						4.60-5.05	40	9	4
		cu @ 4.5 = 50 kPa (Pocket Penetrometer)				20+490.	33.0	Lt C/L	D-0.1	TP	
20+470.	7.0	Lt C/L	D+0.2	TP		0 - 200		Dk Br/Blk Si Tps W Roots Moist			
0 - 200		Dk Br/Blk Si Tps W Roots Moist				200 - 1.0		Gry/Br Cl(y) Si Moist			
200 - 250		Gry F Sa Tr Si Moist				1.0 - 4.9		Dk Gry/Lt Br Si(y) Cl Moist			
250 - 1.5		Gry/Br Cl(y) Si Occ Blds Moist						cu @ 4.5 = 75 kPa (Pocket Penetrometer)			
1.5 - 5.1		Dk Gry/Lt Br Si(y) Cl Moist				20+490.	38.0	Lt C/L	D-0.1	TP	
20+470.	19.0	Lt C/L	D+0.2	TP		0 - 200		Dk Br/Blk Si Tps W Roots Moist			
0 - 200		Dk Br/Blk Si Tps W Roots Moist				200 - 1.1		Gry/Br Cl(y) Si Moist			
200 - 300		Gry F Sa Tr Si Moist				1.1 - 5.0		Dk Gry/Lt Br Si(y) Cl Moist			
300 - 1.4		Gry/Br Cl(y) Si Moist				20+510.	7.0	Lt C/L	D+/-0	TP	
1.4 - 5.2		Dk Gry/Lt Br Si(y) Cl Moist				0 - 200		Dk Br/Blk Si Tps W Roots Moist			
		cu @ 5.0 = 50 kPa (Pocket Penetrometer)				200 - 1.1		Br/Gry Si Tr Cl Occ Cob Moist			
20+470.	33.0	Lt C/L	D+0.2	TP		1.1 - 4.3		Gry/Br Cl(y) Si Moist			
0 - 200		Blk/Dk Br Si Tps W Roots Moist						cu @ 3.5 = 100 kPa (Pocket Penetrometer)			
200 - 1.5		Gry/Br Cl(y) Si Occ Blds Moist									
1.5 - 5.0		Dk Gry/Lt Br Si(y) Cl Moist-Wet									



Proposed Hwy 69 SBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+510.	19.0	Lt C/L	D+/-0	TP	20+530.	38.0	Lt C/L	D+0.2	TP
0 - 200		Blk Si Tps W Roots Moist			0 - 200		Blk Si Tps W Roots Moist		
200 - 4.5		Dk Gry/Lt Br Si(y) Cl Moist			200 - 4.4		Dk Gry/Lt Br Cl(y) Si Tr Sa Wet CL		
20+510.	33.0	Lt C/L	D+/-0	TP			w = 40%		
0 - 200		Blk Si Tps W Roots Moist					% Pass		
200 - 4.3		Dk Gry/Lt Br Si(y) Cl Moist					4.75 mm = 100		
		cu @ 4.0 = 50 kPa (Pocket Penetrometer)					2.00 mm = 100		
20+510.	38.0	Lt C/L	D+/-0	TP			425 um = 99		
0 - 200		Blk Si Tps W Roots Moist					75 um = 98		
200 - 4.5		Dk Gry/Lt Br Si(y) Cl Moist					5 um = 48		
							2 um = 24		
20+530.	7.0	Lt C/L	D+0.2	TP			MSFH		
0 - 200		Dk Br/Blk Si Tps W Roots Moist					WL = 28 IP = 10		
200 - 1.1		Gry/Br Si Tr Cl Occ Cob Moist					K Factor = 0.59		
1.1 - 4.5		Gry/Br Cl(y) Si Moist			20+550.	7.0	Lt C/L	D+0.1	TP
		cu @ 4.0 = 100 kPa (Pocket Penetrometer)			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
20+530.	14.0	Lt C/L	D+0.2	CHD	200 - 800		Br/Gry Si Tr Cl Num Cob Occ Blds Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Sat			800 - 1.4		Gry/Br Cl(y) Si Occ Blds Moist		
200 - 1.8		Br Si(y) Cl Tr Sa Sat			1.4 - 1.8		Gry/Blk Sa And Gr Tr Si Num Cob Moist		
1.8 - 3.1		Br Cl(y) Si Tr Sa Sat			1.8		NFP BR		
3.1 - 4.3		Gry/Br Cl(y) Si Sat			20+550.	19.0	Lt C/L	D+0.2	TP
4.3 - 4.6		Gry Si Tr Cl Tr Sa Sat			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
		Fr Wat @ 0			200 - 1.7		Br/Gry Si Tr Cl Occ Cob Occ Blds Moist		
		Depth USS RSS St			1.7 - 2.3		Gry/Br Cl(y) Si Occ Blds Moist		
		2.10-2.55 >100 - -			2.3 - 3.0		Gry/Blk Gr And Sa Tr Si Num Cob Occ Blds Moist		
20+530.	33.0	Lt C/L	D+0.2	TP	3.0		NFP BR		
0 - 200		Blk Si Tps W Roots Moist					Seepage @ 2.5		
200 - 4.2		Dk Gry/Lt Br Cl(y) Si Tr Sa Moist			20+550.	33.0	Lt C/L	D-0.1	TP
		cu @ 4.0 = 50 kPa (Pocket Penetrometer)			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
					200 - 1.3		Br/Gry Si Tr Cl Occ Cob Moist		
					1.3 - 2.7		Gry/Br Cl(y) Si Num Cob Occ Blds Moist		
					2.7 - 2.9		Gry/Blk Gr And Sa Tr Si Occ Cob Moist		
					2.9		NFP BR		
					20+550.	38.0	Lt C/L	D+0.1	TP
					0 - 200		Dk Br/Blk Si Tps W Roots Moist		
					200 - 1.4		Br/Gry Si Tr Cl Occ Cob Moist		
					1.4 - 2.6		Gry/Br Cl(y) Si Num Cob Occ Blds Moist		
					2.6 - 2.8		Gry/Blk Gr And Sa Tr Si Occ Cob Moist		
					2.8		NFP BR		



Proposed Hwy 69 SBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+570.	7.0	Lt C/L	D+0.7	HA	20+610.	33.0	Lt C/L	D+1.9	HA
0 - 300		Dk Br/Blk Si Tps Num Cob W Roots Moist			0 - 100		Dk Br/Blk Si Tps W Roots Moist		
300		NFP BR			100		NFP BR		
20+570.	19.0	Lt C/L	D+0.3	TP	20+630.	7.0	Lt C/L	D+0.1	HA
0 - 600		Dk Br/Br Si Tps Num Cob Occ Blds W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
600		NFP BR			200 - 500		Br Sa(y) Si Some Gr Num Cob Wet		
					500		NFP BR		
20+570.	33.0	Lt C/L	D+0.3	TP	20+630.	19.0	Lt C/L	D+0.2	HA
0 - 400		Dk Br/Br Si Tps W Wd Pieces W Roots Moist			0 - 300		Dk Br/Blk Si Tps W Roots Moist		
400 - 900		Br/Gry Si Tr Gr Tr Sa Tr Cl Occ Cob Occ Blds Moist			300		NFP BR		
900		NFP BR			20+630.	33.0	Lt C/L	D+0.9	TP
20+590.	7.0	Lt C/L	D+0.7	HA	0 - 400		Dk Br/Br Sa(y) Si Tps W Gr Occ Cob W Roots Moist		
0		NFP BR			400 - 1.1		Br/Lt Br Si W Gr Tr Sa Occ Cob Occ Blds Moist		
20+590.	19.0	Lt C/L	D-0.4	TP	1.1 - 2.1		Dk Br/Br Gr W Sa Some Si Tr Cl Num Cob Num Blds Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			2.1		NFP BR		
200 - 1.7		Br/Gry Cl(y) Si Occ Cob Occ Blds Moist			20+630.	38.0	Lt C/L	D+1.6	TP
1.7 - 1.9		Gry/Br Sa And Gr Tr Si Moist			0 - 300		Dk Br/Br Sa(y) Si Tps W Gr Occ Cob W Roots Moist		
1.9		NFP BR			300 - 1.2		Br/Lt Br Si W Gr Tr Sa Occ Cob Occ Blds Moist		
20+590.	33.0	Lt C/L	D-0.1	HA	1.2 - 2.3		Dk Br/Br Gr W Sa Some Si Tr Cl Num Blds Moist		
0 - 300		Dk Br/Blk Si Tps W Roots Moist			2.3		NFP BR		
300		NFP BR			20+650.	7.0	Lt C/L	D+0.3	HA
20+610.	7.0	Lt C/L	D+0.9	HA	0 - 200		Dk Br/Blk Si Tps W Roots Moist		
0		NFP BR			200		NFP BR		
20+610.	19.0	Lt C/L	D+0.3	TP	20+650.	19.0	Lt C/L	D+1.1	HA
0 - 400		Dk Br/Lt Br Sa(y) Si Tps Tr Gr W Roots Moist			0		NFP BR		
400 - 1.7		Gry/Br Si W Gr Tr Sa Tr Cl Occ Cob Moist			20+650.	33.0	Lt C/L	D+2.4	HA
1.7 - 2.2		Dk Br/Br Gr And Sa Tr Si Num Cob Occ Blds Moist			0 - 150		Dk Br Si Tps Moist		
2.2		NFP BR			150		NFP BR		



Proposed Hwy 69 NBL, Mowat Twp., 20+001 to 21+000
DATUM: Proposed Centreline Median

20+290.	33.0	Rt C/L	D-1.0	TP	20+330.	19.0	Rt C/L	D+0.1	TP
0 - 300		Dk Br/Blk Sa(y) Si Tps Tr Gr Num Cob W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
300 - 700		Br/Gry F Sa Tr Si Tr Cl Num Cob Moist			200 - 700		Br/Gry F Sa Tr Gr Tr Si Moist		
700 - 1.8		Gry/Br Si Tr Cl Num Cob Occ Blds Moist			700 - 1.5		Br/Gry Si Tr Cl Num Cob Occ Blds Moist		
1.8		NFP BR			1.5		NFP BR		
20+290.	38.0	Rt C/L	D-1.2	TP	20+330.	33.0	Rt C/L	D-0.3	TP
0 - 200		Dk Br/Blk Sa(y) Si Tps Tr Gr Num Cob W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
200 - 600		Br/Gry F Sa Tr Si Tr Gr Num Cob Moist			200 - 1.1		Br/Gry Si Tr Cl Moist		
600 - 1.5		Gry/Br Si Tr Cl Num Cob Occ Blds Moist			1.1 - 4.9		Gry/Br Cl(y) Si Moist		
1.5		NFP BR			4.9		NFP BR		
20+310.	7.0	Rt C/L	D-0.1	TP	20+330.	38.0	Rt C/L	D-0.6	TP
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
200 - 800		Br/Gry Si Tr Cl Moist			200 - 1.0		Br/Gry Si Tr Cl Moist		
800 - 4.1		Gry/Br Cl(y) Si Tr Sa Occ Cob Moist			1.0 - 4.7		Gry/Br Cl(y) Si Moist		
4.1		NFP BR			4.7		NFP BR		
20+310.	19.0	Rt C/L	D-0.1	TP	20+350.	7.0	Rt C/L	D+0.1	TP
0 - 300		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
300 - 1.3		Br/Gry Si Tr Cl Num Cob Occ Blds Moist			200 - 600		Br/Gry F Sa Tr Gr Tr Si Moist		
1.3		NFP BR			600 - 3.2		Gry/Br Cl(y) Si Moist		
20+310.	33.0	Rt C/L	D-0.1	TP	3.2 - 4.5		Dk Gry/Lt Br Si(y) Cl Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			4.5		NFP BR		
200 - 1.3		Br/Gry Si Tr Cl Occ Cob Occ Blds Moist			20+350.	19.0	Rt C/L	D-0.1	TP
1.3 - 2.8		Gry/Br Cl(y) Si Tr Sa Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
2.8		NFP BR			200 - 500		Br/Gry F Sa Tr Gr Tr Si Moist		
20+310.	38.0	Rt C/L	D-0.2	TP	500 - 3.3		Gry/Br Cl(y) Si Occ Blds Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			3.3 - 5.4		Dk Gry/Lt Br Si(y) Cl Moist		
200 - 1.4		Br/Gry Si Tr Cl Occ Cob Moist			5.4		NFP BR		
1.4 - 3.0		Gry/Br Cl(y) Si Tr Sa Moist			20+350.	33.0	Rt C/L	D+/-0	TP
3.0		NFP BR			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
20+330.	7.0	Rt C/L	D-0.2	TP	200 - 800		Br/Gry F Sa Tr Gr Tr Si Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			800 - 4.3		Gry/Br Cl(y) Si Moist		
200 - 1.8		Br/Gry Si Tr Cl Num Cob Moist			4.3 - 6.5		Dk Gry/Lt Br Si(y) Cl Moist		
1.8 - 3.6		Gry/Br Cl(y) Si Moist							
3.6		NFP BR							



Proposed Hwy 69 NBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+350.	38.0	Rt C/L	D+/-0	TP	20+390.	19.0	Rt C/L	D+0.1	CHD
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
200 - 700		Br/Gry F Sa Tr Gr Tr Si Moist			200 - 3.1		Br/Gry Cl(y) Si Fill Tr Sa Tr Org Wet		
700 - 3.9		Gry/Br Cl(y) Si Moist			3.1 - 6.1		Gry Si(y) Cl Tr Sa Wet		
3.9 - 6.3		Dk Gry/Lt Br Si(y) Cl Moist			6.1 - 6.6		Gry Si(y) Cl Tr Gr Tr Sa Wet		
		cu @ 5.5 = 50 kPa (Pocket Penetrometer)			6.6		NFP BR		
20+370.	7.0	Rt C/L	D-0.4	TP			Depth	USS	RSS
							3.40-3.85	28	7
0 - 200		Dk Br/Blk Si Tps W Roots Moist			20+390.	33.0	Rt C/L	D+0.3	TP
200 - 600		Br/Gry F Sa Tr Gr Tr Si Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
600 - 4.8		Gry/Br Cl(y) Si Occ Cob Moist			200 - 800		Br/Gry Si Tr Cl Moist		
4.8 - 6.0		Dk Gry/Lt Br Si(y) Cl Moist			800 - 3.2		Gry/Br Cl(y) Si Moist		
		cu @ 5.0 = 50 kPa (Pocket Penetrometer)			3.2		NFP BR		
20+370.	19.0	Rt C/L	D-0.1	TP	20+390.	38.0	Rt C/L	D+0.4	TP
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
200 - 700		Br/Gry F Sa Tr Gr Tr Si Moist			200 - 700		Br/Gry Si Tr Cl Moist		
700 - 3.9		Gry/Br Cl(y) Si Moist			700 - 3.1		Gry/Br Cl(y) Si Moist		
3.9 - 5.3		Dk Gry/Lt Br Si(y) Cl Tr Sa Moist			3.1		NFP BR		
5.3		NFP BR							
20+370.	33.0	Rt C/L	D-0.3	TP	20+410.	7.0	Rt C/L	D-0.1	CHD
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
200 - 600		Br/Gry F Sa Tr Gr Tr Si Moist			200 - 700		Br/Gry Sa Tr Gr Tr Si Moist-Wet		
600 - 4.1		Gry/Br Cl(y) Si Occ Cob Moist					SP		
4.1 - 6.3		Dk Gry/Lt Br Si(y) Cl Moist					w = 8%		
		cu @ 6.0 = 50 kPa (Pocket Penetrometer)					% Pass		
20+370.	38.0	Rt C/L	D-0.3	TP			4.75 mm = 97		
0 - 200		Dk Br/Blk Si Tps W Roots Moist					2.00 mm = 90		
200 - 500		Br/Gry F Sa Tr Gr Tr Si Moist					425 um = 51		
500 - 4.2		Gry/Br Cl(y) Si Occ Cob Moist					75 um = 4		
4.2 - 6.4		Dk Gry/Lt Br Si(y) Cl Moist					MWD = 2.090 t/m3		
							MDD = 1.905 t/m3		
20+390.	7.0	Rt C/L	D+0.1	TP			Wopt = 10%		
0 - 200		Dk Br/Blk Si Tps W Roots Moist					LSFH		
200 - 600		Br/Gry F Sa Tr Si Moist					K Factor = 0.05		
600 - 1.8		Br/Gry Cl(y) Si Moist			700 - 1.5		Br Cl(y) Si Tr Gr Tr Sa Tr Org Wet		
1.8 - 5.0		Gry/Br Si(y) Cl Moist			1.5 - 2.3		Br Si(y) Cl Tr Sa Moist		
		cu @ 4.5 = 50 kPa (Pocket Penetrometer)			2.3 - 6.1		Gry Si(y) Cl Tr Sa Wet		
					6.1		NFP BR		
							Depth	USS	RSS
							5.50 - 6.00	52	13
									St
									4



Proposed Hwy 69 NBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+410.	19.0	Rt C/L	D+0.1	TP	20+430.	38.0	Rt C/L	D+0.2	TP
0 - 200		Dk Br/Blk Si Tps W Roots Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
200 - 1.5		Br/Gry Si Tr Sa Tr Cl Occ Cob Moist			200 - 1.7		Br/Gry Si Tr Cl Moist		
1.5 - 3.9		Gry/Br Cl(y) Si Moist			1.7		NFP BR		
3.9 - 4.3		Gry Cob And Blds Some Gr Tr Sa Tr Si Wet			20+450.	7.0	Rt C/L	D+/-0	TP
		Seepage @ 3.9			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
20+410.	33.0	Rt C/L	D+0.2	TP	200 - 3.8		Gry/Br Cl(y) Si Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			3.8 - 4.8		Dk Gry/Lt Br Si(y) Cl Moist		
200 - 2.2		Br/Gry Si Tr Cl Num Cob Occ Blds Moist			4.8 - 5.0		Gry/Blk Sa Tr Gr Tr Si Moist		
2.2 - 3.4		Gry/Br Cl(y) Si Moist			5.0		NFP BR		
3.4 - 3.7		Gry/Blk Gr And Sa Tr Si Occ Cob Moist			20+450.	19.0	Rt C/L	D+0.1	TP
3.7		NFP BR			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
20+410.	38.0	Rt C/L	D+0.2	TP	200 - 1.7		Br/Gry Si Tr Cl Occ Cob Occ Blds Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			1.7 - 4.3		Gry/Br Cl(y) Si Moist		
200 - 2.1		Br/Gry Si Tr Cl Num Cob Occ Blds Moist			4.3 - 5.0		Dk Gry/Lt Br Si(y) Cl Wet		
2.1 - 3.3		Gry/Br Cl(y) Si Occ Blds Moist					cu @ 4.5 = 50 kPa (Pocket Penetrometer)		
3.3		NFP BR			20+450.	33.0	Rt C/L	D+0.1	TP
20+430.	7.0	Rt C/L	D+/-0	TP	0 - 200		Dk Br/Blk Si Tps W Roots Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			200 - 1.4		Br/Gry Si Tr Cl Moist		
200 - 700		Gry/Br F Sa Tr Si Moist			1.4 - 4.9		Gry/Br Cl(y) Si Moist		
700 - 2.1		Br/Gry Si Tr Cl Moist					cu @ 4.5 = 200 kPa (Pocket Penetrometer)		
2.1 - 4.5		Dk Gry/Lt Br Si(y) Cl Moist			20+450.	38.0	Rt C/L	D+0.1	TP
		cu @ 4.0 = 50 kPa (Pocket Penetrometer)			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
20+430.	19.0	Rt C/L	D+0.3	TP	200 - 1.3		Br/Gry Si Tr Cl Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			1.3 - 5.1		Gry/Br Cl(y) Si Occ Blds Moist		
200 - 1.3		Br/Gry Si Tr Cl Occ Cob Moist			20+470.	7.0	Rt C/L	D+0.2	TP
1.3 - 3.7		Gry/Br Cl(y) Si Tr Sa Moist			0 - 200		Dk Br/Blk Si Tps W Roots Moist		
3.7		NFP BR			200 - 1.5		Br/Gry Si Tr Cl Occ Cob Moist		
20+430.	33.0	Rt C/L	D+/-0	TP	1.5 - 4.1		Gry/Br Cl(y) Si Occ Cob Occ Blds Moist		
0 - 200		Dk Br/Blk Si Tps W Roots Moist			4.1		NFP BR		
200 - 1.8		Br/Gry Si Tr Cl Moist			20+470.	19.0	Rt C/L	D+0.4	TP
1.8 - 3.4		Gry/Br Cl(y) Si Tr Sa Moist			0 - 200		Dk Br/Br Sa(y) Si Tps W Gr W Roots Moist		
3.4		NFP BR			200 - 1.4		Br/Gry Si Tr Cl Occ Cob Occ Blds Moist		
					1.4 - 4.2		Gry/Br Cl(y) Si Occ Cob Moist		
					4.2		NFP BR		



Proposed Hwy 69 NBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+470.	33.0	Rt C/L	D+0.4	TP	20+510.	7.0	Rt C/L	D+/-0	TP
0 -	200	Dk Br/Blk Si Tps W Roots Moist			0 -	200	Dk Br/Blk Si Tps W Roots Moist		
200 -	1.6	Br/Gry Si Tr Cl Occ Cob Moist			200 -	1.7	Br/Gry Si Tr Cl Occ Cob Moist		
1.6 -	4.4	Gry/Br Cl(y) Si Occ Blds Moist			1.7 -	3.2	Gry/Br Cl(y) Si Moist		
		cu @ 4.0 = 100 kPa (Pocket Penetrometer)			3.2	NFP BR			
20+470.	38.0	Rt C/L	D+0.4	TP	20+510.	19.0	Rt C/L	D+0.1	TP
0 -	200	Dk Br/Blk Si Tps W Roots Moist			0 -	200	Dk Br/Blk Si Tps W Roots Moist		
200 -	1.8	Br/Gry Si Tr Cl Occ Cob Moist			200 -	1.7	Br/Gry Si Tr Cl Num Blds Occ Cob Moist		
1.8 -	4.4	Gry/Br Cl(y) Si Occ Blds Moist			1.7 -	4.1	Gry/Br Cl(y) Si Occ Cob Moist		
					4.1	NFP BR			
20+490.	7.0	Rt C/L	D+/-0	TP	20+510.	33.0	Rt C/L	D+/-0	TP
0 -	200	Dk Br/Blk Si Tps W Roots Moist			0 -	200	Dk Br/Blk Si Tps W Roots Moist		
200 -	600	Br/Gry Si Tr Cl Occ Cob Occ Blds Moist			200 -	1.3	Br/Gry Si Tr Cl Occ Blds Moist		
600 -	3.5	Gry/Br Cl(y) Si Moist			1.3 -	3.7	Gry/Br Cl(y) Si Tr Gr Tr Sa Occ Cob Occ Blds Moist		
	3.5	NFP BR			3.7	NFP BR			
20+490.	19.0	Rt C/L	D+0.2	TP	20+510.	38.0	Rt C/L	D+/-0	TP
0 -	300	Dk Br/Blk Si Tps Occ Cob W Roots Moist			0 -	200	Dk Br/Blk Si Tps W Roots Moist		
300 -	1.5	Br/Gry Si Tr Cl Occ Cob Occ Blds Moist			200 -	1.4	Br/Gry Si Tr Cl Occ Blds Moist		
1.5 -	3.3	Gry/Br Cl(y) Si Moist			1.4 -	3.5	Gry/Br Cl(y) Si Tr Gr Tr Sa Occ Cob Occ Blds Moist		
	3.3	NFP BR			3.5	NFP BR			
20+490.	33.0	Rt C/L	D+0.1	TP	20+530.	7.0	Rt C/L	D+/-0	TP
0 -	200	Dk Br/Blk Si Tps W Roots Moist			0 -	200	Dk Br/Blk Si Tps W Roots Moist		
200 -	1.3	Br/Gry Si Tr Cl Occ Cob Moist			200 -	1.2	Br/Gry Si Tr Cl Moist		
1.3 -	3.4	Gry/Br Cl(y) Si Tr Gr Tr Sa Occ Blds Moist			1.2 -	3.8	Gry/Br Cl(y) Si Occ Blds Moist		
3.4 -	4.0	Gry/Blk Gr And Sa Tr Si Num Cob Num Blds Wet			3.8 -	4.4	Gry/Blk Gr And Sa Tr Si Num Cob Num Blds Wet-Sat		
	4.0	NFP BR					Seepage @ 3.8		
							Fr Wat @ 4.0		
20+490.	38.0	Rt C/L	D+0.3	TP	20+530.	19.0	Rt C/L	D-0.1	TP
0 -	200	Dk Br/Blk Si Tps W Roots Moist			0 -	300	Dk Br/Blk Si Tps Num Cob W Roots Moist		
200 -	1.4	Br/Gry Si Tr Cl Occ Cob Moist			300 -	1.2	Br/Gry Si Tr Cl Occ Cob Moist		
1.4 -	3.2	Gry/Br Cl(y) Si Tr Gr Tr Sa Occ Blds Moist			1.2 -	2.2	Gry/Br Cl(y) Si Tr Sa Moist		
3.2 -	3.8	Gry/Blk Gr And Sa Tr Si Num Cob Num Blds Moist			2.2 -	2.6	Gry/Br Sa And Gr Tr Si Occ Cob Moist		
	3.8	NFP BR			2.6	NFP BR			



Proposed Hwy 69 NBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+530.	33.0	Rt C/L	D-0.1	TP	20+570.	7.0	Rt C/L	D-0.2	TP
0 - 200				Dk Br/Blk Si Tps W Roots Moist	0 - 200				Dk Br/Blk Si Tps W Roots Moist
200 - 1.4				Br/Gry Si Tr Cl Occ Cob Occ Blds Moist	200 - 1.5				Br/Gry Si Tr Cl Occ Cob Occ Blds Moist
1.4 - 3.4				Gry/Br Cl(y) Si Tr Gr Tr Sa Occ Cob Occ Blds Moist	1.5				NFP BR
3.4				NFP BR					
20+530.	38.0	Rt C/L	D-0.1	TP	20+570.	19.0	Rt C/L	D+/-0	TP
0 - 200				Dk Br/Blk Si Tps W Roots Moist	0 - 200				Dk Br/Blk Si Tps W Roots Moist
200 - 1.5				Br/Gry Si Tr Cl Occ Cob Moist	200 - 700				Br/Gry Si Tr Cl Moist
1.5 - 3.5				Gry/Br Cl(y) Si Tr Gr Tr Sa Occ Cob Occ Blds Moist	700 - 2.6				Gry/Br Cl(y) Si Occ Cob Moist
3.5				NFP BR	2.6 - 4.0				Gry/Blk Gr And Sa Tr Si Num Cob Num Blds Wet-Sat
									Seepage @ 2.7
									Fr Wat @ 3.5
20+550.	7.0	Rt C/L	D+0.1	TP	20+570.	33.0	Rt C/L	D+/-0	TP
0 - 200				Dk Br/Blk Si Tps W Roots Moist	0 - 200				Dk Br/Blk Si Tps W Roots Moist
200 - 1.4				Br/Gry Si Tr Cl Moist	200 - 1.2				Br/Gry Si Tr Cl Occ Cob Occ Blds Moist
1.4 - 3.0				Gry/Br Cl(y) Si Occ Cob Occ Blds Moist	1.2				NFP BR
3.0 - 3.4				Gry/Blk Gr And Sa Tr Si Num Cob Occ Blds Wet-Sat					
				Seepage @ 3.1	20+570.	38.0	Rt C/L	D+/-0	TP
				Fr Wat @ 3.3	0 - 400				Blds
20+550.	19.0	Rt C/L	D+/-0	TP	400 - 600				Dk Br/Blk Si Tps W Roots Moist
0 - 200				Dk Br/Blk Si Tps W Roots Moist	600				NFP BR
200 - 1.2				Br/Gry Si Tr Cl Occ Blds Moist					
1.2 - 3.4				Gry/Br Cl(y) Si Occ Cob Moist	20+590.	7.0	Rt C/L	D-0.2	TP
3.4 - 4.1				Gry/Blk Gr And Sa Tr Si Num Cob Num Blds Wet	0 - 500				Dk Br/Br Sa(y) Si Tps W Gr Num Cob W Roots Moist
4.1				NFP BR	500				NFP BR
20+550.	33.0	Rt C/L	D+/-0	TP	20+590.	19.0	Rt C/L	D-0.4	TP
0 - 200				Dk Br/Blk Si Tps W Roots Moist	0 - 200				Dk Br/Blk Si Tps W Roots Moist
200 - 1.1				Br/Gry Si Tr Cl Num Cob Occ Blds Moist	200 - 1.2				Br/Gry Si Tr Cl Moist
1.1 - 1.8				Gry/Br Cl(y) Si Occ Blds Moist	1.2 - 3.3				Gry/Br Cl(y) Si Occ Cob Occ Blds Moist
1.8				NFP BR	3.3 - 4.1				Gry/Blk Sa And Gr Tr Si Num Cob Num Blds Wet-Sat
20+550.	38.0	Rt C/L	D+0.1	TP	4.1				NFP BR
0 - 200				Dk Br/Blk Si Tps W Roots Moist					Seepage @ 3.5
200 - 1.0				Br/Gry Si Tr Cl Num Cob Occ Blds Moist					Fr Wat @ 4.0
1.0 - 1.5				Gry/Br Cl(y) Si Occ Blds Moist	20+590.	33.0	Rt C/L	D-0.2	TP
1.5				NFP BR	0 - 100				Dk Br/Blk Si Tps W Roots Moist
					100 - 500				Dk Br/Blk Blds Tr Si Moist
					500				NFP BR



Proposed Hwy 69 NBL, Mowat Twp., 20+001 to 21+000

DATUM: Proposed Centreline Median

20+610.	7.0	Rt C/L	D-0.2	TP	20+630.	33.0	Rt C/L	D-0.2	TP
0 -	200	Dk Br/Blk Si Tps W Roots Moist			0 -	200	Dk Br/Blk Si Tps W Roots Moist		
200 -	1.5	Br/Gry Si Tr Cl Occ Cob Occ Blds Moist			200 -	1.8	Br/Gry Si Tr Cl Num Cob Occ Blds Moist		
1.5 -	1.9	Gry/Blk Gr And Sa Tr Si Num Cob Occ Blds Moist			1.8 -	3.1	Gry/Br Cl(y) Si Occ Cob Occ Blds Moist		
	1.9	NFP BR			3.1 -	4.0	Gry/Blk Gr And Sa Tr Si Num Cob Num Blds Wet-Sat		
							Seepage @ 3.2		
							Fr Wat @ 3.7		
20+610.	19.0	Rt C/L	D-0.5	TP	20+630.	38.0	Rt C/L	D-0.2	TP
0 -	200	Dk Br/Blk Si Tps W Roots Moist			0 -	200	Dk Br/Blk Si Tps W Roots Moist		
200 -	1.7	Br/Gry Si Tr Cl Occ Cob Occ Blds Moist			200 -	1.7	Br/Gry Si Tr Cl Num Cob Occ Blds Moist		
1.7 -	3.9	Gry/Br Cl(y) Si Occ Blds Moist			1.7 -	3.0	Gry/Br Cl(y) Si Occ Cob Occ Blds Moist		
3.9 -	4.0	Gry/Blk Gr And Sa Tr Si Wet			3.0 -	3.8	Gry/Blk Gr And Sa Tr Si Num Cob Num Blds Wet-Sat		
		Seepage @ 4.0					Seepage @ 3.2		
							Fr Wat @ 3.7		
20+610.	33.0	Rt C/L	D-0.4	TP					
0 -	200	Dk Br/Blk Si Tps W Roots Moist							
200 -	1.4	Br/Gry Si Tr Cl Num Blds Occ Cob Moist							
	1.4	NFP BR							
20+610.	38.0	Rt C/L	D-0.3	TP					
0 -	200	Dk Br/Blk Si Tps W Roots Moist							
200 -	1.2	Gry/Br Si Tr Cl Num Blds Occ Cob Moist							
	1.2	NFP BR							
20+630.	7.0	Rt C/L	D-0.1	TP					
0 -	200	Dk Br/Blk Si Tps W Roots Moist							
200 -	1.5	Br/Gry Si Tr Cl Occ Cob Moist							
1.5 -	2.7	Gry/Br Cl(y) Si Occ Cob Moist							
	2.7	NFP BR							
20+630.	19.0	Rt C/L	D-0.1	TP					
0 -	200	Dk Br/Blk Si Tps W Roots Moist							
200 -	1.7	Br/Gry Si Tr Cl Occ Cob Occ Blds Moist							
1.7 -	2.9	Gry/Br Cl(y) Si Moist							
2.9 -	3.8	Gry/Blk Gr And Sa Tr Si Num Cob Num Blds Wet							
		Seepage @ 3.0							