



February 11, 2014

FOUNDATION INVESTIGATION REPORT

**SWAMP CROSSINGS AND HIGH FILL AREAS – CONTRACT 3
HIGHWAY 69 FOUR-LANING FROM 1.7 KM NORTH OF HIGHWAY 529
NORTHERLY TO 3.9 KM NORTH OF HIGHWAY 522
MINISTRY OF TRANSPORTATION, ONTARIO
GWP 5404-05-00; WP 5404-05-01**

Submitted to:
URS Canada Inc.
4th Floor, 30 Leek Crescent
Richmond Hill, Ontario
L4B 4N4



GEOCRES NO.: 41H-134

Report Number: 09-1111-6014-3520

Distribution:

- 5 Copies Ministry of Transportation, Ontario, North Bay, Ontario (Northeastern Region)
- 1 Copy Ministry of Transportation, Ontario, Downsview, Ontario (Foundation Section)
- 2 Copies URS Canada Inc., Richmond Hill, Ontario
- 2 Copies Golder Associates Ltd., Mississauga, Ontario

REPORT





Table of Contents

VOLUME 1 OF 3

PART A – FOUNDATION INVESTIGATION REPORT

| | |
|--|-----------|
| 1.0 INTRODUCTION..... | 1 |
| 2.0 SITE DESCRIPTION..... | 1 |
| 3.0 INVESTIGATION PROCEDURES | 2 |
| 3.1 Foundation Investigation..... | 2 |
| 4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS | 4 |
| 4.1 Regional Geology | 4 |
| 4.2 General Overview of Local Subsurface Conditions | 4 |
| 4.3 Highway 69 SBL – STA 13+725 to 14+050 (Swamp 301)..... | 5 |
| 4.4 Highway 69 NBL – STA 13+700 to 14+000 (Swamp 301)..... | 11 |
| 4.5 Highway 69 SBL – STA 14+430 to 14+600 (Swamp 302)..... | 15 |
| 4.6 Highway 69 NBL – STA 14+550 to 14+600 (Swamp 302)..... | 19 |
| 4.7 Highway 69 SBL – STA 16+375 to 16+625 (Swamp 303)..... | 22 |
| 4.8 Highway 69 NBL – STA 16+875 to 16+925 (Swamp 304)..... | 24 |
| 4.9 Highway 69 SBL – STA 17+425 to 17+635 (Swamp 305)..... | 27 |
| 4.10 Highway 69 NBL – STA 17+025 to 17+550 (Swamp 305)..... | 30 |
| 4.11 Bekanon Road E/W-S Ramp – STA 17+485 to 17+650 (Swamp 305)..... | 32 |
| 4.12 Bekanon Road S-E/W Ramp – STA 16+975 to 17+140 (Swamp 306)..... | 35 |
| 4.13 Bekanon Road S-E/W Ramp – STA 17+415 to 17+450 (Swamp 307)..... | 38 |
| 4.14 Highway 69 SBL – STA 18+375 to 18+550 (Swamp 308)..... | 40 |
| 4.15 Highway 69 NBL – STA 18+375 to 18+535 (Swamp 308)..... | 42 |
| 4.16 Highway 69 SBL – STA 19+200 to 19+325 (Swamp 309)..... | 44 |
| 4.17 Highway 69 SBL – STA 19+450 to 19+500 (Swamp 310)..... | 48 |
| 4.18 Highway 69 NBL – STA 19+400 to 19+500 (Swamp 310)..... | 50 |
| 5.0 CLOSURE | 54 |

Lists of Symbols and Abbreviations

Lithological and Geotechnical Rock Description Terminology

TABLES

| | |
|---------|--|
| Table 1 | Summary of Swamp Crossings and High Fill Areas |
| Table 2 | Summary of Consolidation Test Parameters |



FOUNDATION REPORT – SWAMP CROSSINGS AND HIGH FILL AREAS - HIGHWAY 69 GWP 5404-05-00; WP 5404-05-01

DRAWINGS

Drawing 1 Site Location Plan
Drawings 2A and 2B Swamp Crossings and High Fill Areas – Index Plan

VOLUME 2 OF 3

LIST OF APPENDICES

Appendix A

Highway 69 SBL – STA 13+725 to 14+050 (Swamp 301)
Highway 69 NBL – STA 13+700 to 14+000 (Swamp 301)

| | |
|---------------------|---|
| Drawing A1 | Borehole Locations |
| Drawings A2 to A7 | Soil Strata |
| Record of Boreholes | S301-01 to S301-24, C301-S1 to C301-S3 and C301-N1 to C301-N3 |
| Record of Drillhole | C301-N3 |
| Record of DCPTs | S301-DC01 to S301-DC13 |
| Figure A.S301-01 | Grain Size Distribution – Silty Sand (Near Surface) |
| Figure A.S301-02A | Grain Size Distribution – Clayey Silt (Upper) |
| Figure A.S301-02B | Grain Size Distribution – Silty Clay (Upper) |
| Figure A.S301-03A | Plasticity Chart – Clayey Silt (Upper) |
| Figure A.S301-03B | Plasticity Chart – Clayey Silt to Clay (Upper) |
| Figure A.S301-04 | Consolidation Test – Borehole S301-12 SA 5 |
| Figure A.S301-05 | Consolidation Test – Borehole C301-S2 SA 4 |
| Figure A.S301-06 | Grain Size Distribution – Silt to Sandy Silt (Pockets) |
| Figure A.S301-07 | Plasticity Chart – Silt (Pockets) |
| Figure A.S301-08A | Grain Size Distribution – Silt to Sandy Silt (Interlayer) |
| Figure A.S301-08B | Grain Size Distribution – Silt and Sand (Interlayer) |
| Figure A.S301-09 | Plasticity Chart – Silt to Sandy Silt (Interlayer) |
| Figure A.S301-10 | Plasticity Chart – Clayey Silt to Clay (Lower) |
| Figure A.S301-11 | Consolidation Test – Borehole S301-04 SA 13 |
| Figure A.S301-12A | Grain Size Distribution – Silt |
| Figure A.S301-12B | Grain Size Distribution – Silt to Silt and Sand |
| Figure A.S301-12C | Grain Size Distribution – Silt and Sand to Sand |
| Figure A.S301-13 | Plasticity Chart – Silt |
| Figure A.S301-14 | Grain Size Distribution – Sand and Gravel |
| Figure A.S301-15 | Grain Size Distribution – Silt and Sand (Near Surface) |
| Figure A.S301-16 | Plasticity Chart – Silt to Silt and Sand (Near Surface) |
| Figure A.S301-17 | Grain Size Distribution – Clayey Silt to Clay (Upper) |
| Figure A.S301-18A | Plasticity Chart – Clayey Silt (Upper) |
| Figure A.S301-18B | Plasticity Chart – Silty Clay to Clay (Upper) |
| Figure A.S301-19 | Consolidation Test – Borehole S301-06 SA 6 |
| Figure A.S301-20 | Grain Size Distribution – Silt to Sandy Silt (Pockets) |
| Figure A.S301-21 | Plasticity Chart – Silt (Pockets) |
| Figure A.S301-22 | Grain Size Distribution – Silt to Sandy Silt (Interlayer) |
| Figure A.S301-23 | Plasticity Chart – Silt (Interlayer) |
| Figure A.S301-24 | Grain Size Distribution – Clay (Lower) |
| Figure A.S301-25 | Plasticity Chart – Clayey Silt to Clay (Lower) |
| Figure A.S301-26A | Grain Size Distribution – Silt to Sandy Silt |
| Figure A.S301-26B | Grain Size Distribution – Silt and Sand to Sand |
| Figure A.S301-27 | Bedrock Core Photograph – Borehole C301-N3 |

Appendix B

Highway 69 SBL – STA 14+430 to 14+600 (Swamp 302)
Highway 69 NBL – STA 14+550 to 14+600 (Swamp 302)

| | |
|---------------------|---|
| Drawing B1 | Borehole Locations and Soil Strata |
| Drawing B2 | Soil Strata |
| Record of Boreholes | S302-01 to S302-18 and S302-12A |
| Record of DCPTs | S302-DC01 to S302-DC08 |
| Figure B.S302-01 | Grain Size Distribution – Clayey Silt to Silty Clay |
| Figure B.S302-02 | Grain Size Distribution – Silt (Layers) |
| Figure B.S302-03 | Plasticity Chart – Clayey Silt to Clay |
| Figure B.S302-04 | Plasticity Chart – Silt (Layers) |
| Figure B.S302-05 | Consolidation Test Summary – Borehole S302-03 SA4 |



FOUNDATION REPORT – SWAMP CROSSINGS AND HIGH FILL AREAS - HIGHWAY 69 GWP 5404-05-00; WP 5404-05-01

| | |
|-------------------|---|
| Figure B.S302-06 | Grain Size Distribution – Silt and Sandy Silt (Pockets) |
| Figure B.S302-07A | Grain Size Distribution – Silt to Silty Sand |
| Figure B.S302-07B | Grain Size Distribution – Silt to Silty Sand |
| Figure B.S302-08 | Grain Size Distribution – Silty Sand to Gravelly Sand |
| Figure B.S302-09 | Grain Size Distribution – Clayey Silt to Silty Clay |
| Figure B.S302-10 | Plasticity Chart – Clayey Silt to Clay |
| Figure B.S302-11 | Consolidation Test Summary – Borehole S302-17 SA4 |
| Figure B.S302-12 | Grain Size Distribution – Silt to Sand |

Appendix C

| | |
|---------------------|---|
| Drawing C1 | Borehole Location and Soil Strata |
| Record of Boreholes | S303-01 to S303-11 |
| Record of DCPTs | S303-DC01 to S303-DC05 |
| Figure C.S303-01 | Grain Size Distribution – Clayey Silt to Clay |
| Figure C.S303-02 | Grain Size Distribution – Clayey Silt (with Sand Seams) |
| Figure C.S303-03 | Plasticity Chart – Clayey Silt to Clay |
| Figure C.S303-04A | Grain Size Distribution – Silty Sand to Sand |
| Figure C.S303-04B | Grain Size Distribution – Silt to Silt and Sand |
| Figure C.S303-05 | Grain Size Distribution – Sand and Gravel |

Appendix D

| | |
|---------------------|--|
| Drawing D1 | Borehole Locations and Soil Strata |
| Record of Boreholes | S304-01 to S304-06 |
| Record of DCPTs | S304-DC01 to S304-DC03 |
| Figure D.S304-01 | Grain Size Distribution – Clayey Silt |
| Figure D.S304-02 | Plasticity Chart – Clayey Silt with Sand to Clayey Silt |
| Figure D.S304-03 | Grain Size Distribution – Sandy Silt to Sand |
| Figure D1 | Slope Stability |
| Figure D2 | Slope Stability (2 m Surcharge) |
| Table D1 | Evaluation of Stability / Settlement Mitigation Options: Highway 69 NBL – STA 16+875 to 16+925 (Swamp 304) |

VOLUME 3 OF 3

Appendix E

| | |
|---------------------|---|
| | Highway 69 SBL – STA 17+425 to 17+635 (Swamp 305) |
| | Highway 69 NBL – STA 17+025 to 17+550 (Swamp 305) |
| | Bekanon Road E/W-S Ramp – STA 17+485 to 17+650 (Swamp 305) |
| Drawing E1 | Borehole Locations |
| Drawings E2 to E8 | Soil Strata |
| Record of Boreholes | S305-01 to S305-49 |
| Record of Drillhole | S305-48 |
| Record of DCPTs | S305-DC01 to S305-DC18 |
| Table E1 | Point Load Test Results on Rock Samples – Borehole S305-48 |
| Figure E.S305-01 | Grain Size Distribution – Silt to Silt and Sand |
| Figure E.S305-02 | Plasticity Chart – Silt and Sand |
| Figure E.S305-03 | Plasticity Chart – Silty Clay to Clay |
| Figure E.S305-04 | Grain Size Distribution – Silt and Sand (Fill) |
| Figure E.S305-05 | Grain Size Distribution – Clayey Silt with Sand to Clayey Silt |
| Figure E.S305-06 | Plasticity Chart – Clayey Silt with Sand to Silty Clay |
| Figure E.S305-07A | Grain Size Distribution – Silt to Silt and Sand |
| Figure E.S305-07B | Grain Size Distribution – Silt to Silt and Sand |
| Figure E.S305-08 | Plasticity Chart – Silt and Sand |
| Figure E.S305-09 | Plasticity Chart – Clayey Silt |
| Figure E.S305-10A | Grain Size Distribution – Silt to Silt and Sand |
| Figure E.S305-10B | Grain Size Distribution – Silt to Silt and Sand |
| Figure E.S305-11 | Plasticity Chart – Silt |
| Figure E.S305-12 | Bedrock Core Photograph – Borehole S305-48 |



FOUNDATION REPORT – SWAMP CROSSINGS AND HIGH FILL AREAS - HIGHWAY 69 GWP 5404-05-00; WP 5404-05-01

Appendix F

Drawing F1
Record of Boreholes
Record of DCPTs
Figure F.S306-01
Figure F.S306-02
Figure F.S306-03
Figure F1
Figure F2
Table F1

Bekanon Road S-E/W Ramp – STA 16+975 to 17+140 (Swamp 306)

Borehole Locations and Soil Strata
S306-01 to S306-13
S306-DC01 to S306-DC05
Grain Size Distribution – Clayey Silt with Sand to Silty Clay
Plasticity Chart – Clayey Silt with Sand to Silty Clay
Grain Size Distribution – Sandy Silt to Silt and Sand
Slope Stability
Slope Stability (2 m Surcharge)
Evaluation of Stability / Settlement Mitigation Options: Bekanon Road S-E/W – STA 16+975 to 17+140 (Swamp 306)

Appendix G

Drawing G1
Record of Boreholes
Record of DCPTs
Figure G.S307-01
Figure G.S307-02
Figure G.S307-03
Figure G.S307-04

Bekanon Road S-E/W Ramp – STA 17+415 to 17+450 (Swamp 307)

Borehole Locations and Soil Strata
S307-01 to S307-05
S307-DC01 and S307-DC02
Grain Size Distribution – Clayey Silt with Sand
Plasticity Chart – Clayey Silt
Grain Size Distribution – Silt and Sand to Silty Sand
Grain Size Distribution – Gravelly Sand to Sand and Gravel

Appendix H

Drawing H1
Drawing H2
Record of Boreholes
Record of DCPTs
Figure H.S308-01
Figure H.S308-02
Figure H.S308-03
Figure H.S308-04
Figure H.S308-05
Figure H.S308-06
Figure H.S308-07

Highway 69 SBL – STA 18+375 to 18+550 (Swamp 308) Highway 69 NBL – STA 18+375 to 18+535 (Swamp 308)

Borehole Locations and Soil Strata
Soil Strata
S308-01 to S308-25
S308-DC01 to S308-DC11
Grain Size Distribution – Clayey Silt to Silty Clay
Plasticity Chart – Clayey Silt to Silty Clay
Grain Size Distribution – Sandy Silt to Silt and Sand
Grain Size Distribution – Silty Clay
Plasticity Chart – Clayey Silt to Silty Clay
Grain Size Distribution – Silt to Silt and Sand
Grain Size Distribution – Gravelly Sand

Appendix I

Drawing I1
Record of Boreholes
Record of DCPTs
Figure I.S309-01
Figure I.S309-02
Figure I.S309-03
Figure I.S309-04
Figure I.S309-05
Figure I.S309-06A
Figure I.S309-06B
Figure I.S309-07

Highway 69 SBL – STA 19+200 to 19+325 (Swamp 309)

Borehole Locations and Soil Strata
S309-01 to S309-11
S309-DC01 to S309-DC05
Grain Size Distribution – Sandy Silt to Silt and Sand (Upper)
Grain Size Distribution – Clayey Silt to Clay
Plasticity Chart – Clayey Silt to Clay
Consolidation Test – Borehole S309-03 SA 9
Grain Size Distribution – Sandy Silt (Pockets)
Grain Size Distribution – Silt and Sand (Lower)
Grain Size Distribution – Silt to Sandy Silt (Lower)
Plasticity Chart – Silt (Lower)

Appendix J

Drawing J1
Drawing J2
Record of Boreholes
Record of DCPTs
Figure J.S310-01
Figure J.S310-02
Figure J.S310-03
Figure J.S310-04
Figure J.S310-05
Figure J.S310-06

Highway 69 SBL – STA 19+450 to 19+500 (Swamp 310) Highway 69 NBL – STA 19+400 to 19+500 (Swamp 310)

Borehole Locations and Soil Strata
Soil Strata
S310-01 to S310-14
S310-DC01 to S310-DC06
Grain Size Distribution – Silty Clay
Plasticity Chart – Silty Clay to Clay
Grain Size Distribution – Silt to Silt and Sand
Grain Size Distribution – Silt and Sand
Grain Size Distribution – Clayey Silt to Silty Clay
Plasticity Chart – Clayey Silt to Silty Clay



FOUNDATION REPORT – SWAMP CROSSINGS AND HIGH FILL AREAS - HIGHWAY 69 GWP 5404-05-00; WP 5404-05-01

| | |
|------------------|---|
| Figure J.S310-07 | Consolidation Test – Borehole S310-10 SA 7 |
| Figure J.S310-08 | Grain Size Distribution – Silt (Interlayer) |
| Figure J.S310-09 | Plasticity Chart – Silt (Interlayer) |
| Figure J.S310-10 | Grain Size Distribution – Clayey Silt |
| Figure J.S310-11 | Plasticity Chart – Clay |
| Figure J.S310-12 | Plasticity Chart – Clayey Silt |
| Figure J.S310-13 | Grain Size Distribution – Silt to Silt and Sand |
| Figure J.S310-14 | Plasticity Chart – Silt |



PART A

**FOUNDATION INVESTIGATION REPORT
SWAMP CROSSINGS AND HIGH FILL AREAS – CONTRACT 3
HIGHWAY 69 FOUR-LANING FROM 1.7 KM NORTH OF HIGHWAY 529
NORTHERLY TO 3.9 KM NORTH OF HIGHWAY 522
MINISTRY OF TRANSPORTATION, ONTARIO
GWP 5404-05-00; WP 5404-05-01**



1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been retained by URS Canada Inc. (URS) on behalf of Ministry of Transportation, Ontario (MTO) to provide foundation engineering services for ten (10) swamp crossings/high fill embankments within the Contract 3 limits of the new Highway 69 alignment to the north of the junction with Highway 529. The proposed work in Contract 3 is part of the overall four-laning of Highway 69 from 1.7 km north of Highway 529 northerly to 3.9 km north of Highway 522, for a total project distance of 19.7 km. The foundation engineering components within the overall project limits include: high fill embankments and embankments over swamps; the Canadian National Railway (CNR) re-alignment; the Bekanon Road and Highway 522 interchanges and structures; the Still River, Straight Lake and Key River structures; the Canadian Pacific Railway (CPR) and Canadian National Railway (CNR) structures; as well as a number of culvert crossings. The proposed embankments in Contract 3 extend from approximately 6.2 km north of the junction of the existing Highway 529 and Highway 69 northerly for a total distance of about 6.7 km. The general location and extent of the various contracts as part of the new Highway 69 four-laning alignment are shown on the Site Location Plan on Drawing 1.

The Terms of Reference and the Scope of Work for the foundation investigation are outlined in MTO's Request for Proposal, dated December 2008. Golder's proposal for foundation engineering services is contained in Section 6.8 of URS's Technical Proposal for this assignment. The work has been carried out in accordance with Golder's Supplementary Specialty Plan for foundation engineering services for this project, dated April 19, 2010. The Base Plan showing the proposed horizontal alignment and a drawing showing the proposed vertical alignment for the Contract 3 section of Highway 69 four-laning was provided to Golder by URS on April 23, 2012 and March 14, 2012, respectively.

This report addresses the investigation carried out for the Contract 3 swamp crossings and high fill areas only. A list of the Contract 3 swamp crossings/high fill areas is presented in Table 1. Separate reports address the foundation investigations for the related culvert crossings and bridge structures within the Contract 3 section of the project.

The purpose of this investigation is to establish the subsurface conditions along the new highway alignment at the proposed Contract 3 swamp crossings/high fill areas by methods of borehole drilling, rock coring, in situ testing and laboratory testing on selected samples. The centreline of the proposed swamp crossing/high fill areas was staked in the field by Callon Dietz Inc., a professional surveying company retained by URS and the foundation investigation was carried out within the limits of the swamp crossings/high fill areas as defined in the Terms of Reference. The investigation areas are shown in plan on Drawings 2A and 2B.

Preliminary subsurface information for this project was available and was supplied by the MTO, in a report titled:

- Preliminary Foundation Investigation & Design Report, Swamp Crossings, Highway 69 Route Selection Study, 3.5 km N of Hwy 559 to 3.8 km N of Hwy 522, GWP 5377-02-00, Highway 69, GEOCRESS No. 41H-51, dated September 2005, by Trow Associates Inc.

2.0 SITE DESCRIPTION

The overall proposed Highway 69 alignment is oriented generally in a south-north direction extending within the Township of Wallbridge to the south and the Township of Henvey and Township of Mowat to the north. The Contract 3 section of the new four-lane Highway 69 alignment is also oriented generally in a south-north direction within the project limits, extending within the Township of Henvey for a total distance of 6.7 km. The



proposed culverts are located approximately 300 m from the southern limit of Contract 3, corresponding to approximately 6.5 km northwest of the present junction of Highway 69 and Highway 529.

In general, the topography of the Contract 3 section of the project consists of rolling terrain, including sparsely or densely populated treed areas and numerous bedrock outcrops separated by valleys, and swamps containing areas of standing water and various types of vegetation and organic soils. Several creeks are also present traversing certain swamp areas. The ground surface within the limits of the Contract 3 swamp crossings/high fill areas varies between about Elevations 198.0 m and 182.5 m, referenced to Geodetic datum, and the ground surface in the general area of Contract 3 is gently sloping downward from southeast to northwest towards Georgian Bay. A detailed description of each investigated swamp crossing/high fill area is presented in Section 4.0. The locations of these areas are shown in plan on Drawings 2A and 2B.

3.0 INVESTIGATION PROCEDURES

3.1 Foundation Investigation

The investigation for the Contract 3 swamp crossing/high fill areas was carried out between October 19 and December 7, 2011, between January 11 and March 10, 2012 and between January 8 and March 21, 2013 during which time a total of 186 boreholes and 82 Dynamic Cone Penetration Tests (DCPTs) were advanced at the locations of the swamp crossings/high fill areas. The locations of the boreholes and DCPTs are summarized in Table 1 and are shown on Drawings A1 to J2 in Appendices A to J. In general, boreholes and DCPTs were advanced along the centreline and the toes of the proposed embankment alignment (in accordance with the Terms of Reference). It should be noted that the total number of boreholes presented in Table 1 may be different from the actual total number of boreholes drilled as some boreholes may be applicable to more than one roadway embankment or ramp embankment alignment.

The field investigation was carried out using a variety of drilling equipment as a result of the varying nature of the terrain and accessibility within the Contract 3 project limits. The details of the drilling equipment and suppliers are listed below. Hand shovel excavation methods were used where appropriate depending on the terrain.

| Drilling Equipment | Supplied and Operated By |
|---------------------------|---|
| Track Mounted D-25 | Walker Drilling Ltd. of Utopia, Ontario |
| Track Mounted D-50 | Walker Drilling Ltd. of Utopia, Ontario |
| Track Mounted CME 55 | Landcore Drilling of Sudbury, Ontario |
| Portable Equipment | Walker Drilling Ltd. of Utopia, Ontario and OGS Inc. of Almonte, Ontario |

The boreholes were advanced through the overburden using 165 mm outer diameter (O.D.) solid-stem augers, 203 mm O.D. hollow stem augers, 65 mm or 70 mm outer O.D. solid stem hand augers, and/or 'NW' casing with wash boring techniques. In general, soil samples were taken at intervals of depth of about 0.75 m and 1.5 m, using a 50 mm O.D. split-spoon sampler driven by automatic hammers on the track-mounted drill rigs, and carried out in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586, Standard Test Method for Standard Penetration Test). Boreholes advanced by portable equipment employed full-weight hammers or half-weight hammers lifted manually and dropped from the SPT height. Where a half-weight hammer was used, the 'N'-values were corrected for the lower energy drive. Samples of the cohesive soils were obtained at selected locations using 76 mm O.D. thin-walled 'Shelby' tubes (ASTM D1587, Standard Practice for



Thin-Walled Tube Sampling) for relatively undisturbed samples. Field vane shear tests were carried out in cohesive soils for assessment of undrained shear strengths (ASTM D2573, Standard Test Method for Field Vane Strength Shear Test) using MTO Standard 'N' size vanes, and 'B' size vanes in the smaller diameter boreholes advanced by portable equipment. Samples of the bedrock were obtained using an 'NQ' size rock core barrel. All boreholes were backfilled with bentonite upon completion in accordance with Ontario Regulation 903 Wells (as amended).

The boreholes and DCPTs were advanced to depths up to about 39 m below existing ground surface, generally penetrating 3 m into competent material, which is defined as material that will provide resistance to settlement or instability of the embankments, or to refusal. In general, boreholes and DCPTs were terminated on refusal to further auger, casing and/or split-spoon advancement, shovel penetration or dynamic cone penetration. These depths to refusal do not confirm bedrock surface elevations, but may be inferred to indicate potential proximity to the bedrock surface. At various borehole locations where refusal was encountered at shallow depth (less than about 0.1 m), the bedrock was exposed by hand shovel excavation to confirm the refusal condition. In two (2) boreholes (Boreholes C301-N3 and S305-48), bedrock was cored for a length of about 3 m and photographs of the recovered rock samples are provided in the relevant appendices noted in Section 4.0.

The groundwater conditions and water levels in the open boreholes were observed during the drilling operations and are described on the Record of Borehole sheets provided in Appendices A to J. Groundwater elevations as encountered in the boreholes may not be representative of static groundwater levels since the groundwater levels in the boreholes may not have stabilized on completion of drilling, particularly when employing wash boring or coring techniques to advance the boreholes. Furthermore, groundwater elevations will vary depending on seasonal fluctuations, precipitation and local soil permeability.

The fieldwork was observed by members of our engineering and technical staff, who located the boreholes, arranged for the clearance of underground services, observed the drilling, sampling and in situ testing operations, logged the boreholes, and examined and cared for the soil and rock samples. The samples were identified in the field, placed in appropriate containers, labelled and transported to our Mississauga geotechnical laboratory where the samples underwent further visual examination and laboratory testing. All of the laboratory tests were carried out to MTO and/or ASTM Standards, as appropriate. Classification testing (water content, Atterberg limits and grain size distribution) was carried out on selected soil samples. In addition, one-dimensional consolidation (Oedometer) tests were carried out on select samples of the cohesive deposits and the summary of the consolidation test results is presented in Table 2. The results of the laboratory classification testing are included in the associated appendices.

Classification of the rock mass quality of the bedrock cores with respect to the Rock Quality Designation (RQD) is described based on Table 3.10 of the Canadian Foundation Engineering Manual (CFEM, 2006)¹. The degree of weathering of the bedrock samples (i.e. fresh to slightly weathered – W1 to W2) and the strength classification of the intact rock mass based on field identification (i.e. strong to extremely strong – R4 to R6) are described in accordance with Table B.3 and Table B.6, respectively, of the International Society for Rock Mechanics (ISRM)² standard classification system.

¹Canadian Geotechnical Society, 2006. Canadian Foundation Engineering Manual, 4th Edition.

² International Society for Rock Mechanics Commission on Test Methods, 1985. Int. J. Rock Mech. Min. Sci. & Geomech. Abstr. Vol 22, No. 2, pp. 51-60.



The proposed centreline of the new highway alignment was staked in the field by Callon Dietz prior to drilling. The as-drilled borehole locations, in stations and offsets, were measured in reference to the centreline alignment and were subsequently converted into MTM NAD 83 coordinates in AutoCAD. Borehole elevations were surveyed by a member of our technical staff in reference to the ground surface elevations at the centreline median and to temporary benchmarks which were then surveyed by Callon Dietz upon completion of the fieldwork. The borehole locations shown on Drawings A1 to J2 in Appendices A to J are positioned relative to MTM NAD 83 northing and easting coordinates and the ground surface elevations are referenced to Geodetic datum.

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

As delineated in *The Physiography of Southern Ontario*³, this section of the new Highway 69 lies within the physiographic region known as the Georgian Bay Fringe, which extends along the east side of Georgian Bay through the Parry Sound and Muskoka areas, then eastward from Muskoka in patches into the area north of the Kawartha Lakes.

This part of the Georgian Bay Fringe physiographic region was never submerged during periods of glacial recession. As a result, the surficial soils in this area consist of relatively shallow deposits of sand, silt and clay underlain by metamorphic bedrock and numerous bare knobs and ridges of bedrock are present throughout the area. Localized low-lying swampy areas, containing peat and/or organic soils overlying soft/loose native soils, sometimes to significant depth, are present in valleys between the bedrock knobs and ridges.

The bedrock in the area consists typically of crystalline gneisses of the Britt Domain of the Central Gneiss Belt, a subdivision of the Grenville Structural Province, as described in *Geology of Ontario*, OGS Special Volume 4⁴. Deposition of Paleozoic strata initially covered the bedrock and later erosion during glaciation exposed these Precambrian rocks.

4.2 General Overview of Local Subsurface Conditions

The detailed subsurface soil and groundwater conditions as encountered in the boreholes advanced during this investigation (including excavations by hand shovel), together with the results of the laboratory tests carried out on selected soil samples, are presented on the Record of Borehole and Record of Drillhole sheets and the laboratory test sheets provided in Appendices A to J for the respective swamp crossings/high fill areas investigated. The results of the in situ field tests (i.e. SPT 'N'-values and the undrained shear strengths obtained from the field vanes) as presented on the Record of Borehole sheets and in Sections 4.3 to 4.17 are uncorrected. The stratigraphic boundaries shown on the Record of Borehole sheets are inferred from non-continuous sampling, observations of drilling progress and the results of SPTs and in situ testing. These boundaries, therefore, represent transitions between soil types rather than exact planes of geological change. Further, subsurface conditions will vary between and beyond the borehole locations. The thickness of the

³ Chapman, L.J. and Putnam, D.F., 1984. *The Physiography of Southern Ontario*, Ontario Geological Survey, Special Volume 2, Third Edition. Accompanied by Map P.2715, Scale 1:600,000.

⁴ Ontario Geological Society, 1991. *Geology of Ontario Special Volume 4, Part 2*. Ministry of Northern Development and Mines, Ontario.



overburden/depth to refusal in the investigated areas as inferred from the resistance to DCPT advancement are shown on the Record of DCPT sheets in Appendices A to J.

The inferred soil stratigraphy as encountered in the boreholes and DCPTs advanced for the Contract 3 swamp crossing/high fill areas are shown in profile and cross-section on Drawings A1 to J2, inclusive. The orientation (i.e. north, south, east, west) stated in the text of the report is typically referenced to project north and/or up-chainage (along the proposed Highway 69 alignment). For purposes of this report, Highway 69 is oriented in a north-south direction.

In general, the stratigraphy encountered at the various borehole locations typically consists of relatively thin organic or fill layers underlain by alternating layers of cohesive and non-cohesive soils. The overburden (soil material) thickness is variable, ranging from no cover (i.e. bedrock outcrops exposed at ground surface typically at the limits of the swamp crossings/high fill areas) up to about 39.0 m below ground surface upon borehole termination. The stratigraphy generally consists of:

- Surficial layers of topsoil, existing fill material comprised of sandy silt to silt and sand and wood fragments/sawdust, topsoil, fibrous and amorphous peat or organic root mat;
- Non-cohesive deposits of silt to sand underlain by bedrock and/or interlayered with clayey silt to clay deposits in some areas; and,
- Cohesive deposits of clayey silt to clay generally underlying the surficial deposits or interlayered with non-cohesive deposits and in some layers underlain by inferred bedrock.

Detailed descriptions of the subsurface conditions at each investigated swamp crossing/high fill area are provided in the following sections of this report. Where relatively significant thicknesses of overburden were encountered, the various soil types are described in detail for each main deposit.

4.3 Highway 69 SBL – STA 13+725 to 14+050 (Swamp 301)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 SBL alignment showing the borehole locations and interpreted stratigraphy between about STA 13+725 and 14+050 in the Township of Henvey are presented on Drawings A1 to A4 in Appendix A. The proposed embankment within this section of the highway is up to about 4 m high relative to the existing ground surface.

A total of fifteen (15) boreholes (Boreholes S301-01 to S301-05, S301-10 to S301-13, S301-20, S301-22 and S301-24, and C301-S1 to C301-S3) and eight (8) Dynamic Cone Penetration Tests (DCPTs S301-DC01, S301-DC02, S301-DC05, S301-DC06, and S301-DC10 to S301-DC13) were completed to investigate the subsurface conditions within this swamp area. This section of the proposed highway embankment is located within a low-lying area, grass and tree covered area, with a small creek traversing from east to west near the middle of the area at about STA 13+810.

The subsurface soils along the SBL alignment in Swamp 301 generally consist of topsoil/peat or near surface deposit of sandy silt to sand, underlain by a relatively thick deposit of cohesive soil comprised of clayey silt to silty clay to clay, which is generally separated into an upper and a lower stratum by interlayers of silt, sandy silt and silt and sand. The cohesive deposit is in turn underlain by a non-cohesive interlayered deposit of silt, silt and sand, silty sand and sand, in places underlain by a deposit of sand and gravel, underlain by inferred bedrock.



Topsoil / Peat

An approximately 0.1 m to 0.7 m thick layer of topsoil/peat was encountered at the ground surface in all boreholes, except Boreholes S301-05 and C301-S2. The surface of the topsoil/peat across the boreholes ranges from about Elevations 183.4 m to 181.0 m.

An SPT 'N'-value of 2 blows per 0.3 m of penetration was measured in the thicker portion of the peat deposit, suggesting a very soft consistency.

Sandy Silt to Sand

A deposit of non-cohesive soils comprised of brown to grey sandy silt to silty sand to sand was encountered at the ground surface in Borehole C301-S2 and underlying the topsoil in Boreholes S301-13, S301-20 and S301-24. The deposit contains trace organics, rootlets and wood fragments in Boreholes S301-13 and C301-S2. The top of this deposit ranges from about Elevations 183.3 m to 181.5 m and the thickness of the deposit ranges from about 0.5 m to 1.4 m.

The SPT 'N'-values recorded within this deposit range from 0 blows (weight of hammer) to 5 blows per 0.3 m of penetration, indicating a very loose to loose relative density.

The natural water content measured on two (2) samples of this deposit is about 25 per cent and 37 per cent.

The result of a grain size distribution test completed one (1) sample of the silty sand portion of this deposit is shown on Figure A.S301-01 in Appendix A.

Clayey Silt to Clay (Upper)

A deposit of cohesive soil comprised of brown to grey sandy clayey silt to clayey silt to silty clay to clay was encountered in all the boreholes, underlying either the topsoil/peat or the near surface deposit of sandy silt to sand or at the ground surface. The deposit generally contains trace to some sand and in places contains silt layers and silt to sandy silt pockets up to about 2.7 m thick, while the near surface portion of the deposit contains trace organics and rootlets. The top of the cohesive deposit ranges from about Elevations 183.1 m to 180.1 m and the overall thickness of the deposit ranging from about 2.4 m to 14.5 m. Borehole S301-10 was terminated within this deposit on refusal to further casing penetration, at a depth of about 13.5 m below ground surface, corresponding to about Elevation 168.6 m.

The SPT 'N'-values recorded within this deposit range from 0 blows (weight of hammer) to 9 blows for 0.3 m of penetration. In situ field vane tests carried out within this deposit measured undrained shear strength ranging from about 17 kPa to 60 kPa, but typically less than about 47 kPa, and the sensitivity range from about 2 to 6. The field vane tests results indicate that the clayey silt to clay deposit has predominantly a soft to firm consistency with some higher shear strengths and stiff consistency occurring near the lower portion of the deposit.

The natural water content measured on sixty five (65) samples of this deposit ranges from about 21 per cent to 73 per cent, but is typically lower than 40 per cent.

The results of grain size distribution tests completed on ten (10) samples of the clayey silt and silty clay portions of this deposit are shown on Figures A.S301-02A and A.S301-02B, respectively in Appendix A.



Atterberg limits tests were carried out on thirty nine (39) samples of this cohesive deposit and measured liquid limits ranging from about 17 per cent to 56 per cent, plastic limits ranging from about 12 per cent to 22 per cent and plasticity indices ranging from about 4 per cent to 34 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figures A.S301-03A and A.S301-03B in Appendix A, and indicate that the material is classified as clayey silt of low plasticity to clay of high plasticity.

Laboratory consolidation tests were carried out on two (2) specimens of the cohesive deposit obtained by Shelby tubes in Boreholes S301-12 and C301-S2. A preconsolidation stress of about 105 kPa and 125 kPa were estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot, respectively for these two samples. A bulk unit weight of about 17 kN/m³ and 16 kN/m³ and a specific gravity of about 2.71 and 2.77 were measured on the consolidation test specimens, respectively. Details of the test results are shown on Figures A.S301-04 and A.S301-05 in Appendix A, and the test results are summarized below.

| Borehole Sample No. | Sample Depth / Elevation | σ_{vo}' (kPa) | σ_p' (kPa) | $\sigma_p' - \sigma_{vo}'$ (kPa) | OCR | C_c | C_r | e_o | C_v^* (cm ² /s) |
|---------------------|--------------------------|----------------------|-------------------|----------------------------------|-----|-------|-------|-------|------------------------------|
| S301-12 SA 5 | 4.7 m / 177.6 m | 40 | 105 | 65 | 2.6 | 0.81 | 0.010 | 1.35 | 1.9×10^{-3} |
| C301-S2 SA 4 | 2.8 m / 178.7 m | 30 | 125 | 95 | 4.2 | 1.40 | 0.020 | 1.80 | 5.7×10^{-3} |

Note: * For stress range between effective overburden stress and final stress due to 4.0 m high embankment, that is $40 \text{ kPa} \leq \sigma_v' \leq 160 \text{ kPa}$

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 e_o is the initial void ratio
 C_c is the compression index
 C_r is the recompression index
 C_v is the coefficient of consolidation in cm²/s

Silt to Sandy Silt (Pockets)

Boreholes S301-01, S301-03, S301-05, S301-11 to S301-13, C301-S2 and C301-S3 penetrated approximately 0.6 m to 2.7 m thick pockets of silt to sandy silt trace to some clay within the clayey silt to clay deposit. The top of the silt to sandy silt pockets ranges between about Elevations 181.1 m and 170.4 m.

The SPT 'N'-values recorded within the silt to sandy silt deposit range from 0 blows (weight of hammer) to 7 blows per 0.3 m of penetration, indicating a very loose to loose relative density.

The natural water content measured on seven (7) samples of the silt to sandy silt pockets ranges from about 19 per cent to 26 per cent.

The results of grain size distribution tests completed on six (6) samples of the silt to sandy silt pockets are shown on Figure A.S301-06 in Appendix A.

Atterberg limits tests were carried out on four (4) samples of the silt to sandy silt pockets. Three (3) of the Atterberg limits tests indicate that the fine material of the silt to sandy silt to be non-plastic, and one test yielded a liquid limit of about 17 per cent, plastic limit of about 15 per cent, corresponding to plastic index of about 2 per



cent. The result of the Atterberg limits test is shown on the plasticity chart on Figure A.S301-07 in Appendix A indicating the fines material to be silt of slight plasticity.

Silt to Sand (Interlayer)

An approximately 1.1 m to 5.6 m thick interlayer comprised of grey silt to sandy silt to silt and sand to silty sand to sand was encountered between the upper and lower deposits of clayey silt to clay or at the bottom of this upper deposit in all boreholes, except Borehole S301-10. Cobbles were encountered at about Elevation 170.6 m in Borehole S301-22. The top of the interlayer ranges from about Elevations 171.7 m to 168.1 m and Boreholes S301-22 and S301-24 were terminated within this deposit on refusal to further penetration of the split-spoon /casing or DCPT.

The SPT 'N'-values recorded within the silt to sand interlayer generally range from 1 blow to 15 blows per 0.3 m of penetration, indicating a very loose to compact relative density.

The natural water content measured on eleven (11) samples of the interlayer ranges from about 18 per cent to 23 per cent.

The results of grain size distribution tests completed on nine (9) samples of the silt to sand interlayer are presented on Figures A.S301-08A and A.S301-08B in Appendix A.

Atterberg limits tests were carried out on nine (9) samples of the silt to sandy silt portion of the interlayer. Eight (8) of the Atterberg limits measured liquid limits ranging from about 17 per cent to 20 per cent, plasticity limits ranging from about 14 per cent to 17 per cent and plasticity indices ranging from about 2 per cent to 4 per cent, as presented on plasticity chart on Figure A.S301-09 in Appendix A, indicating the fines material to be silt of slight plasticity. The result of the one Atterberg limits test indicates that the fines material to be non-plastic.

Clayey Silt to Clay (Lower)

A deposit of cohesive soil comprised of brown to grey clayey silt, silty clay and clay was encountered underlying the silt to sand interlayer in all boreholes except Boreholes S301-10, S301-22 and S301-24. The top of this deposit ranges from about Elevations 167.9 m to 164.6 m and the thickness of the deposit ranges from about 2.0 m to 6.5 m.

The SPT 'N'-values recorded within this deposit generally range from 0 blows (weight of hammer) to 11 blows per 0.3 m of penetration. In situ field vane tests carried out within this deposit measured undrained shear strengths ranging from about 29 kPa to greater than 96 kPa, but generally greater than 50 kPa, and the sensitivity range from 2 to 5. The field vane tests results indicate that the lower cohesive deposit has a firm to stiff, but generally stiff consistency.

The natural water content measured on sixteen (16) samples of this deposit ranges from about 22 per cent to 67 per cent, but are generally greater than 40 per cent.

Atterberg limits tests were carried out on ten (10) samples of the lower cohesive deposit and measured liquid limits ranging from about 28 per cent to 69 per cent, plastic limits ranging from about 18 per cent to 22 per cent and plasticity indices ranging from about 13 per cent to 48 per cent. The results of the Atterberg limits tests are



shown on the plasticity chart on Figures A.S301-10 in Appendix A, and indicate that the material is classified as a clayey silt of low plasticity to clay of high plasticity.

A laboratory consolidation test was carried out on one (1) specimen of the clayey silt portion of the cohesive deposit obtained from a Shelby tube sample in Borehole S301-04. A preconsolidation stress of about 210 kPa was estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight of about 19.1 kN/m³ and a specific gravity of about 2.75 were measured on the consolidation test specimen. Details of the test results are shown on Figure A.S301-11 in Appendix A, and the test results are summarized below.

| Borehole Sample No. | Sample Depth / Elevation | σ_{vo}' (kPa) | σ_p' (kPa) | $\sigma_p' - \sigma_{vo}'$ (kPa) | OCR | C_c | C_r | e_o | c_v^* (cm ² /s) |
|-------------------------------|--------------------------|----------------------|-------------------|----------------------------------|-----|-------|-------|-------|------------------------------|
| Borehole S301-04 Sample 13 | 17.1 m / 163.9 m | 120 | 215 | 95 | 1.8 | 0.49 | 0.020 | 0.85 | 2.3×10^{-4} |

Note: * For stress range between effective overburden stress and final stress due to 4.0 m high embankment, that is
 $110 \text{ kPa} \leq \sigma_v' \leq 315 \text{ kPa}$

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 e_o is the initial void ratio
 C_c is the compression index
 C_r is the recompression index
 c_v is the coefficient of consolidation in cm²/s

Silt to Sand

Underlying the cohesive deposit all boreholes except Boreholes S301-10, S301-22 and S301-24 which were terminated within the upper cohesive deposit or the underlying non-cohesive interlayer, encountered a grey non-cohesive deposit comprised of silt, trace to some sand to sandy silt to silt and sand to silty sand to sand, trace silt. The deposit occasionally contains trace to some clay, trace gravel. The top of the deposit ranges between about Elevations 164.2 m and 161.0 m and the thickness of the deposit ranges from about 2.6 m to greater than 11.7 m. Boreholes S301-02 to S301-05 were terminated within this deposit whereas in the remaining boreholes, the bottom of the deposit is defined by either refusal to further split-spoon and/or casing penetration.

The SPT 'N'-values recorded within this deposit range from 4 blows to 23 blows per 0.3 m of penetration, indicating a very loose to compact relative density.

The natural water content measured on twenty two (22) samples of this deposit ranges from about 17 per cent to 24 per cent

The results of grain size distribution tests completed on eighteen (18) samples of this deposit are shown on Figures A.S301-12A to A.S301-12C in Appendix A.

Atterberg limits tests were carried out on four (4) samples of this deposit. One Atterberg limits test measured a liquid limit of about 21 per cent, a plastic limit of about 18 per cent and a plasticity index of about 3 per cent, as



presented on the plasticity chart on Figure A.S301-13 in Appendix A, indicating that the fines material to be silt of slight plasticity. The results of the remaining three Atterberg limits tests indicate the fines material to be non-plastic.

Sand and Gravel

A deposit of grey sand and gravel, trace to some silt was encountered underlying the silt to sand deposit in Boreholes S301-11 and S301-12. The top of the deposit is at about Elevations 162.4 m and 161.1 m and the thickness of the deposit is about 0.8 m to at least 2.0 m in Boreholes S301-11 and S301-12, respectively, and both boreholes were terminated in this deposit.

The SPT 'N'-values recorded within this deposit are 26 blows and 20 blows per 0.3 m of penetration, indicating a compact relative density.

The natural water content measured on one (1) sample of the deposit is about 13 per cent.

The result of grain size distribution test completed on one (1) sample of the sand and gravel deposit is shown on Figure A.S301-14 in Appendix A.

Refusal

The bedrock surface in Boreholes S301-01, S301-10 to S301-13, S301-20, S301-22, S301-24, C301-S2 and C301-S3 as well as all DCPTs is inferred by refusal to further split-spoon or casing advancement or dynamic cone penetration at depths between about 3.5 m and 30.7 m below ground surface, corresponding to between about Elevations 179.9 m and 150.8 m. Refusal was encountered at shallower depths near the north limit of the swamp and greater depths in the centre area middle of the swamp at about STA 13+780.

Groundwater Conditions

In general, the soil samples taken in the boreholes were moist to wet. During the drilling operations, artesian conditions were noted in Boreholes S301-02, S301-04, S301-05 and C301-S1 to C301-S3 when advancing the casing at depths ranging between 11.7 m and 21.3 m below ground surface, with the groundwater level measured in the casing ranging between about 0.9 m and 1.4 m above ground surface, corresponding to between about Elevations 182.1 m and 179.8 m. In Borehole S301-20, artesian condition was observed upon completion of drilling at 0.6 m above ground surface, corresponding to Elevation 182.7 m. In Borehole S301-02 blowing sands were observed at a depth of 31.1 m below ground surface during an attempt to carry out a dynamic cone penetration test from the bottom of the borehole. The groundwater levels measured in the open boreholes upon completion of drilling range from about Elevations 183.2 m to 179.8 m, measured at between about 0.2 m and 1.5 m below ground surface.



4.4 Highway 69 NBL – STA 13+700 to 14+000 (Swamp 301)

The plan and profiles along the centerline and toes of the proposed embankment of the new Highway 69 NBL alignment showing the borehole locations and interpreted stratigraphy between about STA 13+700 to 14+000 in the Township of Henvey are presented on Drawings A1 and A5 to A7 in Appendix A. The proposed embankment within this section of the highway is up to about 4 m high relative to the existing ground surface.

A total of fifteen (15) boreholes (Boreholes S301-06 to S301-09, S301-14 to S301-19, S301-21, S301-23, and C301-N1 to C301-N3) and nine (9) Dynamic Cone Penetration Tests (DCPT S301-DC03, S301-DC04, S301-DC07 to S301-DC13) were completed to investigate the subsurface conditions within this swamp area. This section of the proposed highway embankment is located within a low-lying grass and tree covered area with a small creek traversing from east to west near the middle of the area at about STA 13+810.

The subsurface soils along the NBL alignment in Swamp 301 generally consist of topsoil and a near surface deposit of silt to sand, underlain by a relatively thick deposit of cohesive soil comprised of clayey silt to clay, which is generally separated into an upper and a lower deposit by interlayers of silt to sandy silt to silt and sand to silty sand. The cohesive deposit is in turn underlain by non-cohesive deposits of silt to sand comprised of various interlayers as noted above.

Topsoil

An approximately 0.1 m to 0.2 m thick layer of topsoil was encountered at the ground surface in all boreholes. The surface of topsoil across the boreholes ranges from about Elevations 183.8 m to 181.2 m.

The natural water content measured on two (2) samples of the topsoil is about 43 per cent and 66 per cent.

Silt to Sand

A deposit of non-cohesive soils comprised of dark brown to grey silt to sandy silt to silt and sand to silty sand to sand was encountered immediately below the topsoil in Boreholes S301-17, S301-21, S301-23 and C301-N1 to C301-N3 and near surface pockets within the top portion of the cohesive deposit in Boreholes S301-08 and S301-09. The deposit contains trace to some clay in Boreholes C301-N2 and S301-23 and generally contains trace organics, roots, rootlets and wood fragments in Boreholes S301-08 and C301-N1 to C301-N3. The top of the deposit ranges from about Elevations 183.6 m to 180.8 m and the thickness of the deposit ranges from about 0.2 m to 0.9 m.

The SPT 'N'-values recorded within this layer/pockets range from 1 blow to 7 blows per 0.3 m of penetration, indicating a very loose to loose relative density.

The natural water content measured on five (5) selected samples of this layer ranges from about 21 per cent to 66 per cent.

The results of grain size distribution tests completed on two (2) samples of the silt to sand layer is shown on Figure A.S301-15 in Appendix A.

Atterberg limits tests were carried out on two (2) samples of the silt to silt and sand layer and measured liquid limits of about 19 per cent and 22 per cent, plastic limits of about 13 per cent to 18 per cent and plasticity indices of about 5 per cent to 6 per cent. The results of Atterberg limits tests are shown on the plasticity chart on



Figure A.S301-16 in Appendix A, indicating that the fines material of the deposit consists of silt to clayey silt of slight plasticity.

Clayey Silt to Clay (Upper)

A deposit of cohesive soil comprised of brown to grey clayey silt with sand, clayey silt to silty clay to clay was encountered underlying either the topsoil or the near surface layer of silt to sand in all boreholes. The upper portion of the cohesive deposit in Boreholes S301-06 to S301-09 and S301-17 to S301-19 (to a depth of about 1.4 m) contains trace organics and rootlets. In general, the deposit contains trace sand, silt to sand seams and in places contains silt to sandy silt pockets up to about 2.7 m thick at various depths across the boreholes. The top of the cohesive deposit ranges from about Elevations 183.1 m to 180.5 m, and the overall thickness of the deposit ranges from about 3.9 m to 15.1 m. Boreholes S301-16, S301-17 and S310-21 were terminated within this deposit on split-spoon and/or casing refusal at depths ranging from about 7.5 m to 13.3 m below the existing ground surface, corresponding to approximately Elevations 174.7 m and 169.0 m, respectively.

The SPT 'N'-values recorded within this deposit range from 0 blows (weight of hammer) to 10 blows per 0.3 m of penetration. In situ field vane tests carried out within the cohesive deposit measured undrained shear strengths ranges from about 17 kPa to greater than 96 kPa, but typically within the range of 20 kPa to 45 kPa, and the sensitivity ranging from 1 to 7. The field vane tests results indicate that the clayey silt to clay deposit has a predominantly soft to firm consistency with some higher shear strength zones and stiff consistency.

The natural water content measured on fifty (50) samples of this deposit ranges from about 21 per cent to 76 per cent, but are typically lower than 40 per cent.

The results of grain size distribution tests completed on four (4) samples of the clayey silt and clay portions of the cohesive deposit are shown on Figure A.S301-17 in Appendix A.

Atterberg limits tests were carried out on twenty eight (28) samples of the cohesive deposit and measured liquid limits ranging from about 19 per cent to 52 per cent, plastic limits ranging from about 13 per cent to 22 per cent and plasticity indices ranging from about 4 per cent to 34 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figures A.S301-18A and A.S301-18B in Appendix A, and indicate that the material is classified as a clayey silt of low plasticity to clay of high plasticity.

A laboratory consolidation test was carried out on one (1) specimen of the silty clay portion of the cohesive deposit obtained from a Shelby tube sample in Borehole S301-06. A preconsolidation stress of about 120 kPa was estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight of about 15.8 kN/m³ and a specific gravity of about 2.77 were measured on the consolidation test specimen. Details of the test results are shown on Figure A.S301-19 in Appendix A, and the test results are summarized below.



FOUNDATION REPORT – SWAMP CROSSINGS AND HIGH FILL AREAS - HIGHWAY 69 GWP 5404-05-00; WP 5404-05-01

| Borehole Sample No. | Sample Depth / Elevation | σ_{vo}' (kPa) | σ_p' (kPa) | $\sigma_p' - \sigma_{vo}'$ (kPa) | OCR | C_c | C_r | e_o | c_v^* (cm ² /s) |
|------------------------------|--------------------------|----------------------|-------------------|----------------------------------|-----|-------|-------|-------|------------------------------|
| Borehole S301-06 Sample 6 | 4.9 m / 177.6 m | 45 | 120 | 75 | 2.7 | 1.45 | 0.025 | 1.87 | 8.8×10^{-3} |

Note: * For stress range between effective overburden stress and final stress due to 4 m high embankment, that is
 $45 \text{ kPa} \leq \sigma_v' \leq 125 \text{ kPa}$

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 e_o is the initial void ratio
 C_c is the compression index
 C_r is the recompression index
 c_v is the coefficient of consolidation in cm²/s

Silt to Sandy Silt (Pockets)

Boreholes S301-06 to S301-08, S301-16, S301-18, S301-19, and C301-N1 to C301-N3 penetrated a number of pockets of grey silt, trace to some sand and clay to sandy silt, trace to some clay within the upper cohesive deposit. The top of the silt to sandy silt pockets ranges between about Elevations 181.0 m and 170.3 m and the thickness of the deposit ranges from about 0.2 m to 2.7 m.

The SPT 'N'-values recorded within the silt to sandy silt pockets range from 0 blows (weight of hammer) to 7 blows per 0.3 m of penetration, indicating very loose to loose relative density.

The natural water contents measured on ten (10) samples of the silt to sandy silt pockets ranges from about 20 per cent to 26 per cent.

The results of grain size distribution tests completed on six (6) samples of the silt to sandy silt pockets are shown on Figure A.S301-20 in Appendix A.

Atterberg limits tests were carried out on four (4) samples of the silt pockets and yielded liquid limits ranging from about 16 per cent to 18 per cent, plastic limits ranging from about 13 per cent to 15 per cent, and plasticity indices ranging from about 2 per cent to 3 per cent. The results of Atterberg limits tests are shown on the plasticity chart on Figure A.S301-21 in Appendix A, and indicate that the fines material to be silt of slight plasticity.

Silt to Sandy Silt (Interlayer)

An approximately 1.1 m to 3.4 m thick interlayer comprised of grey silt, trace to some sand, trace to some clay, to sandy silt to silty sand trace to some clay was encountered in Boreholes S301-06 to S301-09, S301-18, S301-21, S301-23 and C301-N1 to C301-N3. The top of the silt to sandy silt interlayer ranges from about Elevations 179.2 m to 167.4 m. Boreholes S301-09 and S301-23 were terminated within this deposit on refusal to casing advancement at Borehole S301-09 and refusal to DCPT advancement from the bottom of Borehole S301-23.

The SPT 'N'-values recorded within the interlayer range from 3 blows to 22 blows per 0.3 m of penetration, indicating a very loose to compact relative density.



The natural water contents measured on nine (9) samples of this interlayer ranging from about 16 per cent to 22 per cent.

The results of grain size distribution tests completed on five (5) samples of the interlayer are shown on Figure A.S301-22 in Appendix A.

An Atterberg limits test carried out on one (1) sample of the interlayer measured a liquid limit of about 18 per cent, a plastic limit of about 16 per cent and a plasticity index of about 2 per cent, indicating that the material is silt of slight plasticity as presented on plasticity chart on Figure A.S301-23.

Clayey Silt to Clay (Lower)

A lower deposit of cohesive soil comprised of brown to grey clayey silt to silty clay to clay was encountered underlying the silt to sandy silt interlayer in Boreholes S301-06 to S301-08, S301-18, S301-19 and C301-N1 to C301-N3. The deposit occasionally contains trace sand and silt seams. The top of the deposit ranges from about Elevations 167.3 m to 165.0 m and the thickness of the deposit varies from about 1.9 m to 5.3 m.

The SPT 'N'-values recorded within the deposit range from 2 blows to 6 blows per 0.3 m of penetration. In situ field vane tests carried out within this deposit measured undrained shear strengths ranging from about 40 kPa to greater than 96 kPa, but generally greater than 50 kPa, and the sensitivity ranges from about 2 to 5. The field vane tests results indicate that the clayey silt to clay deposit has a firm to stiff, but generally stiff consistency.

The natural water content measured on eight (8) samples of the lower cohesive deposit ranges from about 30 per cent to 66 per cent, but are generally greater than 45 per cent.

The result of a grain size distributions test completed on one (1) sample of this deposit is presented on Figure S.301-24 in Appendix A.

The Atterberg limits tests were carried out on eight (8) samples of the lower cohesive deposit and indicate liquid limit ranging from about 24 per cent to 61 per cent, plastic limits ranging from about 16 per cent to 22 per cent and plasticity indices ranging from about 6 per cent to 42 per cent. The results of Atterberg limits tests are shown on plasticity chart on Figure A.S301-25 in Appendix A and indicate that the material is classified as clayey silt of low plasticity to clay of high plasticity.

Silt to Sand

Underlying the lower cohesive deposit, Boreholes S301-6 to S301-08, S301-18, S301-19 and C301-N1 to C301-N3 encountered a non-cohesive deposit comprised of grey silt to sandy silt to silt and sand to silty sand to sand. The deposit in places contains trace to some clay and trace gravel. The top of the silt to sand deposit ranges from about Elevations 166.0 m to 161.0 m and the thickness of the deposit ranges from about 0.3 m to greater than 9.8 m, and potentially up to about 17.7 m as inferred from a Dynamic Cone Penetration Test driven from the bottom of Boreholes S301-06. Boreholes S301-06 to S301-08, S301-19 and C301-N2 were terminated within this deposit.

The SPT 'N'-values recorded within this deposit range from 5 blows to 19 blows per 0.3 m of penetration, generally indicating a loose to compact relative density. An SPT 'N'-values of 57 blows per 0.18 m to 50 blows



with zero penetration was recorded at the bottom of Borehole C301-N3 at the interface with the inferred bedrock surface.

The natural water content measured on fourteen (14) samples of this deposit ranges from about 17 per cent to 28 per cent.

The results of grain size distribution tests completed on nine (9) samples of the silt to sand deposit are shown on Figures A.S301-26A and A.S301-26B in Appendix A.

Bedrock / Refusal

Bedrock outcrops and knobs are present in the immediate vicinity of the investigated area. In Boreholes S301-09, S301-14 to S301-18, S301-21, S301-23 and C301-N1 and DCPTs S301-DC07 to S301-DC09 and S301-DC11 to S301-DC13, the bedrock surface is inferred by refusal to further split-spoon and/or casing advancement or dynamic cone penetration at depths between about 3.6 m and 27.8 m below ground surface, between about Elevations 179.7 m and 153.4 m. Refusals were encountered at shallower depths near the north and south limit of the swamp and the deepest refusal depths were encountered in the middle of the swamp area.

Bedrock was encountered in Borehole C301-N3 at about 19.7 m below existing ground surface, corresponding to Elevation 161.9 m and core samples were recovered as shown on the photograph presented on Figure A.S301-27 in Appendix A. The bedrock consists of granite gneiss and the core samples are described as fresh, foliated, medium crystalline, slightly porous, strong, grey, pink, and black as described as presented on the Record of Drillhole sheet in Appendix A.

The Rock Quality Designation (RQD) measured on the two core runs is 86 per cent and 83 per cent, indicating a rock mass of good quality, in accordance with Table 3.10 of CFEM (2006). The Total Core Recovery (TCR) and Solid Core Recovery (SCR) of the rock core samples is 98 per cent and 100 per cent, and 93 per cent and 87 per cent, respectively.

Groundwater Conditions

In general, the soil samples taken in the boreholes were moist to wet. During the drilling operations, artesian conditions were observed in Borehole C301-N1 when advancing casing to a depth of 19.4 m, with the ground water level measured in the casing at 1.5 m below ground surface, corresponding to about Elevation 179.7 m. The ground water levels measured in open boreholes upon completion of drilling ranged from at ground surface to 1.7 m below ground surface, corresponding to between about Elevations 183.6 m and 179.9 m.

4.5 Highway 69 SBL – STA 14+430 to 14+600 (Swamp 302)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 SBL alignment showing the borehole locations and interpreted stratigraphy between about STA 14+430 and 14+600 in the Township of Henvey as presented on Drawing B1 in Appendix B. The proposed embankment within this section of the highway is up to about 4.5 m relative to the existing ground surface.

A total of 14 boreholes (Boreholes S302-01 to S302-13, inclusive, and Borehole S302-12A) and six (6) DCPTs (DCPTs S302-DC01 to S302-DC06) were completed to investigate the subsurface conditions within this swamp



area. The topography of this section of the proposed highway is comprised of a relatively flat area covered with brushes and sparse trees.

The subsurface soils along the SBL alignment in Swamp 302 generally consist of topsoil underlain in places by a deposit of silt and sand to silty sand; or a deposit of silt and sand to silty sand at ground surface, in turn underlain by a clayey silt to clay deposit. The cohesive deposit is underlain by a silt to sandy silt deposit which in turn is underlain by inferred bedrock, or sand or silty sand to gravelly sand deposit and/or underlain by inferred bedrock.

Resistance to dynamic cone penetration and borehole advancement was encountered at depths ranging from about 1.3 m to 14.0 m, being shallowest between about STA 14+500 and 14+560.

Topsoil

An approximately 0.1 m to 0.2 m thick layer of topsoil was encountered at the ground surface in all boreholes, except in Boreholes S302-08 and S302-11. The surface of the topsoil ranges between about Elevations 184.3 m and 182.5 m.

Silt and Sand to Silty Sand

A deposit of brown silt and sand to silty sand, trace clay was encountered immediately at the ground surface in Boreholes S302-08 and S302-11 and below the topsoil in Boreholes S302-04, S302-07, S302-09 and S302-13. This deposit contains clayey silt seams in Borehole S302-08 and rootlets/organics in Boreholes S302-08, S302-11 and S302-13. The top of this deposit ranges from about Elevations 183.3 m to 182.6 m and the thickness of the deposit ranges from about 0.4 m to 0.6 m.

The SPT 'N'-values measured within this deposit range from 3 blows to 5 blows per 0.3 m of penetration, indicating a very loose to loose relative density.

The natural water content measured on three (3) samples of this deposit ranges from approximately 20 per cent to 25 per cent.

Clayey Silt to Clay

A deposit of brown to grey clayey silt to clay was encountered below the topsoil or below the silt and sand to silty in all boreholes. The deposit generally contains silt and sand layers and occasional silt and sandy silt pockets up to about 1.5 m thick, while the near surface portion of the deposit generally contains trace organics. The top of the cohesive deposit ranges between about Elevations 184.2 m and 182.2 m and the overall thickness of the deposits varies from 0.4 m to 9.0 m, including the thickness of the non-cohesive layers/pockets. Borehole S302-12A was terminated within the silty clay deposit at a depth of about 7.0 m below existing ground surface, corresponding to approximately Elevation 175.5.

The SPT 'N'-values measured within this deposit range from 0 blows (weight of hammer) to 10 blows per 0.3 m of penetration. In situ field vane tests carried out within this deposit generally measured undrained shear strengths ranging from 19 kPa to 46 kPa, indicating a soft to firm consistency. One (1) in situ field vane carried



out near/at the interface with a layer of sandy silt in Borehole S302-13 is 77 kPa, indicating a stiff consistency. The sensitivity of the cohesive deposit ranges from 2 to 6.

The natural water content measured on twenty five (25) samples of this deposit ranges from about 22 per cent to 80 per cent. The natural water content measured on three (3) samples of the silt layer ranges between about 24 per cent and 31 percent.

The grain size distributions of three (3) samples of the clayey silt to silty clay deposit are shown on Figure B.S302-01 in Appendix B. The grain size distributions of two (2) samples of the silt layers are shown on Figure B.S302-02.

Atterberg limits tests carried out on fourteen (14) samples of the cohesive deposit measured liquid limits ranging from about 21 per cent to 72 per cent, plastic limit ranging from about 13 per cent to 23 per cent, and plasticity indices ranging from about 7 per cent to 49 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure B.B302-03 in Appendix B and indicate that the material is classified as a clayey silt of low plasticity to clay of high plasticity.

Atterberg limits tests were also carried out on three (3) samples of the silt layers and measured liquid limits ranging from about 17 per cent to 22 per cent, plastic limits ranging from about 14 per cent to 19 per cent, and plasticity indices ranging from about 3 per cent to 5 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure B.S302-04 in Appendix B and indicate that the material is classified as a silt of low to slight plasticity.

A laboratory consolidation test was carried out on one (1) specimen of the silty clay portion of the cohesive deposit obtained from a Shelby tube sample in Borehole S302-03. A preconsolidation stress of about 75 kPa was estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight of about 15 kN/m³ and a specific gravity of about 2.77 were measured on the consolidation test specimen. Details of the test results are shown on Figure B.S302-05 in Appendix B, and the test results are summarized below.

| Borehole Sample No. | Sample Depth / Elevation | σ_{vo}' (kPa) | σ_p' (kPa) | $\sigma_p' - \sigma_{vo}'$ (kPa) | OCR | C_c | C_r | e_o | c_v^* (cm ² /s) |
|---------------------------|--------------------------|----------------------|-------------------|----------------------------------|-----|-------|-------|-------|------------------------------|
| Borehole S302-03 Sample 4 | 3.3 m / 179.8 m | 30 | 75 | 45 | 2.5 | 1.50 | 0.040 | 2.29 | 2.6×10^{-3} |

Note: * For stress range between effective overburden stress and final stress due to a 4.0 m high embankment, that is $30 \text{ kPa} \leq \sigma_v' \leq 105 \text{ kPa}$.

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 e_o is the initial void ratio
 C_c is the compression index
 C_r is the recompression index
 c_v is the coefficient of consolidation in cm²/s



Silt to Sandy Silt (Pockets)

Boreholes S302-12, S302-12A and S302-13 penetrated approximately 1.1 m to 1.5 m thick pockets of grey silt, trace to some sand, trace to some clay to sandy silt, trace clay within the clayey silt to clay deposit. The top of the silty pockets ranges between about Elevations 181.9 m and 178.1 m.

The SPT 'N'-values measured within these pockets range from 0 blows (weight of hammer) to 5 blows per 0.3 m of penetration, indicating a very loose to loose relative density.

The natural water content measured on three (3) samples of the pockets range from about 20 per cent to 23 per cent.

The grain size distributions of two (2) samples of the silt and sandy silt pockets are shown on Figure B.S302-06 in Appendix B.

Atterberg limits test carried out on one (1) sample of the silt pocket from Borehole S302-12 indicate that the material is non-plastic silt.

Silt to Silt and Sand

A deposit of grey silt, trace to some sand, trace clay, trace gravel to sandy silt, trace to some clay to silt and sand, trace clay was encountered below the clayey silt to clay deposit in all boreholes, except in Boreholes S302-07 and S302-12A. The top of this deposit ranges from about Elevations 182.3 m to 173.5 m and the thickness of the deposit ranges from about 0.4 m to 1.4 m. The bottom of this deposit is defined by refusal to further casing and/or split-spoon advancement in Boreholes S302-03, S302-05 and S302-08 to S302-10.

The SPT 'N'-values measured within this deposit range from 2 blows to 20 blows per 0.3 m of penetration, indicating a very loose to compact relative density. SPT 'N'-values greater than 100 blows per less than 0.2 m of penetration were measured prior to split-spoon and casing refusal in Boreholes S302-08, S302-09 and S302-10.

The natural water content measured on nine (9) samples of this deposit ranges from approximately 22 per cent to 26 per cent.

The grain size distributions of eight (8) samples of the silt to silty sand deposit are shown on Figure B.S302-07A and S.302-07B in Appendix B.

Atterberg limits test carried out on three (3) samples of the silt to sandy silt deposit indicate that the material is non-plastic.

Silty Sand to Gravelly Sand

A deposit of grey silty sand, trace gravel, trace clay to sand, trace to some silt, trace gravel was encountered below the silt to silt and sand deposit or silty clay deposit in Boreholes S302-01, S302-02, S302-04, S302-07, S302-11, S302-12 and S302-13, and a deposit of gravelly sand, some silt was encountered below the silt deposit in Borehole S302-06. The top of this deposit ranges from about Elevations 182.5 m to 170.9 m and the thickness of the deposit ranges from about 0.3 m to 4.7 m. The bottom of this deposit is defined by refusal to further casing and/or split-spoon advancement in Boreholes S302-01, S302-02, S302-04, S302-06, S302-07, S302-11, S302-12 and S302-13.



The SPT 'N'-values measured within this deposit range from 10 blows to 82 blows per 0.3 m of penetration, indicating a compact to very dense relative density. SPT 'N'-values of greater than 62 blows per less than 0.2 m of penetration were measured prior to split-spoon and casing refusal on probable bedrock in Boreholes S302-02, S302-06 and S302-12.

The natural water content measured on eight (8) samples of this deposit ranges from approximately 15 per cent to 25 per cent.

The grain size distributions of four (4) samples of the silty sand to gravelly sand deposit are shown on Figure B.S302-08 in Appendix B.

Refusal

The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon advancement or dynamic cone penetration at depths between about 1.3 m and 14.0 m below ground surface, corresponding to between about Elevations 182.2 m and 168.6 m. Refusal was encountered at lesser depths near the middle of the swamp area and at greater depths at the north and south limits of the swamp.

Groundwater Conditions

The samples taken in the boreholes were moist to wet. In general, the water level in the open boreholes was noted between about Elevations 183.1 m and 179.6 m, at depths between 0.6 m and 3.4 m below ground surface.

4.6 Highway 69 NBL – STA 14+550 to 14+600 (Swamp 302)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 NBL alignment showing the borehole locations and interpreted stratigraphy between about STA 14+550 and 14+600 in the Township of Henvey are presented on Drawings B1 and B2 in Appendix B. The proposed embankment within this section of the highway is up to about 3.5 m high relative to the existing ground surface.

A total of five (5) boreholes (Boreholes S302-14 to S302-18) and two (2) DCPTs (DCPTs S302-DC07 and S302-DC08) were completed to investigate the subsurface conditions within this swamp area. The topography of this section of the proposed highway is comprised of a relatively flat area with brushes and sparse trees.

The subsurface soils along the NBL alignment in Swamp 302 generally consist of topsoil at the ground surface underlain by a deposit of silt and sand which in turn is underlain by a deposit of clayey silt to clay. The deposit of clayey silt to clay is underlain by inferred bedrock or a silt to sand deposit which in turn is underlain by inferred bedrock. Resistance to dynamic cone penetration and borehole advancement was encountered at depths generally ranging from about 2.5 m to 6.5 m; however, resistance to dynamic cone penetration at the northern limit of the west toe of the embankment was encountered at a depth of approximately 13.4 m.



Topsoil

An approximately 0.1 m to 0.2 m thick layer of topsoil was encountered at the ground surface in all boreholes. The surface of the topsoil ranges from about Elevations 184.7 m to 183.9 m.

Silt and Sand

A deposit of brown silt and sand, trace clay, trace organics was encountered underlying the topsoil in Boreholes S302-15 to S302-18. The top of the deposit ranges from about Elevations 184.5 m to 183.7 m and the thickness of the deposit ranges from about 0.4 m to 0.5 m.

The SPT 'N'-values measured within the deposit range from 4 blows to 7 blows per 0.3 m of penetration, indicating a loose relative density.

The natural water content measured on two (2) samples of the deposit is approximately 20 per cent and 23 per cent.

Clayey Silt to Clay

A deposit of brown to grey clayey silt to clay was encountered below the topsoil in Borehole S302-14 and below the silt and sand deposit in Boreholes S302-15 to S302-18. The top of the cohesive deposit ranges between about Elevations 184.1 m and 183.3 m and the thickness of the deposit ranges from 1.6 m to 4.0 m. The bottom of the deposit is defined by refusal to further split-spoon and casing advancement in Borehole S302-15.

The SPT 'N'-values measured within the deposit range from 0 blows (weight of hammer) to 8 blows per 0.3 m of penetration. A SPT 'N'-value of 116 blows per 0.3 m of penetration was measured prior to split-spoon refusal on probable bedrock in Borehole S302-15. In situ field vane tests carried out within this deposit measured undrained shear strengths ranging from 19 kPa to 42 kPa, indicating a soft to firm consistency. The sensitivity of the cohesive deposit ranges from 1 to 6.

The natural water content measured on eight (8) samples of the deposit ranges from about 22 per cent to 66 per cent.

The grain size distributions of two (2) samples of the clayey silt with sand and silty clay portion of the deposit are shown on Figure B.S302-09 in Appendix B.

Atterberg limits tests carried out on six (6) samples of the cohesive deposit measured liquid limits ranging from about 29 per cent to 59 per cent, plastic limits ranging from about 15 per cent to 20 per cent, and plasticity indices ranging from about 12 per cent to 41 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure B.B302-10 in Appendix B and indicate that the material is classified as a clayey silt of low plasticity to clay of high plasticity.

A laboratory consolidation test was carried out on one (1) specimen of the silty clay portion of the cohesive deposit obtained from a Shelby tube sample in Borehole S302-17. A preconsolidation stress of about 100 kPa was estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight of about 19 kN/m³ and a specific gravity of about 2.76 were measured on the consolidation test specimen. Details of the test results are shown on Figure B.S302-11 in Appendix B, and the test results are summarized below.



| Borehole Sample No. | Sample Depth / Elevation | σ_{vo}' (kPa) | σ_p' (kPa) | $\sigma_p' - \sigma_{vo}'$ (kPa) | OCR | C_c | C_r | e_o | c_v^* (cm ² /s) |
|------------------------------|--------------------------|----------------------|-------------------|----------------------------------|------|-------|-------|-------|------------------------------|
| Borehole S302-17 Sample 4 | 2.1 m / 181.8 m | 35 | 100 | 65 | 2.90 | 0.25 | 0.025 | 0.86 | 1.9×10^{-3} |

Note: * For stress range between effective overburden stress and final stress due to a 3.5 m high embankment, that is $35 \text{ kPa} \leq \sigma_v' \leq 100 \text{ kPa}$.

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 e_o is the initial void ratio
 C_c is the compression index
 C_r is the recompression index
 c_v is the coefficient of consolidation in cm²/s

Silt to Sand

A deposit of brown to grey silt to sand, in places comprised of silt, sandy silt or sand, was encountered below the cohesive deposit in all boreholes, except in Boreholes S302-14 and S302-16 to S302-18. The top of this deposit ranges from about Elevations 182.5 m to 179.1 m and the thickness of the deposit ranges from about 0.6 m to 1.6 m and potentially up to about 8.8 m as the deposit was only freely penetrated in a DCPT driven adjacent to Borehole S302-17. The bottom of this deposit is defined by refusal to further split-spoon and casing advancement in Boreholes S302-14 to S302-16 and S302-18.

The SPT 'N'-values measured within this deposit range from 7 blows to 11 blows per 0.3 m of penetration, indicating a loose to compact relative density. A SPT 'N'-value of 110 blows per 0.25 m of penetration was measured prior to split-spoon refusal in Borehole S302-16.

The natural water content measured on four (4) samples of this deposit range from about 21 per cent to 26 per cent.

The grain size distributions of three (3) samples of the deposit are shown on Figure B.S302-12 in Appendix B.

Refusal

The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon and casing advancement or dynamic cone penetration at depths between about 2.5 m and 13.4 m below ground surface, corresponding to between about Elevations 181.8 m and 170.5 m.

Groundwater Conditions

The samples taken in the boreholes were moist to wet. In general, the water level in the open boreholes was noted between about Elevations 183.5 m and 182.5 m, measured at depths between 0.7 m and 1.8 m below ground surface.



4.7 Highway 69 SBL – STA 16+375 to 16+625 (Swamp 303)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 SBL alignment showing the borehole locations and interpreted stratigraphy between about STA 16+375 and 16+625 in the Township of Henvey as presented on Drawing C1 in Appendix C. The proposed embankment within this section of the highway is up to about 6.0 m high relative to the existing ground surface.

A total of eleven (11) boreholes (Boreholes S303-01 to S303-11) and five (5) DCPTs (DCPTs S303-DC01 to S303-DC05) were completed to investigate the subsurface conditions within this swamp area. The topography of this section of the proposed highway is comprised of bedrock outcrops and a relatively flat swamp with areas of shallow open water to the west and brush and tree cover to the east.

Ice and/or water were encountered in some areas of the site at the time of the investigation. The subsurface soils along the SBL alignment in Swamp 303 generally consist of a layer of topsoil at ground surface and a deposit of clayey silt to clay below the ponded water, underlain by a deposit of silt to sand. The silt to sand deposit is in turn underlain by a deposit of sand and gravel or inferred bedrock. Resistance to dynamic cone penetration, shovel excavation and borehole advancement, was encountered at depths of up to about 6.0 m below ground surface, being deepest along the west toe of embankment. Bedrock outcrops are present along the east side of the proposed SBL alignment.

Root Mat

A 0.2 m thick layer of root mat was encountered on the water surface in Borehole S303-10.

Ice/Water

Ponded water and ice to depths of up about 0.9 m were encountered in Boreholes S303-06, S303-07, S303-09 and S303-10.

Peat / Topsoil

A deposit of black fibrous or amorphous peat was encountered under the ponded water in Boreholes S303-06 and S303-09. The top of the peat deposit is at about Elevations 184.6 m and 184.3 m and the thickness of the deposit is about 0.4 m and 0.1 m at the respective boreholes.

A SPT 'N'-value measured within the fibrous peat is 2 blows per 0.3 m of penetration, indicating a soft consistency.

An approximately 0.1 m to 0.4 m thick layer of topsoil at the ground surface was encountered in Boreholes S303-01 to S303-05, S303-08 and S303-11. The surface of the topsoil ranges from about Elevations 188.8 m to 185.4 m. The bottom of the topsoil is defined by refusal to hand shovel excavation in Borehole S303-11.



Sand and Gravel to Gravel

A deposit of brown sand and gravel and black and pink gravel was encountered below topsoil in Borehole S303-08 and below the ponded water in Borehole S303-10, respectively. The top of this layer is at about Elevation 188.3 m and Elevation 183.9 m and the thickness of the layer is about 0.4 m and 0.6 m at the respective boreholes.

The SPT 'N'-value measured within the gravel deposit is 0 blows (weight of hammer) indicating a very loose relative density.

The natural water content measured on a specimen of the sand and gravel and gravel deposits is about 8 per cent and 5 per cent, respectively.

Clayey Silt to Clay

A deposit of brown to grey clayey silt to clay was encountered below the topsoil or peat in Boreholes S303-01, S303-02, S303-06 and S303-09, below the ponded water in Borehole S303-07 and underlying the gravel deposit in Borehole S303-10. The deposit is encountered in boreholes advanced along the proposed west embankment toe and in Boreholes S303-01, S303-07 and S303-11 advanced along the proposed embankment centreline. The deposit contains trace to some sand, trace gravel as well as silty sand seams in Borehole S303-01 and trace organics in Boreholes S303-07 and S303-09. The top of this deposit is between about Elevations 185.9 m and 183.3 m and the thickness of the deposit varies from 0.5 m to 2.6 m.

The SPT 'N'-values measured within the cohesive deposit range from 1 blow to 7 blows per 0.3 m of penetration. Two (2) in situ field vane tests carried out within this deposit measured undrained shear strengths of 14 kPa and 34 kPa, and sensitivities of 4 and 7. The SPT 'N'-values and field vane undrained shear strength values suggest that the deposit has a very soft to firm consistency.

The natural water content measured on six (6) samples of the clay deposit range from about 21 per cent to 65 per cent.

The grain size distributions of two (2) samples of clayey silt to clay and one (1) sample of clayey silt with sand seams are shown on Figure C.S303-01 and C.S303-02, respectively, in Appendix C.

Atterberg limits tests carried out on six (6) samples of the cohesive deposit measured liquid limits ranging from about 21 per cent to 52 per cent, plastic limits ranging from about 14 per cent to 19 per cent, and plasticity indices ranging from about 6 per cent to 33 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure C.S303-03 in Appendix C and indicate that the material is classified as clayey silt of low plasticity to clay of high plasticity.

Silt to Sand

A deposit of brown to grey silt to silt and sand to silty sand to sand, trace gravel and clay was encountered underlying either the peat/topsoil or clayey silt to clay deposit in Borehole S303-01 to S303-07, S303-09 and S303-10. The top of this deposit ranges from about Elevations 186.8 m to 181.6 m and the thickness of the deposit ranges from about 0.7 m to 3.3 m. The bottom of this deposit is defined by refusal to further split-spoon, auger advancement or dynamic cone penetration in Boreholes S303-04, S303-09 and S303-10. A layer of cobbles and boulders about 0.5 m and 0.2 m thick was encountered at about Elevations 185.9 m and 186.0 m in Borehole S303-04 and S303-05, respectively.



The SPT 'N'-values measured within this deposit range from 2 blows to 41 blows per 0.3 m of penetration, indicating a very loose to dense relative density. SPT 'N'-values greater than 58 blows per 0.18 m of penetration were measured at the interface with the layers of cobbles and boulders.

The natural water content measured on thirteen (13) samples of this deposit range from about 12 per cent to 37 per cent.

The grain size distributions of ten (10) samples of this non-cohesive deposit are shown on Figure C.S303-04A and C.S303-04B in Appendix C.

Sand and Gravel

A deposit of brown to grey sand and gravel was encountered underlying the silt to sand deposit in Boreholes S303-01 to S303-03, S303-06 and S303-07. The top of this deposit ranges from about Elevations 184.4 m to 180.3 m and the thickness of the deposit ranges from about 0.2 m to 2.4 m. A 0.3 m thick layer of cobbles and boulders was encountered at the bottom of Borehole S303-05.

In general, the SPT 'N'-values measured within this deposit range from 7 blows to 28 blows per 0.3 m of penetration, indicating a loose to compact relative density. A SPT 'N'-value of 65 blows per 0.15 m of penetration was measured upon split-spoon refusal.

The natural water content measured on three (3) samples of this deposit range from about 7 per cent to 12 per cent.

A grain size distribution of one (1) sample of this deposit is shown on Figure C.S303-05 in Appendix C.

Refusal

Bedrock outcrops are present along the proposed SBL alignment. The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon advancement, shovel excavation or dynamic cone penetration at depths between about 0.1 m and 6.0 m below ground/water/ice surface, ranging between about Elevations 191.8 m and 179.1 m. Along the proposed east toe of the embankment, refusal was encountered at shallower depths below ground surface than along the proposed west toe of the embankment.

Groundwater Conditions

The samples taken in the boreholes were moist to wet. Ponded water and ice was present at the surface at Boreholes S303-06, S303-07, S303-09 and S303-10, with the water surface at between about Elevations 185.0 m and 184.6 m. While three (3) boreholes were dry, in general, the water level in the open boreholes was noted at between about Elevations 185.6 m and 184.5 m, to depths of up to 1.4 m below ground surface.

4.8 Highway 69 NBL – STA 16+875 to 16+925 (Swamp 304)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 NBL alignment showing the borehole locations and interpreted stratigraphy between about STA 16+875 and 16+925



in the Township of Henvey are presented on Drawing D1 in Appendix D. The proposed embankment within this section of the highway is up to about 5 m high relative to the existing ground surface.

A total of six (6) boreholes (Boreholes S304-01 to S304-06) and three (3) DCPTs (DCPTs S304-DC01 to S304-DC03) were completed to investigate the subsurface conditions within this swamp area. This section of the proposed highway embankment is located within the confines of valley slopes to the north and south, and contains a small creek traversing the valley from east to west near the middle of the area. In general, the ground cover consists of shrubs and treed areas, and bedrock outcrops to the north and south. Shallow open water was noted immediately east of the proposed highway embankment.

Ice and/or ponded water were encountered in some areas of the site at the time of the investigation. The subsurface soils along the NBL alignment in Swamp 304 generally consist of a layer of peat at the ground surface or ponded water and/or ice underlain by interlayered deposits of silt and sand deposit which in turn is underlain by a deposit of clayey silt. The peat deposit is also underlain in places by a deposit of clayey silt, silt, sandy silt, silt and sand and silty sand. The interlayered deposits are underlain by inferred bedrock along the toe west toe of the embankment and by a deposit of silt to sand along the east toe of the embankment and along the embankment centreline. Resistance to dynamic cone penetration and borehole advancement was encountered at depths of up to about 4.1 m below the ground/water surface, with the depth to refusal being greater in the vicinity of about STA 16+860 at the east toe of the embankment.

Ice/Water

Ponded water and/or ice were encountered in Boreholes S304-02 and S304-06 to depths of about 0.1 m and 0.9 m, respectively.

Peat

A deposit of black fibrous or amorphous peat was encountered immediately at the ground surface in Boreholes S304-03 to S304-05. The top of the peat deposit ranges between about Elevations 192.3 m and 190.7 m and the thickness of the deposit varies from about 0.2 m to 0.6 m.

The SPT 'N'-values measured within the amorphous peat are 2 blows and 3 blows per 0.3 m of penetration, indicating a very soft to soft consistency.

Clayey Silt with Sand to Clayey Silt

A deposit of brown clayey silt, trace to some sand to clayey silt with sand was encountered underlying the peat deposit in Boreholes S304-01 and S304-04 and interlayered within or underlying a non-cohesive deposit in Boreholes S304-02 to S304-04 and S304-06. The deposit contains trace organics (up to a depth of 1.2 m below ground surface) in Borehole S304-04. The top of this layer ranges between about Elevations 191.7 m and 189.5 m and the thickness of the deposit or layers varies from about 0.3 m to 2.8 m. The bottom of this deposit is defined by refusal to further split-spoon advancement in Boreholes S303-04 and S304-06.

The SPT 'N'-values measured within this deposit range from 2 blows to 17 blows per 0.3 m of penetration with a SPT 'N'-value of 53 blows per 0.13 m of penetration being measured upon split-spoon refusal in Borehole S304-04, suggesting a very soft to stiff consistency. In situ field vane tests carried out within the



cohesive deposit measured undrained shear strengths between approximately 16 kPa and 96 kPa, indicating a stiff consistency. The consistency of the cohesive deposit varies from very soft to hard.

The natural water content measured on seven (7) samples of this deposit range from about 23 per cent to 43 per cent.

The grain size distributions of two (2) samples of the clayey silt deposit are shown on Figure D.S304-01 in Appendix D.

Atterberg limits tests carried out on four (4) samples of the cohesive deposit measured liquid limits ranging from about 23 per cent to 34 per cent, plastic limit ranging from about 14 per cent to 17 per cent, and plasticity indices ranging from about 9 per cent to 16 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure D.S304-02 in Appendix D and indicate that the material is classified as clayey silt of low plasticity.

Silt to Sand

A deposit of brown silt, some sand, trace gravel and clay to sandy silt, trace to some clay to silty sand to sand, some silt, trace to some gravel and clay was encountered below the ice/ponded water or peat in Borehole S304-05 and interlayered with or below the clayey silt deposit in Boreholes S304-01 to S304-03 and S304-06. The portion of the silt to sand deposit encountered above a depth of about 1 m below ground surface generally contains organics. The top of this non-cohesive deposit ranges from about Elevations 191.7 m to 188.3 m and the overall thickness of the deposit ranges from about 0.1 m to 2.4 m (excluding the clayey silt interlayers). The bottom of this deposit is defined by refusal to further split-spoon advancement in Boreholes S304-01 to S304-03 and S304-05.

The SPT 'N'-values measured within the non-cohesive portions of the interlayered deposit range from 1 blow to 26 blows per 0.3 m of penetration, indicating a very loose to compact relative density. SPT 'N'-values exceeding 53 blows per 0.3 m of penetration were measured upon to split-spoon refusal in Boreholes S304-01 and S304-03.

The natural water content measured on five (5) samples of this deposit range from about 17 per cent to 33 per cent.

The grain size distributions of four (4) samples of the sandy silt to sand deposit are shown on Figure D.S304-03 in Appendix D.

Refusal

The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon advancement and dynamic cone penetration, respectively, at depths between about 0.9 m and 4.1 m below ground surface, corresponding to between about Elevations 191.4 m and 187.1 m. The depth to refusal is greater at the east toe of the embankment at STA 16+885.



Groundwater Conditions

The samples taken in the boreholes were moist to wet. The water level in the open boreholes was recorded at depths between the ice surface (i.e. 0.0 m) and 1.8 m below ground surface, corresponding to between about Elevations 191.4 m and 188.9 m. Boreholes S304-04 and S304-05 were noted to be dry upon completion of drilling.

4.9 Highway 69 SBL – STA 17+425 to 17+635 (Swamp 305)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 SBL alignment showing the borehole locations and interpreted stratigraphy between about STA 17+425 and 17+635 in the Township of Henvey as presented on Drawings E1 to E3 in Appendix E. The proposed embankment within this section of the highway is up to about 8.5 m high relative to the existing ground surface.

A total of 14 boreholes (Boreholes S305-21, S305-24 to S305-29 and S305-31 to S305-37) and four (4) DCPTs (DCPTs S305-DC10 to S305-DC13) were completed to investigate the subsurface conditions within this swamp/high fill area. The topography of this section of the highway overall slopes upward northerly from approximately Elevation 191.2 m at the southern limit of the swamp/high fill area, downward slightly to a valley at about Elevation 191.4 m then upwards steeply to approximately Elevation 196.7 m at the northern limit of the swamp/high fill area. The ground cover typically consists of shrubs and treed areas, and bedrock outcrops are present along the entire alignment, especially near the northern limit of the swamp/high fill area. An open field which is part of an existing lumber yard is present along the SBL centreline and along the west toe of embankment between approximately STA 17+500 and 17+550. Relatively thin surficial layers and mounds of wood fragment/sawdust can be found throughout the field.

The subsurface soils along the SBL alignment in Swamp 305 generally consist of a soil/wood fragments, fill, topsoil or ponded water underlain by a silt to sand deposit which in turn is underlain by inferred bedrock. In places, the fill material or the surficial topsoil is immediately underlain by bedrock. Near the northern limit of the swamp/high fill area, a silty clay to clay deposit is interlayered within the silt to sand deposit. Resistance to dynamic cone penetration and borehole advancement was encountered at depths of up to about 4.2 m below the ground/water surface.

Ice / Water

Ice and ponded water were encountered in Borehole S305-31 to a depth of about 0.3 m.

Fill

A layer of grey fill comprised of wood fragments or sandy silt, trace clay, mixed with wood fragments was encountered at the ground surface in Boreholes S305-21, S305-28 and S305-33. The top of this layer is at about Elevation 192.8 m and 191.2 m and the thickness of the fill layer ranges between approximately 0.1 m and 0.3 m. The bottom of the sandy silt fill layer was defined by refusal to further split-spoon and auger advancement in Borehole S305-21.



Fill material comprised of wood fragments/sawdust was encountered at the ground surface in Boreholes S305-28 and S305-33 at about Elevations 192.8 m to 192.0 m, respectively. The thickness of the fill material is about 0.1 m to 0.3 m.

Topsoil

An approximately 0.1 m to 0.2 m thick layer of topsoil was encountered at the ground surface or underlying the soil/wood fill mixture in Boreholes S305-24 to S305-29, and S305-32 to S305-37. The surface of the topsoil ranges from about Elevation 196.7 m to 191.8 m. The bottom of the topsoil is defined by refusal to further shovel advancement in Boreholes S305-24, S305-36 and S305-37.

Silt to Sand

A deposit of non-cohesive soils comprised of various interlayers or pockets of brown to grey silt, sandy silt, silt and sand, silty sand and sand, trace to some silt, trace gravel and trace clay was encountered below the ponded water in Borehole S305-31, below the topsoil in Boreholes S305-25, S305-26, S305-28, S305-29 and S305-32 to S305-35, and below the silty clay to clay deposit in Boreholes S305-33 and S305-34. Rootlets and/or trace organics were encountered in some of the boreholes to depths of 1.4 m below existing ground surface. The top of this deposit ranges from about Elevations 193.5 m to 189.7 m and the overall thickness of the deposit ranges from about 0.2 m to 2.3 m. The bottom of this deposit is defined by refusal to further auger and/or split-spoon advancement or shovel excavation in Boreholes S305-25, S305-26, S305-28, S305-29, S305-32, S305-34 and S305-35.

The SPT 'N'-values measured within this deposit range from 1 blow to 20 blows per 0.3 m of penetration, indicating a very loose to compact relative density. SPT 'N'-values exceeding 72 blows per less than 0.3 m of penetration were measured at bottom of Boreholes S305-26, S305-28, S305-29 and S305-34 upon split-spoon refusal to advancement.

The natural water content measured on 16 samples of this deposit range from about 16 per cent to 42 per cent.

The grain size distributions of seven (7) samples of the silt to silt and sand portions of the deposit are shown on Figure E.S305-01 in Appendix E.

An Atterberg limits test carried out on a sample of the silt and sand deposit from Borehole S305-29 measured a liquid limit of about 17 per cent, a plastic limit of about 14 per cent and a corresponding plasticity index of about 3 per cent. The results of the Atterberg limits test are shown on the plasticity chart on Figure E.S305-02 in Appendix E and indicate that the fines portion of the deposit is classified as a silt of slight plasticity. An Atterberg limits test carried out on one (1) sample of the silt deposit from Borehole S305-29 indicates that the material is non-plastic.

Silty Clay to Clay

A stratum of brown clay and brown and grey silty clay, trace sand was encountered interlayered within the silt to sand deposit in Boreholes S305-33 and S305-34. The top of this deposit is at about Elevations 191.4 m and 191.3 m and the thickness of the deposit is about 1.7 m and 1.3 m in the respective boreholes.



The SPT 'N'-values measured within the cohesive deposit are 8 blows and 11 blows per 0.3 m of penetration. In situ field vane tests carried out within the clay deposit in Borehole S305-33 measured undrained shear strengths of approximately 80 kPa and 97 kPa, and a sensitivity of 2. An in situ field vane test carried out within the silty clay deposit in Borehole S305-34 measured an undrained shear strength greater than 135 kPa. The field vane test results indicate that the cohesive deposit has a stiff to very stiff consistency.

The natural water content measured on two (2) samples of this deposit is about 32 per cent and 34 per cent.

Atterberg limits tests carried out on two (2) samples of this deposit measured liquid limits of about 45 per cent and 52 per cent, plastic limits of about 19 per cent and 21 per cent and corresponding plasticity indices of about 26 per cent and 31 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure E.S305-03 in Appendix E and indicate that the material tested is classified as a silty clay of intermediate plasticity and a clay of high plasticity.

Sand and Gravel

A deposit of brown and grey sand and gravel, trace to some silt was encountered below the sandy silt deposit in Borehole S305-31 and below the silt and sand deposit in Borehole S305-33. The top of this deposit is at about Elevations 189.6 m and 188.3 m in Boreholes S305-31 and S305-33, respectively, and the thickness of the deposit is about 0.4 m and 0.5 m in the respective boreholes. The bottom of this deposit is defined by refusal to further auger advancement in both boreholes.

The SPT 'N'-values measured within this deposit are 20 blows per 0.3 m of penetration and 68 blows per 0.15 m of penetration, indicating a compact and very dense relative density.

Refusal

Bedrock outcrops are present along the alignment, especially near the north limit of the swamp. The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon and/or auger advancement, shovel excavations and dynamic cone penetration, at depths between about 0.1 m and 4.2 m below ground surface, corresponding to between about Elevations 196.6 m and 187.8 m. The depth to refusal is greatest between STA 17+570 and 17+600 along the SBL centreline and west toe of the embankment, that is between about 3.4 m and 4.2 m below the ground surface, corresponding to between about Elevation 188.7 m and 187.8 m.

Groundwater Conditions

In general, the samples taken in the boreholes were moist to wet. Water levels in the open boreholes upon completion of drilling range from about Elevations 193.8 m to 191.2 m, measured at the ground surface to 0.6 m below ground surface. Shovel excavations of Boreholes S305-24 and S305-35 to S305-37, S305-21 and S305-27 were dry upon completion of excavating/drilling.



4.10 Highway 69 NBL – STA 17+025 to 17+550 (Swamp 305)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 NBL alignment showing the borehole locations and interpreted stratigraphy between about STA 17+025 and 17+550 in the Township of Henvey are presented on Drawings E1 and E4 to E6 in Appendix E. The proposed embankment within this section of the highway is up to about 11 m high relative to the existing ground surface.

A total of 25 boreholes (Boreholes S305-01 to S304-23, S305-25 and S305-49) and ten (10) DCPTs (DCPTs S305-DC01 to S305-DC08, S305-DC10 and S305-DC11) were completed to investigate the subsurface conditions within this swamp area. The topography of this section of the highway is quite variable. The ground surface varies from approximately Elevations 187.0 m to 197.0 m and consists of bedrock outcrops, high ground and several valleys. The ground cover typically consists of shrubs, treed areas and swamp vegetation.

The subsurface soils along the NBL alignment in Swamp 305 generally consist of a layer of topsoil or peat underlain by interlayered strata or pockets of silt to sand and clayey silt to silty clay. The interlayered nature of the deposits result in the cohesive strata being underlain by inferred bedrock in places, or the silt to sand deposit being underlain by inferred bedrock. In some places near at north limit of the swamp a deposit of sandy silt to silt and sand fill covers the native overburden. Resistance to dynamic cone penetration and borehole advancement was encountered at depths of up to about 7.2 m below ground surface.

Peat / Topsoil

An approximately 0.2 m to 0.6 m thick layer of fibrous or amorphous peat was encountered at the ground surface in Boreholes S305-02 to S305-05, S305-11 and S305-49. The top of the peat layer ranges from about Elevations 190.8 m to 187.0 m.

SPT 'N'-values measured within the fibrous peat are 1 blow or 2 blows per 0.3 m of penetration, indicating a very soft consistency.

A natural water content measured on one (1) sample of the fibrous peat from Borehole S305-11 is about 79 per cent.

An approximately 0.1 m to 0.2 m thick layer of topsoil was encountered at the ground in Boreholes S305-08, S305-10, S305-12 to S305-20, S305-23 and S305-25. The surface of the topsoil ranges from about Elevations 195.1 m to 187.2 m. The bottom of topsoil is defined by refusal to further shovel advancement in Boreholes S305-08, S305-15, S305-16 and S305-18.

Fill

A layer of fill comprised of sandy silt to silt and sand, trace clay, containing wood fragments was encountered at the ground surface in Borehole S305-21 and S305-22. The top of this layer is at about Elevation 191.2 m and its thickness is approximately 0.3 m and 1.4 m at the respective boreholes. The bottom of the sandy silt fill layer is defined by refusal to further split-spoon and auger advancement in Borehole S305-21.

Two (2) SPT 'N'-values measured within the silt and sand fill are 6 blows and 9 blows per 0.3 m of penetration, indicating a loose relative density. A SPT 'N'-value of 52 blows per 0.15 m of penetration was measured prior to split-spoon and auger refusal.



A grain size distribution of one (1) sample of the silt and sand fill material is shown on Figure E.S305-04 in Appendix E.

Clayey Silt with Sand to Silty Clay

Strata or pockets of brown to grey clayey silt with sand to clayey silt, trace to some sand to silty clay were encountered at ground surface in Borehole S305-06, below the peat or topsoil in Boreholes S305-02 to S305-05, S305-12 and S305-20, below the silt and sand fill material in Borehole S305-22 and below the silt to silty sand deposit in Boreholes S305-09, S305-13, S305-14 and S305-49. Organics were noted within the cohesive deposit in Boreholes S305-03, S305-05 and S305-13. The top of this deposit ranges from about Elevations 191.0 m to 187.0 m and the thickness of the deposit ranges from about 0.1 m to 3.5 m. The bottom of this deposit is defined by refusal to further auger and/or split-spoon advancement in Boreholes S305-02, S305-09 and S305-22.

The SPT 'N'-values measured within the cohesive strata or pockets range from 1 blow to 15 blows per 0.3 m of penetration. SPT 'N'-values exceeding 50 blows per less than 0.15 m of penetration were measured at refusal to split-spoon advancement in Boreholes S305-02, S305-09 and S305-22.

The natural water content measured on eleven (11) samples of the cohesive strata/pockets ranges from about 22 per cent to 49 per cent. Laboratory testing on one specimen of the silty clay deposit from Borehole S305-13 measured an organic content of about 4 per cent.

The grain size distributions of six (6) samples of the clayey silt with sand to clayey silt deposit are shown on Figure E.S305-05 in Appendix E.

Atterberg limits tests carried out on nine (9) samples of the cohesive strata/pockets measured liquid limits ranging from about 22 per cent to 36 per cent, plastic limits ranging from about 13 per cent to 20 per cent and plasticity indices ranging from about 5 per cent to 18 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure E.S305-06 in Appendix E and indicate that the material is classified as clayey silt of low plasticity to silty clay of intermediate plasticity.

Silt to Sand

Deposits, pockets or interlayers of brown to grey silt, sandy silt, silty sand or sand, all containing trace to some clay, trace gravel were encountered from ground surface in Borehole S305-09, below peat or topsoil in Boreholes S305-10, S305-11, S305-13, S305-14, S305-17, S305-23, S305-25 and S305-49 and below the clayey silt to silty clay deposit in Boreholes S305-03 to S305-06, S305-12 to S305-14, S305-20 and S305-49. Rootlets and/or organics were encountered in Boreholes S305-06, S305-09 to S305-14, S305-17, S305-25 and S305-49. Sandy silt seams were observed within the silty sand deposit in Borehole S305-10 while sand seams were encountered within the silt deposit in Borehole S305-13. The top of the overall sand to silt deposit ranges from about Elevations 194.9 m to 186.3 m and the thickness of the deposit ranges from about 0.4 m to 5.8 m. The bottom of this deposit is defined by refusal to further auger and/or split-spoon advancement in Boreholes S305-03 to S305-06, S305-10 to S305-14, S305-17, S305-19, S305-20, S305-23, S305-25 and S305-49.

The SPT 'N'-values measured within the various portions of the overall deposit generally range from 1 blow to 32 blows per 0.3 m of penetration, indicating a very loose to dense relative density. SPT 'N'-values between



50 blows per 0.03 m and 119 blows per 0.2 m were measured prior refusal to split-spoon advancement refusal in Boreholes S305-03, S305-04, S305-10, S305-12, S305-14 and S305-17.

The natural water content measured on 28 samples of this deposit ranges from about 14 per cent to 44 per cent.

The grain size distributions of eleven (11) samples of the silt to sand and silt deposit are shown on Figures E.S305-07A and E.S305-07B in Appendix E.

An Atterberg limits test carried out on one (1) sample of the silt and sand deposit from Borehole S305-20 measured a liquid limit of about 16 per cent, a plastic limit of about 14 per cent and a corresponding plasticity index of about 2 per cent. The result of the Atterberg limits test is shown on the plasticity chart on Figure E.S305-08 in Appendix E and indicates that the fines portion of this deposit is classified as a silt of slight plasticity.

Refusal

Bedrock outcrops are present on the south and north sides of the creek valley traversing the site at about STA 17+290. The bedrock surface at the boreholes and DCPTs as inferred by refusal to further auger or split-spoon advancement, shovel excavations and dynamic cone penetration was encountered at depths between about 0.1 m and 7.2 m below ground surface, corresponding to between about Elevations 192.2 m and 180.5 m. Refusal was encountered at the greatest depths below ground surface in the valley area at about STA 17+300 at about Elevation 180.5 m.

Groundwater Conditions

In general, the samples taken in the boreholes were moist to wet. Water levels observed in the open boreholes upon completion of drilling range from about Elevations 192.8 m to 186.3 m, measured at the ground surface to 1.4 m below ground surface. Shovel excavations at Boreholes S305-01, S305-07, S305-08, S305-15, S305-16 and S305-18 and Boreholes S305-09, S305-19, S305-21 and S305-23 were noted to be dry upon completion of excavating/drilling operations.

4.11 Bekanon Road E/W-S Ramp – STA 17+485 to 17+650 (Swamp 305)

The plan and profiles along the centreline and toes of the proposed embankment of the new Bekanon Road E/W-S Ramp showing the borehole locations and interpreted stratigraphy between about STA 17+485 and 17+650 in the Township of Henvey are presented on Drawings E1, E7 and E8 in Appendix E. The proposed embankment within this section of the ramp alignment is up to about 7.5 m high relative to the existing ground surface.

A total of 13 boreholes (Boreholes S305-27, S305-30 and S305-38 to S305-48) and six (6) Dynamic Cone Penetration Tests (DCPTs S305-DC09 and S305-DC14 to S305-DC18) were completed to investigate the subsurface conditions within the swamp/high fill area. The topography along the alignment of the proposed ramp is relatively flat and sloping down from south to north. The overall site generally consists of an open field, which is part of an existing lumber yard, and relatively thin surficial layers and mounds of wood fragments/sawdust can be found throughout the site. Brush and trees occupy the south limit of the ramp alignment.



The subsurface soils along the ramp alignment in Swamp 305 generally consist of topsoil, or fill materials typically comprised of wood fragments/sawdust, underlain by a deposit of silt to silty sand which in turn is underlain by inferred bedrock. In places, a deposit of silty sand and gravel was encountered between the silt to silty sand deposit and the bedrock. Where encountered in the boreholes, the fill materials and a near surface non-cohesive deposit are underlain by a deposit of clayey silt to silt underlain by a non-cohesive deposit and/or bedrock. Resistance to dynamic cone penetration and borehole advancement was generally encountered at depths ranging from 0.1 m to 2.9 m below ground surface. Bedrock outcrops are present along the west side of the ramp alignment near the southern limit of the investigated area.

Topsoil

An approximately 0.1 m to 0.3 m thick layer of topsoil was encountered at the ground surface in Boreholes S305-27, S305-42, S305-43, S305-47 and S305-48. The top of the topsoil ranges from about Elevations 193.6 m to 191.2 m.

Fill

Fill material comprised of wood fragments/sawdust was encountered at the ground surface in Boreholes S305-38 to S305-41 and S305-44 to S305-46 and a grey layer of fill material comprised of grey sandy silt containing rootlets, organics and wood fragments was encountered at the ground surface in Borehole S305-30 and below the wood fragments/sawdust in Borehole S305-41. The top of the fill deposit ranges from about Elevations 193.4 m to 191.5 m and the thickness of the deposit ranges from about 0.2 m to 0.7 m.

Two (2) SPT 'N'-values measured within the sandy silt fill layer are 1 blow and 2 blows per 0.3 m of penetration, indicating a very loose relative density.

The natural water content measured on two (2) samples of the sandy silt fill material is about 197 per cent and 21 per cent, respectively.

Clayey Silt

A deposit of brown to grey clayey silt, trace sand was encountered below the layer of wood fragments/sawdust fill in Boreholes S305-44 and S305-45, below a silty sand layer in Borehole S305-47 and below topsoil in Borehole S305-48. Organics or rootlets were noted within the cohesive deposit in Boreholes S305-44, S305-45 and S305-47. The top of this deposit ranges from about Elevations 192.0 m to 190.9 m and the thickness of the deposit ranges from about 0.3 m to 1.1 m.

The SPT 'N'-values measured within this deposit range from 2 blows to 5 blows per 0.3 m of penetration, indicating a soft to firm consistency.

The natural water content measured on five (5) samples of this deposit ranges from about 21 per cent to 28 per cent.

Atterberg limits tests carried out on four (4) samples of the cohesive deposit measured liquid limits ranging from about 23 per cent to 34 per cent, plastic limits ranging from about 14 per cent to 19 per cent and plasticity indices ranging from about 5 per cent to 17 per cent. The results of the Atterberg limits tests are shown on the



plasticity chart on Figure E.S305-09 in Appendix E and indicate that the material is classified as clayey silt of low plasticity.

Silt to Sand

A deposit of brown to grey silt to sandy silt to silt and sand to sand, containing trace to some clay, trace to some gravel in places was encountered below the topsoil in Boreholes S305-27, S305-42, S305-43 and S305-47, below the fill materials in Boreholes S305-30, S305-38, to S305-41 and S305-46 and below a layer of clayey silt on Boreholes S305-44, S305-45, S305-47 and S305-48. Rootlets and organics, silt seams, sand seams clayey silt seams were encountered in various boreholes. The top of this deposit ranges from about Elevations 193.5 m to 190.5 m and the thickness of the deposit ranges from about 0.2 m to 1.8 m. The bottom of this deposit is defined by refusal to further split-spoon and/or auger advancement in Boreholes S305-27, S305-30, S305-38, S305-39 and S305-41 to S305-47.

The SPT 'N'-values measured within the various layers of the silt to sand range from 1 blow to 22 blows per 0.3 m of penetration, indicating a very loose to compact relative density. SPT 'N'-values exceeding 51 blows per less than 0.3 m of penetration were measured prior to split-spoon refusal on probable bedrock in Boreholes S305-27, S305-41 to S305-44 and S305-48.

The natural water content measured on 19 samples of the various layers/strata of the silt to sand ranges from about 13 per cent to 41 per cent.

The grain size distributions of 12 samples of the silt to silt and sand portions of the deposit are shown on Figures E.S305-10A and E.S305-10B in Appendix E.

Atterberg limits tests carried out on two (2) samples of the silt stratum of the deposit measured liquid limits of about 22 per cent and 23 per cent, plastic limit of about 19 per cent and 20 per cent and a corresponding plasticity index of about 3 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure E.S305-10 in Appendix E and indicate that the material is classified as a silt of slight plasticity.

An Atterberg limits test carried out on one (1) samples of the silt and sand deposit from Borehole S305-30 indicates that the material is non-plastic.

Silty Sand and Gravel

A deposit of brown silty sand and gravel was encountered below the sandy silt stratum in Borehole S305-40. The top of this deposit is at about Elevation 190.3 m and the thickness of the deposit is about 0.2 m. The bottom of this deposit is defined by refusal to further auger advancement in Borehole S305-40.

The natural water content measured on a sample of this deposit is about 13 per cent.

Bedrock / Refusal

Bedrock outcrops are present along the west side of the ramp alignment near the south limit of the investigated area. The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon and/or auger advancement or dynamic cone penetration at depths between about 0.1 m and 2.9 m below the ground surface, corresponding to between about Elevations 194.2 m and 188.7 m.



Bedrock was encountered and core samples were recovered from Borehole S305-48, as shown on the photograph of the recovered core samples presented on Figure E.S305-12. The depth to the surface of the bedrock in this borehole is about 2.5 m, corresponding to Elevation 188.7 m. The bedrock consist of granite gneiss and the core samples are described as fresh, foliated, grey, pink and dark grey, medium crystalline, slightly porous and strong. The Rock Quality Designation (RQD) measured on the core samples ranges from 89 per cent to 100 per cent, indicating a rock mass of good to excellent quality. The Total Core Recovery (TCR) and Solid Core Recovery (SCR) of the core samples range from 98 per cent to 100 per cent and from 85 per cent to 100 per cent, respectively.

Axial and diametral point load tests were carried out on selected samples of the granite gneiss bedrock core and the strength index values are shown on the Record of Drillhole sheets and are presented in Table E1 in Appendix E. An axial test and a diametral test measured Is_{50} values of about 9 MPa and 4 MPa, respectively.

Also presented in Table E1 are the estimated Uniaxial Compressive Strength (UCS) values for each sample tested for point load strength based on a relationship between Is_{50} and UCS which is given by a correlation factor (K) in accordance with ASTM D5731-08 – Standard Test Method for Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classification, which varies depending on the size of the core sample and the strength of the rock. For this site, the UCS values are based on an estimated average correlation factor (K) of 19.

Based on the point load test results of about 170 MPa and 74 MPa for the axial and diametral tests, respectively, and in accordance with Table 3.5 in *CFEM* (2006), the granite gneiss bedrock is classified as strong (R4, 50 MPa < UCS < 100 MPa) to very strong (R5, 100 MPa < UCS < 250 MPa).

Groundwater Conditions

In general, the samples taken in the boreholes were moist to wet. Water levels observed in the open boreholes upon completion of drilling range from about Elevations 192.6 m to 190.6 m measured at depths between about 0.2 m and 1.1 m below ground surface, with the exception of Boreholes S305-27, S305-38 and S305-39 which were observed to be dry upon completion of drilling.

4.12 Bekanon Road S-E/W Ramp – STA 16+975 to 17+140 (Swamp 306)

The plan and profiles along the centreline and toes of the proposed embankment of the new Bekanon Road S-E/W Ramp showing the borehole locations and interpreted stratigraphy between about STA 16+975 and 17+140 in the Township of Henvey are presented on Drawing F1 in Appendix F. The proposed alignment within this section of the ramp is up to about 7.0 m above the ground surface.

A total of 14 boreholes (Boreholes S305-02 and S306-01 to S306-13) and five (5) Dynamic Cone Penetration Tests (DCPTs S306-DC01 to S306-DC05) were completed to investigate the subsurface conditions within the swamp area. The topography along the proposed ramp is relatively flat with higher ground near the south-west limit of the investigated area. The terrain is brush and tree covered essentially throughout and bedrock outcrops are present on the west side of the swamp.

The subsurface soils along the ramp alignment in Swamp 306 generally consist of layers of peat and topsoil at the ground surface or below ice cover/ponded water, underlain by a deposit of clayey silt to silty clay or a silt and



sand deposit. The cohesive deposit is underlain by inferred bedrock or a sandy silt to sand deposit which is underlain by inferred bedrock. At several locations within the swamp limits, the topsoil or peat extends to the depth of refusal to split-spoon advancement. Resistance to dynamic cone penetration, shovel excavation and borehole advancement was generally encountered at depths ranging from about 0.1 m to 3.6 m below ground surface/water surface.

Ice / Water

Ice or ice/water cover to depths of between 0.1 m and 0.3 m was encountered at surface in Borehole S306-06, S305-11 and S306-13 at the time of investigation.

Peat / Topsoil / Root Mat

An approximately 0.1 m to 0.6 m thick layer of fibrous or amorphous peat or root mat was encountered at the ground surface in Boreholes S305-02, S306-02, S306-05, S306-09 and S306-10 and below the ice or water in Boreholes S306-06, S306-11 and S306-13; and an approximately 0.1 m to 0.2 m thick layer of topsoil was encountered at the ground surface in Boreholes S306-01, S306-03 and S306-07. The top of the organic layer ranges from about Elevations 191.9 m to 190.3 m. The bottom of topsoil was defined by further shovel advancement in Borehole S306-07.

One (1) SPT 'N'-value measured within the fibrous peat is 2 blows per 0.3 m of penetration, suggesting a very soft consistency. SPT 'N'-values of 55 blows per 0.18 m of penetration and 53 blows per 0.2 m of penetration were measured prior to split-spoon refusal on probable bedrock in two (2) boreholes.

The natural water content measured on two (2) specimens of the amorphous peat layer is about 82 per cent and 72 per cent.

Clayey Silt with Sand to Silty Clay

A deposit of brown to grey clayey silt with sand to clayey silt, trace sand to silty clay was encountered below the peat or topsoil or root mat in Boreholes S306-02, S306-03, S306-05, S306-06, S306-11 and S306-13 and below the surface of a deposit of sandy silt in Borehole S306-08. Organics were encountered within the cohesive deposit in all boreholes, except in Borehole S305-02 and S306-11. The top of this deposit ranges from about Elevations 191.2 m to 190.0 m and the thickness of the deposit ranges from about 0.2 m to 1.7 m. Boreholes S305-02, S306-08, S306-11 and S306-13 were terminated within the cohesive deposit upon refusal to further split-spoon advancement.

The SPT 'N'-values measured within the cohesive deposit range from 2 blows to 14 blows per 0.3 m of penetration, indicating a soft to stiff consistency. SPT 'N'-values of greater than 53 blows per less than 0.3 m of penetration were measured at split-spoon refusal on probable bedrock in Boreholes S305-02, S306-08, S306-11 and S306-13.

The natural water content measured on eight (8) samples of the cohesive deposit ranges from about 21 per cent to 41 per cent. Laboratory testing on one specimen of the clayey silt deposit measured an organic content of about 3 per cent.



The grain size distributions of five (5) samples of the clayey silt with sand to silty clay deposit are shown on Figure F.S306-01 in Appendix F.

Atterberg limits tests carried out on five (5) samples of the cohesive deposit measured liquid limits ranging from about 26 per cent to 47 per cent, plastic limits ranging from about 15 per cent to 18 per cent and plasticity indices ranging from about 10 per cent to 28 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure F.S306-02 in Appendix F and indicate that the material is classified as clayey silt of low plasticity to silty clay of intermediate plasticity.

Sandy Silt to Sand

A deposit of sandy silt to silt and sand, trace to some clay to silty sand to sand was encountered at the ground surface in Borehole S306-08, below the topsoil in Borehole S306-01 and below the clayey silt to silty clay deposit in Boreholes S306-02, S306-03, S305-05 and S306-06. Organics were encountered in Boreholes S306-01 and S306-08, and sand seams were also noted in Borehole S306-01. The top of this deposit ranges from about Elevations 191.7 m to 189.1 m and the thickness of the deposit ranges from about 0.3 m to 1.6 m. The bottom of this deposit was defined by refusal to further split-spoon advancement in Boreholes S306-01 to S306-03, S306-05 and S306-06.

The SPT 'N'-values measured within this deposit range from 1 blow to 26 blows per 0.3 m of penetration, indicating a very loose to compact relative density. SPT 'N'-values exceeding 50 blows per less than 0.3 m of penetration were measured in these boreholes prior to split-spoon refusal on probable bedrock.

The natural water content measured on five (5) samples of this deposit ranges from about 17 per cent to 25 per cent.

The grain size distributions of four (4) samples of the sandy silt to silt and sand deposit are shown on Figure F.S306-03 in Appendix F.

Atterberg limits test carried out on two (2) samples of the sandy silt to silt and sand deposit indicate that the material is non-plastic.

Refusal

Bedrock outcrops are present along the west toe of the proposed embankment. The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon advancement and shovel excavation or dynamic cone penetration at depths between about 0.1 m and 3.6 m below the ice cover or ground surface, corresponding to between about Elevations 193.8 m and 187.1 m. In general, refusal was encountered at greater depth near the southern limit of the swamp area between about STA 17+000 and 17+050.

Groundwater Conditions

In general, the samples taken in the boreholes were moist to wet. Water levels observed in the open boreholes upon completion of drilling range from about Elevations 190.7 m to 189.7 m, measured either at the ice/ground surface to 1.2 m below ice/ground surface, with the exception of Boreholes S306-04, S306-07, S306-09, S306-10 and S306-12 which were noted to be dry upon completion of excavating/drilling.



4.13 Bekanon Road S-E/W Ramp – STA 17+415 to 17+450 (Swamp 307)

The plan and profiles along the centreline and toes of the proposed embankment of the new Bekanon Road S-E/W Ramp showing the borehole locations and interpreted stratigraphy between about STA 17+415 and 17+450 in the Township of Henvey are presented on Drawing G1 in Appendix G. The proposed embankment within this section of the ramp is up to about 5 m high relative to the existing ground surface.

A total of five (5) boreholes (Boreholes S307-01 to S307-05) and two (2) DCPTs (DCPTs S307-DC01 and S307-DC02) were completed to investigate the subsurface conditions within this swamp area. This section of the proposed ramp embankment traverses a swamp located within the confines of valley slopes to the north and south. A small creek is present near the middle of the valley and flows from east to west. In general, the ground cover consists of shrubs and treed areas.

The subsurface soils along the ramp alignment in Swamp 307 generally consist of a layer of peat at the ground surface underlain by a cohesive deposit of clayey silt. The cohesive deposit is underlain by a deposit of silt and sand to silty sand along the embankment centreline and by a deposit of sand and gravel along the east and west toes of the embankment. The non-cohesive deposits are in turn underlain by inferred bedrock. Resistance to dynamic cone penetration and borehole advancement was encountered at depths ranging between about 1.4 m and 3.1 m below ground surface.

Peat

A surficial deposit of amorphous peat was encountered at the ground surface in all boreholes. The top of the peat deposit ranges between about Elevations 189.4 m and 189.2 m and the thickness of the deposit varies from about 0.1 m to 0.2 m.

Clayey Silt with Sand to Clayey Silt

A deposit of brown clayey silt with sand to clayey silt, some sand, trace organics was encountered below the peat deposit in all boreholes. The top of the cohesive deposits ranges between about Elevations 189.2 m and 189.0 m and the thickness of the layer varies from about 0.4 m to 1.6 m.

The SPT 'N'-values measured within this deposit range from 1 blow to 11 blows for 0.3 m of penetration, indicating a very soft to stiff consistency.

The natural water content measured on six (6) samples of this deposit ranges from about 17 per cent to 27 per cent.

The grain size distributions of three (3) samples of the clayey silt deposit are shown on Figure G.S307-01 in Appendix G.

Atterberg limits tests carried out on five (5) samples of the cohesive deposit measured liquid limits ranging from about 20 per cent to 23 per cent, plastic limits ranging from about 14 per cent to 18 per cent and plasticity indices ranging from about 5 per cent to 7 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure G.S307-02 in Appendix G and indicate that the material is classified as clayey silt of low plasticity.



Silt and Sand to Silty Sand

A deposit of brown to grey silt and sand to silty sand was encountered below the clayey silt with sand to clayey silt deposit in Boreholes S307-01, S307-03 and S307-05. The top of this non-cohesive deposit ranges from about Elevations 188.7 m to 187.6 m and the thickness of the deposit ranges from about 0.9 m to 1.2 m. The bottom of this deposit was defined by refusal to further split-spoon and/or auger advancement in Boreholes S307-01, S307-03 and S307-05.

The SPT 'N'-values measured within this deposit generally range from 5 blow to 17 blows per 0.3 m of penetration, indicating a loose to compact relative density. SPT 'N'-values exceeding 103 blows per 0.1 m of penetration were measured prior at split-spoon and auger refusal on probable bedrock in two (2) boreholes.

The natural water content measured on three (3) samples of this deposit ranges from about 16 per cent to 21 per cent.

The grain size distribution of two (2) samples of the silt and sand to silty sand deposit is shown on Figure G.S307-03 in Appendix G.

Gravelly Sand to Sand and Gravel

A deposit of grey gravelly sand, trace silt and clay to sand and gravel, trace silt was encountered below the clayey silt deposit in Boreholes S307-02 and S307-04, respectively. The top of this non-cohesive deposit is at about Elevation 188.0 m and the thickness of the deposit is about 0.8 m. The bottom of this deposit was defined by refusal to further split-spoon and/or auger advancement in both boreholes.

The SPT 'N'-values measured within this deposit generally are 12 blows and 21 blows per 0.3 m of penetration, indicating a compact relative density. SPT 'N'-values exceeding 1012 blows per 0.2 m of penetration were measured at split-spoon refusal on probable bedrock in both boreholes.

The natural water content measured on two (2) samples of this deposit is about 13 per cent and 19 per cent.

The grain size distributions of two (2) samples of the gravelly sand to sand and gravel deposit are shown on Figure G.S307-04 in Appendix G.

Refusal

The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon and/or auger advancement or dynamic cone penetration, at depths between about 1.4 m and 3.1 m below ground surface, corresponding to between about Elevations 187.7 m and 186.0 m.

Groundwater Conditions

The samples taken in the boreholes were moist to wet. In general, the water level in the open boreholes was noted at between about Elevations 189.2 m and 188.0 m measured at between 0.1 m and 1.2 m below ground surface.



4.14 Highway 69 SBL – STA 18+375 to 18+550 (Swamp 308)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 SBL alignment showing the borehole locations and interpreted stratigraphy between about STA 18+375 and 18+550 in the Township of Henvey are presented on Drawing H1 in Appendix H. The proposed embankment within this section of the highway is up to about 5 m high relative to the existing ground surface.

A total of 15 boreholes (Boreholes S308-01 to S308-15) and seven (7) DCPTs (DCPTs S308-DC01 to S308-DC07) were completed to investigate the subsurface conditions within this swamp area. The topography of this section of the proposed highway slopes upward to the north, with the surrounding terrain being tree covered and interspersed with bedrock outcrops generally near the middle and northern limit of the investigated area. A small creek traverses the alignment east to west near the south limit of the swamp at approximately STA 18+400 and shallow open water was encountered east of the alignment between about STA 18+480 and 18+520.

Ice and water were encountered near the north limit of the swamp at the time of the investigation. The subsurface soils along the SBL alignment in Swamp 308 generally consist of a layer of peat at the ground surface underlain by a silt to silt and sand deposit, and in places, the peat deposit is underlain by inferred bedrock. The peat layer and the underlying non-cohesive deposit is also underlain in places by a clayey silt with sand to silty clay deposit which in turn is underlain by a lower silt to silt and sand deposit. The silt to silt and sand deposit is underlain by inferred bedrock. At one location near the south limit of the swamp, a sand and gravel deposit was encountered underlying the silt and sand deposit prior to refusal. The resistance to dynamic cone penetration, shovel excavation and borehole advancement, was encountered at depths varying between about 0.1 m and 4.4 m, being the deepest south of the creek at about STA 18+390.

Ice/Water

Ponded water and ice were encountered overlying ground surface in Borehole S308-10 to a depth of about 0.6 m.

Peat

A deposit of black amorphous or fibrous peat was encountered immediately at the ground surface in all boreholes, except in Borehole S308-10. The top of the peat deposit ranges from about Elevations 198.0 m and 192.8 m and the thickness of the deposit ranges from about 0.1 m to 0.6 m. The bottom of this deposit is defined by refusal to further split-spoon advancement in Borehole S308-08, shovel excavation in Boreholes S308-12, S308-13 and S308-15.

SPT 'N'-values measured within the amorphous peat range from 1 blow to 3 blows per 0.3 m of penetration, indicating a very soft to soft consistency.

The natural water content measured on four (4) samples of this deposit ranges from about 42 per cent to 96 per cent.



Clayey Silt with Sand to Silty Clay

A deposit of brown to grey clayey silt with sand to clayey silt, trace to some sand to silty clay, trace to some sand was encountered below the peat deposit in Boreholes S308-02 and S308-04, below the ponded water in Borehole S308-10, and interlayered within the silt to sandy silt deposit in Boreholes S308-01 and S308-14. The deposit contains organics in all boreholes, except in Borehole S308-10 and silt seams were also encountered in Boreholes S308-01, S308-02 and S308-04. The top of this deposit is between about Elevations 196.1 m and 193.0 m and the thickness of the layer varies from 0.6 m to 1.8 m.

The SPT 'N'-values measured within this deposit range from 3 blows to 25 blows for 0.3 m of penetration, suggesting a soft to very stiff consistency.

The natural water content measured on six (6) samples of this deposit ranges from about 21 per cent to 35 per cent.

The grain size distributions of two (2) samples of the clayey silt to silty clay deposit are shown on Figure H.S308-01 and in Appendix H.

Atterberg limits tests carried out on four (4) samples of this deposit measured liquid limits ranging from about 22 per cent to 37 per cent, plastic limits ranging from about 15 per cent to 17 per cent, and plasticity indices ranging from about 7 per cent to 20 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure H.S308-02 in Appendix H and indicate that the material is classified as clayey silt of low plasticity to silty clay of intermediate plasticity.

Silt to Silt and Sand

A deposit of brown to grey silt, trace to some sand to sandy silt, trace to some clay to silt and sand, trace to some gravel, trace to some clay to was encountered below the peat deposit in Boreholes S308-01, S308-03, S308-05 to S308-07, S308-09, S308-11 and S308-14 and below the cohesive deposit in Boreholes S308-01, S308-04, S308-10 and S308-14. The overall top of this deposit ranges from about Elevations 196.4 m to 192.0 m and the total thickness of the deposit ranges from about 0.1 m to 2.7 m. The bottom of this deposit is defined by refusal to further split-spoon and/or casing advancement in Boreholes S308-01, S308-03, S308-05 to S308-07, S308-09 to S308-11 and S308-14.

The SPT 'N'-values measured within this deposit range from 0 blows (weight of hammer) to 32 blows per 0.3 m of penetration, indicating a very loose to dense relative density. SPT 'N'-values greater than 105 blows per less than 0.2 m of penetration were measured in some boreholes on refusal to split-spoon and/or casing advancement.

The natural water content measured on nine (9) samples of this deposit generally ranges from about 14 per cent to 45 per cent.

The grain size distributions of seven (7) samples of the non-cohesive deposit are shown on Figure H.S308-03 in Appendix H.



Sand and Gravel

An approximately 0.6 m thick deposit of grey sand and gravel, trace silt was encountered below the silt and sand deposit in Borehole S308-04. The top of this deposit is at about Elevation 189.3 m.

A SPT 'N'-value measured within this deposit is 7 blows per 0.3 m of penetration, indicating a loose relative density.

Refusal

The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon advancement, shovel excavation or dynamic cone penetration at depths between about 0.1 m and 4.4 m below ground surface, corresponding to between about Elevations 197.9 m and 188.7 m. The depth to refusal is greatest at about STA 18+390 at the west toe of the embankment.

Groundwater Conditions

The samples taken in the boreholes were moist to wet. Ponded water and ice were present at the time of the investigation at the surface of Borehole S308-10, with the ice surface at about Elevation 196.3 m. The water level in the open boreholes was noted at between about Elevations 196.5 m and 192.0 m, measured at between the ground surface and 1.2 m below ground surface. Boreholes S308-08, S308-09, S308-12, S308-13 and S308-15 were noted to be dry.

4.15 Highway 69 NBL – STA 18+375 to 18+535 (Swamp 308)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 NBL alignment showing the borehole locations and interpreted stratigraphy between about STA 18+375 and 18+550 in the Township of Henvey are presented on Drawings H1 and H2 in Appendix H. The proposed embankment within this section of the highway is generally up to about 1 m high relative to the existing ground surface; except at approximately STA 18+400 where the embankment is about 5 m high as it crosses a narrow deeper valley.

A total of 10 (ten) boreholes (Boreholes S308-16 to S308-25) and four (4) DCPTs (DCPTs S308-DC08 to S308-DC11) were completed to investigate the subsurface conditions within this swamp area. The topography of this section of the proposed highway is undulating, but in general, the topography slopes upward to the north, with the surrounding terrain being tree covered and interspersed with occasional bedrock outcrops, generally near the middle of the investigated area. A small creek traverses the alignment east to west near the south limit of the swamp at approximately STA 18+400 and shallow open water was generally encountered west and east of the alignment between about STA 18+480 and 18+520.

Ice and water were present at surface near the north limit of the swamp at the time of the investigation. The subsurface soils along the NBL alignment in Swamp 308 generally consist of a deposit of peat underlain by bedrock or by a clayey silt to silty clay deposit which in turn is underlain by a silt to silt and sand deposit and inferred bedrock. In places, the peat deposit is underlain by a silt and sand deposit or a silty sand to gravelly sand deposit underlain by bedrock. Refusal to dynamic cone penetration, shovel excavation and borehole advancement was encountered at depths up to about 3.8 m, being the deepest along the east toe of the embankment near the northern limit of the swamp (i.e. beyond STA 18+470).



Ice/Water

Ponded water and ice were encountered overlying ground surface in Borehole S308-25 to a depth of about 0.6 m.

Peat

A deposit of black amorphous or fibrous peat was encountered immediately at the ground surface in all boreholes, except in Boreholes S308-19, S308-20 and S308-25. The top of the peat deposit ranges from about Elevations 197.6 m and 193.0 m and the thickness of the deposit ranges from about 0.1 m to 0.6 m. The bottom of peat deposit was defined by refusal to further split-spoon advancement in Borehole S308-16, shovel excavation in Boreholes S308-21 to S308-23.

A SPT 'N'-value measured within the amorphous peat is 1 blow per 0.3 m of penetration, indicating a very soft consistency. A SPT 'N'-value of 105 blows per 0.20 m of penetration was measured on refusal to split-spoon advancement in Borehole S308-16.

Clayey Silt to Silty Clay

A deposit of brown clayey silt to silty clay, trace sand was encountered below the ponded water in Borehole S308-25 and below the peat in Borehole S308-24. The top of this deposit is at about Elevations 196.4 m and 195.8 m in Borehole S302-24 and S308-25, respectively, and the thickness of the layer is about 2.3 m and 1.2 m.

The SPT 'N'-values measured within this deposit range from 2 blows to 8 blows for 0.3 m of penetration, indicating a soft to firm consistency.

The natural water content measured on three (3) samples of this deposit ranges from about 26 per cent to 32 per cent.

A grain size distribution of a sample of the silty clay deposit is shown on Figure H.S308-04 in Appendix H.

Atterberg limits tests carried out on two (2) samples of this deposit measured liquid limits of about 29 per cent and 47 per cent, plastic limits of about 16 per cent and 19 per cent and corresponding plasticity indices of about 13 per cent and 28 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure H.S308-05 in Appendix H and indicate that the material is classified as clayey silt of low plasticity to silty clay of intermediate plasticity.

Silt to Silty Sand

A deposit of brown to grey silt, some sand, trace to some clay to silt and sand, trace clay, trace organics to silty sand, trace gravel was encountered below the peat in Borehole S308-17, below the clayey silt to silty clay in Boreholes S308-24 and S308-25 and below a gravelly sand deposit in Borehole S308-18. The top of this deposit ranges from about Elevations 195.4 m to 191.2 m and the thickness of the deposit ranges from about 0.2 m to 1.3 m. The bottom of this deposit is defined by refusal to further split-spoon and/or casing advancement in Boreholes S308-17, S308-18, S308-24 and S308-25.



The SPT 'N'-values measured within this deposit range from 7 blows to 28 blows per 0.3 m of penetration, indicating a loose to compact relative density. SPT 'N'-values greater than 57 blows per less than 0.2 m of penetration were measured prior to split-spoon and/or casing refusal in Boreholes S308-16, S308-18, S308-24 S308-25.

The natural water content measured on five (5) samples of this deposit generally range from about 19 per cent to 23 per cent.

The grain size distributions of three (3) samples of the silt to silt and sand portions of the deposit are shown on Figure H.S308-06 in Appendix H.

Gravelly Sand

An approximately 1.2 m thick deposit of grey gravelly sand, trace to some silt, trace organics was encountered below the peat deposit in Borehole S308-18. The top of this deposit is at about Elevation 192.4 m.

The SPT 'N'-values measured within this deposit are 12 blows and 14 blows per 0.3 m of penetration, indicating a compact relative density.

A grain size distribution of a sample of the gravelly sand deposit is shown on Figure H.S308-07 in Appendix H.

Refusal

Bedrock outcrops are present along the proposed NBL alignment and at the locations of Boreholes S308-19 to S308-23. The bedrock surface at the locations of the boreholes and DCPTs is inferred by refusal to further split-spoon and/or casing advancement, shovel excavation or dynamic cone penetration at ground surface to depths up to about 3.8 m below ground surface, corresponding to between about Elevations 197.6 m and 191.0 m.

Groundwater Conditions

The samples taken in the boreholes were moist to wet. Ponded water and ice was present at surface in Borehole S308-25, with the ice surface at about Elevation 196.4 m. The water level in the open boreholes was noted at about Elevations 192.4 m and 196.6 m, measured at 0.6 m below ground surface and at ground surface in Borehole S308-18 and S308-24, respectively. All other boreholes and hand shovel excavations were noted to be dry.

4.16 Highway 69 SBL – STA 19+200 to 19+325 (Swamp 309)

The plan and profiles along the centreline and toes of the proposed embankment of the new Highway 69 SBL alignment showing the borehole locations and interpreted stratigraphy between about STA 19+200 and 19+325 in the Township of Henvey are presented on Drawing I1 in Appendix I. The proposed embankment within this section of the highway is up to about 6 m high relative to the existing ground surface.

A total of eleven (11) boreholes (Boreholes S309-01 to S309-11) and five (5) DCPTs (DCPTs S309-DC01 to S309-DC05) were completed to investigate the subsurface conditions within this swamp area. The topography



of this section of the highway is relatively flat with the southern limit of the swamp bounded by a relatively steep slope. The entire swamp area is tree covered.

The subsurface soils along the SBL alignment in Swamp 309 generally consist of a layer of topsoil underlain by a near surface layer of clayey silt and/or an upper non-cohesive deposit of silt to silty sand which in turn is underlain by a deposit of clayey silt to clay which contains occasional pockets of silt to silty sand. The clayey silt to clay deposit is underlain by a lower non-cohesive deposit of silt to sand which in turn is underlain by inferred bedrock. Resistance to dynamic cone penetration and borehole advancement was encountered at depths of up to about 13.8 m below ground surface.

Topsoil

An approximately 0.1 m to 0.7 m thick layer of topsoil was encountered at the ground in all the boreholes. The surface of the topsoil ranges from about Elevations 195.8 m to 195.0 m.

A natural water content measured on a sample of the topsoil is about 27 per cent.

Clayey Silt

A near surface deposit of brown clayey silt, trace to some sand was encountered below the topsoil in Boreholes S309-01 to S309-05. The deposit generally contains oxidation staining and silt seams and rootlets and organics were noted in Borehole S309-01. The top of this deposit ranges between about Elevations 195.6 m and 195.2 m and the thickness of the deposit ranges from about 0.4 m to 0.8 m.

The SPT 'N'-values measured within this deposit range from 1 blow to 6 blows per 0.3 m of penetration, indicating a very soft to firm consistency.

The natural water content measured on two (2) samples of this deposit is about 24 per cent and 25 per cent.

Silt to Silty Sand (Upper Deposit)

A deposit of non-cohesive soil comprised of brown to grey silt to sandy silt to silt and sand to silty sand was encountered below the topsoil or upper stratum of clayey silt in all the boreholes, except in Borehole S309-08. The majority of the non-cohesive deposit contains silt to sand or clayey silt layers/seams and oxidation staining and rootlets/organics in the upper portion of the deposit in Boreholes S309-06 and S309-11. The top of this non-cohesive deposit ranges from about Elevations 195.2 m to 194.4 m, and the thickness of the non-cohesive deposit ranges from about 0.3 m to 1.8 m. Borehole S309-02 was terminated within this deposit at a depth of 2.5 m below existing ground surface, corresponding to approximately Elevation 193.3 m.

The SPT 'N'-values measured within this deposit generally range from 3 blows to 22 blows per 0.3 m of penetration, indicating a very loose to compact relative density. An SPT 'N'-value of 100 blows per 0.15 m of penetration was measured in the silt and sand deposit at refusal to split-spoon advancement on probable bedrock in Borehole S309-02.

The natural water content measured on seven (7) samples of this deposit ranges from about 20 per cent to 28 per cent.



The grain size distributions of two (2) samples of the sandy silt to silt and sand portions of the deposit are shown on Figure I.S309-01 in Appendix I.

Clayey Silt to Clay

A deposit of brown to grey clayey silt to clay was encountered below the topsoil in Boreholes S309-08 and below the upper deposit of silt to silty sand in Boreholes S309-01, S309-03 to S309-07 and S309-09 to S309-11. In general, the deposit contains trace to some silt and sand to sandy silt seams typically within the upper portion of the deposit. In places, the cohesive deposit contains silt to silty sand pockets up to about 1.2 m thick at various depths across the boreholes. The top of this deposit ranges between about Elevations 194.7 m and 193.5 m and the overall thickness of the deposit ranges from 3.4 m to 8.3 m.

The SPT 'N'-values measured within the cohesive deposit generally range from 0 blows (weight of hammer) to 9 blows per 0.3 m of penetration. In situ field vane tests carried out within this deposit generally measured undrained shear strengths ranging from about 15 kPa to 62 kPa, indicating a soft to stiff consistency. The sensitivity ranges from about 1 to 10. In Boreholes S309-04, S309-07, S309-08 and S309-11, in situ field vane tests carried out within the upper portion of the cohesive deposit (i.e. above a depth of about 3.5 m below existing ground surface) measured undrained shear strengths greater than 96 kPa, indicating a stiff upper crust.

The natural water content measured on 30 samples of this deposit ranges from about 21 per cent to 75 per cent.

The grain size distributions of three (3) samples of the clayey silt and clay are shown on Figure I.S309-02 in Appendix I.

Atterberg limits tests carried out on 17 samples of this deposit measured liquid limits ranging from about 21 per cent to 60 per cent, plastic limits ranging from about 14 per cent to 22 per cent and plasticity indices ranging from about 5 per cent to 38 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure I.S309-03 in Appendix I, and indicate that the material ranges from a clayey silt of low plasticity to a clay of high plasticity.

A laboratory consolidation test was carried out on one (1) specimen of the silty clay portion of the cohesive deposit obtained from a Shelby tube sample in Borehole S309-03. A preconsolidation stress of about 110 kPa was estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight of about 15 kN/m³ and a specific gravity of about 2.77 were measured on the consolidation test specimen. Details of the test results are shown on Figure I.S309-04 in Appendix I, and the test results are summarized below.



FOUNDATION REPORT – SWAMP CROSSINGS AND HIGH FILL AREAS - HIGHWAY 69 GWP 5404-05-00; WP 5404-05-01

| Borehole Sample No. | Sample Depth / Elevation | σ_{vo}' (kPa) | σ_p' (kPa) | $\sigma_p' - \sigma_{vo}'$ (kPa) | OCR | C_c | C_r | e_o | c_v^* (cm ² /s) |
|------------------------------|--------------------------|----------------------|-------------------|----------------------------------|-----|-------|-------|-------|------------------------------|
| Borehole S309-03 Sample 9 | 7.2 m / 188.1 m | 110 | 110 | ~ 0 | 1.0 | 1.31 | 0.080 | 1.96 | 1.6×10^{-3} |

Note: * For stress range between effective overburden stress and final stress due to a 6.0 m high embankment, that is $60 \text{ kPa} \leq \sigma_v' \leq 175 \text{ kPa}$.

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 e_o is the initial void ratio
 C_c is the compression index
 C_r is the recompression index
 c_v is the coefficient of consolidation in cm²/s

Silt to Silty Sand (Pockets)

Within the cohesive deposit of clayey silt to clay, pockets of grey silt to sandy silt to silt and sand to silty sand were encountered at various intervals of depth between about Elevations 192.0 m and 189.1 m in Boreholes S309-01, S309-03 to S309-06 and S309-10. The thickness of the silt to silty sand pockets ranges from about 0.3 m to 1.2 m.

The SPT 'N'-values measured within the silt to silty sand pockets range from 5 blows to 23 blows per 0.3 m of penetration, indicating a loose to compact relative density.

The natural water content measured on three (3) samples of the non-cohesive soil pockets ranges from about 14 per cent to 21 per cent.

The results of grain size distribution tests completed on two (2) samples of the sandy silt portion of the soil pockets are shown on Figure I.C309-05 in Appendix I.

Silt to Sand (Lower Deposit)

Underlying the cohesive deposit, all the boreholes, except Borehole S309-02, encountered a deposit of grey non-cohesive soil comprised predominantly of silt to sandy silt to silt and sand. This deposit generally contains trace to some clay and the silt portion of this deposit also contains trace to some sand. A coarser portion of this deposit comprised of sand, trace silt was interlayered within the silt to silt and sand portion of the deposit in Borehole S309-06. Clay lamina and sandy silt seams were noted within the silt portion of the deposit in Borehole S309-07, while cobbles were encountered at depths of 9.6 m and 8.4 m below ground surface in Boreholes S309-01 and S309-07, respectively. The top of this non-cohesive deposit ranges from about Elevations 190.5 m to 185.9 m, and the thickness of the non-cohesive deposit generally ranges from about 1.8 m to 4.8 m. The bottom of this deposit is defined by refusal to further auger and/or split-spoon advancement in Boreholes S309-03, S309-04 to S309-11.

The SPT 'N'-values recorded within the non-cohesive deposit generally range from 0 blows (weight of hammer or weight of rods) to 49 blows per 0.3 m of penetration, indicating a very loose to dense relative density. Several SPT 'N'-values measured 100 blows or greater per 0.15 m of penetration upon refusal to split-spoon advancement on inferred bedrock.



The natural water content measured on 11 samples of this deposit ranges from 14 per cent to 27 per cent.

The grain size distributions of four (4) samples of the silt and sand and seven (7) samples of the silt to sandy silt portions of this non-cohesive deposit are shown on Figures I.S309-06A and I.S309-06B, respectively, in Appendix I.

An Atterberg limits test was carried out on one (1) sample of the silt portion of the lower non-cohesive deposit and measured a liquid limit of about 21 per cent, a plastic limit of about 18 per cent and a corresponding plasticity index of about 3 per cent. The result of the Atterberg limits test is presented on the plasticity chart on Figure I.S309-07 in Appendix A and indicates the material to be silt of slight plasticity.

Sand and Gravel

An approximately 0.3 m thick layer of grey sand and gravel, some silt was encountered below the silt and sand deposit in Borehole S309-01. The top of this layer is at about Elevation 183.5 m. and the bottom of the layer is defined by refusal to further auger advancement.

One (1) SPT 'N'-value measured within this layer is 100 blows per 0.15 m of penetration, indicating a very dense relative density.

Refusal

The bedrock surface at the boreholes and DCPTs is inferred by refusal to further split-spoon and/or auger advancement and dynamic cone penetration, at depths typically between about 5.6 m and 13.8 m below ground surface, corresponding to between about Elevations 190.0 m and 181.6 m. At one borehole location advanced near the toe of a slope which bounds the southern limit of the swamp crossing, refusal was encountered at a depth of 2.5 m below ground surface, corresponding to Elevation 193.3 m.

Groundwater Conditions

In general, the samples taken in the boreholes were moist to wet. Water levels observed in the open boreholes upon completion of drilling range from about Elevations 195.2 m to 192.6 m, measured at the ground surface to depth of up to 2.7 m below ground surface.

4.17 Highway 69 SBL – STA 19+450 to 19+500 (Swamp 310)

The plan and profile along the centerline and toes of the proposed embankment of the new Highway 69 SBL alignment showing the borehole locations and interpreted stratigraphy between STA 19+450 and 19+500 in the Township of Henvey are presented on Drawing J1 in Appendix J. The proposed embankment within this section of the highway is up to about 7 m high relative to the existing ground surface.

A total of five (5) boreholes (Boreholes S310-01 to S310-05) and two (2) Dynamic Cone Penetration Tests (DCPTs S310-DC01 and S301-DC02) were completed to investigate the subsurface conditions within this swamp area. The topography of this section of the proposed highway is relatively flat and with the northern limit



of the swamp area bounded by relatively steep slope. The terrain is primarily tree covered, with a beaver pond occupying the northern limit of the swamp.

The subsurface soils along the SBL alignment of Swamp 310 generally consist of topsoil underlain by a clayey silt to clay deposit which is in turn underlain by deposits of silt to sandy silt to silt and sand or a thin deposit of gravelly sand to sand and gravel which extend to refusal on inferred bedrock. Resistance to dynamic cone penetration and borehole advancement was encountered at depths ranging from about 4.6 m to 8.7 m, with depths generally increasing from west to east.

Topsoil

An approximately 0.1 m to 0.2 m thick layer of topsoil was encountered at the ground surface in all boreholes. The surface of the topsoil across the boreholes ranges from about Elevations 194.9 m to 193.9 m.

Clayey Silt to Clay

A deposit of cohesive soil comprised of brown to grey clayey silt to silty clay to clay was encountered underlying the topsoil in all boreholes. In general, the deposit contains trace to some sand, trace organics to a depth of about 2.2 m and in places silt to silty sand seams to a depth of 4.6 m below ground surface. The top of the cohesive deposit ranges from about Elevations 194.8 m to 193.7 m, and the thickness of the cohesive deposit ranges from 3.3 m to 7.9 m.

The SPT 'N'-values measured within the cohesive deposit typically range from 0 blows (weight of hammer) to 9 blows per 0.3 m of penetration, with an 'N'-value as high as 14 blows per 0.3 m of penetration measured within the upper portion of the deposit. In situ field vane tests carried out within the cohesive deposit measured undrained shear strength ranging from about 20 kPa to greater than 96 kPa, with values generally decreasing with depth, and the sensitivity ranges from about 4 to 8. In general, the field vane test results indicate that the clayey silt to clay deposit has a stiff consistency above about Elevations 191 m and a soft to firm consistency below Elevation 191 m.

The natural water content measured on fifteen (15) samples of this deposit ranges from about 21 per cent to 40 per cent, with values as high as about 80 per cent.

The result of grain size distribution test completed on one (1) sample of the silty clay portion of the deposit is shown on Figure J.S310-01 in Appendix J.

Atterberg limits tests were carried out on seven (7) samples of the cohesive deposit and measured liquid limits ranging from about 35 per cent to 78 per cent, plastic limits ranging from about 16 per cent to 24 per cent, and plasticity indices ranging from about 19 per cent to 54 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure J.S310-02 in Appendix J, and indicate that the material is classified as a silty clay of intermediate plasticity to a clay of high plasticity.

Silt to Silt and Sand

Underlying the clayey silt to silty clay deposit all the boreholes encountered a grey non-cohesive deposit comprised of silt, trace sand, trace to some clay to sandy silt, trace to some clay to silt and sand trace to some



clay. The top of the non-cohesive deposit ranges from about Elevations 190.4 m to 186.7 m and the thickness of the deposit ranges from about 0.6 m to 1.9 m. The bottom of this deposit is defined by refusal to further casing advancement in Boreholes S310-02, S310-03 and S310-05.

The SPT 'N'-values measured within this deposit generally range from 4 blows to 8 blows per 0.3 m of penetration, indicating a very loose to loose relative density. An SPT 'N'-value of 23 blows per 0.3 m of penetration was measured at the bottom of the silt and sand deposit in Borehole S310-01 at the interface with the underlying gravelly sand layer.

The natural water content measured on four (4) samples of this deposit ranges from about 22 per cent to 26 per cent.

The results of grain size distribution tests completed on five (5) samples of this deposit are shown on Figure J.S310-03 in Appendix J.

Gravelly Sand to Sand and Gravel

A 0.1 m thick layer of gravelly sand and a 0.3 m thick layer of sand and gravel, trace to some silt was encountered underlying the silt to silt and sand deposit in Boreholes S310-01 and S310-04. The top these layers were encountered at about Elevations 186.9 m and 189.6 m at the respective boreholes. The bottom of this deposit is defined by refusal to further split-spoon and/or casing advancement.

An SPT 'N'-value of 30 blows per 0.05 m of penetration was recorded within the sand and gravel deposit at refusal to further split-spoon advancement.

Refusal

In all the boreholes and DCPTs, the bedrock surface is inferred by either refusal to further split-spoon and/or casing advancement or dynamic cone penetration at depths between about 4.6 m and 8.7 m below the ground surface, corresponding to between about Elevations 189.3 m and 186.1 m.

Groundwater Conditions

In general, the soil samples taken in the boreholes were moist to wet. The groundwater levels measured in the open boreholes upon completion of drilling range from about Elevations 194.6 m to 193.6 m, measured at depths ranging from about 0.2 m to 1.1 m below the ground surface.

4.18 Highway 69 NBL – STA 19+400 to 19+500 (Swamp 310)

The plan and profiles along the centerline and toes of the proposed embankment of the new Highway 69 NBL alignment showing the borehole locations and interpreted stratigraphy between about STA 19+400 to 19+500 in the Township of Henvey are presented on Drawings J1 and J2 in Appendix J. The proposed embankment within this section of the highway is up to about 7 m high relative to the existing ground surface.

A total of nine (9) boreholes (Boreholes S310-06 to S310-14) and four (4) Dynamic Cone Penetration Tests (DCPTs S310-DC03 to S310-DC06) were completed to investigate the subsurface conditions within this swamp



area. The topography of this section of the highway is similar to that of the SBL, that is relatively flat with the northern limit of the swamp area bounded by a relatively steep slope. The terrain is primarily tree covered, with a beaver pond occupying the northern limit of the swamp.

The subsurface soils along the NBL alignment in Swamp 310 generally consist of topsoil underlain by a near surface deposit of silt to silty sand, which is in turn underlain by a deposit of clayey silt to silty clay. Underlying the clayey silt to silty clay deposit is an interlayer of silt to sandy silt, underlain by a deposit of clay. The deposit of clay is in turn generally underlain by deposits of silt to silt and sand to silty sand, and a deposit of sand and gravel in places, which extend to inferred bedrock.

Topsoil

An approximately 0.1 m to 0.3 m thick layer of topsoil was encountered at the ground surface in all boreholes. The surface of topsoil ranges from about Elevations 195.1 m to 194.0 m.

Silt to Silty Sand

A deposit of non-cohesive soil comprised of brown to grey silt, some sand, trace clay, trace organics to silt and sand to silty sand was encountered underlying the topsoil in Boreholes S310-06, S310-07, S310-11 and S310-13 and underlying an upper stratum of silty clay in Borehole S310-09. The top of the non-cohesive deposit ranges from about Elevations 194.8 m to 193.8 m and the thickness of the deposit ranges from about 0.5 m to 2.8 m. A layer of cobbles is inferred presented within the silt and sand deposit in Borehole S310-09 at about Elevation 192.5 m. The bottom of this deposit is inferred by auger refusal in Borehole S310-09.

The SPT 'N'-values recorded within the non-cohesive deposit range from 4 blows to 16 blows per 0.3 m of penetration, indicating a very loose to compact relative density. A SPT 'N'-value of 24 blows per 0.15 m was measured on the inferred cobbles layer as noted above.

The natural water content measured on five (5) samples of the deposit ranges from about 23 per cent to 25 per cent.

The result of a grain size distribution test completed on one (1) sample of the silt and sand portion of the deposit is shown on Figure J.S310-04 in Appendix J.

An Atterberg limits test carried out on one (1) sample of the silt and sand portion of the deposit and indicates that the fines material of the silt and sand is non-plastic.

Clayey Silt to Silty Clay

A deposit of cohesive soil comprised of brown to grey clayey silt, trace to some sand to silty clay was encountered underlying the topsoil or near surface deposit of silt to silty sand. The deposit also contains trace organics and rootlets to a depth of up to about 2.2 m, silt seams to a depth of up to about 3.7 m and a 0.3 m thick pocket of silt in Borehole S310-10. The top of the cohesive deposit ranges from about Elevations 194.9 m to 193.3 m, and the thickness of the deposit ranges from about 4.8 m to 7.1 m.

The SPT 'N'-values recorded within the cohesive deposit typically range from 0 blows (weight of hammer) to 12 blows per 0.3 m of penetration, with a value of 21 blows per 0.3 m of penetration recorded within the upper portion of the cohesive deposit in Borehole S310-10. In situ field vane tests carried out within the deposit



measured undrained shear strength ranging from about 23 kPa to greater than 96 kPa, with values generally decreasing with depth, and the sensitivity ranges from about 4 to 13. In general, the field vane tests results indicate that the clayey silt to silty clay deposit has a stiff consistency above about Elevation 190.5 m and a soft to firm consistency below Elevation 190.5 m.

The natural water content measured on twenty nine (29) samples of this deposit ranges from about 20 per cent to 52 percent, but are typically below 36 per cent.

The results of grain size distribution tests completed on three (3) samples of the clayey silt to silty clay deposit are shown on Figure J.S310-05 in Appendix J.

Atterberg limits tests were carried out on thirteen (13) samples of the cohesive deposit and measured liquid limits ranging from about 21 per cent to 48 per cent, plastic limits ranging from about 14 per cent to 21 per cent, and plasticity indices ranging from about 7 per cent to 28 per cent. The results of the Atterberg limits tests are shown on the plasticity chart on Figure J.S310-06 in Appendix J, and indicate that the material is classified as a clayey silt of low plasticity to silty clay of intermediate plasticity.

A laboratory consolidation test was carried out on one (1) specimen of the silty clay portion of the cohesive deposit obtained from a Shelby tube sample in Borehole S310-10. A preconsolidation stress of about 115 kPa was estimated from the void ratio versus logarithmic pressure plot and from the total work versus pressure plot. A bulk unit weight of about 16 kN/m³ and a specific gravity of about 2.79 were measured on the consolidation test specimen. Details of the test results are shown on Figure J.S310-07 in Appendix J, and the test results are summarized below.

| Borehole Sample No. | Sample Depth / Elevation | σ_{vo}' (kPa) | σ_p' (kPa) | $\sigma_p' - \sigma_{vo}'$ (kPa) | OCR | C_c | C_r | e_o | c_v^* (cm ² /s) |
|------------------------------|--------------------------|----------------------|-------------------|----------------------------------|-----|-------|-------|-------|------------------------------|
| Borehole S310-10 Sample 7 | 6.4 m / 188.5 m | 105 | 115 | 10 | 1.0 | 1.01 | 0.015 | 1.59 | 1.4×10^{-3} |

Note: * For stress range between effective overburden stress and final stress due to a 4.0 m high embankment, that is $75 \text{ kPa} \leq \sigma_v' \leq 310 \text{ kPa}$.

where: σ_{vo}' is the in situ vertical effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 e_o is the initial void ratio
 C_c is the compression index
 C_r is the recompression index
 c_v is the coefficient of consolidation in cm²/s

Silt to Sandy Silt (Interlayer)

An approximately 0.3 m to 1.1 m thick interlayer comprised of grey silt, trace to some sand to sandy silt, trace clay were encountered below the clayey silt to silty clay deposits in Boreholes S310-06 to S310-08, S310-10 to S310-12 and S310-14. The top of this interlayer ranges from about Elevations 190.1 m to 188.2 m.

The SPT 'N'-values recorded within the silt to sandy silt interlayer range from 1 blow to 4 blows per 0.3 m of penetration, indicating a very loose relative density.



The natural water content measured on two (2) samples of this interlayer is about 25 per cent.

The result of a grain size distribution test completed on one (1) sample of the silt portion the silt to sandy silt interlayer is shown on Figure J.S310-08 in Appendix J.

An Atterberg limits test carried out on one (1) sample of this interlayer measured a liquid limit of about 20 per cent, a plastic limit of about 16 per cent and a corresponding plastic index of about 4 per cent. The results of Atterberg limits test are shown on the plasticity chart on Figure J.S310-09 in Appendix J and indicate that the material is classified as silt of slight plasticity.

Clay

A deposit of grey clay was encountered underlying the silt to sandy silt interlayer in Boreholes S310-06, S310-07, S310-11, S310-12 and S310-14 and underlying the clayey silt to silty clay deposit in Borehole S310-13. The top of the deposit ranges from about Elevations 188.4 m to 186.5 m, and the thickness of the deposit ranges from about 1.5 m to 5.0 m.

The SPT 'N'-values recorded within the deposit range from 0 blows (weight of hammer) to 4 blows per 0.3 m of penetration. In situ field vane tests carried out within the deposit measured undrained shear strengths ranging from about 21 kPa to 67 kPa with one value greater than 96 kPa, and the sensitivity ranges from about 3 to 10. The field vane tests results indicate that the clay cohesive deposit has a firm to stiff consistency.

The natural water content measured on eight (8) samples of this deposit ranges from about 44 per cent to 75 per cent.

The result of grain size distribution test completed on one (1) sample of the clayey silt lower portion of this deposit is shown on Figure J.S310-10 in Appendix J.

Atterberg limits tests were carried out on four (4) samples of cohesive deposit and measured liquid limits ranging from about 52 per cent to 81 per cent, plastic limits ranging from about 19 per cent to 22 per cent, and plasticity indices ranging from about 28 per cent to 60 per cent. An Atterberg limits test was also carried on a sample of clayey silt lower portion of the deposit and measured a liquid limit of about 26, a plastic limit of about 19 and a corresponding plasticity index of about 7. The results of Atterberg limits tests are shown on the plasticity charts on Figure J.S310-11 in Appendix J for the main portion of the deposit, and indicate that the material is generally a clay of high plasticity; and on Figure J.S310-12 in Appendix J and indicates that this portion of the deposit is classified as a clayey silt of low plasticity.

Silt to Silt and Sand

Underlying the clay deposit, Boreholes S310-06, S310-07 and S310-11 to S310-14 encountered a grey non-cohesive deposit comprised of silt, some clay, trace to some sand, trace gravel to silt and sand, trace clay to silty sand to sand. The top of the silt to sand deposit ranges from about Elevations 186.8 m to 183.0 m, and the thickness of deposit ranges from about 0.5 m to 7.4 m. The bottom of this deposit is defined by refusal to further casing and/or split-spoon advancement in Boreholes S310-06 to S310-07, S310-13 and S310-14.

The SPT 'N'-values recorded within this deposit range from about 1 blow to 16 blows per 0.3 m of penetration, SPT 'N'-values of 47 blows and 6 blows per 0.15 m of penetration were measured on refusal to split-spoon



advancement on inferred bedrock indicating that the silt to sand deposit generally has a very loose to compact relative density.

The natural water content measured on five (5) samples of the non-cohesive deposit generally range from about 22 per cent to 36 per cent.

The results of grain size distribution tests completed on three (3) samples of the silt to silt and sand portions of the deposit are shown on Figure J.S310-13 in Appendix J.

An Atterberg limits test carried out on one (1) sample of the silt portion of the non-cohesive deposit measured a liquid limit of about 22 per cent, plastic limit of about 19 per cent and plastic index of about 2 per cent, as presented on plasticity chart on Figure J.S310-14 in Appendix J, indicating the material to be silt of slight plasticity.

Sand and Gravel

A deposit of grey sand and gravel, trace silt was encountered underlying the silt to silt and sand deposit in Boreholes S310-11 and S310-12. The top of the deposit is at about Elevations 181.5 m and 183.2 m in the respective boreholes, and the thickness of the deposit ranges is about 0.3 m and 1.3 m. The bottom of this deposit is defined by refusal to further casing advancement in both boreholes.

An SPT 'N'-values of 45 blows per 0.3 m of penetration was recorded in Borehole S310-11, indicating a dense relative density.

The natural water content measured on one (1) sample of the deposit is about 12 per cent.

Refusal

In Boreholes S310-06 to S310-14 and DCPTs S310-DC03 to S310-DC06 the bedrock surface is inferred by either refusal to further split-spoon and/or casing advancement or dynamic cone penetration at depths ranging from about 3.5 m to 19.4 m below the ground surface, between about Elevations 191.6 m and 175.6 m.

Groundwater Conditions

In general, the soil samples taken in boreholes were moist to wet. The groundwater levels measured in the open boreholes upon completion of drilling range from about Elevations 194.7 m and 193.6 m, measured at depths ranging from about 0.1 m to 1.4 m below the ground surface.

5.0 CLOSURE

Mr. Matt Rhody, a senior field technician with Golder, directed the drilling program and was assisted by several field personnel from our Mississauga, Sudbury and London offices. This report was prepared by Messrs. Al Varshoi and Tomasz Zalucki, P.Eng., and was reviewed by Mr. Christopher Ng, P.Eng., a senior geotechnical engineer and Associate with Golder. Mr. Jorge M. A. Costa, P.Eng., Golder's Designated MTO Contact for this project and Principal with Golder, conducted an independent quality control review of the report.



Report Signature Page



Tomasz Zalucki, P.Eng.
Geotechnical Engineer

Al Varshoi, M.E.Sc.
Geotechnical Engineering Group

Christopher Ng, P. Eng.
Geotechnical Engineer, Associate



Jorge M.A. Costa, P. Eng.
Designated MTO Contact, Principal

CC/AV/TZ/CN/JPD/JMAC/sm

[https://capws.golder.com/sites/0911116014highway69FourLaning/Contract 3/Reporting/Final/Swamp Crossings and Highfill Areas/Part A/09-1111-6014-3520 RPT 14Feb11 Highway 69 Swamp Crossings and High Fill Areas-Part A.docx](https://capws.golder.com/sites/0911116014highway69FourLaning/Contract%203/Reporting/Final/Swamp%20Crossings%20and%20Highfill%20Areas/Part%20A/09-1111-6014-3520%20RPT%2014Feb11%20Highway%2069%20Swamp%20Crossings%20and%20High%20Fill%20Areas-Part%20A.docx)



LIST OF SYMBOLS

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

I. GENERAL

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

II. STRESS AND STRAIN

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

III. SOIL PROPERTIES

(a) Index Properties

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

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

(a) Index Properties (continued)

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

(b) Hydraulic Properties

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

(c) Consolidation (one-dimensional)

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

(d) Shear Strength

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

Notes: 1
2

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



LIST OF ABBREVIATIONS

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

I. SAMPLE TYPE

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

II. PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

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

Dynamic Cone Penetration Resistance; N_d :

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

PH: Sampler advanced by hydraulic pressure

PM: Sampler advanced by manual pressure

WH: Sampler advanced by static weight of hammer

WR: Sampler advanced by weight of sampler and rod

Piezo-Cone Penetration Test (CPT)

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

III. SOIL DESCRIPTION

(a) Non-cohesive (Cohesionless) Soils

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

(b) Cohesive Soils Consistency

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

IV. SOIL TESTS

| | |
|-----------------|---|
| w | water content |
| w _p | plastic limit |
| w _l | liquid limit |
| C | consolidation (oedometer) test |
| CHEM | chemical analysis (refer to text) |
| CID | consolidated isotropically drained triaxial test ¹ |
| CIU | consolidated isotropically undrained triaxial test with porewater pressure measurement ¹ |
| D _R | relative density (specific gravity, G_s) |
| DS | direct shear test |
| M | sieve analysis for particle size |
| MH | combined sieve and hydrometer (H) analysis |
| MPC | Modified Proctor compaction test |
| SPC | Standard Proctor compaction test |
| OC | organic content test |
| SO ₄ | concentration of water-soluble sulphates |
| UC | unconfined compression test |
| UU | unconsolidated undrained triaxial test |
| V | field vane (LV-laboratory vane test) |
| γ | unit weight |

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

V. MINOR SOIL CONSTITUENTS

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



WEATHERINGS STATE

Fresh: no visible sign of weathering

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

BEDDING THICKNESS

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

JOINT OR FOLIATION SPACING

| Description | Spacing |
|------------------|------------------|
| Very wide | Greater than 3 m |
| Wide | 1 m to 3 m |
| Moderately close | 0.3 m to 1 m |
| Close | 50 mm to 300 mm |
| Very close | Less than 50 mm |

GRAIN SIZE

| Term | Size* |
|---------------------|-------------------------|
| Very Coarse Grained | Greater than 60 mm |
| Coarse Grained | 2 mm to 60 mm |
| Medium Grained | 60 microns to 2 mm |
| Fine Grained | 2 microns to 60 microns |
| Very Fine Grained | Less than 2 microns |

Note: * Grains greater than 60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery (TCR)

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)

The percentage of solid drill core, greater than 100 mm length, recovered at full diameter, measured relative to the length of the total core run. RQD varied from 0% for completely broken core to 100% for core in solid sticks.

DISCONTINUITY DATA

Fracture Index

A count of the number of discontinuities (physical separations) in the rock core, including both naturally occurring fractures and mechanically induced breaks caused by drilling.

Dip with Respect to Core Axis

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90° angle is horizontal.

Description and Notes

An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes or mechanically induced features caused by drilling such as ground or shattered core and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

| | |
|---------------------|-------------------|
| JN Joint | PL Planar |
| FLT Fault | CU Curved |
| SH Shear | UN Undulating |
| VN Vein | IR Irregular |
| FR Fracture | K Slickensided |
| SY Stylolite | PO Polished |
| BD Bedding | SM Smooth |
| FO Foliation | SR Slightly Rough |
| CO Contact | RO Rough |
| AXJ Axial Joint | VR Very Rough |
| KV Karstic Void | |
| MB Mechanical Break | |



TABLES



**FOUNDATION REPORT – SWAMP CROSSINGS AND HIGH FILL
AREAS - HIGHWAY 69 GWP 5404-05-00; WP 5404-05-01**

**Table 1: Summary of Swamp Crossings and High Fill Areas
Highway 69 Four-Laning**

| Foundation Investigation Area | Foundation Investigation Area Designation | Proposed Maximum Embankment Height ¹ | Boreholes/DCPTs | Reference Appendix |
|---|---|---|--|--------------------|
| Highway 69 SBL STA 13+725 to 14+050 | Swamp 301 | 4.0 m | 15 Boreholes (S301-01 to S301-05, S301-10 to S301-13, S301-20, S301-22, S301-24 and C301-S1 to C301-S3) 8 DCPTs (S301-DC01, S301-DC02, S301-DC05, S301-DC06 and S301-DC10 to S301-DC13) | A |
| Highway 69 NBL STA 13+700 to 14+000 | Swamp 301 | 4.0 m | 15 Boreholes (S301-06 to S301-09, S301-14 to S301-19, S301-21, S301-23 and C301-N1 to C301-N3) 9 DCPTs (S301-DC03, S301-DC04 and S301-DC07 to S301-DC13) | |
| Highway 69 SBL STA 14+430 to 14+600 | Swamp 302 | 4.5 m | 14 Boreholes (S302-01 to S302-13 and S302-12A) 6 DCPTs (S302-DC01 to S302-DC06) | B |
| Highway 69 NBL STA 14+550 to 14+600 | Swamp 302 | 3.5 m | 5 Boreholes (S302-14 to S302-18) 2 DCPTs (S302-DC07 and S302-DC08) | |
| Highway 69 SBL STA 16+375 to 16+625 | Swamp 303 | 6.0 m | 11 Boreholes (S303-01 to S303-11) 5 DCPTs (S303-DC01 to S303-DC05) | C |
| Highway 69 NBL STA 16+875 to 16+925 | Swamp 304 | 5.0 m | 6 Boreholes (S304-01 to S304-06) 3 DCPTs (S304-DC01 to S304-DC03) | D |
| Highway 69 SBL STA 17+425 to 17+635 | Swamp 305 | 8.5 m | 14 Boreholes (S305-21, S305-24 to S305-29 and S305-31 to S305-37) 4 DCPTs (S305-DC10 to S305-DC13) | E |
| Highway 69 NBL STA 17+025 to 17+550 | Swamp 305 | 11.0 m | 25 Boreholes (S305-01 to S305-23, S305-25 and S305-49) 10 DCPTs (S305-DC01 to S305-DC08, S305-DC10 and S305-DC11) | |
| Bekanon Road E/W-S Ramp STA 17+485 to 17+650 | Swamp 305 | 7.5 m | 13 Boreholes (S305-27, S305-30 and S305-38 to S305-48) 6 DCPTs (S305-DC09 and S305-DC14 to S305-DC18) | |
| Bekanon Road S-E/W Ramp STA 16+975 to 17+140 | Swamp 306 | 7.0 m | 14 Boreholes (S305-02 and S306-01 to S306-13) 5 DCPTs (S306-DC01 to S306-DC05) | F |
| Bekanon Road S-E/W Ramp STA 17+415 to 17+450 | Swamp 307 | 6.5 m | 5 Boreholes (S307-01 to S307-05) 2 DCPTs (S307-DC01 and S307-DC02) | G |



**FOUNDATION REPORT – SWAMP CROSSINGS AND HIGH FILL
AREAS - HIGHWAY 69 GWP 5404-05-00; WP 5404-05-01**

**Table 1: Summary of Swamp Crossings and High Fill Areas
Highway 69 Four-Laning**

| Foundation Investigation Area | Foundation Investigation Area Designation | Proposed Maximum Embankment Height ¹ | Boreholes/DCPTs | Reference Appendix |
|--|---|---|--|--------------------|
| Highway 69 SBL STA 18+375 to 18+550 | Swamp 308 | 5.0 m | 15 Boreholes (S308-01 and S308-15) 7 DCPTs (S308-DC01 to S308-DC07) | H |
| Highway 69 NBL STA 18+375 to 18+535 | Swamp 308 | 5.0 m | 10 Boreholes (S308-16 and S308-25) 4 DCPTs (S308-DC08 to S308-DC11) | |
| Highway 69 SBL STA 19+200 to 19+325 | Swamp 309 | 6.0 m | 11 Boreholes (S309-01 and S309-11) 5 DCPTs (S309-DC01 to S309-DC05) | I |
| Highway 69 SBL STA 19+450 to 19+500 | Swamp 310 | 7.0 m | 5 Boreholes (S310-01 to S310-05) 2 DCPTs (S310-DC01 and S310-DC02) | J |
| Highway 69 NBL STA 19+400 to 19+500 | Swamp 310 | 7.0 m | 9 Boreholes (S310-06 to S310-14) 4 DCPTs (S310-DC03 and S310-DC06) | |

Note: 1. Based on centreline profile of highway alignment and existing ground surface profiles provided by URS on November 28, 2011. Embankment height is approximate and is relative to original ground surface.

Prepared By: TZ

Reviewed By: JPD/JMAC



**FOUNDATION REPORT – SWAMP CROSSINGS AND HIGH FILL
AREAS - HIGHWAY 69 GWP 5404-05-00; WP 5404-05-01**

**Table 2: Summary of Consolidation Test Parameters
Highway 69 Four-Laning**

| Foundation Investigation Area | Borehole and Sample No. | Sample Elevation (m) | σ_{vo}' (kPa) | σ_p' (kPa) | $\sigma_p' - \sigma_{vo}'$ (kPa) | OCR | C _c | C _r | e _o | C _v [*] (cm ² /s) | Reference Appendix |
|-------------------------------|----------------------------|----------------------|---|-------------------|----------------------------------|-----|----------------|----------------|----------------|--|--------------------|
| Highway 69 SBL Swamp 301 | Borehole C301-S2 Sample 4 | 178.7 | 30 | 125 | 95 | 4.2 | 1.40 | 0.020 | 1.80 | 5.7 x 10 ⁻³ | A |
| Highway 69 SBL Swamp 301 | Borehole S301-04 Sample 13 | 163.9 | 120 | 215 | 95 | 1.8 | 0.49 | 0.020 | 0.85 | 2.3 x 10 ⁻⁴ | |
| Highway 69 SBL Swamp 301 | Borehole S301-12 Sample 5 | 177.6 | 40 | 105 | 65 | 2.6 | 0.81 | 0.010 | 1.35 | 1.9 x 10 ⁻³ | |
| Highway 69 NBL Swamp 301 | Borehole S301-06 Sample 6 | 177.6 | 45 | 115 | 75 | 2.7 | 1.45 | 0.025 | 1.87 | 8.8 x 10 ⁻³ | |
| Highway 69 SBL Swamp 302 | Borehole S302-03 Sample 4 | 179.8 | 30 | 75 | 45 | 2.5 | 1.50 | 0.040 | 2.29 | 2.6 x 10 ⁻³ | B |
| Highway 69 NBL Swamp 302 | Borehole S302-17 Sample 4 | 181.8 | 35 | 100 | 65 | 2.9 | 0.25 | 0.025 | 0.86 | 1.9 x 10 ⁻³ | |
| Highway 69 SBL Swamp 309 | Borehole S309-03 Sample 9 | 188.3 | 110 | 110 | ~ 0 | 1.0 | 1.31 | 0.080 | 1.96 | 1.6 x 10 ⁻³ | I |
| Highway 69 NBL Swamp 310 | Borehole S310-10 Sample 7 | 188.5 | 105 | 115 | 10 | 1.1 | 1.01 | 0.015 | 1.59 | 1.4 x 10 ⁻³ | J |
| Highway 69 NBL Swamp 310 | Borehole S310-12 Sample 9 | 184.9 | Laboratory consolidation test in progress – results are not available yet | | | | | | | | |

Note: * For stress range between sample in situ effective overburden stress and final stress due to embankment construction for all embankments (3.5 m to 6.0 m high).

where: σ_{vo}' is the effective overburden stress in kPa
 σ_p' is the preconsolidation stress in kPa
OCR is the overconsolidation ratio
 C_c is the compression index
 C_r is the recompression index
 e_o is the initial void ratio
 c_v is the coefficient of consolidation in cm²/s

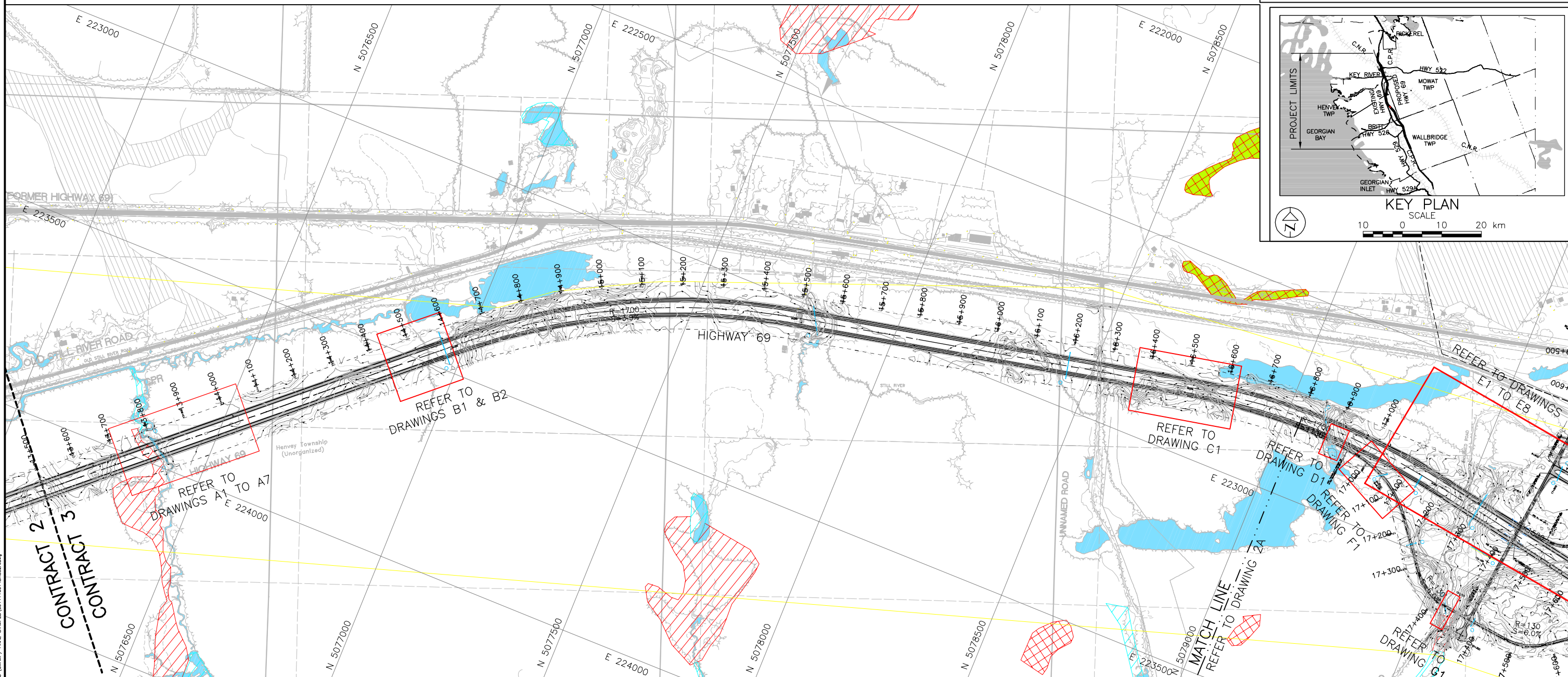
Prepared By: TZ

Reviewed By: JPD/JMAC



DRAWINGS

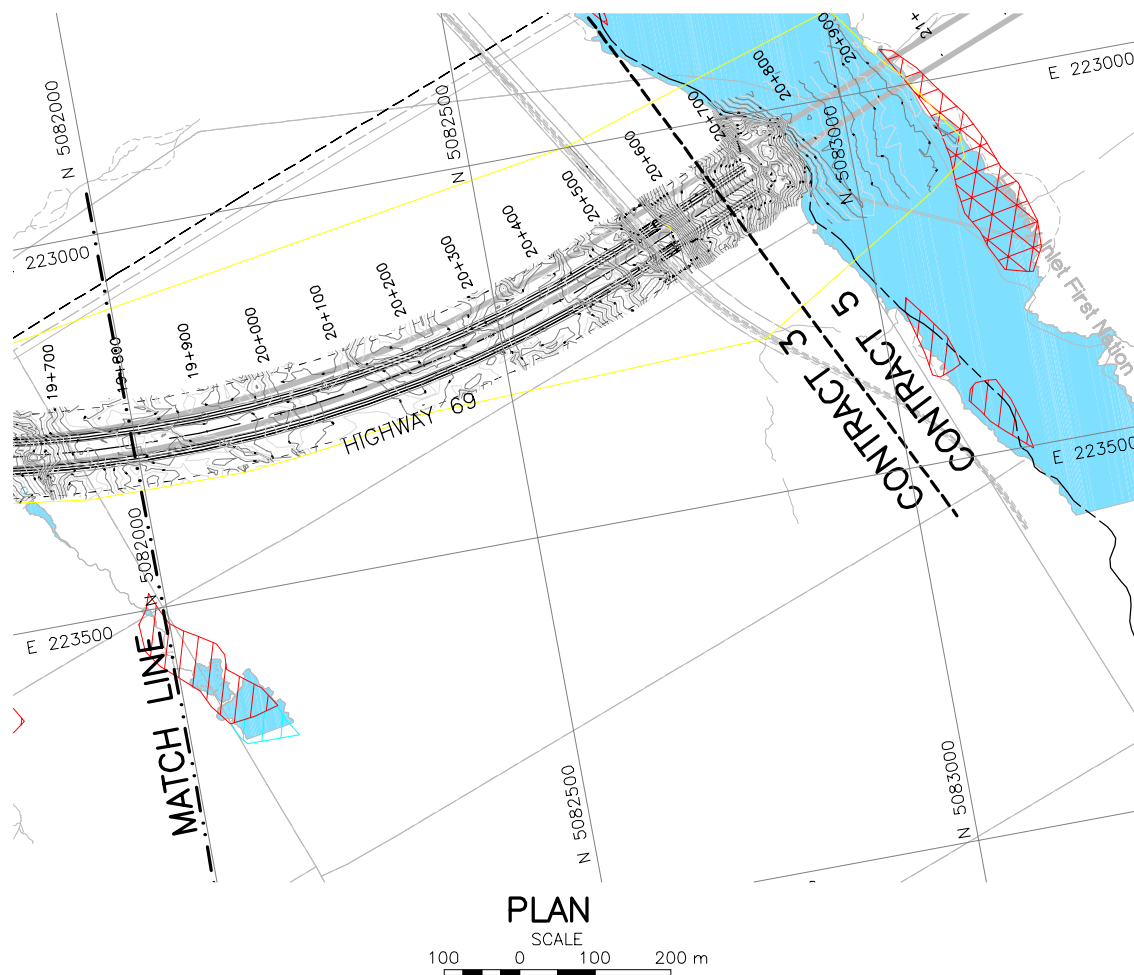
SHEET



SCALE
100 0 100 200 m

Base plans provided in digital format by URS, drawing files
Hwy69_base.dwg received December 16, 2009, Alignment drawing file
Hwy69_plan.dwg, received February 02, 2012 and Contour drawing file
HWY69_Contour-Plan_C3.dwg, received April 23, 2012.

| | | | | | |
|---------------------|------|--------------------------|-----------------|-------|---------|
| NO. | DATE | BY | REVISION | | |
| Geocres No. 41H-134 | | | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | | DIST. | |
| SUBM'D. CC | | CHKD. TZ | DATE: Apr. 2013 | | SITE: |
| DRAWN: JFC/LL | | CHKD. CN | APPD. JPD/JMAC | | DWG. 2A |



PLAN
SCALE
100 0 100 200 m



The map shows the proposed highway alignment (solid line) passing through the Key River area. Key features include:

- Project Limits:** Indicated by a vertical double-headed arrow on the left side of the map.
- Highways:** HWY 592, HWY 58, HWY 528, and HWY 529A.
- Geographic Features:** Key River, Georgian Bay, Georgian Inlet, and Georgian Bay.
- Towns:** Mowat Twp, Wallbridge Twp, and Henve Twp.
- Infrastructure:** C.N.R. (Canadian National Railway) tracks and a bridge.
- Scale:** 0 to 20 km.
- North Arrow:** Located in the bottom left corner.

Base plans provided in digital format by URS, drawing files
Hwy69_base.dwg received December 16, 2009, Alignment drawing file
Hwy69_plan.dwg, recieved February 02, 2012 and Contour drawing file
HWY69-Contour-Plan-C3.dwg, received April 23, 2012.

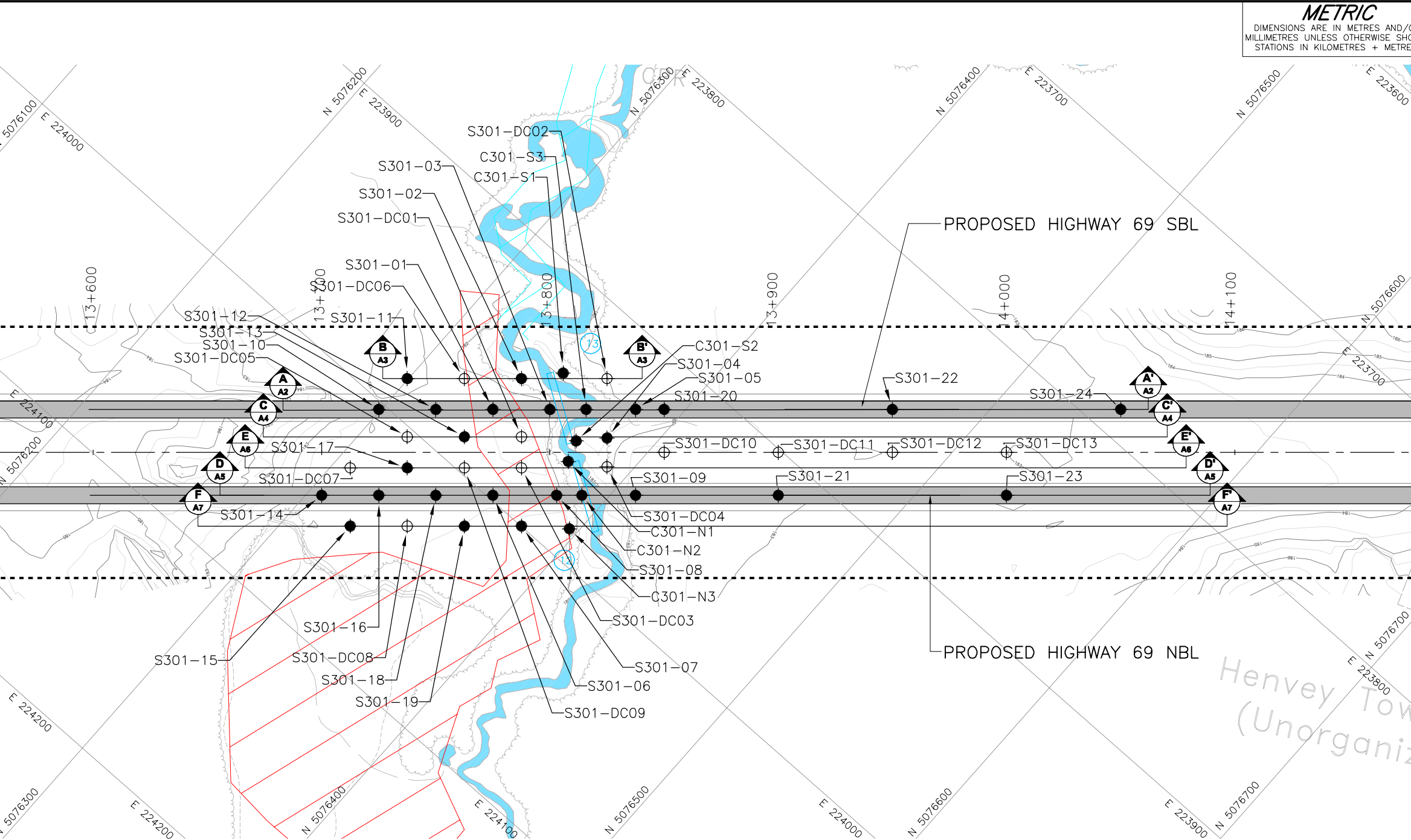
| | | | | | |
|---------------------|------|--------------------------|-----------------|--|---------|
| NO. | DATE | BY | REVISION | | |
| Geocres No. 41H-134 | | | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | | | DIST. |
| SUBM'D. CC | | CHKD. TZ | DATE: Apr. 2013 | | SITE: |
| DRAWN: JFC/LL | | CHKD. CN | APPD. JPD/JMAC | | DWG. 2B |



APPENDIX A

Highway 69 SBL – STA 13+725 to 14+050 (Swamp 301)

Highway 69 NBL – STA 13+700 to 14+000 (Swamp 301)



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

PROPOSED HIGHWAY 69 SBL

PROPOSED HIGHWAY 69 NBL

Henvey Town
(Unorganized)

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

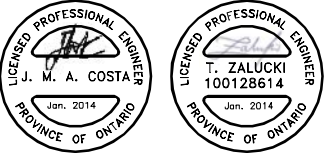
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS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

REFERENCE

Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012



| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S301-DC01 | 182.6 | 5076354.0 | 223970.6 |
| S301-DC02 | 182.3 | 5076365.2 | 223926.6 |
| S301-DC03 | 182.6 | 5076363.0 | 223980.8 |
| S301-DC04 | 181.6 | 5076390.8 | 223955.6 |
| S301-DC05 | 182.1 | 5076316.5 | 224003.6 |
| S301-DC06 | 182.4 | 5076318.4 | 223968.0 |
| S301-DC07 | 182.1 | 5076306.7 | 224030.4 |
| S301-DC08 | 182.4 | 5076342.3 | 224033.0 |
| S301-DC09 | 182.3 | 5076344.2 | 223997.3 |
| S301-DC10 | 182.6 | 5076405.3 | 223934.3 |
| S301-DC11 | 182.6 | 5076442.8 | 223901.2 |
| S301-DC12 | 182.8 | 5076480.3 | 223868.2 |
| S301-DC13 | 183.3 | 5076517.8 | 223835.1 |



CONT No.
WP No. 5404-05-01

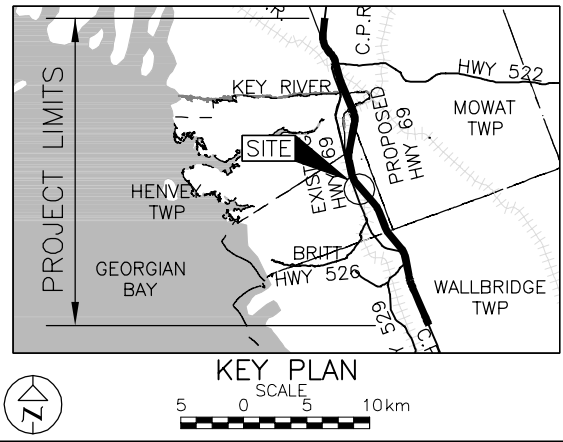
HIGHWAY 69
STA 13+725 TO 14+050 (SBL)
STA 13+700 TO 14+000 (NBL)
BOREHOLE LOCATIONS

1

SHEET

Golder Associates

Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA

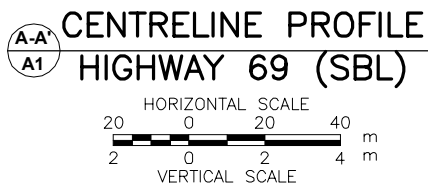
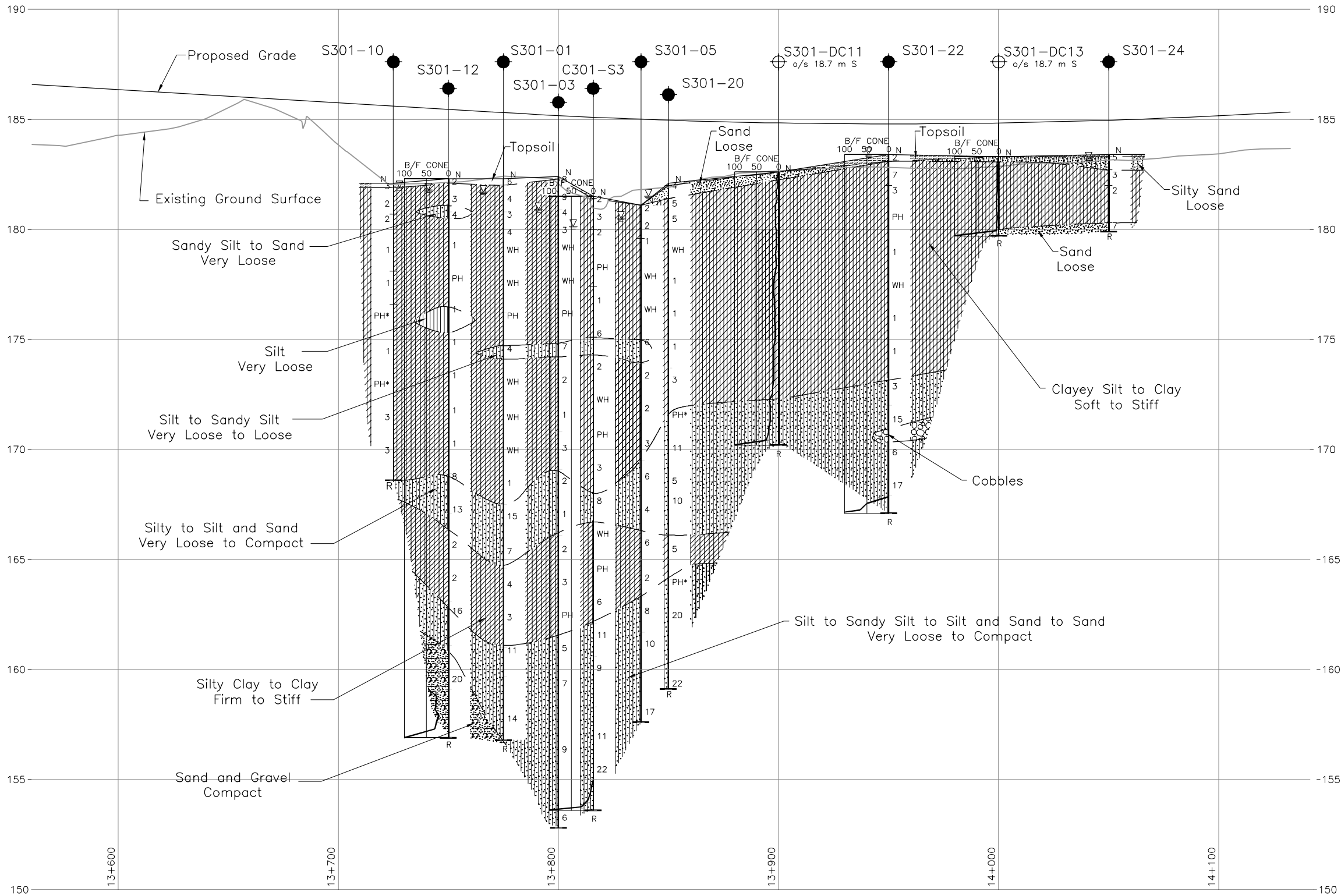


LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| C301-N1 | 181.2 | 5076376.5 | 223965.1 |
| C301-N2 | 181.6 | 5076390.8 | 223972.2 |
| C301-N3 | 181.6 | 5076396.4 | 223986.9 |
| C301-S1 | 181.2 | 5076349.2 | 223937.5 |
| C301-S2 | 181.5 | 5076373.2 | 223956.0 |
| C301-S3 | 181.5 | 5076367.3 | 223942.8 |
| S301-01 | 182.3 | 5076336.7 | 223969.8 |
| S301-02 | 181.4 | 5076337.1 | 223951.4 |
| S301-03 | 182.4 | 5076355.4 | 223953.3 |
| S301-04 | 181.0 | 5076382.4 | 223946.1 |
| S301-05 | 181.1 | 5076383.5 | 223928.5 |
| S301-06 | 182.5 | 5076361.5 | 223998.0 |
| S301-07 | 182.8 | 5076379.8 | 223999.9 |
| S301-08 | 181.3 | 5076382.5 | 223979.6 |
| S301-09 | 182.7 | 5076408.4 | 223956.7 |
| S301-10 | 182.1 | 5076299.2 | 224002.9 |
| S301-11 | 182.2 | 5076299.6 | 223984.5 |
| S301-12 | 182.3 | 5076317.9 | 223986.4 |
| S301-13 | 182.4 | 5076335.2 | 223987.1 |
| S301-14 | 182.0 | 5076305.3 | 224047.6 |
| S301-15 | 182.2 | 5076323.6 | 224049.5 |
| S301-16 | 182.2 | 5076324.0 | 224031.1 |
| S301-17 | 182.3 | 5076325.5 | 224013.8 |
| S301-18 | 182.5 | 5076342.8 | 224014.6 |
| S301-19 | 182.5 | 5076361.1 | 224016.4 |
| S301-20 | 182.1 | 5076392.9 | 223920.2 |
| S301-21 | 182.8 | 5076455.3 | 223915.3 |
| S301-22 | 183.4 | 5076467.9 | 223854.1 |
| S301-23 | 183.8 | 5076530.3 | 223849.2 |
| S301-24 | 183.4 | 5076542.9 | 223787.9 |

| | | | | |
|---------------------|------|--------------------------|----------------|---------|
| | | | | |
| NO. | DATE | BY | REVISION | |
| Geocres No. 41H-134 | | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | | DIST. |
| SUBM'D. AV | | CHKD. AV | DATE: May 2013 | SITE: |
| DRAWN: JFC | | CHKD. TZ | APPD. JPD/JMAC | DWG. A1 |



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

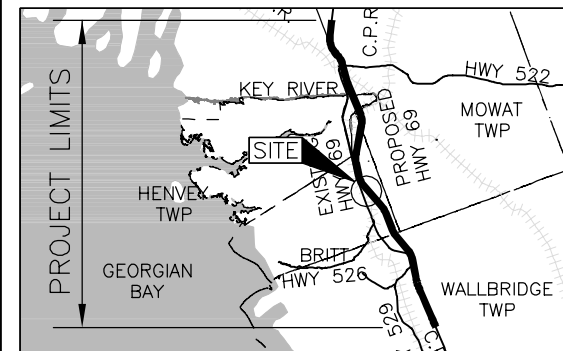
CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 13+725 TO 14+050 (SBL)
SOIL STRATA

SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

SCALE
0 5 10 km

LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated
(Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling
- R Refusal

BOREHOLE CO-ORDINATES

| No. | ELEVATION | NORTHING | EASTING |
|-----------|-----------|-----------|----------|
| C301-S3 | 181.5 | 5076367.3 | 223942.8 |
| S301-01 | 182.3 | 5076336.7 | 223969.8 |
| S301-03 | 182.4 | 5076355.4 | 223953.3 |
| S301-05 | 181.1 | 5076383.5 | 223928.5 |
| S301-10 | 182.1 | 5076299.2 | 224002.9 |
| S301-12 | 182.3 | 5076317.9 | 223986.4 |
| S301-20 | 182.1 | 5076392.9 | 223920.2 |
| S301-22 | 183.4 | 5076467.9 | 223854.1 |
| S301-24 | 183.4 | 5076542.9 | 223787.9 |
| S301-DC11 | 182.6 | 5076442.8 | 223901.2 |
| S301-DC13 | 183.3 | 5076517.8 | 223835.1 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

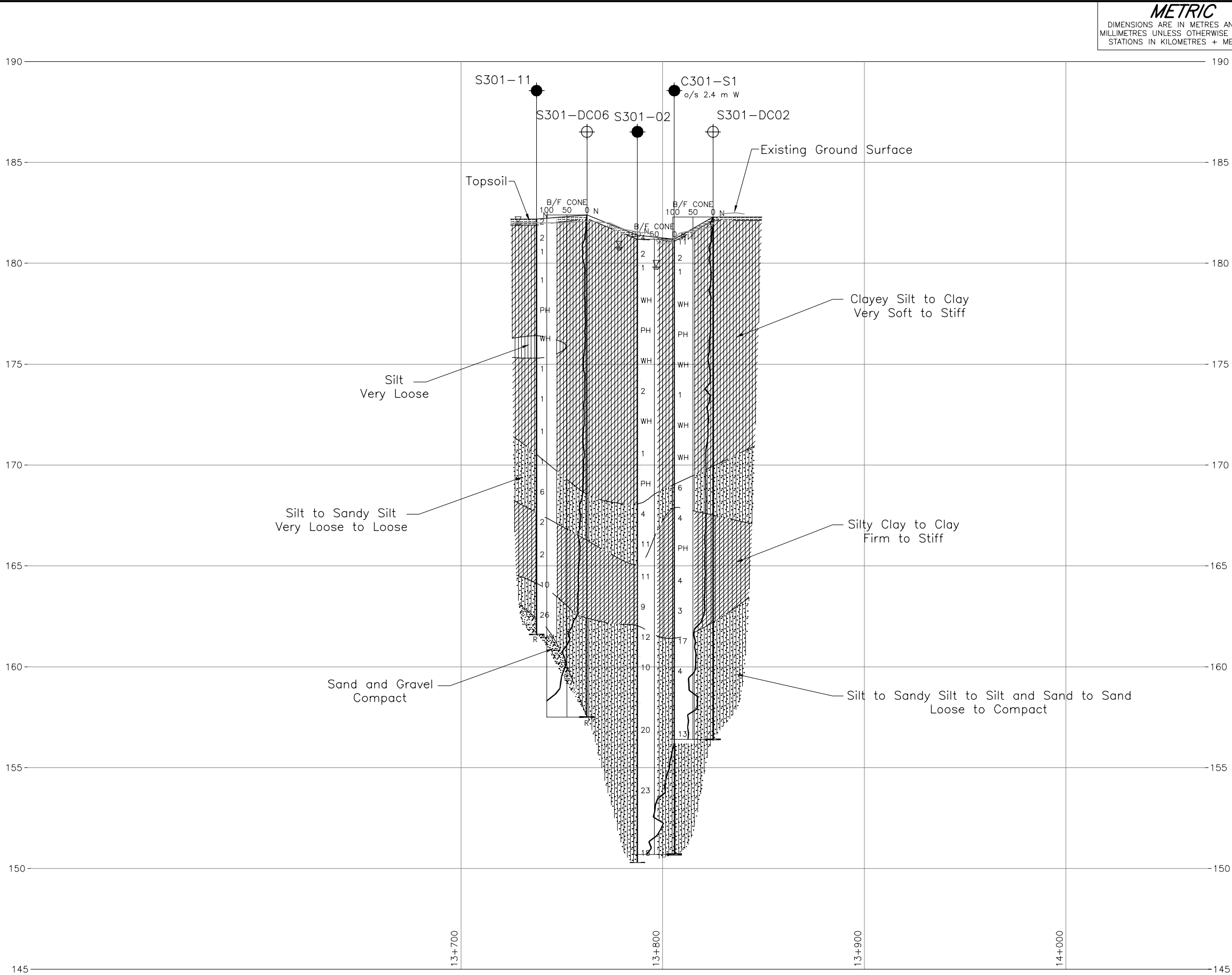
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS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

REFERENCE

The Proposed and Existing ground lines are obtained from a digital file by URS, drawing file no. Hwy69_profile March 2012.dwg, received March 14, 2012.



| NO. | DATE | BY | REVISION |
|---------------------|--------------------------|----------------|----------|
| Geocres No. 41H-134 | | | |
| HWY. 69 | PROJECT NO. 09-1111-6014 | | DIST. |
| SUBM'D. AV | CHKD. AV | DATE: May 2013 | SITE: |
| DRAWN: JFC | CHKD. TZ | APPD. JPD/JMAC | DWG. A2 |



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

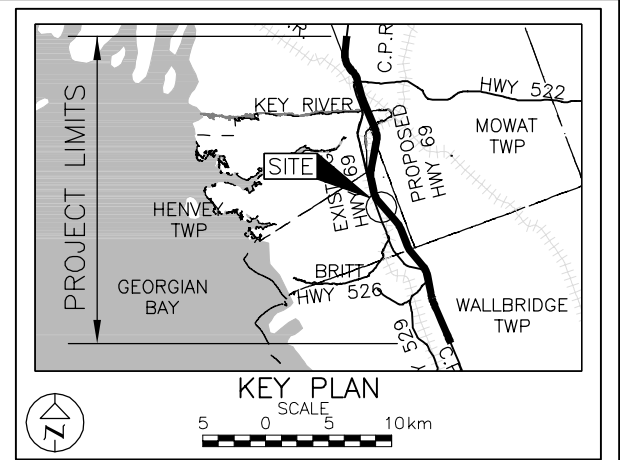
CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 13+725 TO 14+050 (SBL)

SOIL STRATA

Golder Associates
MISSISSAUGA, ONTARIO, CANADA

Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling
- R Refusal

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| C301-S1 | 181.2 | 5076349.2 | 223937.5 |
| S301-02 | 181.4 | 5076337.1 | 223951.4 |
| S301-11 | 182.2 | 5076299.6 | 223984.5 |
| S301-DC02 | 182.3 | 5076365.2 | 223926.6 |
| S301-DC06 | 182.4 | 5076318.4 | 223968.0 |

NOTES

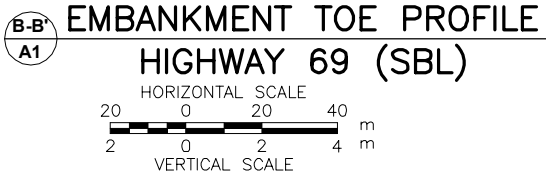
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

REFERENCE

Existing Ground Surface cut from contour plan provided in digital format by URS, drawing file no. Hwy69_Contour-Plan_C3.dwg, received April 23, 2012.



| NO. | DATE | BY | REVISION |
|---------------------|--------------------------|----------------|----------|
| Geocres No. 41H-134 | | | |
| HWY. 69 | PROJECT NO. 09-1111-6014 | | DIST. |
| SUBM'D. AV | CHKD. AV | DATE: May 2013 | SITE: |
| DRAWN: JFC | CHKD. TZ | APPD. JPD/JMAC | DWG. A3 |

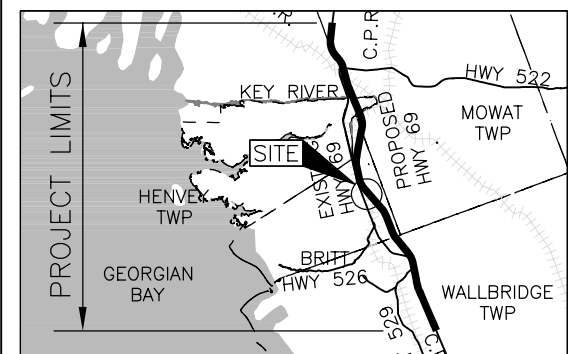
CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 13+725 TO 14+050 (SBL)
SOIL STRATA

SHEET






Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

5 0 SCALE 5 10km

LEGEND

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

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| C301-S2 | 181.5 | 5076373.2 | 223956.0 |
| S301-04 | 181.0 | 5076382.4 | 223946.1 |
| S301-13 | 182.4 | 5076335.2 | 223987.1 |
| S301-DC01 | 182.6 | 5076354.0 | 223970.6 |
| S301-DC05 | 182.1 | 5076316.5 | 224003.6 |
| S301-DC10 | 182.6 | 5076405.3 | 223934.3 |
| S301-DC11 | 182.6 | 5076442.8 | 223901.2 |
| S301-DC12 | 182.8 | 5076480.3 | 223868.2 |
| S301-DC13 | 183.3 | 5076517.8 | 223835.1 |

NOTES

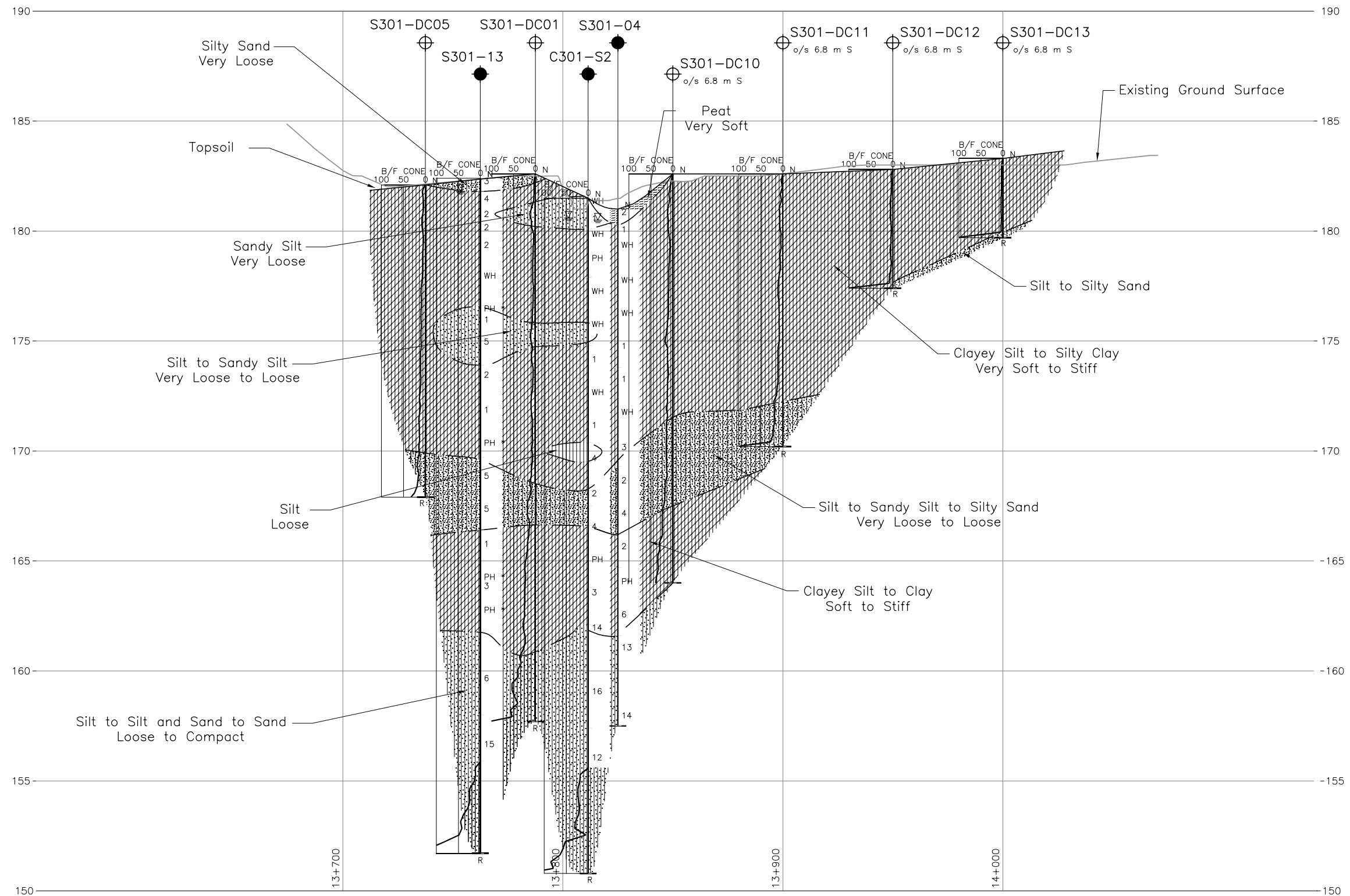
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

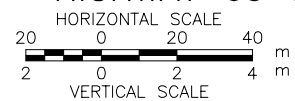
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS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

REFERENCE

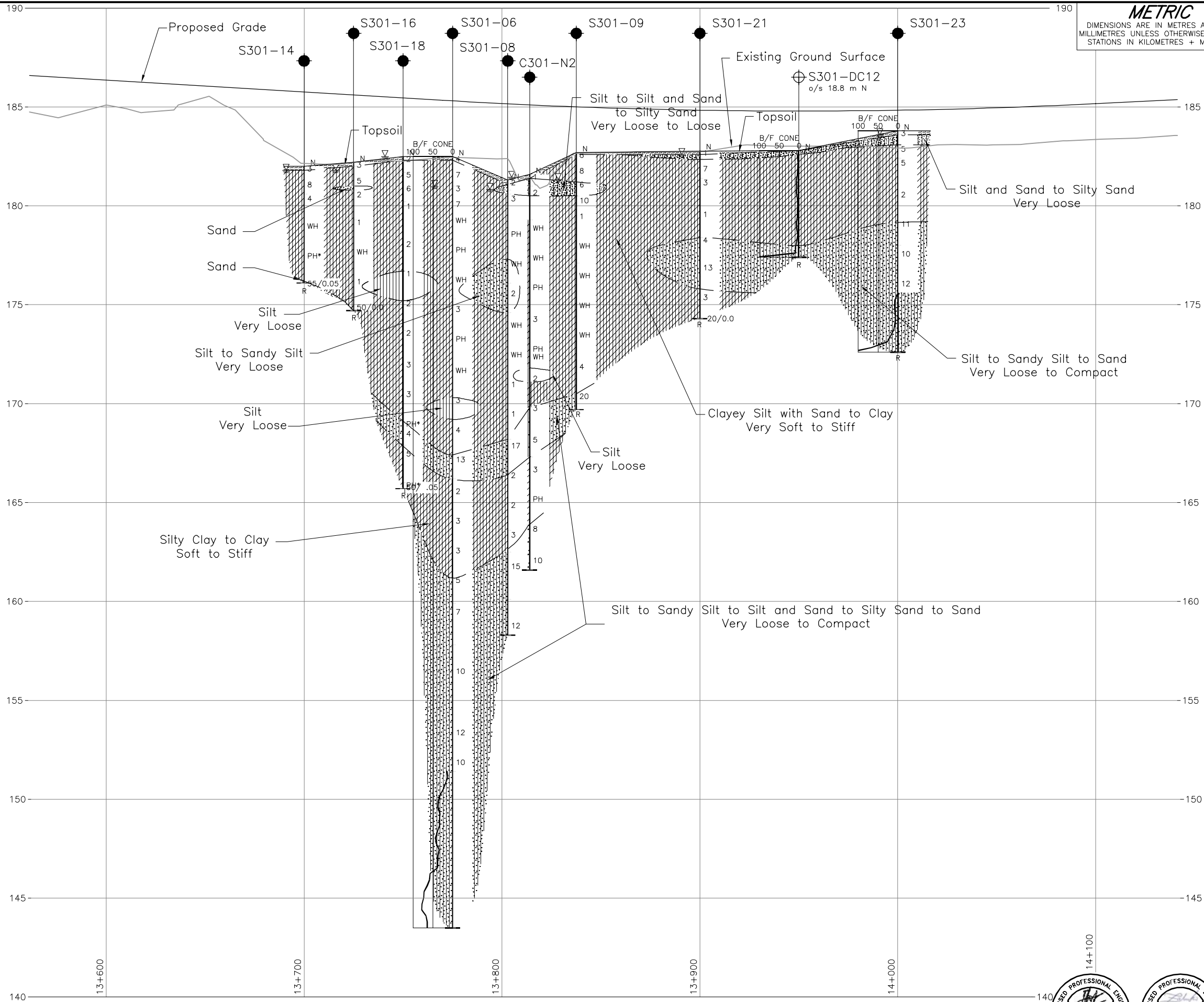
Existing Ground Surface cut from contour plan provided in digital format by URS, drawing file no. Hwy69_Contour-Plan_C3.dwg, received April 23, 2012.



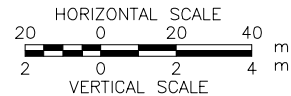
C-C' A1 EMBAKMENT TOE PROFILE HIGHWAY 69 (SBL)



| | | | |
|---------------------|----------|--------------------------|----------|
| NO. | DATE | BY | REVISION |
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | DIST. |
| SUBM'D. AV | CHKD. AV | DATE: May 2013 | SITE: |
| DRAWN: JFC | CHKD. TZ | APPD: JPD/JMAC | DWG. A4 |



**CENTRELINE PROFILE
HIGHWAY 69 (NBL)**

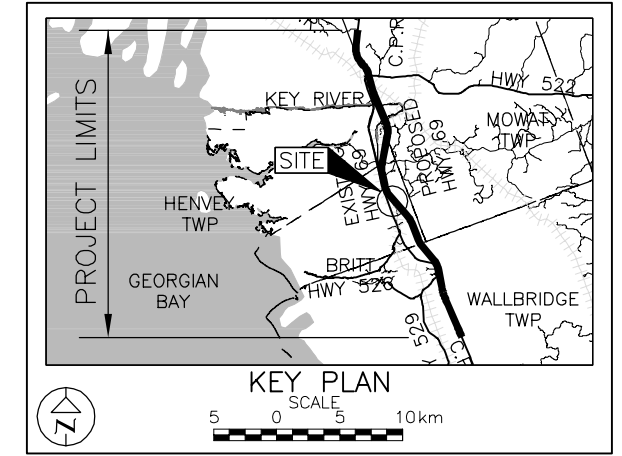


METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 13+700 TO 14+000 (NBL)
SOIL STRATA

Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

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

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| C301-N2 | 181.6 | 5076390.8 | 223972.2 |
| S301-06 | 182.5 | 5076361.5 | 223998.0 |
| S301-08 | 181.3 | 5076382.5 | 223979.6 |
| S301-09 | 182.7 | 5076408.4 | 223956.7 |
| S301-14 | 182.0 | 5076305.3 | 224047.6 |
| S301-16 | 182.2 | 5076324.0 | 224031.1 |
| S301-18 | 182.5 | 5076342.8 | 224014.6 |
| S301-21 | 182.8 | 5076455.3 | 223915.3 |
| S301-23 | 183.8 | 5076530.3 | 223849.2 |
| S301-DC12 | 182.8 | 5076480.3 | 223868.2 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

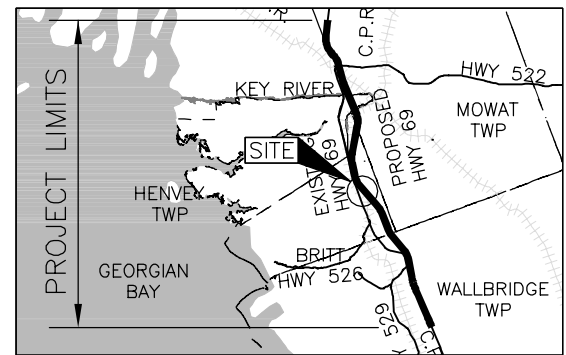
REFERENCE

The Proposed and Existing ground lines are obtained from a digital file by URS, drawing file no. Hwy69_profile March 2012.dwg, received March 14, 2012.

| NO. | DATE | BY | REVISION |
|---------------------|----------|--------------------------|----------|
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | |
| SUBM'D. AV | CHKD. AV | DATE: May 2013 | SITE: |
| DRAWN: JFC | CHKD. TZ | APPD. JPD/JMAC | DWG. A5 |

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

| | |
|--|--|
| CONT No. WP No. 5404-05-01 | |
| HIGHWAY 69 STA 13+700 TO 14+000 (NBL) | |
| SOIL STRATA | |



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

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| C301-N1 | 181.2 | 5076376.5 | 223965.1 |
| S301-17 | 182.3 | 5076325.5 | 224013.8 |
| S301-DC03 | 182.6 | 5076363.0 | 223980.8 |
| S301-DC04 | 181.6 | 5076390.8 | 223955.6 |
| S301-DC07 | 182.1 | 5076306.7 | 224030.4 |
| S301-DC09 | 182.3 | 5076344.2 | 223997.3 |
| S301-DC10 | 182.6 | 5076405.3 | 223934.3 |
| S301-DC11 | 182.6 | 5076442.8 | 223901.2 |
| S301-DC12 | 182.8 | 5076480.3 | 223868.2 |
| S301-DC13 | 183.3 | 5076517.8 | 223835.1 |

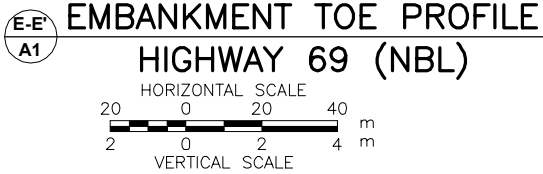
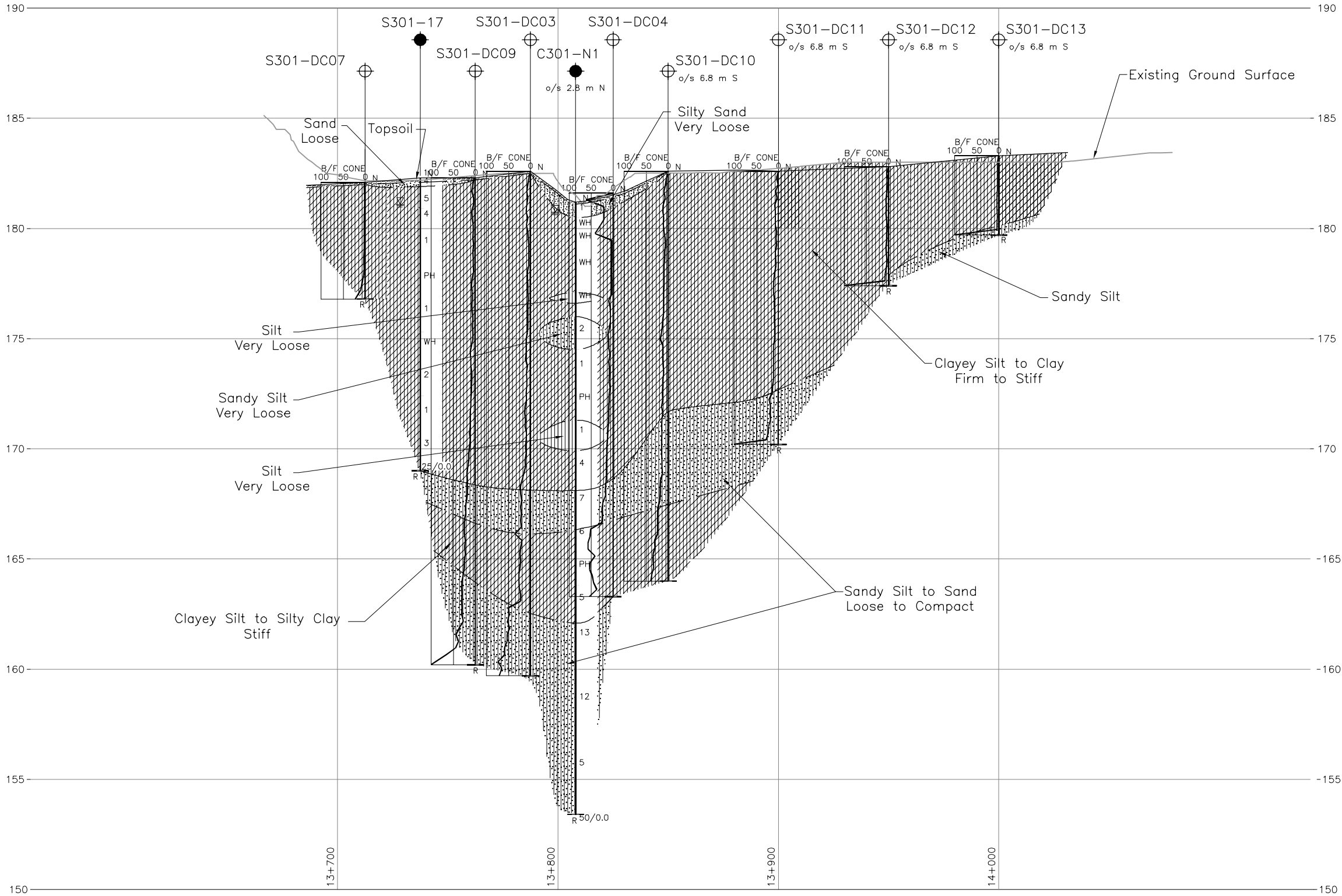
NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

| REFERENCE | | | |
|---|----------|--------------------------|----------|
| Existing Ground Surface cut from contour plan provided in digital format by URS, drawing file no. Hwy69_Contour-Plan_C3.dwg, received April 23, 2012. | | | |
| NO. | DATE | BY | REVISION |
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | |
| SUBM'D. AV | CHKD. AV | DATE: May 2013 | SITE: |
| DRAWN: JFC | CHKD. TZ | APPD. JPD/JMAC | DWG. A6 |



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

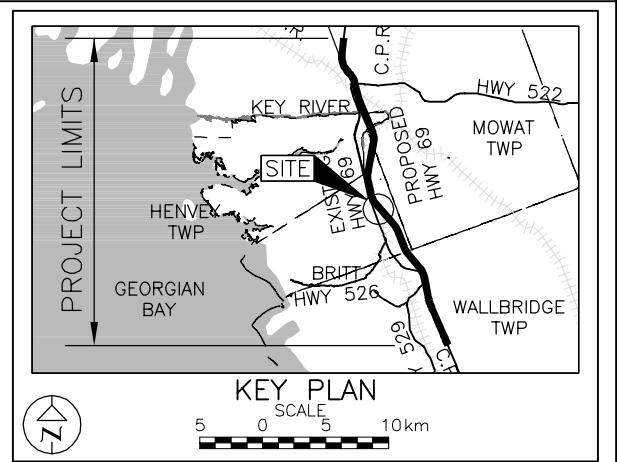
CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 13+700 TO 14+000 (NBL)

SOIL STRATA

Golder Associates
MISSISSAUGA, ONTARIO, CANADA

Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- 100% Rock Quality Designation (RQD)
- ≡ WL upon completion of drilling
- R Refusal

BOREHOLE CO-ORDINATES

| No. | ELEVATION | NORTHING | EASTING |
|-----------|-----------|-----------|----------|
| C301-N3 | 181.6 | 5076396.4 | 223986.9 |
| S301-07 | 182.8 | 5076379.8 | 223999.9 |
| S301-15 | 182.2 | 5076323.6 | 224049.5 |
| S301-19 | 182.5 | 5076361.1 | 224016.4 |
| S301-DC08 | 182.4 | 5076342.3 | 224033.0 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

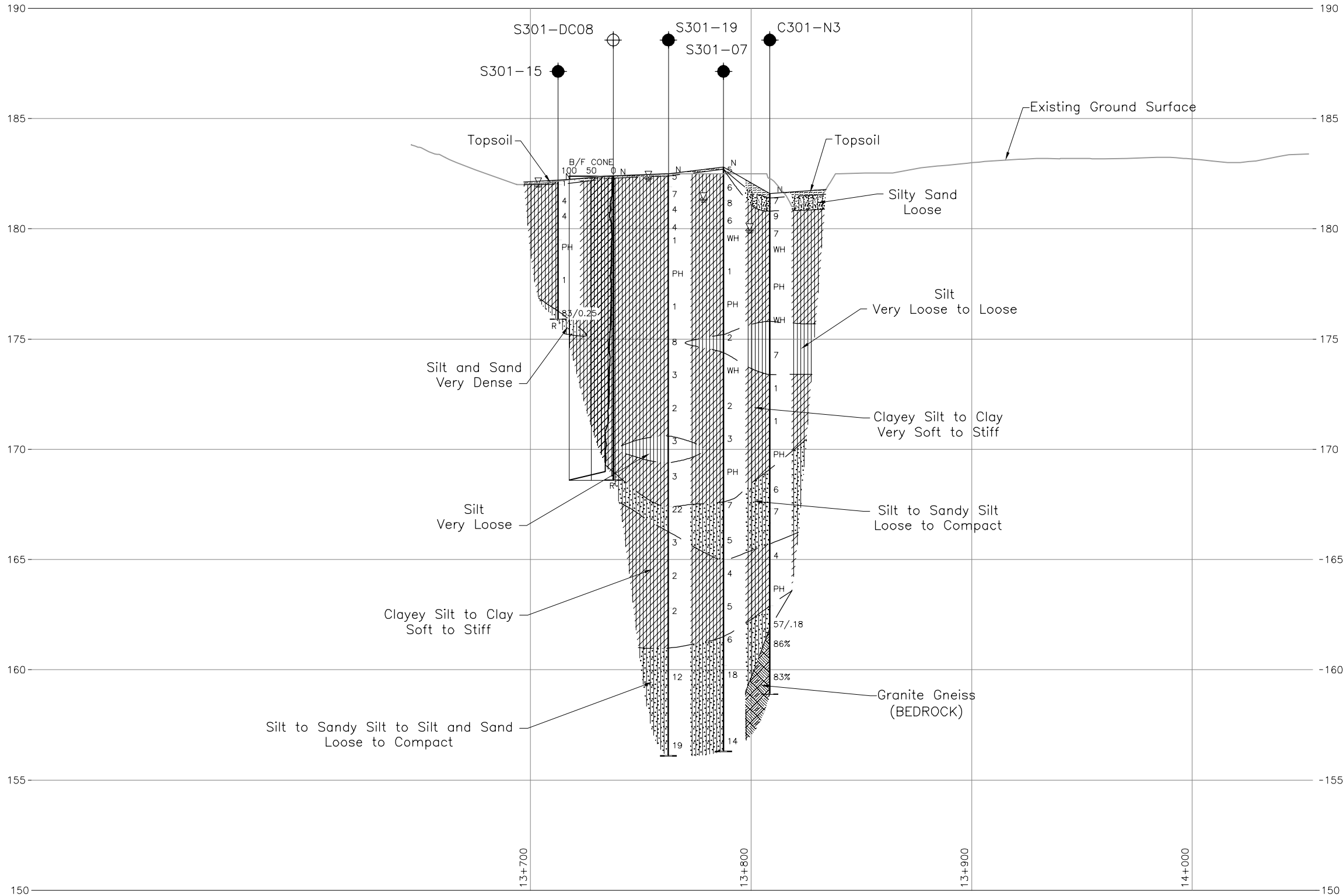
The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

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

REFERENCE

Existing Ground Surface cut from contour plan provided in digital format by URS, drawing file no. Hwy69_Contour-Plan_C3.dwg, received April 23, 2012.

| NO. | DATE | BY | REVISION |
|---------------------|------|--------------------------|----------------|
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | |
| SUBM'D. AV | | CHKD. AV | DATE: May 2013 |
| DRAWN: JFC | | CHKD. TZ | APPD. JPD/JMAC |
| | | SITE: DWG. A7 | |



EMBANKMENT TOE PROFILE
HIGHWAY 69 (NBL)

HORIZONTAL SCALE
20 0 20 40 m

VERTICAL SCALE
2 0 2 4 m



| | | | | | | | |
|----------------------|--|--------------------------------------|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S301-01 | | SHEET 1 OF 2 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076336.7 ; E 223969.8 | | ORIGINATED BY ARM | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE NW Casing, Wash Boring | | COMPILED BY TT | | | |
| DATUM Geodetic | | DATE February 24, 2012 | | CHECKED BY TZ | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|-----------------------------|--|---|----------------|--------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | |
| | | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE × REMOULDED | w _p | w | w _L | | |
| 182.3 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1 | SS | 6 | ▽ | 182 | | | | | | | |
| 182.0 | | | | | | | | | | | | | | |
| 0.3 | CLAYEY SILT, trace to some sand, trace organics, containing silty sand seams Soft to firm Brown Wet | | 2 | SS | 4 | | 181 | | | | | | | |
| 180.8 | | | | | | | | | | | | | | |
| 1.5 | CLAY, trace sand Soft to firm Brown becoming grey below a depth of 4.1 m Wet | | 3 | SS | 3 | | 180 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 4 | SS | 4 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 5 | SS | WH | | 179 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 6 | SS | WH | | 178 | | | | | | | |
| 176.2 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 6.1 | CLAYEY SILT Firm Grey Wet | | 7 | TO | PH | 176 | | | | | | | | |
| | | | | | | | | | | | | | | |
| 174.7 | | | | | | | | | | | | | | |
| 7.6 | Sandy SILT, trace to some clay Loose Grey Wet | | 8 | SS | 4 | 175 | | | | | | | | |
| 174.1 | | | | | | | | | | | | | | |
| 8.2 | CLAYEY SILT, trace sand Firm to stiff Grey Wet | | | | | 174 | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 9 | SS | WH | 173 | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 10 | SS | WH | 172 | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 11 | SS | WH | 170 | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 12 | SS | 1 | 168 | | | | | | | | |
| | | | | | | | | | | | | | | |
| 167.5 | | | | | | | | | | | | | | |
| 14.8 | | | | | | | | | | | | | | |

Continued Next Page

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

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



METRIC

ORIGINATED BY ARM




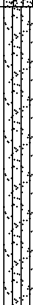

COMPILED BY TT

CHECKED BY TZ

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

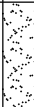
| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S301-02 | | SHEET 2 OF 3 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076337.1 ; E 223951.4</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>NW Casing, Wash Boring</u> | | COMPILED BY <u>TT</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 24 and 25, 2012</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | | |
|---------------|---|---|---------|------|------------|----------------------------|-----------------|---|----|--|----|-----|--------------------------------------|---|---|----------------|----|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | WATER CONTENT (%) | | | GR | SA | SI | CL |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | | W _p | W | W _L | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | | | | |
| 165.1 | Sandy SILT, trace to some clay Loose to compact Grey Wet |  | 12 | SS | 11 | | 166 | | | | | | | | | | | | | |
| 163 | CLAY Stiff Grey Wet | | 13 | SS | 11 | | 165 | | | | | | | | | | | | | |
| | | | | | | | 164 | | | | | | | | | | | | | |
| | | | | 14 | SS | 9 | | 163 | | | | | | | | | | | | |
| 162.0 | | | | | | | | 162 | | | | | | | | | | | | |
| 19.4 | SILT, some clay, trace sand Compact Grey Wet |  | 15 | SS | 12 | | 161 | | | | | | | | | 0 | 3 | 78 | 19 | |
| 160.5 | | | | | | | | | | | | | | | | | | | | |
| 20.9 | Sandy SILT Compact Grey Wet |  | 16 | SS | 10 | | 160 | | | | | | | | | | | | | |
| | | | | | | | 159 | | | | | | | | | | | | | |
| 158.2 | | | | | | | 158 | | | | | | | | | | | | | |
| 23.2 | SILT and SAND, trace clay Compact Grey Wet |  | 17 | SS | 20 | | 157 | | | | | | | | | 0 | 52 | 47 | 1 | |
| | | | | | | | 156 | | | | | | | | | | | | | |
| | | | | | | | 155 | | | | | | | | | | | | | |
| 155.2 | | | | | | 154 | | | | | | | | | | | | | | |
| 26.2 | SAND, trace to some silt Compact Grey Wet |  | 18 | SS | 23 | | 153 | | | | | | | | | | | | | |
| | | | | | | | 152 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT | | RECORD OF BOREHOLE | | No S301-02 | | SHEET 3 OF 3 | | METRIC | | | | | | | | | |
|-------------------|--|---|---------|--------------------------|------------|--------------------------|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076337.1 ; E 223951.4 | | ORIGINATED BY | | ARM | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | NW Casing, Wash Boring | | COMPILED BY | | TT | | | | | | | |
| DATUM | | Geodetic | | DATE | | February 24 and 25, 2012 | | CHECKED BY | | TZ | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 150.3 | SAND, trace to some silt Compact Grey Wet |  | 19 | SS | 18 | | 151 | | | | | | | | | | |
| 31.1 | END OF BOREHOLE | | | | | | | | | | | | | | | | |
| | NOTES: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 180.8 m) upon completion of drilling. 2. "Blowing" sand encountered at a depth of 31.1 m below ground surface (Elev. 150.3 m) during an attempt to carry out a Dynamic Cone Penetration Test. | | | | | | | | | | | | | | | | |

| | | | | | | | |
|----------------------|--|--------------------------------------|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S301-03 | | SHEET 1 OF 3 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076355.4 ; E 223953.3 | | ORIGINATED BY ARM | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE NW Casing, Wash Boring | | COMPILED BY TT | | | |
| DATUM Geodetic | | DATE February 26 and 27, 2012 | | CHECKED BY TZ | | | |






| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|------------|-------------------------|-----------------|--|--|---|---|----------------|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | |
| | | | | | | | 20 40 60 80 100 | | | | | | | |
| 182.4 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1 | SS | 8 | | | | | | | | | |
| | CLAYEY SILT, some sand, containing organics and rootlets Firm to stiff Brown Moist | | 2 | SS | 9 | | | | | | | | | |
| 180.9 | | | | | | | | | | | | | | |
| 1.5 | SILTY CLAY, trace sand Soft to firm Grey Wet | | 3 | SS | 4 | | | | | | | | | |
| | | | 4 | SS | 3 | | | | | | | | | |
| | | | 5 | SS | WH | | | | | | | | | |
| | | | 6 | SS | WH | | | | | | | | | |
| | | | 7 | TO | PH | | | | | | | | | |
| 174.8 | | | | | | | | | | | | | | |
| 7.6 | SILT, some sand, trace to some clay Loose Grey Wet | | 8 | SS | 7 | | | | | | | | | |
| 174.2 | | | | | | | | | | | | | | |
| 8.2 | CLAYEY SILT, trace sand Firm Grey Wet | | 9 | SS | 2 | | | | | | | | | |
| | | | 10 | SS | 1 | | | | | | | | | |
| 170.8 | | | | | | | | | | | | | | |
| 11.6 | SILTY CLAY, trace sand Stiff Grey Wet | | 11 | SS | 3 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 168.7 | | | | | | | | | | | | | | |
| 13.7 | Sandy SILT, trace to some clay Very loose Grey Wet | | 12 | SS | 2 | | | | | | | | | |
| | | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S301-03 | | SHEET 2 OF 3 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076355.4 ; E 223953.3</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>NW Casing, Wash Boring</u> | | COMPILED BY <u>TT</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 26 and 27, 2012</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|---|---------|------|------------|----------------------------|-----------------|---|-----------------------------|--|---|----------------|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | w _p | w | w _L | | |
| | | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE × REMOULDED | | | | | |
| | --- | | | | | | | 20 40 60 80 100 | | | | | | |
| 166.1 | Sandy SILT, trace to some clay Very loose Grey Wet |  | 13 | SS | 1 | | | | | | | | | |
| 163 | CLAY Stiff Grey Wet | | 14 | SS | 2 | | | | | | | | | |
| | | | 15 | SS | 3 | | | | | | | | | |
| | | | 16 | TO | PH | | | | | | | | | |
| 161.4 | | | | | | | | | | | | | | |
| 21.0 | SILT, some sand, trace clay Loose Grey Wet |  | 17 | SS | 5 | | | | | | | | | |
| 159.8 | | | | | | | | | | | | | | |
| 22.6 | Silty SAND, trace gravel, trace clay Loose Grey Wet |  | 18 | SS | 7 | | | | | | | | | |
| 157.7 | | | | | | | | | | | | | | |
| 24.7 | SILT, some sand, trace clay Loose Grey Wet |  | 19 | SS | 9 | | | | | | | | | |
| 154.7 | | | | | | | | | | | | | | |
| 27.7 | Silty SAND, trace gravel, trace clay Loose Grey wet |  | | | | | | | | | | | | |
| 152.8 | | | | 20 | SS | 6 | | | | | | | | |
| 29.6 | END OF BOREHOLE | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC



| | | | | | | | |
|----------------------|--|--------------------------------------|--|---------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S301-04 | | SHEET 1 OF 2 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076382.4 ;E 223946.1 | | ORIGINATED BY | | ARM | |
| DIST HWY 69 | | BOREHOLE TYPE NW Casing, Wash Boring | | COMPILED BY | | TT | |
| DATUM Geodetic | | DATE February 13, 2012 | | CHECKED BY | | TZ | |

[illegible]

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT | | RECORD OF BOREHOLE | | No S301-04 | | SHEET 2 OF 2 | | METRIC | | | | | | |
|-----------------|---|--------------------|---------|--------------------------|------------|-------------------------|-----------------|--|----------|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 5404-05-01 | | LOCATION | | N 5076382.4 ; E 223946.1 | | ORIGINATED BY | | ARM | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| TT | | DATE | | February 13, 2012 | | CHECKED BY | | TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | |
| 164.7 | CLAY Soft Brown Wet | | 12 | SS | 2 | | 165 | | | | | | | |
| 163 | CLAYEY SILT Firm to stiff Grey Wet | | 13 | TO | PH | | 164 | | | | | | | |
| | Containing silt seams below a depth of 17.8 m | | 14 | SS | 6 | | 163 | | | | | | | |
| 161.6 | SILT and SAND, trace clay Compact Grey Wet | | 15 | SS | 13 | | 161 | | | | | | | |
| 157.5 | END OF BOREHOLE | | 16 | SS | 14 | | 158 | | | | | | | |
| 23.5 | NOTES: 1. Water level in casing at 1.1 m above ground surface (Elev. 182.1 m) at a depth of 19.8 m below ground surface (Elev. 161.2 m) during drilling - Artesian Condition. 2. Water level in open borehole at a depth of 0.5 m below ground surface (Elev. 180.5 m) upon completion of drilling. | | | | | | | | | | | | | |




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

| | | | | | | | |
|----------------------|--|--------------------------------------|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S301-05 | | SHEET 1 OF 2 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076383.5 ; E 223928.5 | | ORIGINATED BY ARM | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE NW Casing, Wash Boring | | COMPILED BY TT | | | |
| DATUM Geodetic | | DATE February 14, 2012 | | CHECKED BY TZ | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|-----------------------------|--|---|----------------|---|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | w _p | w | w _L | | | |
| | | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE × REMOULDED | | | | | | |
| 181.1 | GROUND SURFACE | | | | | ▽ | 181 | | | | | | | | |
| 0.0 | SILTY CLAY, trace sand, trace organics, containing rootlets Soft Brown Wet | | 1 | SS | 2 | | 180 | | | | | | | | |
| | | | 2 | SS | 2 | | | | | | | | | | |
| 179.6 | | | 3 | SS | 1 | | 179 | | | | | | | | |
| 1.5 | SILTY CLAY, trace sand Soft to firm Grey Wet | | 4 | SS | WH | | 178 | | | | | | | | |
| | | | | | | | 177 | | | | | | | | |
| | | | 5 | SS | WH | | 176 | | | | | | | | |
| 175.0 | | | | | | | 175 | | | | | | | | |
| 6.1 | Sandy SILT, trace to some clay Loose Grey Wet | | 6 | SS | 6 | | 174 | | | | | | | | |
| 173.9 | | | | | | | | | | | | | | | |
| 7.2 | CLAYEY SILT, trace sand Firm to stiff Grey Wet | | 7 | SS | 2 | | 173 | | | | | | | | |
| | Containing silt seams at a depth of 9.1 m | | 8 | SS | 2 | | 172 | | | | | | | | |
| | | | | | | | 171 | | | | | | | | |
| | | | 9 | SS | 3 | | 170 | | | | | | | | |
| 169.5 | | | | | | | 169 | | | | | | | | |
| 11.6 | SILT, trace sand Loose Wet Grey | | 10 | SS | 6 | 168 | | | | | | | | | |
| | | | 11 | SS | 4 | 167 | | | | | | | | | |
| 166.3 | | | | | | | | | | | | | | | |
| 14.8 | | | | | | | | | | | | | | | |

Continued Next Page

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


| PROJECT | | RECORD OF BOREHOLE | | No S301-05 | | SHEET 2 OF 2 | | METRIC | | | | | | | | | | | | | | |
|--------------------------------------|--|--|---------|---------------|------------|-------------------------|-----------------|--|--|--|--|---|---|--|-------------|-------------------|--|---------------------------------------|-------------|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | | | | | | | | | | | | | |
| DATE | | DATE | | CHECKED BY | | COMPILED BY | | TZ | | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5076383.5 ; E 223928.5 | | ARM | | HWY 69 | | NW Casing, Wash Boring | | | | | | | | | | | | | | |
| Geodetic | | February 14, 2012 | | TZ | | TT | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | | | GR SA SI CL | | | |
| --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | 20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | W _p — W — W _L 20 40 60 | | | kN/m ³ | | | | | | |
| 163.3 | CLAY Firm Grey Wet |  | 12 | SS | 6 | | 166 | | | | | | | | | | | | | | | |
| | | | | | | | 165 | | | | | | | | | | | | | | | |
| 17.8 | SILT, trace to some sand, trace to some clay Loose Grey Wet |  | 13 | SS | 2 | | 164 | | | | | | | | | | | | | | | |
| | | | | | | | 163 | | | | | | | | | | | | | | | |
| 161.7 | SILT and SAND, trace clay Compact Grey Wet |  | 14 | SS | 8 | | 162 | | | | | | | | | | | | | | | |
| | | | | | | | 161 | | | | | | | | | | | | | | | |
| 157.6 | END OF BOREHOLE | | 15 | SS | 10 | | 160 | | | | | | | | | | | | | | | |
| 23.5 | NOTES: 1. Water level in casing at a depth of 0.9 m above ground surface (Elev. 182.0 m) at a depth of 19.8 m below ground surface (Elev. 161.3 m) during drilling - Artesian Condition. 2. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 180.5 m) upon completion of drilling. | | 16 | SS | 17 | | 159 | | | | | | | | | | | | | | | |
| | | | | | | | 158 | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S301-06 | | SHEET 2 OF 3 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076361.5 ; E 223998.0</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>NW Casing, Wash Boring</u> | | COMPILED BY <u>TT</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 22 and 23, 2012</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | |
|--------------------------------------|---|------------|---------|------|------------|----------------------------|-----------------|---|--------------|--|---|----------------|--------------------------------------|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | w _p | w | w _L | | | | | |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | | | | | | | | |
| | | | | | | | | ● QUICK TRIAXIAL | × REMOULDED | | | | | | | | |
| --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | 20 40 60 80 100 | | 20 40 60 | | | | | | | | |
| 167.4 15.1 | SILT, some sand Compact Grey Wet | | 13 | SS | 13 | 167 | | | | | | | | | | | |
| 166.2 16.3 | | | 14 | SS | 2 | 166 | | | | | | | | | | | |
| | | | 15 | SS | 3 | 165 | | | | | | | | | | | |
| | | | 16 | SS | 3 | 164 | | | | | | | | | | | |
| | | | 17 | SS | 5 | 163 | | | | | | | | | | | |
| | | | 18 | SS | 7 | 162 | | | | | | | | | | | |
| | | | 19 | SS | 10 | 161 | | | | | | | | | | | |
| 161.2 21.3 | SILT, trace sand, trace clay Loose Grey Wet | | 17 | SS | 5 | 161 | | | | | | | | | | | |
| 159.9 22.6 | SILT and SAND, trace clay Loose Grey Wet | | 18 | SS | 7 | 160 | | | | | | | | | | | |
| | | | 19 | SS | 10 | 159 | | | | | | | | | | | |
| 157.8 24.7 | Sandy SILT, trace gravel, trace clay Compact Grey Wet | | 20 | SS | 12 | 158 | | | | | | | | | | | |
| | | | 21 | SS | 15 | 157 | | | | | | | | | | | |
| | | | 22 | SS | 18 | 156 | | | | | | | | | | | |
| | | | 23 | SS | 21 | 155 | | | | | | | | | | | |
| | | | 24 | SS | 24 | 154 | | | | | | | | | | | |
| | | | 25 | SS | 27 | 153 | | | | | | | | | | | |

Continued Next Page

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





| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S301-06 | | SHEET 3 OF 3 | | METRIC | | | | | | | |
|--------------------------------------|--|---|--------|-------------------|----------------------------|-----------------|---|--------------------|---|----------------|---|---|--|
| W.P. 5404-05-01 | | LOCATION N 5076361.5 ; E 223998.0 | | ORIGINATED BY ARM | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE NW Casing, Wash Boring | | COMPILED BY TT | | | | | | | | | |
| DATUM Geodetic | | DATE February 22 and 23, 2012 | | CHECKED BY TZ | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | W _p | W | | |
| --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | |
| 151.4 | Sandy SILT, trace gravel, trace clay Compact Grey Wet |  | 21 | SS | 10 | | | | | | | | |
| 31.1 | END OF BOREHOLE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | |
| 143.5 | END OF DCPT | | | | | | | | | | | | |
| 39.0 | NOTE: 1. Water level in open borehole at a depth of 1.5 m below ground surface (Elev. 181.0 m) upon completion of drilling. | | | | | | | | | | | | |



GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

Continued Next Page

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

| PROJECT | | RECORD OF BOREHOLE | | No S301-07 | | SHEET 2 OF 2 | | METRIC | | | | | | | | |
|--|--|---|---------|--------------------------|------------|----------------------------|--------------------|---|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION | | N 5076379.8 ; E 223999.9 | | ORIGINATED BY | | ARM | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | NW Casing, Wash Boring | | COMPILED BY | | TT | | | | | | | | |
| DATUM Geodetic | | DATE | | February 28 and 29, 2012 | | CHECKED BY | | TZ | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | |
| 167.6 | Sandy SILT, some clay Loose Grey Wet |  | 13 | SS | 7 | | 167 | | | | | | | | | 0 21 66 13 |
| 15.2 | | | | | | | 166 | | | | | | | | | |
| | | | | | | | 165 | | | | | | | | | |
| 165.0 | CLAY Stiff Grey Wet |  | | | | | 164 | | | | | | | | | |
| 17.8 | | | | | | | 163 | | | | | | | | | |
| | | | | | | | 162 | | | | | | | | | |
| 161.5 | SILT, trace to some sand, trace to some clay Loose to compact Grey Wet |  | 16 | SS | 5 | | 161 | | | | | | | | 0 14 80 6 | |
| 21.3 | | | | | | | 160 | | | | | | | | | |
| | | | | | | | 159 | | | | | | | | | |
| | | | 18 | SS | 18 | | 158 | | | | | | | | | |
| | | | | | | | 157 | | | | | | | | | |
| 156.3 | END OF BOREHOLE |  | 19 | SS | 14 | | | | | | | | | | | |
| 26.5 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.5 m below ground surface (Elev. 181.3 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

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



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

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

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S301-10 | | SHEET 1 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076299.2 ; E 224002.9</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 27, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|-------------------------|-----------------|--|--|---|---|----------------|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | |
| 182.1 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace to some sand, containing rootlets and sand seams Soft Brown to grey Moist to wet | | 1B | SS | 3 | | | | | | | | | |
| 180.7 | | | 2 | SS | 2 | | | | | | | | | |
| 1.4 | CLAYEY SILT, some sand Firm to stiff Grey Wet | | 3 | SS | 2 | | | | | | | | | |
| 178.1 | | | | | | | | | | | | | | |
| 4.0 | CLAY Soft to firm Grey Wet | | 5 | SS | 1 | | | | | | | | | |
| 176.6 | | | | | | | | | | | | | | |
| 5.5 | CLAYEY SILT, trace to some sand Soft to stiff Grey Wet | | 6 | TO | PH* | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 7 | SS | 1 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 8 | TO | PH* | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 9 | SS | 3 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 10 | SS | 3 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 168.6 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | |
| 13.5 | | | | | | | | | | | | | | |

Continued Next Page

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



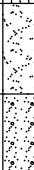
| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S301-11 | | SHEET 1 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076299.6 ; E 223984.5</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 27, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|------------|----------------------------|--------------------|---|-----------------------------|--|---|----------------|--------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | w _p | w | w _L | | |
| | | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE × REMOULDED | | | | | |
| 182.2 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | | | | | | |
| 0.0 | TOPSOIL | | 1A | AS | 2 | | 182 | | | | | | | |
| 181.9 | | | 1B | | | | | | | | | | | |
| 0.3 | CLAYEY SILT, trace sand Soft Brown to grey Moist | | 2 | SS | 2 | | 181 | | | | | | | |
| 180.7 | | | | | | | | | | | | | | |
| 1.5 | CLAY, trace sand Firm Grey Moist to wet | | 3 | SS | 1 | | 180 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 4 | SS | 1 | | 179 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 5 | TO | PH | | 178 | | | | | | | |
| | | | | | | | | | | | | | | |
| 176.4 | | | | | | | | | | | | | | |
| 5.8 | SILT, some sand, trace to some clay Very loose Grey Wet | | 6 | SS | WH | | 176 | | | | | | | |
| | | | | | | | | | | | | | | |
| 175.3 | | | | | | | | | | | | | | |
| 6.9 | CLAYEY SILT, trace sand Firm to stiff Grey Wet | | 7 | SS | 1 | | 175 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 8 | SS | 1 | | 174 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 9 | SS | 1 | | 173 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | </ | | | | | | | | | |

Continued Next Page



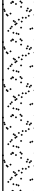
+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT | | RECORD OF BOREHOLE | | No S301-11 | | SHEET 2 OF 2 | | METRIC | | | | | | | |
|--------------------------------------|---|--|---------|--------------------------|------------|---|-----------------|--|----|------------------------------|----|-----|-------------|---------------------------------------|----------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076299.6 ; E 223984.5 | | ORIGINATED BY | | MR | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | | |
| DATUM Geodetic | | DATE | | January 27, 2013 | | CHECKED BY | | TZ | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT | | | UNIT WEIGHT | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | W _p |
| --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | |
| 164.2 | CLAY Firm to stiff Grey Wet |  | 12 | SS | 2 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 18.0 | SILT, trace to some sand, trace to some clay Compact Grey Wet |  | 14 | SS | 10 | | | | | | | | | | |
| 163.3 | | | | | | | | | | | | | | | |
| 18.9 | SAND Compact Grey Wet |  | | | | | | | | | | | | | |
| 162.4 | | | | | | | | | | | | | | | |
| 19.8 | SAND and GRAVEL Compact Grey Wet | | | | | | | | | | | | | | |
| 161.6 | | | 15A | SS | 26 | | | | | | | | | | |
| | | | 15B | | | | | | | | | | | | |
| 20.6 | END OF BOREHOLE SPOON AND CASING REFUSAL NOTE: 1. Water level in open borehole at a depth of 0.2 m below ground surface (Elev. 182.0 m) upon completion of drilling. | | | | | | | | | | | | | | |

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT | | RECORD OF BOREHOLE | | No S301-12 | | SHEET 2 OF 2 | | METRIC | | | | | | | |
|-------------------|--|---|---------|--------------------------|------------|---|-----------------|--|--|---|---|----------------|----------------------|---------------------------------------|-------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076317.9 ; E 223986.4 | | ORIGINATED BY | | MR | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | | |
| DATUM Geodetic | | DATE | | January 25, 2013 | | CHECKED BY | | TZ | | | | | | | |
| 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 | | W _p | W | W _L | | | WATER CONTENT (%) |
| 167.1 | SILTY CLAY Stiff Grey Wet |  | 12A | SS | 13 | | 167 | | | | | | | | 0 40 53 7 |
| 15.2 | | | 12B | | | | 167 | | | | | | | | |
| | | | | | | | 166 | | | | | | | | |
| | | | 13 | SS | 2 | | 165 | | | | | | | | |
| | | | 14 | SS | 2 | | 164 | | | | | | | | |
| 163.1 | SILT, trace sand, trace clay Compact Grey Wet |  | | | | 163 | | | | | | | | 0 5 91 4 | |
| 19.2 | | | 15 | SS | 16 | 162 | | | | | | | | | |
| 161.1 | SAND and GRAVEL, trace to some silt Compact Grey Wet |  | | | | 161 | | | | | | | | 42 47 11 0 | |
| 21.2 | | | 16 | SS | 20 | 160 | | | | | | | | | |
| 159.1 | END OF BOREHOLE Dynamic Cone Penetration Test (DCPT) | | | | | 159 | | | | | | | | | |
| 23.2 | | | | | | 158 | | | | | | | | | |
| 156.9 | END OF DCPT Refusal to Further Penetration (100 blows / 0.08 m) | | | | | 157 | | | | | | | | | |
| 25.4 | NOTE: 1. Water level in open borehole at a depth of 0.5 m below ground surface (Elev. 181.8 m) upon completion of drilling. | | | | | | | | | | | | | | |

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



GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

Continued Next Page

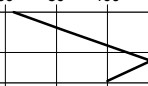
+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S301-13 | | SHEET 2 OF 3 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076335.2 ; E 223987.1</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>CC/AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 24, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|---|---|----------------|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | |
| | | | | | | | 20 40 60 80 100 | | | | | | | |
| | | | | | | | 20 40 60 80 100 | | | | | | | |
| 166.4 | SILT of slight plasticity, some sand, trace to some clay Loose Grey Wet | | 14 | SS | 5 | | | | | | | | | |
| 16.0 | SILTY CLAY Stiff Grey Wet | | 15 | SS | 1 | | | | | | | | | |
| | | | 16 | TO | PH * | | | | | | | | | |
| | | | 17 | SS | 3 | | | | | | | | | |
| | | | 18 | TO | PH * | | | | | | | | | |
| 161.8 | SILT and SAND, trace clay Loose Grey Wet | | | | | | | | | | | | | |
| 20.6 | | | 19 | SS | 6 | | | | | | | | | |
| 158.0 | SAND Compact Grey Wet | | 20 | SS | 15 | | | | | | | | | |
| 24.4 | | | | | | | | | | | | | | |
| 155.9 | END OF BOREHOLE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | |
| 26.5 | | | | | | | | | | | | | | |

Continued Next Page

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

| PROJECT | | RECORD OF BOREHOLE | | No S301-13 | | SHEET 3 OF 3 | | METRIC | | | | | | | | | | |
|-----------------|--|--------------------|--------|--------------------------|----------------------------|---|---|--------------------|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|--|--|
| W.P. 5404-05-01 | | LOCATION | | N 5076335.2 ; E 223987.1 | | ORIGINATED BY | | MR | | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 24, 2013 | | CHECKED BY | | | | | | | | | | |
| | | | | | | | | TZ | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | 20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100 | | | | | WATER CONTENT (%) 20 40 60 | | | | | | |
| 151.7 | | | | | | 152 |  | | | | | | | | | | | |
| 30.7 | END OF DCPT Refusal to Further Penetration (100 blows / 0.20 m) NOTES: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 181.8 m) upon completion of drilling. * Unable to recover Shelby tube samples between depths of 5.8 m and 6.2 m (Elev. 176.6 m and 176.2 m); between depths of 11.9 m and 12.3 m (Elev. 170.5 m and 170.1 m); between depths of 18.0 m and 18.4 m (Elev. 164.4 m and 164.0 m) and between depths of 19.6 m and 20.0 m (Elev. 162.8 m and 162.4 m). | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S301-14 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076305.3 ; E 224047.6</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 28, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|-------------------|---|----|----------------|--------------------------------------|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | WATER CONTENT (%) | | | | | | |
| 182.0 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace sand, containing sand seams Soft to firm Brown to grey Moist | | 1B | SS | 3 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 2 | SS | 8 | | | | | | | | | | |
| 180.6 | | | | | | | 181 | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | 180 | | | | | | | | |
| 1.4 | CLAY Soft to firm Grey Moist to wet | | 3 | SS | 4 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 4 | SS | WH | | 179 | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | 178 | | | | | | | | |
| | | | 5 | TO | PH* | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | 177 | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

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

| PROJECT | | RECORD OF BOREHOLE | | No S301-15 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|-------------------|--|--------------------|---------|--------------------------|------------|---|-----------------|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076323.6 ; E 224049.5 | | ORIGINATED BY | | MR | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| DATUM Geodetic | | DATE | | January 28, 2013 | | CHECKED BY | | TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 182.2 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace sand Very soft to firm Brown to grey Moist to wet | | 1B | SS | 1 | | | | | | | | | |
| | | | 2 | SS | 4 | | | | | | | | | |
| | | | 3 | SS | 4 | | | | | | | | | |
| 179.5 | SILTY CLAY, trace sand Firm to soft Grey Wet | | 4 | TO | PH | | | | | | | | | |
| 2.7 | | | | | | | | | | | | | | |
| | | | 5 | SS | 1 | | | | | | | | | |
| 176.3 | SILT and SAND, trace gravel, trace clay Very dense Grey Wet | | 6 | SS | 83/0.25 | | | | | | | | | |
| 175.9 | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | |
| 6.3 | NOTE: 1. Water level in open borehole at a depth of 0.2 m below ground surface (Elev. 182.0 m) upon completion of drilling. | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S301-16 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|-------------------|--|--------------------|---------|--------------------------|------------|---|-----------------|--|--|---|---|----------------|--|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076324.0 ; E 224031.1 | | ORIGINATED BY | | MR | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| DATUM | | Geodetic | | DATE | | January 29, 2013 | | CHECKED BY | | | | | | |
| | | | | | | | | TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | |
| 182.2 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace sand Soft to firm Brown to grey Wet | | 1B | SS | 3 | | | | | | | | | |
| 181.0 | | | 2A | SS | 5 | | | | | | | | | |
| 1.4 | SAND, trace silt Brown Wet | | 2B | | | | | | | | | | | |
| | CLAYEY SILT, trace sand, containing silt seams Firm to stiff Grey Wet | | 3 | SS | 2 | | | | | | | | | |
| 179.3 | | | | | | | | | | | | | | |
| 2.9 | SILTY CLAY, trace sand Firm Grey Wet | | 4 | SS | 1 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 5 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 6 | SS | 1 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 174.7 | | | | | | | | | | | | | | |
| 7.5 | END OF BOREHOLE SPOON REFUSAL | | 7 | SS | 50/0.0 | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.4 m below ground surface (Elev. 181.8 m) upon completion of drilling. | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

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


| | | | | | | | |
|----------------------|--|---|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S301-18 | | SHEET 1 OF 2 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076342.8 ; E 224014.6 | | ORIGINATED BY MR | | | |
| DIST HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY CC/AV | | | |
| DATUM Geodetic | | DATE January 14 and 15, 2013 | | CHECKED BY TZ | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | | |
|---------------|---|------------|---------|------|------------|----------------------------|--------------------|---|----|------------------------------------|-------------------------------------|-----------------------------------|--|--|-------------------|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | |
| 182.5 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT with SAND, trace organics and rootlets | | 1B | SS | 2 | | | | | | | | | | | | | | |
| 181.7 | Soft Brown Moist | | | | | | | | | | | | | | | | | | |
| 0.8 | CLAYEY SILT, trace sand | | 2 | SS | 5 | | | | | | | | | | | | | | |
| | Firm Grey Wet | | 3 | SS | 6 | | | | | | | | | | | | | | |
| 180.2 | | | | | | | | | | | | | | | | | | | |
| 2.3 | SILTY CLAY | | 4 | SS | 1 | | | | | | | | | | | | | | |
| | Firm Grey Wet | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | 5 | SS | 2 | | | | | | | | | | | | | | |
| 176.7 | | | | | | | | | | | | | | | | | | | |
| 5.8 | SILT of slight plasticity, some sand, trace clay | | 6 | SS | 1 | | | | | | | | | | | | | | |
| | Very loose Grey Wet | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 175.2 | | | | | | | | | | | | | | | | | | | |
| 7.3 | SILTY CLAY, trace sand | | 7 | SS | 2 | | | | | | | | | | | | | | |
| | Firm Grey Wet | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 173.7 | | | | | | | | | | | | | | | | | | | |
| 8.8 | CLAYEY SILT, trace sand | | 8 | SS | 2 | | | | | | | | | | | | | | |
| | Firm to stiff Grey Wet | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | 9 | SS | 3 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | 10 | SS | 3 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 169.1 | | | | | | | | | | | | | | | | | | | |
| 13.4 | SILT of slight plasticity, trace to some sand, trace to some clay | | 11 | TO | PH* | | | | | | | | | | | | | | |
| | Loose Grey Wet | | | | | | | | | | | | | | | | | | |
| | | | 12 | SS | 4 | | | | | | | | | | | | | | |
| 167.9 | | | | | | | | | | | | | | | | | | | |
| 14.6 | | | | | | | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT | | RECORD OF BOREHOLE | | No S301-18 | | SHEET 2 OF 2 | | METRIC | | | | | | | | | |
|---|---|---|---------|--------------------------|------------|---|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076342.8 ; E 224014.6 | | ORIGINATED BY | | MR | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 14 and 15, 2013 | | CHECKED BY | | | | | | | | | |
| | | | | | | | | TZ | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 166.0 | SILTY CLAY Firm Grey wet |  | 13 | SS | 5 | | 167 | | | | | | | | | | |
| 165.7 | SAND Grey Wet | | 14 | TO | PH* | | 166 | | | | | | | | | | |
| 16.8 | END OF BOREHOLE SPOON AND CASING REFUSAL | | 15 | SS | 50/0.05 | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at ground surface (Elev. 182.5 m) upon completion of drilling. * Unable to recover Shelby tube samples between depths of 13.4 m and 13.9 m (Elev. 169.1 m and 168.6 m), and between depths of 16.5 m and 16.6 m (Elev. 166.0 m and 165.9 m). | | | | | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14


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

| | | | | | | | |
|----------------------|--|---|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S301-20 | | SHEET 1 OF 2 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076392.9 ; E 223920.2 | | ORIGINATED BY MR | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY GL/AV | | | |
| DATUM Geodetic | | DATE January 12, 2013 | | CHECKED BY TZ | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|---|--|-----------------------------------|--------------------------------------|--|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | |
| | | | | | | 20 40 60 80 100 | | | | | | w _p w w _L | | | | | |
| 182.1 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | 182 | | | | | | | | | | |
| 0.1 | SAND, trace silt | | 1B | SS | 4 | | | | | | | | | | | | |
| 181.4 | Loose Brown Moist | | | | | | | | | | | | | | | | |
| 0.7 | SILTY CLAY, trace sand Soft to firm Brown becoming grey below a depth of 2.9 m Wet Containing silt seams between depths of 0.7 m and 2.6 m | | 2 | SS | 5 | | 181 | | | | | | | | | | |
| | | | 3 | SS | 5 | | 180 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 4 | SS | WH | | 179 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 5 | SS | 1 | | 178 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 6 | SS | 1 | | 177 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 7 | SS | 1 | | 176 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | 175 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | 174 | | | | | | | | | | |
| 173.7 | CLAYEY SILT, trace sand Firm Grey Wet | | 8 | SS | 3 | | 173 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | 172 | | | | | | | | | | |
| 171.7 | SILT, trace sand, trace clay Loose to compact Grey Wet | | 9 | TO | PH* | | | | | | | | | | | | |
| 10.4 | | | | | | | 171 | | | | | | | | | | |
| | | | 10 | SS | 11 | | 170 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 11 | SS | 5 | | 169 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 12 | SS | 10 | | 168 | | | | | | | | | | |

Continued Next Page

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

| PROJECT | | RECORD OF BOREHOLE | | No S301-20 | | SHEET 2 OF 2 | | METRIC | | | | | | | | |
|--------------------------------------|--|---|---------|--------------------------|------------|---|-----------------|--|--|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076392.9 ; E 223920.2 | | ORIGINATED BY | | MR | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | | | |
| GL/AV | | DATE | | January 12, 2013 | | CHECKED BY | | TZ | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | |
| 166.1 | SILT, trace sand, trace clay Loose to compact Grey Wet Containing silty sand seams at a depth of 15.4 m |  | 13 | SS | 5 | | 167 | | | | | | | | | |
| 166.0 | SILTY CLAY, trace sand Stiff Grey Wet | | | | | | 166 | | | | | | | | | |
| 164.1 | SAND, trace silt Compact Grey Wet | | 14 | TO | PH* | | 165 | | | | | | | | | |
| 18.0 | | | 15 | SS | 20 | | 164 | | | | | | | | | |
| | | | | | | | 163 | | | | | | | | | |
| | | | | | | | 162 | | | | | | | | | |
| | | | | | | | 161 | | | | | | | | | |
| | | | | | | | 160 | | | | | | | | | |
| 159.1 | | | 16 | SS | 22 | | | | | | | | | | | |
| 23.0 | END OF BOREHOLE SPOON REFUSAL NOTES: 1. Water level in open borehole at 0.6 m above ground surface (Elev. 182.7 m) upon completion of drilling - Artesian condition. * Unable to recover Shelby tube samples between depths of 10.4 m and 10.8 m (Elev. 171.7 m and 171.3 m), and between depths of 18.0 m and 18.4 m (Elev. 164.1 m and 163.7 m). | | | | | | | | | | | | | | | 0 98 2 0 |

| | | | | | | | |
|----------------------|--|---|--|------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S301-21 | | SHEET 1 OF 1 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076455.3 ; E 223915.3 | | ORIGINATED BY MR | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY AV | | | |
| DATUM Geodetic | | DATE January 11, 2013 | | CHECKED BY TZ | | | |

| 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 | | W _p | W | W _L | | |
| 182.8 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | W | | 1A | | | | | | | | | | | |
| 0.4 | SILTY SAND Very loose Brown Wet | | 1B | SS | 1 | | | | | | | | | |
| 181.4 | CLAYEY SILT, trace sand Firm Brown Moist to wet | | 1C | | | | | | | | | | | |
| 1.4 | | | 2 | SS | 7 | | | | | | | | | |
| | SILTY CLAY, trace sand Firm to stiff Brown becoming grey below a depth of 3.0 m Wet | | 3 | SS | 3 | | | | | | | | | |
| | | | 4 | SS | 1 | | | | | | | | | |
| 178.4 | SILT, trace to some sand, trace clay Loose to compact Grey Wet | | 5 | SS | 4 | | | | | | | | | |
| 4.4 | | | 6 | SS | 13 | | | | | | | | | |
| 175.8 | SILTY CLAY Soft Grey Wet | | 7 | SS | 3 | | | | | | | | | |
| 7.0 | | | 8 | SS | 20/0.0 | | | | | | | | | |
| 174.3 | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | |
| 8.5 | NOTE: 1. Water level at a depth of 0.2 m (Elev. 182.6 m) below ground surface upon completion of drilling, | | | | | | | | | | | | | |

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

| | | | | | | | |
|------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S301-22 | | SHEET 1 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076467.9 ;E 223854.1</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>GL/AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 11, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

[illegible]

Continued Next Page

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

○ 3% STRAIN AT FAILURE

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S301-22 | | | | SHEET 2 OF 2 | | METRIC | | | | | | | | | |
|----------------------|---|---|--------|------|----------------------------|-------------------|---|--------------------|--|--|--|---|-------------------|--|---|--|--|
| W.P. 5404-05-01 | | LOCATION N 5076467.9 ; E 223854.1 | | | | ORIGINATED BY MR | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | | | COMPILED BY GL/AV | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 11, 2013 | | | | CHECKED BY TZ | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | |
| 167.9 | | | 12 | SS | 17 | | 168 | | | | | | | | | | |
| 15.5 | END OF BOREHOLE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | |
| 167.1 | | | | | | | | | | | | | | | | | |
| 16.3 | END OF DCPT Refusal to Further Penetration (100 blows / 0.10 m) NOTE: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 183.1 m) during drilling. upon completion of drilling (Artesian condition). | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S301-23 | | SHEET 1 OF 1 | | METRIC | | | | | |
|-------------------|---|--------------------|---------|--------------------------|------------|---|--------------------|---|--|--|---|---|---|
| W.P. 09-1111-6014 | | LOCATION | | N 5076530.3 ; E 223849.2 | | ORIGINATED BY | | MR | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY | | | | | |
| DATUM | | Geodetic | | DATE | | January 9, 2013 | | CHECKED BY | | | | | |
| | | | | | | | | TZ | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | | |
| 183.8 | GROUND SURFACE | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 3 | | | | | | | | 0 65 34 1 |
| 0.2 | SILT and SAND, trace clay | | 1B | SS | 3 | | | | | | | | |
| 183.1 | Very loose Brown Wet | | | | | | | | | | | | |
| 0.7 | CLAYEY SILT, trace sand | | 2 | SS | 5 | | | | | | | | |
| 182.4 | Firm Brown Moist | | | | | | | | | | | | |
| 1.4 | SILTY CLAY, trace sand, containing silt seams | | 3 | SS | 5 | | | | | | | | |
| | Soft to stiff Grey Wet | | | | | | | | | | | | |
| | | | 4 | SS | 2 | | | | | | | | |
| | | | | | | | | | | | | | |
| 179.2 | Sandy SILT | | 5 | SS | 11 | | | | | | | | |
| 4.6 | Compact Grey Wet | | | | | | | | | | | | |
| 178.0 | SAND, trace silt | | 6 | SS | 10 | | | | | | | | |
| 5.8 | Compact Grey Wet | | | | | | | | | | | | |
| | | | 7 | SS | 12 | | | | | | | | |
| 175.6 | END OF BOREHOLE | | | | | | | | | | | | |
| 8.2 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 172.6 | END OF DCPT | | | | | | | | | | | | |
| 11.2 | Refusal to Further Penetration (100 blows / 0.83 m) | | | | | | | | | | | | |
| | NOTE: 1. Water level at a depth of 0.2 m below ground surface (Elev. 183.6 m) upon completion of drilling. | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S301-24 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|---|---|--------------------|---------|--------------------------|------------|---|-----------------|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076542.9 ; E 223787.9 | | ORIGINATED BY | | MR | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY | | | | | | |
| DATUM | | Geodetic | | DATE | | January 9, 2013 | | CHECKED BY | | | | | | |
| | | | | | | | | TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 183.4 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | | |
| 0.1 | Silty SAND | | 1B | SS | 5 | | | | | | | | | 0 67 23 0 |
| 182.7 | Loose Brown Moist | | | | | | | | | | | | | |
| 0.7 | CLAYEY SILT, trace organics to a depth of 0.9 m | | 2 | SS | 3 | | | | | | | | | |
| 182.0 | Soft | | | | | | | | | | | | | |
| 1.4 | Dark grey Moist | | 3 | SS | 2 | | | | | | | | | |
| | SILTY CLAY | | | | | | | | | | | | | |
| | Soft Brown to grey Wet | | | | | | | | | | | | | |
| 180.3 | SAND, trace silt, trace gravel | | 4 | SS | 7 | | | | | | | | | |
| 179.9 | Loose Grey Wet | | | | | | | | | | | | | |
| 3.5 | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | |
| NOTE: 1. Water level at a depth of 0.2 m below ground surface (Elev. 183.2 m) upon completion of drilling. | | | | | | | | | | | | | | |

| | | | | | | | |
|----------------------|--|--------------------------------------|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No C301-S1 | | SHEET 1 OF 3 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076349.2 ; E 223937.5 | | ORIGINATED BY ARM | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE NW Casing, Wash Boring | | COMPILED BY TT | | | |
| DATUM Geodetic | | DATE February 10 and 14, 2012 | | CHECKED BY CN/TVA | | | |

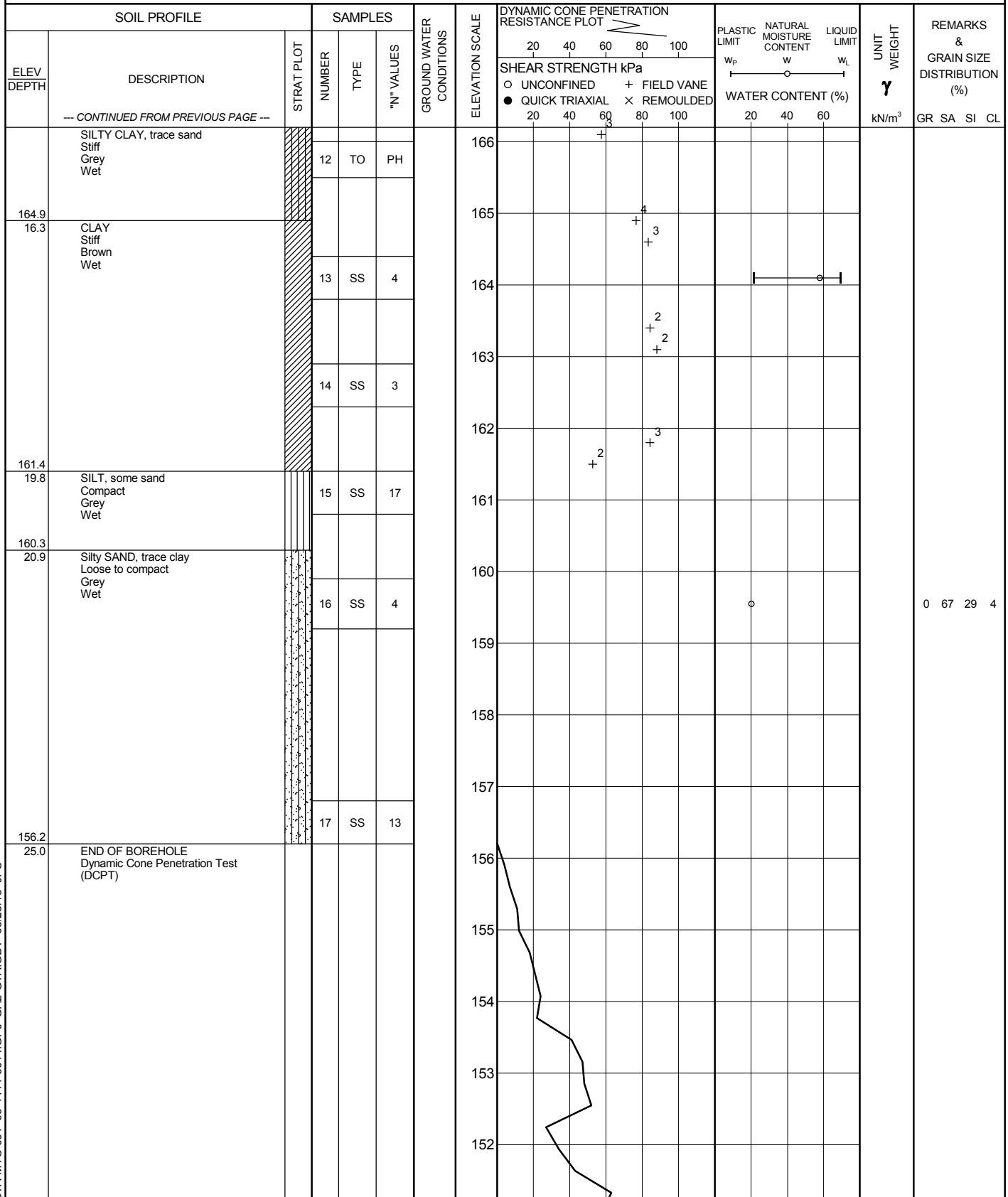
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|---|---|----------------|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | |
| | | | | | | | 20 40 60 80 100 | | | | | | | |
| 181.2 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| | Sandy CLAYEY SILT, containing organics Soft to stiff Brown to black Moist | | 1 | SS | 11 | | | | | | | | | |
| | | | 2 | SS | 2 | | | | | | | | | |
| 179.7 | SILTY CLAY, trace sand Firm Grey Wet | | 3 | SS | 1 | | | | | | | | | |
| 1.5 | | | | | | | | | | | | | | |
| | | | 4 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 176.7 | CLAYEY SILT, some sand Firm to stiff Grey Wet | | 5 | TO | PH | | | | | | | | | |
| 4.5 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 6 | SS | WH | | | | | | | | | |
| | Silt seams at a depth of 6.4 m | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 7 | SS | 1 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 8 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 9 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 169.0 | SILT, some sand, some clay Loose Grey Wet | | 10 | SS | 6 | | | | | | | | | |
| 12.2 | | | | | | | | | | | | | | |
| 167.9 | SILTY CLAY, trace sand Stiff Grey Wet | | 11 | SS | 4 | | | | | | | | | |
| 13.3 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |


Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No C301-S1 | | SHEET 2 OF 3 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076349.2 ; E 223937.5</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>NW Casing, Wash Boring</u> | | COMPILED BY <u>TT</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 10 and 14, 2012</u> | | CHECKED BY <u>CN/TVA</u> | | | |



| PROJECT | | RECORD OF BOREHOLE | | | | No C301-S1 | | SHEET 3 OF 3 | | METRIC | | | | | | |
|-----------------|---|--------------------|--------|--------------------------|----------------------------|--------------------------|---|--------------------|--|--------|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION | | | | N 5076349.2 ; E 223937.5 | | ORIGINATED BY | | ARM | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | NW Casing, Wash Boring | | COMPILED BY | | TT | | | | | | |
| DATUM Geodetic | | DATE | | February 10 and 14, 2012 | | CHECKED BY | | CN/TVA | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | 20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100 | | | | | WATER CONTENT (%) | | | | |
| 150.7 30.5 | END OF DCPT NOTES: 1. Artesian conditions encountered when casing advanced to a depth of 20.4 m below ground surface (Elev. 160.8 m), with the water level measured at about 0.9 m above ground surface (Elev. 182.1 m). 2. Water level in open borehole at a depth of 1.4 m below ground surface (Elev. 179.8 m) upon completion of drilling. | | | | | 151 |  | | | | | 20 40 60 | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No C301-S2 | | SHEET 1 OF 3 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076373.2 ; E 223956.0</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>March 7, 2012</u> | | CHECKED BY <u>CN/TVA</u> | | | |

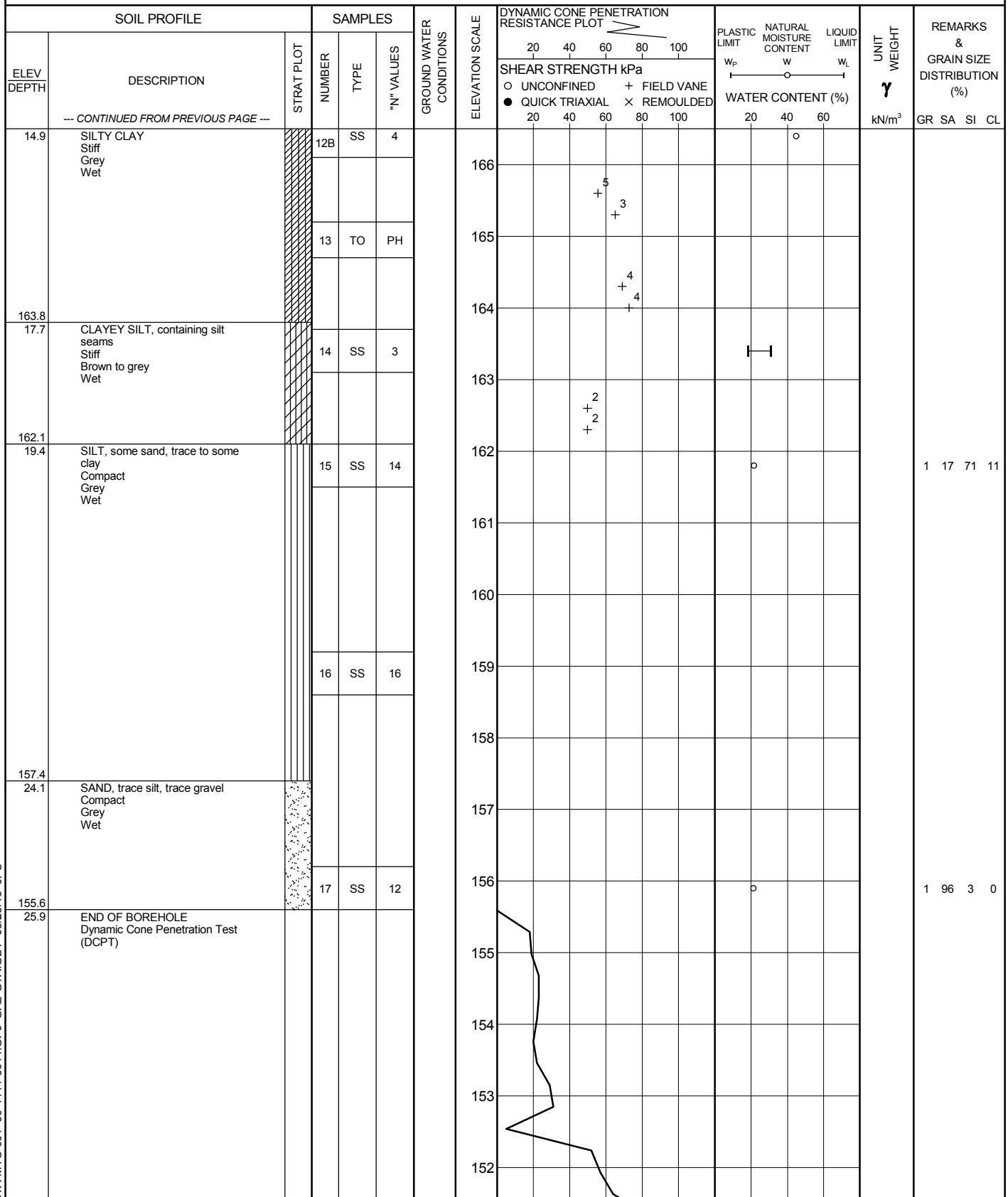
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
|----------------|--|------------|---------|------|------------|----------------------------|--------------------|---|-----|----|----|-----|--|---|----------------|---|---|----|----|----|--|
| ELEV. DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL | |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | | | | | |
| 181.5 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | | |
| 0.0 | Sandy SILT, containing organics, rootlets and wood fragments Very loose Dark brown to grey Wet | | | 1 | SS | WH | | 181 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | 2 | SS | 1 | | | | | | | | | | | | | | | |
| 180.1 | | | | | | | | | 180 | | | | | | | | | | | | |
| 1.4 | SILTY CLAY, trace sand Very soft to soft Grey Wet | | | 3 | SS | WH | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | 4 | TO | PH | | | 179 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| 177.9 | | | | | | | | 178 | | | | | | | | | | | | | |
| 3.6 | CLAYEY SILT, trace sand Soft Grey Wet | | | 5 | SS | WH | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| 175.9 | | | | | | | | 176 | | | | | | | | | | | | | |
| 5.6 | SILT, trace sand, trace clay Very loose Grey Wet | | | 6 | SS | WH | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| 174.8 | | | | | | | | 175 | | | | | | | | | | | | | |
| 6.7 | CLAYEY SILT, trace sand Soft to firm Grey Wet | | | 7 | SS | 1 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | 8 | SS | WH | | 173 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | 9 | SS | 1 | | 171 | | | | | | | | | | | | | |
| 170.4 | | | | | | | | | | | | | | | | | | | | | |
| 11.1 | SILT, some sand, some clay Loose Grey Wet | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | 10A | SS | 4 | | | | | | | | | | | | | | | |
| 169.5 | | | | | | | | | | | | | | | | | | | | | |
| 12.0 | SILTY CLAY, trace to some sand Firm to stiff Grey Wet | | | 10B | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| 168.2 | | | | | | | | | | | | | | | | | | | | | |
| 13.3 | SILT, trace sand, trace clay Very loose Grey Wet | | | 11 | SS | 2 | | | | | | | | | | | | | | | |
| 167.5 | | | | | | | | | | | | | | | | | | | | | |
| 14.0 | Silty SAND, trace clay Grey Wet | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| 166.6 | | | | 12A | | | | 167 | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No C301-S2 | | SHEET 2 OF 3 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076373.2 ; E 223956.0</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>March 7, 2012</u> | | CHECKED BY <u>CN/TVA</u> | | | |



Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

| PROJECT | | RECORD OF BOREHOLE | | | | No C301-S2 | | SHEET 3 OF 3 | | METRIC | | | | | | |
|-----------------|--|--------------------|--------|---------------|-------------------------|--------------------------|--|---|--|------------------|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 5404-05-01 | | LOCATION | | | | N 5076373.2 ; E 223956.0 | | | | ORIGINATED BY MR | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | | | COMPILED BY BM | | | | |
| DATUM Geodetic | | DATE | | March 7, 2012 | | | | CHECKED BY CN/TVA | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | |
| 150.8 | | | | | | 151 | | | | | | | | | | |
| 30.7 | END OF DCPT Refusal to Further Penetration NOTES: 1. Vane tests carried out on Sample No. 4 are laboratory shear vanes performed on shelly tube sample. 2. Artesian conditions encountered when advanced casing to a depth of 11.7 m below ground surface (Elev. 169.8 m), with the water level measured at about 0.8 m above ground surface (Elev. 182.3 m). 3. Water level in open borehole at a depth of 0.9 m below ground surface (Elev. 180.6 m) upon completion of drilling. | | | | | | | | | | | | | | | |



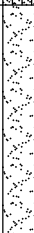

| | | | | | | | |
|----------------------|--|--------------------------------------|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No C301-S3 | | SHEET 1 OF 3 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076367.3 ; E 223942.8 | | ORIGINATED BY ARM | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE NW Casing, Wash Boring | | COMPILED BY TT | | | |
| DATUM Geodetic | | DATE February 8 and 9, 2012 | | CHECKED BY CN/TVA | | | |

| 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 | | W _p | W | W _L | | |
| | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED | | | | | | | |
| 181.5 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1 | SS | 2 | | | | | | | | | |
| | CLAYEY SILT, some sand, trace gravel, containing organics | | 2 | SS | 3 | | | | | | | | | |
| 180.0 | | | | | | | | | | | | | | |
| 1.5 | SILTY CLAY, trace sand | | 3 | SS | 2 | | | | | | | | | |
| | Firm | | | | | | | | | | | | | |
| | Brown becoming grey at a depth of 3.4 m | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | |
| | | | 4 | TO | PH | | | | | | | | | |
| 177.4 | | | | | | | | | | | | | | |
| 4.1 | CLAYEY SILT, trace sand | | 5 | SS | 1 | | | | | | | | | |
| | Firm | | | | | | | | | | | | | |
| | Grey | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | |
| 175.1 | | | 6A | SS | 6 | | | | | | | | | |
| 6.4 | SILT, some sand, trace to some clay | | 6B | | | | | | | | | | | |
| | Loose | | | | | | | | | | | | | |
| | Grey | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | |
| 174.3 | | | | | | | | | | | | | | |
| 7.2 | CLAYEY SILT, trace sand | | 7 | SS | 2 | | | | | | | | | |
| | Firm to stiff | | | | | | | | | | | | | |
| | Grey | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | |
| | | | 8 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 9 | TO | PH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 10 | SS | 3 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 167.8 | | | | | | | | | | | | | | |
| 13.7 | SILT, trace to some clay | | 11 | SS | 8 | | | | | | | | | |
| | Loose | | | | | | | | | | | | | |
| | Grey | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

| PROJECT | | RECORD OF BOREHOLE | | No C301-S3 | | SHEET 2 OF 3 | | METRIC | | | | | | |
|--------------------------------------|---|---|---------|--------------------------|------------|----------------------------|--------------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION | | N 5076367.3 ; E 223942.8 | | ORIGINATED BY | | ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | NW Casing, Wash Boring | | COMPILED BY | | TT | | | | | | |
| DATUM Geodetic | | DATE | | February 8 and 9, 2012 | | CHECKED BY | | CN/TVA | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | |
| 166.4 15.1 | SILTY CLAY, trace sand Stiff Grey Wet |  | 12 | SS | WH | | 166 | | | | | | | |
| | | | | | | | | 165 | | | | | | |
| | | | | | | | | 164 | | | | | | |
| | | | | | | | | 163 | | | | | | |
| 162.1 19.4 | SANDY SILT, trace to some clay Compact Grey Wet |  | 15 | SS | 11 | | 162 | | | | | | | |
| | | | | | | | | 161 | | | | | | |
| | | | | | | | | 160 | | | | | | |
| | | | | | | | | 159 | | | | | | |
| 160.6 20.9 | SAND, trace silt, trace gravel Loose Grey Wet |  | 16 | SS | 9 | | 160 | | | | | | | |
| | | | | | | | | 159 | | | | | | |
| | | | | | | | | 158 | | | | | | |
| | | | | | | | | 157 | | | | | | |
| 158.3 23.2 | SAND and SILT, trace to some clay Compact Grey Wet |  | 17 | SS | 11 | | 157 | | | | | | | |
| | | | | | | | | 156 | | | | | | |
| | | | | | | | | 155 | | | | | | |
| | | | | | | | | 154 | | | | | | |
| 155.0 26.5 | END OF BOREHOLE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | |
| 153.6 27.9 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.15 m) | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC



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

GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

| | | | | | | | |
|----------------------|--|---|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No C301-N1 | | SHEET 1 OF 3 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5076376.5 ; E 223965.1 | | ORIGINATED BY MR | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY BM | | | |
| DATUM Geodetic | | DATE March 5 and 6, 2012 | | CHECKED BY CN/TVA | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|--------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | |
| 181.2 | GROUND SURFACE | | | | | ▽ | 20 40 60 80 100 | 20 40 60 | | | | | | |
| 0.0 | TOPSOIL | | | | | | 181 | | | | | | | |
| 0.1 | Silty SAND, containing organics, wood fragments and roots | | 1 | SS | 1 | | | | | | | | | |
| 180.5 | Very loose | | | | | | | | | | | | | |
| 0.7 | Dark brown | | | | | | | | | | | | | |
| | Moist | | | | | | | | | | | | | |
| | SILTY CLAY, trace sand | | 2 | SS | WH | | | | | | | | | |
| | Firm | | | | | | | | | | | | | |
| | Grey | | 3 | SS | WH | | | | | | | | | |
| | Wet | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No C301-N1 | | SHEET 3 OF 3 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076376.5 ; E 223965.1</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>March 5 and 6, 2012</u> | | CHECKED BY <u>CN/TVA</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|----|----|--------------------------------------|---|----|----|----|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | | | | |
| | NOTES: 1. Water level in casing at a depth of 1.5 m below ground surface (Elev. 179.7 m) at 5:30 pm on March 5, 2012, when casing advanced to a depth of 19.4 m (Elev. 161.8 m). 2. Artesian conditons observed in casing with water level at 0.7 m above ground surface (Elev. 181.9 m) at 7:30 am on March 6, 2012. 3. Sand blow back encountered when advanced casing to a depth of 23.8 m below ground surface (Elev. 157.4 m). 4. Water level in open borehole at a depth of 0.5 m below ground surface (Elev. 180.7 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC



SHEET 1 OF 2

METRIC

ORIGINATED BY MR

COMPILED BY MAS





CHECKED BY CN/TVA

Continued Next Page

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

GTGTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No C301-N2 | | SHEET 2 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076390.8 ; E 223972.2</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>March 9, 2012</u> | | CHECKED BY <u>CN/TVA</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | | |
|--------------------------------------|---|---|---------|------|------------|----------------------------|-----------------|---|----------|--|---|---------------------------------------|--|--|-------------------|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) | | | | |
| | | | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | | | | | | |
| --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | | | | |
| 163.9 | SILTY CLAY, containing silt seams Stiff Grey Wet |  | 12 | SS | 3 | | 166 |  | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | 13 | TO | PH | | | | | | | | | | | | | | |
| 17.7 | Sandy SILT, trace to some clay, containing sand seams Loose to compact Grey Wet |  | 14 | SS | 8 | | 165 |  | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 161.6 | | | 15 | SS | 10 | | 164 | | | | | | | | | | | | |
| 20.0 | END OF BOREHOLE | | | | | | 163 | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.2 m below ground surface (Elev. 181.4 m) upon completion of drilling. | | | | | | 162 | | | | | | | | | | | | |

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

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No C301-N3 | | SHEET 1 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076396.4 ; E 223986.9</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>March 10, 2012</u> | | CHECKED BY <u>CN/TVA</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|--------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | w _p w w _L | | | | | |
| 181.6 | GROUND SURFACE | | | | | | 20 40 60 80 100 | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| 0.2 | Silty SAND, containing organics and roots | | 1A | SS | 7 | | | | | | | | | |
| 180.8 | Loose Brown Moist | | 1B | | | | | | | | | | | |
| 0.8 | CLAYEY SILT, trace sand, containing sand seams | | 2 | SS | 9 | | | | | | | | 0 2 76 22 | |
| | Firm Grey Wet | | 3 | SS | 7 | | | | | | | | | |
| | | | 4 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 5 | TO | PH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 175.8 | | | 6A | SS | WH | | | | | | | | | |
| 5.8 | SILT, trace to some sand, trace clay | | 6B | | | | | | | | | | | |
| | Very loose to loose Grey Wet | | | | | | | | | | | | | |
| | | | 7 | SS | 7 | | | | | | | | | |
| 173.4 | | | | | | | | | | | | | | |
| 8.2 | CLAYEY SILT, containing silt seams | | 8 | SS | 1 | | | | | | | | | |
| | Firm Grey Wet | | | | | | | | | | | | | |
| | | | 9 | SS | 1 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 10 | TO | PH | | | | | | | | | |
| 169.1 | | | | | | | | | | | | | | |
| 12.5 | SILT, some sand, trace clay | | 11 | SS | 6 | | | | | | | | | |
| | Loose Grey Wet | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 167.3 | | | | | | | | | | | | | | |
| 14.3 | Sandy SILT, trace clay | | 12 | SS | 7 | | | | | | | | | |
| | Loose Grey Wet | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 03/28/13 JFC

| PROJECT | | RECORD OF BOREHOLE | | No C301-N3 | | SHEET 2 OF 2 | | METRIC | | | | | | | | | |
|---------------|--|--------------------------|---------|---------------|------------|-------------------------|-----------------|---|----|-------------|----|-----|---------------------------------|-------------------------------|--------------------------------|---------------------------------------|---------------------------------------|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5076396.4 ; E 223986.9 | | MR | | HWY 69 | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | MAS | | | | | | | |
| Geodetic | | March 10, 2012 | | CN/TVA | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 165.7 | Sandy SILT, trace clay Loose Grey Wet | | | | | | 166 | | | | | | | | | | |
| 15.9 | CLAY Stiff Grey Wet | | 13 | SS | 4 | | 165 | | | | | | | | | | |
| | | | | | | | 164 | | | | | | | | | | |
| 162.9 | | | 14 | TO | PH | | 163 | | | | | | | | | | |
| 18.7 | Sandy SILT, trace to some clay Compact Grey Wet | | | | | | 162 | | | | | | | | | | |
| 161.9 | | | 15 | SS | 57/18 | | 161 | | | | | | | | | | |
| 19.7 | Granite Gneiss (BEDROCK) | | | | | | 160 | | | | | | | | | | |
| | Bedrock cored from depths of 19.7 m to 22.7 m | | 1 | RC | REC 98% | | 159 | | | | | | | | | | |
| | For bedrock coring details, refer to Record of Drillhole C301-N3 | | 2 | RC | REC 100% | | | | | | | | | | | | |
| 158.9 | | | | | | | | | | | | | | | | | |
| 22.7 | END OF BOREHOLE | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 1.7 m below ground surface (Elev. 179.9 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

PROJECT: 03-1112-001 T-6000

RECORD OF DRILLHOLE: C301-N3

SHEET 1 OF 1

LOCATION: N 5076396.4 ; E 223986.9

DRILLING DATE:

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: D25 Track Mount

DRILLING CONTRACTOR: WALKER DRILLING

| DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | FLUSH | COLOUR % RETURN | JN - Joint FLT - Fault SH - Shear VN - Vein CJ - Conjugate BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular PO - Polished K - Slickensided SM - Smooth RO - Rough VR - Very Rough MB - Mechanical Break BR - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols. | | | | | | | | | | | | NOTES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|-----------------|--|--------------|-----------------------|---------|-------|--------------------|--|-----------------|-------------|---------------------------------|--------------------|----------------------------|---------------------------------|----|----|----|--|-----|-------|---|-------------------|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | RECOVERY | | | FRACT. INDEX PER 0.3 m | DISCONTINUITY DATA | | | | | | HYDRAULIC CONDUCTIVITY K, cm/sec | | | Diametral Point Load Index (MPa) | RMC -Q AVG. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | TOTAL CORE % | SOLID CORE % | R.Q.D. % | | B Angle | DIP w.r.t. CORE AXIS | TYPE AND SURFACE DESCRIPTION | Jr | Ja | Jn | 10° | 10° | | | | 10° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | NW Casing | GRANITE GNEISS Fresh, foliated, medium crystalline, slightly porous, strong, grey, pink and black | | 161.91 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

DEPTH SCALE

1 : 50



LOGGED: MR

CHECKED: MAS/TVA

GTA-RCK 018 09-1111-6014.GPJ GAL-MISS.GDT 03/27/13 JFC

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S301-DC01 | | SHEET 2 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076354.0 ; E 223970.6</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>CC</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 28, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL LIMIT MOISTURE LIQUID CONTENT LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | |
|---------------|--------------------------------------|------------|---------|------|------------|--------------------------------|-----------------|---|--|--|---|---|----------------|--------------------------------------|---|--|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | W _p | W | W _L | | WATER CONTENT (%) | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | | | | ○ | | | | | | | | |
| | | | | | | ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | | | | |
| | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S301-DC02 | | SHEET 2 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076365.2 ; E 223926.6</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>CC</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 28, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | |
|---------------|--------------------------------------|------------|---------|------|------------|----------------------------|-----------------|---|------------------|------------|---|---|----------------|--------------------------------------|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | W _p | W | W _L | | | | |
| | | | | | | | | ○ UNCONFINED | + | FIELD VANE | WATER CONTENT (%) | | | | | | |
| | | | | | | | | | ● QUICK TRIAXIAL | × | REMOULDED | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | |
| | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S301-DC03 | | SHEET 1 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076363.0 ; E 223980.8</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>CC</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 28, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--------------------------------------|------------|---------|------|------------|----------------------------|-----------------|---|-------------------|--|---|----------------|--------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | WATER CONTENT (%) | | | | | |
| 182.6 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14



| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S301-DC04 | | SHEET 1 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076390.8 ;E 223955.6</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>CC</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 13, 2012</u> | | CHECKED BY <u>CN</u> | | | |

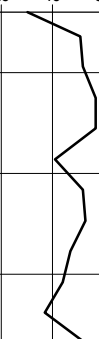
[illegible]

Continued Next Page

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

○ 3% STRAIN AT FAILURE

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT <u>09-1111-6014</u> | | | | RECORD OF DCPT No S301-DC04 | | | | SHEET 2 OF 2 | | | | METRIC | | | | |
|--------------------------------------|--------------------------------------|------------|--------|--|----------------------------|-----------------|--|--------------------------|--|--|--|---|-----------------------------------|--|--|--|
| W.P. <u>5404-05-01</u> | | | | LOCATION <u>N 5076390.8 ; E 223955.6</u> | | | | ORIGINATED BY <u>ARM</u> | | | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | | | COMPILED BY <u>CC</u> | | | | | | | | |
| DATUM <u>Geodetic</u> | | | | DATE <u>February 13, 2012</u> | | | | CHECKED BY <u>CN</u> | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | W _p W W _L | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | <div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED </div> | | | | | <div style="display: flex; justify-content: space-between;"> W_p W W_L WATER CONTENT (%) </div> | | | | |
| 163.3 | Dynamic Cone Penetration Test (DCPT) | | | | | 166 |  | | | | | | | | | |
| | | | | | 165 | | | | | | | | | | | |
| | | | | | 164 | | | | | | | | | | | |
| 18.3 | END OF DCPT | | | | | | | | | | | | | | | |



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



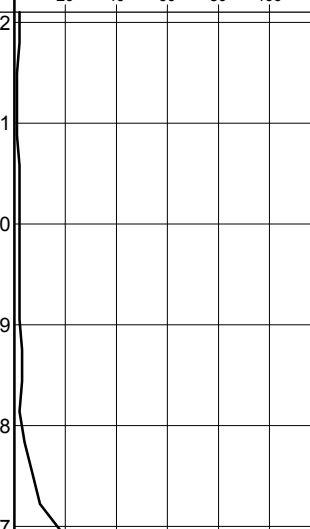
+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S301-DC06 | | SHEET 2 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076318.4 ; E 223968.0</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 22, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | |
|---------------|--------------------------------------|------------|---------|------|------------|----------------------------|--------------------------------|---|-------------------|---|---|----------------|--------------------------------------|--|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | WATER CONTENT (%) | | | | | | | | | |
| | | | | | | | ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | | |
| | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S301-DC07 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | | |
|----------------------|--|---|--------|------|-------------------------|------------------|--|--------------------|--|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|--|--|--|--|
| W.P. 5404-05-01 | | LOCATION N 5076306.7 ; E 224030.4 | | | | ORIGINATED BY MR | | | | | | | | | | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | | | COMPILED BY AV | | | | | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 16, 2013 | | | | CHECKED BY TZ | | | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) | | | | |
| 182.1 | GROUND SURFACE | | | | | | <div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED </div> | | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | 182 |  | | | | | | | | | | | | | | |
| | | | | | | 181 | | | | | | | | | | | | | | | |
| | | | | | | 180 | | | | | | | | | | | | | | | |
| | | | | | | 179 | | | | | | | | | | | | | | | |
| | | | | | | 178 | | | | | | | | | | | | | | | |
| 176.8 | END OF DCPT Refusal to Further Penetration (23 Blows / 0.10 m) | | | | | 177 | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S301-DC08 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076342.3 ; E 224033.0</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 16, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|--------------------------------------|------------|--------|---------|------------|--------------------|----------------------------|-----------------|---|------------------|----------------|---|--|--|--------------------------------------|---|--|--|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | SHEAR STRENGTH kPa | | | W _p | W | W _L | WATER CONTENT (%) | | | | | | | |
| | | | | | | ○ UNCONFINED | | | + FIELD VANE | ● QUICK TRIAXIAL | × REMOULDED | | | | | | | | GR |
| 182.4 | GROUND SURFACE | | | | | | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

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

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S301-DC09 | | SHEET 2 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076344.2 ; E 223997.3</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 16, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|--------------|------------------|---|-------------------|----------------|---|---|----|----|----|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | W _p | W | W _L | | GR | SA | SI | CL | |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | ● QUICK TRIAXIAL | × REMOULDED | WATER CONTENT (%) | | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | | | |
| | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | | | |
| | | | | | | | 167 | | | | | | | | | | | | |
| | | | | | | | 166 | | | | | | | | | | | | |
| | | | | | | | 165 | | | | | | | | | | | | |
| | | | | | | | 164 | | | | | | | | | | | | |
| | | | | | | | 163 | | | | | | | | | | | | |
| | | | | | | | 162 | | | | | | | | | | | | |
| | | | | | | | 161 | | | | | | | | | | | | |
| 160.2 | | | | | | | | | | | | | | | | | | | |
| 22.1 | END OF DCPT Refusal to Further Penetration (100 Blows / 0.20 m) | | | | | | | | | | | | | | | | | | |

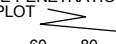
+ ³, × ³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

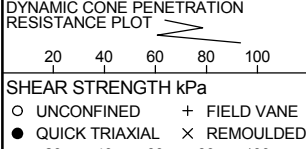
| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S301-DC10 | | SHEET 1 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076405.3 ; E 223934.3</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>CC</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 20, 2012</u> | | CHECKED BY <u>CN</u> | | | |

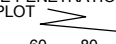
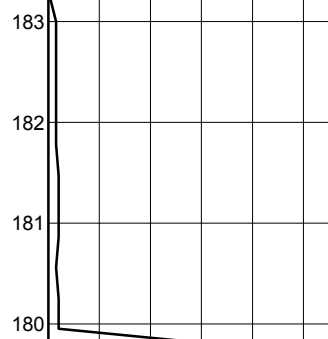
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--------------------------------------|------------|---------|------|------------|----------------------------|-----------------|---|-------------------|--|---|----------------|--------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | WATER CONTENT (%) | | | | | |
| 182.6 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

Continued Next Page

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

| PROJECT | | RECORD OF DCPT No S301-DC10 | | SHEET 2 OF 2 | | METRIC | | | | |
|-------------------|--------------------------------------|---|--------|-------------------|-------------------------|-----------------|---|---|---------------------------------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5076405.3 ; E 223934.3 | | ORIGINATED BY ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Dynamic Cone Penetration Test | | COMPILED BY CC | | | | | | |
| DATUM Geodetic | | DATE February 20, 2012 | | CHECKED BY CN | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 164.0 | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | |
| 18.6 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| | END OF DCPT | | | | | | | | | |

| PROJECT | | RECORD OF DCPT No S301-DC12 | | SHEET 1 OF 1 | | METRIC | | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|--|---|---------------------------------------|--|------------|
| W.P. 09-1111-6014 | | LOCATION N 5076480.3 ; E 223868.2 | | ORIGINATED BY ARM | | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE Dynamic Cone Penetration Test | | COMPILED BY CC | | | | | | | |
| DATUM Geodetic | | DATE February 22, 2012 | | CHECKED BY CN | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | | "N" VALUES |
| 182.8 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | |
| 177.4 5.4 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.20 m) | | | | | | | | | | |

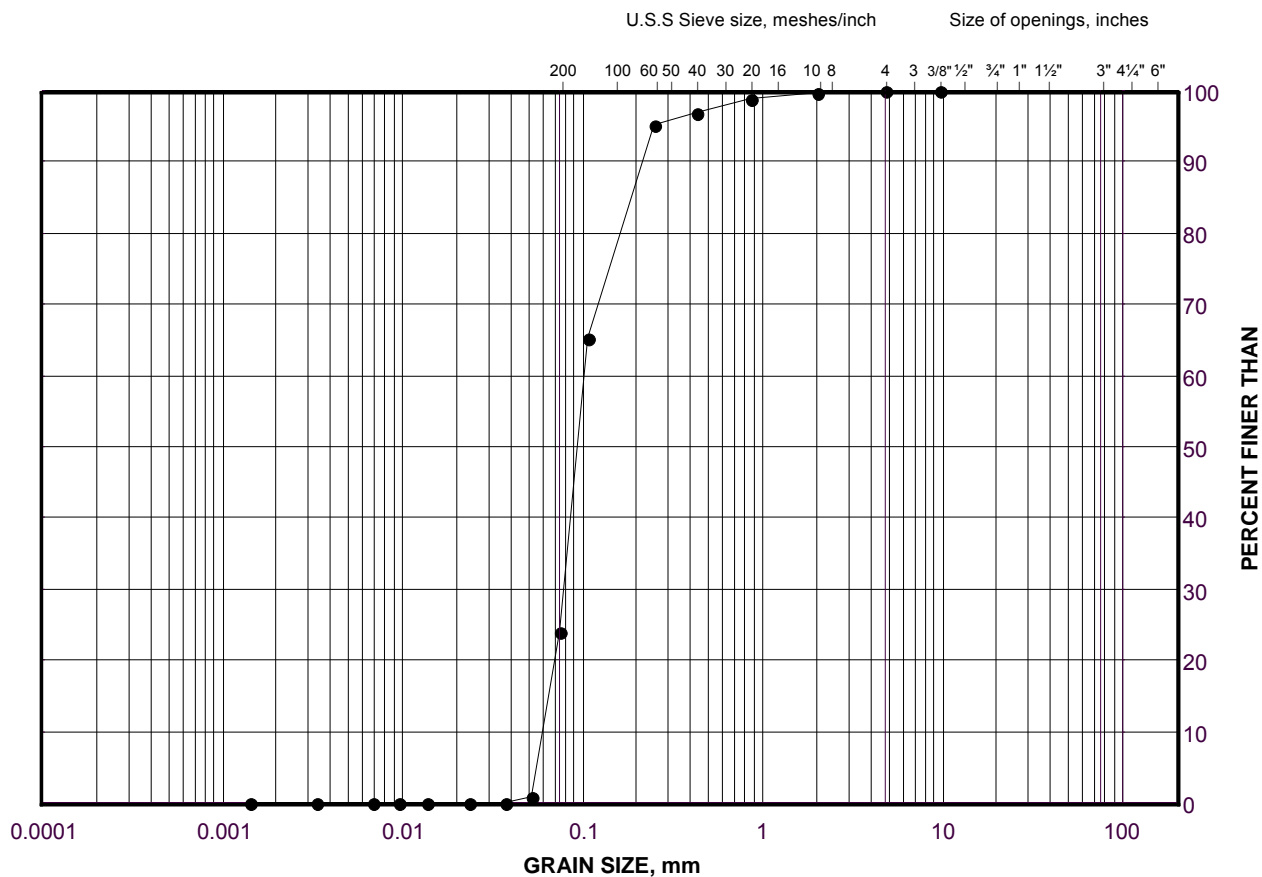
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S301-DC13 | | SHEET 1 OF 1 | | METRIC | | | | |
|--------------------------------------|---|--|--------|--------------------------|----------------------------|-----------------|--|--|--|--|
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076517.8 ; E 223835.1</u> | | ORIGINATED BY <u>ARM</u> | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>CC</u> | | | | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 22, 2012</u> | | CHECKED BY <u>CN</u> | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 183.3 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | |  | | | |
| 179.7 3.6 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.25 m) | | | | | | | | | |

GRAIN SIZE DISTRIBUTION

Silty Sand (Near Surface)

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-01



LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S301-24 | 1B | 183.0 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

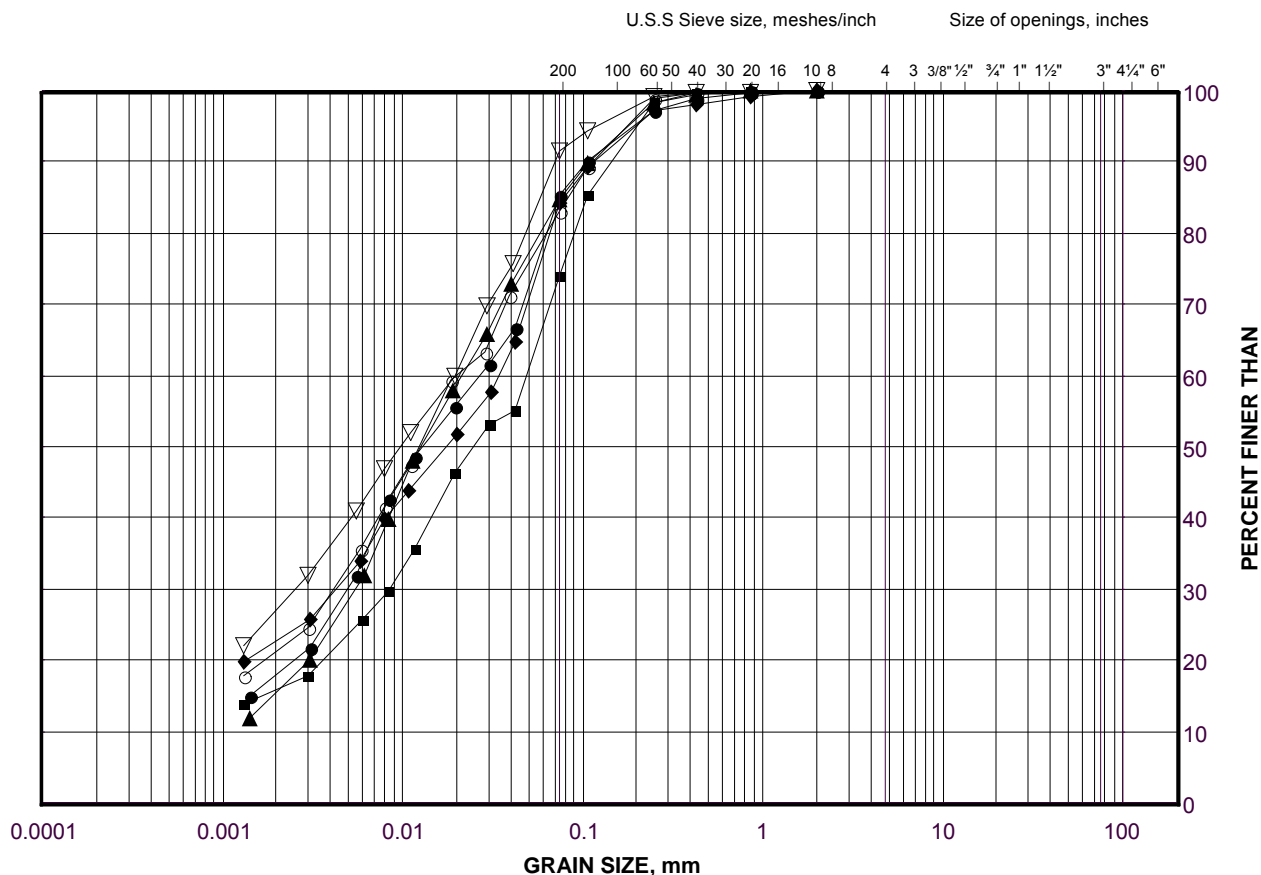
Date: 26-Mar-13

GRAIN SIZE DISTRIBUTION

Clayey Silt (Upper)

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-02A



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S301-22 | 2 | 182.3 |
| ■ | C301-S1 | 2 | 180.1 |
| ◆ | S301-10 | 3 | 180.3 |
| ▲ | C301-S1 | 5 | 176.4 |
| ▽ | S301-10 | 7 | 174.3 |
| ○ | C301-S1 | 8 | 171.8 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

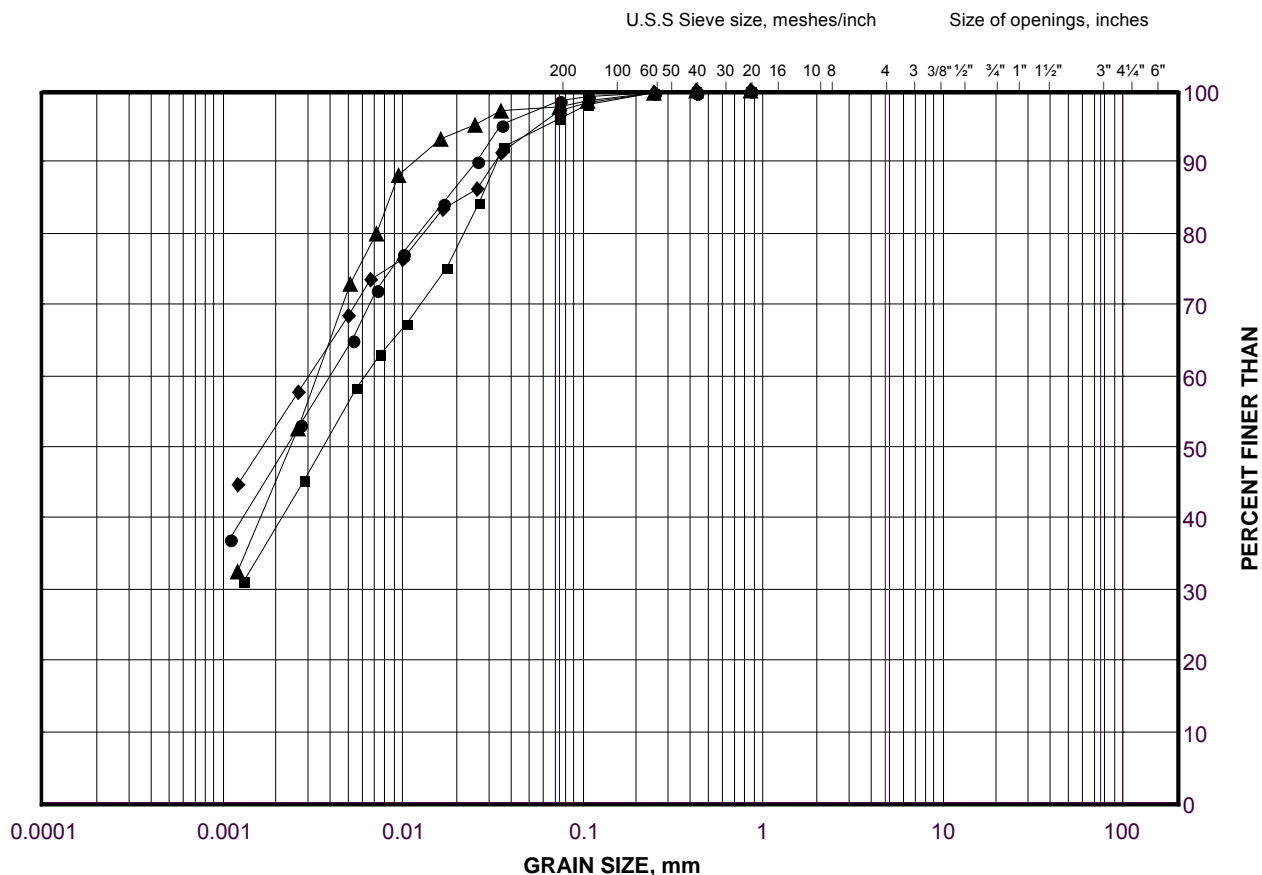
Date: 26-Mar-13

GRAIN SIZE DISTRIBUTION

Silty Clay (Upper)

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-02B



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

LEGEND

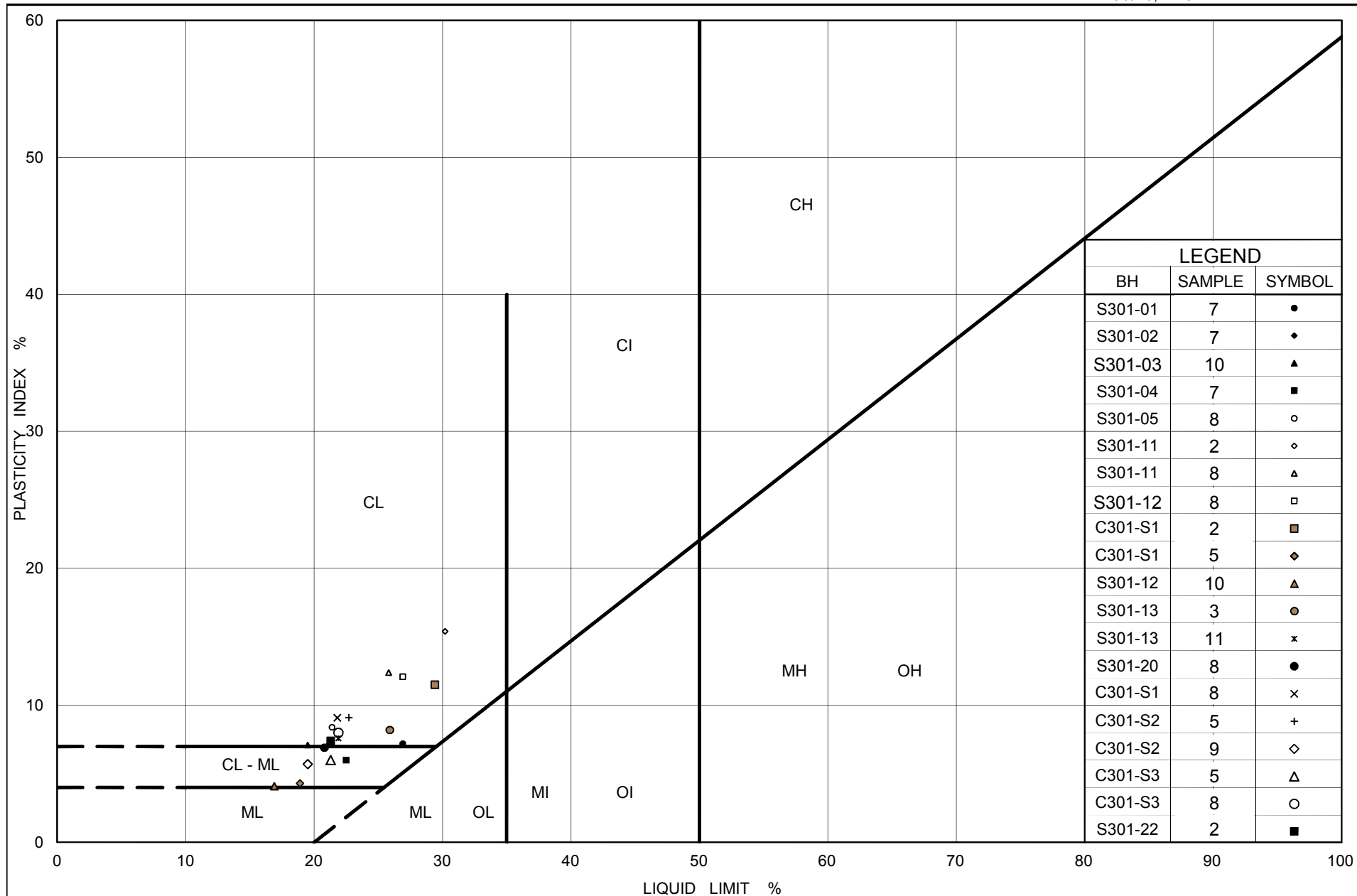
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | C301-S2 | 3 | 179.7 |
| ■ | S301-04 | 4 | 177.6 |
| ◆ | S301-02 | 4 | 180.0 |
| ▲ | S301-03 | 6 | 177.5 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 26-Mar-13



Ministry of
Transportation

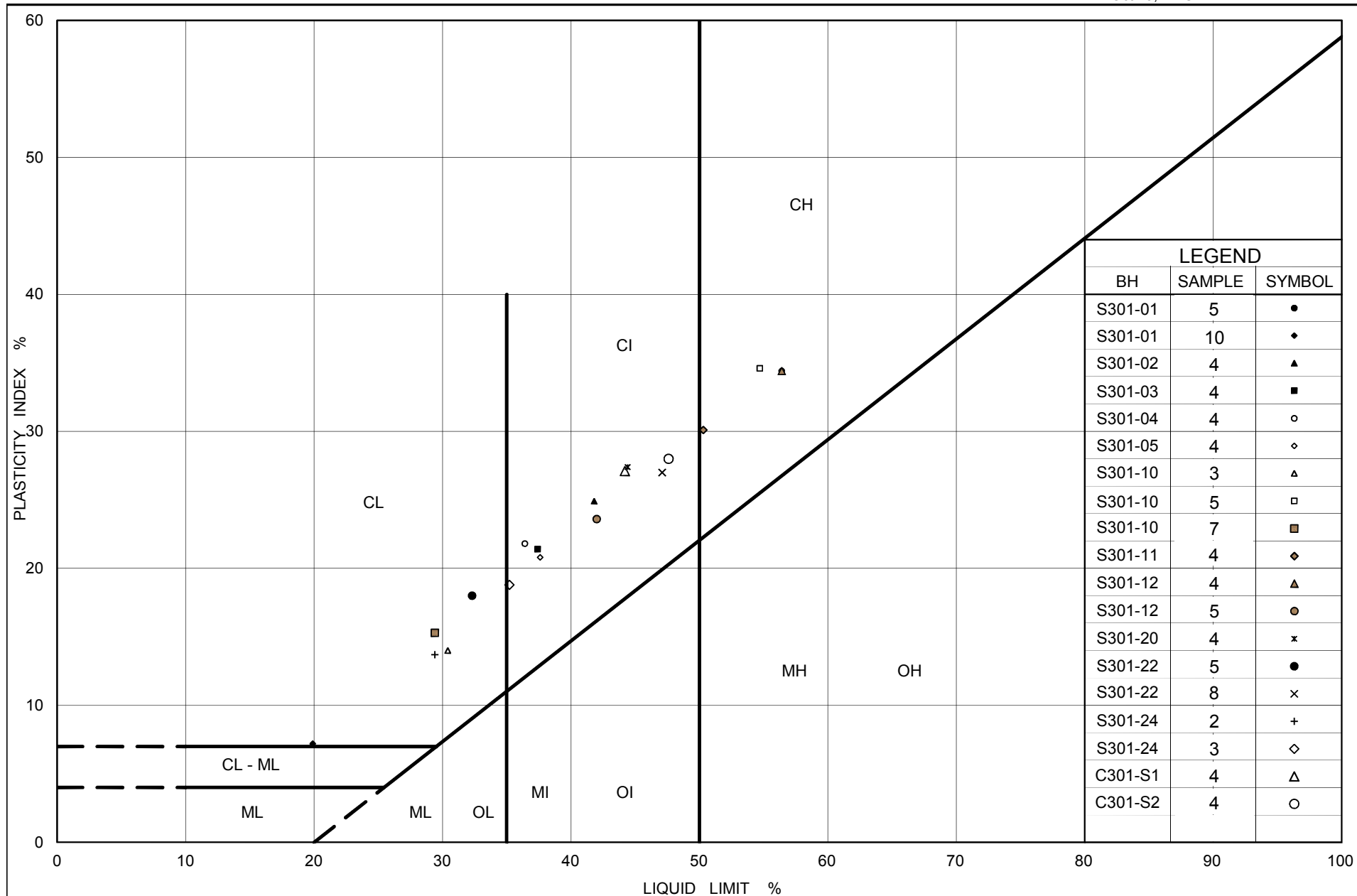
Ontario

PLASTICITY CHART
Clayey Silt (Upper)
Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

Figure No. A.S301-03A

Project No. 09-1111-6014

Checked By: AV



Ministry of
Transportation

Ontario

PLASTICITY CHART
 Clayey Silt to Clay (Upper)
 Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

Figure No. A.S301-03B

Project No. 09-1111-6014

Checked By: AV

CONSOLIDATION TEST SUMMARY
Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

Figure A.S301-04
Sheet 1 of 4

SAMPLE IDENTIFICATION

| | | | |
|-----------------|--------------|-----------------|---------|
| Project Number | 09-1111-6014 | Sample Number | 5 |
| Borehole Number | S301-12 | Sample Depth, m | 4.4-4.9 |

TEST CONDITIONS

| | | | |
|------------------|-----------|-------------------|----|
| Test Type | Standard | Load Duration, hr | 24 |
| Oedometer Number | 4 | | |
| Date Started | 2/12/2013 | | |
| Date Completed | 3/02/2013 | | |

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

| | | | |
|-------------------------|--------|------------------------------------|-------|
| Sample Height, cm | 2.53 | Unit Weight, kN/m ³ | 16.98 |
| Sample Diameter, cm | 6.35 | Dry Unit Weight, kN/m ³ | 11.31 |
| Area, cm ² | 31.71 | Specific Gravity, measured | 2.71 |
| Volume, cm ³ | 80.22 | Solids Height, cm | 1.077 |
| Water Content, % | 50.18 | Volume of Solids, cm ³ | 34.14 |
| Wet Mass, g | 138.93 | Volume of Voids, cm ³ | 46.09 |
| Dry Mass, g | 92.51 | Degree of Saturation, % | 100.7 |

TEST COMPUTATIONS

| Stress | Corr. Height | Void | Average Height | t ₉₀ | cv. | mv | k |
|---------|-----------------|-------|-------------------|-----------------|--------------------|--------------------|----------|
| kPa | cm | Ratio | cm | sec | cm ² /s | m ² /kN | cm/s |
| 0.00 | 2.530 | 1.350 | 2.530 | | | | |
| 6.24 | 2.529 | 1.349 | 2.530 | 36 | 3.77E-02 | 5.07E-05 | 1.87E-07 |
| 10.88 | 2.528 | 1.348 | 2.528 | 173 | 7.83E-03 | 1.45E-04 | 1.11E-07 |
| 20.77 | 2.522 | 1.342 | 2.525 | 375 | 3.60E-03 | 2.28E-04 | 8.04E-08 |
| 39.97 | 2.505 | 1.327 | 2.513 | 421 | 3.18E-03 | 3.46E-04 | 1.08E-07 |
| 20.77 | 2.509 | 1.331 | 2.507 | | | | |
| 6.24 | 2.515 | 1.336 | 2.512 | | | | |
| 20.77 | 2.509 | 1.330 | 2.512 | 167 | 8.01E-03 | 1.77E-04 | 1.39E-07 |
| 39.97 | 2.503 | 1.325 | 2.506 | 317 | 4.20E-03 | 1.19E-04 | 4.91E-08 |
| 78.71 | 2.468 | 1.293 | 2.486 | 1058 | 1.24E-03 | 3.56E-04 | 4.32E-08 |
| 155.82 | 2.322 | 1.157 | 2.395 | 8720 | 1.39E-04 | 7.50E-04 | 1.03E-08 |
| 310.34 | 2.080 | 0.932 | 2.201 | 1185 | 8.66E-04 | 6.19E-04 | 5.26E-08 |
| 619.11 | 1.917 | 0.781 | 1.998 | 778 | 1.09E-03 | 2.08E-04 | 2.22E-08 |
| 1240.18 | 1.788 | 0.660 | 1.852 | 437 | 1.66E-03 | 8.24E-05 | 1.34E-08 |
| 2474.40 | 1.678 | 0.559 | 1.733 | 406 | 1.57E-03 | 3.49E-05 | 5.37E-09 |
| 1240.18 | 1.683 | 0.564 | 1.681 | | | | |
| 310.34 | 1.713 | 0.591 | 1.698 | | | | |
| 78.71 | 1.757 | 0.632 | 1.735 | | | | |
| 20.77 | 1.795 | 0.667 | 1.776 | | | | |
| 6.24 | 1.817 | 0.688 | 1.806 | | | | |

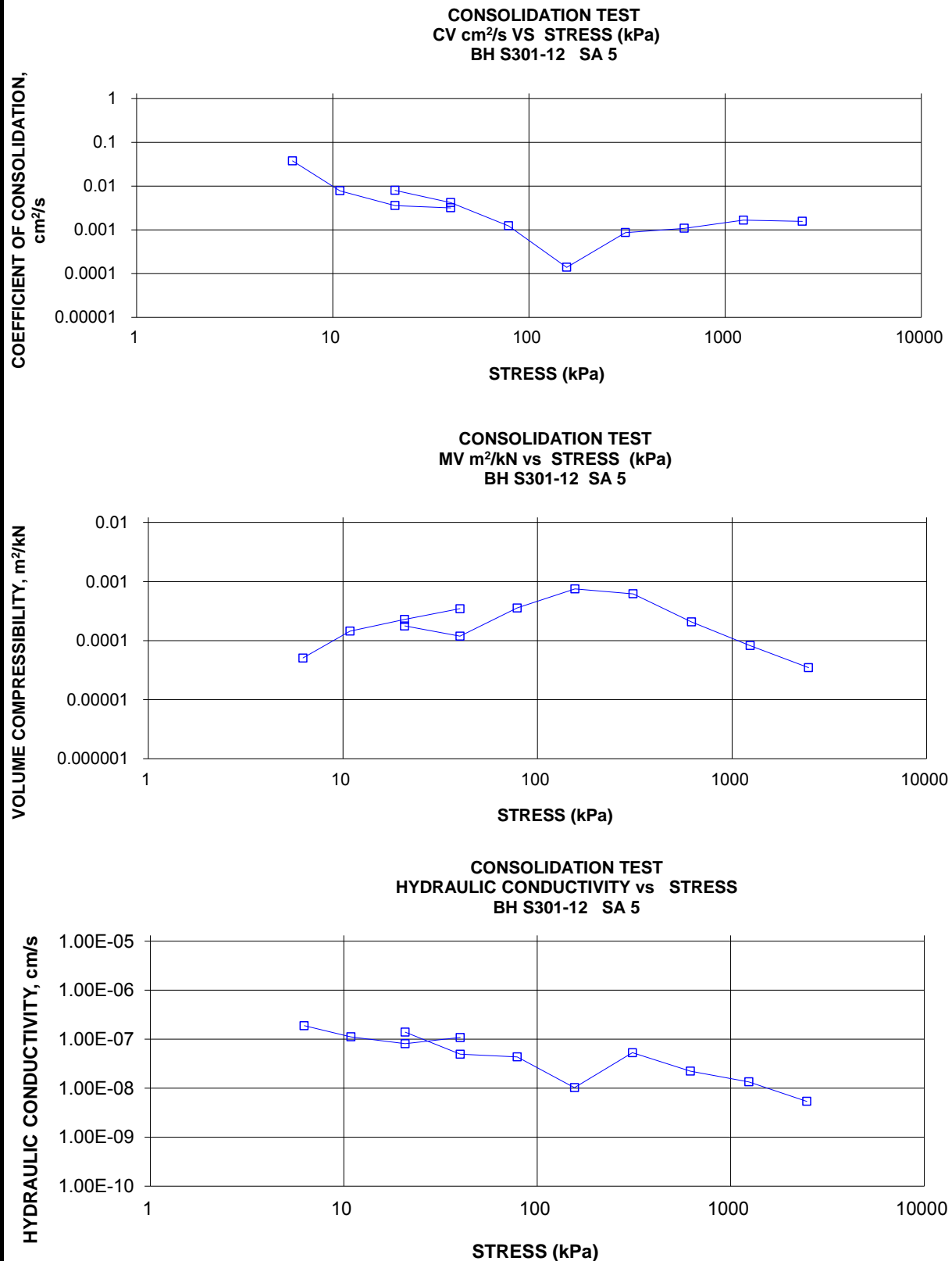
Note:

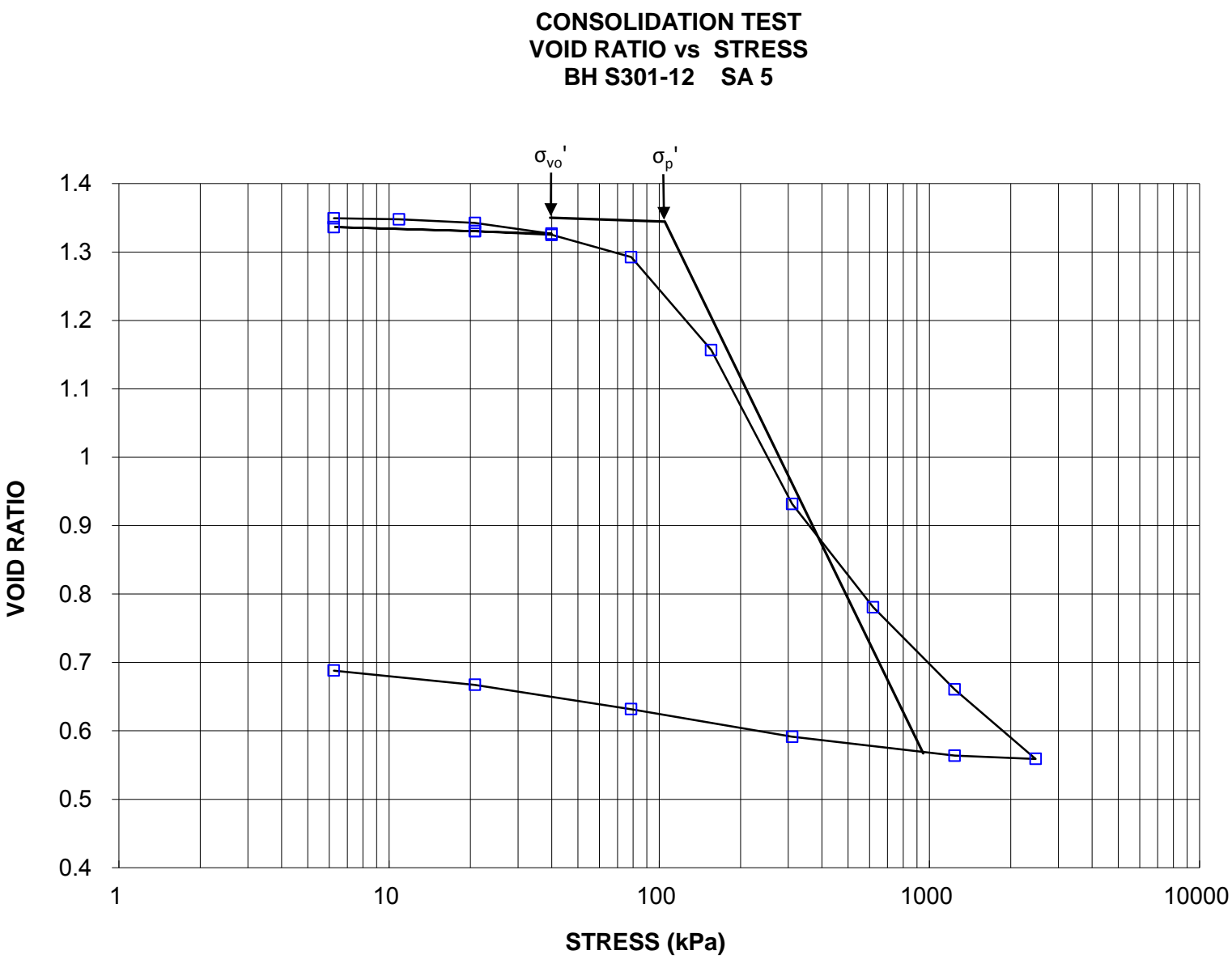
k calculated using cv based on t₉₀ values.

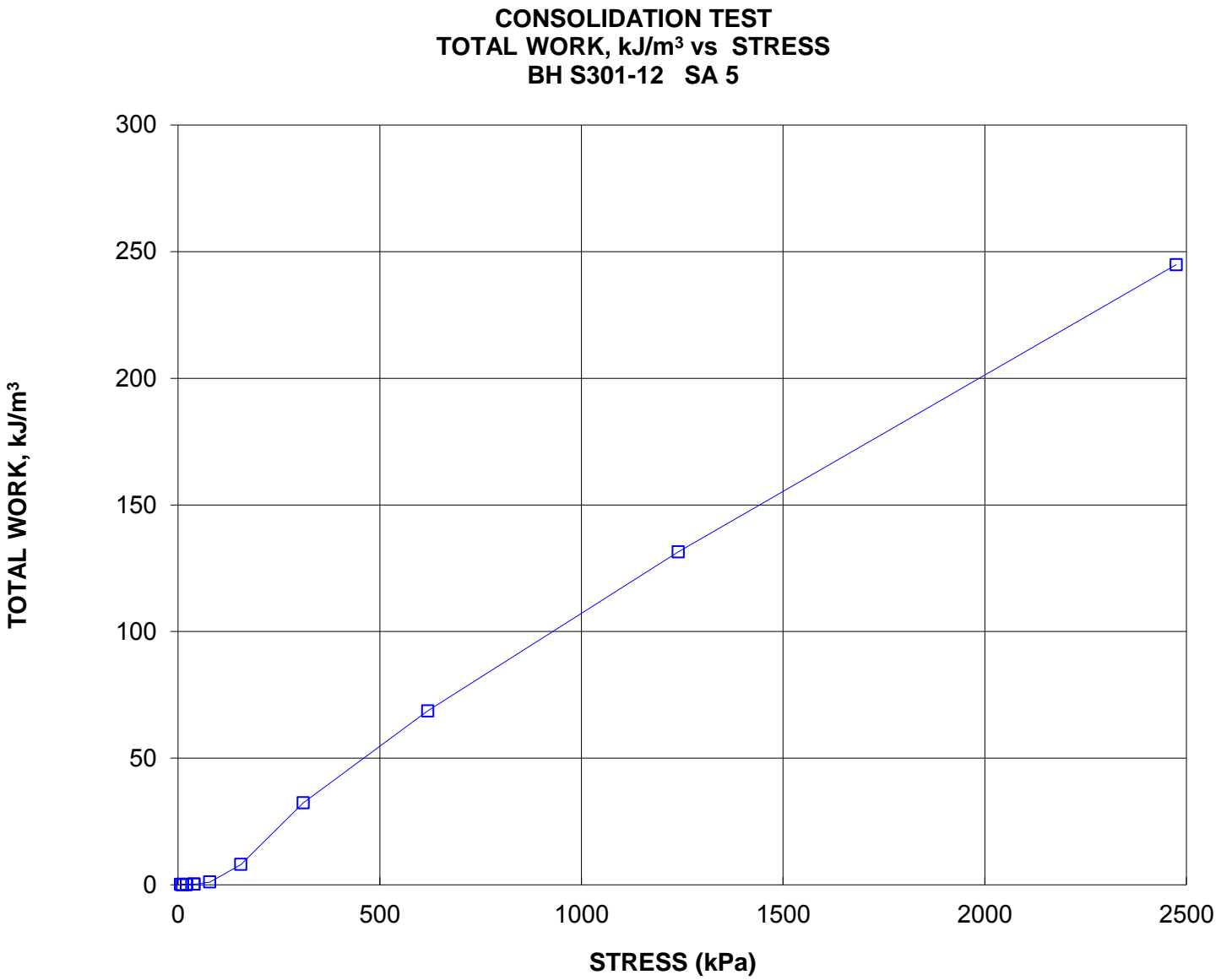
sample taken 23-33cm from bottom of the tube

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

| | | | |
|-------------------------|--------|------------------------------------|-------|
| Sample Height, cm | 1.68 | Unit Weight, kN/m ³ | 21.59 |
| Sample Diameter, cm | 6.35 | Dry Unit Weight, kN/m ³ | 17.00 |
| Area, cm ² | 31.71 | Specific Gravity, measured | 2.71 |
| Volume, cm ³ | 53.38 | Solids Height, cm | 1.077 |
| Water Content, % | 27.05 | Volume of Solids, cm ³ | 34.14 |
| Wet Mass, g | 117.53 | Volume of Voids, cm ³ | 19.24 |
| Dry Mass, g | 92.51 | | |

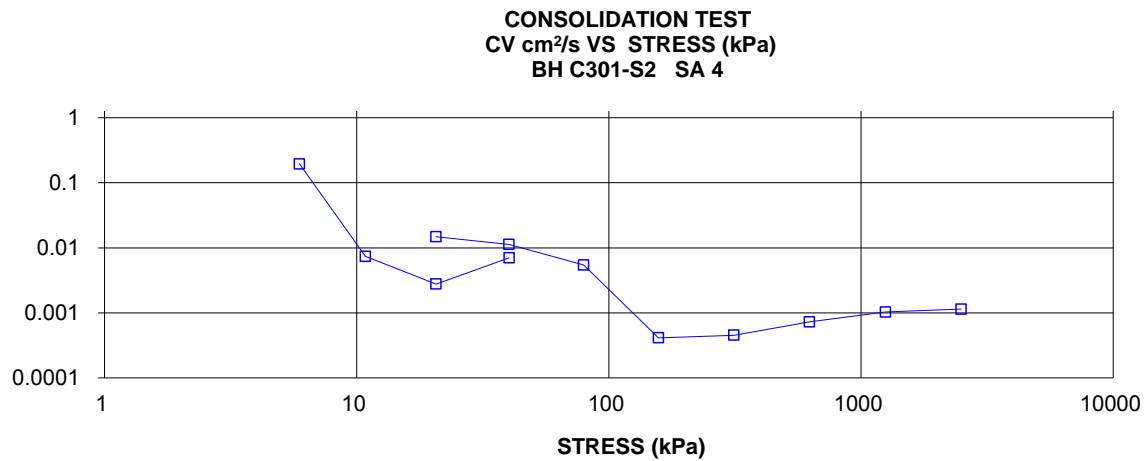




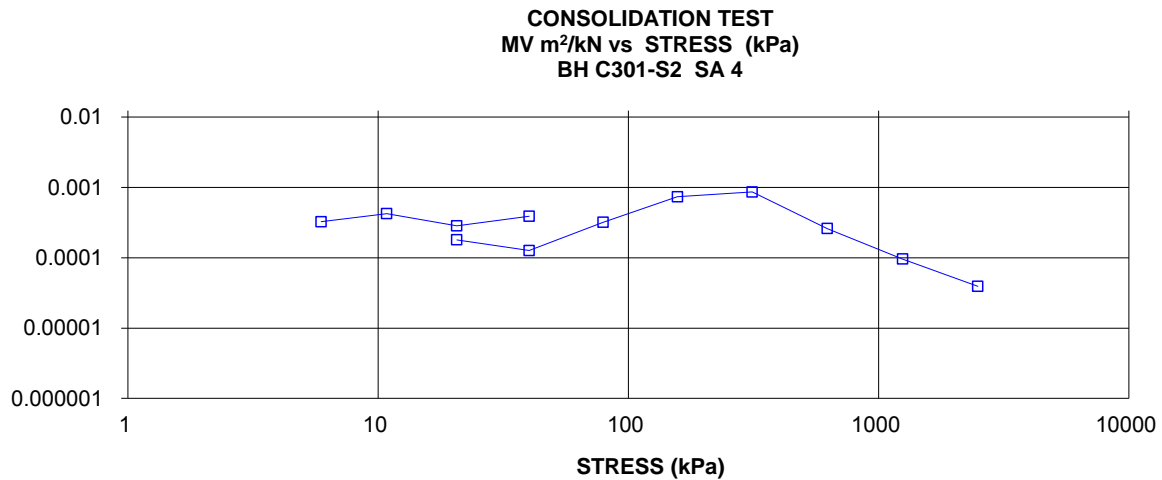


| CONSOLIDATION TEST SUMMARY | | | | | FIGURE A.S301-05 | | |
|---|--------------|-------|------------------------------------|-------------------|--------------------|--------------------|----------|
| Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301) | | | | | Sheet 1 of 4 | | |
| SAMPLE IDENTIFICATION | | | | | | | |
| Project Number | 09-1111-6014 | | | Sample Number | 4 | | |
| Borehole Number | C301-S2 | | | Sample Depth, m | 2.6-3.0 | | |
| TEST CONDITIONS | | | | | | | |
| Test Type | Standard | | | Load Duration, hr | 24 | | |
| Oedometer Number | 3 | | | | | | |
| Date Started | 9/28/2012 | | | | | | |
| Date Completed | 10/27/2012 | | | | | | |
| SAMPLE DIMENSIONS AND PROPERTIES - INITIAL | | | | | | | |
| Sample Height, cm | 2.54 | | Unit Weight, kN/m ³ | 15.92 | | | |
| Sample Diameter, cm | 6.32 | | Dry Unit Weight, kN/m ³ | 9.70 | | | |
| Area, cm ² | 31.40 | | Specific Gravity, measured | 2.77 | | | |
| Volume, cm ³ | 79.76 | | Solids Height, cm | 0.907 | | | |
| Water Content, % | 64.22 | | Volume of Solids, cm ³ | 28.47 | | | |
| Wet Mass, g | 129.50 | | Volume of Voids, cm ³ | 51.29 | | | |
| Dry Mass, g | 78.86 | | Degree of Saturation, % | 98.7 | | | |
| TEST COMPUTATIONS | | | | | | | |
| | Corr. | | Average | | | | |
| Stress | Height | Void | Height | t ₉₀ | cv. | mv | k |
| kPa | cm | Ratio | cm | sec | cm ² /s | m ² /kN | cm/s |
| 0.00 | 2.540 | 1.802 | 2.540 | | | | |
| 5.92 | 2.535 | 1.796 | 2.538 | 7 | 1.95E-01 | 3.26E-04 | 6.23E-06 |
| 10.82 | 2.530 | 1.790 | 2.532 | 184 | 7.39E-03 | 4.26E-04 | 3.08E-07 |
| 20.63 | 2.523 | 1.782 | 2.526 | 487 | 2.78E-03 | 2.85E-04 | 7.76E-08 |
| 40.20 | 2.503 | 1.761 | 2.513 | 190 | 7.05E-03 | 3.88E-04 | 2.68E-07 |
| 20.84 | 2.508 | 1.766 | 2.506 | | | | |
| 10.77 | 2.512 | 1.771 | 2.510 | | | | |
| 20.61 | 2.508 | 1.766 | 2.510 | 90 | 1.48E-02 | 1.80E-04 | 2.62E-07 |
| 40.15 | 2.501 | 1.759 | 2.505 | 118 | 1.13E-02 | 1.27E-04 | 1.40E-07 |
| 79.27 | 2.470 | 1.724 | 2.485 | 240 | 5.46E-03 | 3.21E-04 | 1.72E-07 |
| 157.20 | 2.324 | 1.563 | 2.397 | 2940 | 4.14E-04 | 7.38E-04 | 2.99E-08 |
| 312.87 | 1.983 | 1.187 | 2.153 | 2160 | 4.55E-04 | 8.61E-04 | 3.84E-08 |
| 624.49 | 1.777 | 0.960 | 1.880 | 1033 | 7.25E-04 | 2.60E-04 | 1.85E-08 |
| 1248.90 | 1.625 | 0.792 | 1.701 | 595 | 1.03E-03 | 9.60E-05 | 9.70E-09 |
| 2494.56 | 1.501 | 0.655 | 1.563 | 454 | 1.14E-03 | 3.92E-05 | 4.38E-09 |
| 1248.90 | 1.507 | 0.662 | 1.504 | | | | |
| 312.87 | 1.550 | 0.710 | 1.529 | | | | |
| 79.27 | 1.606 | 0.771 | 1.578 | | | | |
| 20.63 | 1.664 | 0.835 | 1.635 | | | | |
| 5.92 | 1.693 | 0.868 | 1.679 | | | | |
| Note: k calculated using cv based on t ₉₀ values. | | | | | | | |
| SAMPLE DIMENSIONS AND PROPERTIES - FINAL | | | | | | | |
| Sample Height, cm | 1.69 | | Unit Weight, kN/m ³ | 19.43 | | | |
| Sample Diameter, cm | 6.32 | | Dry Unit Weight, kN/m ³ | 14.54 | | | |
| Area, cm ² | 31.40 | | Specific Gravity, measured | 2.77 | | | |
| Volume, cm ³ | 53.17 | | Solids Height, cm | 0.907 | | | |
| Water Content, % | 33.60 | | Volume of Solids, cm ³ | 28.47 | | | |
| Wet Mass, g | 105.36 | | Volume of Voids, cm ³ | 24.70 | | | |
| Dry Mass, g | 78.86 | | | | | | |
| <div> <div>Prepared By: LFG</div> <div>Golder Associates</div> <div>Checked By: TZ</div> </div> | | | | | | | |

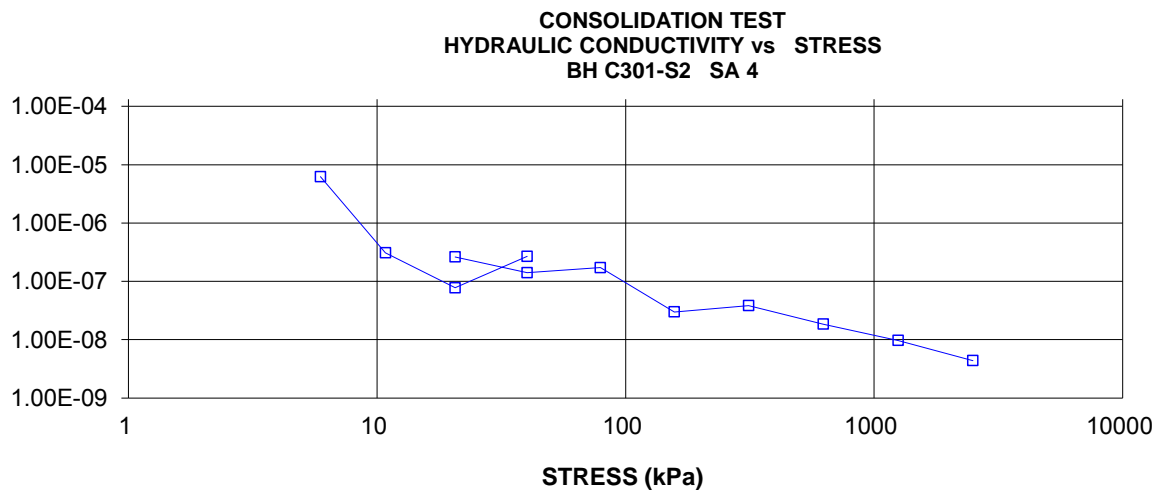
COEFFICIENT OF CONSOLIDATION,
cm²/s

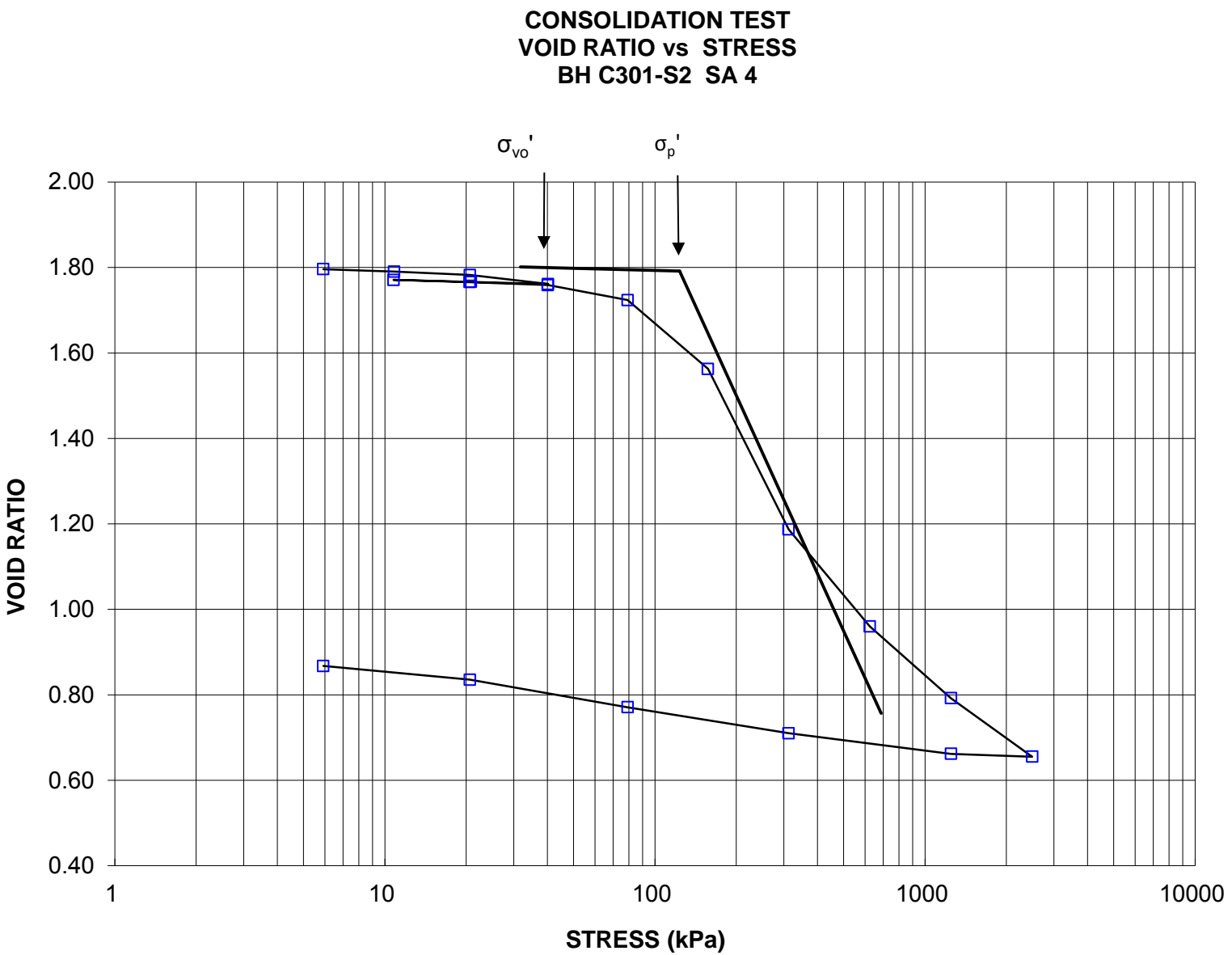


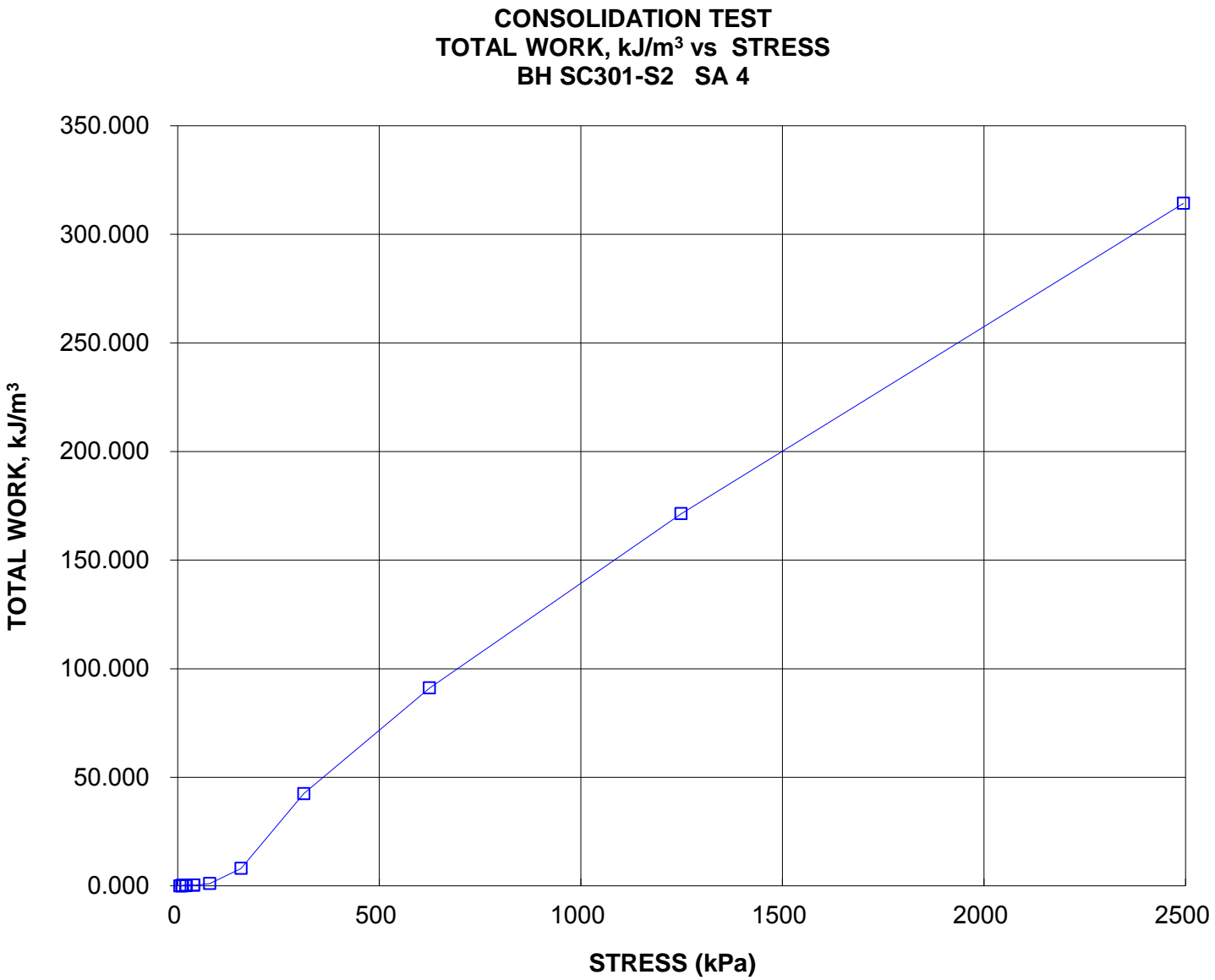
VOLUME COMPRESSIBILITY, m²/kN



HYDRAULIC CONDUCTIVITY, cm/s





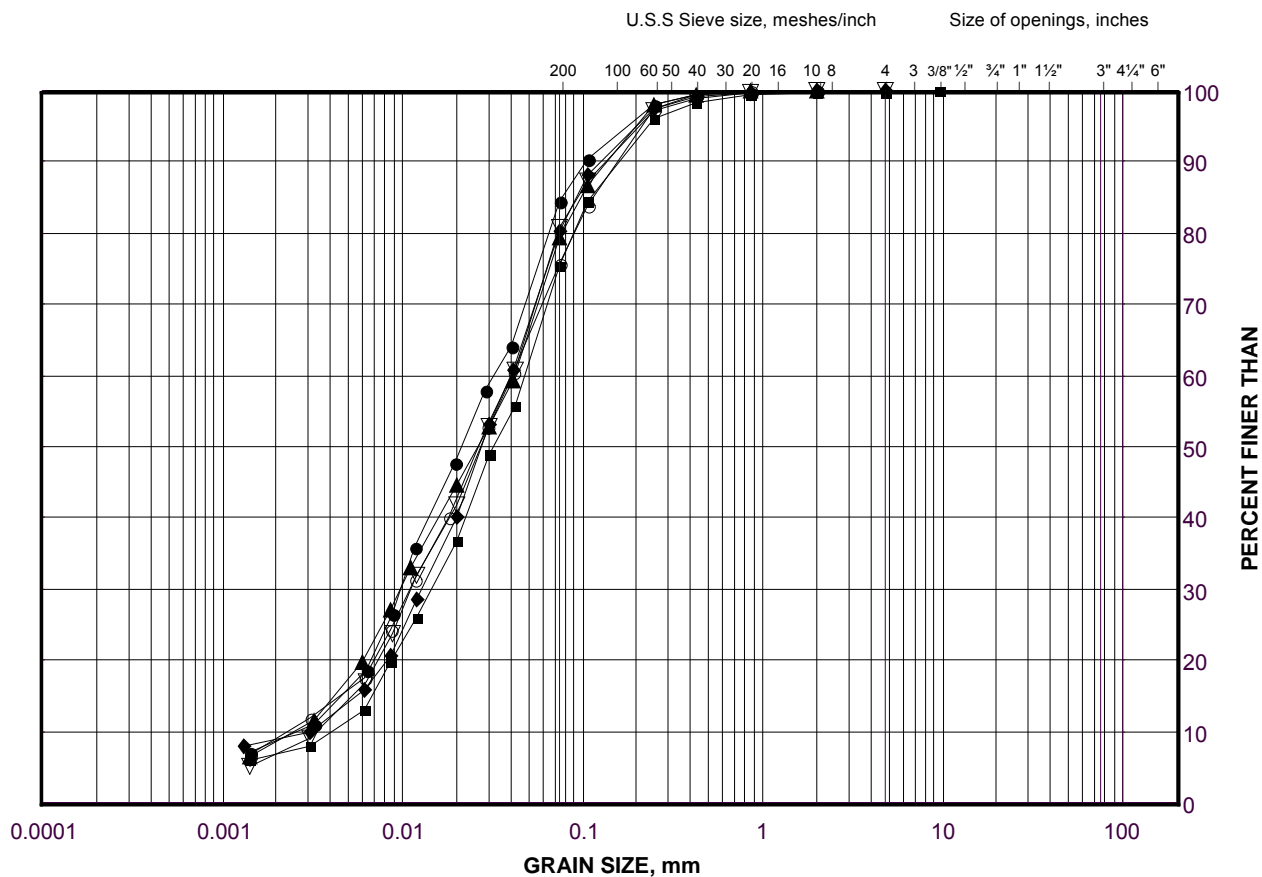


GRAIN SIZE DISTRIBUTION

Silt to Sandy Silt (Pockets)

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-06



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

LEGEND

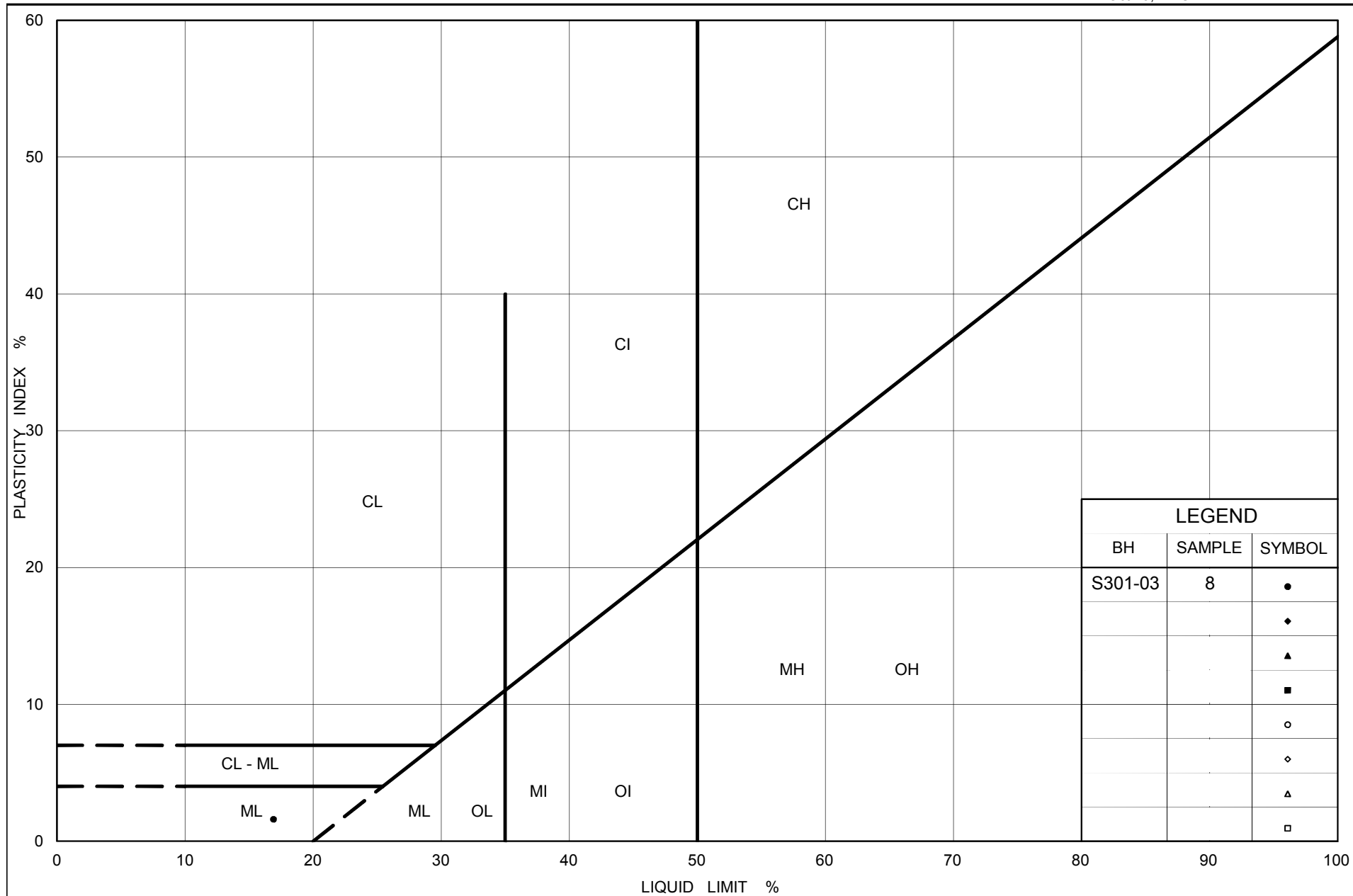
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S301-11 | 6 | 176.1 |
| ■ | S301-05 | 6 | 174.7 |
| ◆ | C301-S3 | 6B | 174.8 |
| ▲ | S301-13 | 8 | 175.9 |
| ▽ | S301-03 | 8 | 174.5 |
| ○ | S301-01 | 8 | 174.4 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 26-Mar-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Silt (Pocket)

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

Figure No. A.S301-07

Project No. 09-1111-6014

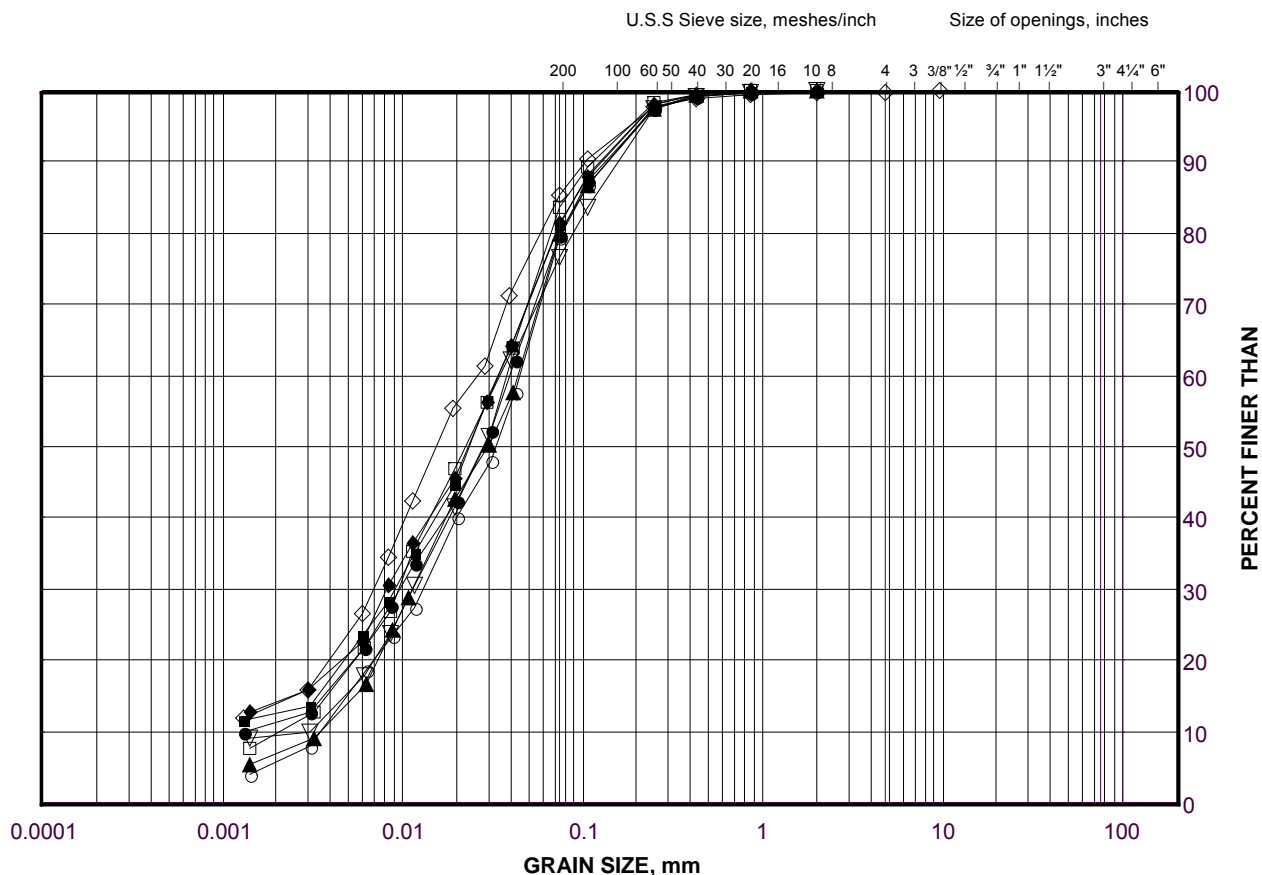
Checked By: AV

GRAIN SIZE DISTRIBUTION

Silt to Sandy Silt (Interlayer)

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-08A



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S301-04 | 10 | 168.5 |
| ■ | C301-S1 | 10 | 168.8 |
| ◆ | C301-S2 | 10A | 169.7 |
| ▲ | S301-11 | 11 | 168.5 |
| ▽ | S301-02 | 11 | 167.3 |
| ○ | S301-03 | 12 | 168.4 |
| □ | S301-13 | 13 | 168.7 |
| △ | S301-01 | 13 | 166.8 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

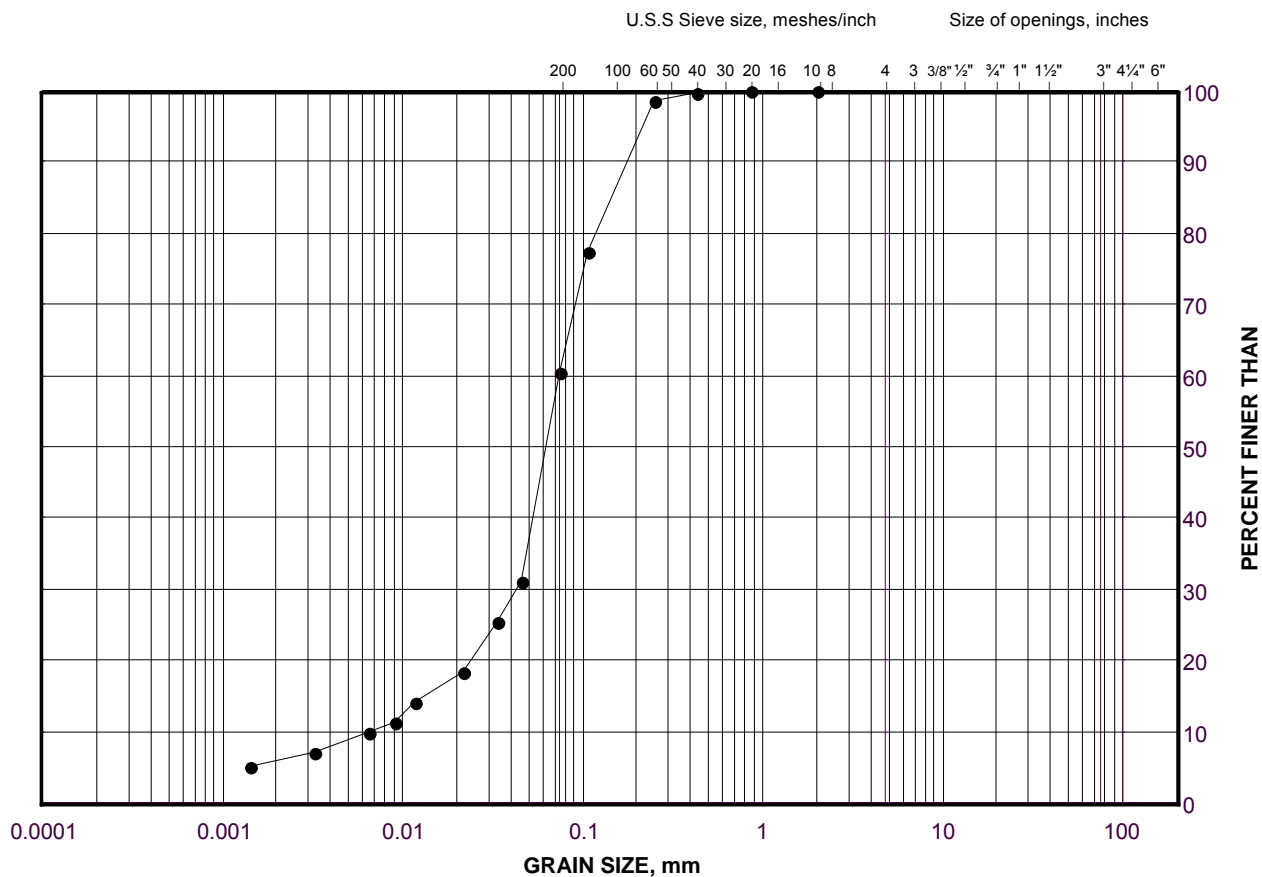
Date: 02-May-13

GRAIN SIZE DISTRIBUTION

Silt and Sand (Interlayer)

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-08B



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

LEGEND

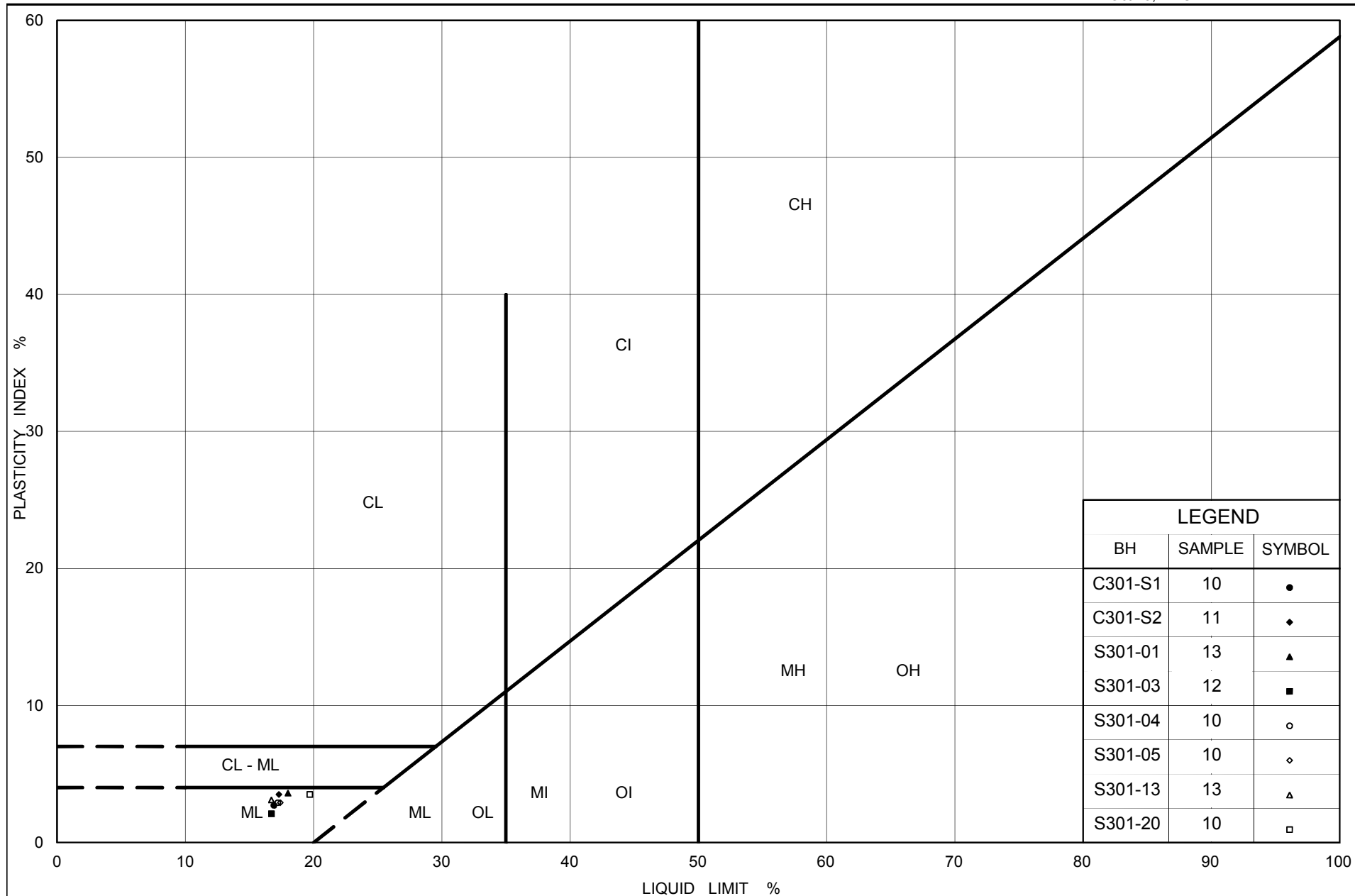
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S301-12 | 12A | 167.2 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 16-Apr-13



Ministry of Transportation

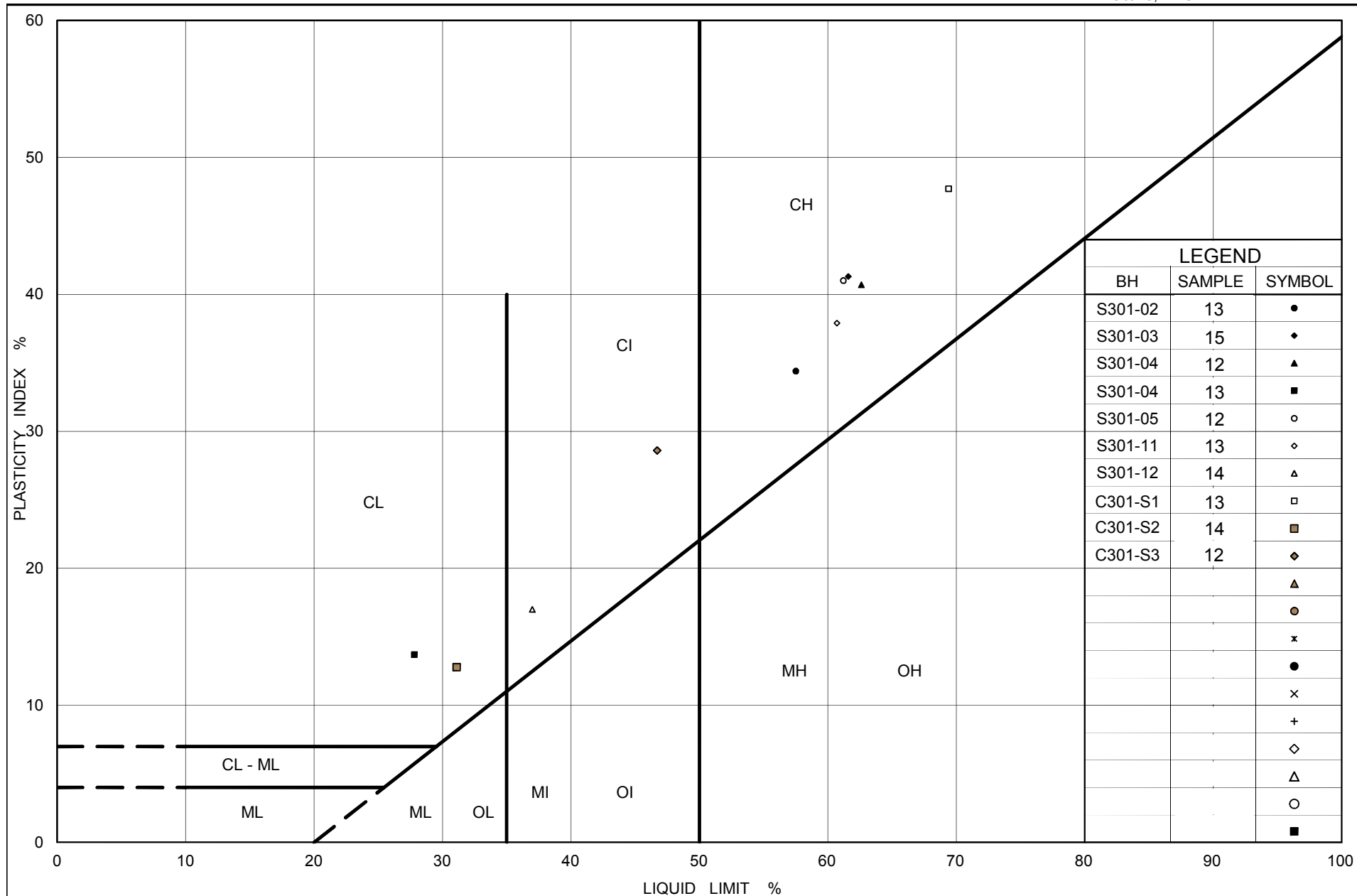
Ontario

PLASTICITY CHART
 Silt to Sandy Silt (Interlayer)
 Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

Figure No. A.S301-09

Project No. 09-1111-6014

Checked By: AV



Ministry of
Transportation

Ontario

PLASTICITY CHART
 Clayey Silt to Clay (Lower)
 Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

Figure No. A.S301-10

Project No. 09-1111-6014

Checked By: AV

| CONSOLIDATION TEST SUMMARY | | | | | FIGURE A.S301-11 | | |
|--|--------------|-------|---------|------------------------------------|--------------------|--------------------|----------|
| Clayey Silt (Lower) | | | | | Sheet 1 of 4 | | |
| SAMPLE IDENTIFICATION | | | | | | | |
| Project Number | 09-1111-6014 | | | Sample Number | 13 | | |
| Borehole Number | S301-04 | | | Sample Depth, m | 16.8-17.4 | | |
| TEST CONDITIONS | | | | | | | |
| Test Type | Standard | | | Load Duration, hr | 24 | | |
| Oedometer Number | 5 | | | | | | |
| Date Started | 10/03/2012 | | | | | | |
| Date Completed | 10/23/2012 | | | | | | |
| SAMPLE DIMENSIONS AND PROPERTIES - INITIAL | | | | | | | |
| Sample Height, cm | 1.90 | | | Unit Weight, kN/m ³ | 19.11 | | |
| Sample Diameter, cm | 6.33 | | | Dry Unit Weight, kN/m ³ | 14.55 | | |
| Area, cm ² | 31.48 | | | Specific Gravity, measured | 2.75 | | |
| Volume, cm ³ | 59.94 | | | Solids Height, cm | 1.027 | | |
| Water Content, % | 31.37 | | | Volume of Solids, cm ³ | 32.33 | | |
| Wet Mass, g | 116.80 | | | Volume of Voids, cm ³ | 27.61 | | |
| Dry Mass, g | 88.91 | | | Degree of Saturation, % | 101.0 | | |
| TEST COMPUTATIONS | | | | | | | |
| | Corr. | | Average | | | | |
| Stress | Height | Void | Height | t ₉₀ | cv. | mv | k |
| kPa | cm | Ratio | cm | sec | cm ² /s | m ² /kN | cm/s |
| 0.00 | 1.904 | 0.854 | 1.904 | | | | |
| 6.00 | 1.890 | 0.840 | 1.897 | 29 | 2.63E-02 | 1.24E-03 | 3.20E-06 |
| 10.71 | 1.883 | 0.833 | 1.886 | 470 | 1.60E-03 | 7.81E-04 | 1.23E-07 |
| 20.52 | 1.872 | 0.823 | 1.877 | 437 | 1.71E-03 | 5.78E-04 | 9.69E-08 |
| 40.07 | 1.859 | 0.810 | 1.865 | 217 | 3.40E-03 | 3.57E-04 | 1.19E-07 |
| 79.00 | 1.837 | 0.789 | 1.848 | 228 | 3.18E-03 | 2.90E-04 | 9.03E-08 |
| 117.91 | 1.823 | 0.775 | 1.830 | 2003 | 3.54E-04 | 1.97E-04 | 6.84E-09 |
| 40.07 | 1.831 | 0.782 | 1.827 | | | | |
| 10.71 | 1.843 | 0.794 | 1.837 | | | | |
| 40.07 | 1.834 | 0.785 | 1.838 | 94 | 7.62E-03 | 1.57E-04 | 1.18E-07 |
| 79.00 | 1.826 | 0.778 | 1.830 | 118 | 6.02E-03 | 1.01E-04 | 5.97E-08 |
| 117.91 | 1.820 | 0.772 | 1.823 | 2289 | 3.08E-04 | 8.91E-05 | 2.69E-09 |
| 156.77 | 1.808 | 0.760 | 1.814 | 9542 | 7.31E-05 | 1.58E-04 | 1.13E-09 |
| 312.15 | 1.735 | 0.689 | 1.771 | 2241 | 2.97E-04 | 2.48E-04 | 7.22E-09 |
| 623.73 | 1.614 | 0.571 | 1.674 | 667 | 8.91E-04 | 2.04E-04 | 1.78E-08 |
| 1246.35 | 1.520 | 0.480 | 1.567 | 279 | 1.87E-03 | 7.87E-05 | 1.44E-08 |
| 2490.86 | 1.443 | 0.405 | 1.482 | 217 | 2.15E-03 | 3.25E-05 | 6.84E-09 |
| 623.73 | 1.450 | 0.412 | 1.447 | | | | |
| 20.52 | 1.526 | 0.486 | 1.488 | | | | |
| 6.00 | 1.546 | 0.506 | 1.536 | | | | |
| Note: | | | | | | | |
| k calculated using cv based on t ₉₀ values. | | | | | | | |
| SAMPLE DIMENSIONS AND PROPERTIES - FINAL | | | | | | | |
| Sample Height, cm | 1.55 | | | Unit Weight, kN/m ³ | 21.64 | | |
| Sample Diameter, cm | 6.33 | | | Dry Unit Weight, kN/m ³ | 17.91 | | |
| Area, cm ² | 31.48 | | | Specific Gravity, measured | 2.75 | | |
| Volume, cm ³ | 48.67 | | | Solids Height, cm | 1.027 | | |
| Water Content, % | 20.79 | | | Volume of Solids, cm ³ | 32.33 | | |
| Wet Mass, g | 107.39 | | | Volume of Voids, cm ³ | 16.34 | | |
| Dry Mass, g | 88.91 | | | | | | |
| Prepared By: LFG | | | | Golder Associates | | Checked By: AV | |

CONSOLIDATION TEST SUMMARY

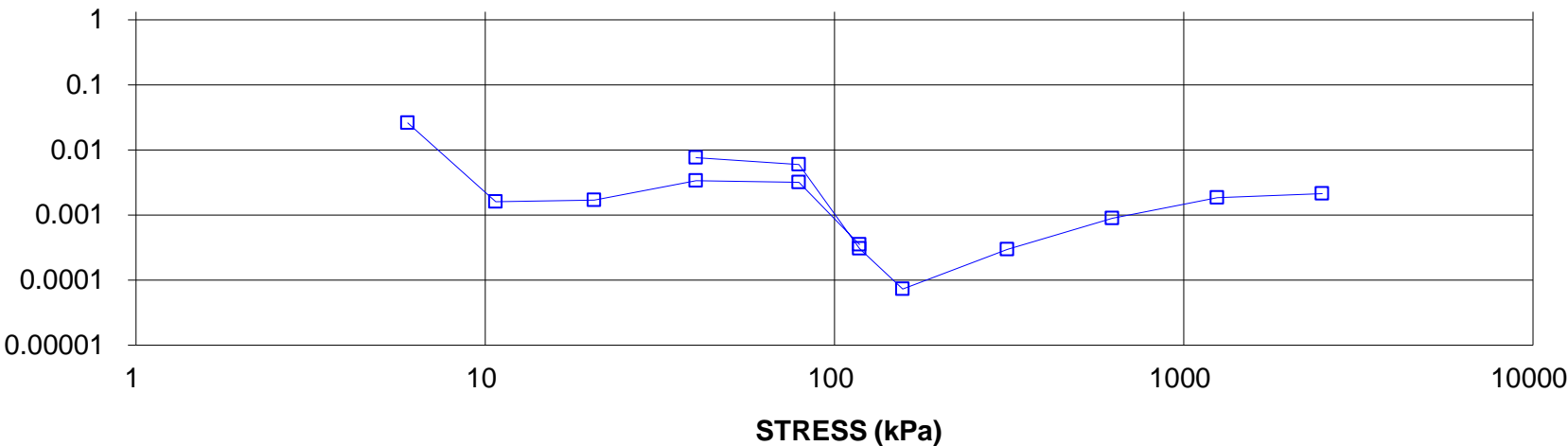
Clayey Silt (Lower)

FIGURE A.S301-11

Sheet 2 of 4

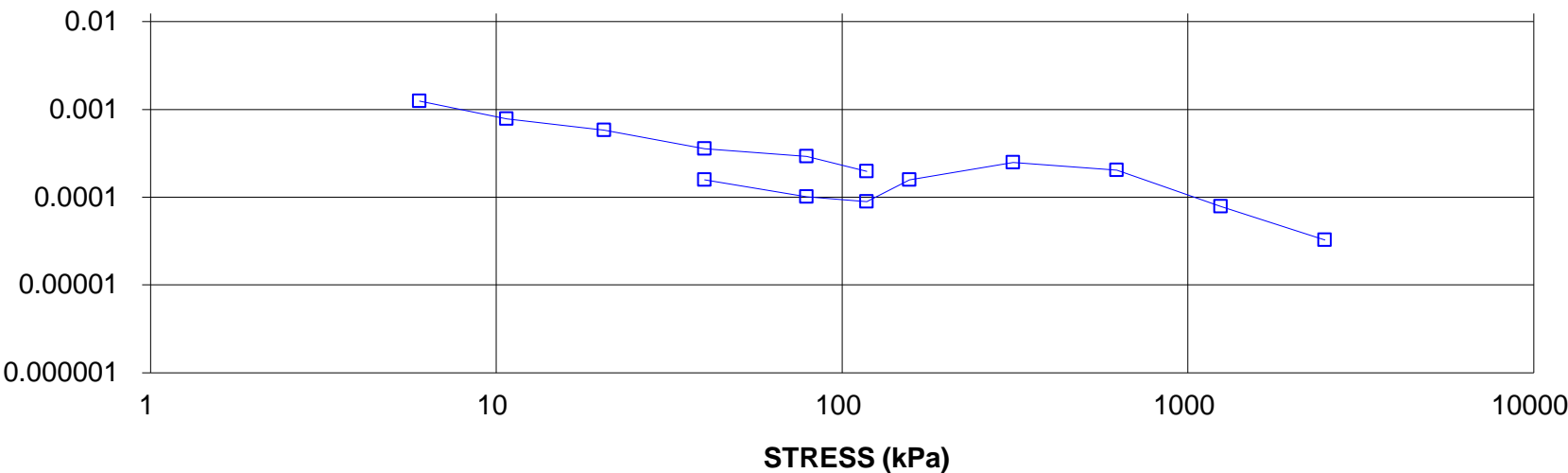
COEFFICIENT OF CONSOLIDATION,
cm²/s

CONSOLIDATION TEST
CV cm²/s VS STRESS (kPa)
BH S301-04 SA 13



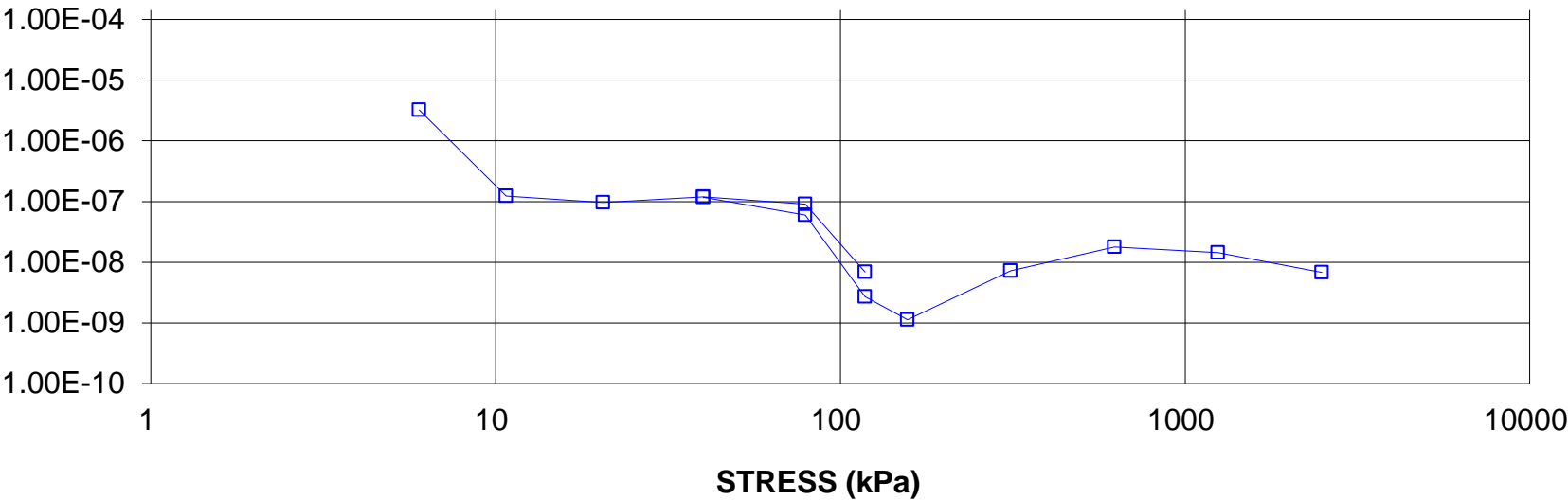
VOLUME COMPRESSIBILITY, m²/kN

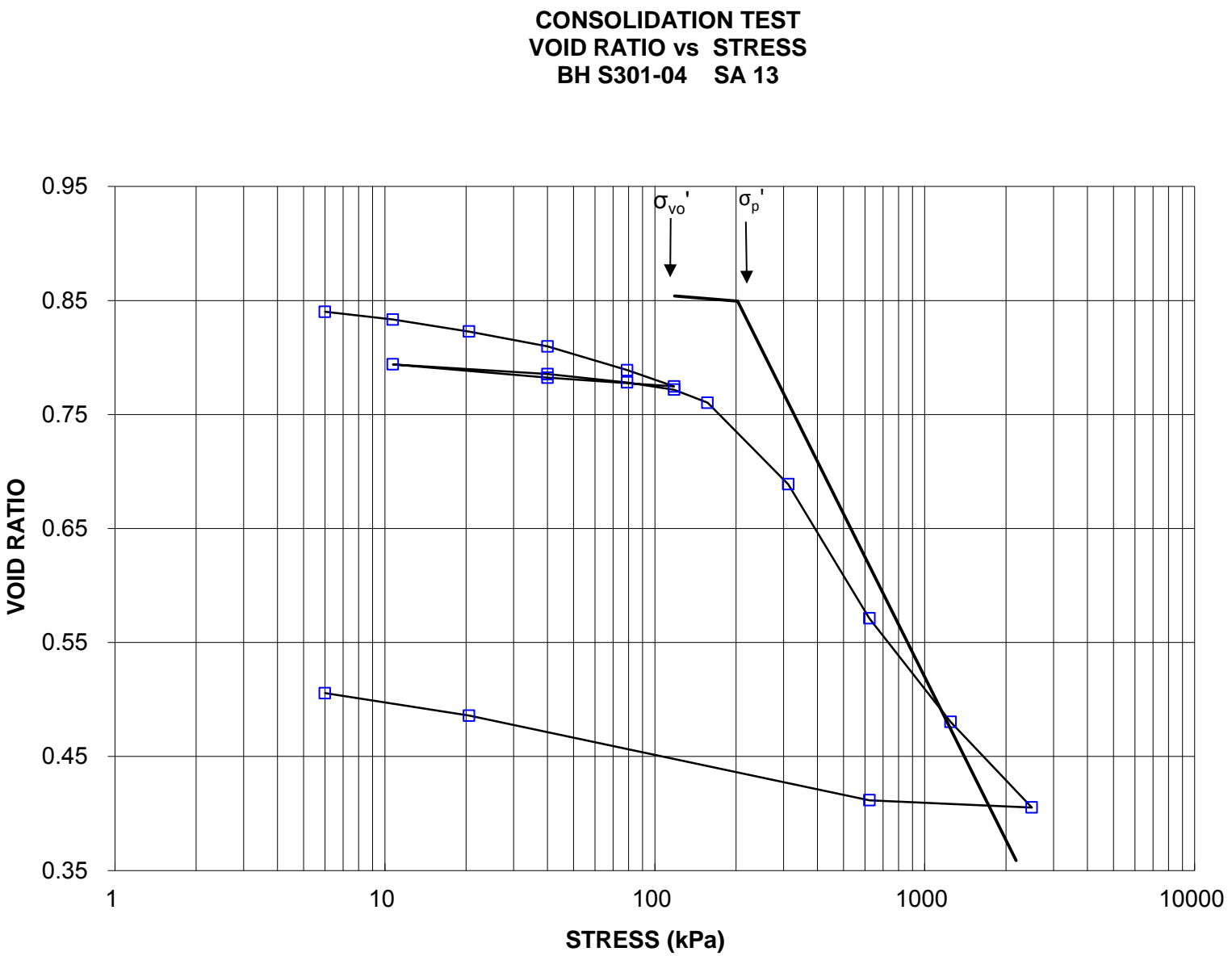
CONSOLIDATION TEST
MV m²/kN vs STRESS (kPa)
BH S301-04 SA 13

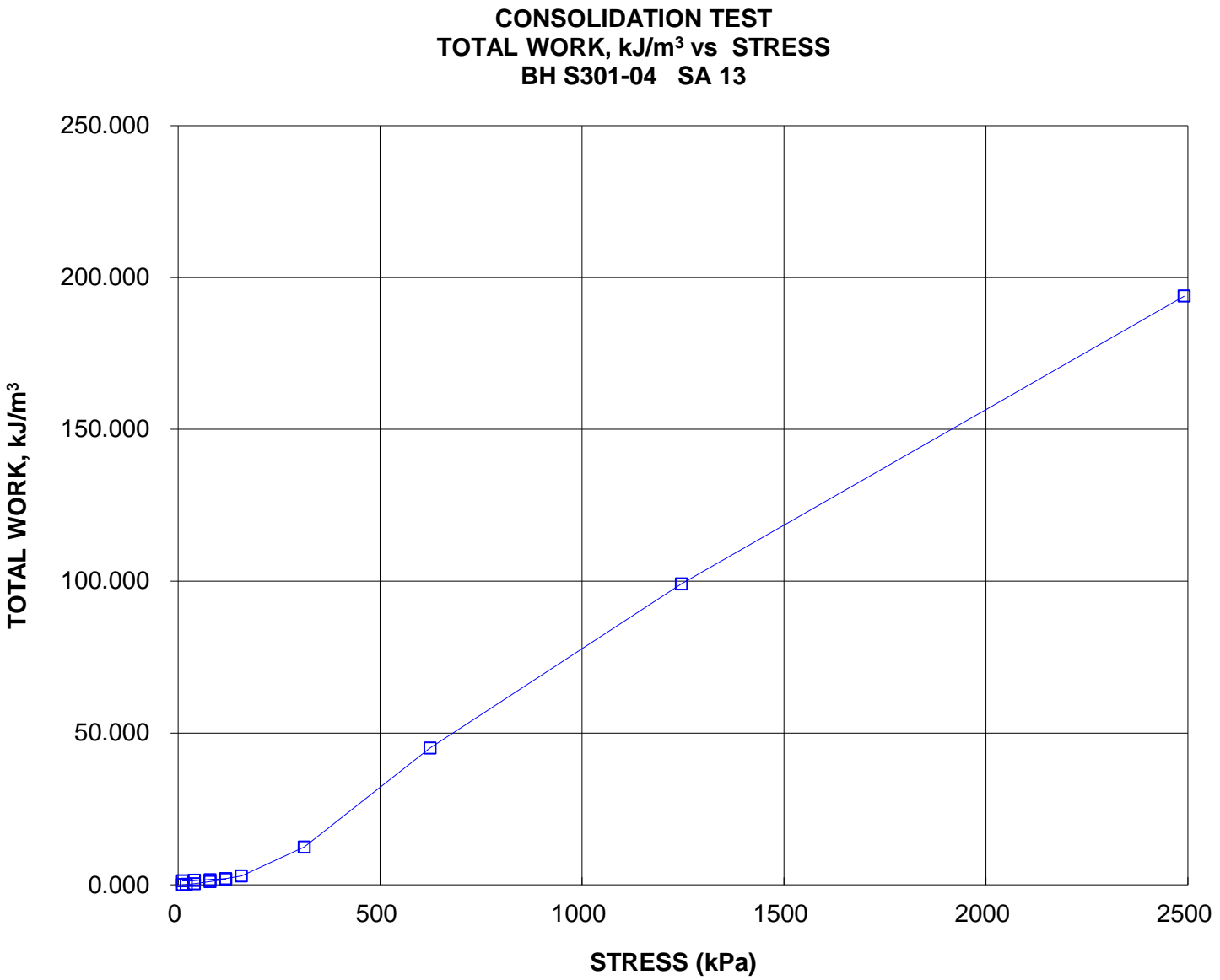


HYDRAULIC CONDUCTIVITY,
cm/s

CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs STRESS
BH S301-04 SA 13





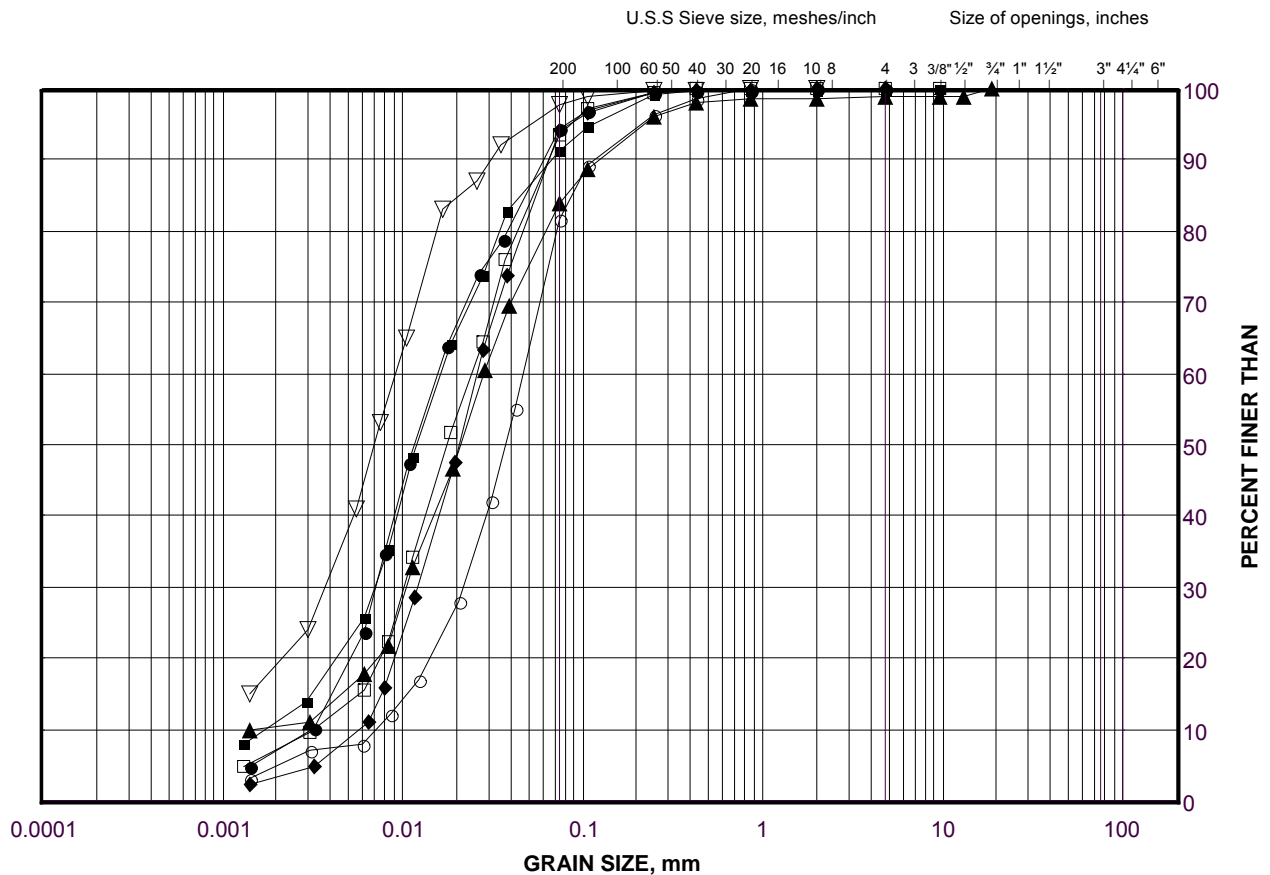


GRAIN SIZE DISTRIBUTION

Silt

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-12A



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S301-11 | 14 | 163.9 |
| ■ | S301-05 | 14 | 162.5 |
| ◆ | S301-12 | 15 | 162.5 |
| ▲ | C301-S2 | 15 | 161.8 |
| ▽ | S301-02 | 15 | 161.2 |
| ○ | S301-03 | 17 | 160.8 |
| □ | S301-01 | 17 | 160.7 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

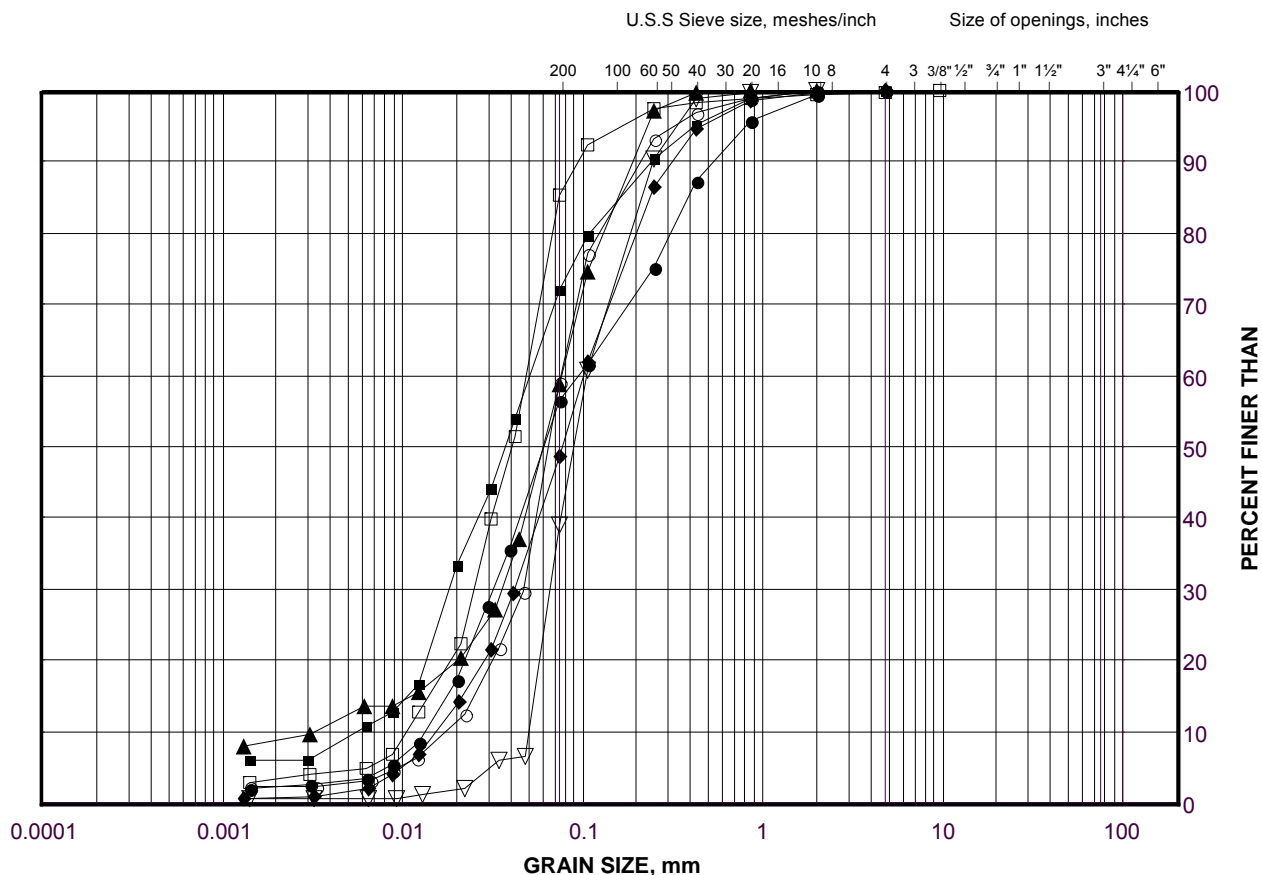
Date: 09-Apr-13

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-12B



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S301-04 | 15 | 160.9 |
| ■ | C301-S3 | 15 | 161.4 |
| ◆ | S301-02 | 17 | 156.6 |
| ▲ | C301-S3 | 17 | 156.8 |
| ▽ | S301-01 | 18 | 157.6 |
| ○ | S301-13 | 19 | 159.5 |
| □ | S301-03 | 19 | 156.2 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

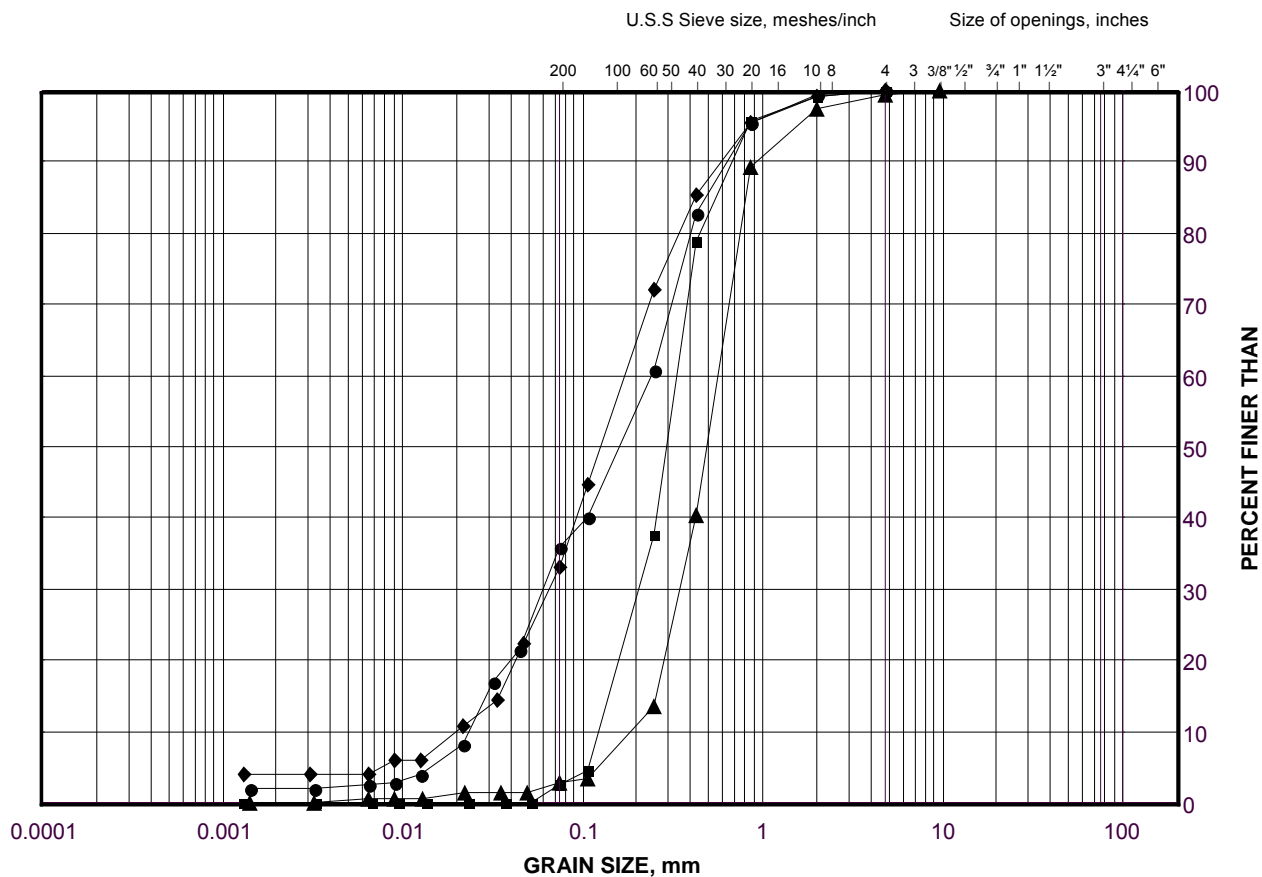
Date: 02-May-13

GRAIN SIZE DISTRIBUTION

Silt and Sand to Sand

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-12C



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

LEGEND

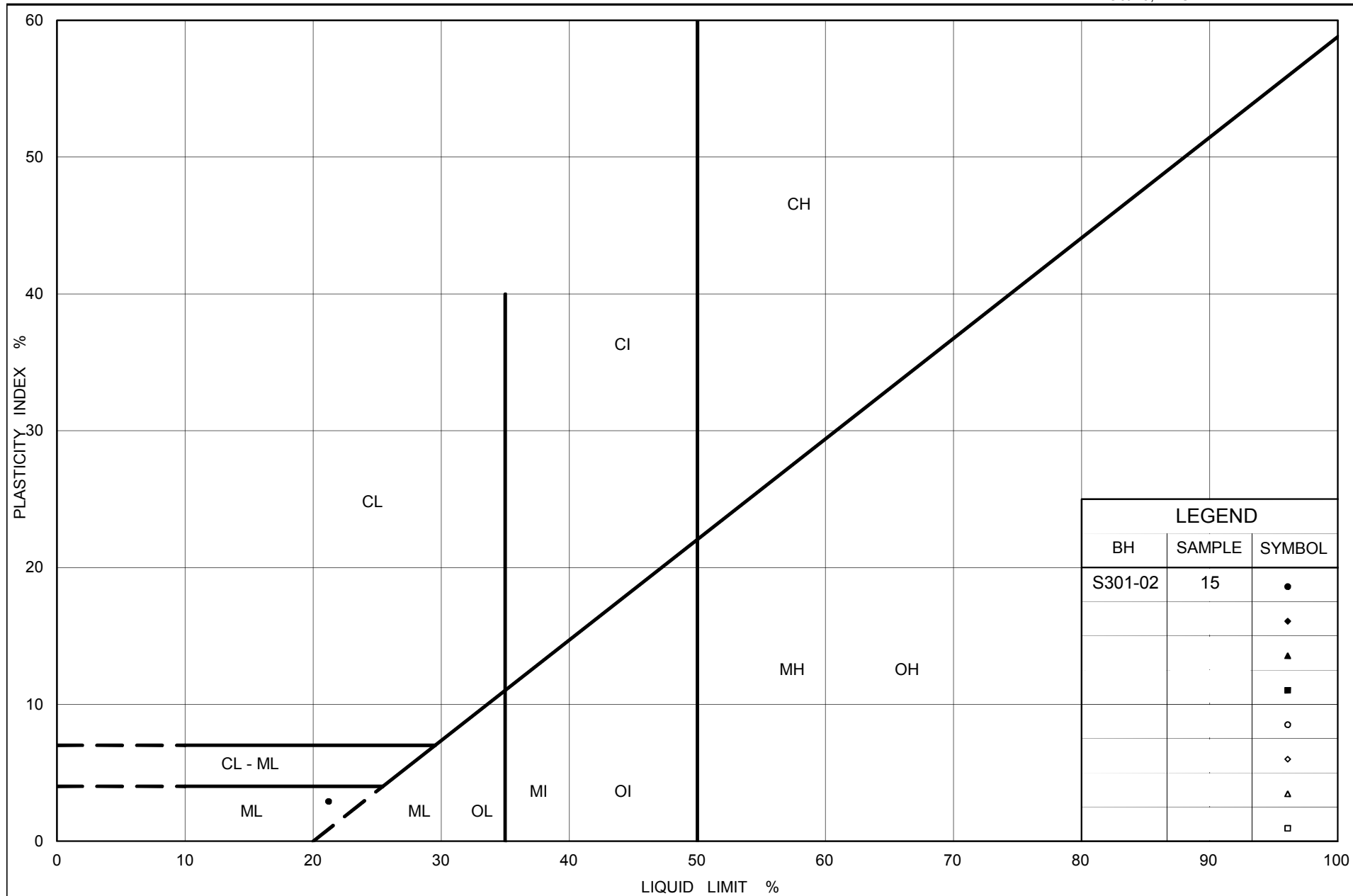
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S301-05 | 15 | 161.0 |
| ■ | S301-20 | 16 | 159.2 |
| ◆ | C301-S1 | 16 | 159.6 |
| ▲ | C301-S2 | 17 | 155.9 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 16-Apr-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Silt

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

Figure No. A.S301-13

Project No. 09-1111-6014

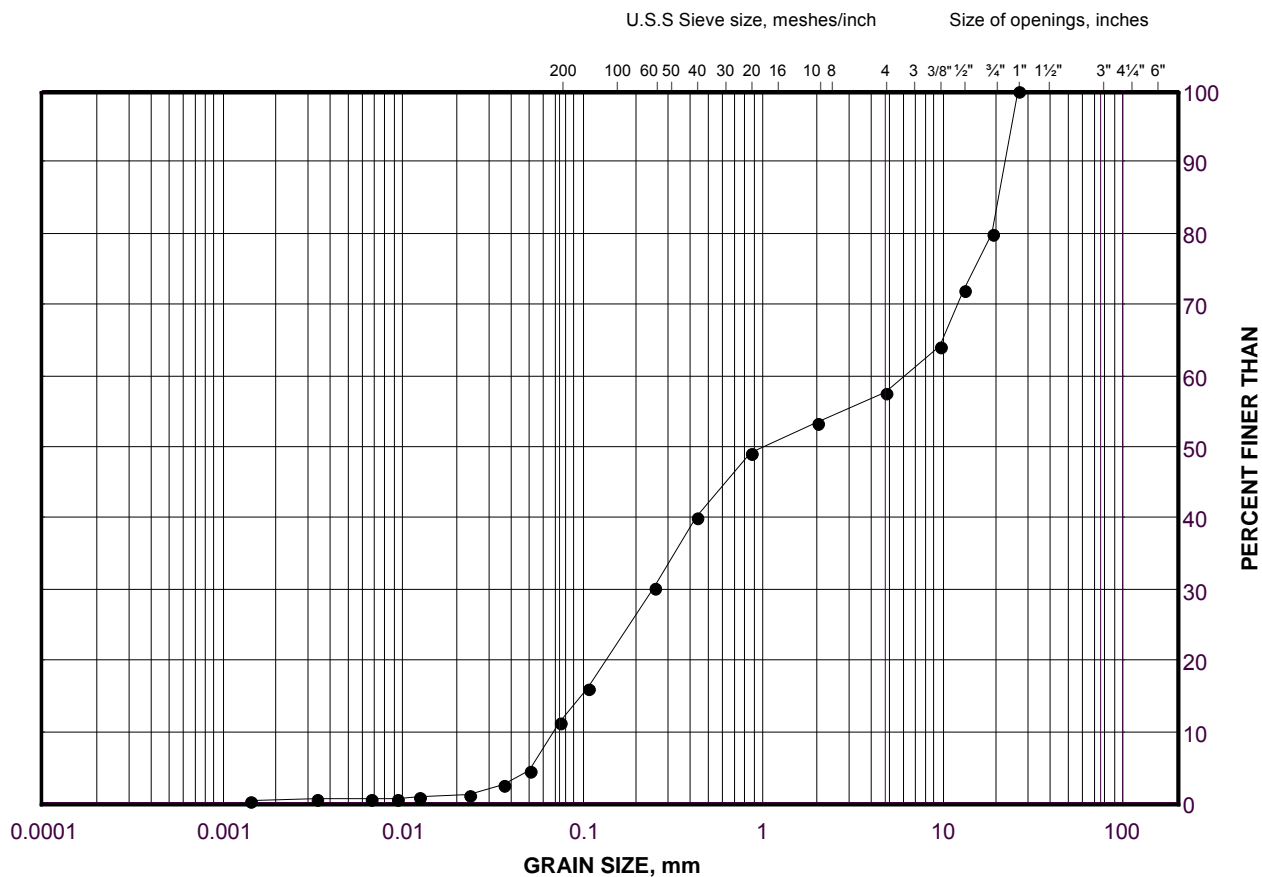
Checked By: AV

GRAIN SIZE DISTRIBUTION

Sand and Gravel

Highway 69 (SBL) STA 13+725 to 14+050 (Swamp 301)

FIGURE A.S301-14



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S301-12 | 16 | 159.4 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

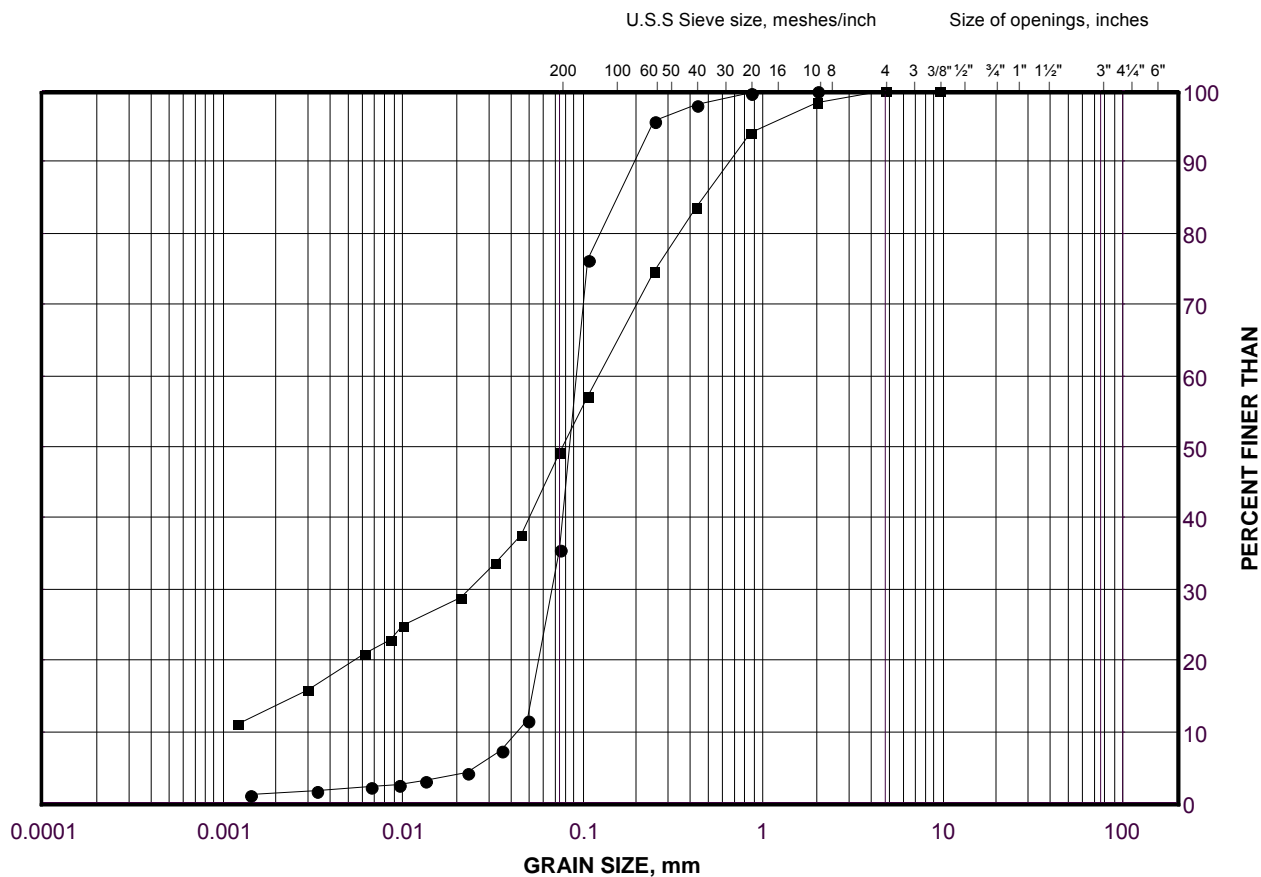
Date: 26-Mar-13

GRAIN SIZE DISTRIBUTION

Silt and Sand (Near Surface)

Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

FIGURE A.S301-15



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

LEGEND

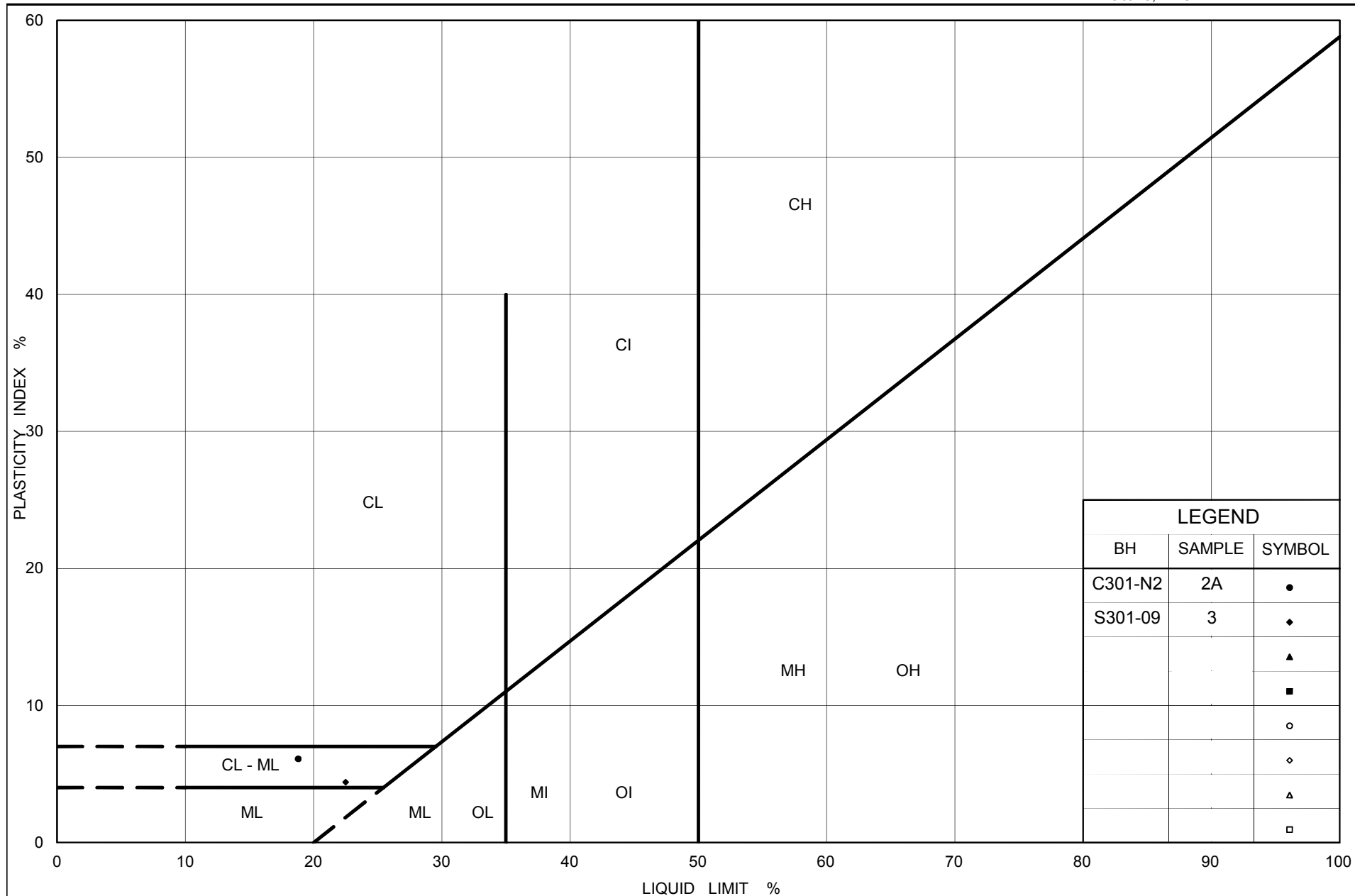
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S301-23 | 1B | 183.5 |
| ■ | C301-N2 | 2A | 180.7 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 17-Apr-13



Ministry of Transportation

Ontario

PLASTICITY CHART
 Silt to Silt and Sand (Near Surface)
 Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

Figure No. A.S301-16

Project No. 09-1111-6014

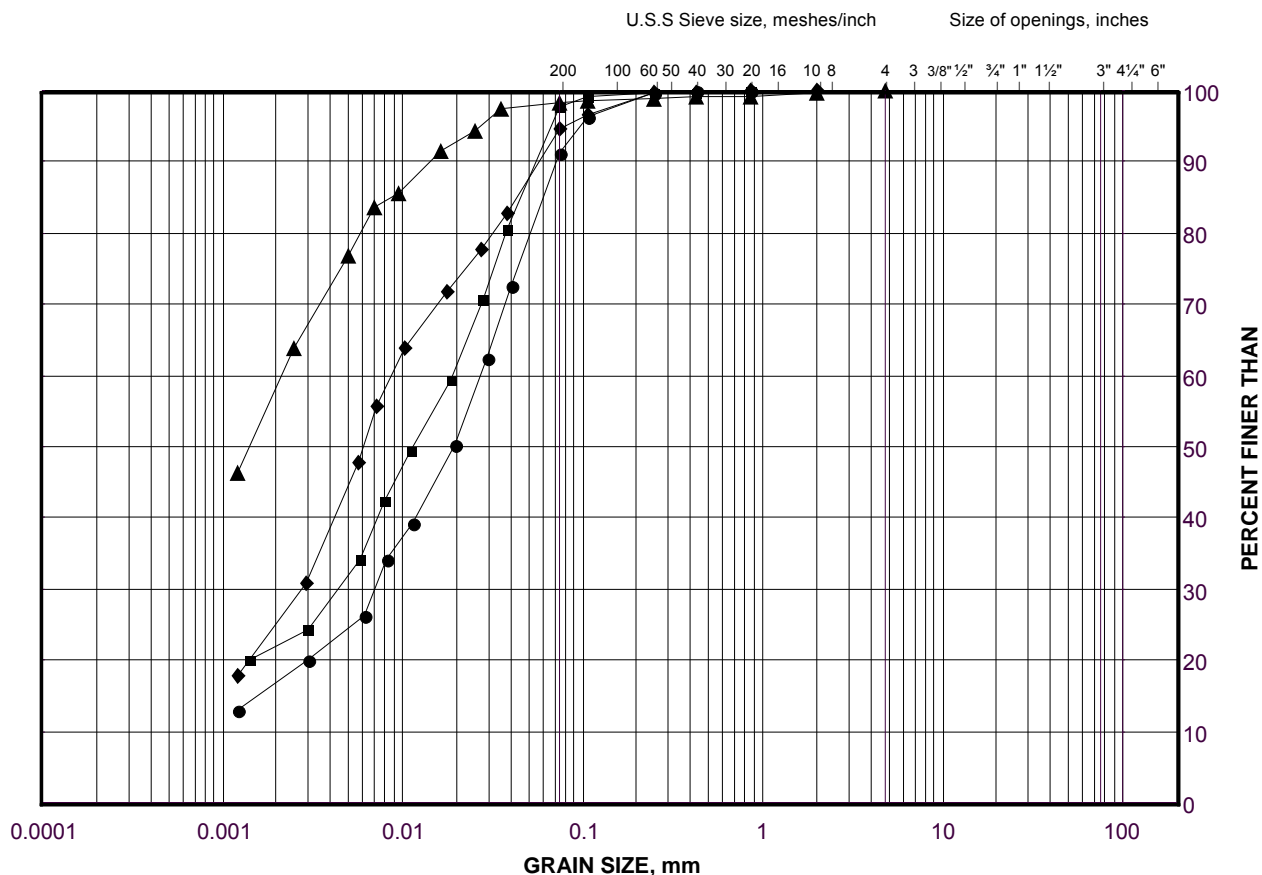
Checked By: AV

GRAIN SIZE DISTRIBUTION

Clayey Silt to Clay (Upper)

Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

FIGURE A.S301-17



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

LEGEND

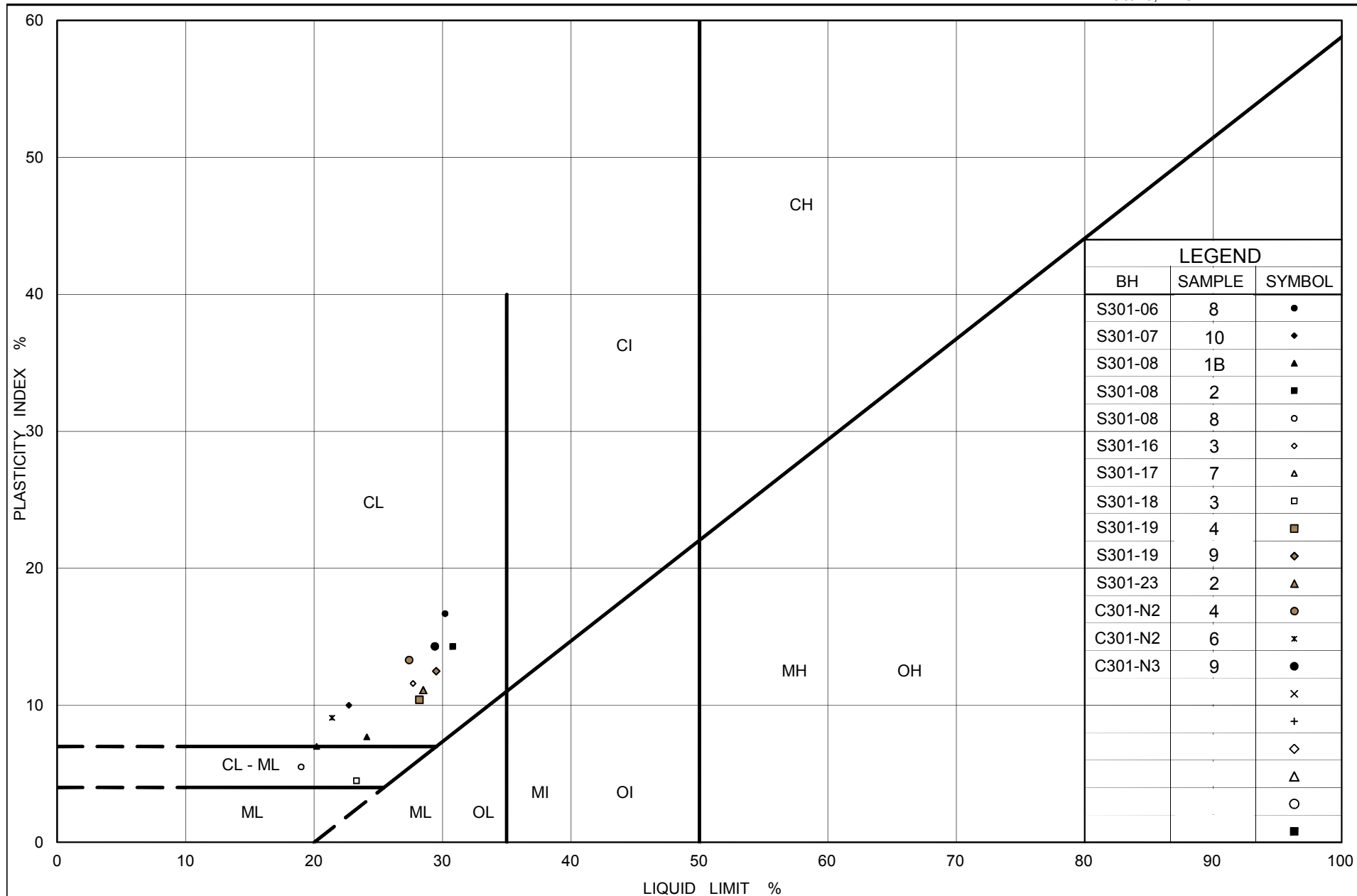
| SYMBOL | BOREHOLE | SAMPLE | DEPTH(m) |
|--------|----------|--------|----------|
| ● | S301-08 | 1B | 180.9 |
| ■ | C301-N3 | 2 | 180.4 |
| ◆ | C301-N2 | 4 | 177.2 |
| ▲ | S301-07 | 6 | 177.8 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 25-Mar-13



Ministry of
Transportation

Ontario

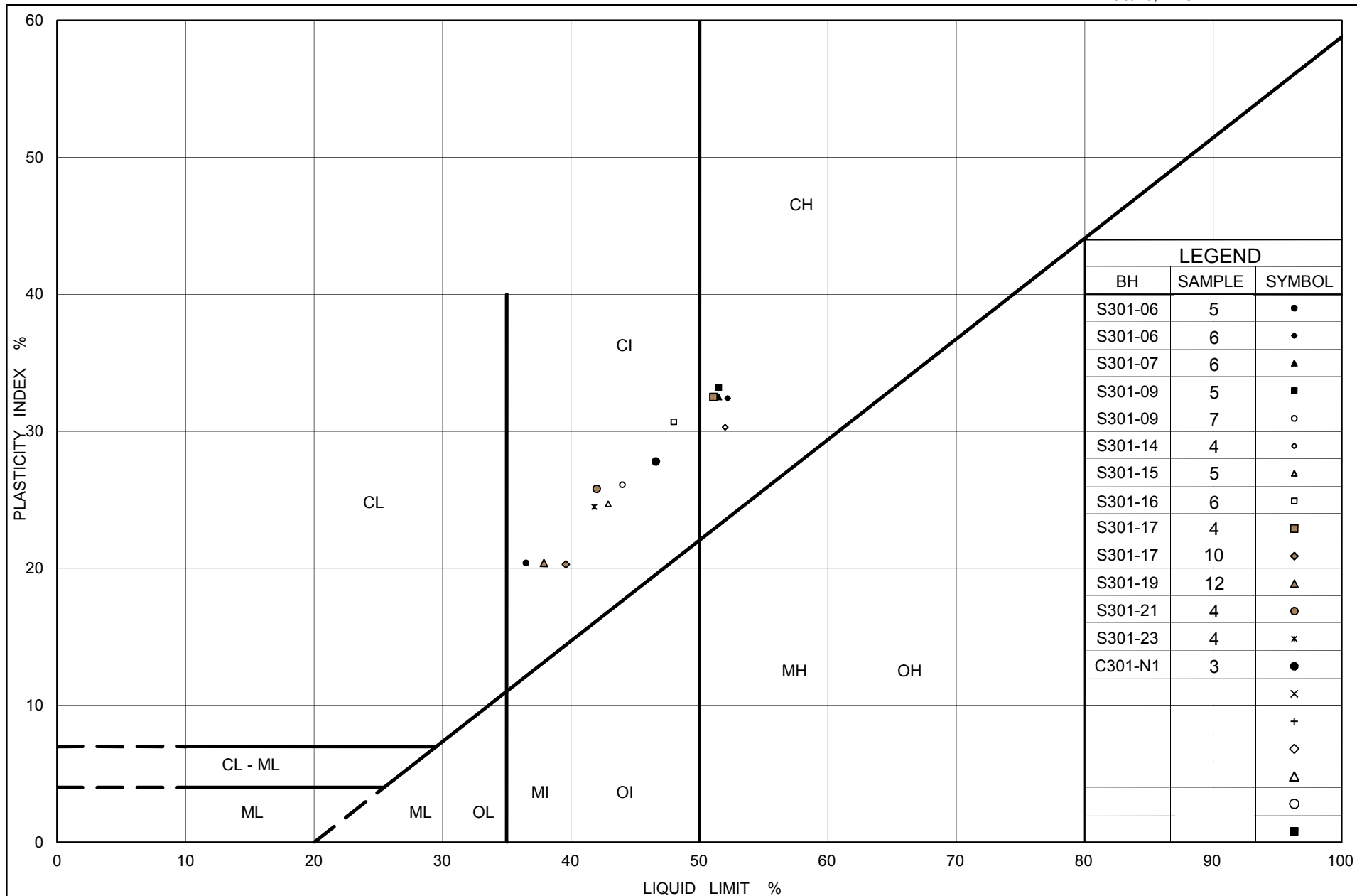
PLASTICITY CHART Clayey Silt (Upper)

Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

Figure No. A.S301-18A

Project No. 09-1111-6014

Checked By: AV



Ministry of
Transportation

Ontario

PLASTICITY CHART
Silty Clay to Clay (Upper)
 Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

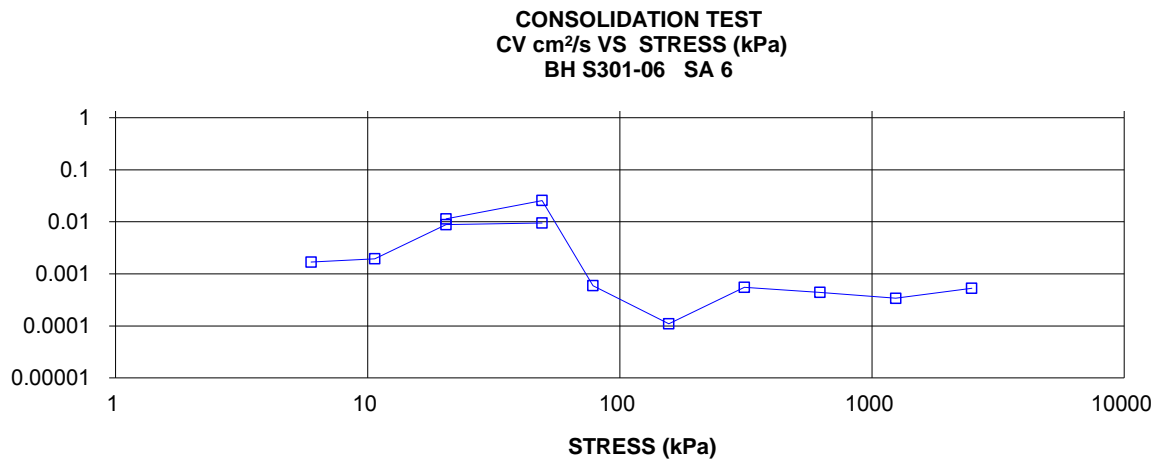
Figure No. A.S301-18B

Project No. 09-1111-6014

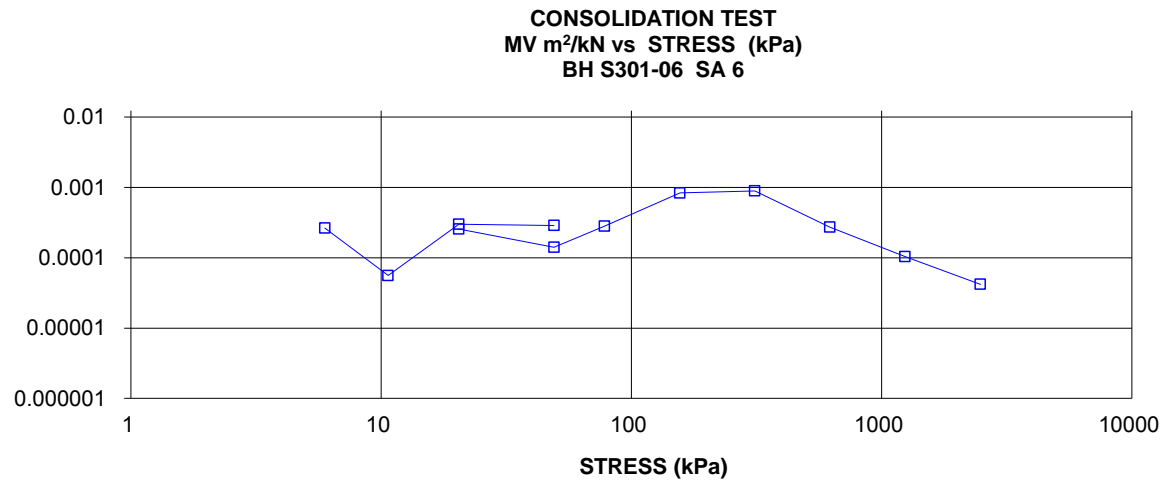
Checked By: AV

| CONSOLIDATION TEST SUMMARY Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301) | | | | | FIGURE A.S301-19 Sheet 1 of 4 | | |
|---|--------------|------------------------------------|--------|-------------------|----------------------------------|--------------------|----------|
| SAMPLE IDENTIFICATION | | | | | | | |
| Project Number | 09-1111-6014 | | | Sample Number | 6 | | |
| Borehole Number | S301-06 | | | Sample Depth, m | 4.6-5.2 | | |
| TEST CONDITIONS | | | | | | | |
| Test Type | Standard | | | Load Duration, hr | 24 | | |
| Oedometer Number | 6 | | | | | | |
| Date Started | 10/03/2012 | | | | | | |
| Date Completed | 10/29/2012 | | | | | | |
| SAMPLE DIMENSIONS AND PROPERTIES - INITIAL | | | | | | | |
| Sample Height, cm | 1.90 | Unit Weight, kN/m ³ | 15.84 | | | | |
| Sample Diameter, cm | 6.34 | Dry Unit Weight, kN/m ³ | 9.47 | | | | |
| Area, cm ² | 31.55 | Specific Gravity, measured | 2.77 | | | | |
| Volume, cm ³ | 59.88 | Solids Height, cm | 0.661 | | | | |
| Water Content, % | 67.32 | Volume of Solids, cm ³ | 20.87 | | | | |
| Wet Mass, g | 96.73 | Volume of Voids, cm ³ | 39.01 | | | | |
| Dry Mass, g | 57.81 | Degree of Saturation, % | 99.8 | | | | |
| TEST COMPUTATIONS | | | | | | | |
| | Corr. | Average | | | | | |
| Stress | Height | Void | Height | t ₉₀ | cv. | mv | k |
| kPa | cm | Ratio | cm | sec | cm ² /s | m ² /kN | cm/s |
| 0.00 | 1.898 | 1.869 | 1.898 | | | | |
| 5.96 | 1.895 | 1.865 | 1.897 | 454 | 1.68E-03 | 2.65E-04 | 4.37E-08 |
| 10.66 | 1.895 | 1.864 | 1.895 | 390 | 1.95E-03 | 5.61E-05 | 1.07E-08 |
| 20.44 | 1.889 | 1.855 | 1.892 | 86 | 8.82E-03 | 3.02E-04 | 2.61E-07 |
| 49.06 | 1.873 | 1.832 | 1.881 | 79 | 9.50E-03 | 2.89E-04 | 2.69E-07 |
| 20.42 | 1.880 | 1.842 | 1.877 | | | | |
| 5.86 | 1.887 | 1.853 | 1.884 | | | | |
| 20.44 | 1.880 | 1.842 | 1.883 | 66 | 1.14E-02 | 2.57E-04 | 2.87E-07 |
| 49.06 | 1.872 | 1.830 | 1.876 | 29 | 2.57E-02 | 1.42E-04 | 3.57E-07 |
| 78.07 | 1.857 | 1.807 | 1.864 | 1242 | 5.93E-04 | 2.82E-04 | 1.64E-08 |
| 156.30 | 1.733 | 1.619 | 1.795 | 6202 | 1.10E-04 | 8.35E-04 | 9.01E-09 |
| 311.37 | 1.469 | 1.220 | 1.601 | 987 | 5.50E-04 | 8.97E-04 | 4.84E-08 |
| 621.55 | 1.307 | 0.976 | 1.388 | 923 | 4.43E-04 | 2.74E-04 | 1.19E-08 |
| 1241.29 | 1.185 | 0.791 | 1.246 | 970 | 3.39E-04 | 1.04E-04 | 3.47E-09 |
| 2482.93 | 1.086 | 0.641 | 1.135 | 519 | 5.26E-04 | 4.20E-05 | 2.17E-09 |
| 621.55 | 1.114 | 0.684 | 1.100 | | | | |
| 156.30 | 1.152 | 0.742 | 1.133 | | | | |
| 49.06 | 1.191 | 0.800 | 1.172 | | | | |
| 20.44 | 1.211 | 0.831 | 1.201 | | | | |
| 5.96 | 1.242 | 0.878 | 1.227 | | | | |
| Note: k calculated using cv based on t ₉₀ values. | | | | | | | |
| SAMPLE DIMENSIONS AND PROPERTIES - FINAL | | | | | | | |
| Sample Height, cm | 1.24 | Unit Weight, kN/m ³ | 19.46 | | | | |
| Sample Diameter, cm | 6.34 | Dry Unit Weight, kN/m ³ | 14.47 | | | | |
| Area, cm ² | 31.55 | Specific Gravity, measured | 2.77 | | | | |
| Volume, cm ³ | 39.18 | Solids Height, cm | 0.661 | | | | |
| Water Content, % | 34.51 | Volume of Solids, cm ³ | 20.87 | | | | |
| Wet Mass, g | 77.76 | Volume of Voids, cm ³ | 18.31 | | | | |
| Dry Mass, g | 57.81 | | | | | | |
| <div> <div>Prepared By: LFG</div> <div>Golder Associates</div> <div>Checked By: TZ</div> </div> | | | | | | | |

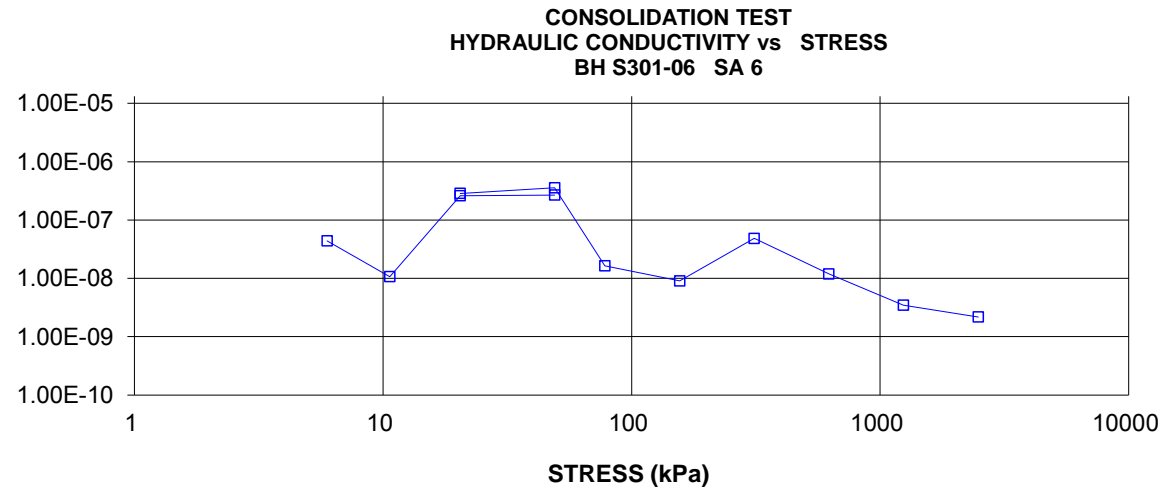
COEFFICIENT OF CONSOLIDATION,
cm²/s

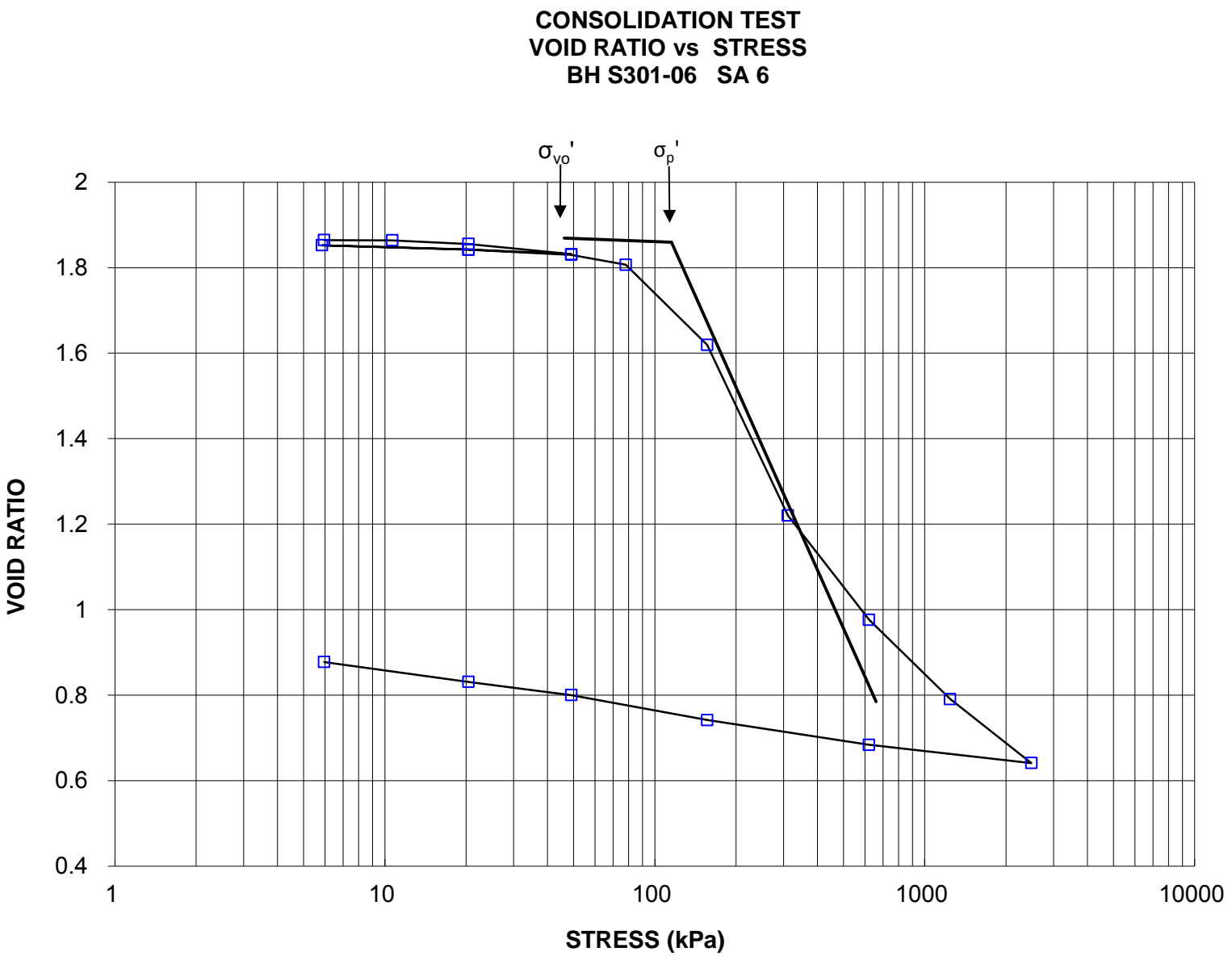


VOLUME COMPRESSIBILITY, m²/kN

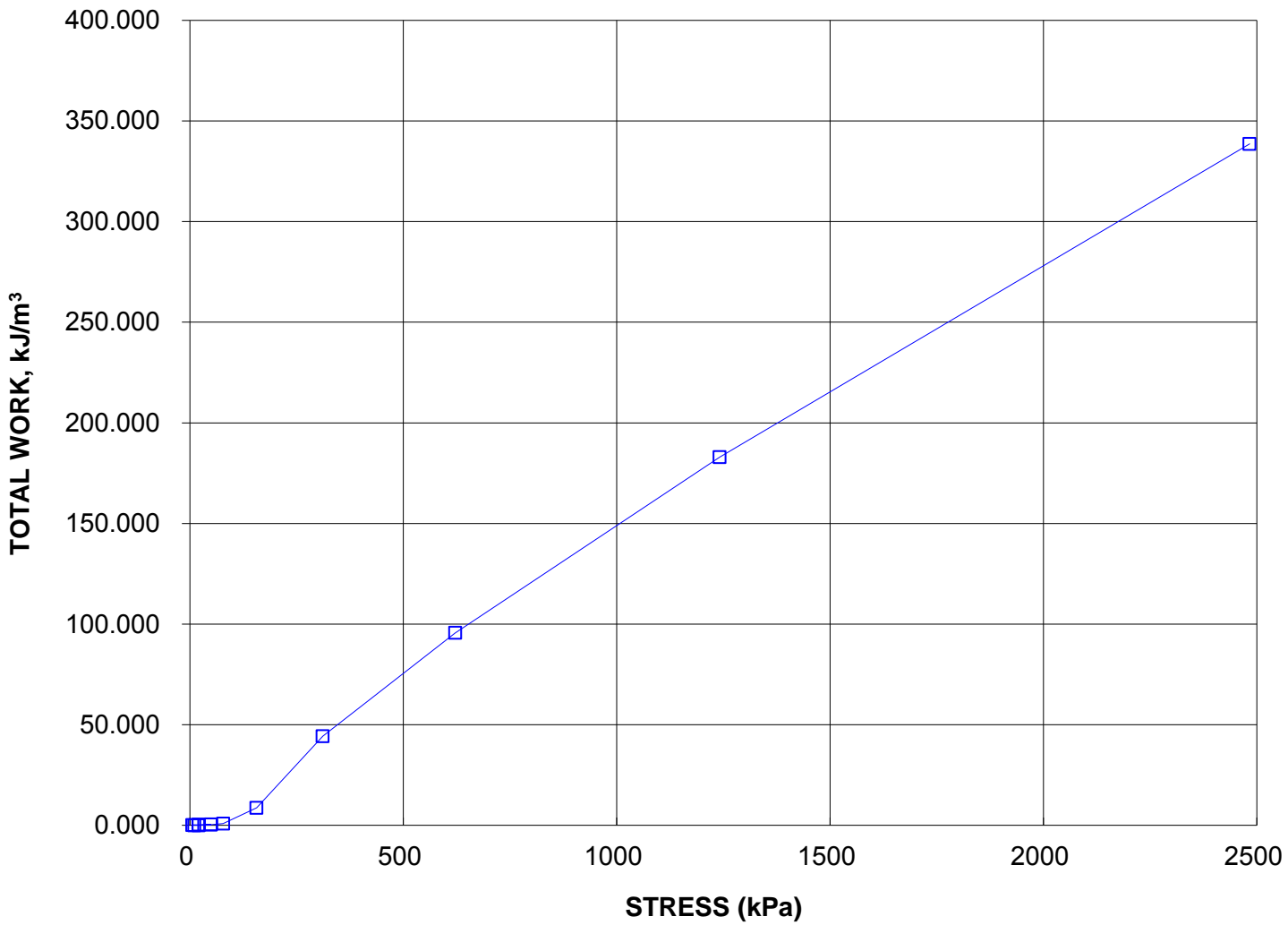


HYDRAULIC CONDUCTIVITY, cm/s





CONSOLIDATION TEST
TOTAL WORK, kJ/m^3 vs STRESS
BH S301-06 SA 6

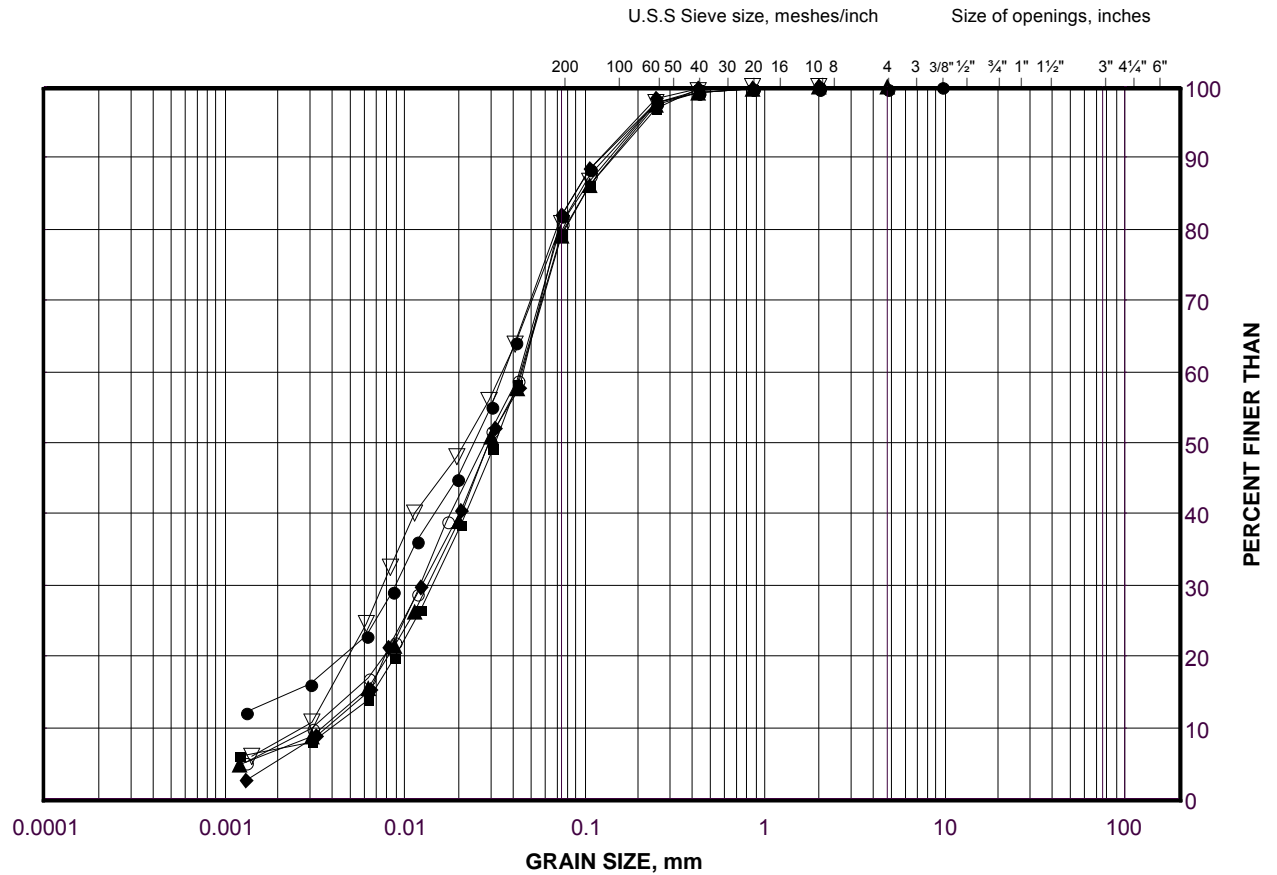


GRAIN SIZE DISTRIBUTION

Silt to Sandy Silt (Pockets)

Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

FIGURE A.S301-20



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

LEGEND

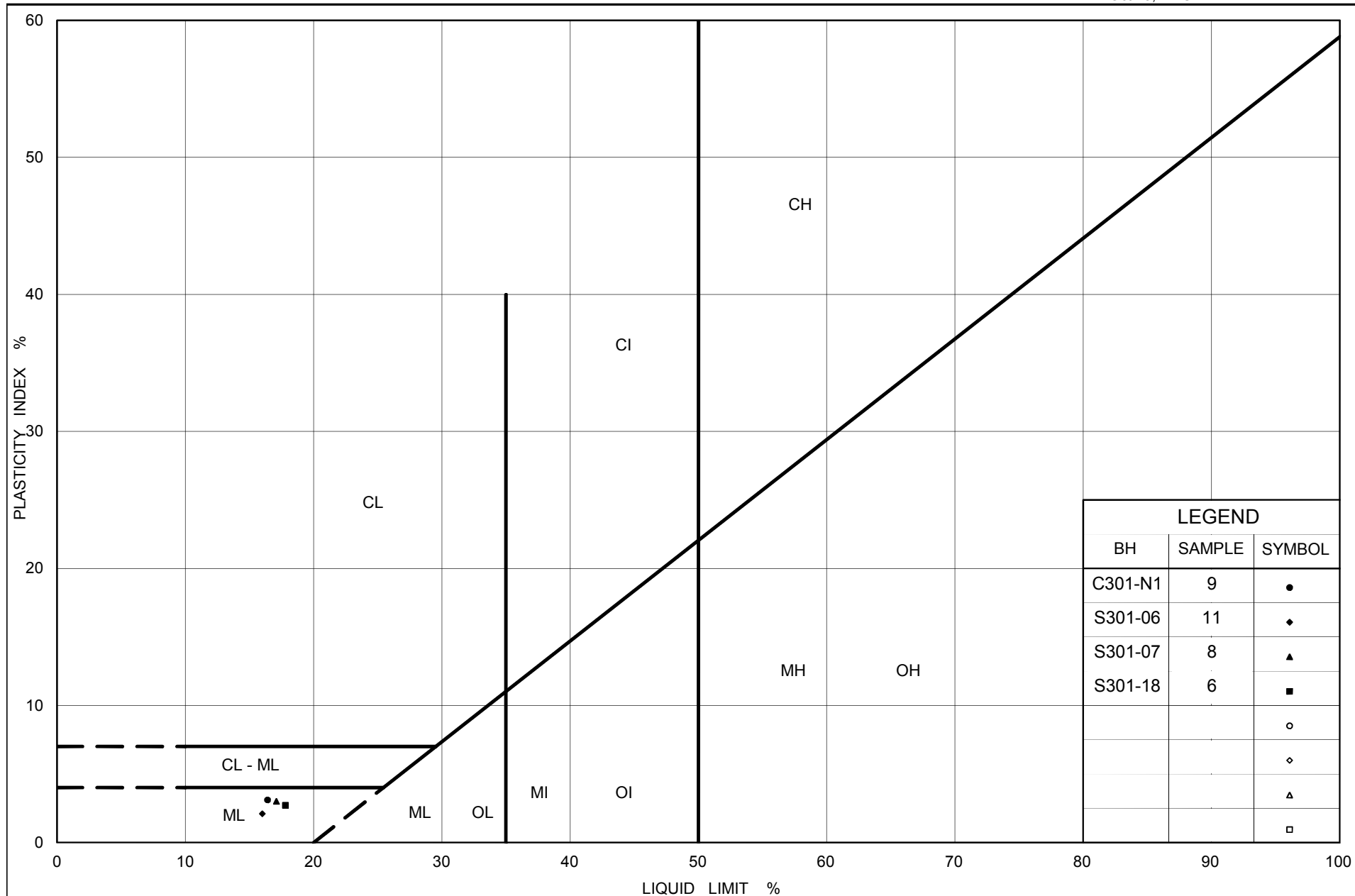
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S301-06 | 11 | 170.0 |
| ■ | S301-08 | 5 | 175.4 |
| ◆ | S301-18 | 6 | 176.4 |
| ▲ | C301-N1 | 6 | 175.3 |
| ▽ | S301-07 | 8 | 174.8 |
| ○ | C301-N1 | 9 | 170.7 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 25-Mar-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Silt (Pockets)

Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

Figure No. A.S301-21

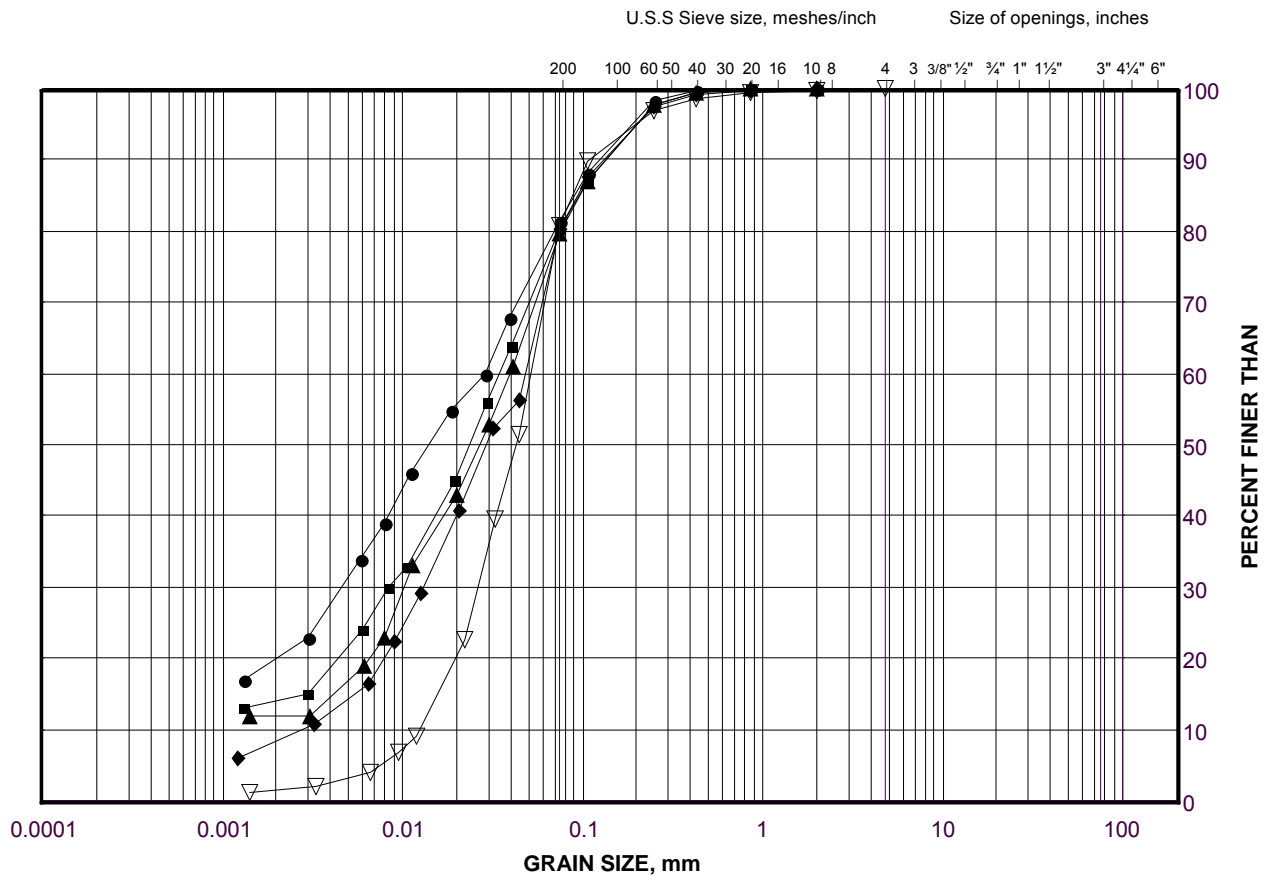
Project No. 09-1111-6014

Checked By: AV

GRAIN SIZE DISTRIBUTION

Silt to Sandy Silt (Interlayer)
Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

FIGURE A.S301-22



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

LEGEND

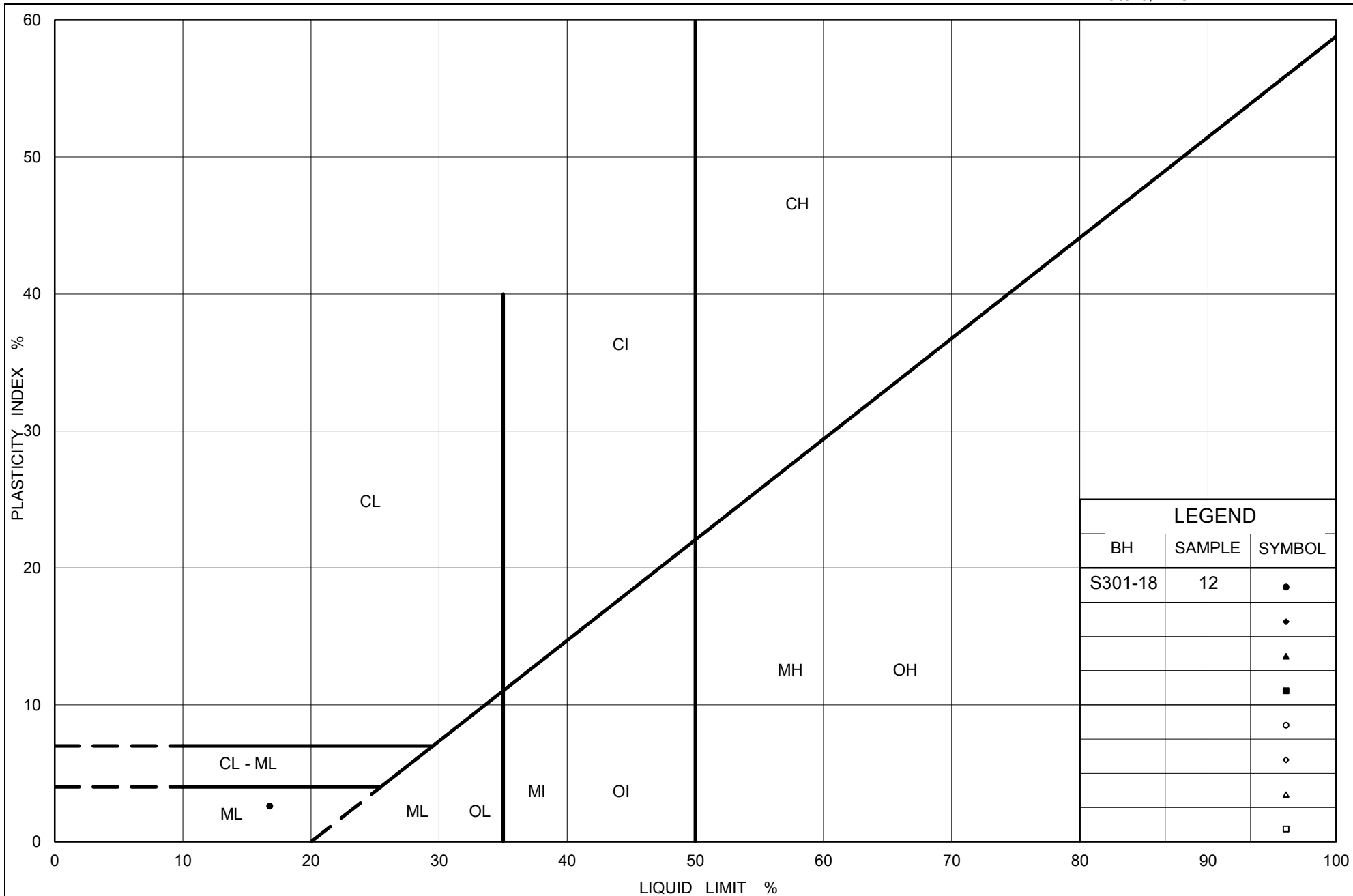
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | C301-N2 | 10B | 169.6 |
| ■ | C301-N1 | 11 | 167.6 |
| ◆ | S301-19 | 13 | 167.1 |
| ▲ | S301-07 | 13 | 167.2 |
| ▽ | S301-21 | 6 | 176.7 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 25-Mar-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Silt (Interlayer)

Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

Figure No. A.S301-23

Project No. 09-1111-6014

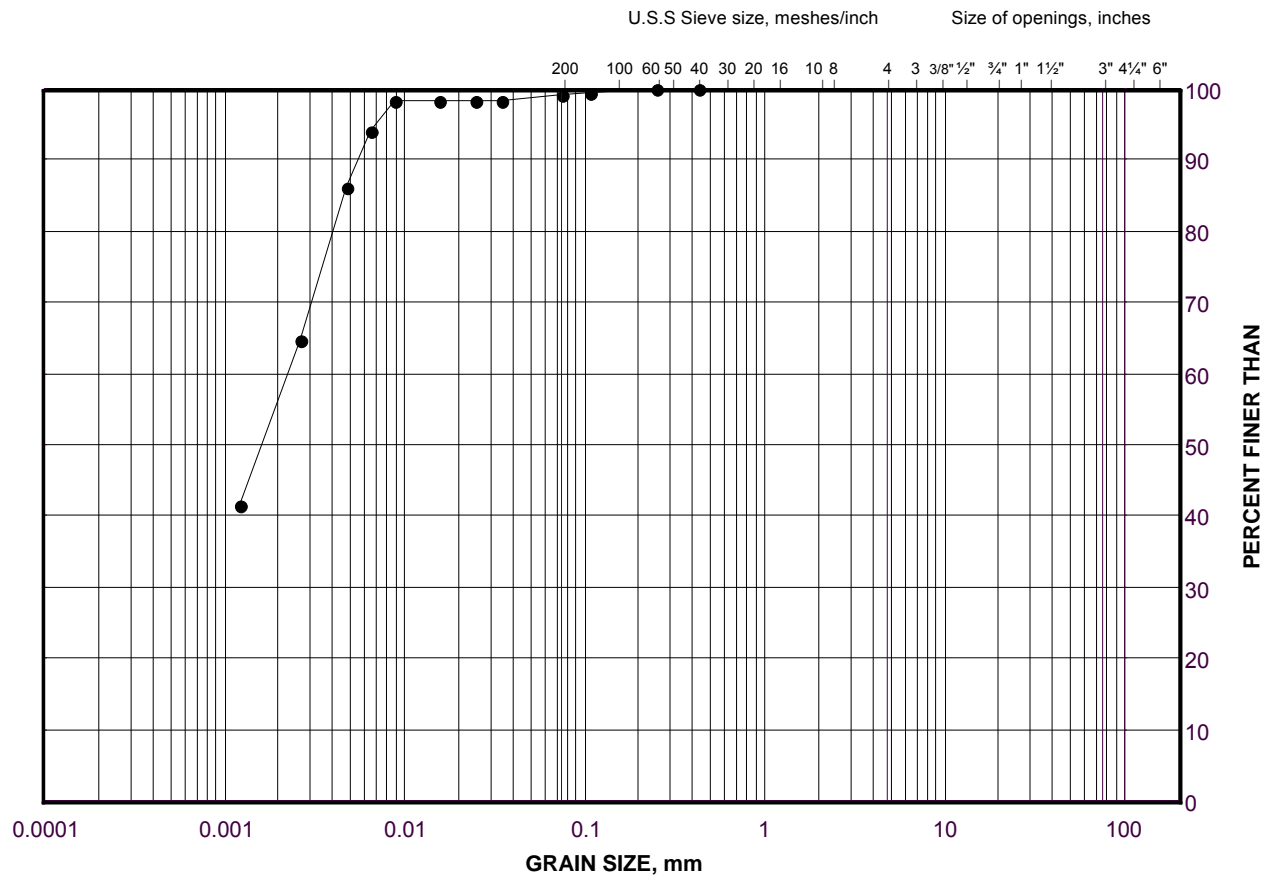
Checked By: AV

GRAIN SIZE DISTRIBUTION

Clay (Lower)

Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

FIGURE A.S301-24



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

LEGEND

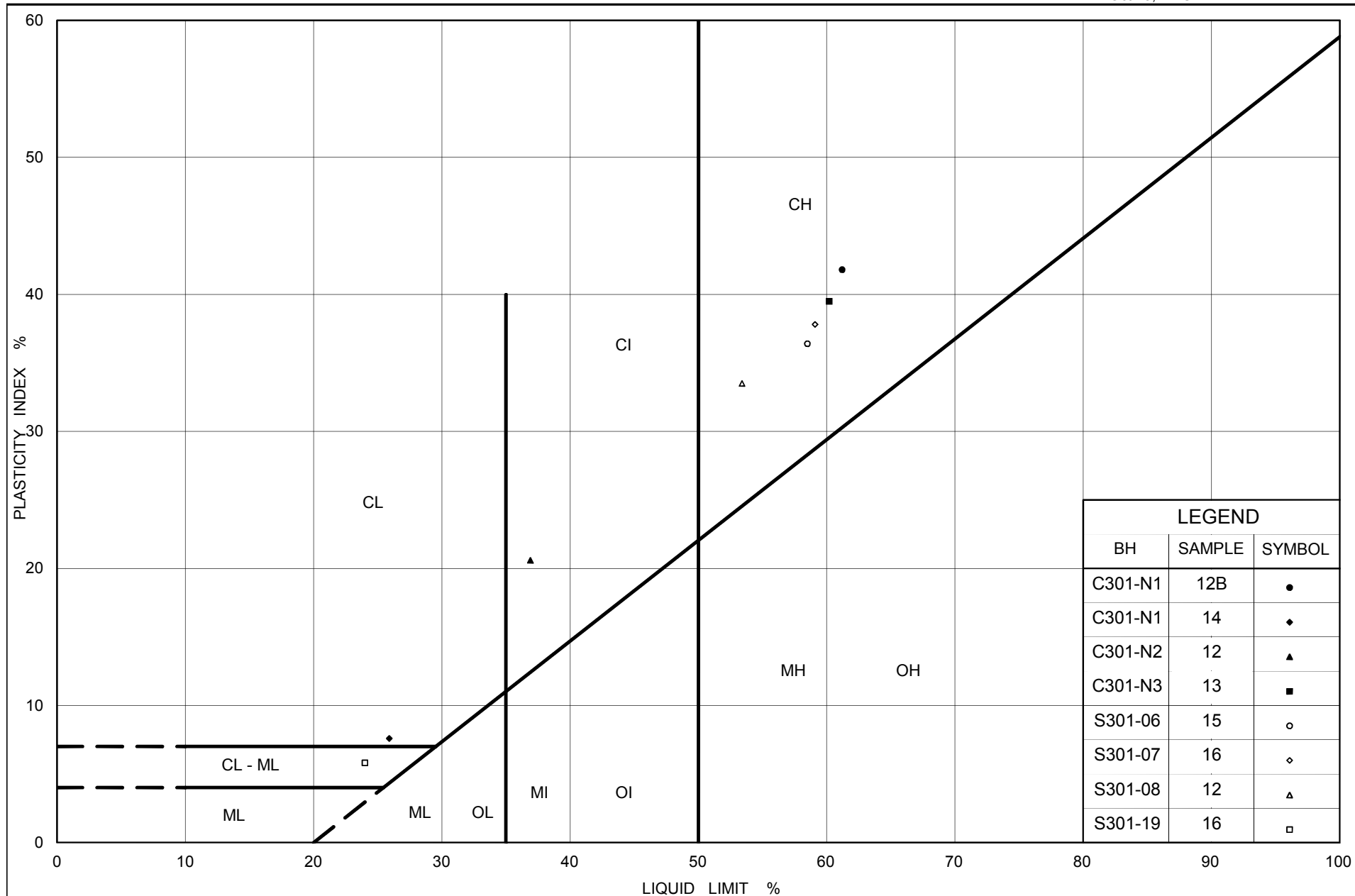
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S301-08 | 12 | 164.7 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 25-Mar-13



Ministry of Transportation

Ontario

PLASTICITY CHART
Clayey Silt to Clay (Lower)
Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

Figure No. A.S301-25

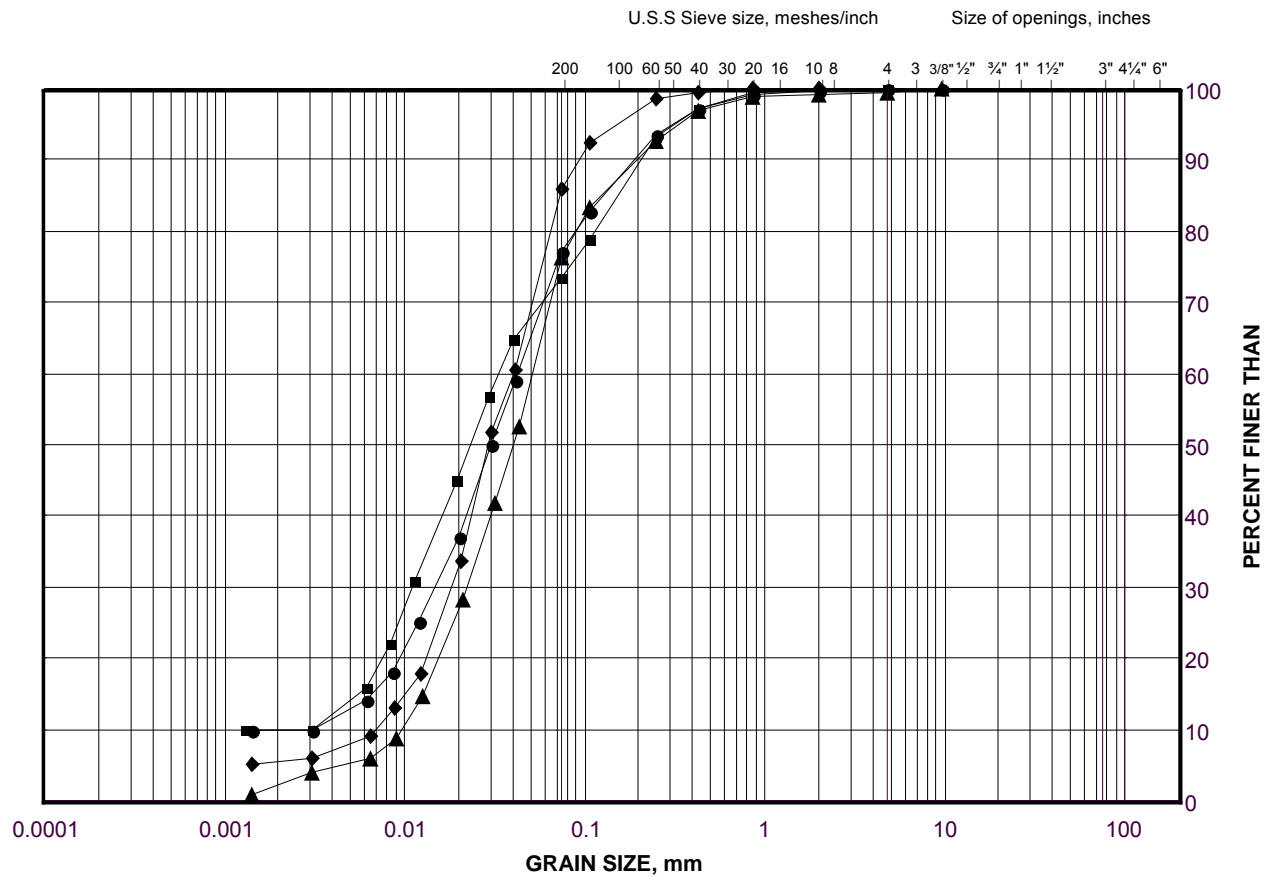
Project No. 09-1111-6014

Checked By: AV

GRAIN SIZE DISTRIBUTION

Silt to Sandy Silt
Highway 69 (NBL) STA 13+700 to 14+000

FIGURE A.S301-26A



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | C301-N3 | 15 | 162.1 |
| ■ | C301-N2 | 15 | 161.9 |
| ◆ | S301-07 | 18 | 159.6 |
| ▲ | S301-06 | 19 | 156.4 |

Project Number: 09-1111-6014

Checked By: AV

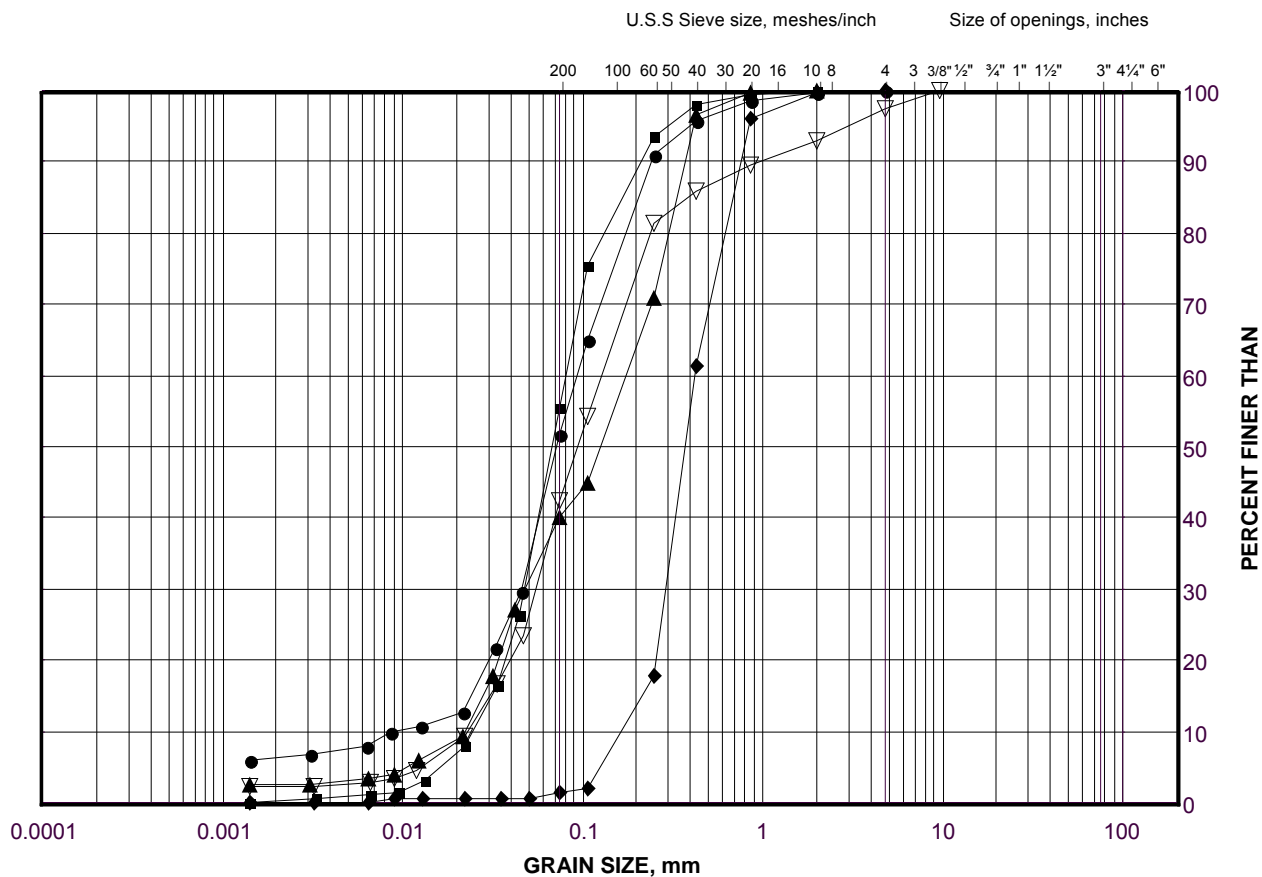
Golder Associates

Date: 25-Mar-13

GRAIN SIZE DISTRIBUTION

Silt and Sand to Sand
Highway 69 (NBL) STA 13+700 to 14+000 (Swamp 301)

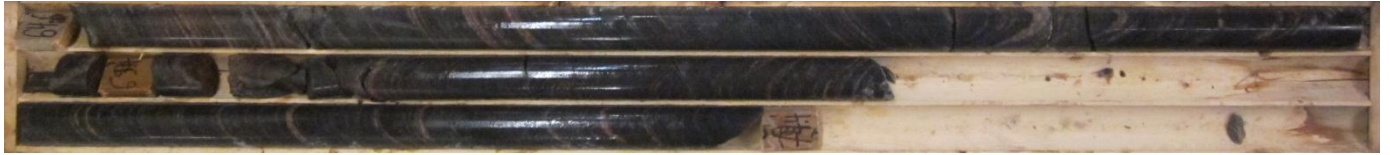
FIGURE A.S301-26B



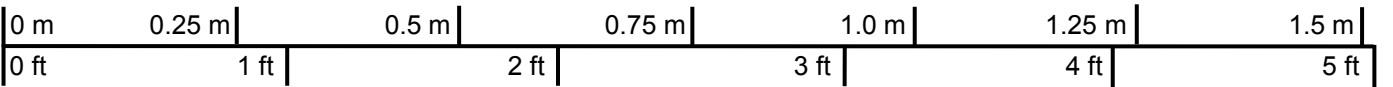
LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S301-08 | 15 | 158.6 |
| ■ | S301-19 | 17 | 156.5 |
| ◆ | C301-N1 | 17 | 155.6 |
| ▲ | S301-06 | 18 | 159.3 |
| ▽ | S301-15 | 6 | 176.1 |


Borehole C301-N3



Box 1: 19.69 m – 22.68 m



Scale

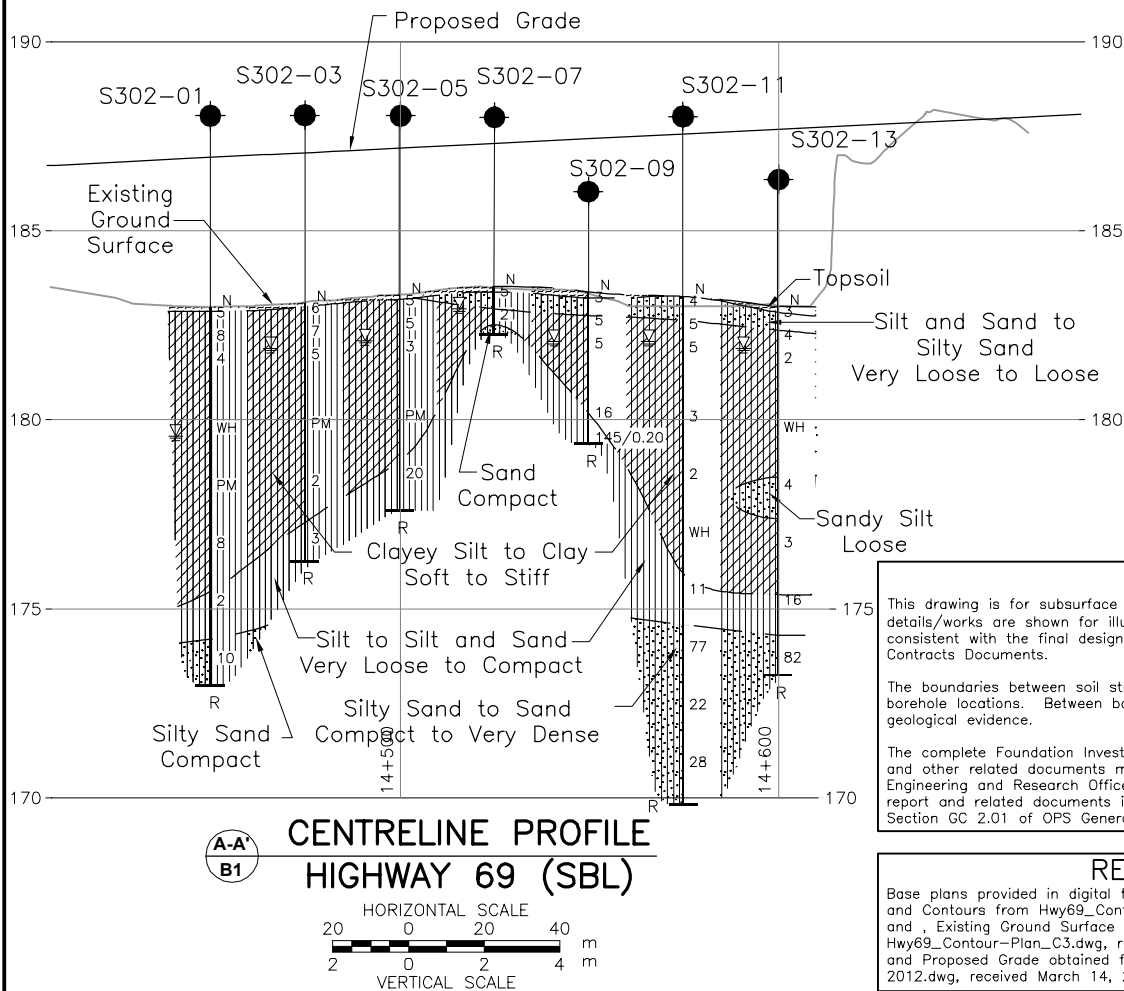
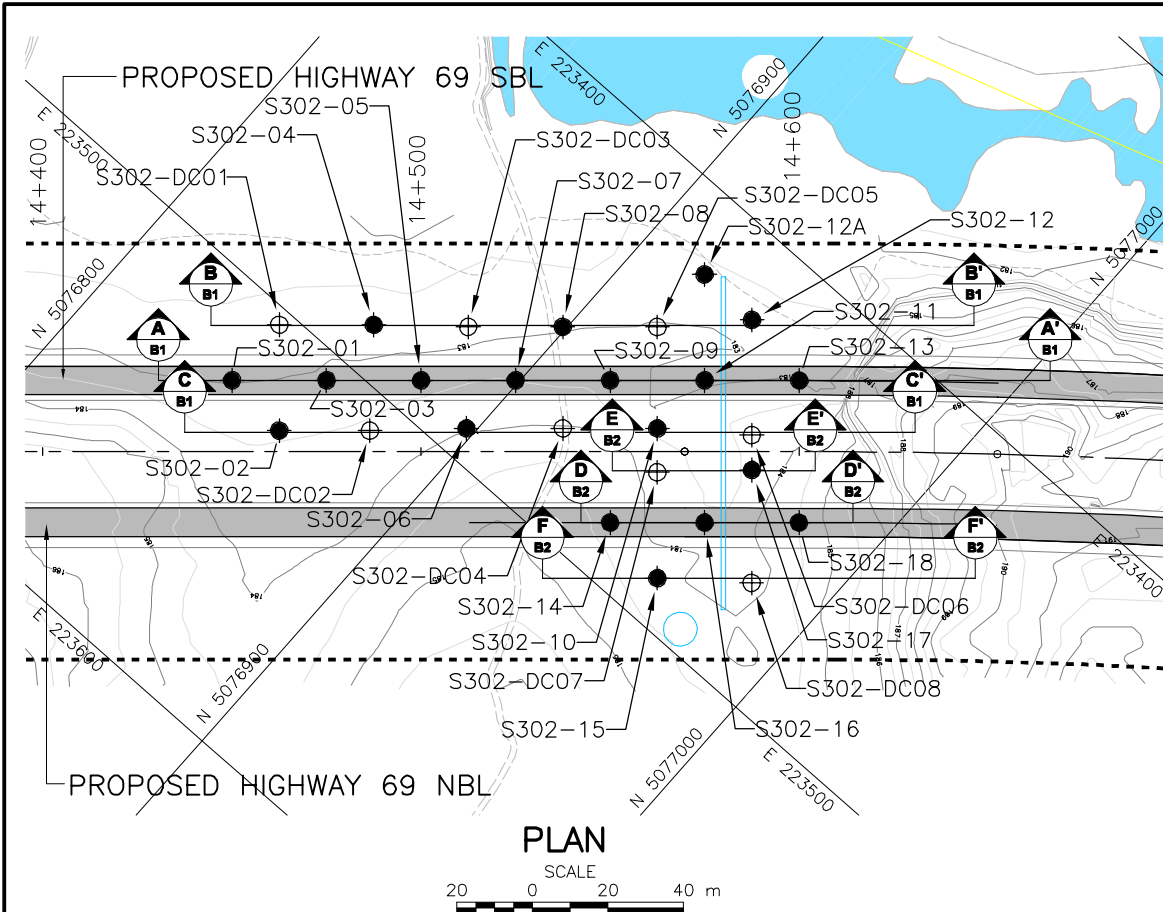
| | | | | | |
|--|--|--|--|----------|---------------|
| PROJECT | | | Swamp 301 Highway 69 Four-Laning GWP 5404-05-00; WP 5404-05-01 | | |
| TITLE | | | Bedrock Core Photograph – C301–N3 Highway 69 (NBL) STA 13+700 to 14+000 | | |
|  | | | PROJECT No. 09-1111-6014 | | FILE No. ---- |
| | | | DESIGN | AV | MAY 13 |
| | | | CADD | -- | -- |
| | | | CHECK | TZ | MAY 13 |
| | | | REVIEW | JPD/JMAC | MAY 13 |
| | | | FIGURE A.S301-27 | | |



APPENDIX B

Highway 69 SBL – STA 14+430 to 14+600 (Swamp 302)

Highway 69 NBL – STA 14+550 to 14+600 (Swamp 302)



NOTES

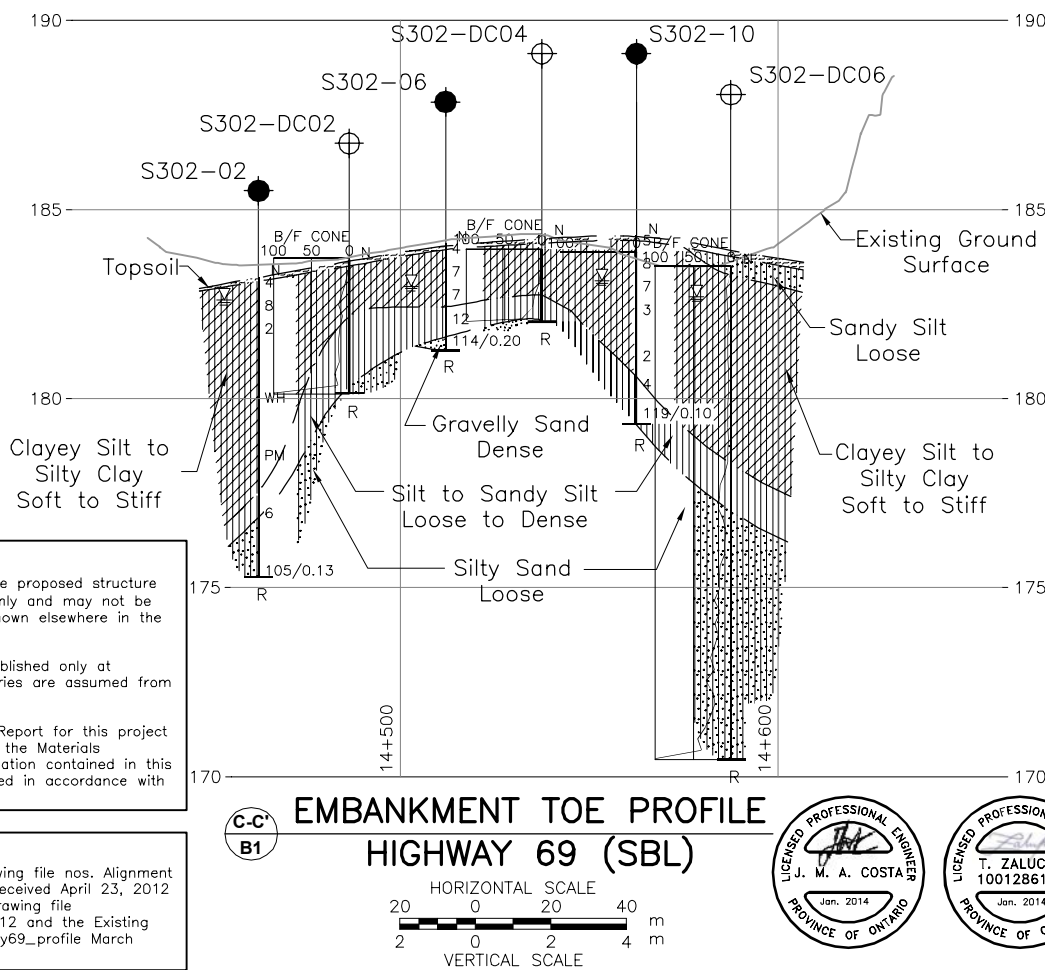
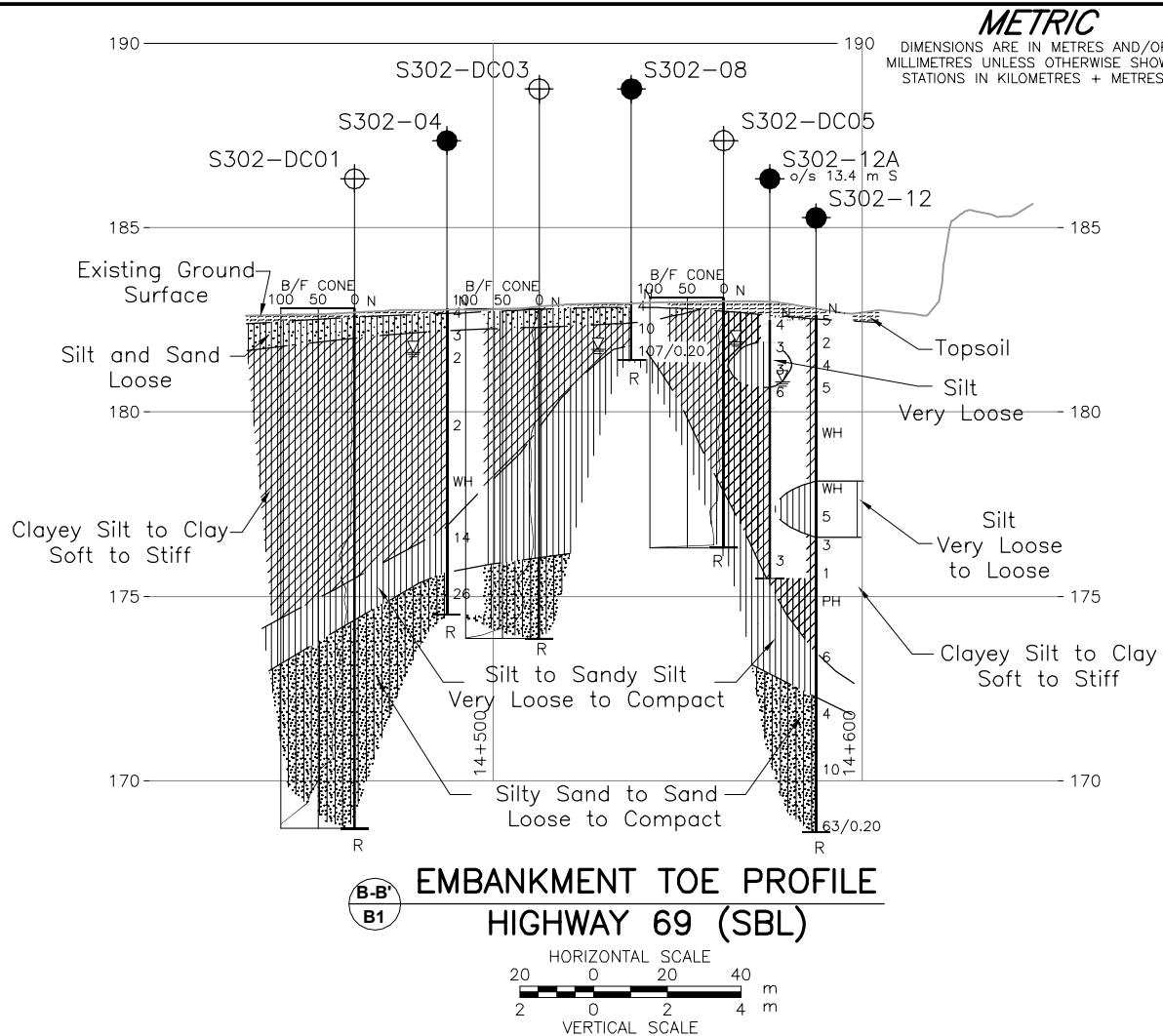
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

REFERENCE

Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and , Existing Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Existing and Proposed Grade obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.



CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 14+430 TO 14+600 (SBL)
STA 14+550 TO 14+600 (NBL)

BOREHOLE LOCATIONS AND SOIL STRATA

Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA

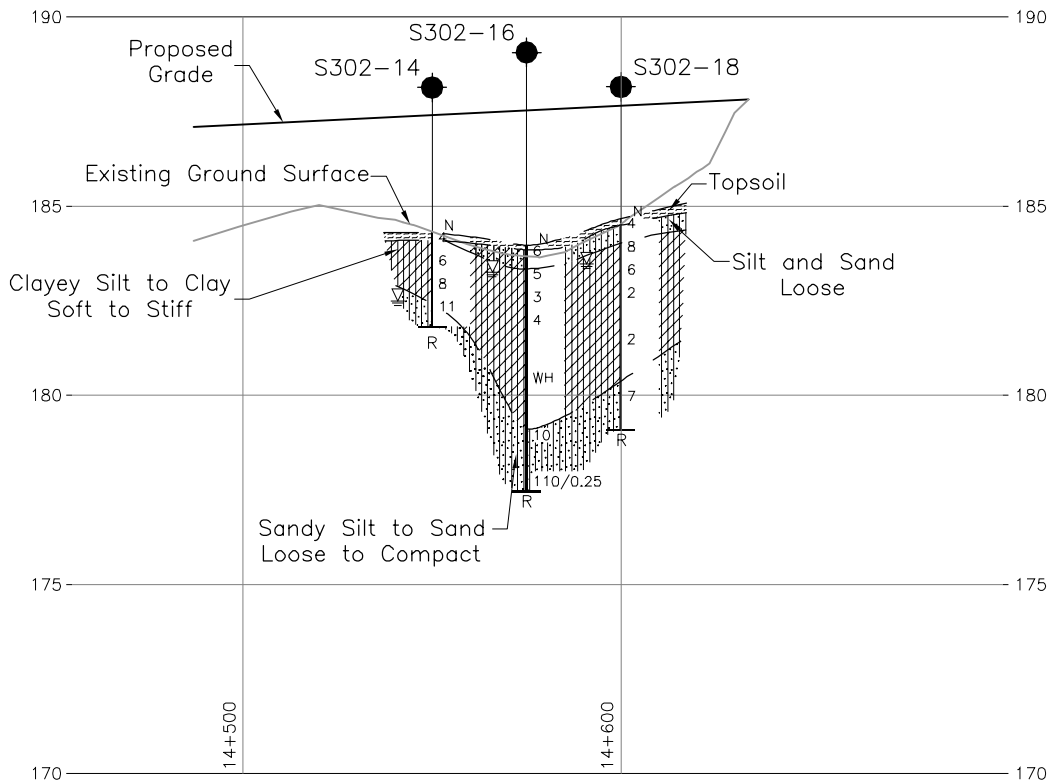
KEY PLAN
SCALE 5 0 5 10 km

LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling
- R Refusal

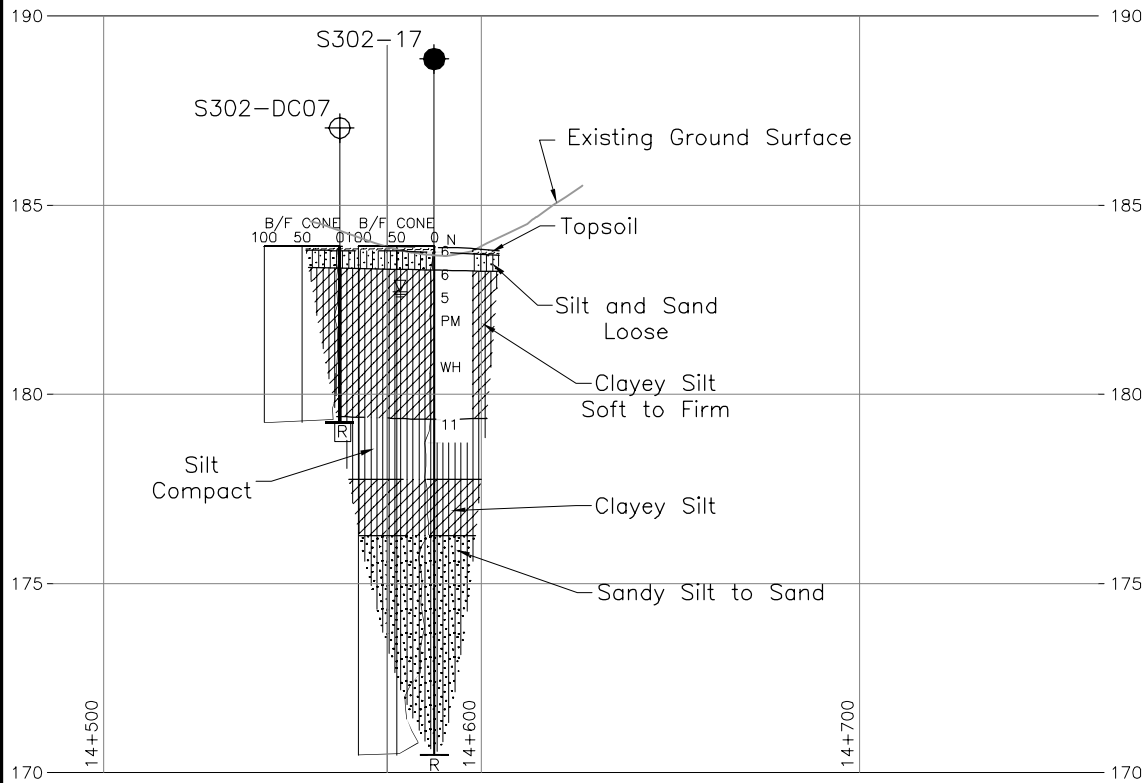
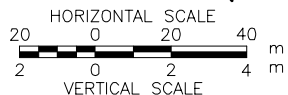
| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S302-01 | 183.0 | 5076842.9 | 223523.3 |
| S302-02 | 183.2 | 5076861.1 | 223525.0 |
| S302-03 | 183.1 | 5076861.6 | 223506.8 |
| S302-04 | 182.8 | 5076861.3 | 223487.5 |
| S302-05 | 183.3 | 5076880.4 | 223490.2 |
| S302-06 | 184.1 | 5076897.8 | 223491.8 |
| S302-07 | 183.5 | 5076899.1 | 223473.7 |
| S302-08 | 183.0 | 5076899.2 | 223454.9 |
| S302-09 | 183.4 | 5076917.9 | 223457.2 |
| S302-10 | 184.3 | 5076935.7 | 223458.4 |
| S302-11 | 183.3 | 5076936.6 | 223440.6 |
| S302-12 | 182.6 | 5076935.5 | 223420.3 |
| S302-12A | 182.5 | 5076918.1 | 223419.6 |
| S302-13 | 183.0 | 5076955.4 | 223424.1 |
| S302-14 | 184.3 | 5076942.8 | 223485.4 |
| S302-15 | 184.0 | 5076961.9 | 223488.1 |
| S302-16 | 184.0 | 5076961.5 | 223468.8 |
| S302-17 | 183.9 | 5076961.7 | 223450.2 |
| S302-18 | 184.7 | 5076980.2 | 223452.4 |
| S302-DC01 | 182.8 | 5076842.5 | 223504.0 |
| S302-DC02 | 183.7 | 5076879.1 | 223509.2 |
| S302-DC03 | 182.8 | 5076880.4 | 223471.4 |
| S302-DC04 | 183.9 | 5076916.9 | 223475.0 |
| S302-DC05 | 183.1 | 5076917.9 | 223438.3 |
| S302-DC06 | 183.5 | 5076955.6 | 223443.2 |
| S302-DC07 | 183.9 | 5076943.3 | 223467.1 |
| S302-DC08 | 184.0 | 5076981.4 | 223472.6 |

| NO. | DATE | BY | REVISION |
|---------------------|----------|--------------------------------|----------|
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 DIST. | |
| SUBM'D. CC | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | CHKD. CN | APPD. JPD/JMAC | DWG. B1 |



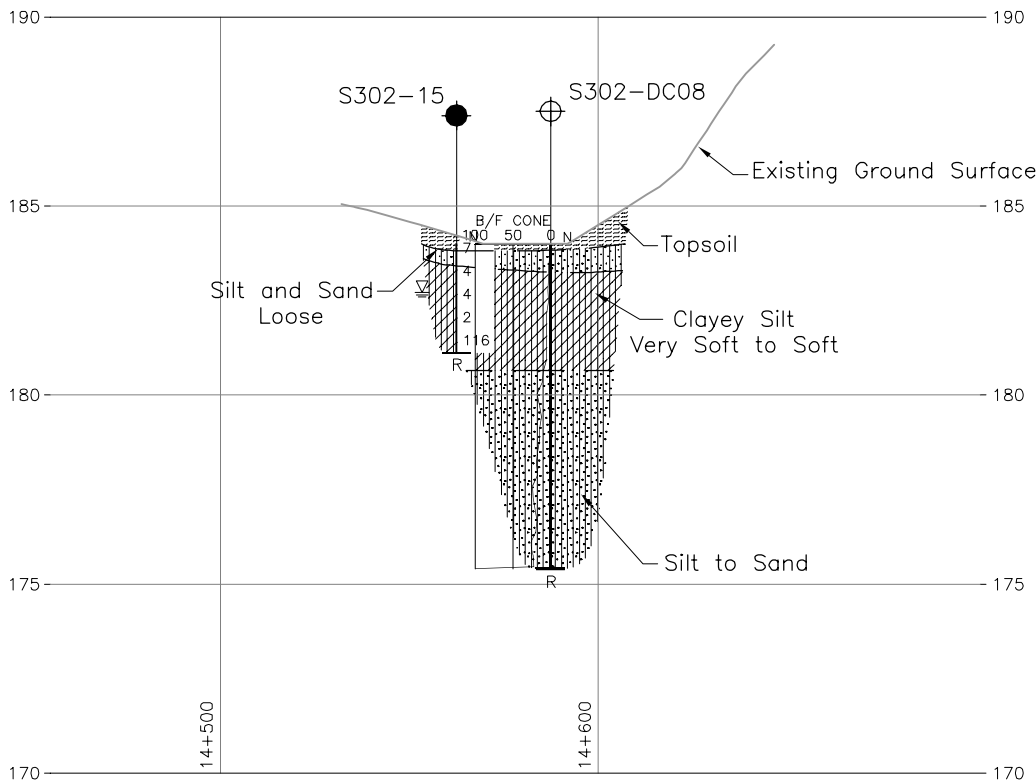
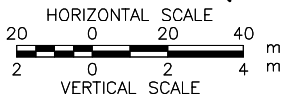
D-D'
B2

CENTERLINE PROFILE HIGHWAY 69 (NBL)



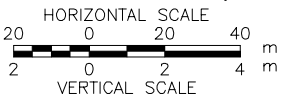
E-E'
B2

EMBANKMENT TOE PROFILE HIGHWAY 69 (NBL)



F-F'
B2

EMBANKMENT TOE PROFILE HIGHWAY 69 (NBL)



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

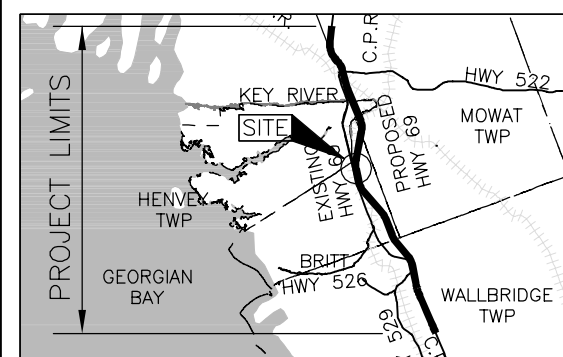
CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 14+550 TO 14+600 (NBL)
SOIL STRATA

SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN
SCALE
5 0 5 10 km

LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling
- R Refusal

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S302-14 | 184.3 | 5076942.8 | 223485.4 |
| S302-15 | 184.0 | 5076961.9 | 223488.1 |
| S302-16 | 184.0 | 5076961.5 | 223468.8 |
| S302-17 | 183.9 | 5076961.7 | 223450.2 |
| S302-18 | 184.7 | 5076980.2 | 223452.4 |
| S302-DC07 | 183.9 | 5076943.3 | 223467.1 |
| S302-DC08 | 184.0 | 5076981.4 | 223472.6 |

NOTES

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

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

REFERENCE

Base plans provided in digital format by URS, drawing file nos. Original Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Proposed Grade obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.



| NO. | DATE | BY | REVISION |
|---------------------|----------|--------------------------|----------|
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | DIST. |
| SUBM'D. CC | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | CHKD. CN | APPD. JPD/JMAC | DWG. B2 |

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

| PROJECT | | RECORD OF BOREHOLE | | No S302-02 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|-------------------|--|--------------------|---------|--------------------------|------------|--|-----------------|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076861.1 ; E 223525.0 | | ORIGINATED BY | | ARM | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| DATUM | | Geodetic | | DATE | | October 20, 2011 | | CHECKED BY | | | | | | |
| | | | | | | | | CN/TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 183.2 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| 182.0 | CLAYEY SILT, trace to some sand, containing rootlets Firm to stiff Brown Moist becoming wet below a depth of 0.6 m | | 1 | SS | 4 | | | | | | | | | 0 9 68 23 |
| 1.2 | SILTY CLAY, trace sand Firm Grey Wet | | 2 | SS | 8 | | | | | | | | | |
| | | | 3 | SS | 2 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 4 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 5 | TO | PM | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 177.4 | SILT, trace to some sand, trace clay Loose Grey Wet | | 6A | SS | 6 | | | | | | | | | 0 76 22 2 |
| 176.8 | Silty SAND, trace clay Loose to very dense Grey Wet | | 6B | | | | | | | | | | | |
| 6.4 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 175.3 | Gravel encountered below a depth of 7.6 m | | 7 | SS | 105/0.13 | | | | | | | | | |
| 7.9 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 182.6 m) upon completion of drilling. | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S302-03 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|-------------------|--|--------------------|---------|--------------------------|------------|--|-----------------|---|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5076861.6 ; E 223506.8 | | ORIGINATED BY | | ARM | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | | | | | | |
| DATUM | | Geodetic | | DATE | | October 20, 2011 | | CHECKED BY | | | | | | | |
| | | | | | | | | CN/TZ | | | | | | | |
| 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 | | | | | | | |
| 183.1 | GROUND SURFACE | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1 | SS | 6 | | | | | | | | | | |
| | CLAYEY SILT, trace to some sand, containing rootlets and sand seams Firm Brown Moist | | 2 | SS | 7 | | | | | | | | | | |
| 181.9 | | | | | | | | | | | | | | | |
| 1.2 | SILTY CLAY to CLAY, trace sand Soft to firm Grey Wet | | 3 | SS | 5 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 4 | TO | PM | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 5 | SS | 2 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 177.3 | | | | | | | | | | | | | | | |
| 5.8 | SILT and SAND Very loose Grey Wet | | 6 | SS | 3 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 176.3 | | | | | | | | | | | | | | | |
| 6.8 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 181.9 m) upon completion of drilling. | | | | | | | | | | | | | | |

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

| PROJECT | | RECORD OF BOREHOLE | | No S302-04 | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|-------------------|--|--------------------|---------|--|------------|-------------------------|-----------------|--|--|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076861.3 ; E 223487.5 | | ORIGINATED BY | | ARM | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | MAS | | | | | | | | |
| DATUM Geodetic | | DATE | | October 23, 2011 | | CHECKED BY | | CN/TZ | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| 182.8 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | |
| 0.2 | SILT and SAND, trace clay | | 1 | SS | 4 | | | | | | | | | | | |
| 182.2 | Loose Brown Moist | | 2 | SS | 3 | | | | | | | | | | | |
| 0.6 | CLAYEY SILT, trace sand | | | | | | | | | | | | | | | |
| 181.6 | Soft Brown Moist | | 3 | SS | 2 | | | | | | | | | | | |
| 1.2 | CLAYEY SILT, trace sand | | | | | | | | | | | | | | | |
| | Soft to firm Grey Wet | | | | | | | | | | | | | | | |
| | | | 4 | SS | 2 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 5 | SS | WH | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 176.7 | SILT, some sand, some clay | | 6 | SS | 14 | | | | | | | | | | | |
| 6.1 | Compact Grey Wet | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 175.6 | Silty SAND, trace gravel | | | | | | | | | | | | | | | |
| 7.2 | Compact Grey Wet | | 7 | SS | 26 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 174.5 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | | |
| 8.3 | NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 181.6 m) upon completion of drilling. | | | | | | | | | | | | | | | |

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

| PROJECT | | RECORD OF BOREHOLE | | No S302-05 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | COMPILED BY | | CHECKED BY | | DATUM | | DATE | |
| 09-1111-6014 | | N 5076880.4 ; E 223490.2 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | |
| Geodetic | | October 23, 2011 | | CN/TZ | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|---------|------|------------|-------------------------|-----------------|--|----|---|----|-----|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | |
| 183.3 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| 0.1 | CLAYEY SILT, trace to some sand, containing rootlets and sand seams | | 1 | SS | 5 | | | | | | | | | |
| | Firm | | 2 | SS | 5 | | | | | | | | | |
| 182.1 | Brown Moist | | | | | | | | | | | | | |
| 1.2 | SILTY CLAY, trace sand | | 3 | SS | 3 | | | | | | | | | |
| | Soft to firm | | | | | | | | | | | | | |
| | Grey Wet | | | | | | | | | | | | | |
| | | | 4 | TO | PM | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 178.9 | SILT, some sand, trace to some clay, trace gravel | | | | | | | | | | | | | |
| 4.4 | Compact | | 5 | SS | 20 | | | | | | | | | |
| | Grey Wet | | | | | | | | | | | | | |
| 177.6 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | |
| 5.7 | NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 182.1 m) upon completion of drilling. | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S302-06 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | DATE | | COMPILED BY | | DATUM | | CHECKED BY | |
| 09-1111-6014 | | N 5076897.8 ; E 223491.8 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | |
| Geodetic | | October 23, 2011 | | MAS | | | | CN/TZ | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 184.1 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1 | SS | 4 | | | | | | | | | | | | |
| | CLAYEY SILT, trace clay, containing rootlets to 0.6 m depth, silt seams below a depth of 1.2 m Firm Brown to grey Moist becoming wet below a depth of 1.1 m | | 2 | SS | 7 | | | | | | | | | | | | |
| | | | 3 | SS | 7 | | | | | | | | | | | | |
| 182.3 | SILT, trace sand, trace clay Compact Grey Wet | | 4 | SS | 12 | | | | | | | | | | | | |
| 181.7 | Gravelly SAND, some silt Dense Grey Wet | | 5 | SS | 114/0.20 | | | | | | | | | | | | |
| 181.3 | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | | | | |
| 2.8 | NOTE: 1. Water level in open borehole at a depth of 1.1 m below ground surface (Elev. 183.0 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S302-07 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|--|-----------------------------------|--------------------|---------|--|------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5076899.1 ; E 223473.7 | | ORIGINATED BY | | ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | MAS | | | | | | |
| DATUM Geodetic | | DATE | | October 24, 2011 | | CHECKED BY | | CN/TZ | | | | | | |
| 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 | | | | | | |
| 183.5 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| 0.2 | SILT and SAND, trace clay | | 1 | SS | 5 | | | | | | | | | |
| 182.9 | Loose Brown | | | | | | | | | | | | | |
| 0.6 | Moist | | 2A | SS | 21 | | | | | | | | | |
| 182.5 | SILTY CLAY, some sand | | 2B | | | | | | | | | | | |
| | Firm Grey Wet | | | | | | | | | | | | | |
| 1.3 | SAND, trace to some silt | | | | | | | | | | | | | |
| | Compact Grey Wet | | | | | | | | | | | | | |
| | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 182.9 m) upon completion of drilling. | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S302-08 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|-------------|--|------------------|--|------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATE | | CHECKED BY | |
| 09-1111-6014 | | N 5076899.2 ; E 223454.9 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | | MAS | | October 24, 2011 | | CN/TZ | |
| Geodetic | | | | | | | | | | | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|-----|----|---|----|--|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | |
| 183.0 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | SILT and SAND, containing clayey silt seams and rootlets | | 1 | SS | 4 | | | | | | | | | | | | |
| 182.4 | Loose Brown Moist | | 2 | SS | 10 | | | | | | | | | | | | |
| 0.6 | CLAYEY SILT, trace sand | | | | | | | | | | | | | | | | |
| 181.8 | Stiff brown Moist | | 3 | SS | 107/0.20 | | | | | | | | | | | | |
| 181.4 | Sandy SILT, trace to some clay | | | | | | | | | | | | | | | | |
| 1.6 | Compact Grey Wet | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 1.3 m below ground surface (Elev. 181.7 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S302-09 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|--|---|--------------------|---------|--------------------------|------------|--|--------------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5076917.9 ; E 223457.2 | | ORIGINATED BY | | ARM | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| DATUM | | Geodetic | | DATE | | October 25, 2011 | | CHECKED BY | | | | | | |
| | | | | | | | | CN/TZ | | | | | | |
| 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 | | | | | | |
| 183.4 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| 0.2 | Silty SAND, trace clay | | 1 | SS | 3 | | | | | | | | | |
| 182.8 | Very loose | | | | | | | | | | | | | |
| 0.6 | Brown | | | | | | | | | | | | | |
| | Moist | | | | | | | | | | | | | |
| 182.2 | CLAYEY SILT, trace sand | | 2 | SS | 5 | | | | | | | | | |
| | Firm | | | | | | | | | | | | | |
| 1.2 | brown | | | | | | | | | | | | | |
| | Moist | | | | | | | | | | | | | |
| | CLAY, trace sand, trace silt | | | | | | | | | | | | | |
| | Soft to firm | | | | | | | | | | | | | |
| | Grey | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | |
| 180.3 | Sandy SILT, trace to some clay | | | | | | | | | | | | | |
| 3.1 | Compact to very dense | | 4 | SS | 16 | | | | | | | | | |
| | Grey | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | |
| 179.4 | | | 5 | SS | 145/0.20 | | | | | | | | | |
| 4.0 | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.3 m below ground surface (Elev. 182.1 m) upon completion of drilling. | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE No S302-10 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--|--|--|---------|-------------------|------------|--|-----------------|--|--|---|--|---------------------------------------|--|-------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5076935.7 ; E 223458.4 | | ORIGINATED BY ARM | | | | | | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE Portable Equipment, NW Casing, Wash Boring | | COMPILED BY MAS | | | | | | | | | | | |
| DATUM Geodetic | | DATE October 25, 2011 | | CHECKED BY CN/TZ | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | UNIT WEIGHT | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | γ | | GR SA SI CL | |
| 184.3 | GROUND SURFACE | | | | | | | 20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | W _p — W — W _L 20 40 60 | | kN/m ³ | | | |
| 0.0 | TOPSOIL | | 1 | SS | 5 | | 184 | | | | | | | | |
| | CLAYEY SILT, trace sand, containing rootlets and sand seams Firm to stiff Brown Moist becoming wet below a depth of 1.2 m | | 2 | SS | 8 | | 183 | | | | | | | | |
| | | | 3 | SS | 7 | | | | | | | | | | |
| 182.5 | SILT CLAY, trace sand Firm Grey Wet | | 4 | SS | 3 | | 182 | | | | | | | | |
| 1.8 | | | | | | | | | | | | | | | |
| | | | 5 | SS | 2 | | 181 | | | | | | | | |
| 180.6 | SILT, trace to some sand, trace to some clay Loose Grey Wet | | 6 | SS | 4 | | 180 | | | | | | | | |
| 3.7 | | | | | | | | | | | | | | | |
| 180.0 | SANDY SILT, trace clay Dense Grey Wet | | 7 | SS | 119/0.10 | | | | | | | | | | |
| 4.3 | | | | | | | | | | | | | | | |
| 179.3 | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | | |
| 5.0 | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 183.1 m) upon completion of drilling. | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S302-11 | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|-------------------|---|--------------------|---------|--|------------|-------------------------|-----------------|--|--|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 5404-05-01 | | LOCATION | | N 5076936.6 ; E 223440.6 | | ORIGINATED BY | | ARM | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | MAS | | | | | | | | |
| DATUM Geodetic | | DATE | | October 26, 2011 | | CHECKED BY | | CN/TZ | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| 183.3 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | SILT and SAND, trace clay, trace organics | | 1 | SS | 4 | | | | | | | | | | | |
| 182.7 | Loose Brown Moist | | 2 | SS | 5 | | | | | | | | | | | |
| 0.6 | CLAYEY SILT with sand, trace organics, containing sand seams | | 3 | SS | 5 | | | | | | | | | | | |
| 182.1 | Firm Brown grey Moist | | | | | | | | | | | | | | | |
| 1.2 | CLAYEY SILT, trace sand, containing silt seams | | | | | | | | | | | | | | | |
| | Soft to firm Grey Wet | | 4 | SS | 3 | | | | | | | | | | | |
| | | | 5 | SS | 2 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 6 | SS | WH | | | | | | | | | | | |
| 176.0 | | | | | | | | | | | | | | | | |
| 7.3 | SILT and SAND, trace clay | | 7 | SS | 11 | | | | | | | | | | | |
| | Compact Grey Wet | | | | | | | | | | | | | | | |
| 174.6 | | | | | | | | | | | | | | | | |
| 8.7 | SAND, trace silt, trace gravel | | 8 | SS | 77 | | | | | | | | | | | |
| | Compact to very dense Grey Wet | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 9 | SS | 22 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 10 | SS | 28 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 169.9 | | | | | | | | | | | | | | | | |
| 13.4 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | | |
| | NOTE: | | | | | | | | | | | | | | | |
| | 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 182.1 m) upon completion of drilling. | | | | | | | | | | | | | | | |

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

| PROJECT | | RECORD OF BOREHOLE | | No S302-12 | | SHEET 1 OF 2 | | METRIC | |
|------------------|--|--------------------------|--|---------------|--|--------------|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | DATE | | COMPILED BY | | DATUM | | CHECKED BY | |
| 09-1111-6014 | | N 5076935.5 ; E 223420.3 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | |
| November 2, 2011 | | November 2, 2011 | | MAS | | Geodetic | | CN/TZ | |

| 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 | | W _p | W | W _L | | |
| 182.6 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace to some sand, trace organics, containing sandy silt seams Soft to firm Brown Moist | | 1 | SS | 5 | | | | | | | | | |
| 181.4 | CLAYEY SILT, some sand Soft to firm Grey to brown Wet | | 2 | SS | 2 | | | | | | | | | |
| 1.2 | Silt seam from depths of 2.1m to 2.2m | | 3 | SS | 4 | | | | | | | | | |
| | | | 4 | SS | 5 | | | | | | | | | |
| | | | 5 | SS | WH | | | | | | | | | |
| 178.1 | SILT, some sand, trace to some clay Very loose to loose Grey Wet | | 6 | SS | WH | | | | | | | | | |
| 4.5 | | | 7 | SS | 5 | | | | | | | | | |
| 176.6 | CLAY, trace sand Firm Grey Wet | | 8 | SS | 3 | | | | | | | | | |
| 6.0 | | | 9 | SS | 1 | | | | | | | | | |
| | | | 10 | TO | PH | | | | | | | | | |
| 173.5 | SILT, trace to some sand, trace clay Loose Grey Wet | | 11 | SS | 6 | | | | | | | | | |
| 9.1 | | | | | | | | | | | | | | |
| 172.4 | Silty SAND Loose Grey Wet | | 12 | SS | 4 | | | | | | | | | |
| 10.2 | | | | | | | | | | | | | | |
| 170.9 | SAND, trace to some silt, trace gravel, trace clay Compact Grey Wet | | 13 | SS | 10 | | | | | | | | | |
| 11.7 | | | | | | | | | | | | | | |
| 168.7 | END OF BOREHOLE Dynamic Cone Penetration Test (DCPT) END OF DCPT Refusal to Further Penetration (53 blows/0.05 m) | | 14 | SS | 63/0.20 | | | | | | | | | |
| 14.0 | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

Continued Next Page

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



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



GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT | | 09-1111-6014 | | RECORD OF BOREHOLE No S302-12A | | | | SHEET 1 OF 1 | | METRIC | | | | | | |
|---------------|--|--------------|---------|--------------------------------|------------|--|-----------------|--|--|--------|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. | | 5404-05-01 | | LOCATION | | N 5076918.1 ; E 223419.6 | | ORIGINATED BY | | ARM | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | MAS | | | | | | |
| DATUM | | Geodetic | | DATE | | November 6, 2011 | | CHECKED BY | | CN/TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| 182.5 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | |
| 181.9 | CLAYEY SILT, trace sand, trace organics Firm Brown Moist | | 1 | SS | 4 | ▽ | 182 | | | | | | | | | |
| 0.6 | SILT, trace sand, trace clay, trace organics Very loose Grey Wet | | 2 | SS | 3 | | 181 | | | | | | | | | |
| 180.7 | CLAYEY SILT, trace sand Firm Grey Wet | | 3 | SS | 3 | | 180 | | | | | | | | | |
| 1.8 | SILTY CLAY, trace sand Firm Grey Wet | | 4 | SS | 6 | | 179 | | | | | | | | | |
| 180.1 | | | | | | | 178 | | | | | | | | | |
| 2.4 | | | | | | 177 | | | | | | | | | | |
| | | | | | | 176 | | | | | | | | | | |
| 175.5 | END OF BOREHOLE | | 5 | SS | 3 | | | | | | | | | | | |
| 7.0 | NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 181.9 m) upon completion of drilling. | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S302-13 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|-------------------|--|--------------------|---------|--|------------|-------------------------|-----------------|--|----------|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5076955.4 ; E 223424.1 | | ORIGINATED BY | | ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | MAS | | | | | | |
| DATUM Geodetic | | DATE | | October 27, 2011 | | CHECKED BY | | CN/TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 183.0 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | |
| 0.0 | TOPSOIL | | 1 | SS | 3 | | | | | | | | | |
| 182.4 | SILT and SAND, trace clay, trace organics Very loose Brown Moist | | 2 | SS | 4 | | | | | | | | | |
| 0.6 | CLAYEY SILT, trace to some sand, containing sand seams Soft to stiff Brown Moist becoming wet below a depth of 1.1 m | | 3 | SS | 2 | | | | | | | | | |
| | | | 4 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 178.5 | Sandy SILT, trace clay Loose Grey Wet | | 5 | SS | 4 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 177.4 | SILTY CLAY, trace sand Soft to firm Grey Wet | | 6 | SS | 3 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 175.4 | SILT, trace sand, trace clay Compact Grey Wet | | 7 | SS | 16 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 174.3 | Silty SAND, trace gravel Very dense Grey Wet | | 8 | SS | 82 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 173.2 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | |
| 9.8 | NOTE: 1. Water level in open borehole at a depth of 1.1 m below ground surface (Elev. 181.9 m) upon completion of drilling. | | | | | | | | | | | | | |

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

| PROJECT | | RECORD OF BOREHOLE | | No S302-14 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | DATE | | CHECKED BY | | COMPILED BY | | MAS | |
| 09-1111-6014 | | N 5076942.8 ; E 223485.4 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | |
| Geodetic | | November 7, 2011 | | CN/TZ | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|---|---------|------|------------|---|-----------------|--|----|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 184.3 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | | |
| 0.2 | SILTY CLAY, trace sand, trace organics Firm to stiff Brown Moist |  | 1 | SS | 4 |  | 184 | | | | | | | | | | 0 2 55 43 |
| | | | 2 | SS | 6 | | 183 | | | | | | | | | | |
| | | | 3 | SS | 8 | | | | | | | | | | | | |
| 182.5 | Sandy SILT, trace clay Compact Brown Wet | 4 | SS | 11 | 182 | | | | | | | | | | | | |
| 181.8 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | | | |
| 2.5 | NOTE: 1. Water level in open borehole at a depth of 1.8 m below ground surface (Elev. 182.5 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S302-15 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|--|---|--------------------|---------|----------------------------------|------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5076961.9 ; E 223488.1 | | ORIGINATED BY | | ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | 65 mm O.D. Solid Stem Hand Auger | | COMPILED BY | | MAS | | | | | | |
| DATUM Geodetic | | DATE | | November 7, 2011 | | CHECKED BY | | CN/TZ | | | | | | |
| 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 | | | | | | |
| 184.0 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| 0.2 | SILT and SAND, trace clay, trace organics | | 1 | SS | 7 | | | | | | | | | |
| 183.4 | Loose Brown Moist | | 2 | SS | 4 | | | | | | | | | |
| 0.6 | CLAYEY SILT, trace sand, trace organics | | 3 | SS | 4 | | | | | | | | | |
| 182.2 | Soft Brown Moist | | 4 | SS | 2 | | | | | | | | | |
| 1.8 | CLAYEY SILT, some sand, trace gravel, containing silt seams | | 5 | SS | 116 | | | | | | | | | |
| 181.1 | Very soft Grey Wet | | | | | | | | | | | | | |
| 2.9 | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.3 m below ground surface (Elev. 182.7 m) upon completion of drilling. | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S302-16 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | DATE | | COMPILED BY | | CHECKED BY | | | |
| 09-1111-6014 | | N 5076961.5 ; E 223468.8 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | |
| Geodetic | | November 8, 2011 | | MAS | | CN/TZ | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|---------|------|------------|-------------------------|-----------------|--|----|---|----|-----|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | |
| 184.0 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1 | SS | 6 | | | | | | | | | |
| 183.4 | SILT and SAND, trace organics | | 2 | SS | 5 | | | | | | | | | |
| 0.6 | Loose Brown Moist | | 3 | SS | 3 | | | | | | | | | |
| 182.2 | CLAYEY SILT, some sand, trace organics | | 4 | SS | 4 | | | | | | | | | |
| 1.8 | Soft to firm Grey Wet | | 5 | SS | WH | | | | | | | | | |
| 179.1 | SILT and SAND, trace clay | | 6 | SS | 10 | | | | | | | | | |
| 4.9 | Compact Grey Wet | | 7 | SS | 110/0.25 | | | | | | | | | |
| 177.5 | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | |
| 6.5 | NOTE: 1. Water level in open borehole at a depth of 0.7 m below ground surface (Elev. 183.3 m) upon completion of drilling. | | | | | | | | | | | | | |

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 1/29/14

| PROJECT | | RECORD OF BOREHOLE | | No S302-18 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | COMPILED BY | | CHECKED BY | | DATUM | | DATE | |
| 09-1111-6014 | | N 5076980.2 ; E 223452.4 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | |
| Geodetic | | November 17, 2011 | | CN/TZ | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--|---|------------|---------|------|------------|-------------------------|-----------------|--|----|----|-----|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 184.7 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | G | | | | | | | | | | | | | | | | |
| 0.2 | SILT and SAND, trace organics | | 1 | SS | 4 | | | | | | | | | | | | |
| 184.1 | Loose Brown Moist | | 2 | SS | 8 | | | | | | | | | | | | |
| 0.6 | CLAYEY SILT, some sand, trace organics | | 3 | SS | 6 | | | | | | | | | | | | |
| 182.9 | Firm to stiff Brown Moist becoming wet below a depth of 1.2 m | | 4 | SS | 2 | | | | | | | | | | | | |
| 1.8 | SILTY CLAY, trace sand | | 5 | SS | 2 | | | | | | | | | | | | |
| 180.4 | Soft Brown to grey Wet | | 6 | SS | 7 | | | | | | | | | | | | |
| 4.3 | SAND, some silt, trace gravel and clay | | | | | | | | | | | | | | | | |
| 179.1 | Loose Grey Wet | | | | | | | | | | | | | | | | |
| 5.6 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 183.5 m) upon completion of drilling. | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S302-DC01 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5076842.5 ; E 223504.0</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>October 20, 2011</u> | | CHECKED BY <u>CN/TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--------------------------------------|------------|---------|------|------------|----------------------------|-----------------------------------|---|-------------------|--|---|----------------|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | WATER CONTENT (%) | | | | | |
| | | | | | | | ● QUICK TRIAXIAL × REMOULDED | | | | | | | |
| 182.8 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14



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

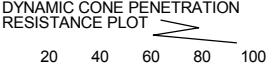
GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

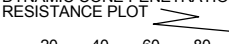
| PROJECT | | RECORD OF DCPT No S302-DC03 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|-------------------|---|---|--------|-------------------|----------------------------|-----------------|--|--------------------|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 09-1111-6014 | | LOCATION N 5076880.4 ; E 223471.4 | | ORIGINATED BY ARM | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | | | | |
| DATUM Geodetic | | DATE October 21, 2011 | | CHECKED BY CN/TZ | | | | | | | | | |
| 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 | | | | | |
| 182.8 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | <div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE </div> <div style="display: flex; justify-content: space-between;"> ● QUICK TRIAXIAL × REMOULDED </div> | | | | | | |
| 173.9 8.9 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.10 m) | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S302-DC04 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|----------------------|---|---|--------|------|-------------------------|-------------------|--|--------------------|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|
| W.P. 5404-05-01 | | LOCATION N 5076916.9 ; E 223475.0 | | | | ORIGINATED BY ARM | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | | | COMPILED BY MAS | | | | | | | | | | | |
| DATUM Geodetic | | DATE October 23, 2011 | | | | CHECKED BY CN/TZ | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) |
| 183.9 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | |
| 182.0 | | | | | | | | | | | | | | | | | |
| 1.9 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.07 m) | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF DCPT No S302-DC05 | | SHEET 1 OF 1 | | METRIC | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|---|---|---------------------------------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5076917.9 ; E 223438.3 | | ORIGINATED BY ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | |
| DATUM Geodetic | | DATE October 24, 2011 | | CHECKED BY CN/TZ | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 183.1 | GROUND SURFACE | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| 176.3 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.07 m) | | | | | | | | | |
| 6.8 | | | | | | | | | | |

| PROJECT | | RECORD OF DCPT No S302-DC07 | | SHEET 1 OF 1 | | METRIC | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|---|---|---------------------------------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5076943.3 ; E 223467.1 | | ORIGINATED BY ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | |
| DATUM Geodetic | | DATE November 17, 2011 | | CHECKED BY CN/TZ | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 183.9 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| 179.2 4.7 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.07 m) | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

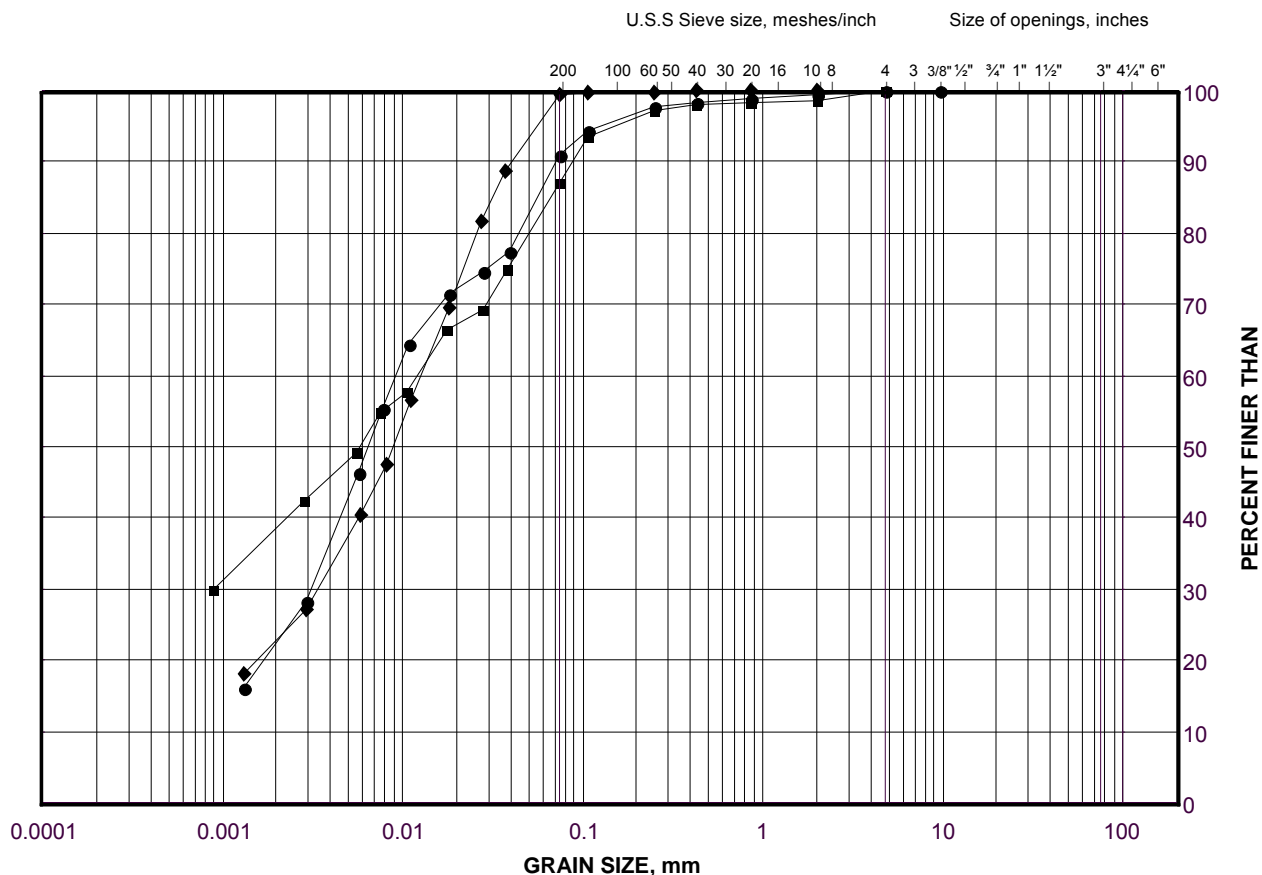
| PROJECT | | RECORD OF DCPT No S302-DC08 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|--|--------------------|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION N 5076981.4 ; E 223472.6 | | ORIGINATED BY ARM | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | | | | |
| DATUM Geodetic | | DATE November 17, 2011 | | CHECKED BY CN/TZ | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | |
| 184.0 | GROUND SURFACE | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | <div style="display: flex; justify-content: space-between;"> <div> ○ UNCONFINED ● QUICK TRIAXIAL </div> <div> + FIELD VANE × REMOULDED </div> </div> | | | | | | |
| | | | | | | | 183 | | | | | | |
| | | | | | | | 182 | | | | | | |
| | | | | | | | 181 | | | | | | |
| | | | | | | | 180 | | | | | | |
| | | | | | | | 179 | | | | | | |
| | | | | | | | 178 | | | | | | |
| | | | | | | | 177 | | | | | | |
| | | | | | | | 176 | | | | | | |
| 175.4 | END OF DCPT | | | | | | | | | | | | |
| 8.6 | Refusal to Further Penetration (105 Blows / 0.05 m) | | | | | | | | | | | | |

GRAIN SIZE DISTRIBUTION

Clayey Silt to Silty Clay

Highway 69 (SBL) STA 14+430 to 14+600 (Swamp 302)

FIGURE B.S302-01



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

LEGEND

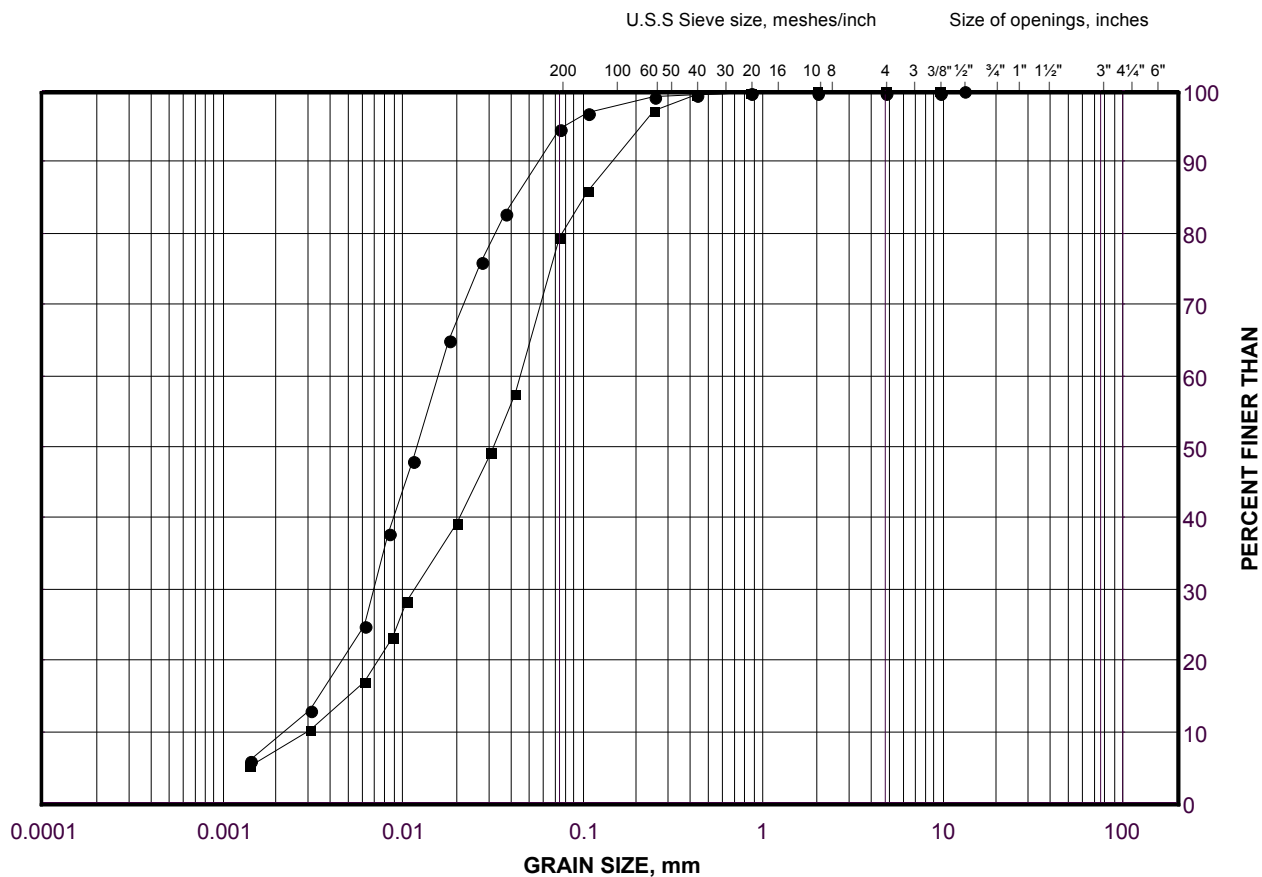
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S302-02 | 2 | 182.3 |
| ■ | S302-07 | 2A | 182.7 |
| ◆ | S302-10 | 3 | 182.8 |

GRAIN SIZE DISTRIBUTION

Silt (Layers)

Highway 69 (SBL) STA 14+430 to 14+600 (Swamp 302)

FIGURE B.S302-02



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

LEGEND

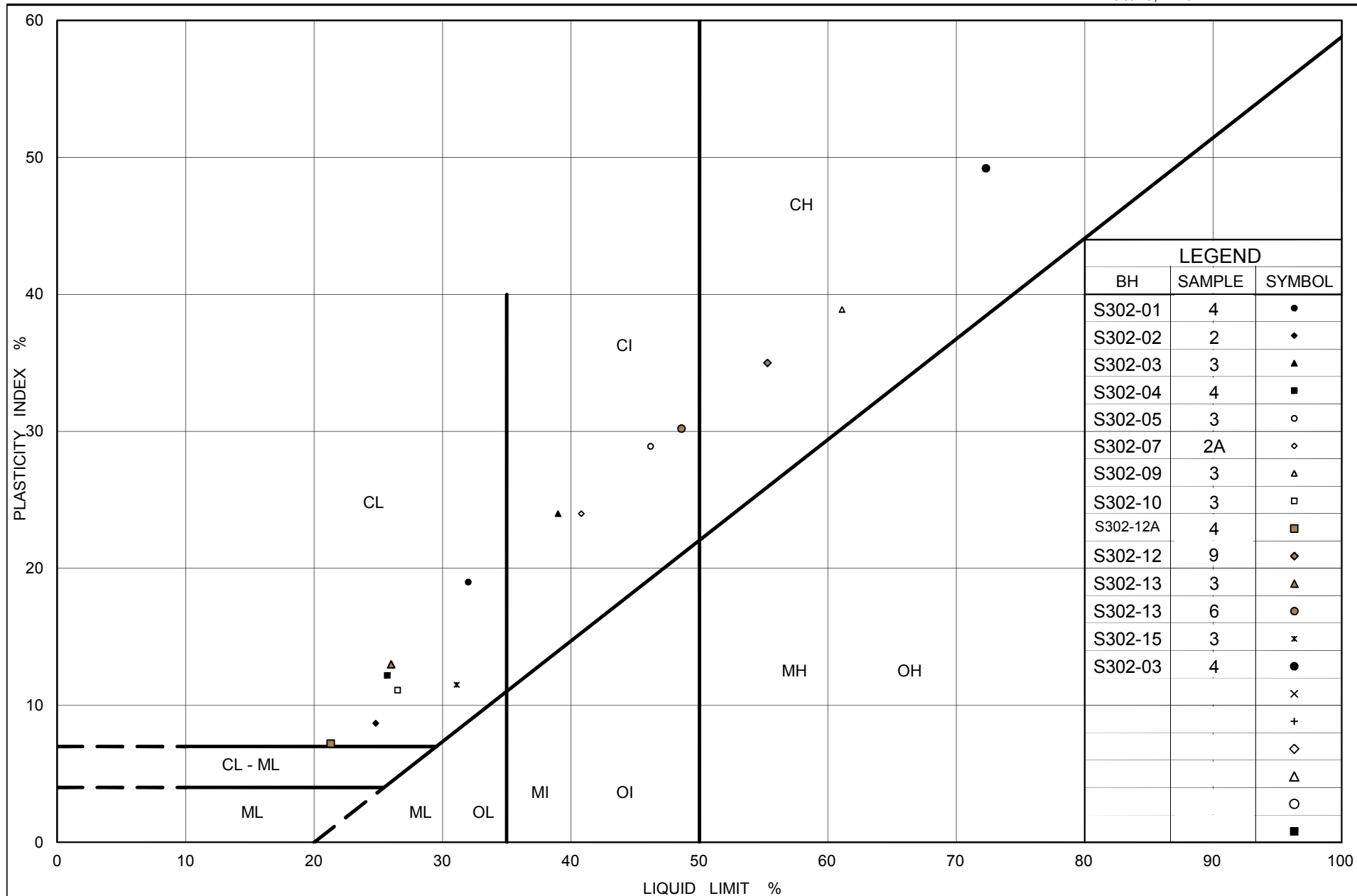
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S302-06 | 3 | 182.6 |
| ■ | S302-12 | 4 | 180.5 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 06-Nov-12



Ministry of
Transportation

Ontario

PLASTICITY CHART

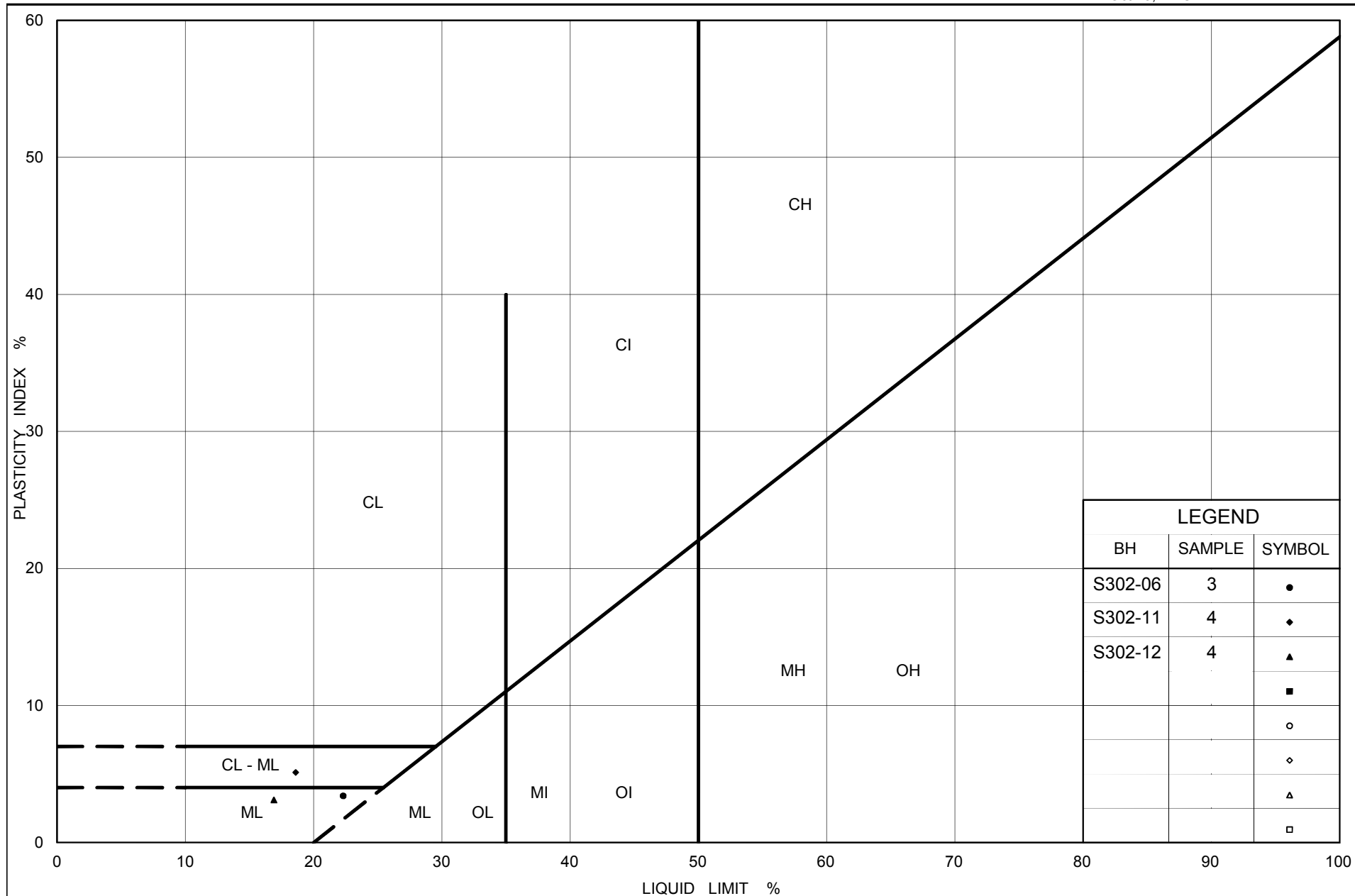
Clayey Silt to Clay

Highway 69 (SBL) STA 14+430 to 14+600 (Swamp 302)

Figure No. B.S302-03

Project No. 09-1111-6014

Checked By: TZ



Ministry of Transportation

Ontario

PLASTICITY CHART

Silt (Layers)

Highway 69 (SBL) STA 14+430 to 14+600 (Swamp 302)

Figure No. B.S302-04

Project No. 09-1111-6014

Checked By: TZ

CONSOLIDATION TEST SUMMARY
Highway 69 (SBL) STA 14+430 to 14+600 (Swamp 302)

FIGURE B.S302-05
Sheet 1 of 4

SAMPLE IDENTIFICATION

| | | | |
|-----------------|--------------|-----------------|---------|
| Project Number | 09-1111-6014 | Sample Number | 4 |
| Borehole Number | S302-03 | Sample Depth, m | 3.0-3.5 |

TEST CONDITIONS

| | | | |
|------------------|-----------|-------------------|----|
| Test Type | Standard | Load Duration, hr | 24 |
| Oedometer Number | 7 | | |
| Date Started | 9/14/2012 | | |
| Date Completed | 10/1/2012 | | |

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

| | | | |
|-------------------------|-------|------------------------------------|-------|
| Sample Height, cm | 1.89 | Unit Weight, kN/m ³ | 15.14 |
| Sample Diameter, cm | 6.33 | Dry Unit Weight, kN/m ³ | 8.25 |
| Area, cm ² | 31.48 | Specific Gravity, measured | 2.77 |
| Volume, cm ³ | 59.59 | Solids Height, cm | 0.575 |
| Water Content, % | 83.50 | Volume of Solids, cm ³ | 18.10 |
| Wet Mass, g | 91.99 | Volume of Voids, cm ³ | 41.49 |
| Dry Mass, g | 50.13 | Degree of Saturation, % | 100.9 |

TEST COMPUTATIONS

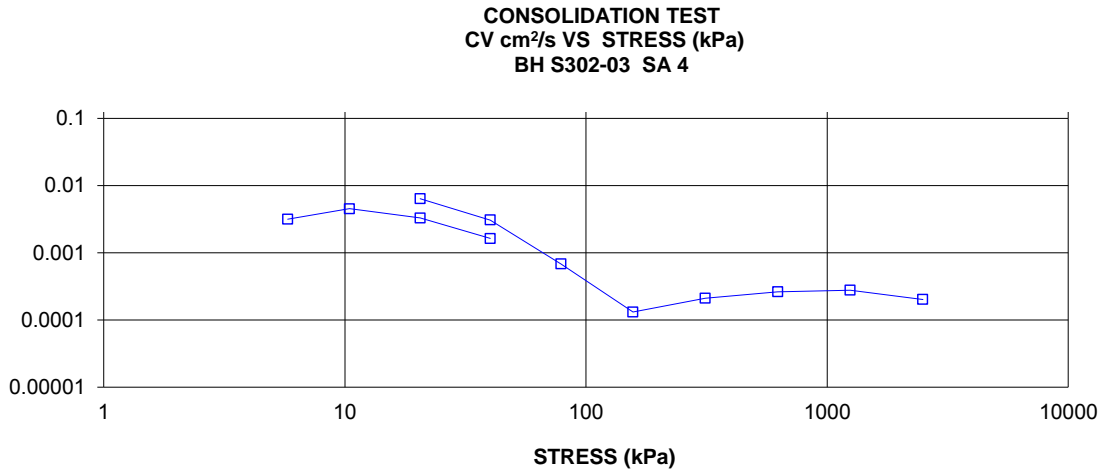
| Stress kPa | Corr. Height cm | Void Ratio | Average Height cm | t ₉₀ sec | cv. cm ² /s | mv m ² /kN | k cm/s |
|---------------|-----------------------|---------------|-------------------------|------------------------|---------------------------|--------------------------|-----------|
| 0.00 | 1.893 | 2.293 | 1.893 | | | | |
| 5.79 | 1.889 | 2.286 | 1.891 | 240 | 3.16E-03 | 3.65E-04 | 1.13E-07 |
| 10.45 | 1.889 | 2.285 | 1.889 | 167 | 4.53E-03 | 5.67E-05 | 2.52E-08 |
| 20.54 | 1.880 | 2.271 | 1.884 | 228 | 3.30E-03 | 4.29E-04 | 1.39E-07 |
| 40.05 | 1.865 | 2.244 | 1.873 | 454 | 1.64E-03 | 4.14E-04 | 6.65E-08 |
| 10.45 | 1.877 | 2.265 | 1.871 | | | | |
| 20.54 | 1.871 | 2.255 | 1.874 | 116 | 6.42E-03 | 2.88E-04 | 1.81E-07 |
| 40.05 | 1.864 | 2.242 | 1.868 | 240 | 3.08E-03 | 1.98E-04 | 5.97E-08 |
| 78.79 | 1.829 | 2.182 | 1.847 | 1058 | 6.83E-04 | 4.73E-04 | 3.17E-08 |
| 156.45 | 1.600 | 1.783 | 1.715 | 4753 | 1.31E-04 | 1.56E-03 | 2.00E-08 |
| 312.42 | 1.338 | 1.327 | 1.469 | 2160 | 2.12E-04 | 8.89E-04 | 1.84E-08 |
| 623.46 | 1.179 | 1.050 | 1.258 | 1270 | 2.64E-04 | 2.70E-04 | 6.99E-09 |
| 1245.84 | 1.063 | 0.849 | 1.121 | 960 | 2.77E-04 | 9.81E-05 | 2.67E-09 |
| 2491.64 | 0.962 | 0.673 | 1.012 | 1070 | 2.03E-04 | 4.30E-05 | 8.55E-10 |
| 1245.84 | 0.975 | 0.695 | 0.968 | | | | |
| 312.42 | 1.025 | 0.783 | 1.000 | | | | |
| 78.79 | 1.084 | 0.885 | 1.055 | | | | |
| 20.54 | 1.150 | 1.000 | 1.117 | | | | |
| 5.79 | 1.190 | 1.070 | 1.170 | | | | |

Note:
k calculated using cv based on t₉₀ values.

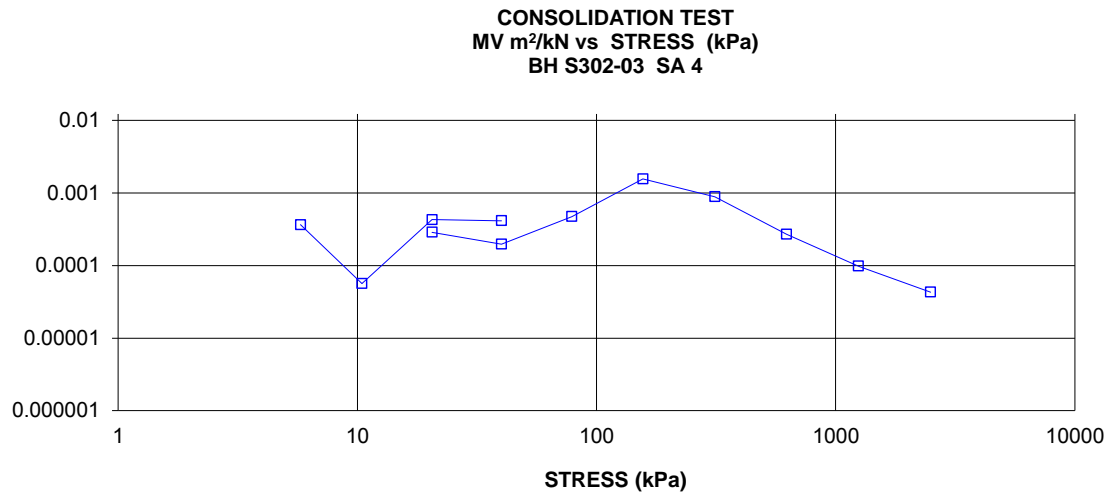
SAMPLE DIMENSIONS AND PROPERTIES - FINAL

| | | | |
|-------------------------|-------|------------------------------------|-------|
| Sample Height, cm | 1.19 | Unit Weight, kN/m ³ | 18.48 |
| Sample Diameter, cm | 6.33 | Dry Unit Weight, kN/m ³ | 13.12 |
| Area, cm ² | 31.48 | Specific Gravity, measured | 2.77 |
| Volume, cm ³ | 37.46 | Solids Height, cm | 0.575 |
| Water Content, % | 40.79 | Volume of Solids, cm ³ | 18.10 |
| Wet Mass, g | 70.58 | Volume of Voids, cm ³ | 19.36 |
| Dry Mass, g | 50.13 | | |

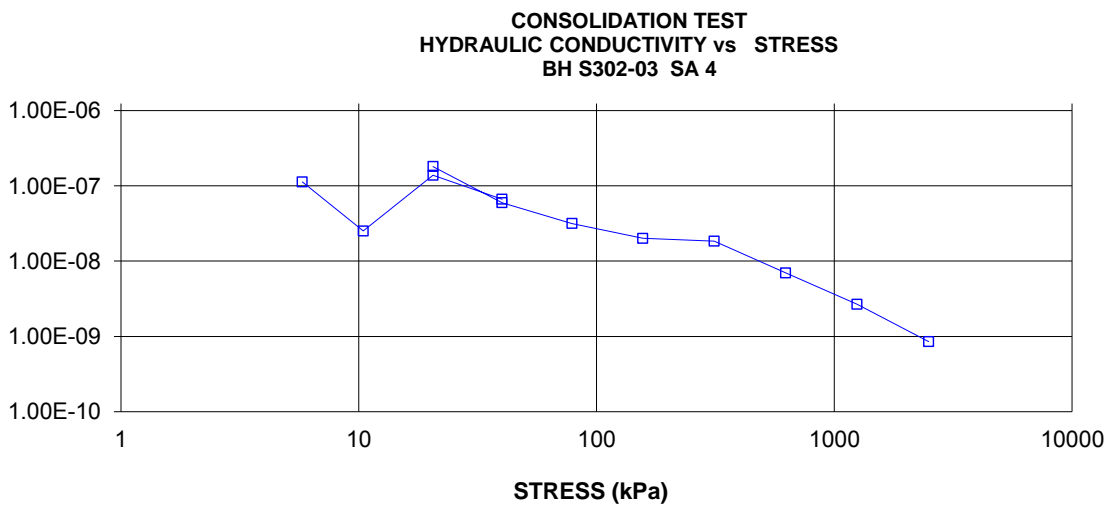
COEFFICIENT OF CONSOLIDATION,
cm²/s



VOLUME COMPRESSIBILITY, m²/kN



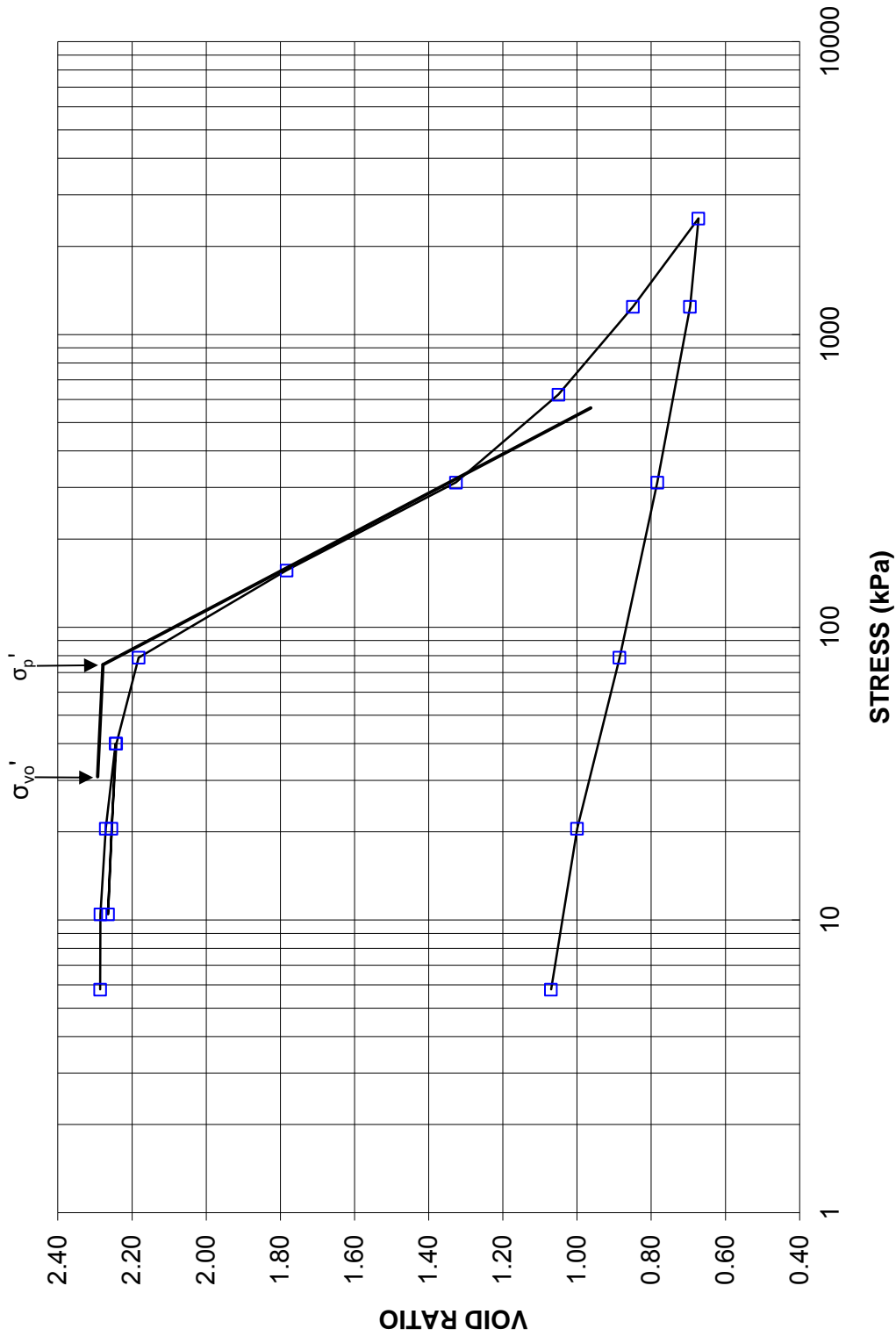
HYDRAULIC CONDUCTIVITY, cm/s



CONSOLIDATION TEST
VOID RATIO VS LOG STRESS

FIGURE B.S302-05
Sheet 3 of 4

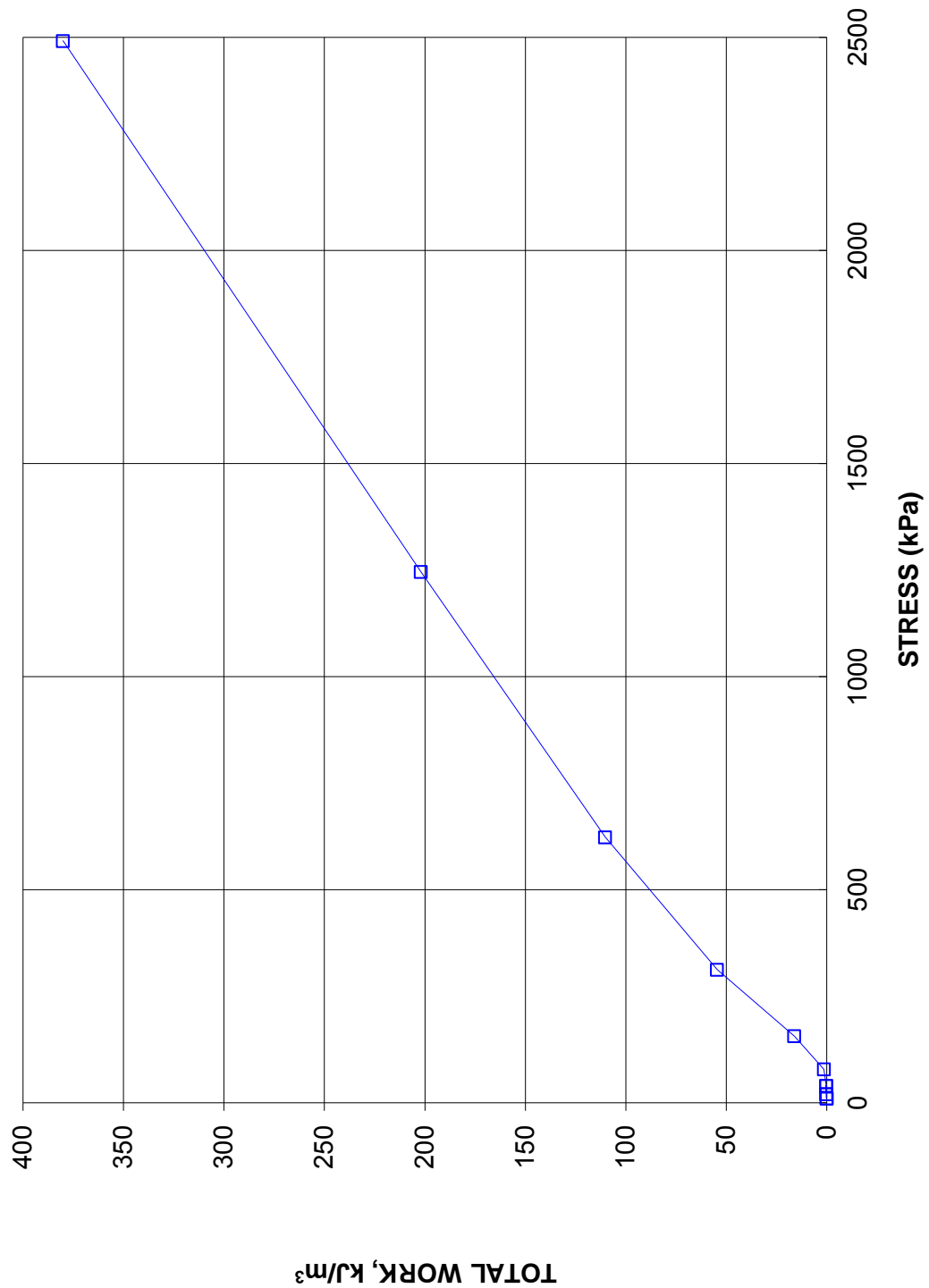
CONSOLIDATION TEST
VOID RATIO vs STRESS
BH S302-03 SA 4



**CONSOLIDATION TEST
TOTAL WORK VS STRESS**

FIGURE B.S302-05
Sheet 4 of 4

**CONSOLIDATION TEST
TOTAL WORK, kJ/m³ vs STRESS
BH S302-03 SA 4**

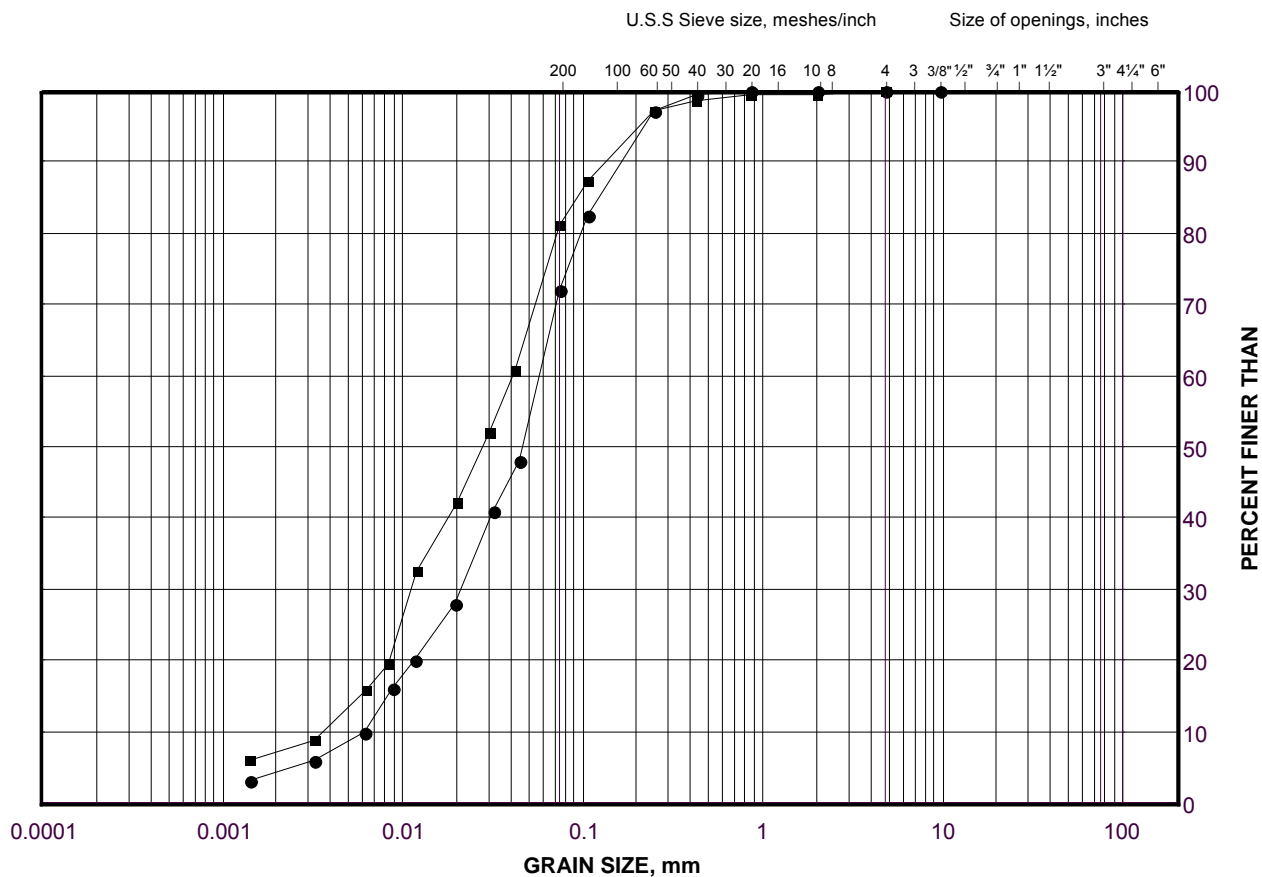


GRAIN SIZE DISTRIBUTION

Silt and Sandy Silt (Pockets)

Highway 69 (SBL) STA 14+430 to 14+600 (Swamp 302)

FIGURE B.S302-06



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

LEGEND

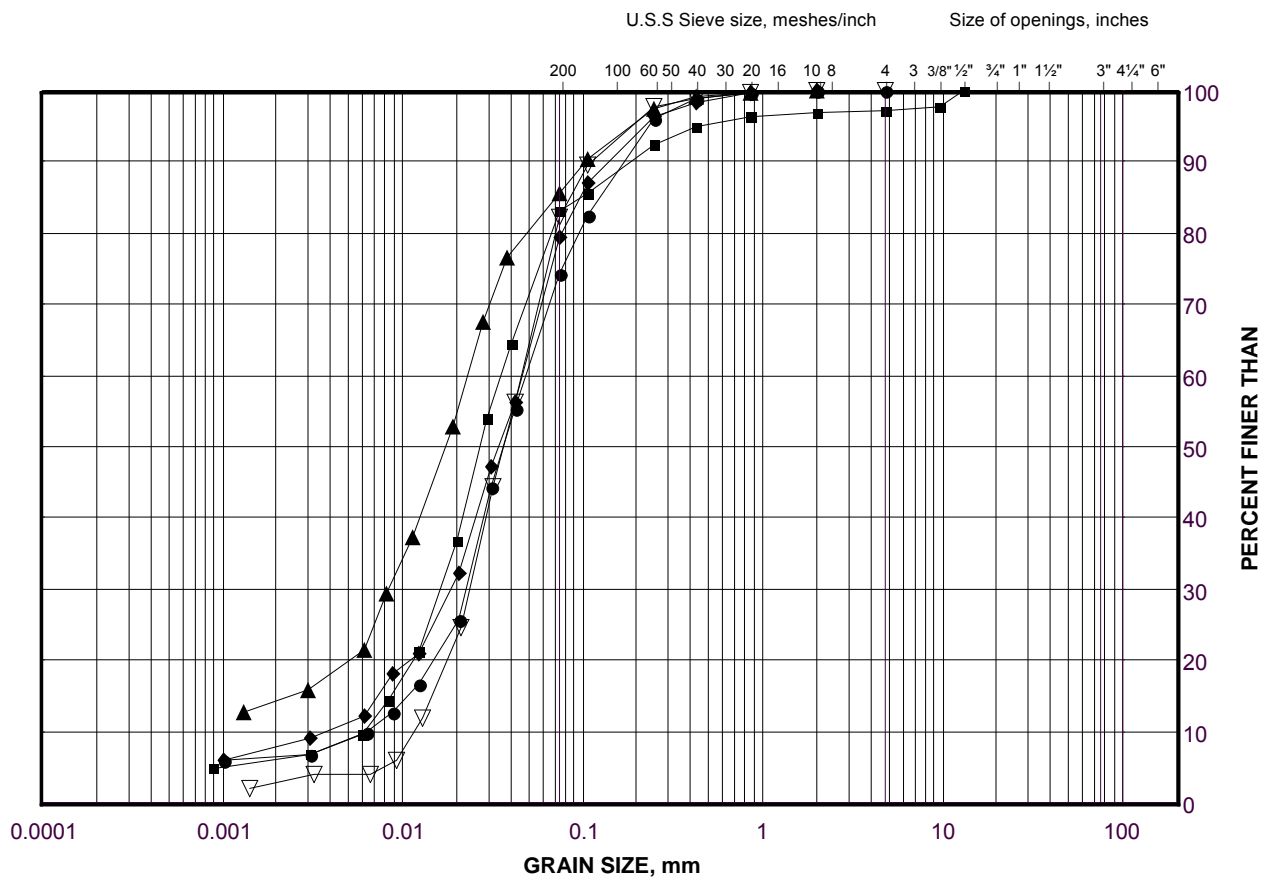
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S302-13 | 5 | 178.1 |
| ■ | S302-12 | 7 | 177.0 |

GRAIN SIZE DISTRIBUTION

Silt to Silty Sand

Highway 69 (SBL) STA 14+430 to 14+600 (Swamp 302)

FIGURE B.S302-07A



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S302-08 | 3 | 181.6 |
| ■ | S302-05 | 5 | 178.4 |
| ◆ | S302-09 | 5 | 179.5 |
| ▲ | S302-04 | 6 | 176.4 |
| ▽ | S302-01 | 7 | 175.1 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

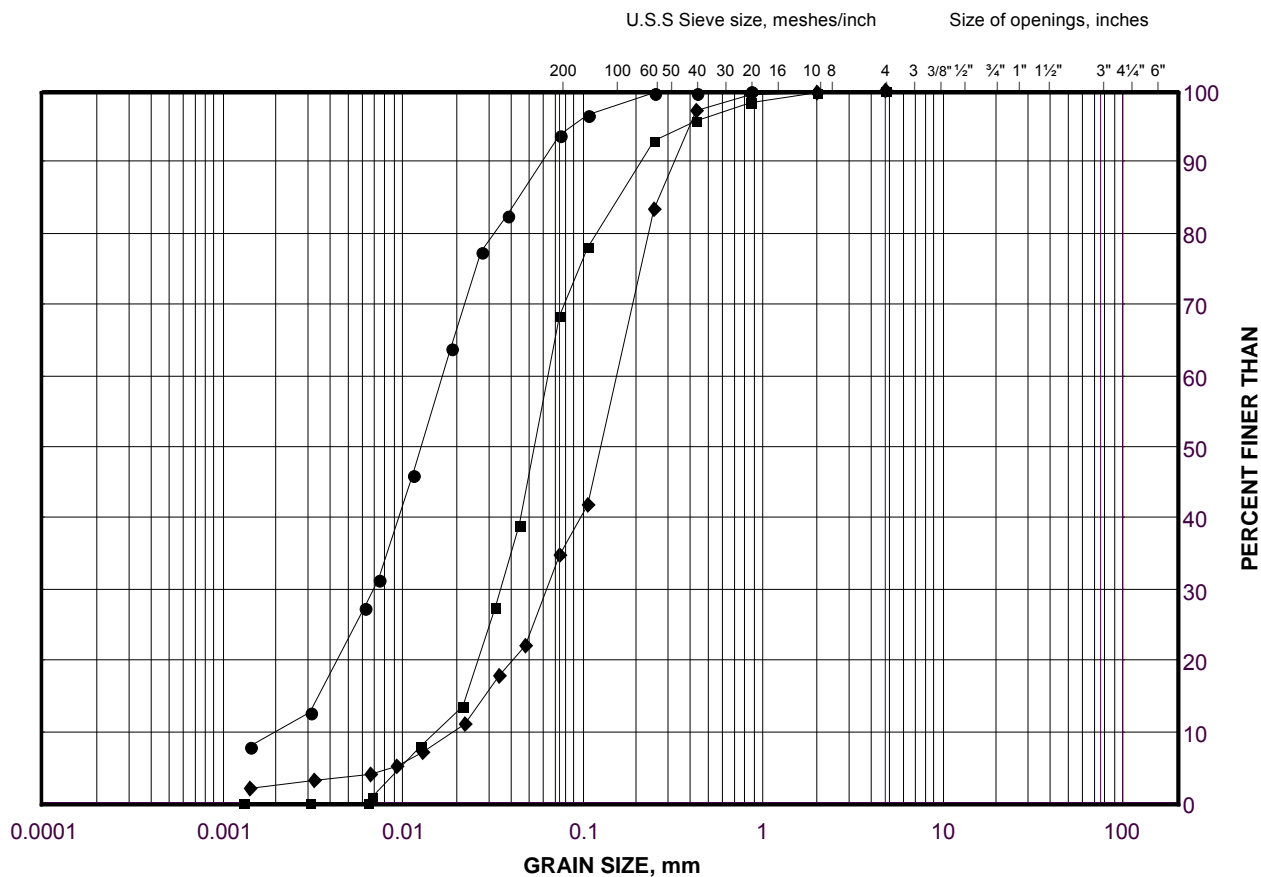
Date: 03-Apr-13

GRAIN SIZE DISTRIBUTION

Silt to Silty Sand

Highway 69 (SBL) STA 14+430 to 14+600 (Swamp 302)

FIGURE B.S302-07B



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S302-10 | 6 | 180.2 |
| ■ | S302-03 | 6 | 176.4 |
| ◆ | S302-11 | 7 | 175.4 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

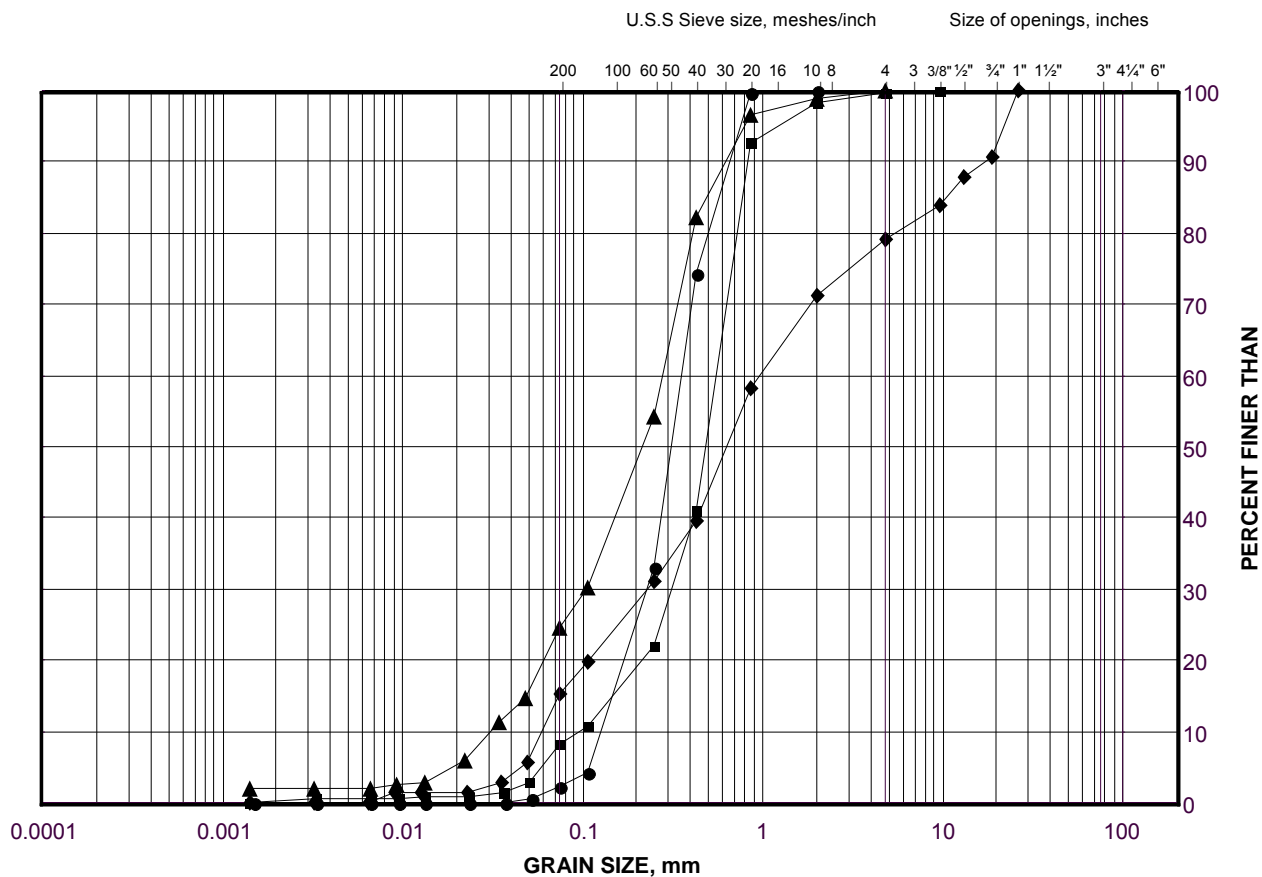
Date: 03-Apr-13

GRAIN SIZE DISTRIBUTION

Silty Sand to Gravelly Sand

Highway 69 (SBL) STA 14+430 to 14+600 (Swamp 302)

FIGURE B.S302-08



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S302-11 | 10 | 170.8 |
| ■ | S302-12 | 13 | 170.1 |
| ◆ | S302-06 | 5 | 181.4 |
| ▲ | S302-02 | 6B | 176.7 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

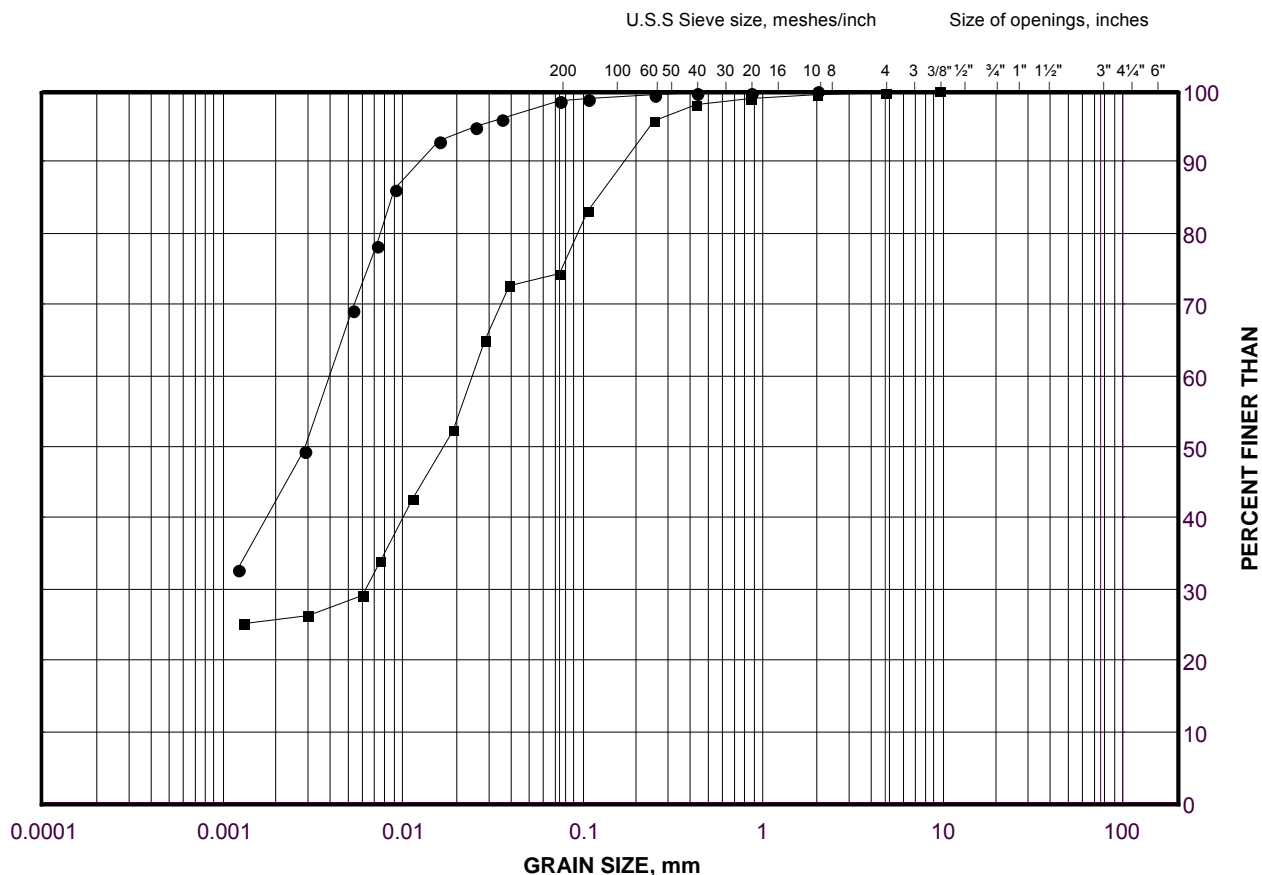
Date: 03-Apr-13

GRAIN SIZE DISTRIBUTION

Clayey Silt to Silty Clay

Highway 69 (NBL) STA 14+550 to 14+600 (Swamp 302)

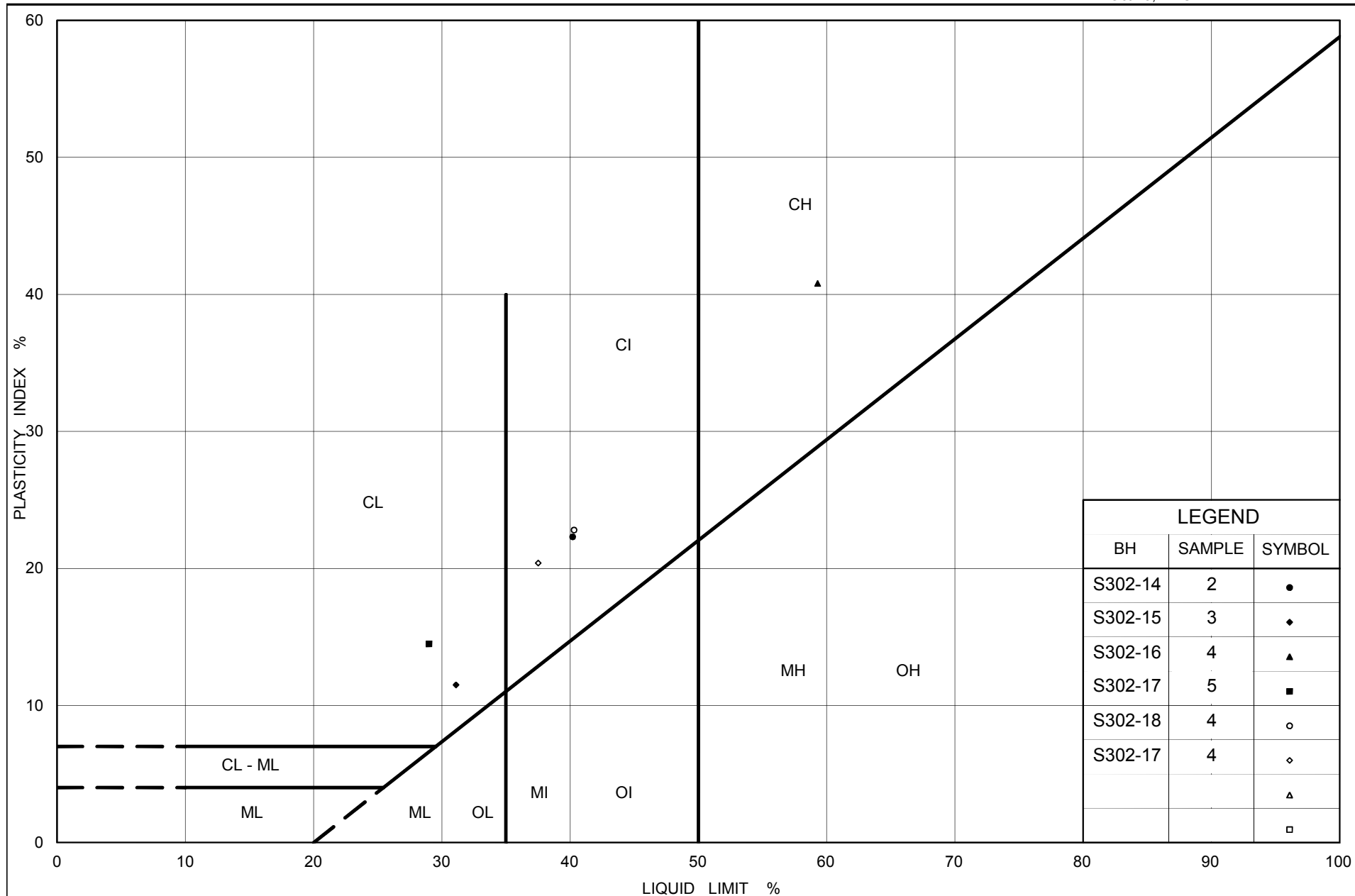
FIGURE B.S302-09



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | DEPTH(m) |
|--------|----------|--------|----------|
| ● | S302-14 | 2 | 183.4 |
| ■ | S302-15 | 5 | 181.4 |



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt to Clay

Highway 69 (NBL) STA 14+550 to 14+600 (Swamp 302)

Figure No. B.S302-10

Project No. 09-1111-6014

Checked By: TZ

CONSOLIDATION TEST SUMMARY
Highway 69 (NBL) STA 14+550 to 14+600 (Swamp 302)

FIGURE B.S302-11
Sheet 1 of 4

SAMPLE IDENTIFICATION

| | | | |
|-----------------|--------------|-----------------|---------|
| Project Number | 09-1111-6014 | Sample Number | 4 |
| Borehole Number | S302-17 | Sample Depth, m | 1.8-2.3 |

TEST CONDITIONS

| | | | |
|------------------|-----------|-------------------|----|
| Test Type | Standard | Load Duration, hr | 24 |
| Oedometer Number | 6 | | |
| Date Started | 9/14/2012 | | |
| Date Completed | 9/28/2012 | | |

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

| | | | |
|-------------------------|--------|------------------------------------|-------|
| Sample Height, cm | 1.90 | Unit Weight, kN/m ³ | 19.13 |
| Sample Diameter, cm | 6.34 | Dry Unit Weight, kN/m ³ | 14.53 |
| Area, cm ² | 31.55 | Specific Gravity, measured | 2.76 |
| Volume, cm ³ | 59.88 | Solids Height, cm | 1.019 |
| Water Content, % | 31.65 | Volume of Solids, cm ³ | 32.14 |
| Wet Mass, g | 116.80 | Volume of Voids, cm ³ | 27.74 |
| Dry Mass, g | 88.72 | Degree of Saturation, % | 101.2 |

TEST COMPUTATIONS

| Stress | Corr. Height | Void | Average Height | t ₉₀ | cv. | mv | k |
|---------|-----------------|-------|-------------------|-----------------|--------------------|--------------------|----------|
| kPa | cm | Ratio | cm | sec | cm ² /s | m ² /kN | cm/s |
| 0.00 | 1.898 | 0.863 | 1.898 | | | | |
| 5.80 | 1.890 | 0.855 | 1.894 | 375 | 2.03E-03 | 6.90E-04 | 1.37E-07 |
| 10.66 | 1.882 | 0.847 | 1.886 | 1307 | 5.77E-04 | 9.65E-04 | 5.46E-08 |
| 20.44 | 1.867 | 0.832 | 1.874 | 487 | 1.53E-03 | 7.87E-04 | 1.18E-07 |
| 10.66 | 1.873 | 0.838 | 1.870 | | | | |
| 20.44 | 1.866 | 0.831 | 1.869 | 163 | 4.54E-03 | 3.66E-04 | 1.63E-07 |
| 39.92 | 1.847 | 0.813 | 1.857 | 735 | 9.94E-04 | 5.08E-04 | 4.95E-08 |
| 78.77 | 1.816 | 0.782 | 1.831 | 778 | 9.14E-04 | 4.26E-04 | 3.81E-08 |
| 156.26 | 1.773 | 0.740 | 1.794 | 522 | 1.31E-03 | 2.92E-04 | 3.75E-08 |
| 310.37 | 1.721 | 0.689 | 1.747 | 437 | 1.48E-03 | 1.77E-04 | 2.57E-08 |
| 620.65 | 1.661 | 0.631 | 1.691 | 375 | 1.62E-03 | 1.01E-04 | 1.60E-08 |
| 1244.15 | 1.594 | 0.564 | 1.628 | 304 | 1.85E-03 | 5.71E-05 | 1.03E-08 |
| 2485.88 | 1.521 | 0.493 | 1.557 | 252 | 2.04E-03 | 3.10E-05 | 6.19E-09 |
| 1244.15 | 1.532 | 0.503 | 1.526 | | | | |
| 310.37 | 1.557 | 0.528 | 1.544 | | | | |
| 78.77 | 1.587 | 0.557 | 1.572 | | | | |
| 20.44 | 1.622 | 0.592 | 1.604 | | | | |
| 5.80 | 1.644 | 0.614 | 1.633 | | | | |

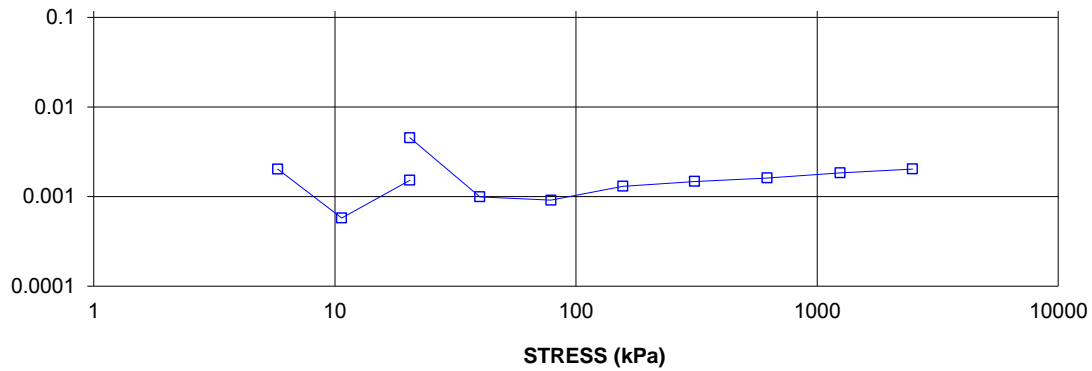
Note:
k calculated using cv based on t₉₀ values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

| | | | |
|-------------------------|--------|------------------------------------|-------|
| Sample Height, cm | 1.64 | Unit Weight, kN/m ³ | 20.90 |
| Sample Diameter, cm | 6.34 | Dry Unit Weight, kN/m ³ | 16.77 |
| Area, cm ² | 31.55 | Specific Gravity, measured | 2.76 |
| Volume, cm ³ | 51.87 | Solids Height, cm | 1.019 |
| Water Content, % | 24.61 | Volume of Solids, cm ³ | 32.14 |
| Wet Mass, g | 110.55 | Volume of Voids, cm ³ | 19.72 |
| Dry Mass, g | 88.72 | | |

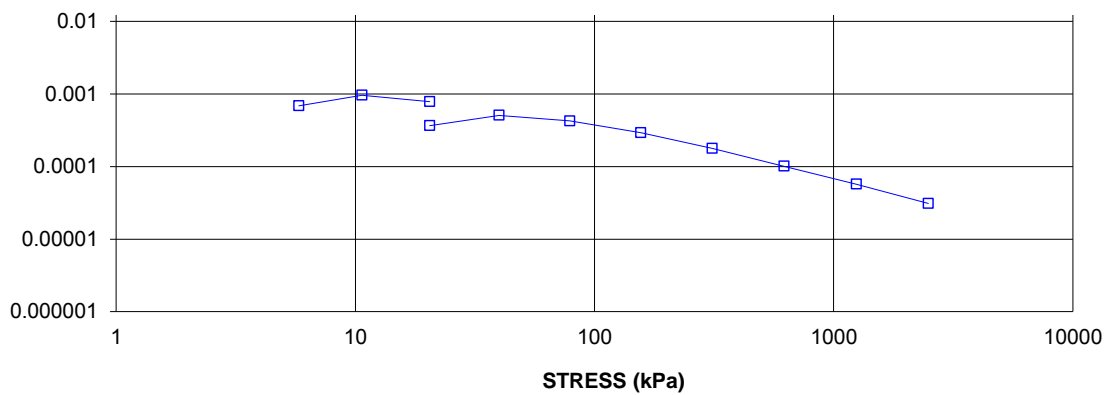
COEFFICIENT OF CONSOLIDATION,
 cm^2/s

CONSOLIDATION TEST
 CV cm^2/s VS STRESS (kPa)
 BH S302-17 SA 4



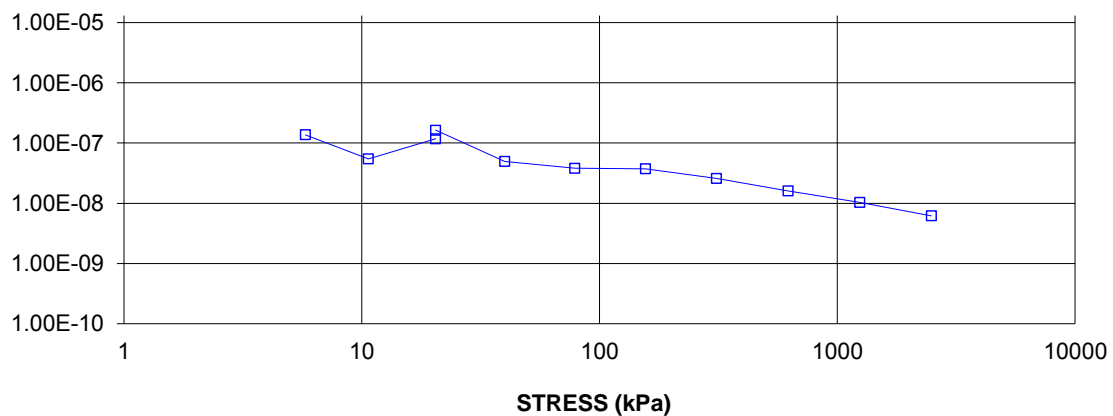
VOLUME COMPRESSIBILITY, m^2/kN

CONSOLIDATION TEST
 MV m^2/kN vs STRESS (kPa)
 BH S302-17 SA 4



HYDRAULIC CONDUCTIVITY, cm/s

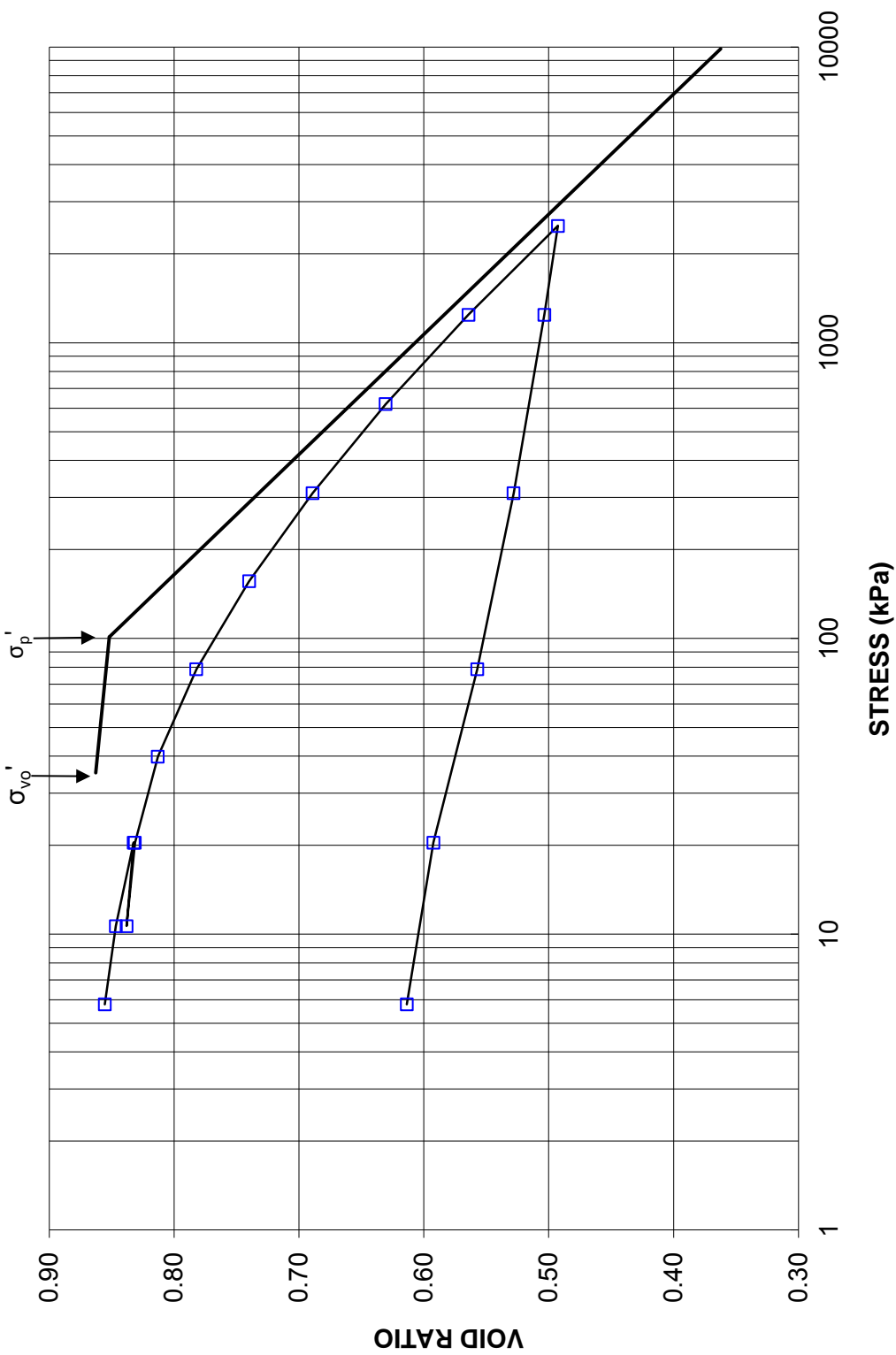
CONSOLIDATION TEST
 HYDRAULIC CONDUCTIVITY vs STRESS
 BH S302-17 SA 4



CONSOLIDATION TEST
VOID RATIO VS LOG STRESS

FIGURE B.S302-11
Sheet 3 of 4

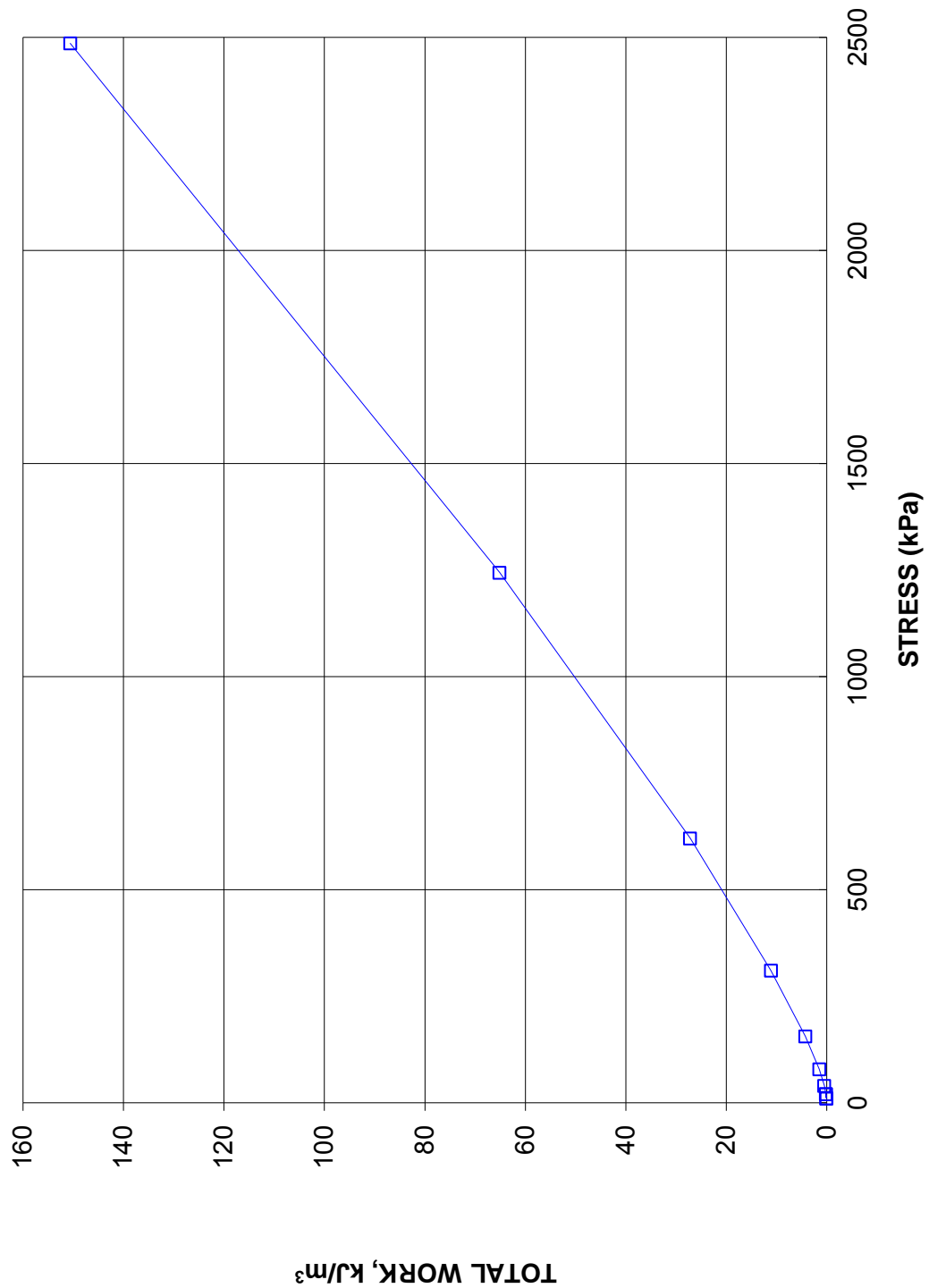
CONSOLIDATION TEST
VOID RATIO vs STRESS
BH S302-17 SA 4



**CONSOLIDATION TEST
TOTAL WORK VS STRESS**

FIGURE B.S302-11
Sheet 4 of 4

**CONSOLIDATION TEST
TOTAL WORK, kJ/m³ vs STRESS
BH S302-17 SA 4**

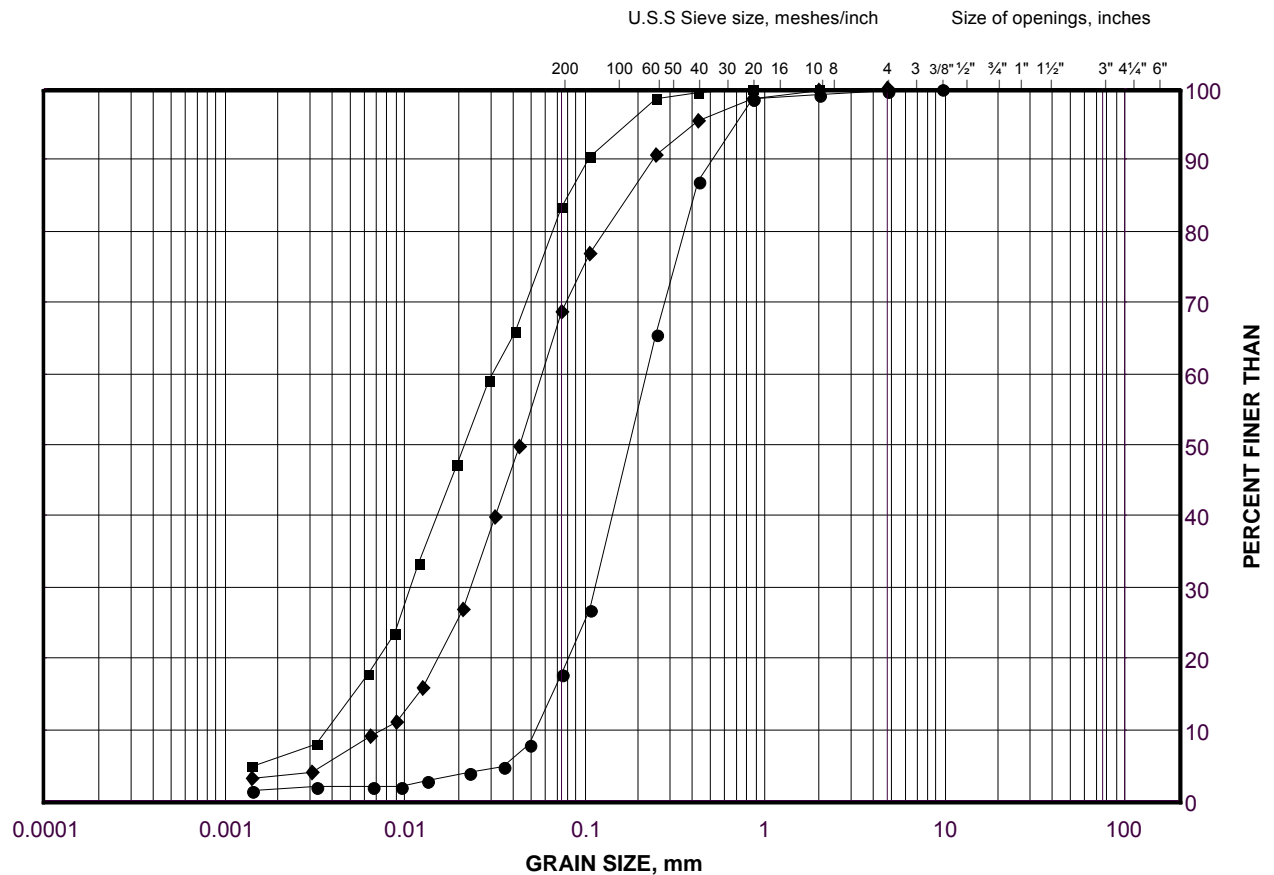


GRAIN SIZE DISTRIBUTION

Silt to Sand

Highway 69 (NBL) STA 14+550 to 14+600 (Swamp 302)

FIGURE B.S302-12



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S302-18 | 6 | 179.8 |
| ■ | S302-17 | 6 | 179.0 |
| ◆ | S302-16 | 6 | 178.8 |

Project Number: 09-1111-6014

Checked By: TZ

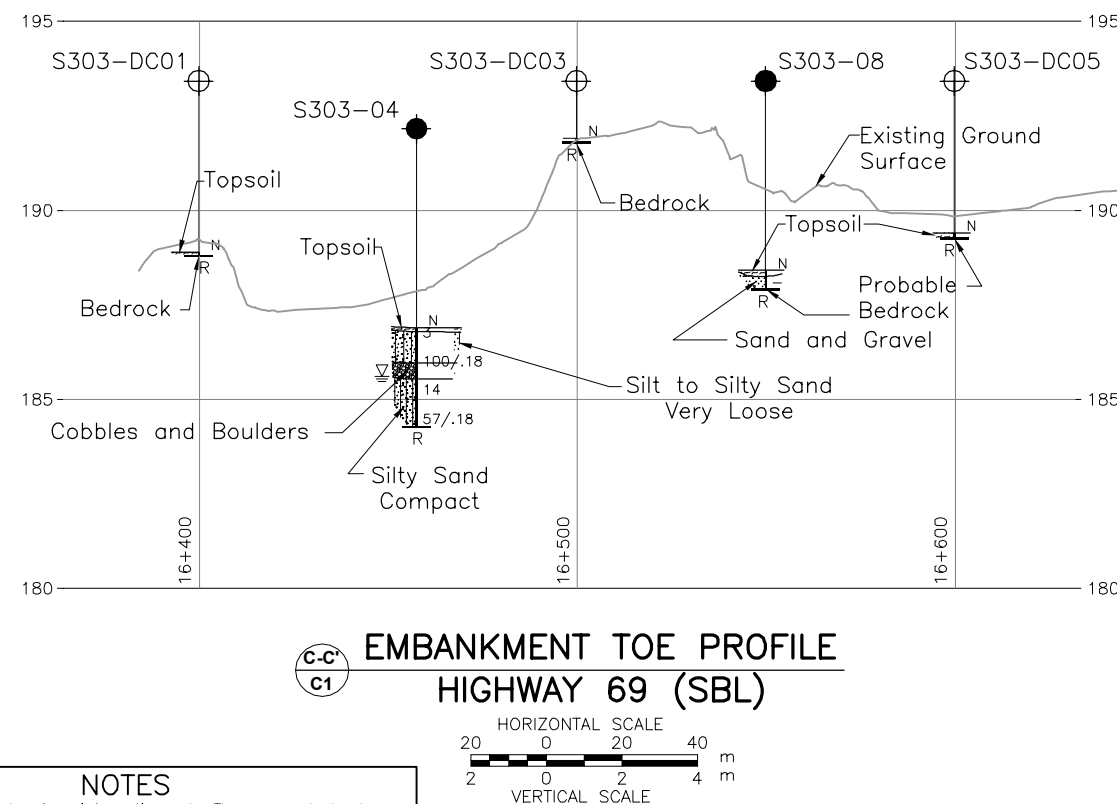
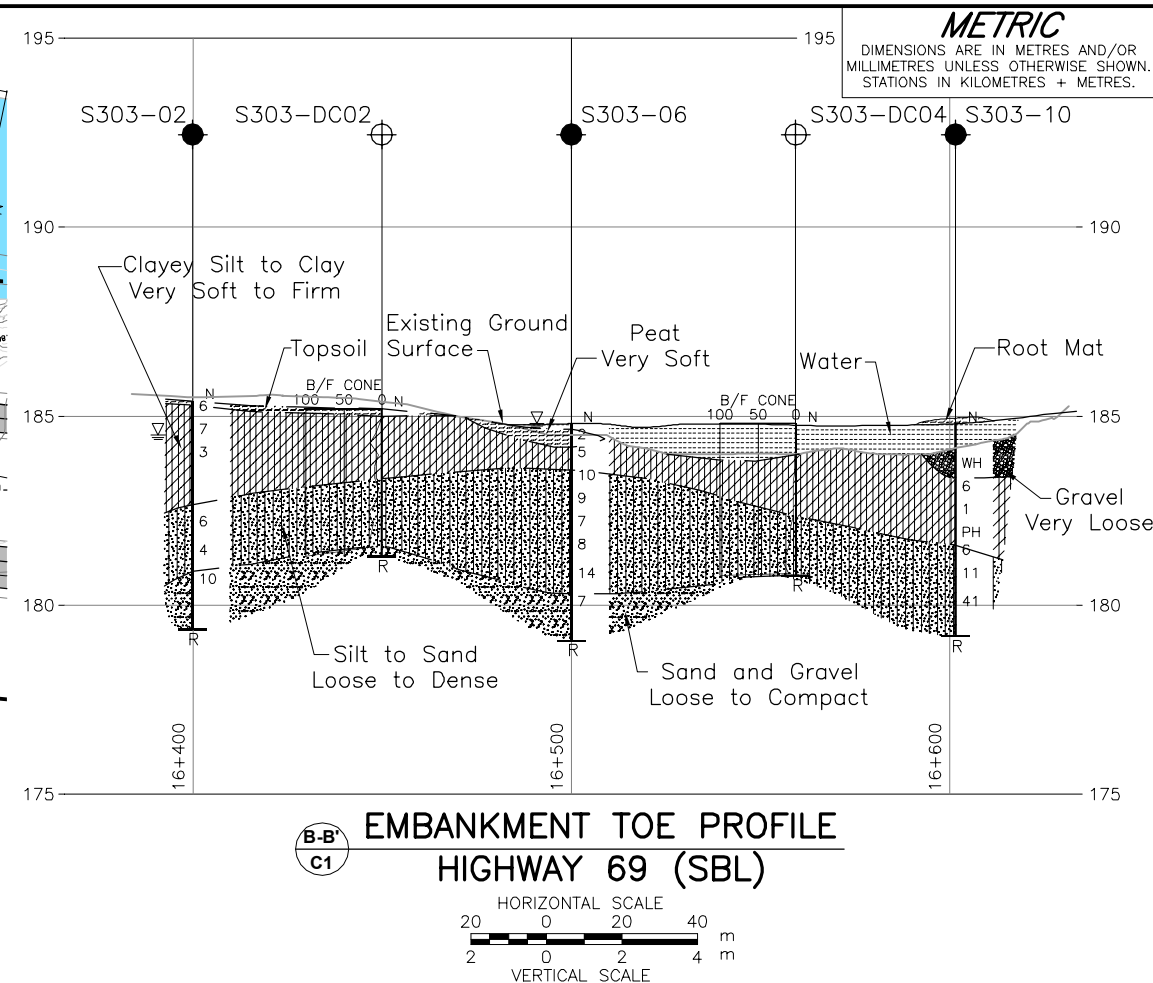
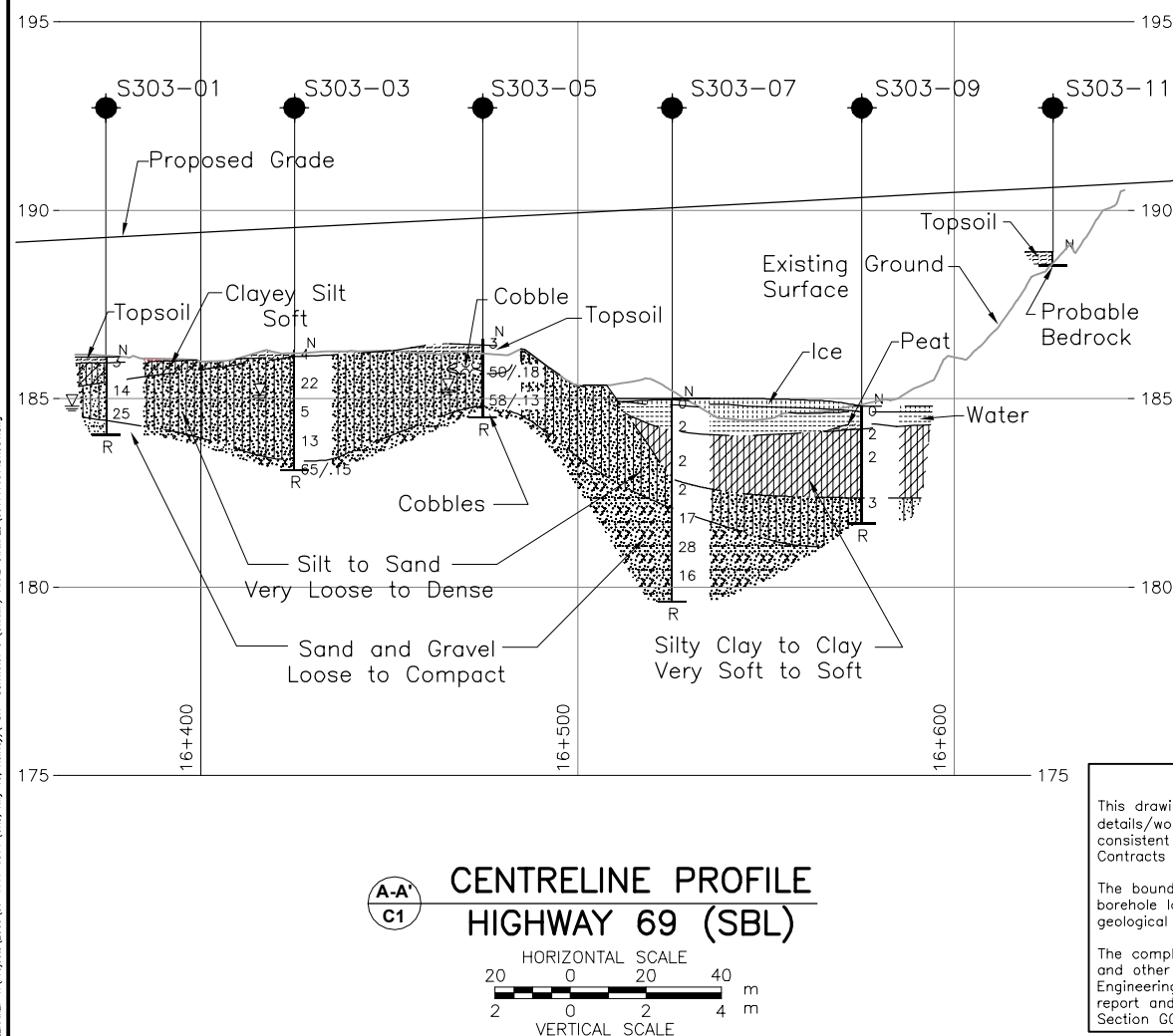
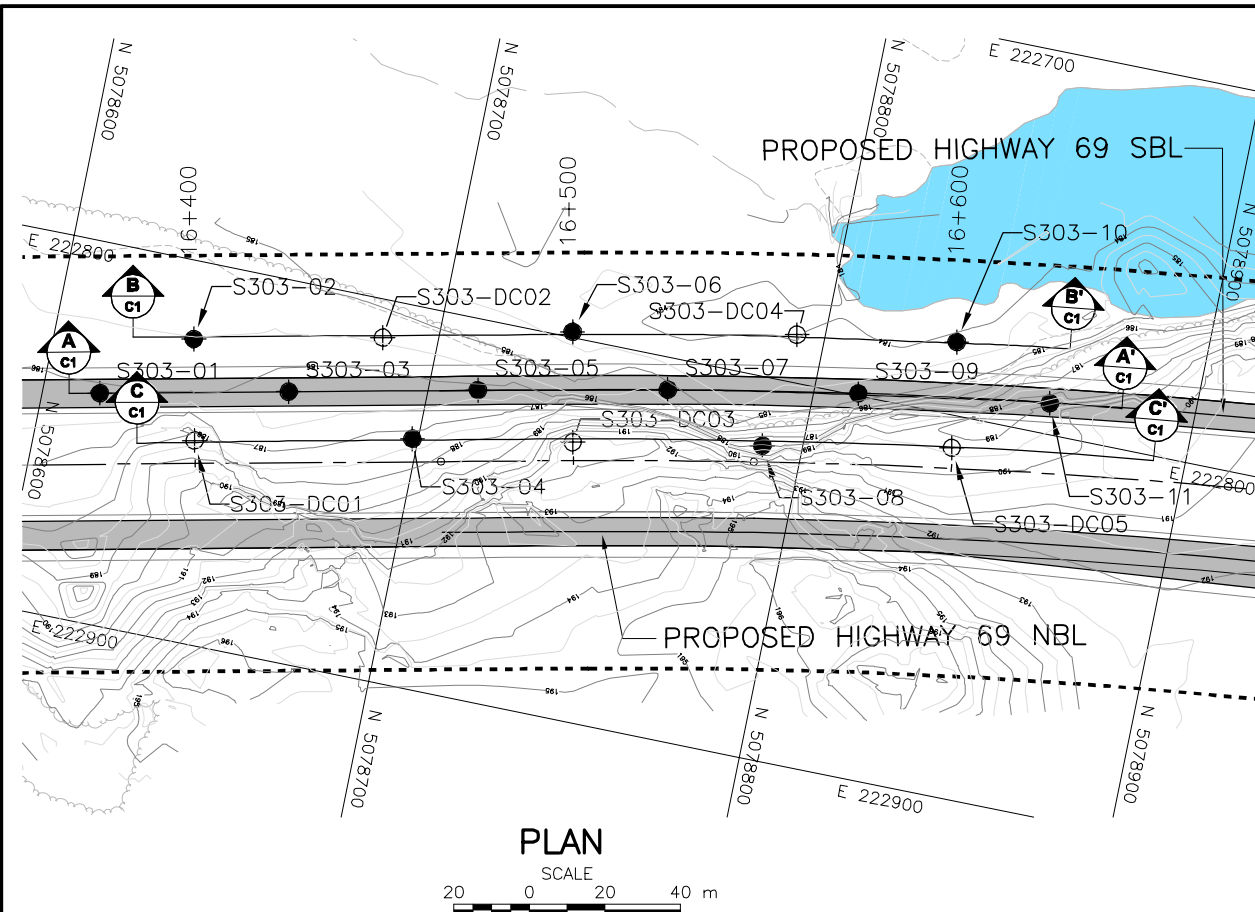
Golder Associates

Date: 03-Apr-13



APPENDIX C

Highway 69 SBL – STA 16+375 to 16+625 (Swamp 303)



NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

CONT No.
WP No. 5404-05-01

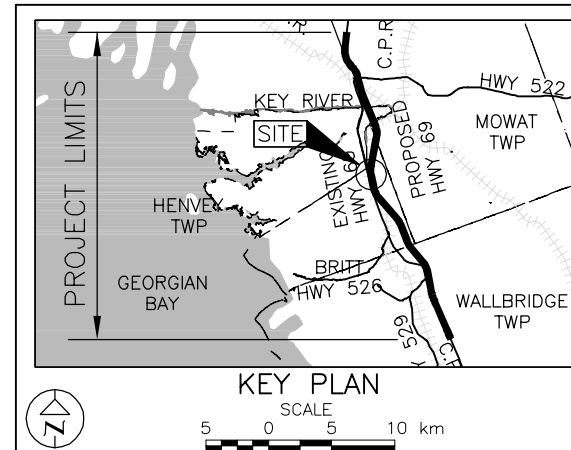
HIGHWAY 69

STA 16+375 TO 16+625 (SBL)




BOREHOLE LOCATIONS AND SOIL STRATA



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

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

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S303-01 | 186.1 | 5078615.0 | 222839.5 |
| S303-02 | 185.4 | 5078636.5 | 222820.5 |
| S303-03 | 186.3 | 5078663.9 | 222829.1 |
| S303-04 | 186.9 | 5078698.5 | 222834.7 |
| S303-05 | 186.6 | 5078712.9 | 222818.7 |
| S303-06 | 184.8 | 5078734.3 | 222798.6 |
| S303-07 | 185.0 | 5078762.1 | 222808.5 |
| S303-08 | 188.4 | 5078789.5 | 222818.0 |
| S303-09 | 184.8 | 5078811.6 | 222799.4 |
| S303-10 | 184.8 | 5078834.4 | 222780.9 |
| S303-11 | 188.8 | 5078861.8 | 222791.8 |
| S303-DC01 | 188.9 | 5078642.1 | 222846.7 |
| S303-DC02 | 185.2 | 5078685.5 | 222810.1 |
| S303-DC03 | 191.9 | 5078740.2 | 222827.2 |
| S303-DC04 | 184.8 | 5078792.6 | 222787.4 |
| S303-DC05 | 189.4 | 5078838.7 | 222808.6 |

REFERENCE

Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and , Original Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Proposed Grade obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.

| | | | | | |
|---------------------|-----------|--------------------------|----------|---------|--|
| | | | | | |
| | | | | | |
| NO. | DATE | BY | REVISION | | |
| Geocres No. 41H-134 | | | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | | DIST. | |
| SUBM'D. CC | CHKD. CZ | DATE: May 2013 | | SITE: | |
| DRAWN: DD/JFC | CHKD. JPD | APPD. JPD/JMAC | | DWG. C1 | |



| PROJECT | | RECORD OF BOREHOLE | | No S303-01 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|-------------------|--|--------------------|---------|--------------------------|------------|---|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5078615.0 ; E 222839.5 | | ORIGINATED BY | | MR | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 10, 2012 | | CHECKED BY | | | | | | | | | |
| | | | | | | | | CN | | | | | | | | | |
| 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 | | | | | | | | | |
| 186.1 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 3 | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, containing silty sand seams | | 1B | | | | | | | | | | | | | | |
| 185.4 | Soft Grey Moist | | 2 | SS | 14 | | | | | | | | | | | | |
| 0.7 | SILT, some sand, trace gravel, trace clay | | 3A | SS | 25 | | | | | | | | | | | | |
| 184.4 | Compact Brown and grey Moist | | 3B | | | | | | | | | | | | | | |
| 184.0 | SAND and GRAVEL, trace to some silt | | | | | | | | | | | | | | | | |
| 2.1 | Compact Brown Wet | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 1.3 m below ground surface (Elev. 184.8 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S303-02 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|-------------------|--|--------------------|---------|--|------------|----------------------------|--------------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5078636.5 ; E 222820.5 | | ORIGINATED BY | | ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | MAS | | | | | | |
| DATUM Geodetic | | DATE | | November 18, 2011 | | CHECKED BY | | CN | | | | | | |
| 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 | | | | | | |
| 185.4 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| 184.8 | CLAYEY SILT, some sand, trace organics Firm Brown Moist | | 1 | SS | 6 | | | | | | | | | |
| 0.6 | SILTY CLAY, trace sand Soft to firm Brown to grey Wet | | 2 | SS | 7 | | | | | | | | | |
| | | | 3 | SS | 3 | | | | | | | | | |
| 182.7 | SILT and SAND, trace gravel, trace clay Loose Grey Wet | | 4 | SS | 6 | | | | | | | | | |
| 181.7 | Silty SAND, trace gravel, trace clay Loose Grey Wet | | 5 | SS | 4 | | | | | | | | | |
| 180.9 | Silty SAND and GRAVEL Compact Grey Wet | | 6 | SS | 10 | | | | | | | | | |
| 179.4 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | |
| 6.0 | NOTE: 1. Water level in open borehole at a depth of 0.9 m below ground surface (Elev. 184.5 m) upon completion of drilling. | | | | | | | | | | | | | |

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S303-03 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | |
|--|--|---|---------|------------------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| W.P. 5404-05-01 | | LOCATION N 5078663.9 ; E 222829.1 | | ORIGINATED BY MR | | | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY MAS | | | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 10, 2012 | | CHECKED BY CN | | | | | | | | | | | | | |
| 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 | | | | | | | | | |
| 186.3 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 4 | | 186 | | | | | | | | | | 0 10 85 5 |
| 0.2 | SILT, trace to some sand, trace clay | | 1B | | | | | | | | | | | | | | |
| 185.6 | Loose Brown Moist | | | | | | | | | | | | | | | | |
| 0.7 | SAND, trace gravel, trace silt, trace clay | | 2 | SS | 22 | | 185 | | | | | | | | | | |
| | Loose to compact Brown Wet | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 5 | | | | | | | | | | | | 2 95 2 1 |
| | | | | | | | | | | | | | | | | | |
| | | | 4 | SS | 13 | | 184 | | | | | | | | | | |
| 183.3 | SAND and GRAVEL, trace silt Brown Wet | | 5 | SS | 65/0.15 | | | | | | | | | | | | |
| 3.2 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 185.1 m) upon completion of drilling. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S303-04 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|---|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | DATE | | COMPILED BY | | DATUM | | CHECKED BY | |
| 09-1111-6014 | | N 5078698.5 ; E 222834.7 | | MR | | HWY 69 | | 165 mm O.D. Continuous Flight Solid Stem Augers | |
| Geodetic | | January 11, 2012 | | MAS | | | | CN | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 186.9 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 3 | | | | | | | | | | | | |
| 0.1 | SILT, some sand, trace to some clay | | 1B | | | | | | | | | | | | | | |
| 186.2 | Very loose | | | | | | | | | | | | | | | | |
| 186.0 | Brown and grey | | 2 | SS | 100/0.18 | | | | | | | | | | | | |
| 0.9 | Moist | | | | | | | | | | | | | | | | |
| 185.5 | Silty SAND, trace gravel | | | | | | | | | | | | | | | | |
| 1.4 | Brown and grey | | | | | | | | | | | | | | | | |
| | Moist | | | | | | | | | | | | | | | | |
| | COBBLES and BOULDERS | | 3 | SS | 14 | | | | | | | | | | | | |
| | Silty SAND, trace to some gravel, trace clay | | | | | | | | | | | | | | | | |
| | Compact | | | | | | | | | | | | | | | | |
| 184.3 | Brown | | 4 | SS | 57/0.18 | | | | | | | | | | | | |
| 2.6 | Wet | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.3 m below ground surface (Elev. 185.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S303-05 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|---------------|---|--------------------|--------|-------------------------|------------|-------------------------|-----------------|--|-----------------|---|---------------------------------|---------------------------------|---|---------------------------------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | COMPILED BY | | CHECKED BY | | | | | | | |
| DIST | | BOREHOLE TYPE | | DATE | | DATE | | DATE | | | | | | | |
| Geodetic | | January 11, 2012 | | January 11, 2012 | | January 11, 2012 | | January 11, 2012 | | | | | | | |
| SOIL PROFILE | | SAMPLES | | GROUND WATER CONDITIONS | | ELEVATION SCALE | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | UNIT WEIGHT | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | 20 40 60 80 100 | 20 40 60 80 100 | W _p W W _L | W _p W W _L | W _p W W _L | γ | GR SA SI CL | |
| 186.6 | GROUND SURFACE | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 3 | | | | | | | | | | |
| 185.9 | Silty SAND, containing rootlets Very loose Brown | | 1B | SS | | | | | | | | | | | |
| 185.7 | Moist | | 2 | SS | 50/0.18 | | | | | | | | | | |
| 0.9 | COBBLE | | | | | | | | | | | | | | |
| | SAND, trace gravel, trace silt, trace clay Compact | | | | | | | | | | | | | | |
| 184.8 | Brown | | 3 | SS | 58/0.13 | | | | | | | | | 1 95 3 1 | |
| 184.5 | Wet | | | | | | | | | | | | | | |
| 2.1 | COBBLES | | | | | | | | | | | | | | |
| | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 1.4 m below ground surface (Elev. 185.2 m) upon completion of drilling. | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S303-06 | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|-------------------|---|--------------------|---------|--------------------------|------------|--|-----------------|---|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. 09-1111-6014 | | LOCATION | | N 5078734.3 ; E 222798.6 | | ORIGINATED BY | | ARM | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | | | | | | | |
| DATUM | | Geodetic | | DATE | | November 18, 2011 | | CHECKED BY | | | | | | | | |
| | | | | | | | | CN | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| 184.8 | WATER SURFACE | | | | | | | | | | | | | | | |
| 0.0 | Water | | | | | | | | | | | | | | | |
| 0.2 | PEAT (Fibrous) | | 1 | SS | 2 | | | | | | | | | | | |
| 184.2 | Soft Black Wet | | | | | | | | | | | | | | | |
| 0.6 | CLAYEY SILT, trace gravel, trace sand | | 2 | SS | 5 | | | | | | | | | | | |
| 183.6 | Firm Grey Wet | | | | | | | | | | | | | | | |
| 1.2 | SILT, trace sand, trace clay | | 3 | SS | 10 | | | | | | | | | | | |
| 183.0 | Compact Grey Wet | | | | | | | | | | | | | | | |
| 1.8 | SAND, trace to some silt, trace clay | | 4 | SS | 9 | | | | | | | | | | | |
| | Loose to compact Grey Wet | | | | | | | | | | | | | | | |
| | | | 5 | SS | 7 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 6 | SS | 8 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 7 | SS | 14 | | | | | | | | | | | |
| 180.3 | SAND and GRAVEL, trace silt | | | | | | | | | | | | | | | |
| 4.5 | Loose Grey Wet | | 8 | SS | 7 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 179.1 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | | |
| 5.7 | NOTE: 1. Water level in open borehole at ground surface (Elev. 184.8 m) upon completion of drilling. | | | | | | | | | | | | | | | |


| PROJECT | | RECORD OF BOREHOLE | | No S303-07 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|---|--|--------------------|---------|--------------------------|------------|--|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. 09-1111-6014 | | LOCATION | | N 5078762.1 ; E 222808.5 | | ORIGINATED BY | | ARM | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| DATUM | | Geodetic | | DATE | | January 18, 2012 | | CHECKED BY | | | | | | |
| | | | | | | | | CN | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 185.0 | ICE SURFACE | | | | | | | | | | | | | |
| 0.0 | ICE | | | | | | | | | | | | | |
| 0.2 | WATER | | 1 | - | - | | | | | | | | | |
| 184.2 | | | | | | | | | | | | | | |
| 0.8 | SILTY CLAY, trace sand, trace organics Very soft to soft Grey Wet | | 2 | SS | 3 | | | | | | | | | |
| 182.8 | | | | | | | | | | | | | | |
| 2.2 | SILT, trace to some sand, trace clay Very loose Grey Wet | | 4 | SS | 2 | | | | | | | | | |
| 182.0 | | | | | | | | | | | | | | |
| 3.0 | SAND and GRAVEL, trace to some silt, trace clay Compact Grey Wet | | 5 | SS | 17 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 6 | SS | 28 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 7 | SS | 16 | | | | | | | | | |
| 179.6 | | | | | | | | | | | | | | |
| 5.4 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at ground surface (Elev. 185.0 m) upon completion of drilling. | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S303-08 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|---|--|--------------------|---------|--------------------------|------------|----------------------------|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5078789.5 ; E 222818.0 | | ORIGINATED BY | | MR | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Hand Shovel Excavation | | COMPILED BY | | | | | | | | | |
| MAS | | DATUM | | Geodetic | | DATE | | January 11, 2012 | | | | | | | | | |
| | | | | | | CHECKED BY | | CN | | | | | | | | | |
| 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 | | | | | | | | | |
| 188.4 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | | |
| 187.9 | SAND and GRAVEL, some silt, containing rootlets Brown Moist | | 1 | CS | - | | 188 | | | | | | | | | | |
| 0.5 | END OF EXCAVATION PROBABLE BEDROCK | | | | | | | | | | | | | | | | |
| NOTE: 1. Excavation dry upon completion. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S303-09 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|---------------|--|--------------------------|---------|---------------|------------|----------------------------|-----------------|---|--|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | | | | | | |
| 5404-05-01 | | N 5078811.6 ; E 222799.4 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | | | | | | | |
| DATUM | | DATE | | COMPILED BY | | MASS | | CHECKED BY | | | | | | | |
| Geodetic | | January 17, 2012 | | CN | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | |
| 184.8 | ICE SURFACE | | | | | | | | | | | | | | |
| 0.0 | ICE | | | | | | | | | | | | | | |
| 184.3 | WATER | | | | | | | | | | | | | | |
| 0.6 | Peat (Amorphous) | | 1 | - | - | | | | | | | | | | |
| | CLAY, trace to some sand, containing rootlets and trace organics to a depth of 1.2 m | | 2 | SS | 2 | | | | | | | | | | |
| | Soft | | 3 | SS | 2 | | | | | | | | | | |
| | Brown | | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | |
| 182.4 | | | | | | | | | | | | | | | |
| 2.4 | SILT and SAND, trace to some clay | | 4 | SS | 3 | | | | | | | | | | |
| | Very loose | | | | | | | | | | | | | | |
| | Brown | | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | |
| 181.7 | | | | | | | | | | | | | | | |
| 3.1 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | |
| | NOTE: | | | | | | | | | | | | | | |
| | 1. Water level in open borehole at ground surface (Elev. 184.8 m) upon completion of drilling. | | | | | | | | | | | | | | |


| PROJECT | | RECORD OF BOREHOLE | | No S303-10 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | COMPILED BY | | CHECKED BY | | DATUM | | DATE | |
| 09-1111-6014 | | N 5078834.4 ; E 222780.9 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | |
| Geodetic | | November 20, 2011 | | CN | | | | | |

| 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 | | | | | W _p | W | W _L | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 184.8 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Root mat | | | | | | | | | | | | | | | | |
| 0.2 | Water | | | | | | | | | | | | | | | | |
| 183.9 | | | | | | | 184 | | | | | | | | | | |
| 0.9 | GRAVEL, trace sand Very loose | | 1 | SS | WH | | | | | | | | | | | | |
| 183.3 | Black and pink Wet | | | | | | | | | | | | | | | | |
| 1.5 | CLAY, trace sand Very soft to firm | | 2 | SS | 6 | | 183 | | | | | | | | | | |
| | Grey Wet | | 3 | SS | 1 | | | | | | | | | | | | |
| | | | 4 | TO | PH | | 182 | | | | | | | | | | |
| 181.6 | | | | | | | | | | | | | | | | | |
| 3.2 | SILT, trace to some sand and clay Loose to compact | | 5 | SS | 6 | | 181 | | | | | | | | | | |
| | Grey Wet | | 6 | SS | 11 | | | | | | | | | | | | |
| 180.5 | | | | | | | | | | | | | | | | | |
| 4.3 | Sandy SILT, trace gravel Dense | | 7 | SS | 41 | | 180 | | | | | | | | | | |
| | Grey Wet | | | | | | | | | | | | | | | | |
| 179.2 | | | | | | | | | | | | | | | | | |
| 5.6 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 0.2 m below ground surface (Elev. 184.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | | |

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S303-11 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | |
|----------------------|--|---|--------|------------------|----------------------------|-----------------|---|--------------------|--|--|--|---|---------------------------------|--|--|--|--|
| W.P. 5404-05-01 | | LOCATION N 5078861.8 ; E 222791.8 | | ORIGINATED BY MR | | | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Hand Shovel Excavation | | COMPILED BY MAS | | | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 11, 2012 | | CHECKED BY CN | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | W _p W W _L | | | | |
| 188.8 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL |  | | | | | | | | | | | | | | | |
| 188.4 | END OF EXCAVATION PROBABLE BEDROCK | | | | | | | | | | | | | | | | |
| 0.4 | NOTE: 1. Excavation dry upon completion. | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S303-DC01 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|----------------------|--|--------------------------------------|--------|------|----------------------------|------------------|---|--------------------|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION N 5078642.1 ; E 222846.7 | | | | ORIGINATED BY MR | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Hand Shovel Excavation | | | | COMPILED BY MAS | | | | | | | | | | |
| DATUM Geodetic | | DATE January 10, 2012 | | | | CHECKED BY CN | | | | | | | | | | |
| 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 | | | | | | | | |
| 188.9 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | MOSS | | | | | | | | | | | | | | | |
| 0.1 | END OF EXCAVATION BEDROCK | | | | | | | | | | | | | | | |
| | NOTE: 1. Bedrock exposed by hand excavation at a depth of 0.1 m below ground surface (Elev. 188.8 m) at location of DCPT. 2. Excavation dry upon completion. | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF DCPT No S303-DC02 | | SHEET 1 OF 1 | | METRIC | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|---|---|---------------------------------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5078685.5 ; E 222810.1 | | ORIGINATED BY ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | |
| DATUM Geodetic | | DATE November 18, 2011 | | CHECKED BY CN | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 185.2 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| 181.3 3.9 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.25 m) | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S303-DC03 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|----------------------|--|--------------------------------------|--------|------|----------------------------|------------------|---|--------------------|----|----|-----|---|-------------------|--|---|--|--|
| W.P. 5404-05-01 | | LOCATION N 5078740.2 ; E 222827.2 | | | | ORIGINATED BY MR | | | | | | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE Hand Shovel Excavation | | | | COMPILED BY MAS | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 11, 2012 | | | | CHECKED BY CN | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| 191.9 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | | |
| 0.1 | END OF EXCAVATION BEDROCK | | | | | | | | | | | | | | | | |
| | NOTE: 1. Bedrock exposed by hand excavation at a depth of 0.1 m below ground surface (Elev. 191.8 m) at location of DCPT. 2. Excavation dry upon completion. | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF DCPT No S303-DC04 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|-------------------|---|---|--------|------------------|----------------------------|-----------------|---|--------------------|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. 09-1111-6014 | | LOCATION N 5078792.6 ; E 222787.4 | | ORIGINATED BY MR | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | | | | |
| DATUM Geodetic | | DATE November 19, 2011 | | CHECKED BY CN | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | |
| 184.8 | GROUND SURFACE | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | |
| 184 | | | | | | | | | | | | | |
| 183 | | | | | | | | | | | | | |
| 182 | | | | | | | | | | | | | |
| 181 | | | | | | | | | | | | | |
| 180.8 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.05 m) | | | | | | | | | | | | |
| 4.0 | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| | | | | | | | |
|--------------------------------------|--|---|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S303-DC05 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5078838.7 ; E 222808.6</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Hand Shovel Excavation</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 11, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|--|---|----|----|--------------------------------------|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | | | |
| 189.4 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | 20 | 40 | 60 | | | | | |
| 0.0 | TOPSOIL | /// | | | | | | | | | | | | | | | | | | | |
| 0.1 | END OF EXCAVATION BEDROCK | | | | | | | | | | | | | | | | | | | | |
| | NOTE: 1. Bedrock exposed by hand excavation at a depth of 0.1 m below ground surface (Elev. 189.3 m) at location of DCPT. | | | | | | | | | | | | | | | | | | | | |

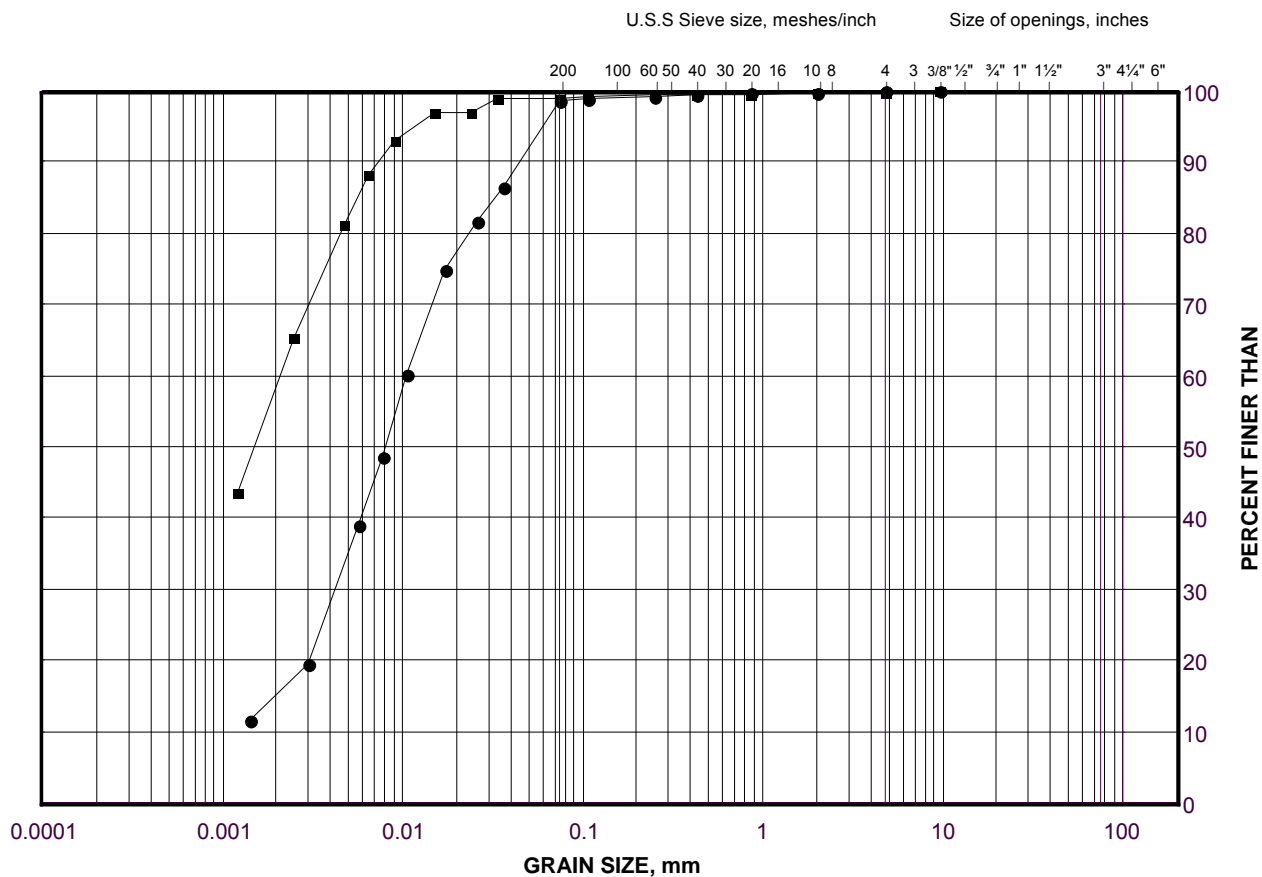
GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

GRAIN SIZE DISTRIBUTION

Clayey Silt to Clay

Highway 69 (SBL) STA 16+375 to 16+625 (Swamp 303)

FIGURE C.S303-01



LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S303-06 | 2 | 183.9 |
| ■ | S303-10 | 3 | 182.4 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

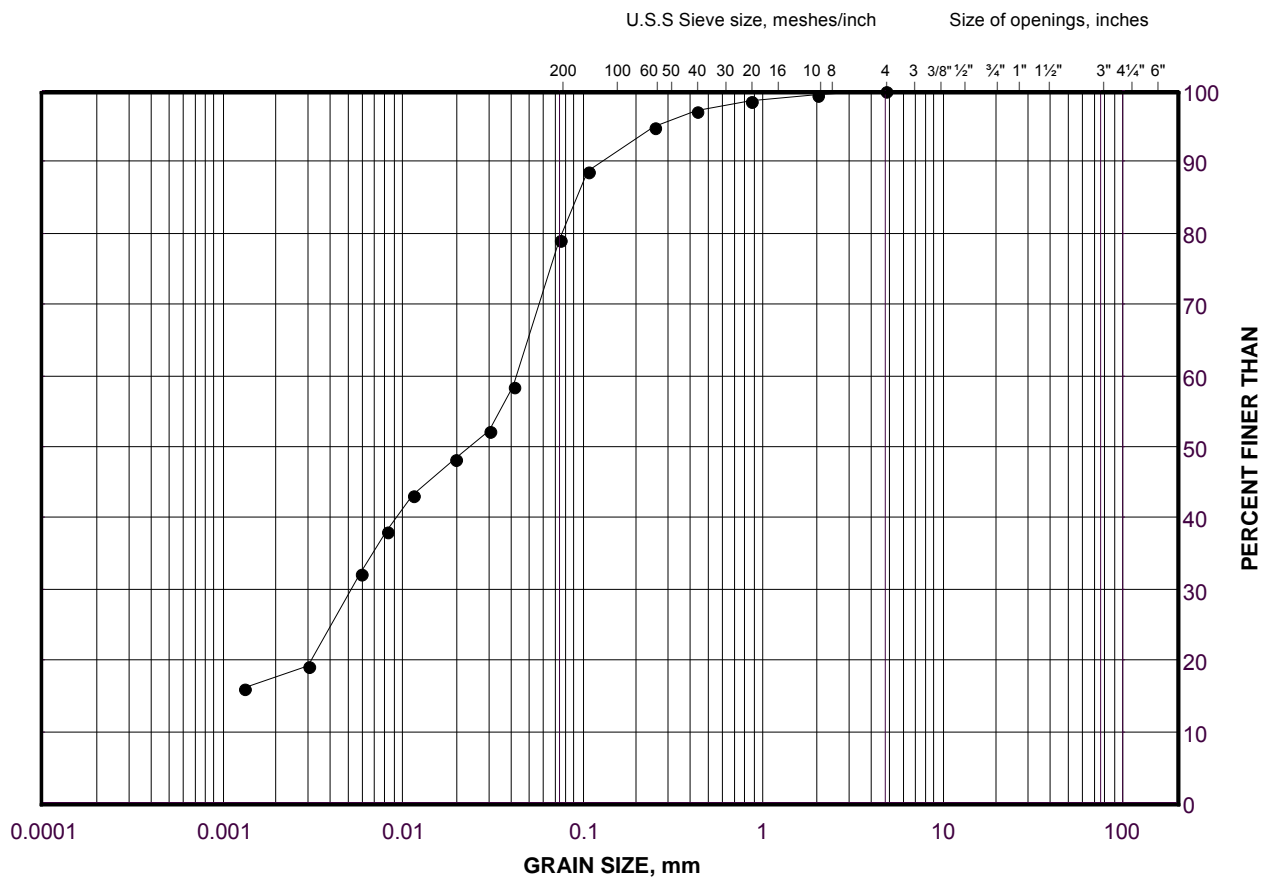
Date: 04-Mar-13

GRAIN SIZE DISTRIBUTION

Clayey Silt (with Sand Seams)

Highway 69 (SBL) STA 16+375 to 16+625 (Swamp 303)

FIGURE C.S303-02



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

LEGEND

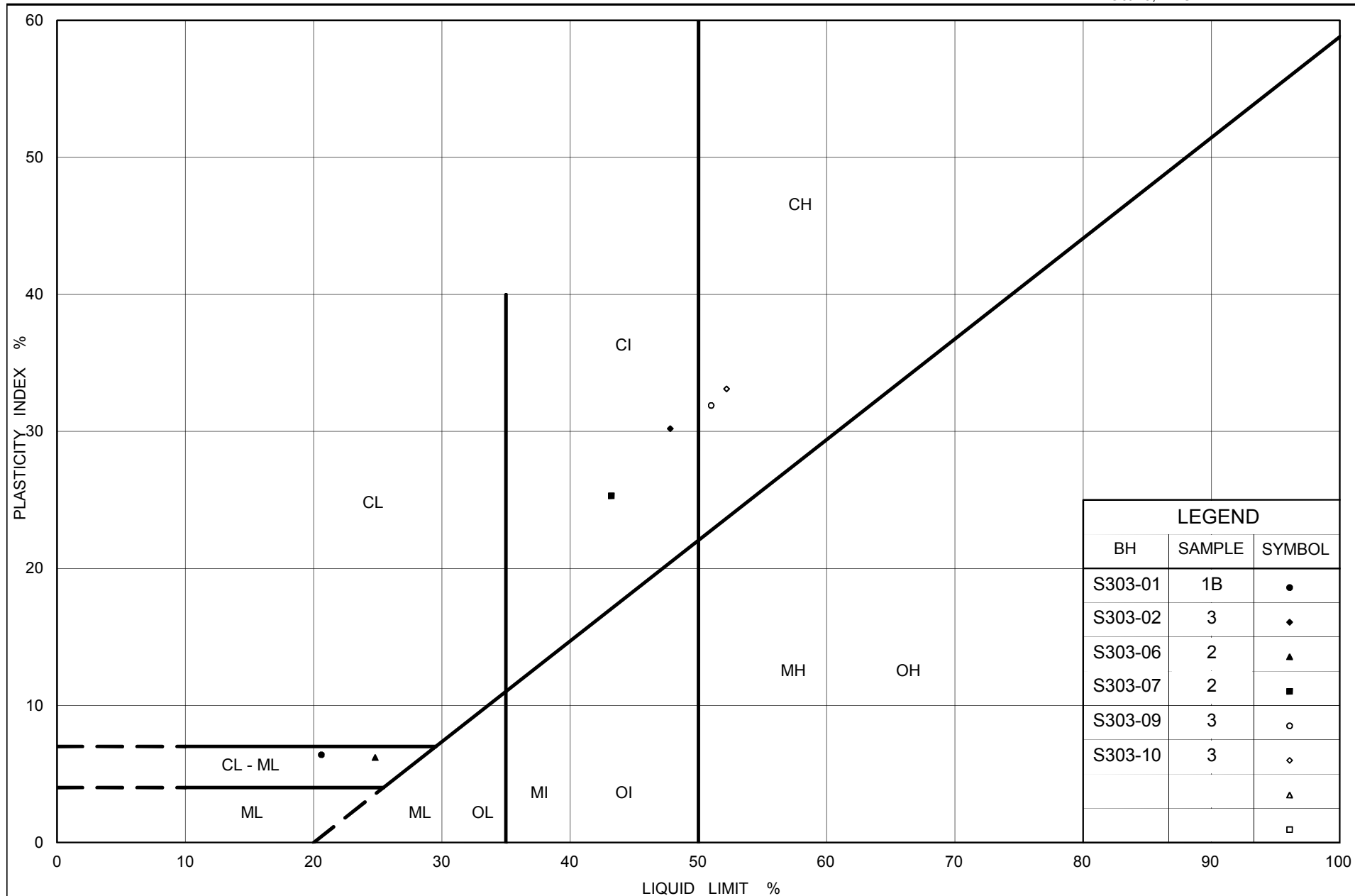
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S303-01 | 1B | 185.7 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 26-Apr-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt to Clay

Highway 69 (SBL) STA 6+375 to 6+625 (Swamp 303)

Figure No. C.S303-03

Project No. 09-1111-6014

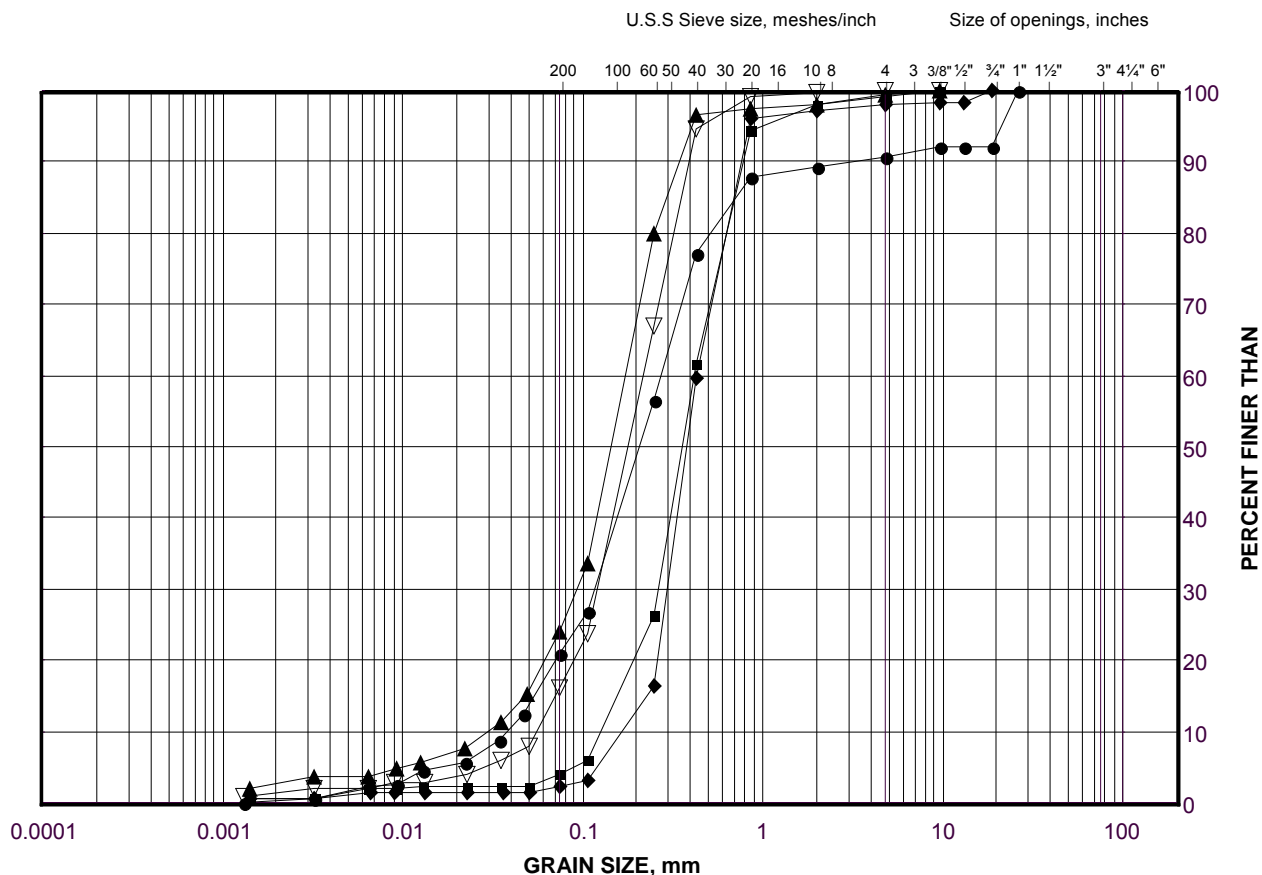
Checked By: TZ

GRAIN SIZE DISTRIBUTION

Silty Sand to Sand

Highway 69 (SBL) STA 16+375 to 16+625 (Swamp 303)

FIGURE C.S303-04A



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

LEGEND

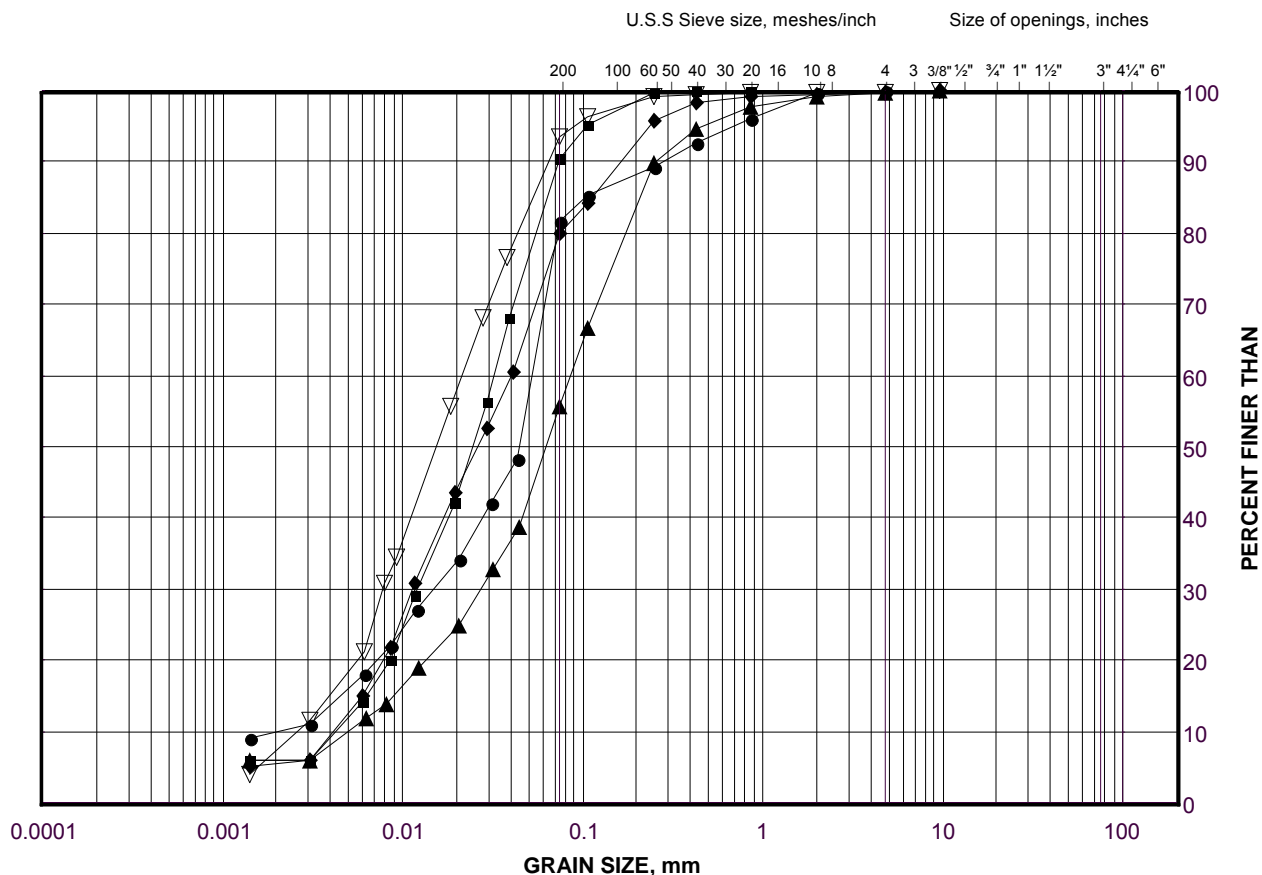
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S303-04 | 3 | 185.1 |
| ■ | S303-05 | 3 | 184.9 |
| ◆ | S303-03 | 3 | 184.5 |
| ▲ | S303-02 | 5 | 181.3 |
| ▽ | S303-06 | 6 | 181.5 |

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Highway 69 (SBL) STA 16+375 to 16+625 (Swamp 303)

FIGURE C.S303-04B



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S303-04 | 1B | 186.5 |
| ■ | S303-03 | 1B | 185.9 |
| ◆ | S303-01 | 3A | 184.6 |
| ▲ | S303-09 | 4 | 182.1 |
| ▽ | S303-10 | 5 | 181.3 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

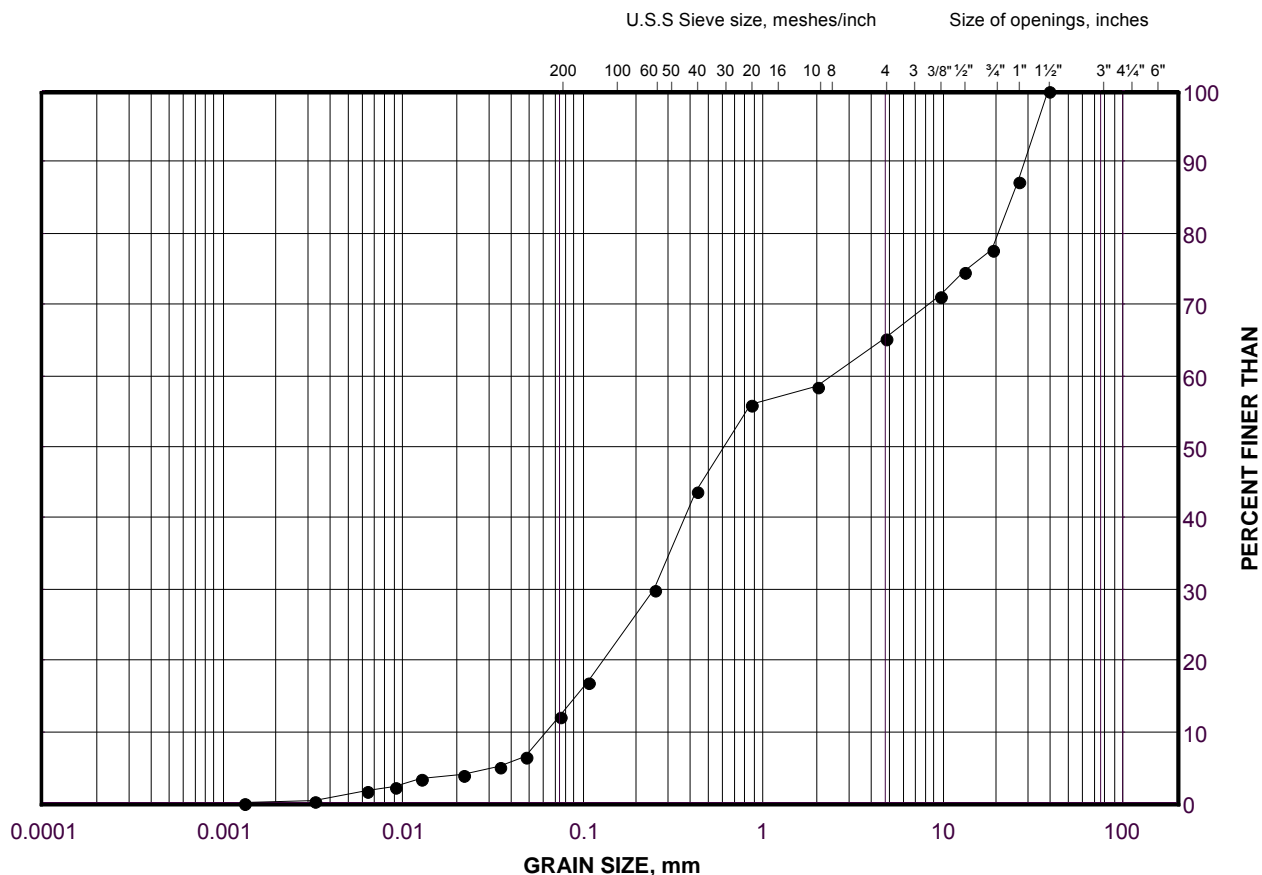
Date: 03-Apr-13

GRAIN SIZE DISTRIBUTION

Sand and Gravel

Highway 69 (SBL) STA 16+375 to 16+625 (Swamp 303)

FIGURE C.S303-05



LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S303-07 | 6 | 180.9 |

Project Number: 09-1111-6014

Checked By: TZ

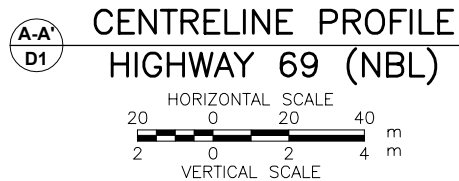
Golder Associates

Date: 03-Apr-13



APPENDIX D

Highway 69 NBL – STA 16+875 to 16+925 (Swamp 304)



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



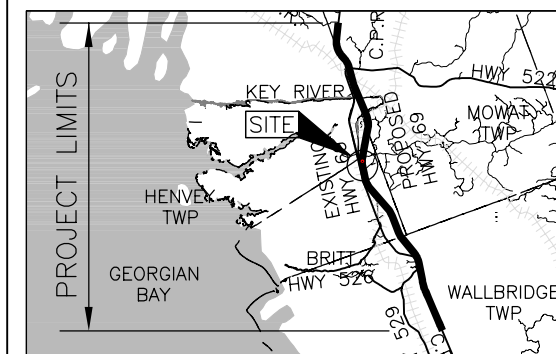
SHEET

STA 16+875 TO 16+925 (NBL)

BOREHOLE LOCATIONS AND SOIL STRATA






Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

SCALE
0 5 10 km

LEGEND

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

| BOREHOLE CO—ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S304—01 | 191.3 | 5079113.4 | 222813.8 |
| S304—02 | 191.2 | 5079125.6 | 222830.0 |
| S304—03 | 190.7 | 5079138.4 | 222814.1 |
| S304—04 | 192.3 | 5079150.9 | 222801.8 |
| S304—05 | 191.9 | 5079163.0 | 222814.8 |
| S304—06 | 191.4 | 5079149.8 | 222839.7 |
| S304—DC01 | 191.1 | 5079126.1 | 222799.5 |
| S304—DC02 | 191.4 | 5079150.1 | 222828.6 |
| S304—DC03 | 191.6 | 5079125.5 | 222840.2 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

REFERENCE

Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and , Original Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Proposed Grade obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.

| | | | | | | | |
|---------------------|------|----------|--------------------------|-----------------|--|---------|-------|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| NO. | DATE | BY | REVISION | | | | |
| Geocres No. 41H-134 | | | | | | | |
| HWY. 69 | | | PROJECT NO. 09-1111-6014 | | | | DIST. |
| SUBM'D. CC | | CHKD. TZ | | DATE: Apr. 2013 | | SITE: | |
| DRAWN: JFC/LL | | CHKD. CN | | APPD. JPD/JMAC | | DWG. D1 | |



| PROJECT | | RECORD OF BOREHOLE | | No S304-01 | | SHEET 1 OF 1 | | METRIC | | | | | |
|---------------|--|--------------------------|---------|---------------|------------|--|-----------------|--|---------------------------------------|-------------------------------|--------------------------------|------------------|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | | | | |
| DATE | | DATE | | CHECKED BY | | COMPILED BY | | BOREHOLE TYPE | | | | | |
| 09-1111-6014 | | N 5079113.4 ; E 222813.8 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | | | | |
| Geodetic | | January 15, 2012 | | CN/TZ | | BM | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | 20 40 60 80 100 | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | GR SA SI CL |
| 191.3 | GROUND SURFACE | | | | | | | | | | | | |
| 0.0 | PEAT (Fibrous) | | 1 | SS | 2 | | 191 | | | | | | |
| 0.2 | CLAYEY SILT, trace sand, trace organics to a depth of 1.2 m Soft to stiff Brown Moist becoming wet below a depth of 1.2 m | | 2 | SS | 11 | | 190 | | | | | | |
| | | | 3 | SS | 9 | | 189 | | | | | | |
| | | | 4 | SS | 9 | | | | | | | | |
| | | | 5 | SS | 6 | | | | | | | | |
| 188.3 | Sandy SILT, trace clay Brown Wet END OF BOREHOLE SPOON REFUSAL | | 6 | SS | 53/0.08 | | | | | | | | |
| 3.1 | NOTES: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 190.1 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S304-02 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|---|---|--------------------|---------|--------------------------|------------|--|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5079125.6 ; E 222830.0 | | ORIGINATED BY | | ARM | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | COMPILED BY | | | | | | |
| DATUM | | Geodetic | | DATE | | January 16, 2012 | | CHECKED BY | | | | | | |
| | | | | | | | | CN/TZ | | | | | | |
| 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 | | | | | | |
| 191.2 | ICE SURFACE | | | | | | | | | | | | | |
| 0.0 | Ice | | | | | | | | | | | | | |
| 190.6 | Silty SAND, trace organics Very loose Brown and black Wet | | 1 | SS | 1 | | | | | | | | | |
| 0.6 | | | | | | | | | | | | | | |
| 190.0 | SILT and SAND, some clay Loose Grey Wet | | 2 | SS | 5 | | | | | | | | | |
| 1.2 | | | | | | | | | | | | | | |
| | CLAYEY SILT, trace sand Stiff to very stiff Brown Wet | | 3 | SS | 9 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 4 | SS | 17 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 5 | SS | 9 | | | | | | | | | |
| 188.1 | SILT, some sand, trace gravel, trace clay Compact Brown Wet | | 6 | SS | 21 | | | | | | | | | |
| 3.1 | | | | | | | | | | | | | | |
| 187.5 | SAND, trace gravel, trace silt Compact Grey Wet | | 7 | SS | 20 | | | | | | | | | |
| 3.7 | | | | | | | | | | | | | | |
| 187.1 | | | | | | | | | | | | | | |
| 4.1 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at ground surface (Elev. 191.2 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S304-03 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|-------------------|--|--------------------|---------|--------------------------|------------|--|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5079138.4 ; E 222814.1 | | ORIGINATED BY | | ARM | | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | COMPILED BY | | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 16, 2012 | | CHECKED BY | | | | | | | | | | |
| | | | | | | | | CN/TZ | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | WATER CONTENT (%) |
| 190.7 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 0.0 | PEAT (Amorphous) Soft Black Moist | | 1 | SS | 3 | | | | | | | | | | | | | |
| 190.1 | | | | | | | | | | | | | | | | | | |
| 0.6 | SILT and SAND, trace organics Loose Brown Moist | | 2 | SS | 10 | | | | | | | | | | | | | |
| 189.5 | | | | | | | | | | | | | | | | | | |
| 1.2 | CLAYEY SILT, trace to some sand Firm Brown Moist | | 3 | SS | 7 | | | | | | | | | | | | | |
| 188.9 | | | | | | | | | | | | | | | | | | |
| 1.8 | SANDY SILT, trace to some clay, containing sand seams Compact Brown Wet | | 4 | SS | 24 | | | | | | | | | | | | | |
| 188.3 | | | | | | | | | | | | | | | | | | |
| 2.4 | SAND, some gravel, some silt, trace clay Compact Brown Wet | | 5 | SS | 26 | | | | | | | | | | | | | |
| 187.4 | | | | | | | | | | | | | | | | | | |
| 3.3 | END OF BOREHOLE SPOON REFUSAL | | 6 | SS | 53/0.28 | | | | | | | | | | | | | |
| | NOTES: 1. Water level in open borehole at a depth of 1.8 m below ground surface (Elev. 188.9 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S304-04 | | SHEET 1 OF 1 | | METRIC | | | |
|--|---|--------------------------|---------|---------------|------------|-------------------------|--|--|---|---|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | |
| DATUM | | DATE | | CHECKED BY | | ELEVATION SCALE | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | |
| 09-1111-6014 | | N 5079150.9 ; E 222801.8 | | ARM | | 5404-05-01 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | BM | |
| Geodetic | | January 16, 2012 | | CN/TZ | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | | | ELEVATION SCALE | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | ELEVATION SCALE | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | |
| 192.3 | GROUND SURFACE | | | | | 20 40 60 80 100 | | | SHEAR STRENGTH kPa | | |
| 0.0 | PEAT (Amorphous) Very soft Black Moist | | 1 | SS | 2 | 192 | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | |
| 191.7 | | | | | | | | | WATER CONTENT (%) | | |
| 191.4 | CLAYEY SILT with sand, trace organics Firm Brown Moist | | 2 | SS | 53/0.13 | | | | W _p — W — W _L 20 40 60 | | |
| 0.9 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | UNIT WEIGHT γ kN/m ³ | | |
| NOTES: 1. Open borehole dry upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | |
| REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S304-05 | | SHEET 1 OF 1 | | METRIC | | | | | |
|--|--|--|---------|---------------|------------|--|-----------------|-----------------|---------------------------------------|-------------------------------|--------------------------------|------------------|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | | | | | | | | |
| DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | | | | | | | | |
| 09-1111-6014 | | N 5079163.0 ; E 222814.8 | | ARM | | | | | | | | | |
| 5404-05-01 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | BM | | | | | | | | | |
| Geodetic | | January 16, 2012 | | CN/TZ | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | 20 40 60 80 100 | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | GR SA SI CL |
| 191.9 | GROUND SURFACE | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | | | | | | | | | | | |
| 0.2 | Very soft | | 1 | SS | 2 | | | | | | | | 0 27 63 10 |
| 191.3 | Black Moist | | | | | | | | | | | | |
| 0.6 | Sandy SILT, trace to some clay, trace organics | | 2 | SS | 22 | | 191 | | | | | | |
| 190.8 | Very loose | | | | | | | | | | | | |
| 1.1 | Brown Moist | | | | | | | | | | | | |
| | SAND, some silt, trace gravel, trace clay | | | | | | | | | | | | |
| | Compact | | | | | | | | | | | | |
| | Brown Moist | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | |
| NOTES: 1. Open borehole dry upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S304-06 | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|---|--|--------------------|---------|--------------------------|------------|--|-----------------|---|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. 09-1111-6014 | | LOCATION | | N 5079149.8 ; E 222839.7 | | ORIGINATED BY | | ARM | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 16, 2012 | | CHECKED BY | | | | | | | | |
| | | | | | | | | CN/TZ | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| 191.4 | ICE SURFACE | | | | | | | | | | | | | | | |
| 0.0 | Ice | | | | | | | | | | | | | | | |
| 191.1 | | | | | | | | | | | | | | | | |
| 0.3 | Water | | | | | | | | | | | | | | | |
| 190.5 | | | | | | | | | | | | | | | | |
| 190.2 | Silty SAND, trace organics Very loose | | 1 | SS | 2 | | | | | | | | | | | |
| 1.2 | Brown | | | | | | | | | | | | | | | |
| 189.7 | Wet | | 2 | SS | 15 | | | | | | | | | | | |
| 1.7 | CLAYEY SILT, trace to some sand Stiff Brown Wet | | | | | | | | | | | | | | | |
| END OF BOREHOLE SPOON REFUSAL NOTES: 1. Water level in open borehole at ground surface (Elev. 191.4 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT "N" values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |

| PROJECT | | 09-1111-6014 | | RECORD OF DCPT No S304-DC01 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|---------------|---|--------------|--------|-----------------------------|------------|---|-----------------|---|----|----|----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|-----|
| W.P. | | 5404-05-01 | | LOCATION | | N 5079126.1 ; E 222799.5 | | ORIGINATED BY | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 15, 2012 | | CHECKED BY | | | | | | | | | |
| CN/TZ | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | | | | | | 100 |
| 191.1 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | 191 | | | | | | | | | | |
| | | | | | | | 190 | | | | | | | | | | |
| 189.2 | END OF DCPT | | | | | | | | | | | | | | | | |
| 1.9 | Refusal to Further Penetration (53 Blows / 0.08 m) | | | | | | | | | | | | | | | | |
| | NOTE: 1. Borehole advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S304-DC02 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|----------------------|---|---|--------|------|----------------------------|-------------------|---|--------------------|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION N 5079150.1 ; E 222828.6 | | | | ORIGINATED BY ARM | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | | | COMPILED BY MAS | | | | | | | | | | |
| DATUM Geodetic | | DATE January 15, 2012 | | | | CHECKED BY CN/TZ | | | | | | | | | | |
| 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 | | | | | | | | |
| 191.4 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 189.9 | END OF DCPT Refusal to Further Penetration (50 Blows / 0.25 m) | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 1.5 | NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

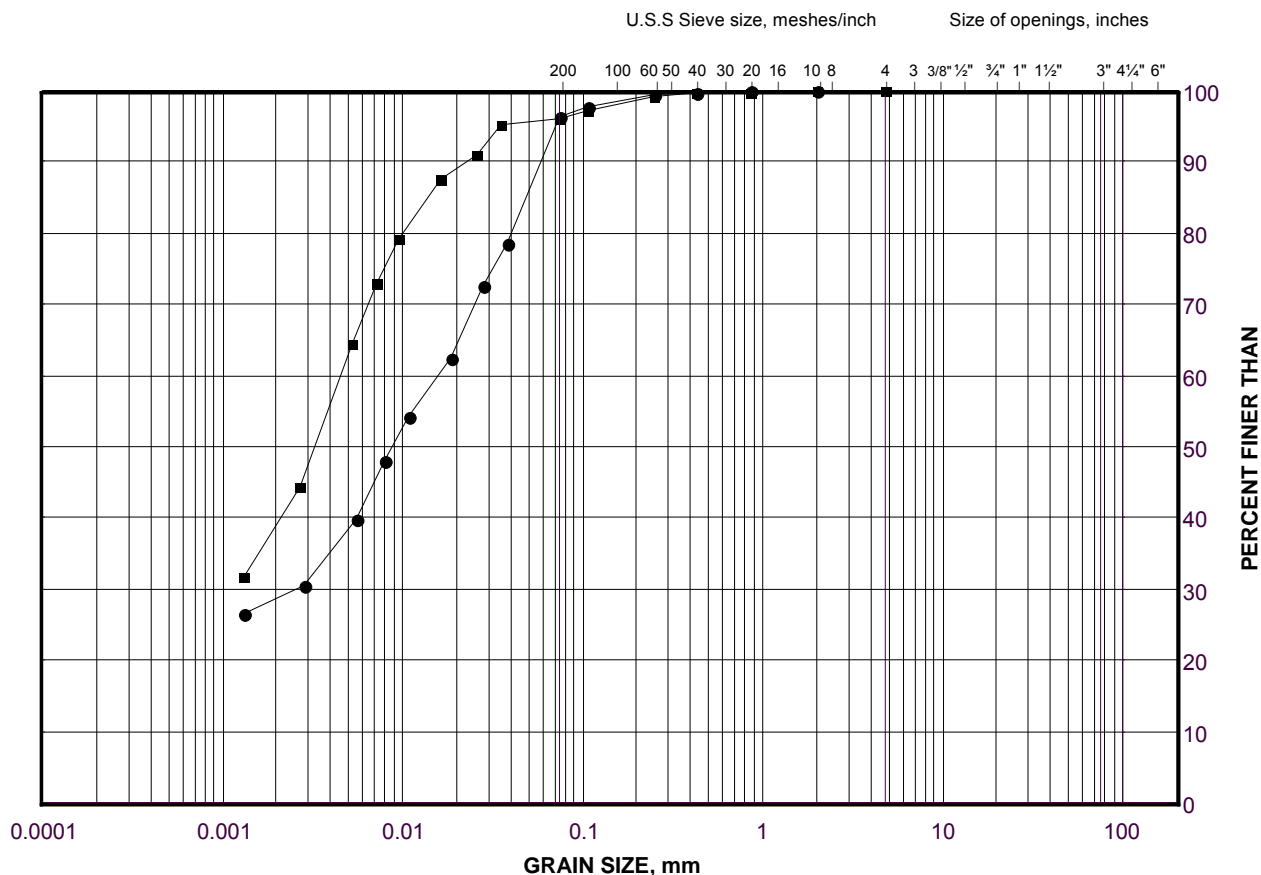
| PROJECT 09-1111-6014 | | RECORD OF DCPT No S304-DC03 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|----------------------|---|---|--------|-------------------|-------------------------|-----------------|--|--------------------|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 5404-05-01 | | LOCATION N 5079125.5 ; E 222840.2 | | ORIGINATED BY ARM | | | | | | | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 16, 2012 | | CHECKED BY CN/TZ | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | |
| 191.6 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | |
| 189.4 | END OF DCPT Refusal to Further Penetration (53 Blows / 0.05 m) | | | | | | | | | | | | | | | |
| 2.2 | NOTE: 1. Borehole advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | |

GRAIN SIZE DISTRIBUTION

Clayey Silt

Highway 69 (NBL) STA 16+875 to 16+925 (Swamp 304)

FIGURE D.S304-01



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

LEGEND

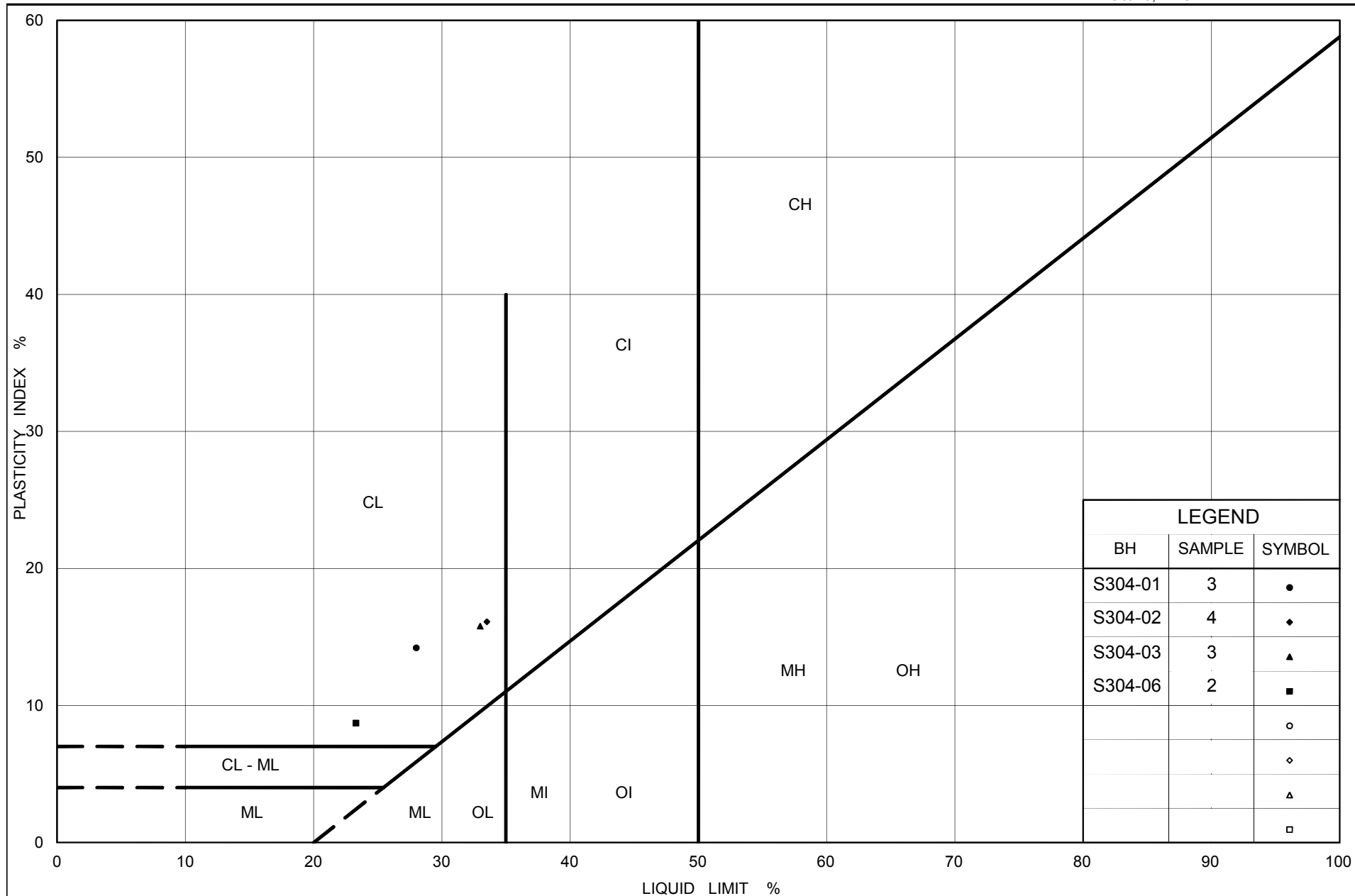
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S304-01 | 3 | 189.8 |
| ■ | S304-02 | 4 | 189.1 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 06-Nov-12



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt

Highway 69 (NBL) STA 16+875 to 16+925 (Swamp 304)

Figure No. D.S304-02

Project No. 09-1111-6014

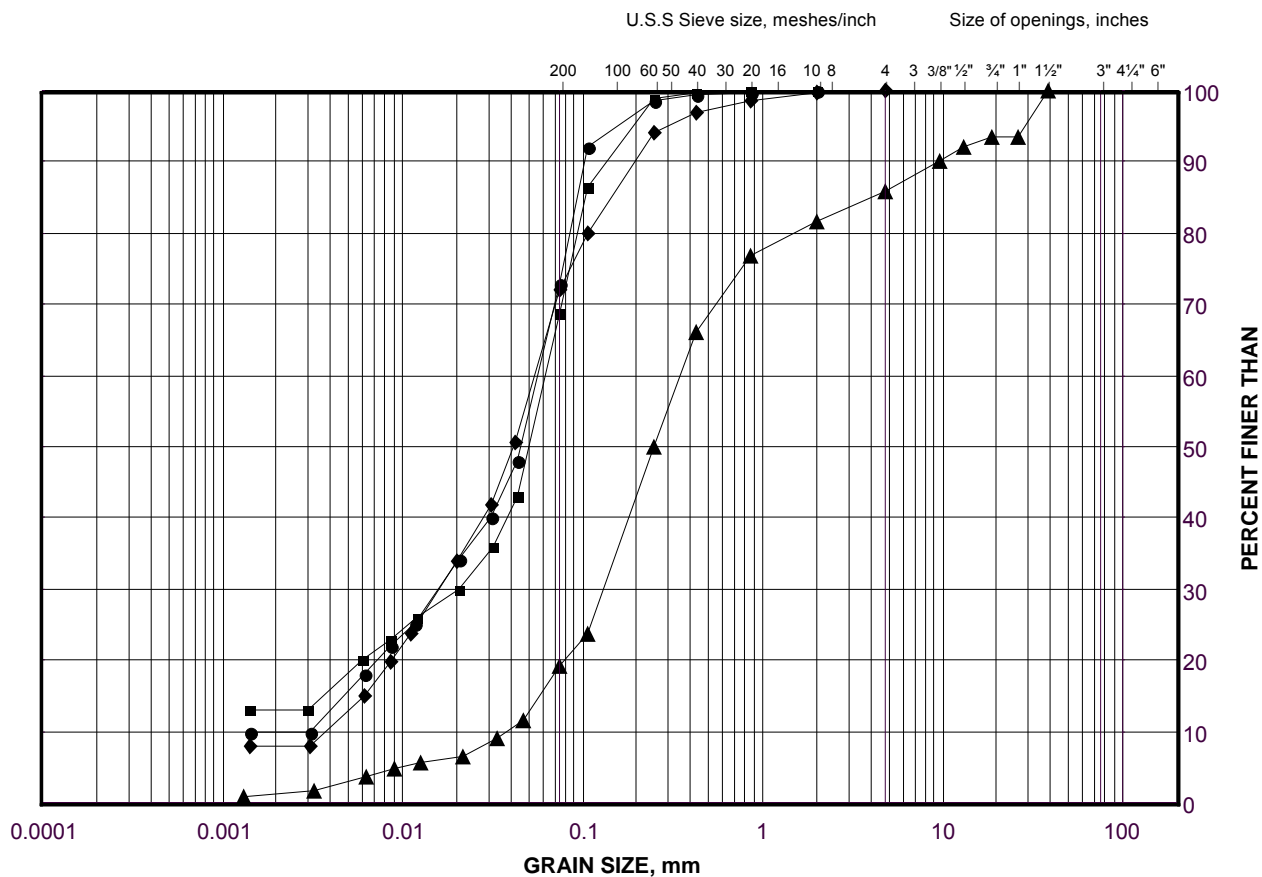
Checked By: TZ

GRAIN SIZE DISTRIBUTION

Sandy Silt to Sand

Highway 69 (NBL) STA 16+875 to 16+925 (Swamp 304)

FIGURE D.S304-03



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S304-05 | 1 | 191.6 |
| ■ | S304-02 | 2 | 190.3 |
| ◆ | S304-03 | 4 | 188.6 |
| ▲ | S304-03 | 6 | 187.6 |

Project Number: 09-1111-6014

Checked By: TZ

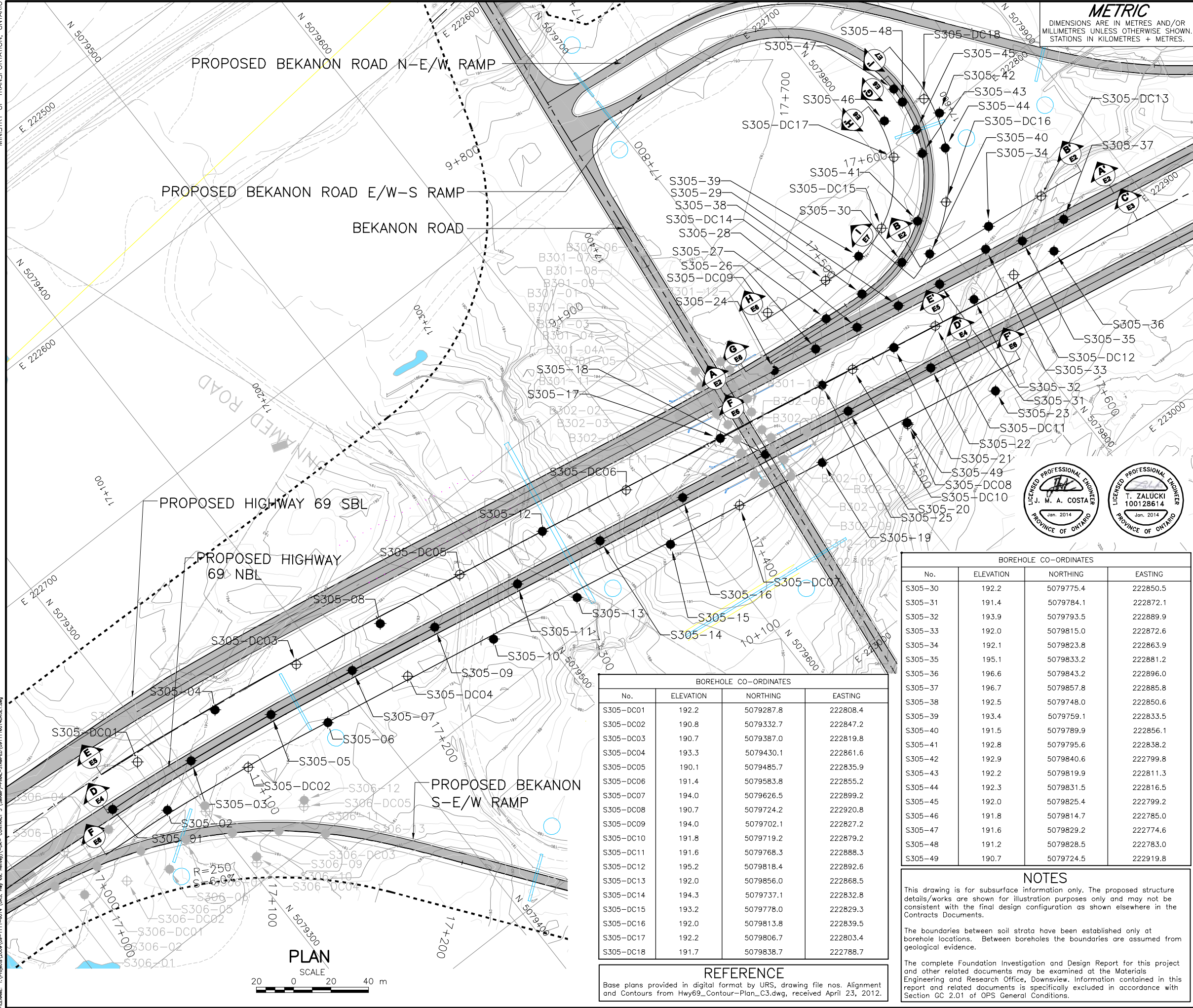
Golder Associates

Date: 06-Nov-12



APPENDIX E

Highway 69 SBL – STA 17+425 to 17+635,
Highway 69 NBL – STA 17+025 to 17+550 and
Bekanon Road E/W-S Ramp – STA 17+485 to 17+650
(Swamp 305)



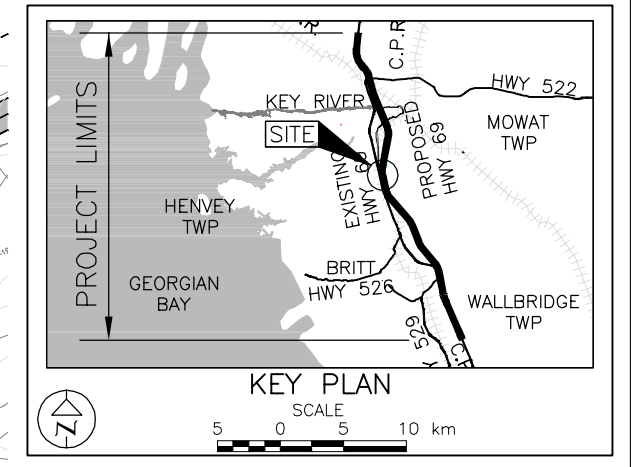
METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
WP No. 5404-05-01


HIGHWAY 69 and BEKANON ROAD
STA 17+425 TO 17+635 (SBL)
STA 17+025 TO 17+550 (NBL)
STA 17+485 TO 17+650 (E/W-S RAMP)
BOREHOLE LOCATIONS



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

 Borehole - Current Investigation

 Dynamic Cone Penetration Test

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-DC01 | 192.2 | 5079287.8 | 222808.4 |
| S305-DC02 | 190.8 | 5079332.7 | 222847.2 |
| S305-DC03 | 190.7 | 5079387.0 | 222819.8 |
| S305-DC04 | 193.3 | 5079430.1 | 222861.6 |
| S305-DC05 | 190.1 | 5079485.7 | 222835.9 |
| S305-DC06 | 191.4 | 5079583.8 | 222855.2 |
| S305-DC07 | 194.0 | 5079626.5 | 222899.2 |
| S305-DC08 | 190.7 | 5079724.2 | 222920.8 |
| S305-DC09 | 194.0 | 5079702.1 | 222827.2 |
| S305-DC10 | 191.8 | 5079719.2 | 222879.2 |
| S305-DC11 | 191.6 | 5079768.3 | 222888.3 |
| S305-DC12 | 195.2 | 5079818.4 | 222892.6 |
| S305-DC13 | 192.0 | 5079856.0 | 222868.5 |
| S305-DC14 | 194.3 | 5079737.1 | 222832.8 |
| S305-DC15 | 193.2 | 5079778.0 | 222829.3 |
| S305-DC16 | 192.0 | 5079813.8 | 222839.5 |
| S305-DC17 | 192.2 | 5079806.7 | 222803.4 |
| S305-DC18 | 191.7 | 5079838.7 | 222788.7 |

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-30 | 192.2 | 5079775.4 | 222850.5 |
| S305-31 | 191.4 | 5079784.1 | 222872.1 |
| S305-32 | 193.9 | 5079793.5 | 222889.9 |
| S305-33 | 192.0 | 5079815.0 | 222872.6 |
| S305-34 | 192.1 | 5079823.8 | 222863.9 |
| S305-35 | 195.1 | 5079833.2 | 222881.2 |
| S305-36 | 196.6 | 5079843.2 | 222896.0 |
| S305-37 | 196.7 | 5079857.8 | 222885.8 |
| S305-38 | 192.5 | 5079748.0 | 222850.6 |
| S305-39 | 193.4 | 5079759.1 | 222833.5 |
| S305-40 | 191.5 | 5079789.9 | 222856.1 |
| S305-41 | 192.8 | 5079795.6 | 222838.2 |
| S305-42 | 192.9 | 5079840.6 | 222799.8 |
| S305-43 | 192.2 | 5079819.9 | 222811.3 |
| S305-44 | 192.3 | 5079831.5 | 222816.5 |
| S305-45 | 192.0 | 5079825.4 | 222799.2 |
| S305-46 | 191.8 | 5079814.7 | 222785.0 |
| S305-47 | 191.6 | 5079829.2 | 222774.6 |
| S305-48 | 191.2 | 5079828.5 | 222783.0 |
| S305-49 | 190.7 | 5079724.5 | 222919.8 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

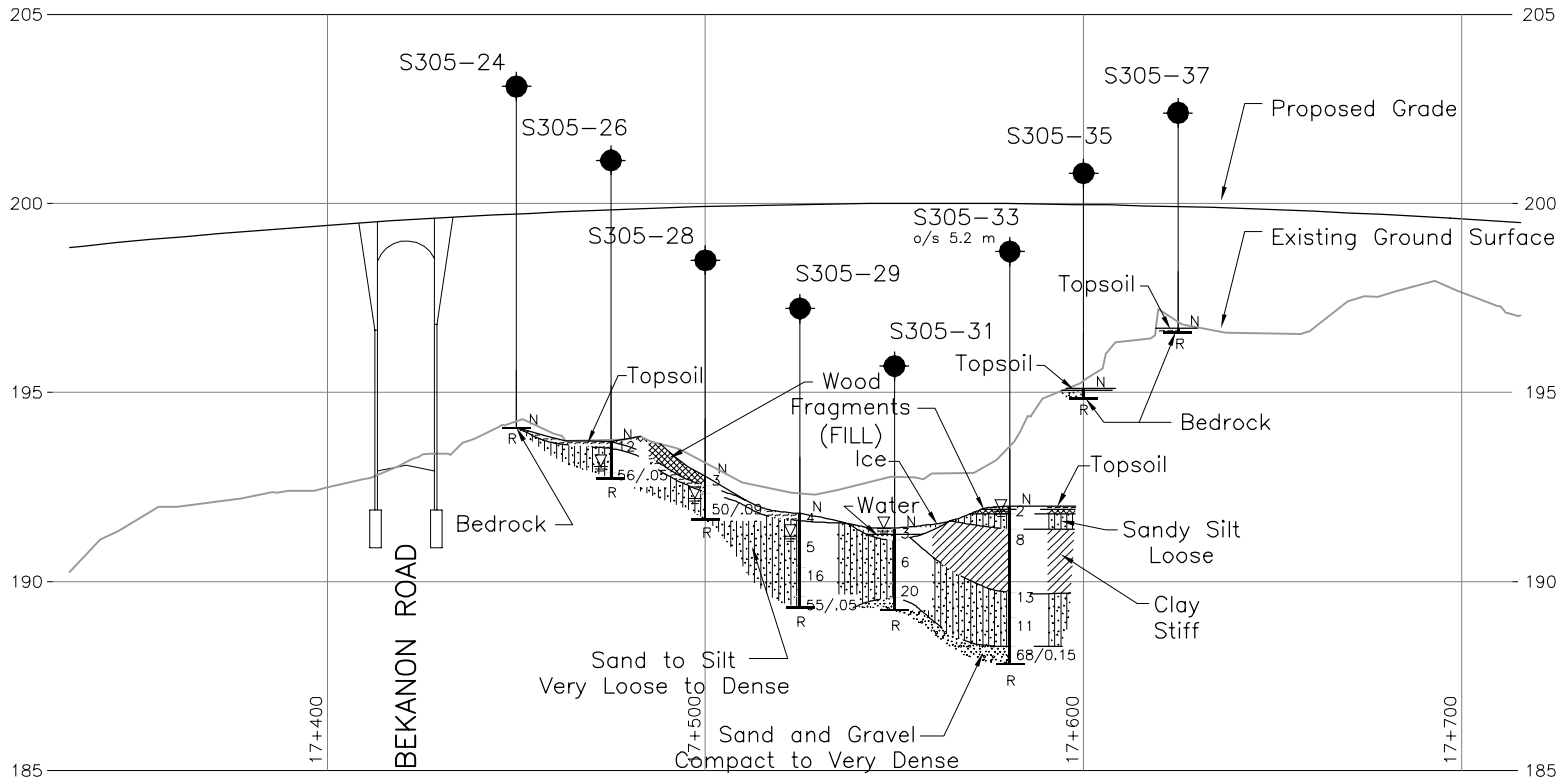
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS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

REFERENCE

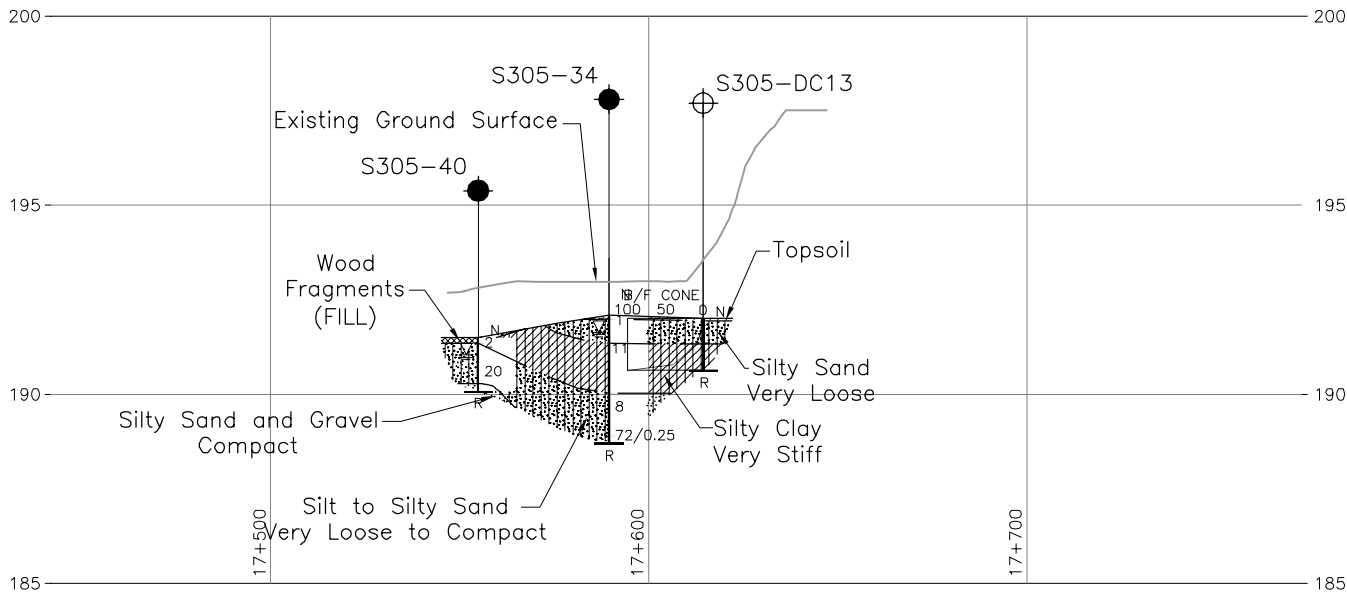
Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012.

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-01 | 193.4 | 5079261.6 | 222820.2 |
| S305-02 | 190.7 | 5079284.4 | 222838.6 |
| S305-03 | 190.7 | 5079310.7 | 222825.6 |
| S305-04 | 190.8 | 5079337.6 | 222812.1 |
| S305-05 | 190.7 | 5079359.7 | 222832.5 |
| S305-06 | 190.7 | 5079381.0 | 222854.8 |
| S305-07 | 191.7 | 5079408.6 | 222840.8 |
| S305-08 | 192.2 | 5079435.8 | 222830.3 |
| S305-09 | 191.5 | 5079457.6 | 222849.8 |
| S305-10 | 190.2 | 5079478.5 | 222874.4 |
| S305-11 | 187.0 | 5079506.8 | 222858.9 |
| S305-12 | 187.2 | 5079534.8 | 222845.0 |
| S305-13 | 187.7 | 5079527.5 | 222884.4 |
| S305-14 | 189.2 | 5079556.0 | 222868.1 |
| S305-15 | 194.1 | 5079584.5 | 222892.9 |
| S305-16 | 194.6 | 5079605.1 | 222877.2 |
| S305-17 | 192.9 | 5079640.6 | 222864.6 |
| S305-18 | 194.7 | 5079654.3 | 222886.3 |
| S305-19 | 192.0 | 5079675.6 | 222908.6 |
| S305-20 | 191.1 | 5079703.5 | 222895.4 |
| S305-21 | 191.2 | 5079743.8 | 222883.8 |
| S305-22 | 191.2 | 5079752.6 | 222904.5 |
| S305-23 | 195.1 | 5079772.3 | 222935.6 |
| S305-24 | 194.1 | 5079685.7 | 222853.9 |
| S305-25 | 193.6 | 5079701.0 | 222875.8 |
| S305-26 | 193.7 | 5079710.3 | 222858.4 |
| S305-27 | 193.6 | 5079724.7 | 222849.2 |
| S305-28 | 192.8 | 5079734.9 | 222863.0 |
| S305-29 | 191.8 | 5079759.5 | 222867.6 |

| NO. | DATE | BY | REVISION |
|---------------------|----------|----------------|--------------------------------|
| Geocres No. 41H-134 | | | |
| HWY. 69 | | | PROJECT NO. 09-1111-6014 DIST. |
| SUBM'D. CC | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: LL/JFC | CHKD. CN | APPD. JPD/JMAC | DWG. E1 |



A-A'
E1
CENTRELINE PROFILE
HIGHWAY 69 (SBL)
HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m



B-B'
E1
EMBANKMENT TOE PROFILE
HIGHWAY 69 (SBL)
HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m

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

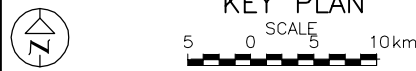
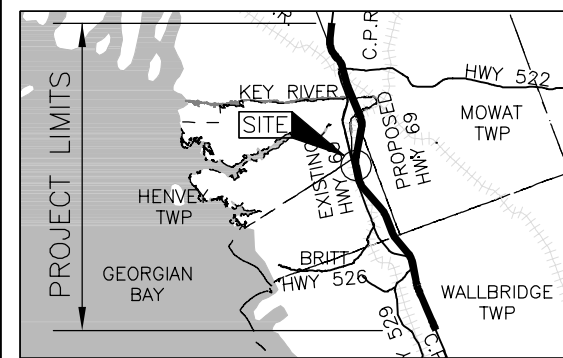
CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 17+425 TO 17+635 (SBL)
SOIL STRATA

SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling
- R Refusal

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-24 | 194.1 | 5079685.7 | 222853.9 |
| S305-26 | 193.7 | 5079710.3 | 222858.4 |
| S305-28 | 192.8 | 5079734.9 | 222863.0 |
| S305-29 | 191.8 | 5079759.5 | 222867.6 |
| S305-31 | 191.4 | 5079784.1 | 222872.1 |
| S305-33 | 192.0 | 5079815.0 | 222872.6 |
| S305-34 | 192.1 | 5079823.8 | 222863.9 |
| S305-35 | 195.1 | 5079833.2 | 222881.2 |
| S305-37 | 196.7 | 5079857.8 | 222885.8 |
| S305-40 | 191.5 | 5079789.9 | 222856.1 |
| S305-DC13 | 192.0 | 5079856.0 | 222868.5 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

REFERENCE

Proposed and Existing Grades obtained from URS drawing file Hwy69_profile March 2012.dwg, received March 14, 2012 and Existing Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012


| NO. | DATE | BY | REVISION | |
|---------------------|------|--------------------------|----------------|---------|
| Geocres No. 41H-134 | | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | | DIST. |
| SUBM'D. CC | | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | | CHKD. CN | APPD. JPD/JMAC | DWG. E2 |



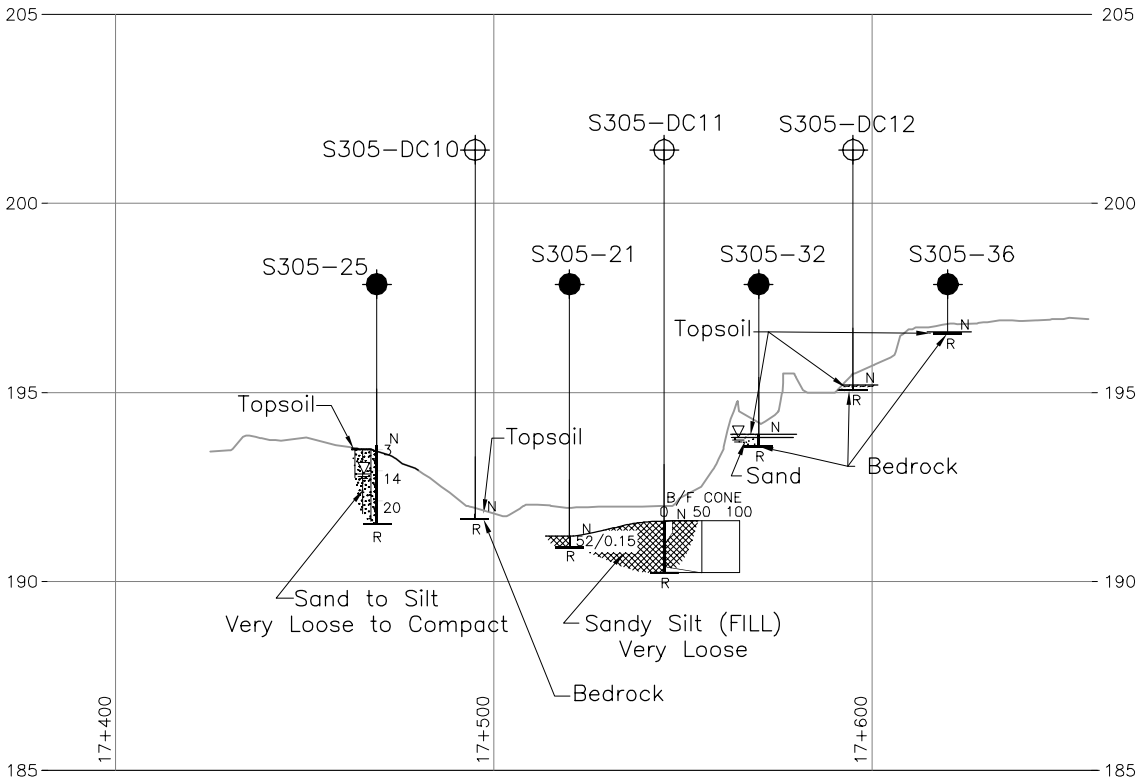
METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
WP No.5404-05-01

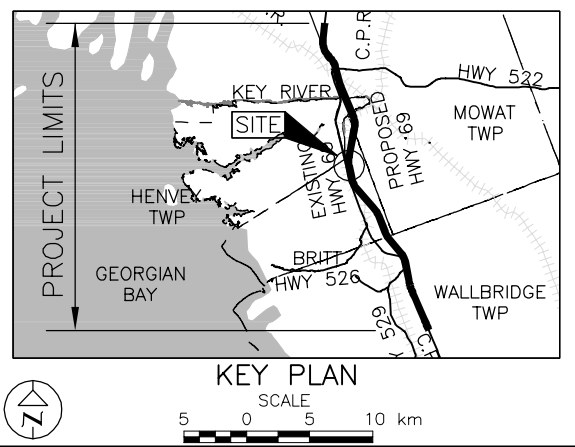
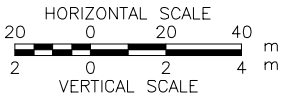
HIGHWAY 69
STA 17+425 TO 17+635 (SBL)
SOIL STRATA






Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



**EMBANKMENT TOE PROFILE
HIGHWAY 69 (SBL)**



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

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-21 | 191.2 | 5079743.8 | 222883.8 |
| S305-25 | 193.6 | 5079701.0 | 222875.8 |
| S305-32 | 193.9 | 5079793.5 | 222889.9 |
| S305-36 | 196.6 | 5079843.2 | 222896.0 |
| S305-DC10 | 191.8 | 5079719.2 | 222879.2 |
| S305-DC11 | 191.6 | 5079768.3 | 222888.3 |
| S305-DC12 | 195.2 | 5079818.4 | 222892.6 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

REFERENCE

Existing Ground Surface cut from contour plan provided in digital format by URS, drawing file no. Hwy69_Contour-Plan_C3.dwg, received April 23, 2012.



| NO. | DATE | BY | REVISION | |
|---------------------|------|--------------------------|----------------|---------|
| Geocres No. 41H-134 | | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | | DIST. |
| SUBM'D. CC | | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | | CHKD. CN | APPD. JPD/JMAC | DWG. E3 |

| | |
|---|-------|
| CONT No. WP No. 5404-05-01 | |
| HIGHWAY 69 STA 17+025 TO 17+550 (NBL) SOIL STRATA | SHEET |

KEY PLAN

PROJECT LIMITS

KEY RIVER

SITE

EXISTING HWY 69

PROPOSED HWY 69

C.P.R.

HWY 522

MOWAT TWP

HENVET TWP

BRITT

HWY 526

GEORGIAN BAY

WALLBRIDGE TWP

HWY 529

SCALE

0 5 10 km

North Arrow

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-01 | 193.4 | 5079261.6 | 222820.2 |
| S305-03 | 190.7 | 5079310.7 | 222825.6 |
| S305-05 | 190.7 | 5079359.7 | 222832.5 |
| S305-07 | 191.7 | 5079408.6 | 222840.8 |
| S305-09 | 191.5 | 5079457.6 | 222849.8 |
| S305-11 | 187.0 | 5079506.8 | 222858.9 |
| S305-14 | 189.2 | 5079556.0 | 222868.1 |
| S305-16 | 194.6 | 5079605.1 | 222877.2 |
| S305-18 | 194.7 | 5079654.3 | 222886.3 |
| S305-20 | 191.1 | 5079703.5 | 222895.4 |
| S305-22 | 191.2 | 5079752.6 | 222904.5 |

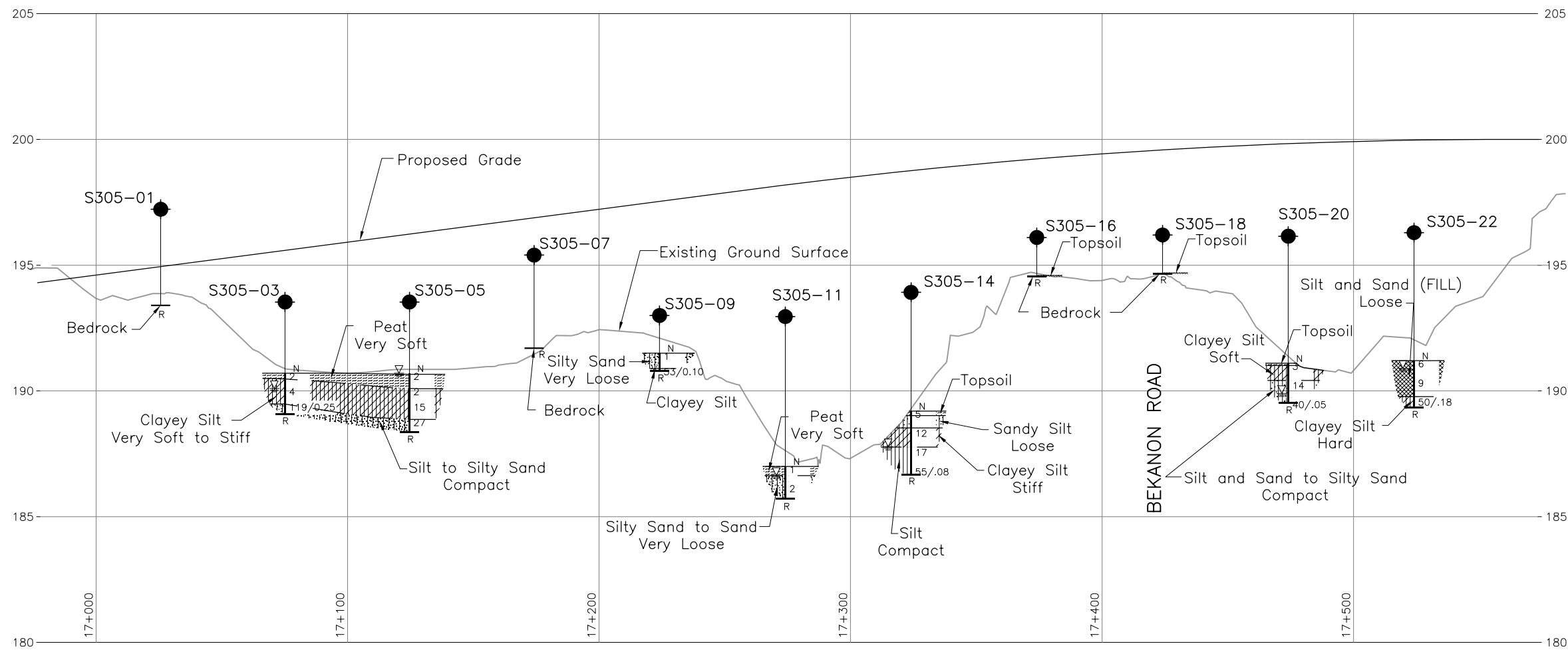
NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

| | | | |
|---|----------|--------------------------|----------|
| <h1>REFERENCE</h1> | | | |
| Existing Ground Surface cut from contour plan provided in digital format by URS, drawing file no. Hwy69_Contour-Plan_C3.dwg, received April 23, 2012. | | | |
| NO. | DATE | BY | REVISION |
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | DIST. |
| SUBM'D. CC | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | CHKD. CN | APPD. JPD/JMAC | DWG. E4 |



D-D'
E1

CENTRELINE PROFILE
HIGHWAY 69 (NBL)

HORIZONTAL SCALE
20 0 20 40 m


VERTICAL SCALE
2 0 2 4 m



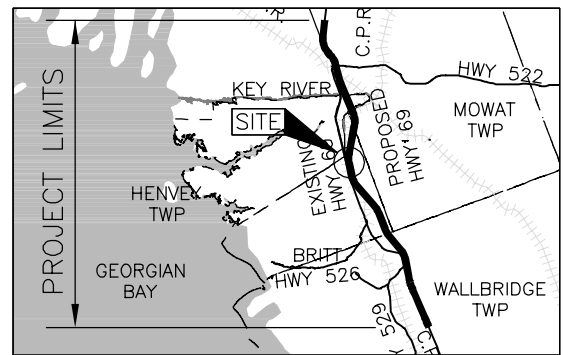
METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
WP No.5404-05-01

HIGHWAY 69
STA 17+025 TO 17+550 (NBL)
SOIL STRATA



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

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

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-04 | 190.8 | 5079337.6 | 222812.1 |
| S305-08 | 192.2 | 5079435.8 | 222830.3 |
| S305-12 | 187.2 | 5079534.8 | 222845.0 |
| S305-17 | 192.9 | 5079640.6 | 222864.6 |
| S305-21 | 191.2 | 5079743.8 | 222883.8 |
| S305-25 | 193.6 | 5079701.0 | 222875.8 |
| S305-DC01 | 192.2 | 5079287.8 | 222808.4 |
| S305-DC03 | 190.7 | 5079387.0 | 222819.8 |
| S305-DC05 | 190.1 | 5079485.7 | 222835.9 |
| S305-DC06 | 191.4 | 5079583.8 | 222855.2 |
| S305-DC10 | 191.8 | 5079719.2 | 222879.2 |
| S305-DC11 | 191.6 | 5079768.3 | 222888.3 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

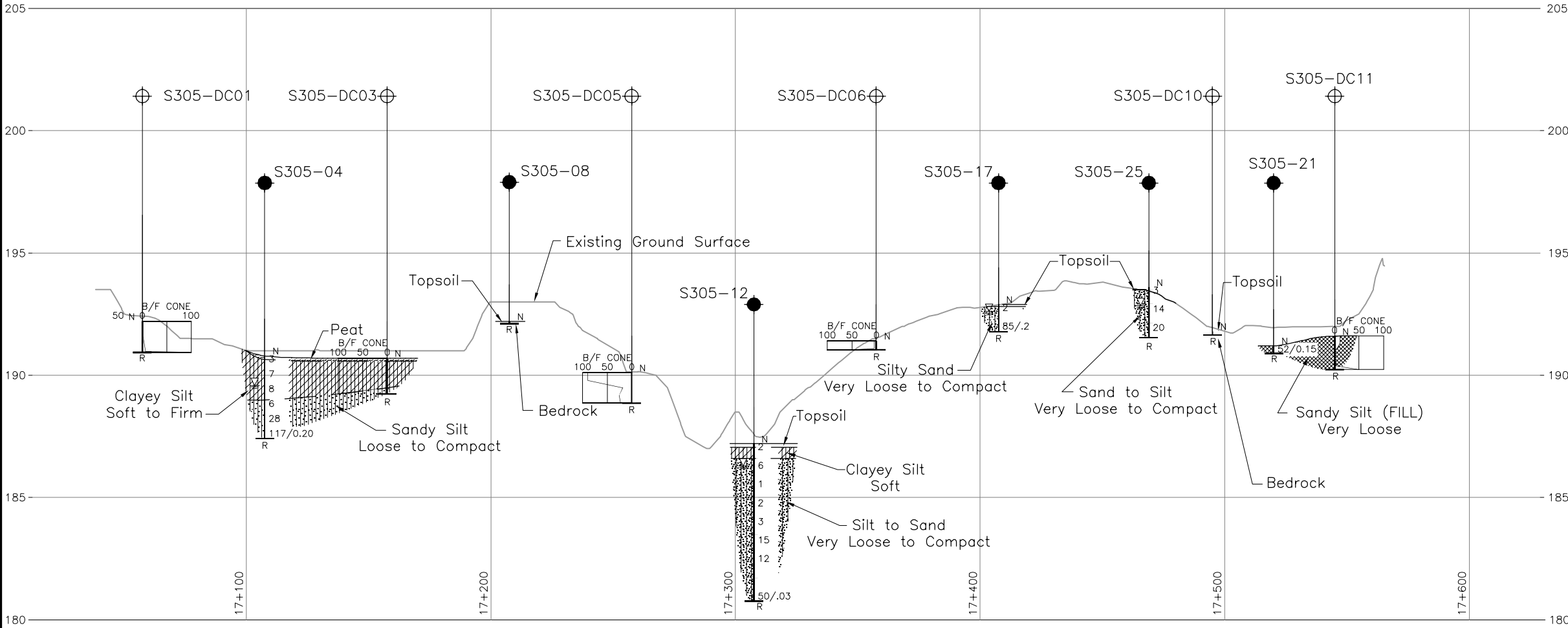
The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

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

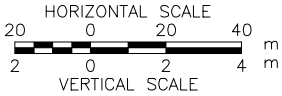
REFERENCE

Existing Ground Surface cut from contour plan provided in digital format by URS, drawing file no. Hwy69_Contour-Plan_C3.dwg, received April 23, 2012.

| NO. | DATE | BY | REVISION |
|---------------------|----------|--------------------------|----------|
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | |
| SUBM'D. CC | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | CHKD. CN | APPD. JPD/JMAC | DWG. E5 |



**EMBANKMENT TOE PROFILE
HIGHWAY 69 (NBL)**



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

CONT No.
WP No. 5404-05-01

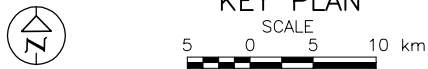
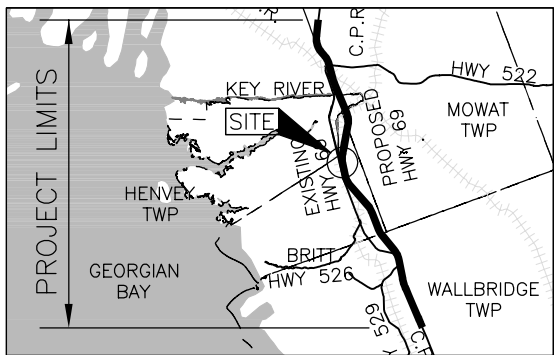
HIGHWAY 69
STA 17+025 TO 17+550 (NBL)

SOIL STRATA

SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling
- R Refusal

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-02 | 190.7 | 5079284.4 | 222838.6 |
| S305-06 | 190.7 | 5079381.0 | 222854.8 |
| S305-10 | 190.2 | 5079478.5 | 222874.4 |
| S305-13 | 187.7 | 5079527.5 | 222884.4 |
| S305-15 | 194.1 | 5079584.5 | 222892.9 |
| S305-19 | 192.0 | 5079675.6 | 222908.6 |
| S305-23 | 195.1 | 5079772.3 | 222935.6 |
| S305-49 | 190.7 | 5079724.5 | 222919.8 |
| S305-DC02 | 190.8 | 5079332.7 | 222847.2 |
| S305-DC04 | 193.3 | 5079430.1 | 222861.6 |
| S305-DC07 | 194.0 | 5079626.5 | 222899.2 |
| S305-DC08 | 190.7 | 5079724.2 | 222920.8 |

REFERENCE

Existing Ground Surface cut from contour plan provided in digital format by URS, drawing file no. Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 .

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

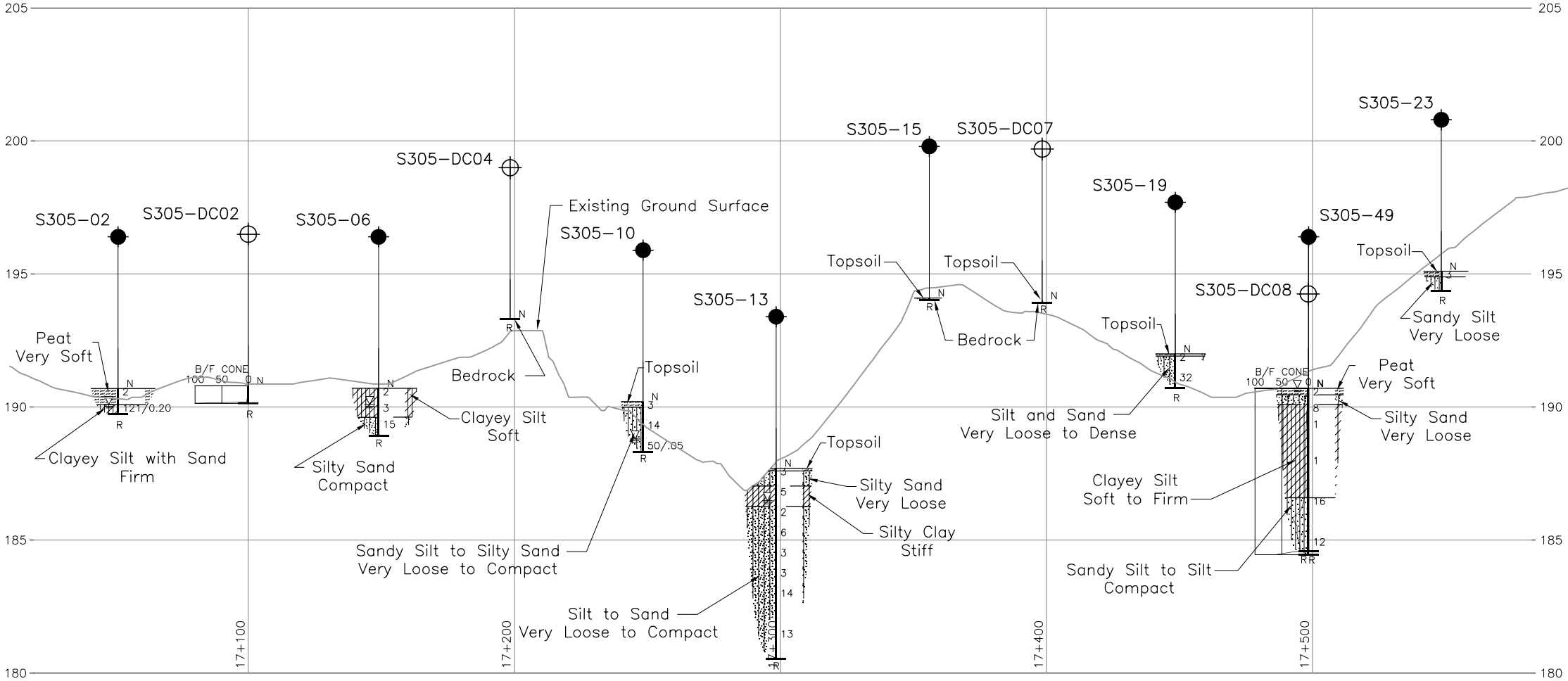
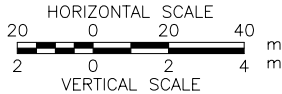
The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

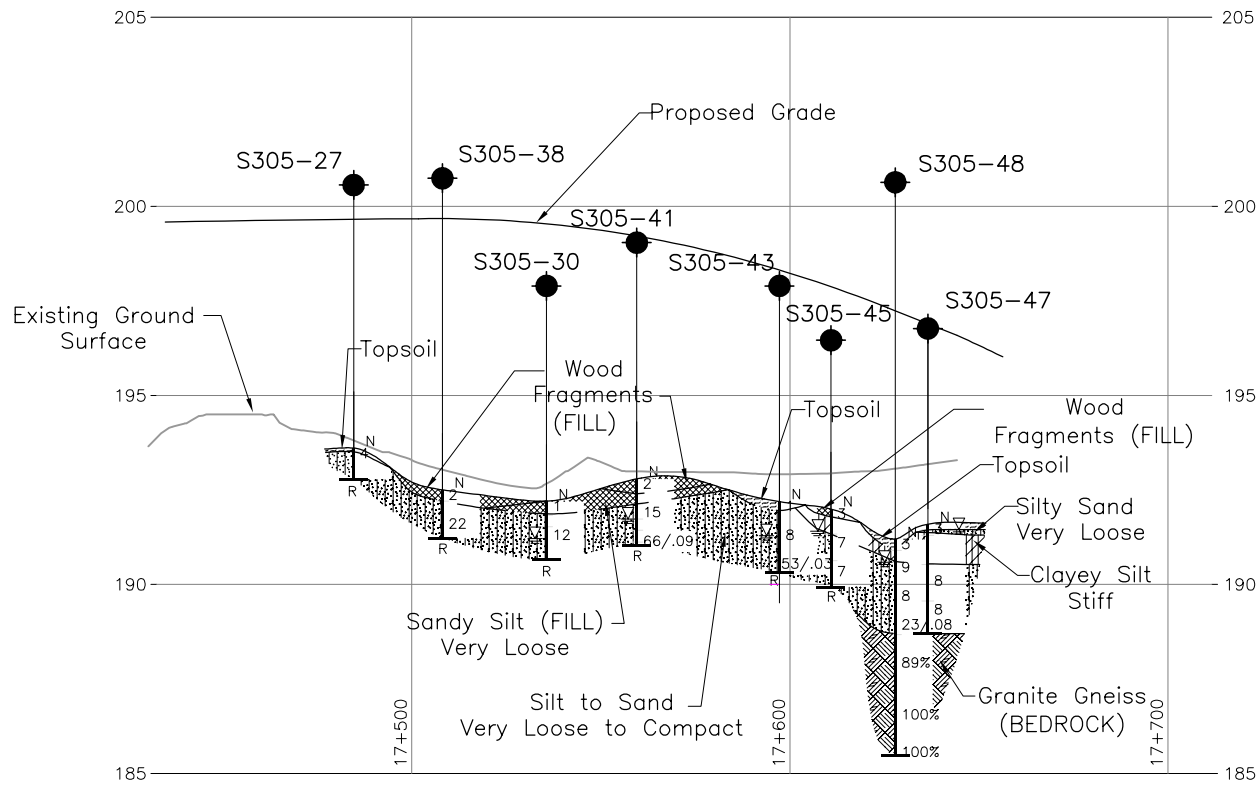
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS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

| NO. | DATE | BY | REVISION | |
|---------------------|------|--------------------------|----------------|---------|
| Geocres No. 41H-134 | | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | | DIST. |
| SUBM'D. CC | | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | | CHKD. CN | APPD. JPD/JMAC | DWG. E6 |



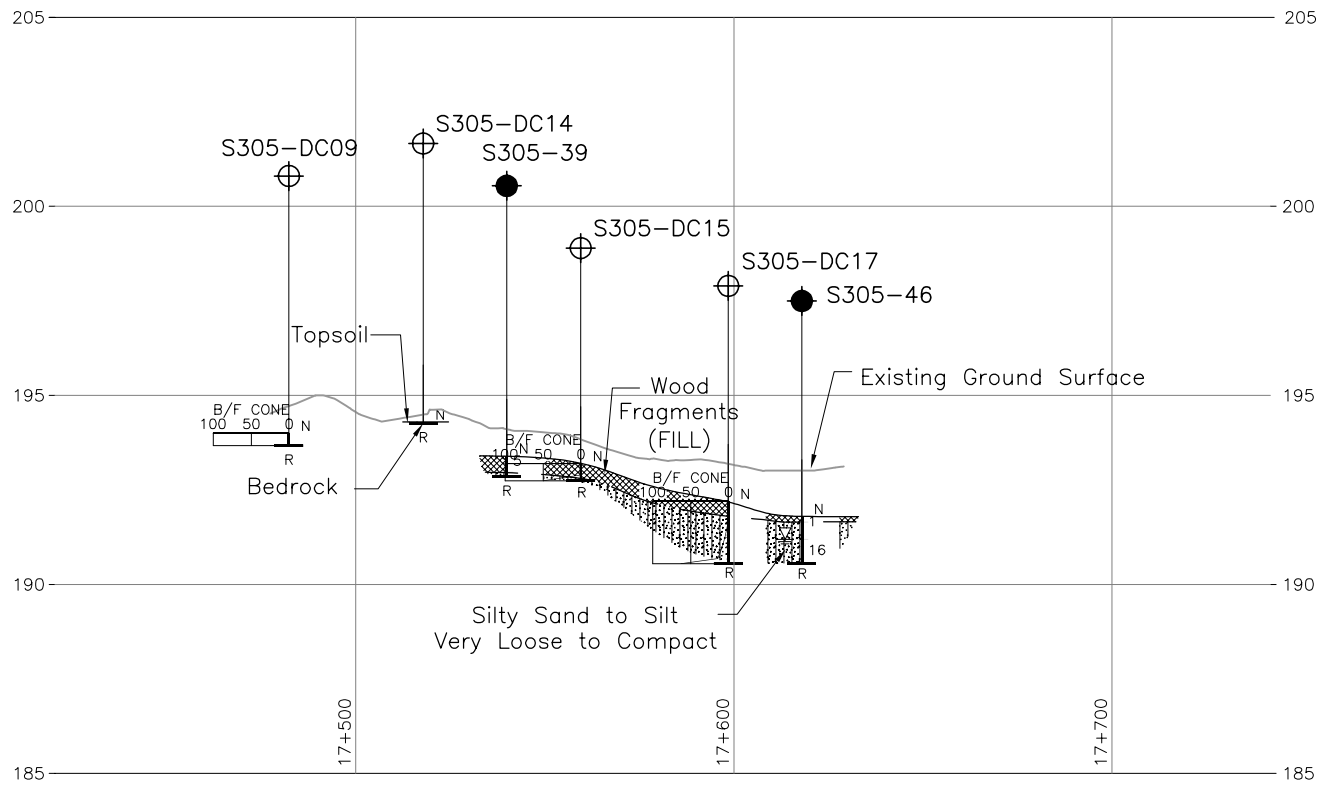
**EMBANKMENT TOE PROFILE
HIGHWAY 69 (NBL)**





G-G'
E1 CENTRELINE PROFILE
BEKANON ROAD E/W-S RAMP

HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m



H-H'
E1 EMBANKMENT TOE PROFILE
BEKANON ROAD E/W-S RAMP

HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m

REFERENCE
Proposed and Existing Grades obtained from URS drawing file
Hwy69_profile March 2012.dwg, received March 14, 2012 and Existing
Ground Surface cut from contour drawing file
Hwy69_Contour-Plan_C3.dwg, received April 23, 2012

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

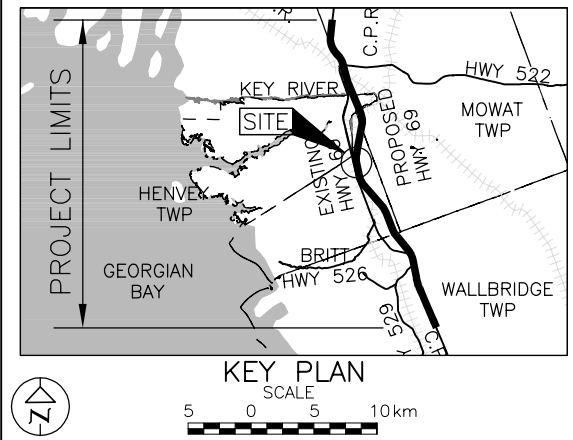
CONT No.
WP No. 5404-05-01

BEKANON ROAD E/W-S RAMP
STA 17+485 TO 17+650 (RAMP)

SOIL STRATA



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



| LEGEND | | | |
|--------|--|--|--|
| ● | Borehole – Current Investigation | | |
| ⊕ | Dynamic Cone Penetration Test | | |
| N | Standard Penetration Test Value | | |
| 16 | Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow) | | |
| 100% | Rock Quality Designation (RQD) | | |
| ▽ | WL upon completion of drilling | | |
| R | Refusal | | |

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-27 | 193.6 | 5079724.7 | 222849.2 |
| S305-30 | 192.2 | 5079775.4 | 222850.5 |
| S305-38 | 192.5 | 5079748.0 | 222850.6 |
| S305-39 | 193.4 | 5079759.1 | 222833.5 |
| S305-41 | 192.8 | 5079795.6 | 222838.2 |
| S305-43 | 192.2 | 5079819.9 | 222811.3 |
| S305-45 | 192.0 | 5079825.4 | 222799.2 |
| S305-46 | 191.8 | 5079814.7 | 222785.0 |
| S305-47 | 191.6 | 5079829.2 | 222774.6 |
| S305-48 | 191.2 | 5079828.5 | 222783.0 |
| S305-DC09 | 194.0 | 5079702.1 | 222827.2 |
| S305-DC14 | 194.3 | 5079737.1 | 222832.8 |
| S305-DC15 | 193.2 | 5079778.0 | 222829.3 |
| S305-DC17 | 192.2 | 5079806.7 | 222803.4 |

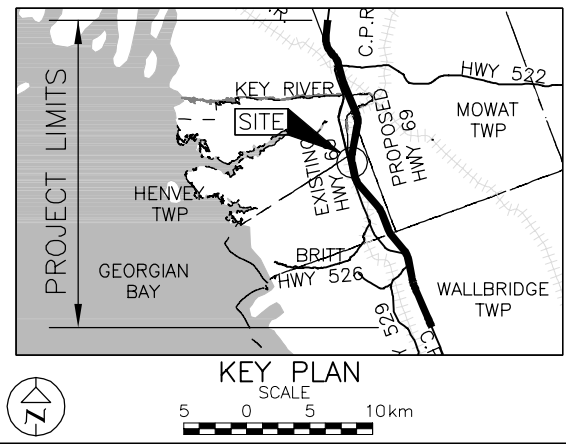
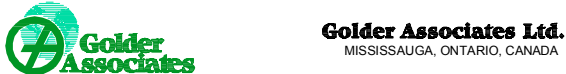
NOTES
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.
The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.






| NO. | DATE | BY | REVISION | |
|---------------------|------|--------------------------|----------------|---------|
| Geocres No. 41H-134 | | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | | DIST. |
| SUBM'D. CC | | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | | CHKD. CN | APPD. JPD/JMAC | DWG. E7 |

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

| | | |
|--|--|-------|
| CONT No. WP No. 5404-05-01 | | |
| BEKANON ROAD E/W-S RAMP STA 17+485 TO 17+650 (RAMP) | | SHEET |
| SOIL STRATA | | |



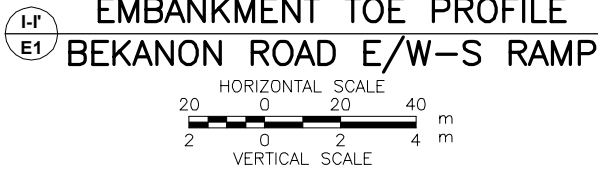
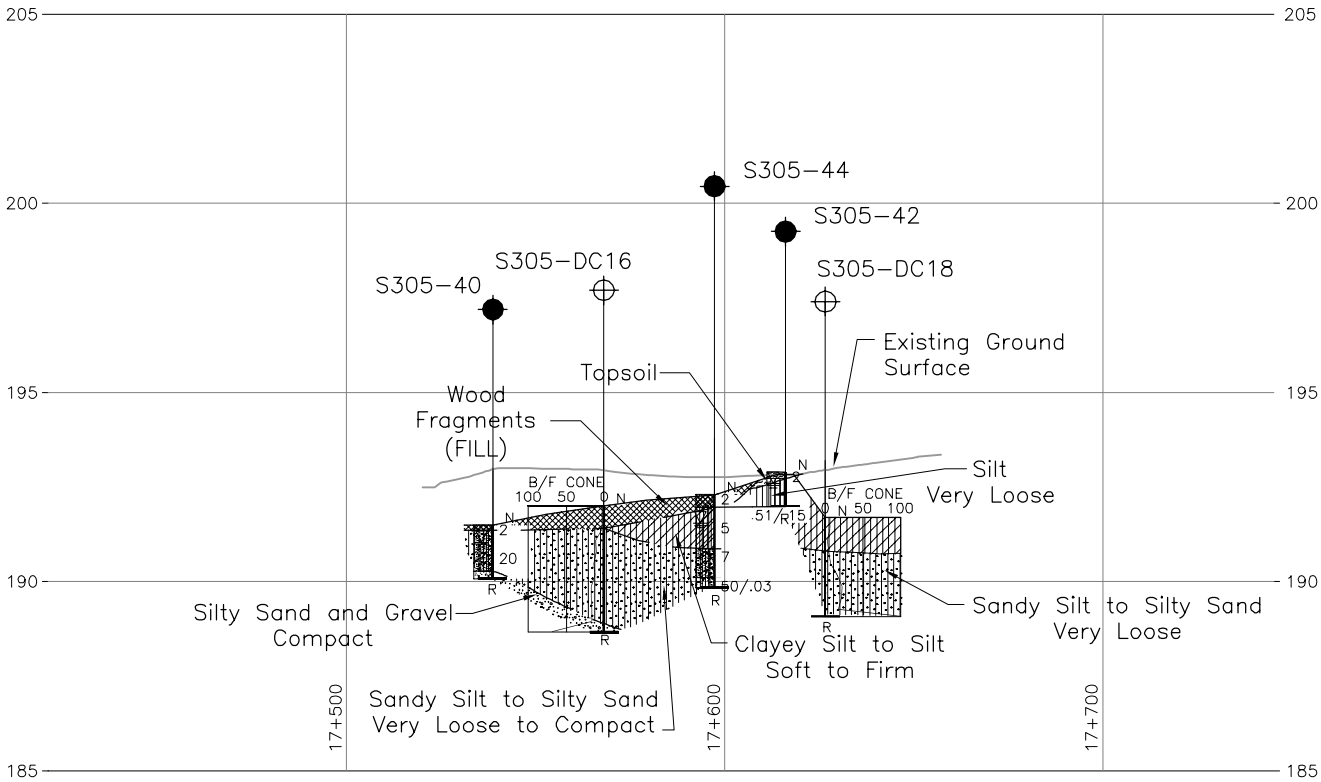
| LEGEND | |
|---|--|
|  | Borehole - Current Investigation |
|  | Dynamic Cone Penetration Test |
| N | Standard Penetration Test Value |
| 16 | Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow) |
|  | WL upon completion of drilling |
| R | Refusal |

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S305-40 | 191.5 | 5079789.9 | 222856.1 |
| S305-42 | 192.9 | 5079840.6 | 222799.8 |
| S305-44 | 192.3 | 5079831.5 | 222816.5 |
| S305-DC16 | 192.0 | 5079813.8 | 222839.5 |
| S305-DC18 | 191.7 | 5079838.7 | 222788.7 |

| REFERENCE | |
|---|--|
| Existing Ground Surface cut from contour plan provided in digital format by URS, drawing file no. Hwy69_Contour-Plan_C3.dwg, received April 23, 2012. | |

| NOTES | |
|---|--|
| This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents. | |
| The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence. | |
| The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions. | |




| NO. | DATE | BY | REVISION | |
|---------------------|------|--------------------------|----------------|---------|
| Geocres No. 41H-134 | | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | | DIST. |
| SUBM'D. CC | | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | | CHKD. CN | APPD. JPD/JMAC | DWG. E8 |





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

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-02 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079284.4 ; E 222838.6</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 12, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---|---|---|---------|------|------------|---|-----------------|---|----|----|----|-----|---|---|----------------|---|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | | | | |
| 190.7 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Fibrous) Very soft Black Moist |  | 1 | SS | 2 |  | | | | | | | | | | | | | | |
| 190.1 | | | | | | | | | | | | | | | | | | | | |
| 189.7 | CLAYEY SILT with sand Firm Grey Wet |  | 2 | SS | 121/0.20 | | | | | | | | | | | | | | | |
| 1.0 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | | | | |
| <div>NOTE:</div> <div>1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 190.1 m) upon completion of drilling.</div> | | | | | | | | | | | | | | | | | | | | |






| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-03 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079310.7 ; E 222825.6</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 11, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|--|--|--|--------------------------------------|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | | | | | | | | | | | | | |
| 190.7 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Fibrous) | | | | | | | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace sand, trace organics to a depth of 0.8 m Soft to firm Grey Wet | | 1 | SS | 2 | ▽ | 190 | | | | | | | | | | | | | |
| 189.5 | | | 2 | SS | 4 | | | | | | | | | | | | | | | |
| 189.1 | Silty SAND Compact Grey Wet | | 3 | SS | 119/0.25 | | | | | | | | | | | | | | | |
| 1.6 | END OF BOREHOLE SPOON REFUSAL NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 190.1 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-04 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|-------------|--|----------|--|------------------|--|------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATUM | | DATE | | CHECKED BY | |
| 09-1111-6014 | | N 5079337.6 ; E 222812.1 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | BM | | Geodetic | | January 11, 2012 | | CN | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|-----|----|---|----|--|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | |
| 190.8 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Fibrous) | | | | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace to some sand Soft to firm Grey Moist becoming wet below a depth of 1.2 m | | 1 | SS | 3 | | | | | | | | | | | | |
| | | | 2 | SS | 7 | | | | | | | | | | | | |
| | | | 3 | SS | 8 | | | | | | | | | | | | |
| 189.0 | Sandy SILT, trace gravel, trace clay Loose to compact Grey Wet | | 4 | SS | 6 | | | | | | | | | | | | |
| 1.8 | | | 5 | SS | 28 | | | | | | | | | | | | |
| | | | 6 | SS | 117/0.20 | | | | | | | | | | | | |
| 187.4 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| 3.4 | NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 189.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-05 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079359.7 ; E 222832.5</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 11, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | |
|---------------|---|---|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|---|---|---|--|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | w _p w w _L | | | | | | | | |
| 190.7 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | | |
| 0.0 | PEAT (Fibrous) Very soft Black Wet |  | 1 | SS | 2 | | 190 | | | | | | | | | | | | | | |
| 190.1 | CLAYEY SILT, trace to some sand, containing organics Soft to stiff Grey Wet |  | 2 | SS | 2 | | | | | | | | |  | ○ | | | | | | |
| 0.6 | | | | 3 | SS | 15 | | | | | | | | | | | | | | | |
| 188.9 | SILT, some sand, some clay, trace gravel Compact Grey Wet |  | 4 | SS | 27 | | 189 | | | | | | | | ○ | | | 4 | 15 | 68 | 13 |
| 1.8 | | | | | | | | | | | | | | | | | | | | | |
| 188.4 | END OF BOREHOLE SPOON REFUSAL |  | | | | | | | | | | | | | | | | | | | |
| 2.3 | | | | | | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at ground surface (Elev. 190.7 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-06 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|--------------|-------|---|------------|---------------|------|--|-------------------------|--|---|-----------------|-----------------|-----------------|-----------------|-------------------|---------------------------------------|--|---|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5079381.0 ; E 222854.8 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | BM | | | | | | | | |
| Geodetic | | January 11, 2012 | | CN | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
| ELEV | DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | GR SA SI CL |
| | | | | | | | | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | | | |
| 190.7 | 0.0 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| | | CLAYEY SILT, some sand, trace organics | | 1 | SS | 2 | | 190 | | | | | | | | | | |
| | | Soft | | 2 | SS | 3 | | | | | | | | | | | | |
| | | Dark brown | | | | | | | | | | | | | | | | |
| | | Moist becoming wet below a depth of 0.6 m | | | | | | | | | | | | | | | | |
| 189.5 | 1.2 | Silty SAND, trace gravel, trace organics | | 3 | SS | 15 | | 189 | | | | | | | | | | |
| 188.9 | 1.8 | Compact | | | | | | | | | | | | | | | | |
| | | Grey | | | | | | | | | | | | | | | | |
| | | Wet | | | | | | | | | | | | | | | | |
| | | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| | | NOTE: | | | | | | | | | | | | | | | | |
| | | 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 190.1 m) upon completion of drilling. | | | | | | | | | | | | | | | | |



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

GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14





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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF BOREHOLE | | No S305-09 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|---------------|--|--------------------------|---------|---------------|------------|--|-----------------|--|---|-----------------|-----------------|-----------------|-------------------|-----------------|---------------------------------------|---|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5079457.6 ; E 222849.8 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | BM | | | | | | | |
| Geodetic | | January 15, 2012 | | CN | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | GR SA SI CL |
| | | | | | | | | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | | | |
| 191.5 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Silty SAND, trace organics Very loose Dark brown Moist | | 1 | SS | 1 | | 191 | | | | | | | | | | |
| 190.9 | | | 2 | SS | 53/0.10 | | | | | | | | | | | | |
| 0.7 | CLAYEY SILT, some sand, trace organics Brown Moist END OF BOREHOLE SPOON REFUSAL NOTES: 1. Open borehole dry upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT "N" values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-10 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|--|--|--------------------|--------|-------------------------|------------|-------------------------|-----------------|--|-----------------|---|---------------------------------|---------------------------------|---|---------------------------------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | COMPILED BY | | CHECKED BY | | | | | | | |
| DIST | | BOREHOLE TYPE | | DATE | | DATE | | DATE | | | | | | | |
| Geodetic | | January 12, 2012 | | January 12, 2012 | | January 12, 2012 | | January 12, 2012 | | | | | | | |
| SOIL PROFILE | | SAMPLES | | GROUND WATER CONDITIONS | | ELEVATION SCALE | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | UNIT WEIGHT | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | 20 40 60 80 100 | 20 40 60 80 100 | W _p W W _L | W _p W W _L | W _p W W _L | γ | GR SA SI CL | |
| 190.2 | GROUND SURFACE | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 3 | | 190 | | | | | | | | |
| 0.2 | Sandy SILT, trace clay, trace organics and rootlets | | 1B | | | | | | | | | | | | |
| 189.5 | Very loose Brown Moist | | | | | | | | | | | | | | |
| 0.7 | | | | | | | | | | | | | | | |
| 188.8 | SILT and SAND, trace clay Compact Brown Wet | | 2 | SS | 14 | | 189 | | | | | | | 0 39 56 5 | |
| 1.4 | | | | | | | | | | | | | | | |
| 188.3 | Silty SAND, containing sandy silt seams Compact Brown and grey Wet | | 3 | SS | 50/0.05 | | | | | | | | | | |
| 1.9 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.4 m below ground surface (Elev. 188.8 m) upon completion of drilling. | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-11 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|---|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | COMPILED BY | | CHECKED BY | | DATUM | | DATE | |
| 09-1111-6014 | | N 5079506.8 ; E 222858.9 | | MR | | HWY 69 | | 165 mm O.D. Continuous Flight Solid Stem Augers | |
| Geodetic | | January 12, 2012 | | CN | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|---|---------|------|------------|---|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 187.0 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Fibrous) |  | 1A | SS | 1 |  | | | | | | | | | | | |
| 186.6 | Very soft Brown Wet | | 1B | | | | | | | | | | | | | | |
| 0.6 | Silty SAND, trace organics, containing rootlets | | 2 | SS | 2 | | | | | | | | | | | | |
| 185.7 | Very loose Grey Wet | | | | | | | | | | | | | | | | |
| 1.3 | SAND, some silt, trace organics, containing rootlets | | | | | | | | | | | | | | | | |
| | Very loose Grey Wet | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.4 m below ground surface (Elev. 186.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-12 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|-------------------|---|--------------------|---------|--------------------------|------------|---|--------------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5079534.8 ; E 222845.0 | | ORIGINATED BY | | MR | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY | | | | | | | | | |
| DATUM Geodetic | | DATE | | January 12, 2012 | | CHECKED BY | | CN | | | | | | | | | |
| 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 | | | | | | | | | |
| 187.2 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace sand | | 1 | SS | 2 | | | | | | | | | | | | |
| 186.6 | Very soft Brown and grey Moist | | | | | | | | | | | | | | | | |
| 0.6 | Silty SAND, trace clay, trace organics Very loose to loose Grey Wet | | 2 | SS | 6 | | | | | | | | | | | | |
| | | | 3 | SS | 1 | | | | | | | | | | | | |
| 185.0 | | | | | | | | | | | | | | | | | |
| 2.2 | SILT, some sand, trace to some clay Very loose Grey Wet | | 4 | SS | 2 | | | | | | | | | | | | 0 19 74 7 |
| | | | 5 | SS | 3 | | | | | | | | | | | | |
| 183.5 | | | | | | | | | | | | | | | | | |
| 3.7 | Sandy SILT, trace to some clay Compact Grey Wet | | 6 | SS | 15 | | | | | | | | | | | | 0 22 72 6 |
| | | | 7 | SS | 12 | | | | | | | | | | | | |
| 181.7 | | | | | | | | | | | | | | | | | |
| 5.5 | SAND, trace gravel Compact Grey Wet | | | | | | | | | | | | | | | | |
| 180.8 | | | 8 | SS | 50/0.03 | | | | | | | | | | | | |
| 6.4 | END OF BOREHOLE SPOON AND AUGER REFUSAL NOTE: 1. Water level in open borehole at a depth of 0.9 m below ground surface (Elev. 186.3 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-13 | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|-------------------|--|--------------------|---------|--------------------------|------------|---|-----------------|--|--|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5079527.5 ; E 222884.4 | | ORIGINATED BY | | MR | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY | | | | | | | | |
| DATUM Geodetic | | DATE | | January 12, 2012 | | CHECKED BY | | CN | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | |
| 187.7 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.9 | TOPSOIL | | 1A | SS | 3 | | | | | | | | | | | |
| 187.0 | Silty SAND Very loose Brown and grey Wet | | 1B | SS | 3 | | | | | | | | | | | |
| 0.7 | SILTY CLAY, trace organics Stiff Brown Moist | | 2 | SS | 5 | | | | | | | | | | | |
| 186.3 | SILT, trace to some sand, containing sand seams, trace organics Very loose Grey | | 3 | SS | 2 | | | | | | | | | | | |
| 1.4 | SANDY SILT, trace organics Loose Grey | | 4A | SS | 6 | | | | | | | | | | | |
| 185.5 | SILT and SAND, trace clay Very loose to loose Grey Wet | | 4B | SS | 6 | | | | | | | | | | | |
| 185.1 | SAND, some silt Compact Grey Wet | | 5 | SS | 3 | | | | | | | | | | | |
| 2.6 | SAND, some silt Compact Grey Wet | | 6 | SS | 3 | | | | | | | | | | | |
| 183.2 | SAND, some silt Compact Grey Wet | | 7 | SS | 14 | | | | | | | | | | | |
| 4.5 | SAND, some silt Compact Grey Wet | | 8 | SS | 13 | | | | | | | | | | | |
| 182.1 | SAND, some silt Compact Grey Wet | | | | | | | | | | | | | | | |
| 5.6 | SAND, some silt Compact Grey Wet | | | | | | | | | | | | | | | |
| 180.5 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | |
| 7.2 | NOTES: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 186.5 m) upon completion of drilling. 2. An additional Borehole was advanced 1.0 m west of Borehole S305-13 to carry out in situ field vanes in the silty clay deposit. | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-14 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|---------------|--|--------------------|---------|---------------|------------|----------------------------|--------------------|---|----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|-------------------|----|----|
| W.P. | | LOCATION | | ORIGINATED BY | | MR | | | | | | | | | | | |
| DIST | | BOREHOLE TYPE | | COMPILED BY | | BM | | | | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | CN | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) | | |
| 189.2 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 5 | | 189 | | | | | | | | | | |
| 0.2 | Sandy SILT, trace organics | | 1B | | | | | | | | | | | | | | |
| 188.5 | Loose Brown Moist | | 2A | SS | 12 | | 188 | | | | | | | 0 | 10 | 73 | 17 |
| 0.7 | CLAYEY SILT, trace to some sand | | 2B | | | | | | | | | | | | | | |
| 187.8 | Stiff Brown Moist | | | | | | | | | | | | | | | | |
| 1.4 | SILT, trace to some clay, trace sand | | 3 | SS | 17 | | 187 | | | | | | | 0 | 5 | 87 | 8 |
| | Compact Brown Wet | | 4 | SS | 55/0.08 | | | | | | | | | | | | |
| 186.7 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| 2.5 | NOTE: 1. Water level in open borehole at a depth of 1.4 m below ground surface (Elev. 187.8 m) upon completion of drilling. | | | | | | | | | | | | | | | | |



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

GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-16 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | |
|--------------------------------------|---|---|--------|-------------------------|----------------------------|-----------------|---|--------------------|--|--|--|---|-----------------------------------|--|--|--|--|
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079605.1 ; E 222877.2</u> | | ORIGINATED BY <u>MR</u> | | | | | | | | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Hand Shovel Excavation</u> | | COMPILED BY <u>MAS</u> | | | | | | | | | | | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 13, 2012</u> | | CHECKED BY <u>CN</u> | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | W _p W W _L | | | | |
| 194.6 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.9 | TOPSOIL | | | | | | | | | | | | | | | | |
| | END OF EXCAVATION BEDROCK | | | | | | | | | | | | | | | | |
| | NOTE: 1. Excavation dry upon completion. | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-17 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079640.6 ;E 222864.6</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 13, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|---|--|--|--------------------------------------|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | w _p w w _L | | | | | | | |
| 192.9 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 2 | | | | | | | | | | | | | | | |
| | Silty SAND, containing rootlets to a depth of 0.6 m Very loose to dense Brown and grey Wet | | 1B | | | | | | | | | | | | | | | | | |
| 191.8 | | | 2 | SS | 85/0.2 | | | | | | | | | | | | | | | |
| 1.1 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 192.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | |

| | | | |
|-----------------------------|---|-------------------------|---------------|
| PROJECT <u>09-1111-6014</u> | RECORD OF BOREHOLE No S305-18 | SHEET 1 OF 1 | METRIC |
| W.P. <u>5404-05-01</u> | LOCATION <u>N 5079654.3 ; E 222886.3</u> | ORIGINATED BY <u>MR</u> | |
| DIST <u></u> HWY <u>69</u> | BOREHOLE TYPE <u>Hand Shovel Excavation</u> | COMPILED BY <u>MAS</u> | |
| DATUM <u>Geodetic</u> | DATE <u>January 13, 2012</u> | CHECKED BY <u>CN</u> | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|------------------------------------|------------|---------|------|------------|----------------------------|-----------------|---|------------------|---|---|------------|---|-------------------|----------------|--------------------------------------|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | W _p | W | W _L | | GR | SA | SI | CL |
| | | | | | | | | ○ UNCONFINED | ● QUICK TRIAXIAL | + | × | FIELD VANE | REMOULDED | WATER CONTENT (%) | | | | | | |
| 194.7 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | | | | | |
| | END OF EXCAVATION | | | | | | | | | | | | | | | | | | | |
| | BEDROCK | | | | | | | | | | | | | | | | | | | |
| | NOTE: | | | | | | | | | | | | | | | | | | | |
| | 1. Excavation dry upon completion. | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF BOREHOLE No S305-19 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | | |
|-------------------|--|---|---------|------------------|------------|--|-----------------|---|---|--|--|-------------|--|--|---------------------------------------|---|-------------|--|--|
| W.P. 09-1111-6014 | | LOCATION N 5079675.6 ; E 222908.6 | | ORIGINATED BY MR | | | | | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY BM | | | | | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 14, 2012 | | CHECKED BY CN | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | WATER CONTENT (%) W _p — W — W _L | | | γ | GR SA SI CL | | |
| 192.0 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | | | | | | | | | | | |
| 8.9 | TOPSOIL | | 1A | SS | 2 | | | | | | | | | | | | | | |
| | SILT and SAND, trace clay Very loose to dense Brown to grey Wet | | 1B | | | | | | | | | | | | | | | | |
| | | | 2 | SS | 32 | | 191 | | | | | | | | | | 0 34 65 1 | | |
| 190.7 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | | | |
| 1.3 | NOTE: 1. Open borehole dry upon completion of drilling. | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-20 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--|--|--------------------|---------|--------------------------|------------|---|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. 09-1111-6014 | | LOCATION | | N 5079703.5 ; E 222895.4 | | ORIGINATED BY | | MR | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY | | | | | | | | | |
| DATUM Geodetic | | DATE | | January 14, 2012 | | CHECKED BY | | CN | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| 191.1 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.9 | TOPSOIL | | 1A | SS | 3 | | 191 | | | | | | | | | | |
| 190.4 | CLAYEY SILT, trace sand Soft Brown Moist | | 1B | | | | | | | | | | | | | | 0 3 65 32 |
| 0.7 | SILT and SAND, trace to some clay Compact Brown and grey Wet | | 2A | SS | 14 | | 190 | | | | | | | | | | 0 36 56 8 |
| 189.7 | | | 2B | | | | | | | | | | | | | | |
| 1.6 | Silty SAND Loose Brown and grey Wet END OF BOREHOLE SPOON AND AUGER REFUSAL | | 3 | SS | 40/0.05 | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 189.9 m) upon completion of drilling. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-21 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--|--|--------------------|--------|--------------------------|------------|---|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. 5404-05-01 | | LOCATION | | N 5079743.8 ; E 222883.8 | | ORIGINATED BY | | MR | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 14, 2012 | | CHECKED BY | | | | | | | | | |
| CN | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| 191.2 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | Sandy silt, trace clay, mixed with wood fragments (FILL) | | 1 | SS | 52/0.15 | | 191 | | | | | | | | | | |
| 190.9 | Compact Grey Wet | | | | | | | | | | | | | | | | |
| 0.3 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| NOTE: 1. Open borehole dry upon completion of drilling. | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF BOREHOLE | | No S305-22 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|---|--|-------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | COMPILED BY | |
| DATUM | | DATE | | CHECKED BY | | BOREHOLE TYPE | | | |
| 09-1111-6014 | | N 5079752.6 ; E 222904.5 | | MR | | 165 mm O.D. Continuous Flight Solid Stem Augers | | MAS | |
| 5404-05-01 | | January 14, 2012 | | CN | | HWY 69 | | | |
| Geodetic | | | | | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 191.2 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Sand and silt, trace clay, containing rootlets, organics and wood fragments (FILL) Loose Dark brown Wet | | 1 | SS | 6 | | | | | | | | | | | | |
| 189.8 | | | 2 | SS | 9 | | | | | | | | | | | | |
| 189.3 | CLAYEY SILT, trace sand Hard Brown and grey Wet | | 3 | SS | 50/0.18 | | | | | | | | | | | | |
| 1.9 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 190.9 m) upon completion of drilling. 2. An additional borehole was advanced 1.0 m north of Borehole S305-22 to carry out in situ field vanes in the clayey silt deposit. | | | | | | | | | | | | | | | | | |

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S305-23 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|----------------------|---|---|--------|------------------|----------------------------|-----------------|---|--------------------|--|--|--|---|-------------------|--|---|--|
| W.P. 5404-05-01 | | LOCATION N 5079772.3 ; E 222935.6 | | ORIGINATED BY MR | | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY MAS | | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 15, 2012 | | CHECKED BY CN | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | |
| 195.1 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 3 | | 195 | | | | | | | | | |
| 0.2 | Sandy SILT | | 1B | | | | | | | | | | | | | |
| 194.4 | Very loose | | | | | | | | | | | | | | | |
| 0.7 | Grey | | | | | | | | | | | | | | | |
| | Moist | | | | | | | | | | | | | | | |
| | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | |
| | NOTE: 1. Open borehole dry upon completion of drilling. | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-24 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079685.7 ; E 222853.9</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Hand Shovel Excavation</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 16, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
|---------------|------------------------------------|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|----|----|--------------------------------------|---|----|----|----|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL | |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | | | | |
| 194.1 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | | | | | | |
| | END OF EXCAVATION | | | | | | | | | | | | | | | | | | | | |
| | BEDROCK | | | | | | | | | | | | | | | | | | | | |
| | NOTE: | | | | | | | | | | | | | | | | | | | | |
| | 1. Excavation dry upon completion. | | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-25 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079701.0 ; E 222875.8</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 13, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|-----------------------------------|---|----|-----|--------------------------------------|---|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | ● QUICK TRIAXIAL × REMOULDED | | | | | | | | |
| 193.6 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 3 | | | | | | | | | | | | |
| 0.1 | SAND, trace silt, trace organics | | 1B | SS | | | | | | | | | | | | | |
| 192.9 | Very loose | | | | | | | | | | | | | | | | |
| 0.7 | Brown | | | | | | | | | | | | | | | | |
| | Moist | | | | | | | | | | | | | | | | |
| | SILT, trace to some clay, trace sand | | 2 | SS | 14 | | | | | | | | | | | | |
| 192.1 | Compact | | | | | | | | | | | | | | | | |
| 1.5 | Brown and grey | | | | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | | | |
| 191.5 | Silty SAND, trace clay | | 3 | SS | 20 | | | | | | | | | | | | |
| 2.1 | Compact | | | | | | | | | | | | | | | | |
| | Brown and grey | | | | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.8 m below ground surface (Elev. 192.8 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-26 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|---|--|-------------|--|------------------|--|------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATE | | CHECKED BY | |
| 09-1111-6014 | | N 5079710.3 ; E 222858.4 | | MR | | HWY 69 | | 165 mm O.D. Continuous Flight Solid Stem Augers | | MAS | | January 16, 2012 | | CN | |
| Geodetic | | | | | | | | | | | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 193.7 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 12 | | | | | | | | | | | | |
| 0.2 | SILT and SAND Compact Brown Moist | | 1B | | | | | | | | | | | | | | |
| 192.9 | | | 2A | SS | 56/0.05 | | | | | | | | | | | | |
| 1.0 | SILT, trace gravel, trace sand Compact Grey Wet | | 2B | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.7 m below ground surface (Elev. 193.0 m) upon completion of drilling. | | | | | | | | | | | | | | | | |










| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-27 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079724.7 :E 222849.2</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 16, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---|--|------------|---------|------|------------|----------------------------|-----------------|---|----|------------|------------------|---|---|-------------------|----------------|--------------------------------------|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | W _p | W | W _L | | GR | SA | SI | CL |
| | | | | | | | | ○ UNCONFINED | + | FIELD VANE | ● QUICK TRIAXIAL | × | REMOULDED | WATER CONTENT (%) | | | | | | |
| 193.6 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 4 | | | | | | | | | | | | | | | |
| | Silty SAND, trace gravel, containing rootlets | | 1B | | | | | | | | | | | | | | | | | |
| 192.8 | Loose Brown Moist | | 2 | SS | 50/0.05 | | | | | | | | | | | | | | | |
| 0.8 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | | | | |
| NOTE: 1. Open borehole dry upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-28 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079734.9 ; E 222863.0</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 16, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|--------------------------------|----|----|-----|---|---|-------------------|--------------------------------------|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | W _p | W | W _L | | GR | SA | SI | CL |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | ● QUICK TRIAXIAL × REMOULDED | | | | | | WATER CONTENT (%) | | | | | |
| 192.8 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | |
| 192.3 | Wood fragments/sawdust (FILL) | | 1 | SS | 3 | | | | | | | | | | | | | | | |
| 0.5 | TOPSOIL | | | | | | | | | | | | | | | | | | | |
| | SILT, trace to some sand, containing sand seams | | | | | | | | | | | | | | | | | | | |
| | Compact | | 2 | SS | 50/0.09 | | | | | | | | | | | | | | | |
| 191.6 | Brown and grey | | | | | | | | | | | | | | | | | | | |
| 1.2 | Wet | | | | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 192.2 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-29 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079759.5 ; E 222867.6</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 15, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
|---------------|--|---|---------|------|------------|----------------------------|-----------------|---|--------------|------------------|-------------|--|---|--|--|---|---|----|----|----|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL | |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | ● QUICK TRIAXIAL | × REMOULDED | | | | | | | | | | |
| 191.8 | GROUND SURFACE |  | | | | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL |  | 1A | SS | 4 | | | | | | | | | | | | | | | | |
| 0.2 | SILT, trace to some clay, trace sand, trace organics to a depth of 0.7 m Loose Grey Wet |  | 1B | | | | | | | | | | | | | | | | | | |
| | |  | 2 | SS | 5 | | | | | | | | | | | | | | | | |
| 190.4 | |  | | | | | | | | | | | | | | | | | | | |
| 1.4 | SILT and SAND, trace clay Compact Brown and grey Wet |  | 3 | SS | 16 | | | | | | | | | | | | | | | | |
| 189.6 | |  | | | | | | | | | | | | | | | | | | | |
| 189.3 | Silty SAND, trace gravel Dense Brown Wet |  | 4 | SS | 55/0.05 | | | | | | | | | | | | | | | | |
| 2.5 | END OF BOREHOLE SPOON AND AUGER REFUSAL NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 191.2 m) upon completion of drilling. |  | | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-30 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|---|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | COMPILED BY | | CHECKED BY | | DATUM | | DATE | |
| 09-1111-6014 | | N 5079775.4 ; E 222850.5 | | MR | | HWY 69 | | 165 mm O.D. Continuous Flight Solid Stem Augers | |
| Geodetic | | January 17, 2012 | | CN | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--|---|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 192.2 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Sandy silt, trace organics, containing wood fragments and rootlets (FILL) | | 1A | SS | 1 | | | | | | | | | | | | |
| 191.8 | Very loose Brown Moist | | 1B | | | | | | | | | | | | | | |
| 191.5 | SILT, trace organics Very loose Grey Moist | | 2 | SS | 12 | | | | | | | | | | | | |
| 0.7 | | | | | | | | | | | | | | | | | |
| 190.6 | SILT and SAND, trace to some clay, containing silt seams Compact Grey Wet | | | | | | | | | | | | | | | | |
| 1.6 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.0 m below ground surface (Elev. 191.2 m) upon completion of drilling. | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-31 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079784.1 ; E 222872.1</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 15, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|--------------------------------|----|----|-----|---|---|--|--------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | ● QUICK TRIAXIAL × REMOULDED | | | | | | | | |
| 191.4 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | Ice | | | | | | | | | | | | | | | | |
| 0.3 | Water | | 1 | SS | 3 | | | | | | | | | ○ | | | Non-Plastic |
| | SILT, trace to some sand, trace clay, trace organics and sand seams | | | | | | | | | | | | | | | | |
| | Very loose to loose | | 2 | SS | 6 | | | | | | | | | | | | |
| 190.0 | Brown to grey | | | | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | | | |
| 189.6 | Sandy SILT, trace clay | | 3A | | | | | | | | | | | | | | |
| | Compact | | | | | | | | | | | | | ○ | | | 0 27 72 1 |
| 189.2 | Grey | | 3B | SS | 20 | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | | | |
| 2.2 | SAND and GRAVEL, trace silt | | | | | | | | | | | | | | | | |
| | Compact | | | | | | | | | | | | | | | | |
| | Brown | | | | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at ground surface (Elev. 191.4 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

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

GTGA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-33 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079815.0 ; E 222872.6</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 15, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | |
|---------------|---|------------|---------|------|------------|----------------------------|--------------------|---|-----------------|--|---|----------------|---|--|----|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | | | |
| | | | | | | | | 20 40 60 80 100 | 20 40 60 80 100 | W _p | W | W _L | | | | |
| 192.0 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | Wood fragments (FILL) | | 1A | SS | 2 | | | ○ UNCONFINED + FIELD VANE | | | | | | | | |
| | TOPSOIL | | 1B | | | | | ● QUICK TRIAXIAL × REMOULDED | | | | | | | | |
| 191.4 | Sandy SILT, trace clay | | | | | | | | | | | | | | | |
| 0.6 | Very loose | | | | | | | | | | | | | | | |
| | Grey | | 2 | SS | 8 | | | | | | | | | | | |
| | Moist | | | | | | | | | | | | | | | |
| | CLAY | | | | | | | | | | | | | | | |
| | Stiff | | | | | | | | | | | | | | | |
| | Brown | | | | | | | | | | | | | | | |
| | Moist | | | | | | | | | | | | | | | |
| 189.7 | SAND, trace silt, trace clay | | | | | | | | | | | | | | | |
| 2.3 | Compact | | 3 | SS | 13 | | | | | | | | | | | |
| | Grey | | | | | | | | | | | | | | | |
| 189.0 | Wet | | | | | | | | | | | | | | | |
| 3.0 | SILT and SAND, trace gravel | | | | | | | | | | | | | | | |
| | Compact | | 4 | SS | 11 | | | | | | | | 1 | 43 | 56 | 0 |
| | Grey | | | | | | | | | | | | | | | |
| 188.3 | Wet | | | | | | | | | | | | | | | |
| 3.7 | SAND and GRAVEL, some silt | | 5 | SS | 68/0.15 | | | | | | | | | | | |
| 187.8 | Very dense | | | | | | | | | | | | | | | |
| 4.2 | Grey | | | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | | |
| | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | |
| | NOTES: 1. Water level in open borehole at a depth of 0.2 m below ground surface (Elev. 191.8 m) upon completion of drilling. 2. An additional borehole was advanced 1.0 m north of Borehole S305-33 to obtain a Shelby tube sample from a depth of 0.9 m to 1.4 m. | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-34 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|-------------------|--|--------------------|---------|---|------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| W.P. 5404-05-01 | | LOCATION | | N 5079823.8 ; E 222863.9 | | ORIGINATED BY | | MR | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY | | MAS | | | | | | |
| DATUM Geodetic | | DATE | | January 16, 2012 | | CHECKED BY | | CN | | | | | | |
| 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 | | | | | | |
| 192.1 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 1 | | | | | | | | | |
| 0.1 | Silty SAND, trace gravel, trace organics | | 1B | SS | | | | | | | | | | |
| 191.3 | Very loose Brown | | | | | | | | | | | | | |
| 0.8 | Moist becoming wet below a depth of 0.5 m | | 2 | SS | 11 | | | | | | | | | |
| | SILTY CLAY, trace sand | | | | | | | | | | | | | |
| | Very stiff Brown and grey | | | | | | | | | | | | | |
| 190.0 | Wet | | | | | | | | | | | | | |
| 2.1 | SILT, some sand, trace to some clay, containing sand seams | | | | | | | | | | | | | |
| | Loose Grey | | 3 | SS | 8 | | | | | | | | | |
| | Wet | | | | | | | | | | | | | |
| 188.9 | | | 4A | | | | | | | | | | | |
| | Silty SAND, trace to some gravel | | 4B | SS | 72/0.25 | | | | | | | | | |
| 3.4 | Dense Brown Wet | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.5 m below ground surface (Elev. 191.6 m) upon completion of drilling. | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-35 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--|---|--------------------|---------|--------------------------|------------|----------------------------|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5079833.2 ; E 222881.2 | | ORIGINATED BY | | MR | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Hand Shovel Excavation | | COMPILED BY | | | | | | | | | |
| MAS | | DATE | | January 15, 2012 | | CHECKED BY | | CN | | | | | | | | | |
| 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 | | | | | | | | | |
| 195.1 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1 | CS | - | | 195 | | | | | | | | | | |
| 0.3 | SAND, some silt, trace gravel, trace organics and rootlets Brown Moist END OF EXCAVATION BEDROCK | | | | | | | | | | | | | | | | |
| NOTES: 1. Excavation dry upon completion. 2. Bedrock outcrops in vicinity of BH S305-35. | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S305-36 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|----------------------|--|--------------------------------------|--------|------------------|----------------------------|-----------------|---|--------------------|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION N 5079843.2 ; E 222896.0 | | ORIGINATED BY MR | | | | | | | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE Hand Shovel Excavation | | COMPILED BY MAS | | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 15, 2012 | | CHECKED BY CN | | | | | | | | | | | | |
| 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 | | | | | | | | |
| 196.6 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.9 | TOPSOIL | | | | | | | | | | | | | | | |
| | END OF EXCAVATION BEDROCK | | | | | | | | | | | | | | | |
| | NOTES: | | | | | | | | | | | | | | | |
| | 1. Excavation dry upon completion. | | | | | | | | | | | | | | | |
| | 2. Bedrock outcrops in vicinity of BH S305-36. | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-38 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079748.0 ; E 222850.6</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 16, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|--|---|--|--|---|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | | | |
| 192.5 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | | |
| 0.0 192.2 | Wood fragments/sawdust (FILL) | | 1A | SS | 2 | | | | | | | | | | | | | | | | |
| 0.3 | SILT, trace to some, some sand, containing rootlets Very loose to compact Brown and grey Moist | | 1B | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| 191.2 | | | 2 | SS | 22 | | | | | | | | | | | | | | | | |
| 1.3 | END OF BOREHOLE AUGER REFUSAL NOTE: 1. Open borehole dry upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |






| PROJECT | | RECORD OF BOREHOLE | | No S305-39 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | | |
|---------------|---|--------------------------|---------|---------------|------------|--|-----------------|---|---|-------------|----------|-------------|-------------------|----------|---------------------------------------|----------|----------|----------|----------|----------|----------|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | | | | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5079759.1 ; E 222833.5 | | MR | | HWY 69 | | 165 mm O.D. Continuous Flight Solid Stem Augers | | MAS | | | | | | | | | | | |
| Geodetic | | January 16, 2012 | | CN | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | | | | | |
| 193.4 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 |
| 0.0 | Wood fragments/sawdust (FILL) | | 1A | SS | 5 | | 193 | | | | | | | | | | | | | | |
| 193.0 | | | 1B | | | | | | | | | | | | | | | | | | |
| 0.6 | Silty SAND, trace organics and rootlets Loose Dark brown Moist END OF BOREHOLE AUGER REFUSAL NOTE: 1. Open borehole dry upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-40 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | | |
|--|--|---|---------|---------------|------------|--|-----------------|--------------------|---|----------|----------|-------------|-------------------|----------|---------------------------------------|----------|----------|----------|----------|----------|----------|
| W.P. | | LOCATION | | ORIGINATED BY | | | | | | | | | | | | | | | | | |
| DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | | | | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | | | | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5079789.9 ; E 222856.1 | | MR | | | | | | | | | | | | | | | | | |
| 5404-05-01 | | 165 mm O.D. Continuous Flight Solid Stem Augers | | MAS | | | | | | | | | | | | | | | | | |
| Geodetic | | January 17, 2012 | | CN | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | | | | | |
| 191.5 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 | 20 40 60 |
| 0.0 | Wood fragments/sawdust (FILL) | | 1A | SS | 2 | | 191 | | | | | | | | | | | | | | |
| 0.2 | Sandy SILT, trace gravel Very loose to compact Grey to brown below a depth of 1.2 m Wet | | 1B | SS | | | | | | | | | | | | | | | | | |
| 190.3 | Silty SAND and GRAVEL Compact Brown Moist | | 2A | SS | 20 | | | | | | | | | | | | | | | | |
| 1.4 | END OF BOREHOLE AUGER REFUSAL | | 2B | | | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 0.5 m below ground surface (Elev. 191.0 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-41 | | SHEET 1 OF 1 | | METRIC | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|---|--|-------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | |
| DATUM | | DATE | | CHECKED BY | | | | | | | |
| 09-1111-6014 | | N 5079795.6 ; E 222838.2 | | MR | | HWY 69 | | 165 mm O.D. Continuous Flight Solid Stem Augers | | MAS | |
| Geodetic | | January 17, 2012 | | CN | | | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|--------------|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | | 20 |
| 192.8 | GROUND SURFACE | | | | | | | | | | | | | | | | | |
| 0.0 | Wood fragments/sawdust (FILL) | | 1A | SS | 2 | | | | | | | | | | | | | |
| 192.4 | | | 1B | | | | | | | | | | | | | | | |
| 192.1 | Sandy silt, containing rootlets, trace organics (FILL) | | | | | | | | | | | | | | | | | |
| 191.7 | Very loose Grey Moist | | 2A | SS | 15 | | | | | | | | | | | | | |
| 191.4 | | | 2B | | | | | | | | | | | | | | | |
| 191.1 | SILT, some sand, trace clay, containing sand seams | | 3A | | | | | | | | | | | | | | | |
| 1.8 | Compact Brown to grey Moist | | 3B | SS | 66/0.09 | | | | | | | | | | | | | |
| | Silty SAND, containing silt seams | | | | | | | | | | | | | | | | | |
| | Compact Grey Wet | | | | | | | | | | | | | | | | | |
| | SILT, trace to some sand, trace clay | | | | | | | | | | | | | | | | | |
| | Compact Grey Wet | | | | | | | | | | | | | | | | | |
| | Silty SAND, trace to some gravel | | | | | | | | | | | | | | | | | |
| | Compact Grey Wet | | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 1.1 m below ground surface (Elev. 191.7 m) upon completion of drilling. | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-42 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079840.6 ; E 222799.8</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 18, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
|---------------|---|---|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|---|---|----------------|--------------------------------------|---|----|----|----|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | w _p | w | w _L | | GR | SA | SI | CL | |
| | | | | | | | | | | | | | | | | | | | | | |
| 192.9 | GROUND SURFACE |  | | | | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL |  | 1A | SS | 2 | | | | | | | | | | | | | 0 | 17 | 83 | 0 |
| 0.2 | SILT, some sand, trace organics Very loose Grey Wet |  | 1B | | | | | | | | | | | | | | | | | | |
| 192.0 | |  | 2 | SS | 51/0.15 | | | | | | | | | | | | | | | | |
| 0.9 | END OF BOREHOLE SPOON AND AUGER REFUSAL |  | | | | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 192.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-43 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079819.9 ; E 222811.3</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 18, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|----|----|---|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | | | |
| 192.2 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 1 | | | | | | | | | | | | | | | |
| 0.2 | SILT, some sand, trace to some clay, containing rootlets to a depth of 0.6 m Very loose to compact Grey Moist becoming wet below a depth of 0.6 m | | 1B | | | | | | | | | | | | | | | | | |
| | | | 2 | SS | 8 | | | | | | | | | | | | | | | |
| | | | 3 | SS | 53/0.03 | | | | | | | | | | | | | | | |
| 190.3 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | | | | |
| 1.9 | NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 191.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | |










| PROJECT | | RECORD OF BOREHOLE | | No S305-44 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|-------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | COMPILED BY | |
| DATE | | BOREHOLE TYPE | | CHECKED BY | | DATUM | | DATE | |
| 09-1111-6014 | | N 5079831.5 ; E 222816.5 | | MR | | HWY 69 | | MAS | |
| Geodetic | | January 18, 2012 | | CN | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|-----|----|---|----|--|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | |
| 192.3 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Wood fragments/sawdust (FILL) | | 1A | SS | 2 | | | | | | | | | | | | |
| 0.3 | CLAYEY SILT, trace sand, trace organics to a depth of 0.7 m Soft to firm Grey Moist becoming wet below a depth of 0.7 m | | 1B | | | | | | | | | | | | | | |
| 190.9 | | | 2 | SS | 5 | | | | | | | | | | | | |
| 1.4 | Sandy SILT, containing clayey silt seams Loose Grey Wet | | 3 | SS | 7 | | | | | | | | | | | | |
| 190.1 | | | 4 | SS | 50/0.03 | | | | | | | | | | | | |
| 189.8 | Silty SAND Compact Grey Wet | | | | | | | | | | | | | | | | |
| 2.5 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 0.8 m below ground surface (Elev. 191.5 m) upon completion of drilling. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-45 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|---|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | COMPILED BY | | CHECKED BY | | DATUM | | DATE | |
| 09-1111-6014 | | N 5079825.4 ; E 222799.2 | | MR | | HWY 69 | | 165 mm O.D. Continuous Flight Solid Stem Augers | |
| Geodetic | | January 17, 2012 | | CN | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 192.0 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Wood fragments/sawdust (FILL) | | 1A | SS | 3 | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace sand, containing rootlets | | 1B | SS | | | | | | | | | | | | | |
| 191.3 | Soft Grey Wet | | | | | | | | | | | | | | | | |
| 0.7 | | | | | | | | | | | | | | | | | |
| 190.6 | SILT, trace to some sand, trace to some clay | | 2 | SS | 7 | | | | | | | | | | | | |
| 1.4 | Loose Grey Wet | | | | | | | | | | | | | | | | |
| 189.9 | Sandy SILT, containing silt seams | | 3 | SS | 7 | | | | | | | | | | | | |
| 2.1 | Loose Grey Wet | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 191.4 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S305-46 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079814.7 ; E 222785.0</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 17, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|--|---|---------|------|------------|---|-----------------|---|--|--|--|--|---|---|----------------|--------------------------------------|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | w _p | w | w _L | | GR | SA | SI | CL |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | | |
| 191.8 | GROUND SURFACE |  | | | |  | 191 | | | | | | | | | | | | | |
| 0.0 | Wood fragments/sawdust (FILL) |  | | | | | | | | | | | | | | | | | | |
| 0.2 | SILT, some sand, containing rootlets |  | 1 | SS | 1 | | | | | | | | | | | | | | | |
| 191.2 | Very loose |  | | | | | | | | | | | | | | | | | | |
| 0.6 | Grey Wet |  | | | | | | | | | | | | | | | | | | |
| | | | 2 | SS | 16 | | | | | | | | | | | | | | | |
| 190.5 | SILT and SAND, trace clay |  | | | | | | | | | | | | | | | | | | |
| 1.3 | Compact Grey Wet |  | | | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE AUGER REFUSAL |  | | | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 191.2 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-47 | | SHEET 1 OF 1 | | METRIC | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|---|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | |
| DATE | | COMPILED BY | | CHECKED BY | | DATUM | | DATE | |
| 09-1111-6014 | | N 5079829.2 ; E 222774.6 | | MR | | HWY 69 | | 165 mm O.D. Continuous Flight Solid Stem Augers | |
| Geodetic | | January 17, 2012 | | CN | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|----------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 191.6 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 3 | | | | | | | | | | | | |
| 0.3 | Silty SAND, trace organics Very loose Grey Wet | | 1B 1C | | | | | | | | | | | | | | |
| 190.5 | CLAYEY SILT, containing silt seams and rootlets, trace sand Stiff Grey Wet | | 2 | SS | 8 | | | | | | | | | | | | |
| 189.6 | SILT of slight plasticity, trace to some clay, trace sand Loose Brown and grey Wet | | 3 | SS | 8 | | | | | | | | | | | | |
| 188.7 | SAND, containing silt seams Loose Grey Wet | | | | | | | | | | | | | | | | |
| 188.7 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | |
| 2.9 | NOTE: 1. Water level in open borehole at a depth of 0.2 m below ground surface (Elev. 191.4 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S305-48 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|-------------------|---|--------------------|---------|--------------------------|------------|----------------------------|-----------------|---|----------|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. 09-1111-6014 | | LOCATION | | N 5079828.5 ; E 222783.0 | | ORIGINATED BY | | MR | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| CS | | DATE | | February 2, 2012 | | CHECKED BY | | CN | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 191.2 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | |
| 190.9 | TOPSOIL | | 1A | SS | 3 | | 191 | | | | | | | |
| 190.6 | CLAYEY SILT, trace sand Soft Brown Moist | | 1B | SS | 9 | | | | | | | | | |
| 0.6 | SILT, trace to some sand and clay, containing sand seams Loose to compact Grey Wet | | 2 | SS | 9 | | 190 | | | | | | | |
| | | | 3 | SS | 8 | | 189 | | | | | | | 0 5 90 5 |
| | | | 4 | SS | 23/0.08 | | | | | | | | | |
| 188.7 | Granite Gneiss (BEDROCK) | | 1 | RC | REC 98% | | 188 | | | | | | | RQD = 89% |
| 2.5 | Bedrock cored from depths of 2.5 m to 5.7 m For bedrock coring details refer to Record of Drillhole S305-48 | | 2 | RC | REC 100% | | 187 | | | | | | | RQD = 100% |
| | | | 3 | RC | REC 100% | | 186 | | | | | | | RQD = 100% |
| 185.5 | END OF BOREHOLE | | | | | | | | | | | | | |
| 5.7 | NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 190.6 m) upon completion of drilling. | | | | | | | | | | | | | |

PROJECT: 09-1111-6014

RECORD OF DRILLHOLE: S305-48

SHEET 1 OF 1

LOCATION: N 5079828.5 ; E 222783.0

DRILLING DATE:

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: D25 Track Mount

DRILLING CONTRACTOR: WALKER DRILLING

| DEPTH SCALE METRES | DRILLING RECORD | DESCRIPTION | SYMBOLIC LOG | ELEV. DEPTH (m) | RUN No. | COLOUR % RETURN | FLUSH | RECOVERY | | R.Q.D. % | FRACT. INDEX PER 0.3 m | B Angle ° | DIP w.r.t. CORE AXIS ° | DISCONTINUITY DATA | | | HYDRAULIC CONDUCTIVITY K, cm/sec | | | Diametral Point Load Index (MPa) | RMC -Q AVG. | NOTES | |
|-----------------------|---------------------------------------|---|--------------|-----------------------|---------|--------------------|-------|-----------------|-----------------|-------------|---------------------------------|--------------|---------------------------------|---------------------------------|----|----|--|---------|---------|---|--------------------|-------|---------|
| | | | | | | | | TOTAL CORE % | SOLID CORE % | | | | | TYPE AND SURFACE DESCRIPTION | Jr | Ja | Jn | 10 ° | 10 ° | | | | 10 ° |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | NW Casing NQRC February 2, 2012 | Continued from Record of Borehole S305-48 | | 188.67 2.53 | 1 | | | | 100 | | 0 | 0 | 0 | JN,IR,RO | 1 | 2 | 2 | | | | 9.0 MPa (Axial) | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | NQRC February 2, 2012 | GRANITE GNEISS Fresh, foliated, grey, pink and dark grey, medium crystalline, slightly porous, strong to very strong | | 188.67 2.53 | 2 | | | | 100 | | 0 | 0 | 0 | JN,PL,SM JN,IR,SM | 1 | 4 | 2 | | | | 9.0 MPa (Axial) | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | NQRC February 2, 2012 | GRANITE GNEISS Fresh, foliated, grey, pink and dark grey, medium crystalline, slightly porous, strong to very strong | | 188.67 2.53 | 3 | | | | 100 | | 0 | 0 | 0 | JN,CU,SM | 1 | 1 | | | | 9.0 MPa (Axial) | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | END OF BOREHOLE | | 185.47 5.73 | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | | | | |

DEPTH SCALE

1 : 50



LOGGED:

CHECKED:

| PROJECT | | RECORD OF BOREHOLE | | No S305-49 | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|--|--|--------------------|---------|--------------------------|------------|----------------------------|--------------------|---|--|--|--|--|--|--|---|---|
| W.P. 09-1111-6014 | | LOCATION | | N 5079724.5 ; E 222919.8 | | ORIGINATED BY | | MR | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | NW Casing, Wash Boring | | COMPILED BY | | | | | | | | |
| DATUM | | Geodetic | | DATE | | February 2, 2012 | | CHECKED BY | | | | | | | | |
| | | | | | | | | CN | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | WATER CONTENT (%) | | | | |
| 190.7 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) Very soft Black Wet | | 1A | SS | 2 | | | | | | | | | | | |
| 190.1 | | | 1B | | | | | | | | | | | | | |
| 0.6 | Silty SAND, trace gravel, trace clay, trace organics Very loose Brown Wet | | 2 | SS | 8 | | | | | | | | | | | 0 9 76 15 |
| | CLAYEY SILT, trace to some sand, containing silt seams Stiff to soft Brown Wet | | 3 | SS | 1 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | 4 | SS | 1 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 186.6 | Sandy SILT, trace clay Compact Grey Wet | | 5 | SS | 16 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 185.5 | SILT, some sand, trace clay Compact Grey Wet | | | | | | | | | | | | | | | |
| 184.6 | | | 6 | SS | 12 | | | | | | | | | | | 0 14 83 3 |
| 6.1 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at ground surface (Elev. 190.7 m) upon completion of drilling. 2. An additional borehole was advanced 1.0 m west of Borehole S305-49 to obtain a Shelby tube sample between a depth of 1.5 m and 2.0 m. | | | | | | | | | | | | | | | | |

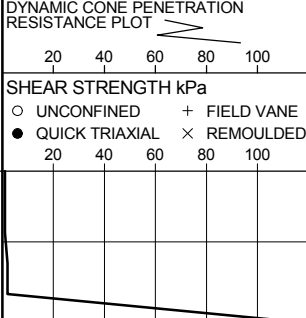
| PROJECT | | 09-1111-6014 | | RECORD OF DCPT No S305-DC01 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|--------------|---|--------------|--------|-----------------------------|------------|---|-----------------|--|----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|----|----|-----|----|
| W.P. | | 5404-05-01 | | LOCATION | | N 5079287.8 ; E 222808.4 | | ORIGINATED BY | | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY | | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 12, 2012 | | CHECKED BY | | | | | | | | | | |
| CN | | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | | | | | | 60 | 80 | 100 | 20 |
| 192.2 | GROUND SURFACE | | | | | | 192 | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | | |
| 190.9 | END OF DCPT | | | | | | 191 | | | | | | | | | | | |
| 1.3 | Refusal to Further Penetration (105 Blows / 0.08 m) | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14



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

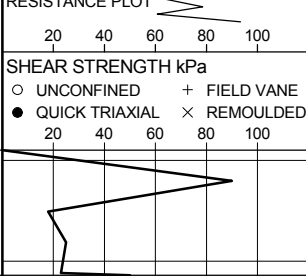
GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| PROJECT | | RECORD OF DCPT No S305-DC03 | | SHEET 1 OF 1 | | METRIC | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|--|---|---------------------------------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5079387.0 ; E 222819.8 | | ORIGINATED BY ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | |
| DATUM Geodetic | | DATE January 11, 2012 | | CHECKED BY CN | | | | | | |
| 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 WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 190.7 | GROUND SURFACE | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| 189.2 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.83 m) | | | | | | | | | |
| 1.5 | | | | | | | | | | |



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S305-DC05 | | SHEET 1 OF 1 | | METRIC | | | | |
|--------------------------------------|--|--|--------|-------------------------|----------------------------|-----------------|--|---|---------------------------------------|--|
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079485.7 ; E 222835.9</u> | | ORIGINATED BY <u>MR</u> | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>MAS</u> | | | | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 12, 2012</u> | | CHECKED BY <u>CN</u> | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 190.1 | GROUND SURFACE | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | 190 | | | | |
| 188.9 | | | | | | 189 | | | | |
| 1.2 | END OF DCPT Refusal to Further Penetration (50 Blows / 0.03 m) | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S305-DC07 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|----------------------|--|--------------------------------------|--------|------|-------------------------|------------------|--|--------------------|--|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 5404-05-01 | | LOCATION N 5079626.5 ; E 222899.2 | | | | ORIGINATED BY MR | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Hand Shovel Excavation | | | | COMPILED BY MAS | | | | | | | | | | |
| DATUM Geodetic | | DATE January 13, 2012 | | | | CHECKED BY CN | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | |
| 194.0 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | |
| 0.1 | END OF DCPT BEDROCK | | | | | | | | | | | | | | | |
| | NOTE: 1. Bedrock outcrop at ground surface. | | | | | | | | | | | | | | | |



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| PROJECT | | 09-1111-6014 | | RECORD OF DCPT No S305-DC11 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|---------------|--|--------------|--------|-----------------------------|------------|-------------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. | | 5404-05-01 | | LOCATION | | N 5079768.3 ; E 222888.3 | | ORIGINATED BY | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Dynamic Cone Penetration Test | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 15, 2012 | | CHECKED BY | | | | | | | | | |
| CN | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 191.6 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | 191 | | | | | | | | | | |
| 190.2 | | | | | | | | | | | | | | | | | |
| 1.4 | END OF DCPT Refusal to Further Penetration (47 Blows / 0.18 m) NOTE: 1. Bedrock outcrop in vicinity of DCPT. | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14



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


GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S305-DC13 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | |
|--------------------------------------|---|--|--------|-------------------------|----------------------------|-----------------|---|--------------------|----|----|----|------------------------------------|-------------------------------------|-----------------------------------|-------------------------|--|-------------------|
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079856.0 ; E 222868.5</u> | | ORIGINATED BY <u>MR</u> | | | | | | | | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>MAS</u> | | | | | | | | | | | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 16, 2012</u> | | CHECKED BY <u>CN</u> | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) |
| 192.0 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | 191 | | | | | | | | | | |
| 190.6 | END OF DCPT Refusal to Further Penetration (100 Blows / 0.18 m) | | | | | | | | | | | | | | | | |
| 1.4 | NOTE: 1. Bedrock outcrop in vicinity of DCPT. | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S305-DC14 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079737.1 ; E 222832.8</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Hand Shovel Excavation</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 16, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|------------------|---|---|------------|---|-------------------|----------------|--------------------------------------|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | W _p | W | W _L | | GR | SA | SI | CL |
| | | | | | | | | ○ UNCONFINED | ● QUICK TRIAXIAL | + | × | FIELD VANE | REMOULDED | WATER CONTENT (%) | | | | | | |
| 194.3 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | | | | | |
| | END OF EXCAVATION | | | | | | | | | | | | | | | | | | | |
| | BEDROCK | | | | | | | | | | | | | | | | | | | |
| | NOTE: | | | | | | | | | | | | | | | | | | | |
| | 1. Bedrock exposed by hand shovel excavation under 100 mm of topsoil at location of DCPT S305-DC14. | | | | | | | | | | | | | | | | | | | |


| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S305-DC15 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | |
|--------------------------------------|--|--|--------|-------------------------|----------------------------|-----------------|---|--------------------|----|----|----|---|-------------------|----|---|--|--|
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079778.0 ; E 222829.3</u> | | ORIGINATED BY <u>MR</u> | | | | | | | | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>MAS</u> | | | | | | | | | | | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 17, 2012</u> | | CHECKED BY <u>CN</u> | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| 193.2 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | 193 | | | | | | | | | | |
| 192.7 | END OF DCPT BEDROCK | | | | | | | | | | | | | | | | |
| 0.5 | Refusal to Further Penetration (50 Blows / 0.15 m) | | | | | | | | | | | | | | | | |
| | NOTE: | | | | | | | | | | | | | | | | |
| | 1. Bedrock outcrop in vicinity of DCPT S305-DC15. | | | | | | | | | | | | | | | | |

| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S305-DC16 | | SHEET 1 OF 1 | | METRIC | | | | |
|--------------------------------------|--|--|--------|-------------------------|----------------------------|-----------------|--|---|---------------------------------------|--|
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079813.8 ; E 222839.5</u> | | ORIGINATED BY <u>MR</u> | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>MAS</u> | | | | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 17, 2012</u> | | CHECKED BY <u>CN</u> | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 192.0 | GROUND SURFACE | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| 188.7 | | | | | | | | | | |
| 3.3 | END OF DCPT Refusal to Further Penetration (69 Blows / 0.28 m) | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S305-DC17 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079806.7 ; E 222803.4</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 17, 2012</u> | | CHECKED BY <u>CN</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--------------|------------------|---|-----|----------------|--------------------------------------|--|--|--|--|-------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | w _p | w | w _L | | | | | | |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | ● QUICK TRIAXIAL | | | | | | | | | × REMOULDED |
| 192.2 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | 192 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 190.5 | END OF DCPT Refusal to Further Penetration (63 Blows / 0.13 m) | | | | | | 191 | | | | | | | | | | | | |
| 1.7 | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| PROJECT | | RECORD OF DCPT No S305-DC18 | | SHEET 1 OF 1 | | METRIC | | | | |
|-------------------|---|---|--------|------------------|----------------------------|-----------------|--|---|---------------------------------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5079838.7 ; E 222788.7 | | ORIGINATED BY MR | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | |
| DATUM Geodetic | | DATE January 17, 2012 | | CHECKED BY CN | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 191.7 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| 189.1 2.6 | END OF DCPT Refusal to Further Penetration (100 Blows / 0.18 m) | | | | | | | | | |

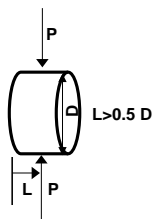
GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

TABLE E1[illegible]

(1) $Is_{50} \times K$, from ASTM Designation: D 5731 "Standard Test Method for Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications". A value of $K = 19$ has been used for the two (2) Is_{50} tests.

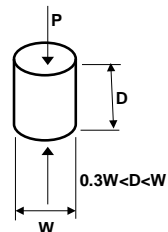
DIAMETRAL SPECIMEN SHAPE REQUIREMENTS

Note: Diametral tests are perpendicular to core axis (planes of weakness)



AXIAL SPECIMEN SHAPE REQUIREMENTS

**Note: Axial tests are parallel to core axis
(planes of weakness)**



Compiled by: TZ

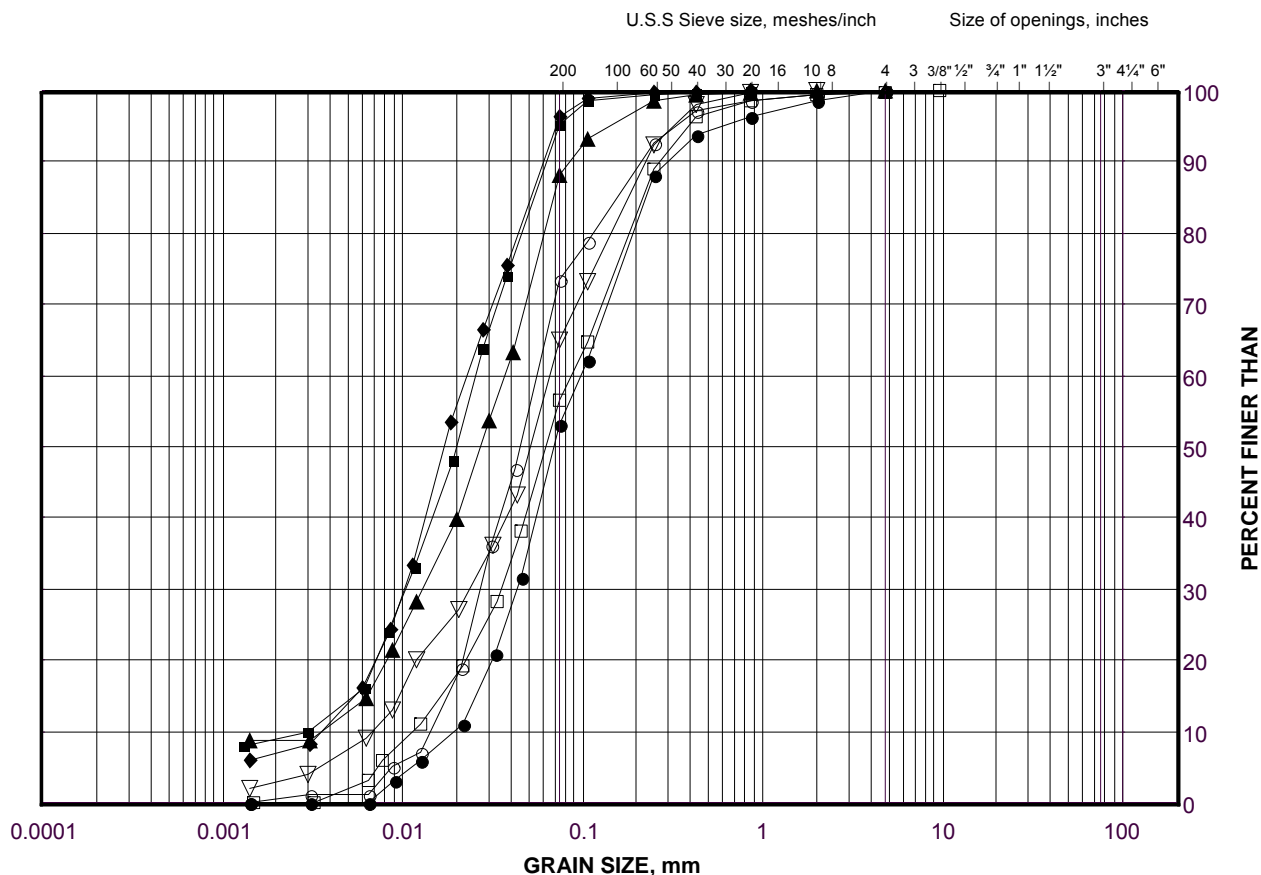
Reviewed by: JPD/JMAC

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Highway 69 (SBL) STA 17+425 to 17+635 (Swamp 305)

FIGURE E.S305-01



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

LEGEND

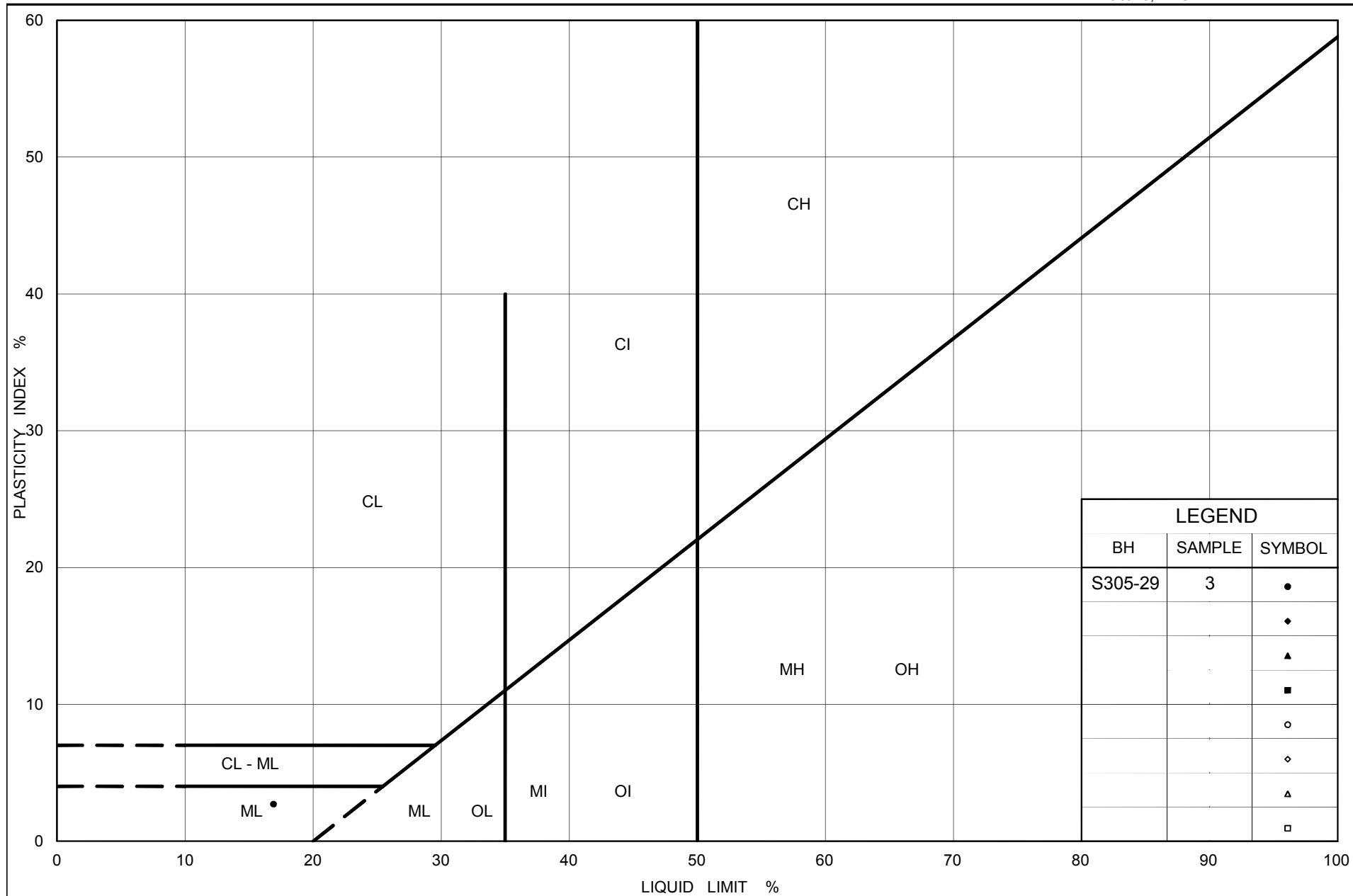
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S305-26 | 1B | 193.3 |
| ■ | S305-29 | 2 | 190.7 |
| ◆ | S305-25 | 2 | 192.5 |
| ▲ | S305-34 | 3 | 189.5 |
| ▽ | S305-29 | 3 | 190.0 |
| ○ | S305-31 | 3A | 189.8 |
| □ | S305-33 | 4 | 188.7 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 07-Nov-12



Ministry of Transportation

Ontario

PLASTICITY CHART

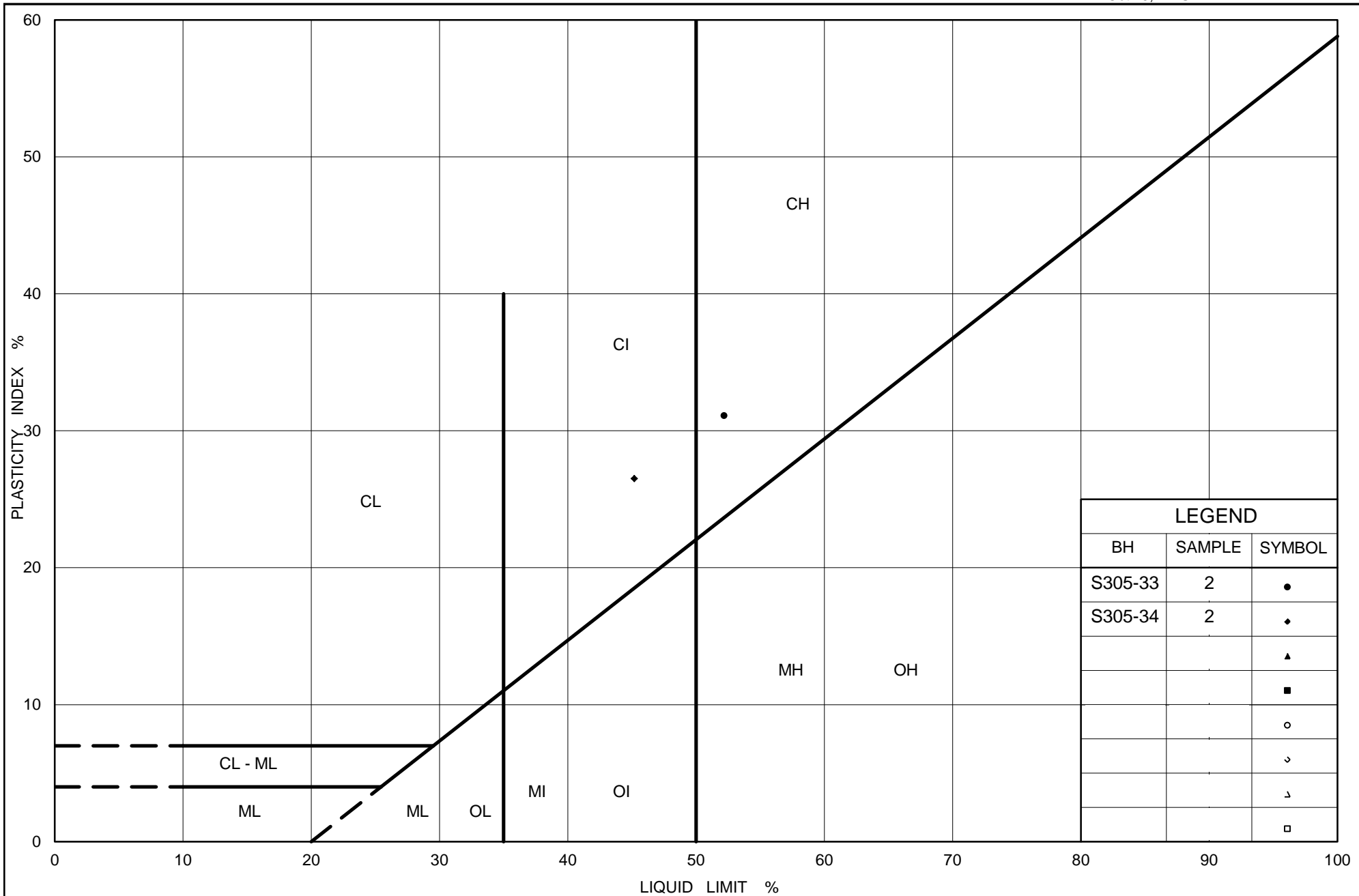
Silt and Sand

Highway 69 (SBL) STA 17+425 to 17+635 (Swamp 305)

Figure No. E.S305-02

Project No. 09-1111-6014

Checked By: TZ



Ministry of Transportation

Ontario

PLASTICITY CHART

Silty Clay to Clay

Highway 69 (SBL) STA 17+425 to 17+635 (Swamp 305)

Figure No. E.S305-03

Project No. 09-1111-6014

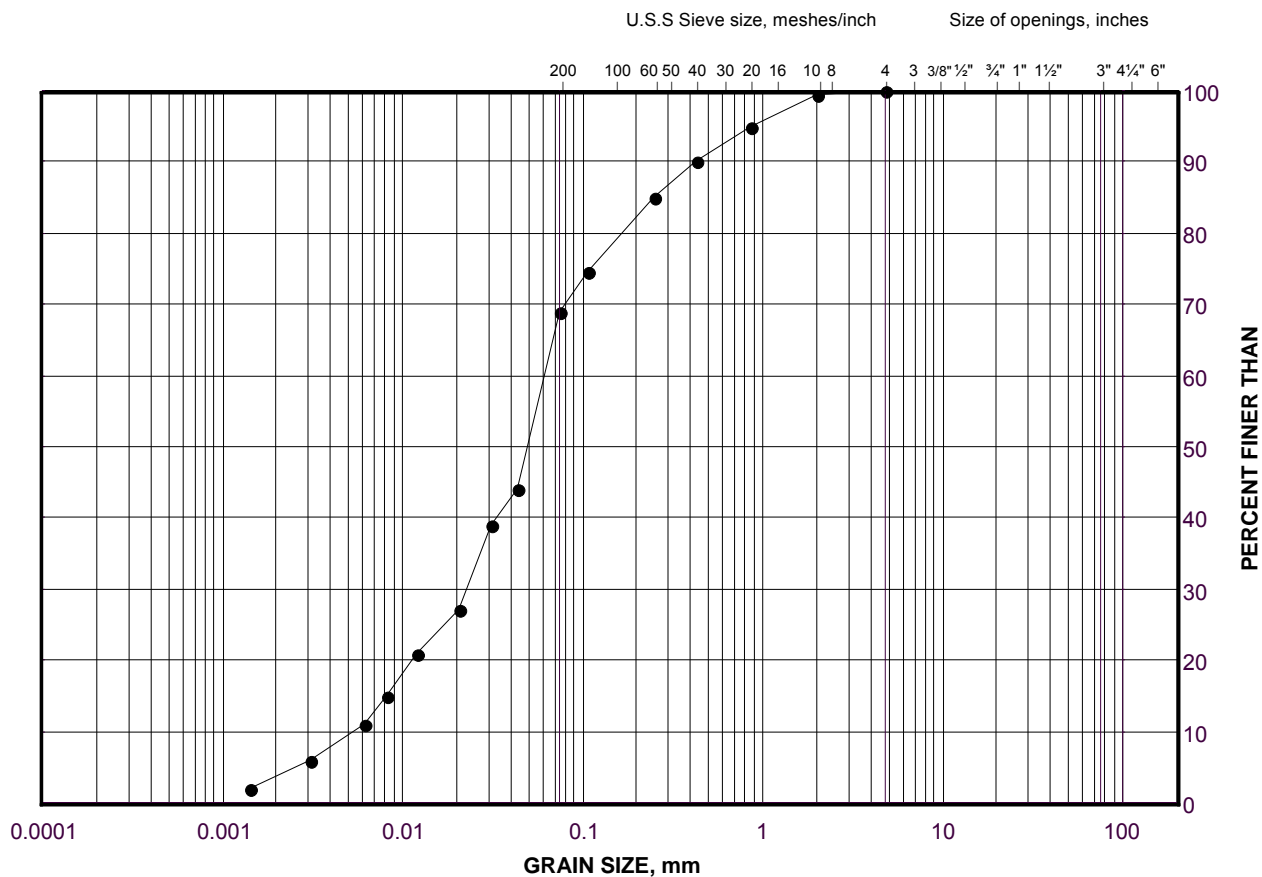
Checked By: TZ

GRAIN SIZE DISTRIBUTION

Sand and Silt (Fill)

Highway 69 (NBL) STA 17+025 to 17+550 (Swamp 305)

FIGURE E.S305-04



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S305-22 | 2 | 190.1 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

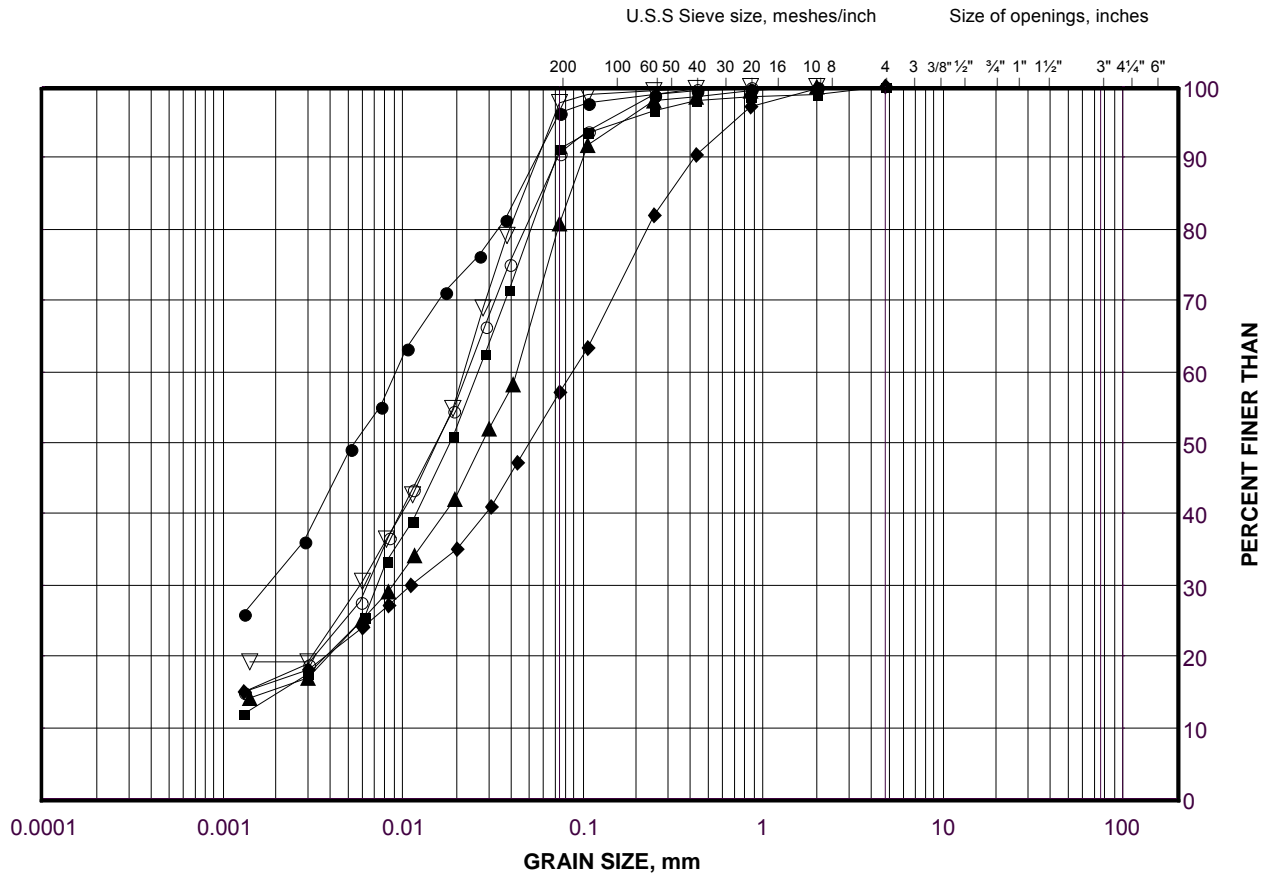
Date: 07-Nov-12

GRAIN SIZE DISTRIBUTION

Clayey Silt with Sand to Clayey Silt

Highway 69 (NBL) STA 17+025 to 17+550 (Swamp 305)

FIGURE E.S305-05



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

LEGEND

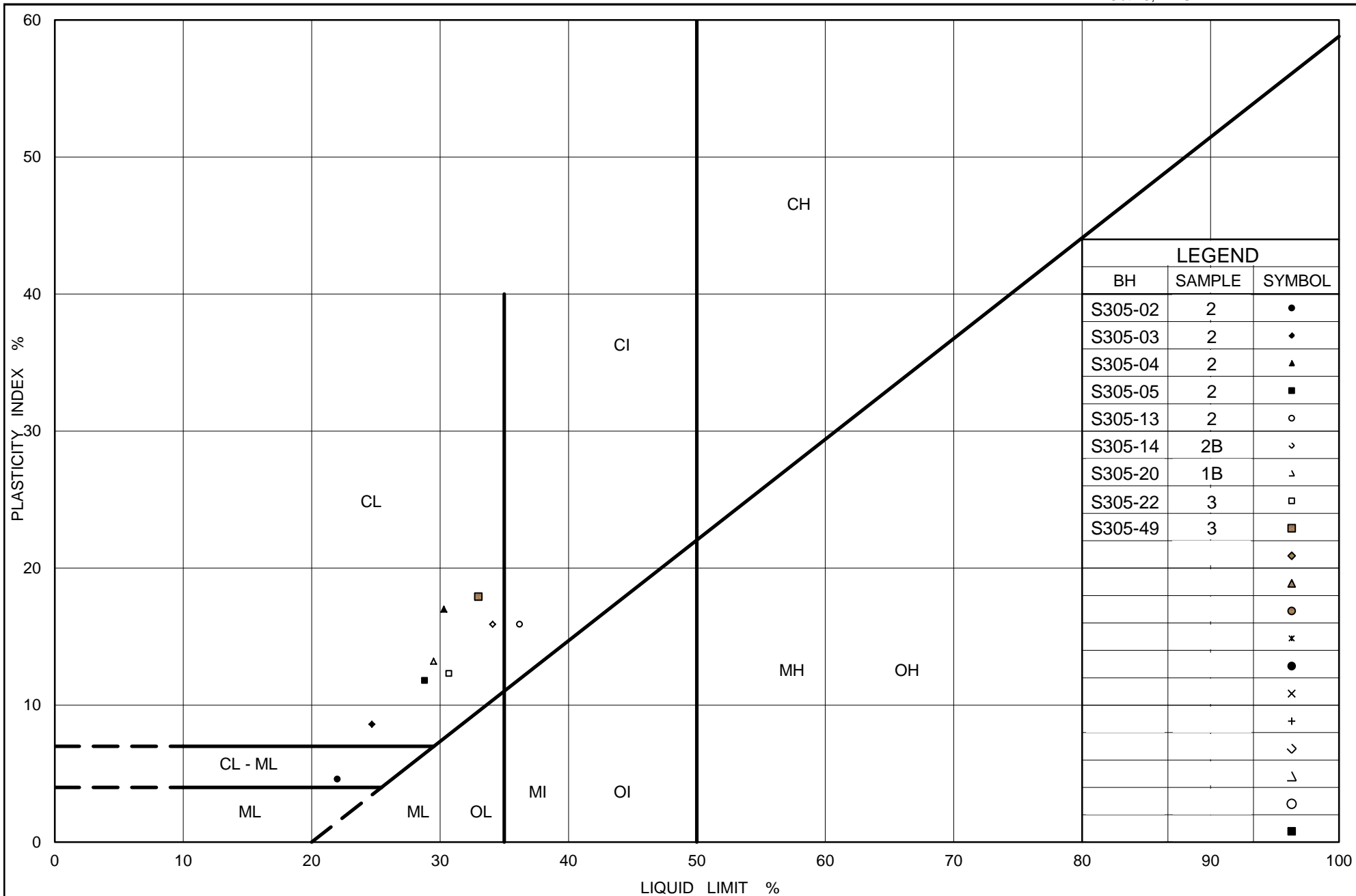
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|----------------|
| ● | S305-20 | 1B | 190.70 - 20.70 |
| ■ | S305-49 | 2 | 189.8 |
| ◆ | S305-02 | 2 | 189.8 |
| ▲ | S305-06 | 2 | 189.8 |
| ▽ | S305-03 | 2 | 189.8 |
| ○ | S305-14 | 2A | 188.3 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 30-Apr-13

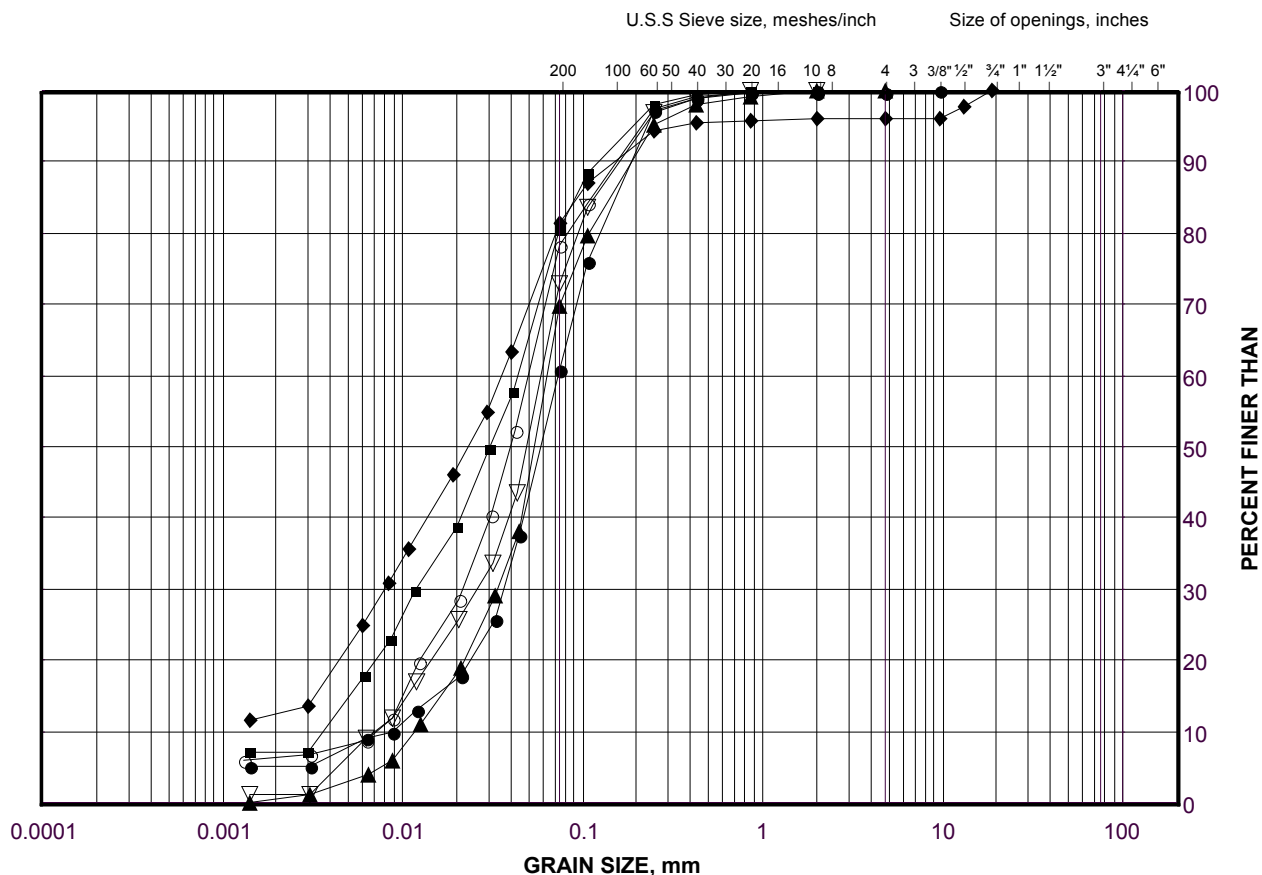


GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Highway 69 (NBL) STA 17+025 to 17+550 (Swamp 305)

FIGURE E.S305-07A



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S305-10 | 2 | 189.2 |
| ■ | S305-12 | 4 | 184.6 |
| ◆ | S305-05 | 4 | 188.7 |
| ▲ | S305-13 | 5 | 184.4 |
| ▽ | S305-04 | 5 | 188.1 |
| ○ | S305-12 | 6 | 183.1 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

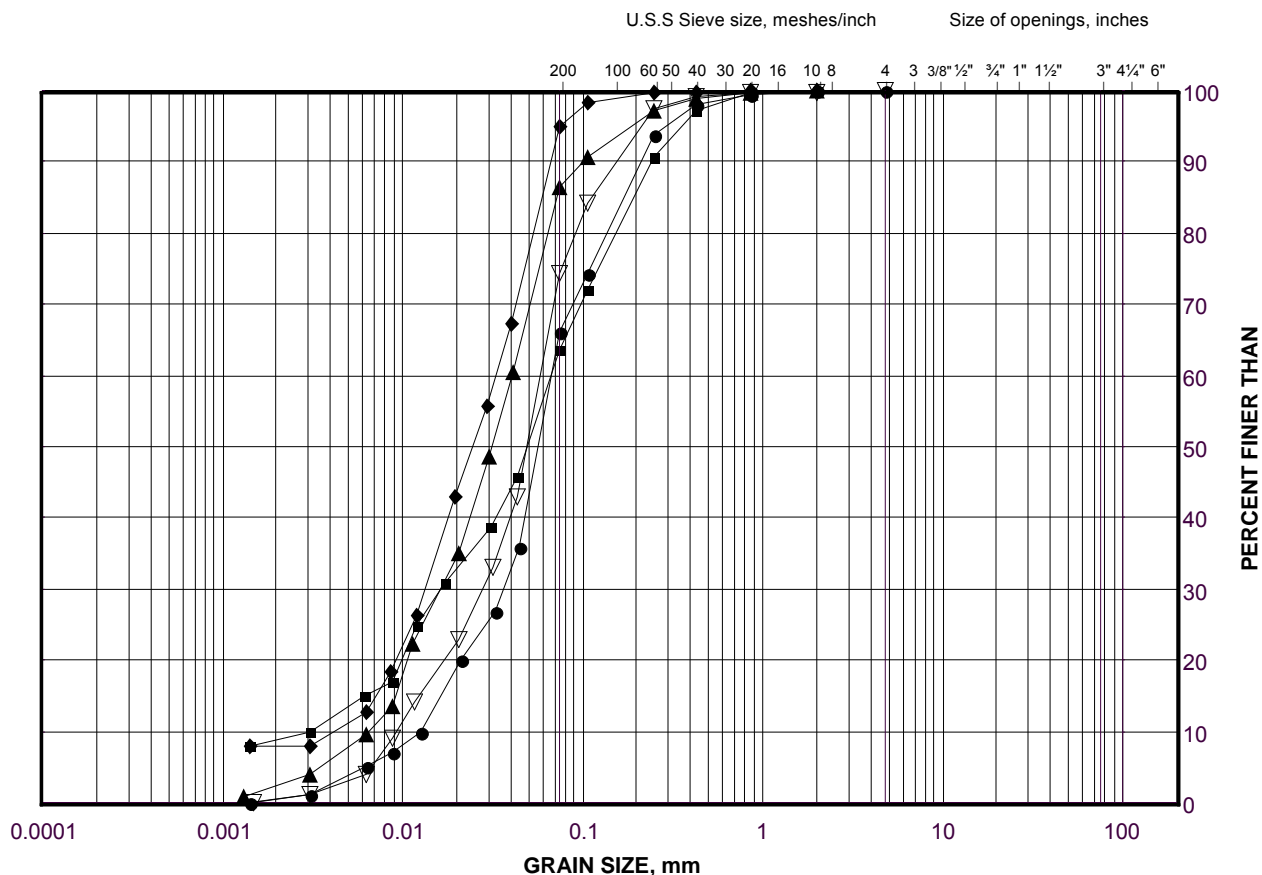
Date: 30-Apr-13

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Highway 69 (NBL) STA 17+025 to 17+550 (Swamp 305)

FIGURE ES305-07B



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

LEGEND

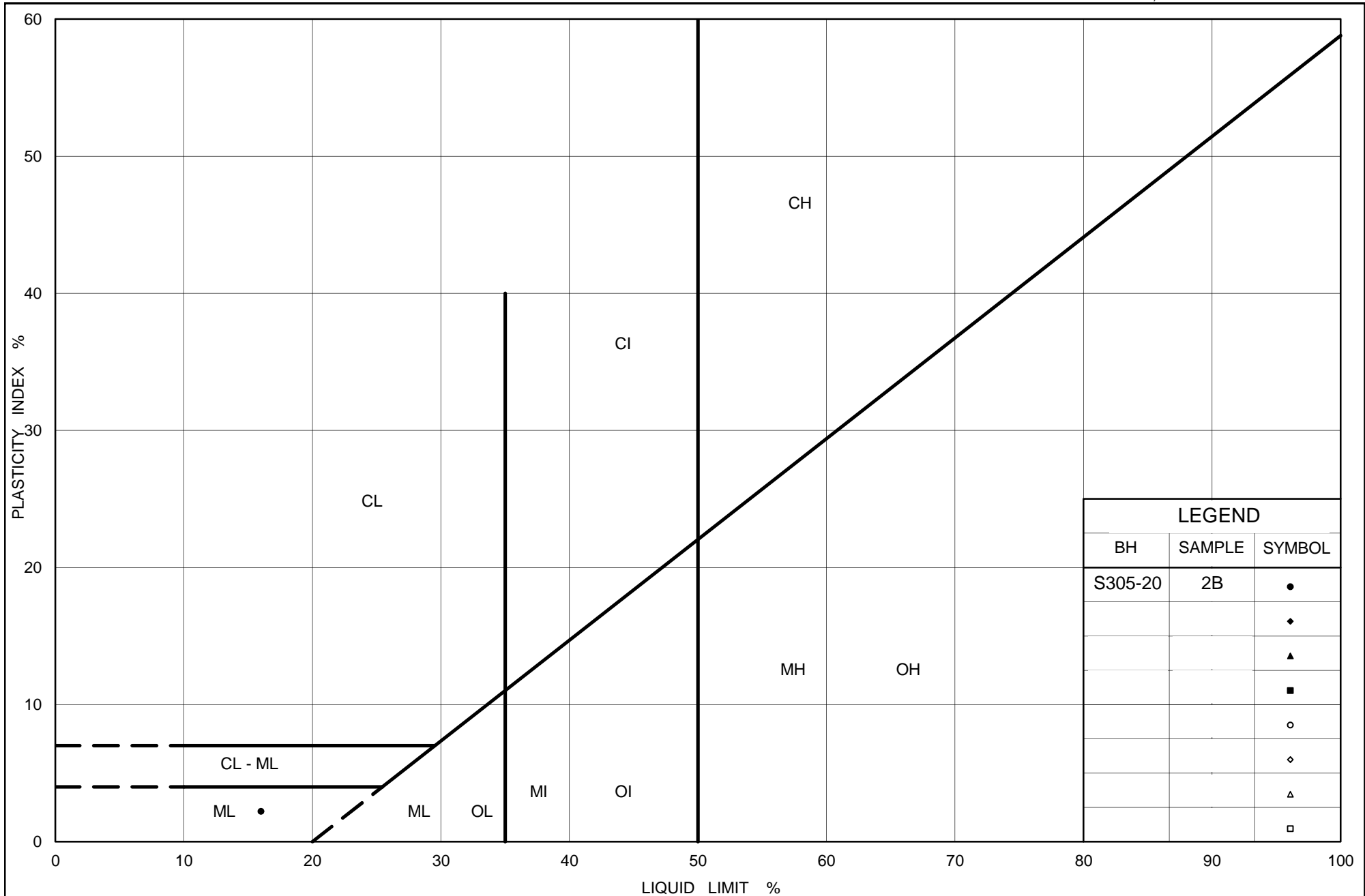
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S305-19 | 2 | 191.0 |
| ■ | S305-20 | 2B | 189.9 |
| ◆ | S305-14 | 3 | 187.4 |
| ▲ | S305-49 | 6 | 184.8 |
| ▽ | S305-13 | 7 | 182.8 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 04-Apr-13



Ministry of Transportation

Ontario

PLASTICITY CHART

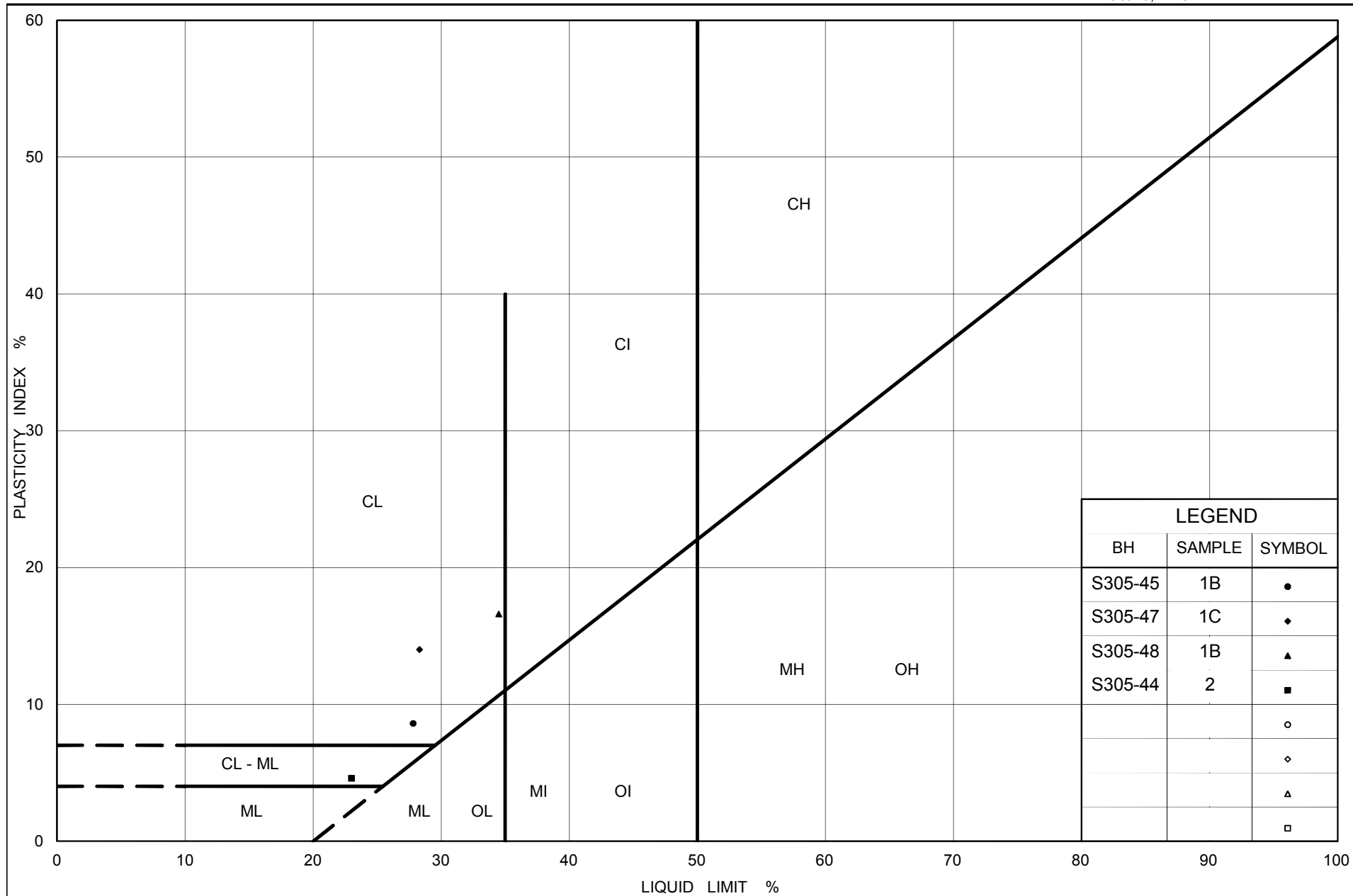
Silt and Sand (Slight Plasticity)

Highway 69 (NBL) STA 17+025 to 17+550 (Swamp 305)

Figure No. E.S305-08

Project No. 09-1111-6014

Checked By: TZ



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt

Bekanon Road E/W-S Ramp STA 17+485 to 17+650 (Swamp 305)

Figure No. E.S305-9

Project No. 09-1111-6014

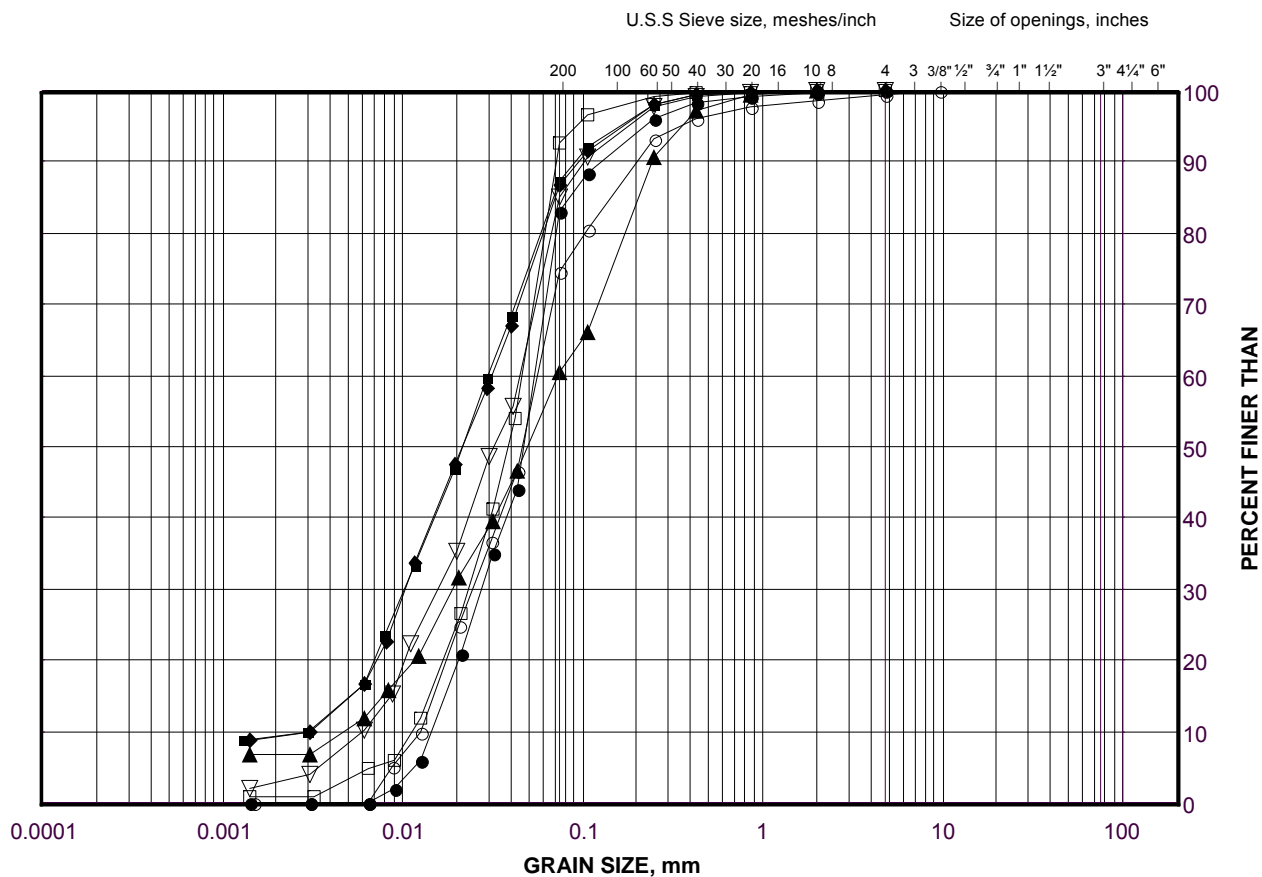
Checked By: TZ

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Bekanon Road E/W-S Ramp STA 17+485 to 17+650 (Swamp 305)

FIGURE E.S305-10A



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S305-42 | 1B | 192.5 |
| ■ | S305-43 | 2 | 191.1 |
| ◆ | S305-38 | 2 | 191.5 |
| ▲ | S305-30 | 2 | 191.1 |
| ▽ | S305-41 | 2A | 191.9 |
| ○ | S305-40 | 2A | 190.6 |
| □ | S305-41 | 3A | 191.2 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

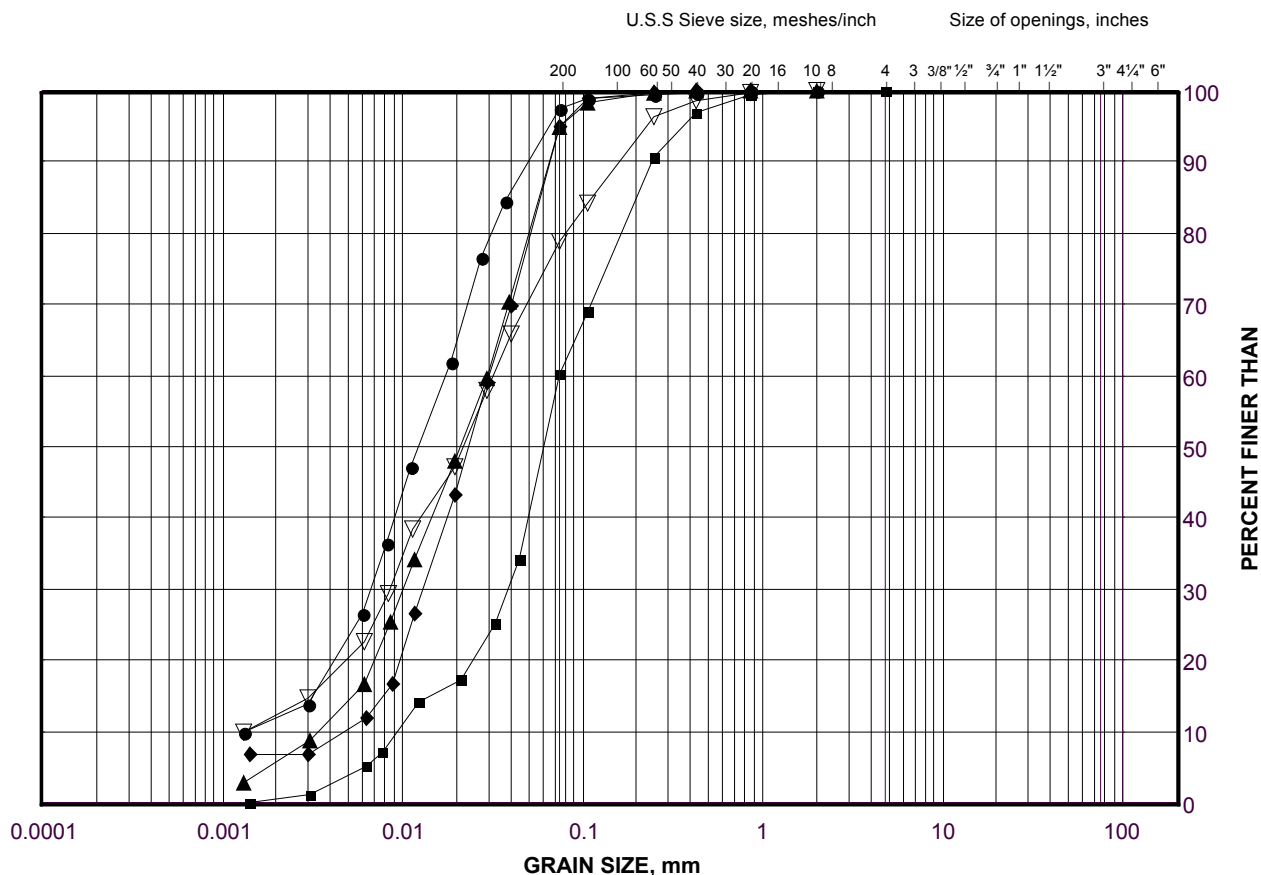
Date: 15-Nov-12

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Bekanon Road E/W-S Ramp STA 17+485 to 17+650 (Swamp 305)

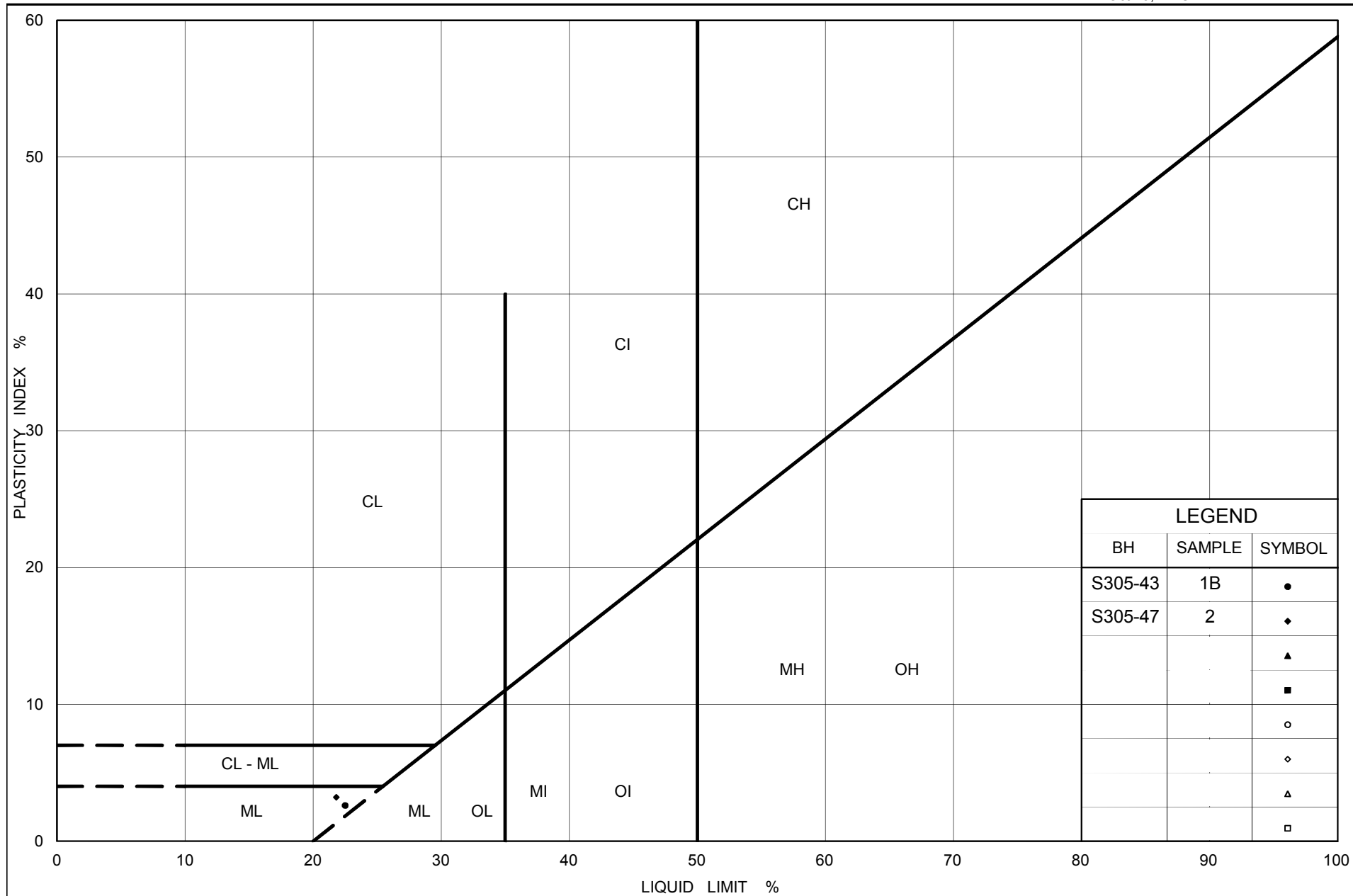
FIGURE E.S305-10B



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S305-47 | 2 | 189.9 |
| ■ | S305-46 | 2 | 190.9 |
| ◆ | S305-45 | 2 | 190.9 |
| ▲ | S305-48 | 3 | 189.5 |
| ▽ | S305-44 | 3 | 190.5 |



Ministry of Transportation

Ontario

PLASTICITY CHART

Silt

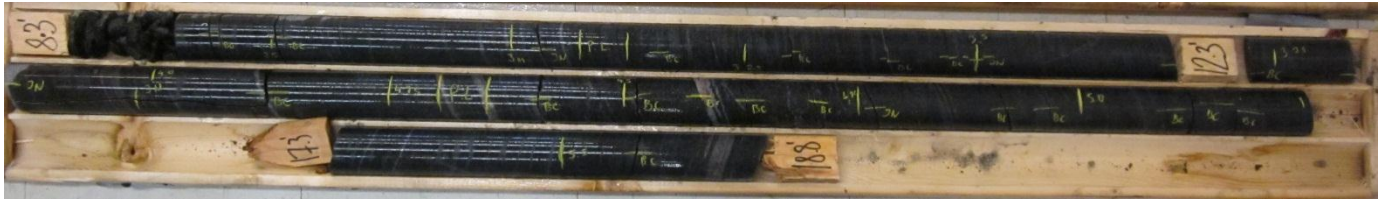
Bekanon Road E/W-S Ramp STA 17+485 to 17+650 (Swamp 305)

Figure No. E.S305-11

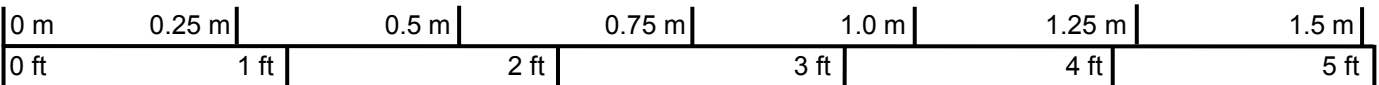
Project No. 09-1111-6014

Checked By: TZ


Borehole S305-48



Box 1: 2.5 m – 5.7 m



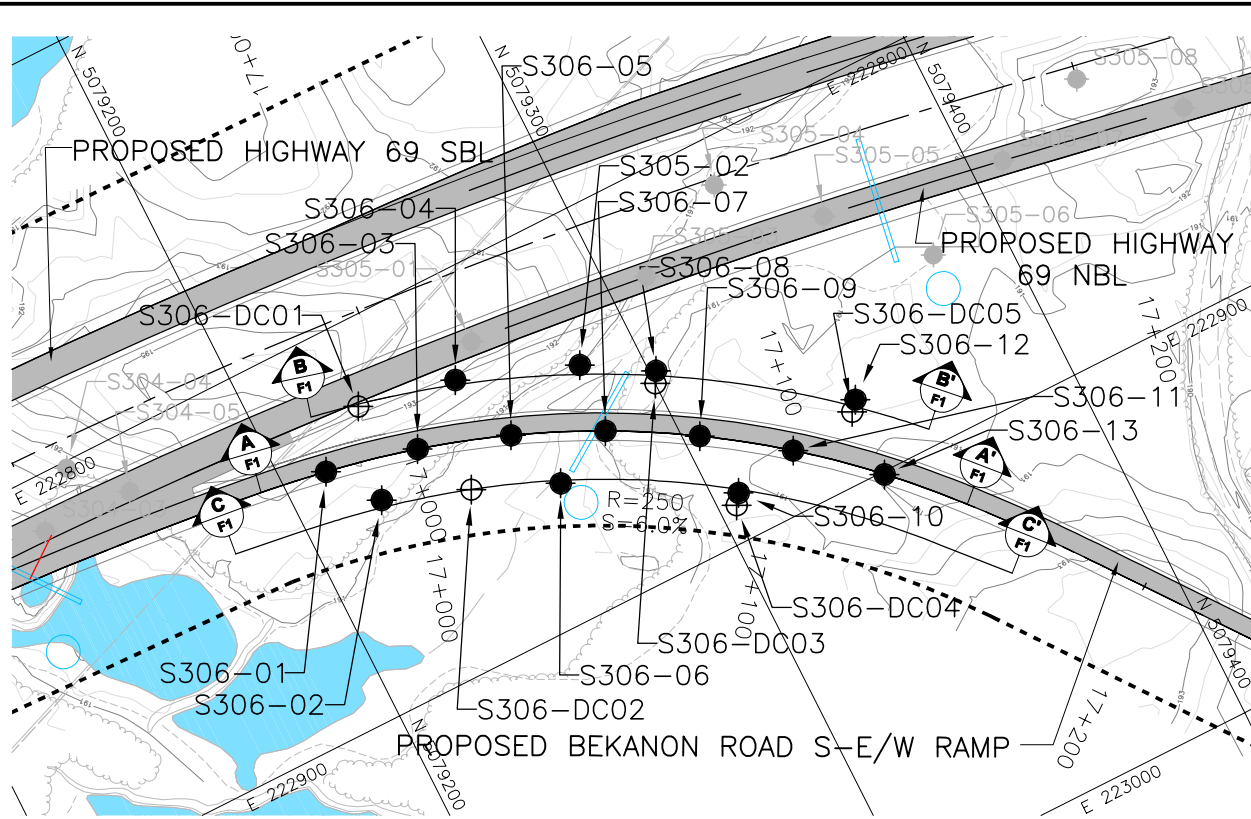
Scale

| | | | | | |
|--|--|--|--------------------------|------|-----------------|
| PROJECT | | | | | |
| Swamp Crossings and High Fill Areas – Contract 3 Highway 69 Four-Laning GWP 5404-05-00 ; WP 5404-05-01 | | | | | |
| TITLE | | | | | |
| Bedrock Core Photograph – S305-48 Bekanon Road E/W-S Ramp – STA 17+485 to 17+650 (Swamp 305) | | | | | |
|  | | | PROJECT No. 09-1111-6014 | | FILE No. ---- |
| | | | DESIGN | TZ | MAY 13 |
| | | | CADD | -- | |
| | | | CHECK | TZ | MAY 13 |
| | | | REVIEW | JMAC | MAY 13 |
| | | | | | FIGURE E.305-12 |

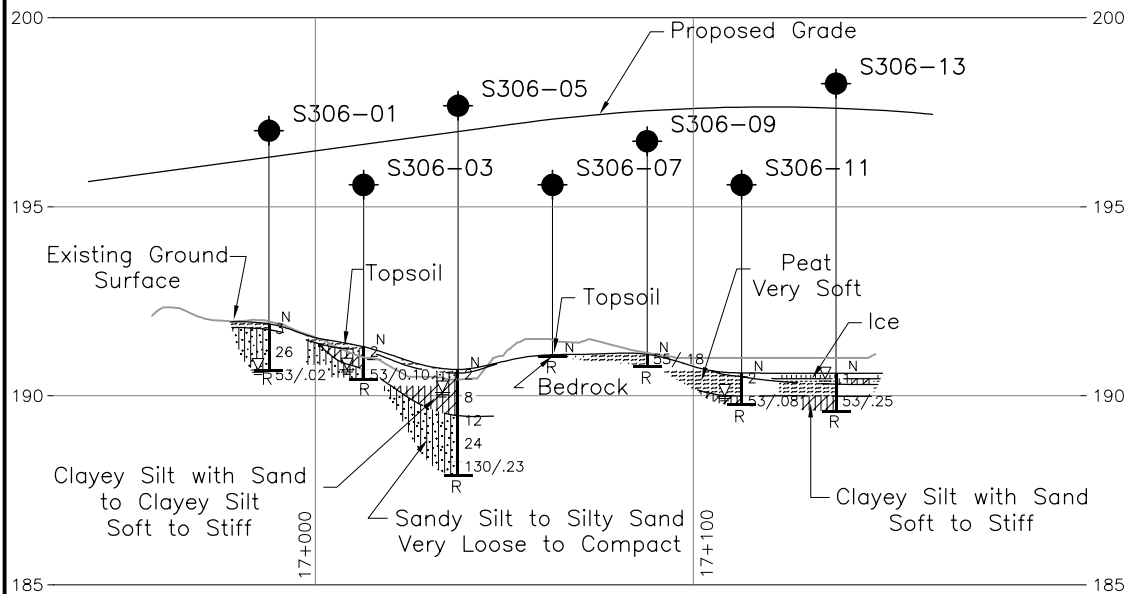


APPENDIX F

**Bekanon Road S-E/W Ramp – STA 16+975 to 17+140
(Swamp 306)**



PLAN
SCALE
20 0 20 40 m



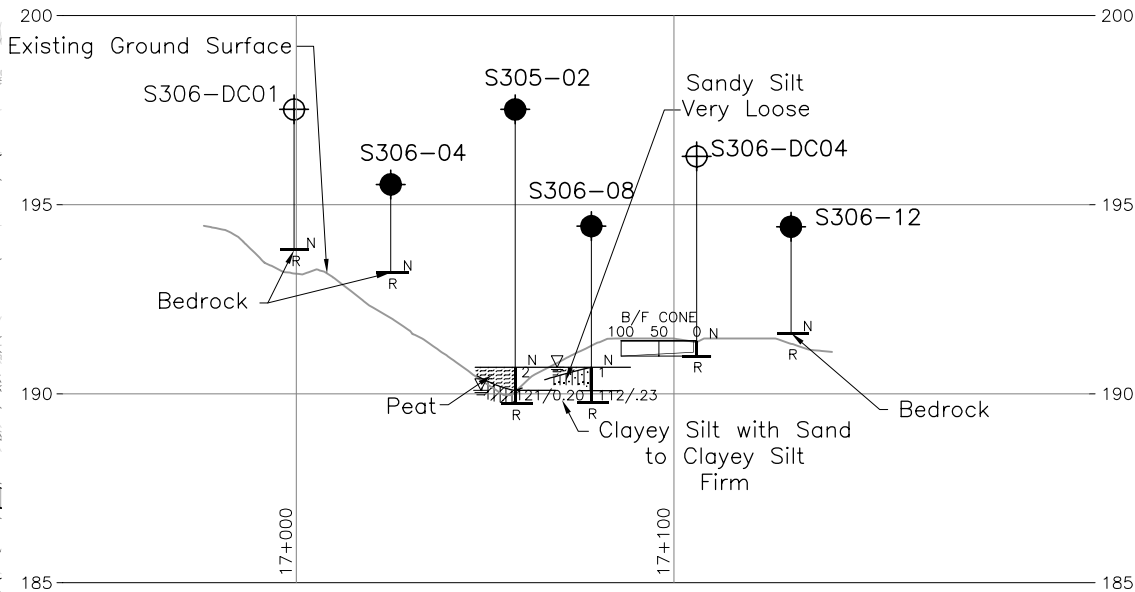
A-A
F1
CENTRELINE PROFILE
BEKANON ROAD S-E/W RAMP

HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m

NOTES

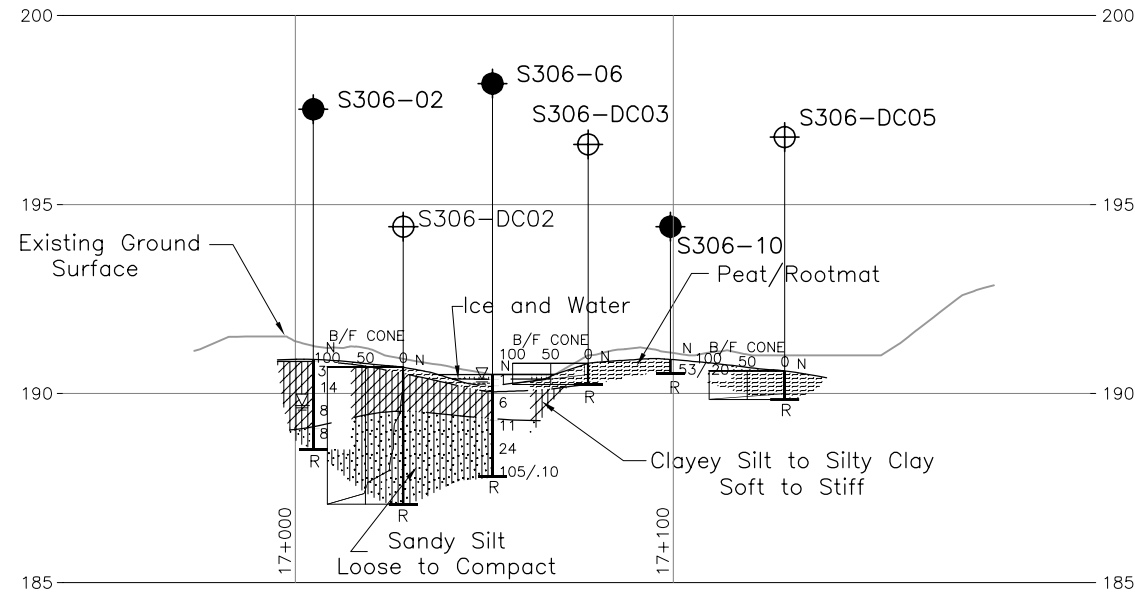
The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

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



B-B
F1
EMBANKMENT TOE PROFILE
BEKANON ROAD S-E/W RAMP

HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m



C-C
F1
EMBANKMENT TOE PROFILE
BEKANON ROAD S-E/W RAMP

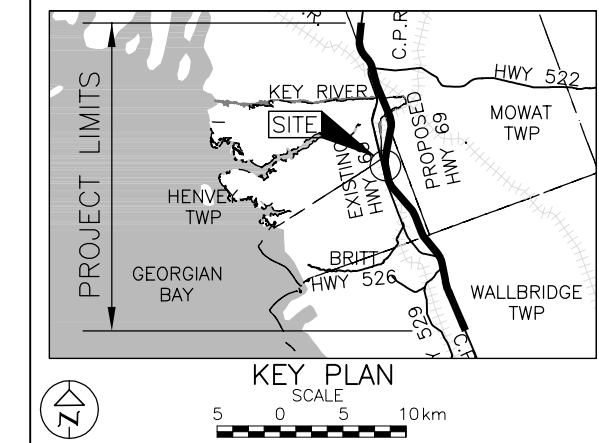
HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m

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

CONT No.
WP No.5404-05-01

BEKANON ROAD S-E/W RAMP
STA 16+975 TO 17+140 (RAMP)
BOREHOLE LOCATIONS AND SOIL STRATA

Golder Associates
Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling
- R Refusal

BOREHOLE CO-ORDINATES

| No. | ELEVATION | NORTHING | EASTING |
|-----------|-----------|-----------|----------|
| S305-02 | 190.7 | 5079284.4 | 222838.6 |
| S306-01 | 191.9 | 5079211.7 | 222833.6 |
| S306-02 | 190.9 | 5079221.5 | 222846.9 |
| S306-03 | 191.3 | 5079236.1 | 222839.1 |
| S306-04 | 193.2 | 5079253.2 | 222827.3 |
| S306-05 | 190.7 | 5079259.8 | 222847.0 |
| S306-06 | 190.5 | 5079265.8 | 222864.3 |
| S306-07 | 191.1 | 5079282.6 | 222857.2 |
| S306-08 | 190.7 | 5079301.7 | 222849.1 |
| S306-09 | 191.1 | 5079304.3 | 222869.7 |
| S306-10 | 190.9 | 5079306.7 | 222887.8 |
| S306-11 | 190.6 | 5079324.6 | 222884.3 |
| S306-12 | 191.6 | 5079345.4 | 222879.7 |
| S306-13 | 190.6 | 5079343.3 | 222900.8 |
| S306-DC01 | 193.8 | 5079227.2 | 222822.0 |
| S306-DC02 | 190.7 | 5079243.9 | 222855.1 |
| S306-DC03 | 190.8 | 5079300.1 | 222851.9 |
| S306-DC04 | 191.4 | 5079304.8 | 222890.4 |
| S306-DC05 | 190.6 | 5079343.2 | 222882.1 |

REFERENCE

Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and , Existing Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Existing and Proposed Grades obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.

| NO. | DATE | BY | REVISION |
|-----|-----------|----------|--------------------------|
| 1 | Jan. 2014 | JFC | Initial Issue |
| 2 | May 2013 | JPD/JMAC | Revised for Construction |

Geocres No. 41H-134

| | | |
|---------------|--------------------------|----------------|
| HWY. | PROJECT NO. 09-1111-6014 | DIST. |
| SUBM'D. CC | CHKD. TZ | DATE: May 2013 |
| DRAWN: JFC/LL | CHKD. CN | APPD. JPD/JMAC |

DWG. F1



| PROJECT | | RECORD OF BOREHOLE | | No S306-01 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|--------------|-------|---|------------|---------------|------|--|-------------------------|--|---|-----------------|-----------------|-----------------|-----------------|-------------------|---------------------------------------|--|---|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5079211.7 ; E 222833.6 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | BM | | | | | | | | |
| Geodetic | | January 12, 2012 | | CN/TZ | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
| ELEV | DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | GR SA SI CL |
| | | | | | | | | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | 20 40 60 80 100 | | | |
| 191.9 | 0.0 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| | 0.2 | TOPSOIL | | | | | | | | | | | | | | | | |
| | | SILT and SAND, trace clay, trace organics, containing sand seams Very loose to compact Brown Moist | | 1 | SS | 3 | | | | | | | | | | | | 0 30 69 1 |
| | | | | 2 | SS | 26 | | 191 | | | | | | | | | | Non-Plastic |
| 190.7 | 1.2 | SAND, trace silt Brown Wet | | 3 | SS | 53/6.02 | | | | | | | | | | | | |
| | | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| | | NOTES: | | | | | | | | | | | | | | | | |
| | | 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 190.7 m) upon completion of drilling. | | | | | | | | | | | | | | | | |
| | | 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S306-02 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079221.5 ; E 222846.9</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 12, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|----|----|---|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | | | |
| 190.9 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | |
| 189.7 | PEAT (Fibrous) | | 1 | SS | 3 | | | | | | | | | | | | | | | |
| | CLAYEY SILT, trace sand, trace organics | | 2 | SS | 14 | | | | | | | | | | | | | | | |
| | Soft to stiff | | | | | | | | | | | | | | | | | | | |
| | Brown | | 3 | SS | 8 | | | | | | | | | | | | | | | |
| | Moist becoming wet below a depth of 1.2 m | | | | | | | | | | | | | | | | | | | |
| 189.1 | Sandy SILT | | | | | | | | | | | | | | | | | | | |
| 1.8 | Loose | | 4 | SS | 8 | | | | | | | | | | | | | | | |
| 188.5 | Grey | | | | | | | | | | | | | | | | | | | |
| 2.4 | Wet | | | | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | | | | |
| | NOTE: | | | | | | | | | | | | | | | | | | | |
| | 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 189.7 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S306-03 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079236.1 ; E 222839.1</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 12, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | |




| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
|---|---------------------------------------|------------|---------|------|------------|----------------------------|-----------------|---|--------------------------------|---|----|-----|--------------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | ● QUICK TRIAXIAL × REMOULDED | | | | | | |
| 191.3 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | |
| 0.1 | CLAYEY SILT with sand, trace organics | | 1 | SS | 2 | | | | | | | | | | |
| 190.7 | Soft Brown Moist | | 2 | SS | 53/0.10 | | | | | | | | | | |
| 0.9 | Sandy SILT Compact Brown Wet | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | |
| NOTES: | | | | | | | | | | | | | | | |
| 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 190.7 m) upon completion of drilling. | | | | | | | | | | | | | | | |
| 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | |



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

GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| | | | | | | | |
|----------------------|--|--|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S306-05 | | SHEET 1 OF 1 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5079259.8 ;E 222847.0 | | ORIGINATED BY ARM | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | COMPILED BY BM | | | |
| DATUM Geodetic | | DATE January 12, 2012 | | CHECKED BY CN/TZ | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|---|---|---------|------|------------|---|-----------------|---|----|----|----|-----|--|---|--|--|--------------------------------------|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | | | |
| 190.7 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | | |
| 0.0 | PEAT (Amorphous) |  | 1 | SS | 2 |  | 190 | | | | | | | | | | | | | | |
| | CLAYEY SILT, trace sand, trace organics Soft to stiff Brown Moist to wet | | 2 | SS | 8 | | | | | | | | | | | | | | | | |
| 189.5 | Sandy SILT, trace clay | | | | | | | | | | | | | | | | | | | | |
| 1.2 | Compact Brown Wet |  | 3 | SS | 12 | | 189 | | | | | | | | | | | | | | |
| | | | 4 | SS | 24 | | | | | | | | | | | | | | | | |
| 188.3 | Silty SAND | | | | | | | | | | | | | | | | | | | | |
| | Compact Brown Wet | | 5 | SS | 130/0.23 | 188 | | | | | | | | | | | | | | | |
| 187.9 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | | | | | |
| 2.8 | NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 190.1 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S306-06 | | SHEET 1 OF 1 | | METRIC | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|-------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | |
| DATUM | | DATE | | CHECKED BY | | | | | | | |
| 09-1111-6014 | | N 5079265.8 ; E 222864.3 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | BM | |
| Geodetic | | January 14, 2012 | | CN/TZ | | | | | | | |

| 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 ● QUICK TRIAXIAL × REMOULDED | | | | | WATER CONTENT (%) | | | | | | |
| | | | | | | 20 40 60 80 100 | | | | | 20 40 60 | | | | | | |
| 190.5 | ICE SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Ice | | | | | | | | | | | | | | | | |
| | Water | | 1 | SS | 1 | | | | | | | | | | | | |
| 0.5 | Root mat | | | | | | | | | | | | | | | | |
| | SILTY CLAY, trace sand, trace organics | | 2 | SS | 6 | | | | | | | | | | | | 0 2 47 51 |
| 189.3 | Firm Brown Wet | | | | | | | | | | | | | | | | |
| 1.2 | Sandy SILT, trace to some clay | | 3 | SS | 11 | | | | | | | | | | | | 0 27 72 1 |
| | Compact Brown Wet | | 4 | SS | 24 | | | | | | | | | | | | 0 27 66 7 |
| 187.8 | END OF BOREHOLE SPOON REFUSAL | | 5 | SS | 105/0.10 | | | | | | | | | | | | |
| 2.7 | NOTE: 1. Water level in open borehole at ice surface (Elev. 190.5 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

| | | | |
|--------------------------------------|---|--------------------------|---------------|
| PROJECT <u>09-1111-6014</u> | RECORD OF BOREHOLE No S306-07 | SHEET 1 OF 1 | METRIC |
| W.P. <u>5404-05-01</u> | LOCATION <u>N 5079282.6 ; E 222857.2</u> | ORIGINATED BY <u>ARM</u> | |
| DIST <u> </u> HWY <u>69</u> | BOREHOLE TYPE <u>Hand Shovel Excavation</u> | COMPILED BY <u>BM</u> | |
| DATUM <u>Geodetic</u> | DATE <u>January 16, 2012</u> | CHECKED BY <u>CN/TZ</u> | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | |
|---------------|------------------------------------|------------|---------|------|------------|----------------------------|-----------------|---|------------------|---|---|--|---|--|--|--------------------------------------|--|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | | | | | |
| | | | | | | | | ○ UNCONFINED | ● QUICK TRIAXIAL | + | × | | | | | | | | | | |
| 191.1 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | | |
| 0.9 | TOPSOIL | | | | | | | | | | | | | | | | | | | | |
| | END OF EXCAVATION | | | | | | | | | | | | | | | | | | | | |
| | BEDROCK | | | | | | | | | | | | | | | | | | | | |
| | NOTE: | | | | | | | | | | | | | | | | | | | | |
| | 1. Excavation dry upon completion. | | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S306-08 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079301.7 ; E 222849.1</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 14, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | |

| 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 | | | | | | |
| 190.7 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | Sandy SILT, trace organics Very loose Black Wet | | 1 | SS | 1 | | | | | | | | | |
| 190.1 | | | | | | | | | | | | | | |
| 189.8 | CLAYEY SILT with sand, trace organics Firm Grey Wet | | 2 | SS | 112/0.23 | | | | | | | | | |
| 0.9 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at ground surface (Elev. 190.7 m) upon completion of drilling. | | | | | | | | | | | | | |

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S306-09 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|----------------------|---|--|--------|------|----------------------------|-------------------|---|--------------------|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION N 5079304.3 ; E 222869.7 | | | | ORIGINATED BY ARM | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | | | COMPILED BY BM | | | | | | | | | | |
| DATUM Geodetic | | DATE January 14, 2012 | | | | CHECKED BY CN/TZ | | | | | | | | | | |
| 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 | | | | | | | | |
| 191.1 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | 1 | SS | 55/0.18 | 191 | | | | | | | | | | |
| 190.8 | Black | | | | | | | | | | | | | | | |
| 0.3 | Moist | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | |
| | NOTES: | | | | | | | | | | | | | | | |
| | 1. Open borehole dry upon completion of drilling. | | | | | | | | | | | | | | | |
| | 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S306-10 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079306.7 ; E 222887.8</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>BM</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 15, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|----|----|---|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | | | |
| 190.9 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | 1 | SS | 53/0.20 | | | | | | | | | | | | | | | |
| 190.5 | Black | | | | | | | | | | | | | | | | | | | |
| 0.4 | Moist | | | | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | | | | |
| | NOTES: 1. Open borehole dry upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF BOREHOLE | | No S306-11 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--|---|--------------------|---------|--------------------------|------------|--|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. 09-1111-6014 | | LOCATION | | N 5079324.6 ; E 222884.3 | | ORIGINATED BY | | ARM | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 14, 2012 | | CHECKED BY | | | | | | | | | |
| | | | | | | | | CN/TZ | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| 190.6 | ICE SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | Ice | | 1 | SS | 2 | | | | | | | | | | | | |
| 190.0 | PEAT (Amorphous) Very soft Black Wet | | 2 | SS | 53/0.08 | | 190 | | | | | | | | | | |
| 0.8 | CLAYEY SILT with sand Soft Brown Wet | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 190.0 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | |



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

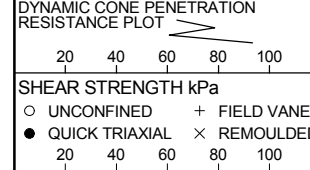
GTGA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF BOREHOLE | | No S306-13 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--|--|--------------------|---------|--------------------------|------------|--|-----------------|--|--|--|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5079343.3 ; E 222900.8 | | ORIGINATED BY | | ARM | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 14, 2012 | | CHECKED BY | | | | | | | | | |
| CN/TZ | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| 190.6 | ICE SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Ice | | | | | | | | | | | | | | | | |
| | Water | | | | | | | | | | | | | | | | |
| 190.0 | PEAT (Fibrous) | | 1 | SS | 1 | | 190 | | | | | | | | | | |
| | Very soft | | | | | | | | | | | | | | | | |
| 189.6 | Black | | 2 | SS | 53/0.25 | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | | | |
| 1.0 | CLAYEY SILT, some sand, trace organics | | | | | | | | | | | | | | | | |
| | Stiff | | | | | | | | | | | | | | | | |
| | Brown | | | | | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 0.2 m below ground surface (Elev. 190.4 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | |



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

GTGTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| PROJECT | | RECORD OF DCPT No S306-DC02 | | SHEET 1 OF 1 | | METRIC | | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|--|--|---------------------------------------|--|------------|
| W.P. 09-1111-6014 | | LOCATION N 5079243.9 ; E 222855.1 | | ORIGINATED BY ARM | | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | | |
| DATUM Geodetic | | DATE January 12, 2012 | | CHECKED BY CN/TZ | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p W W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | | "N" VALUES |
| 190.7 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | |
| 187.1 3.6 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.28 m) NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | |

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S306-DC03 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|----------------------|--|---|--------|------|-------------------------|-------------------|--|--------------------|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|
| W.P. 5404-05-01 | | LOCATION N 5079300.1 ; E 222851.9 | | | | ORIGINATED BY ARM | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | | | COMPILED BY MAS | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 14, 2012 | | | | CHECKED BY CN/TZ | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) |
| 190.8 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | |
| 190.2 | | | | | | | | | | | | | | | | | |
| 0.6 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.25 m) NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S306-DC04 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | |
|----------------------|---|---|--------|------|----------------------------|-------------------|---|--------------------|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION N 5079304.8 ; E 222890.4 | | | | ORIGINATED BY ARM | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | | | COMPILED BY MAS | | | | | | | | | | |
| DATUM Geodetic | | DATE January 14, 2012 | | | | CHECKED BY CN/TZ | | | | | | | | | | |
| 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 | | | | | | | | |
| 191.4 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | |
| 191.0 | | | | | | | | | | | | | | | | |
| 0.4 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.10 m) | | | | | | | | | | | | | | | |
| | NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S306-DC05 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|----------------------|---|---|--------|------|----------------------------|-------------------|---|--------------------|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|--|
| W.P. 5404-05-01 | | LOCATION N 5079343.2 ; E 222882.1 | | | | ORIGINATED BY ARM | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | | | COMPILED BY MAS | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 14, 2012 | | | | CHECKED BY CN/TZ | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | |
| 190.6 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | |
| 189.8 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.15 m) | | | | | | | | | | | | | | | | |
| 0.8 | NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |

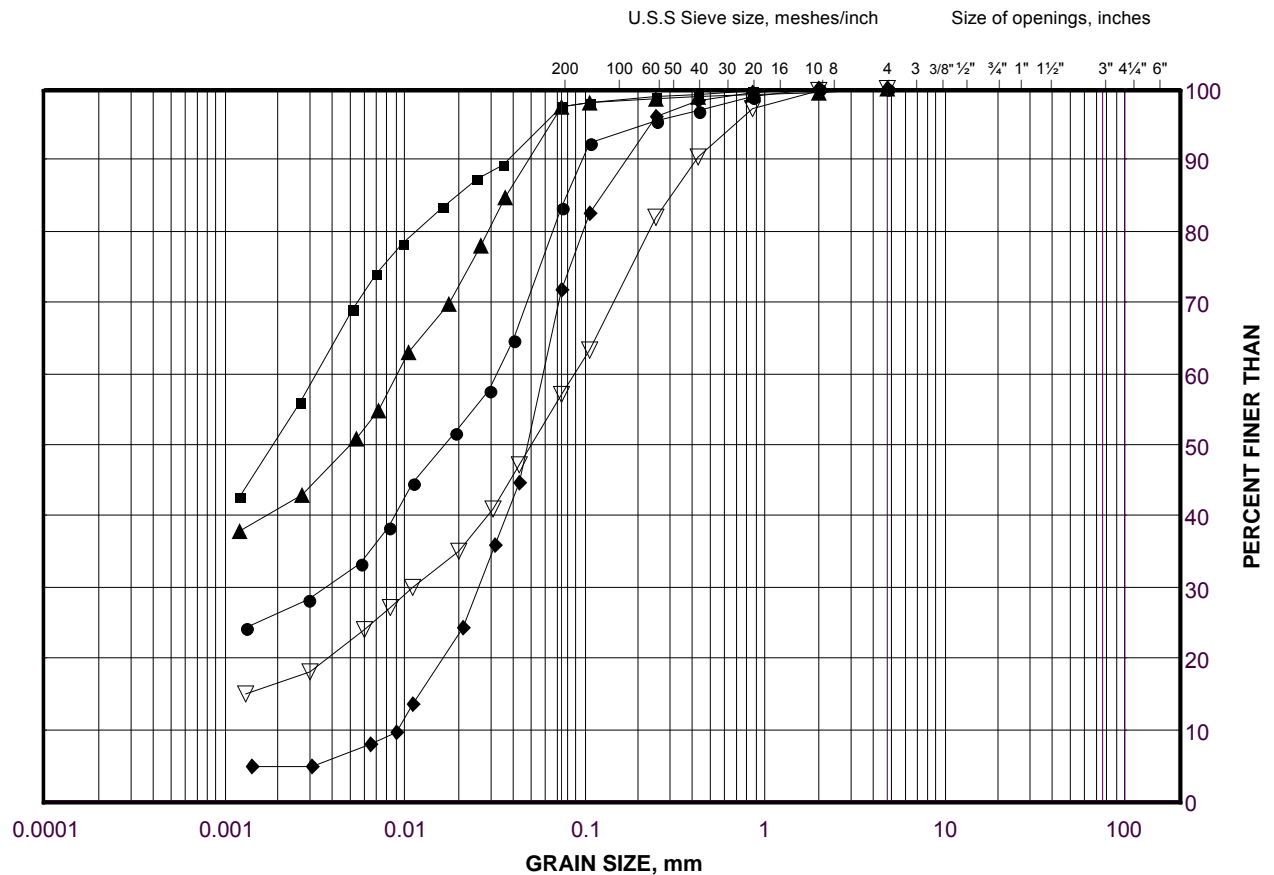
GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

GRAIN SIZE DISTRIBUTION

Clayey Silt with Sand to Silty Clay

Bekanon Road S-E/W Ramp STA 16+975 to 17+140 (Swamp 306)

FIGURE F.S306-01



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

LEGEND

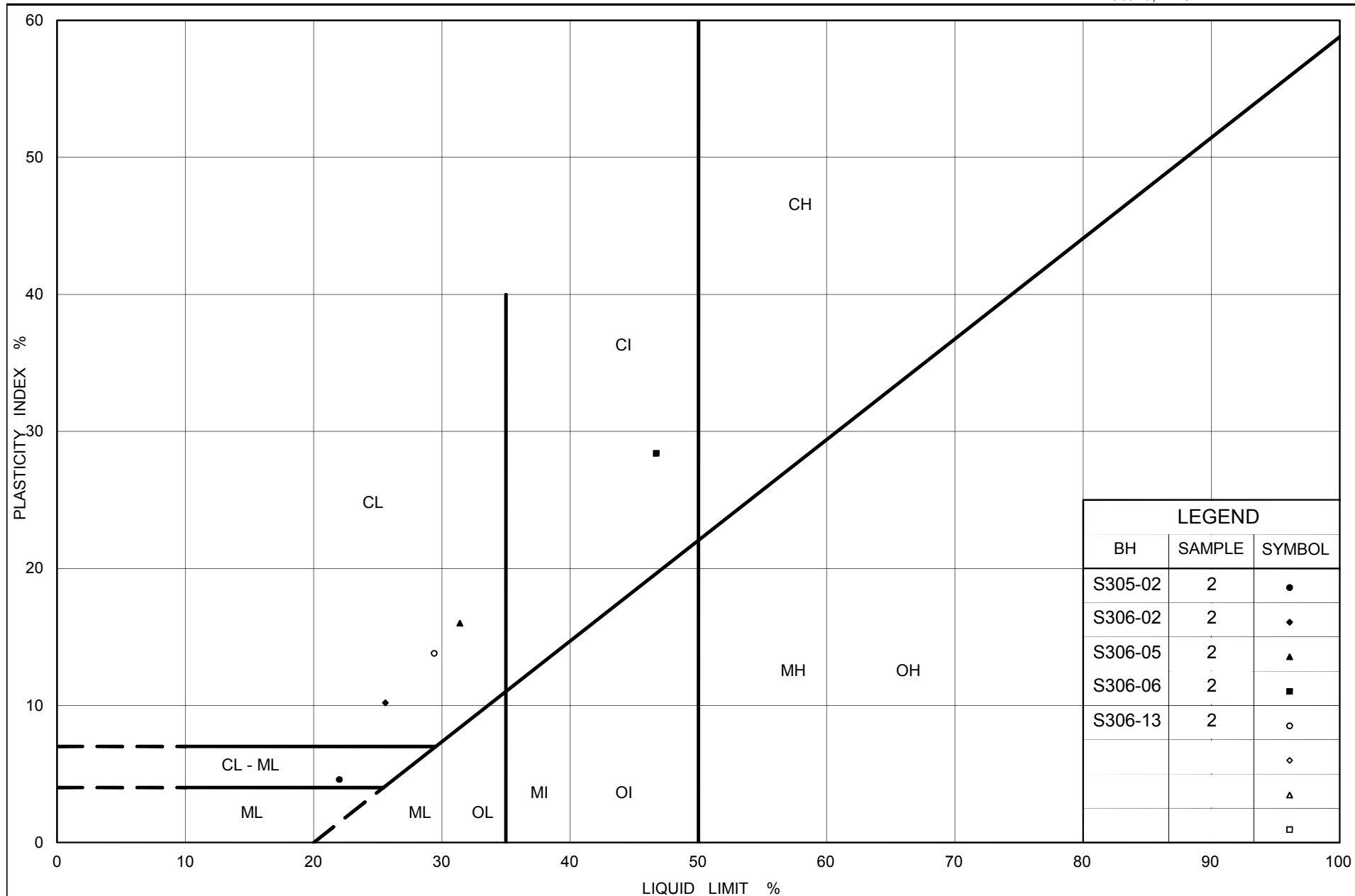
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S306-13 | 2 | 189.8 |
| ■ | S306-06 | 2 | 189.6 |
| ◆ | S306-05 | 2 | 189.8 |
| ▲ | S306-02 | 2 | 190.0 |
| ▽ | S305-02 | 2 | 189.8 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 05-Apr-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt with Sand to Silty Clay

Bekanon Road S-E/W Ramp STA 16+975 to 17+140 (Swamp 306)

Figure No. F.S306-02

Project No. 09-1111-6014

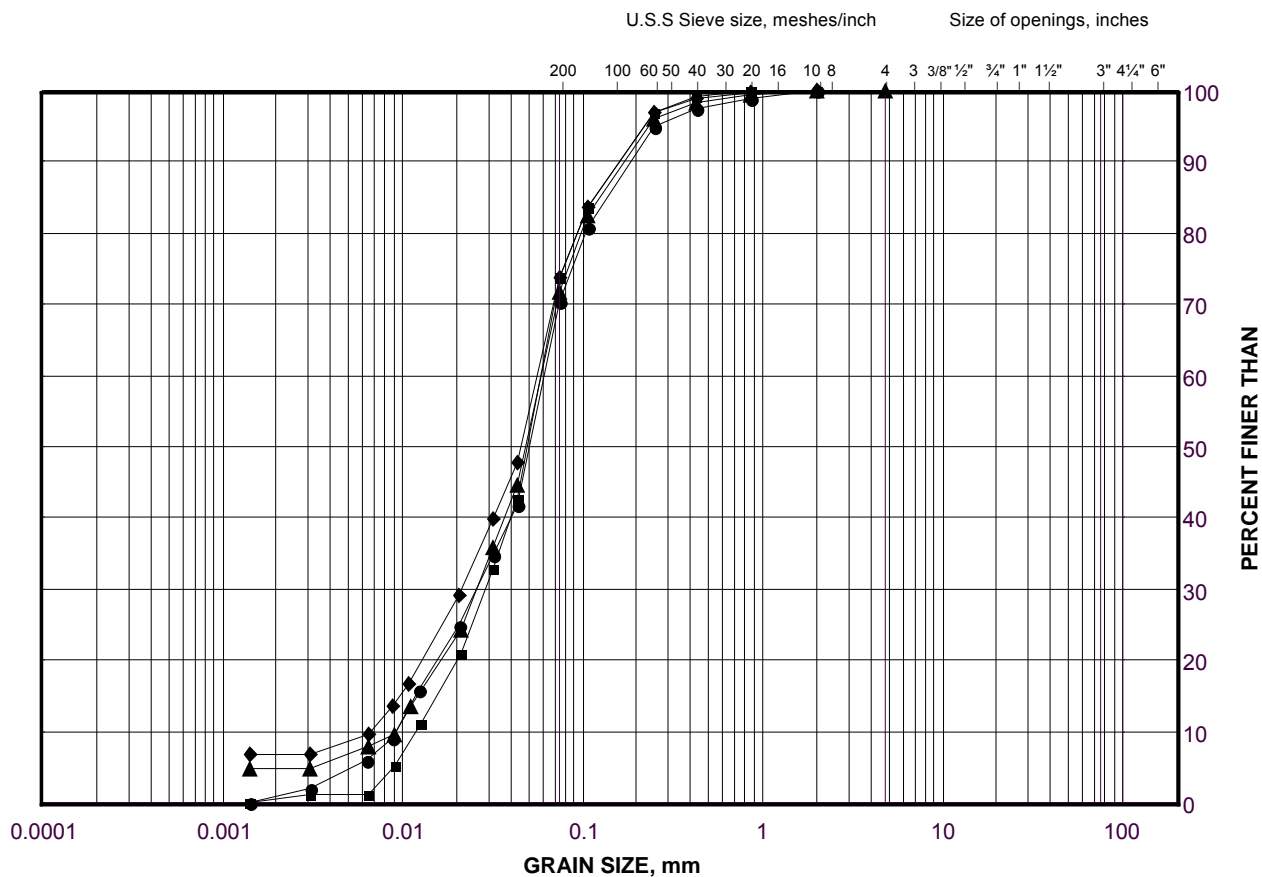
Checked By: TZ

GRAIN SIZE DISTRIBUTION

Sandy Silt to Silt and Sand

Bekanon Road S-E/W Ramp STA 16+975 to 17+140 (Swamp 306)

FIGURE F.S306-03



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

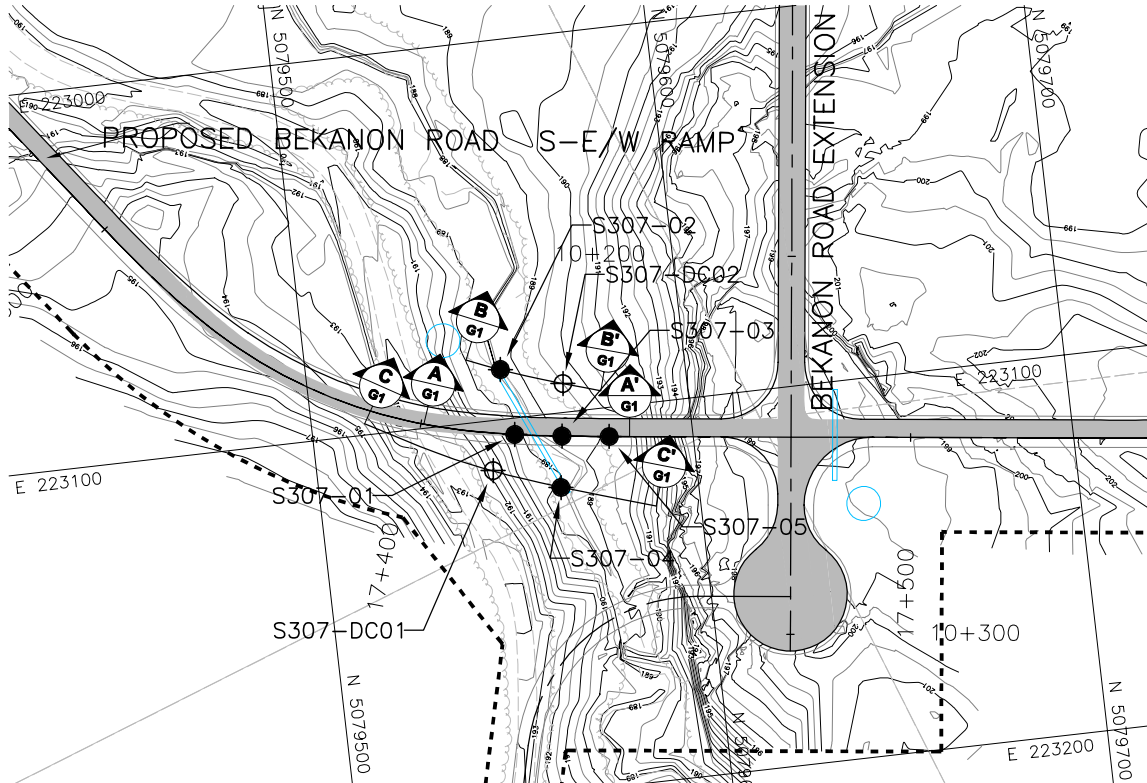
LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S306-01 | 1 | 191.6 |
| ■ | S306-06 | 3 | 189 |
| ◆ | S306-06 | 4 | 188.4 |
| ▲ | S306-05 | 4 | 188.6 |



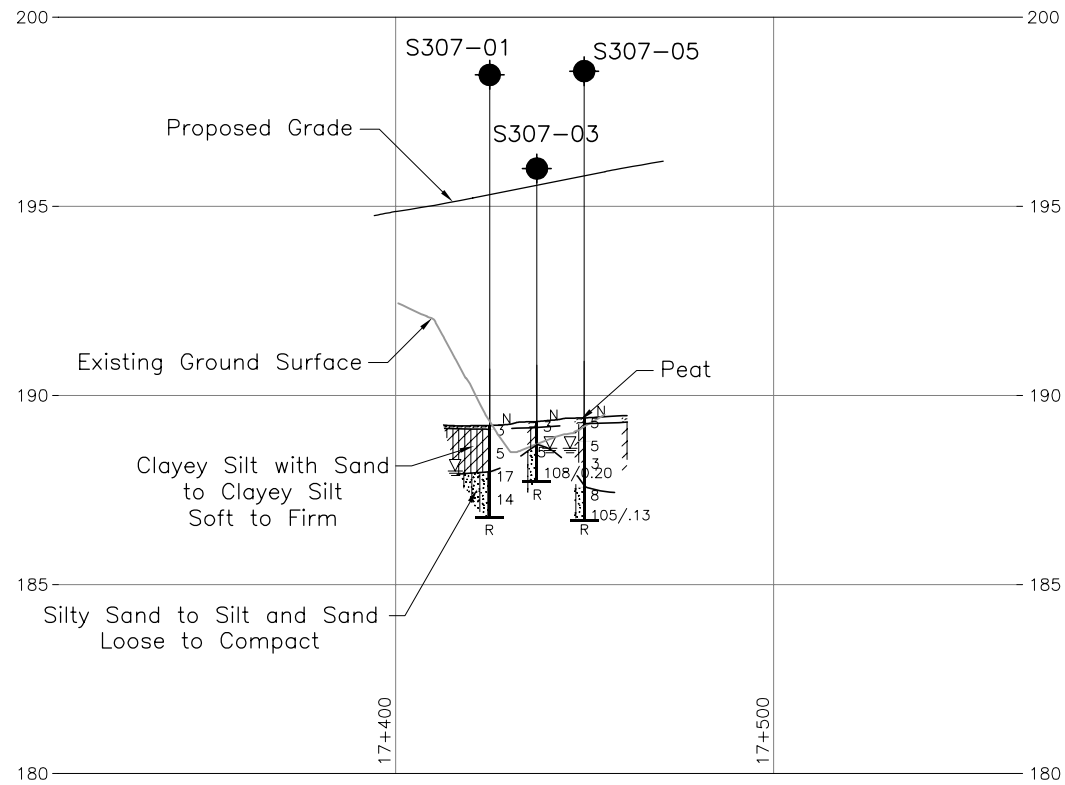
APPENDIX G

**Bekanon Road S-E/W Ramp – STA 17+415 to 17+450
(Swamp 307)**



PLAN

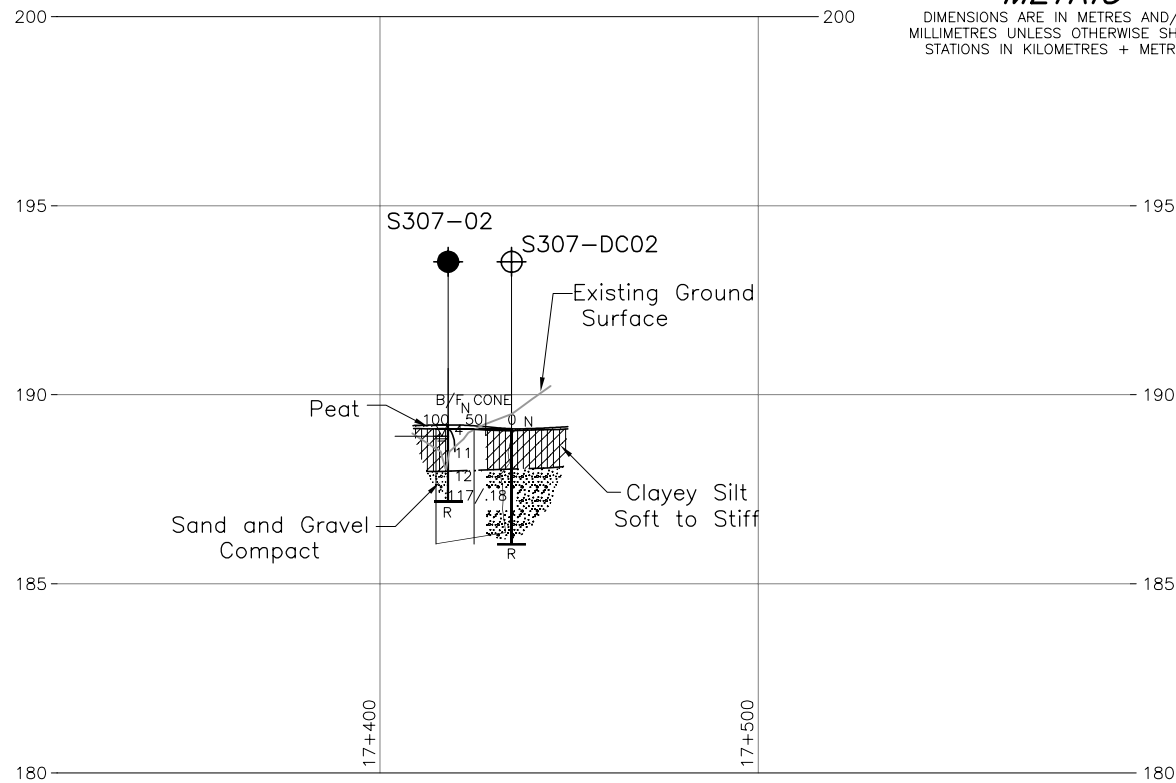
SCALE
20 0 20 40 m



(A-A')
G1

CENTRELINE PROFILE
BEKANON ROAD S-E/W RAMP

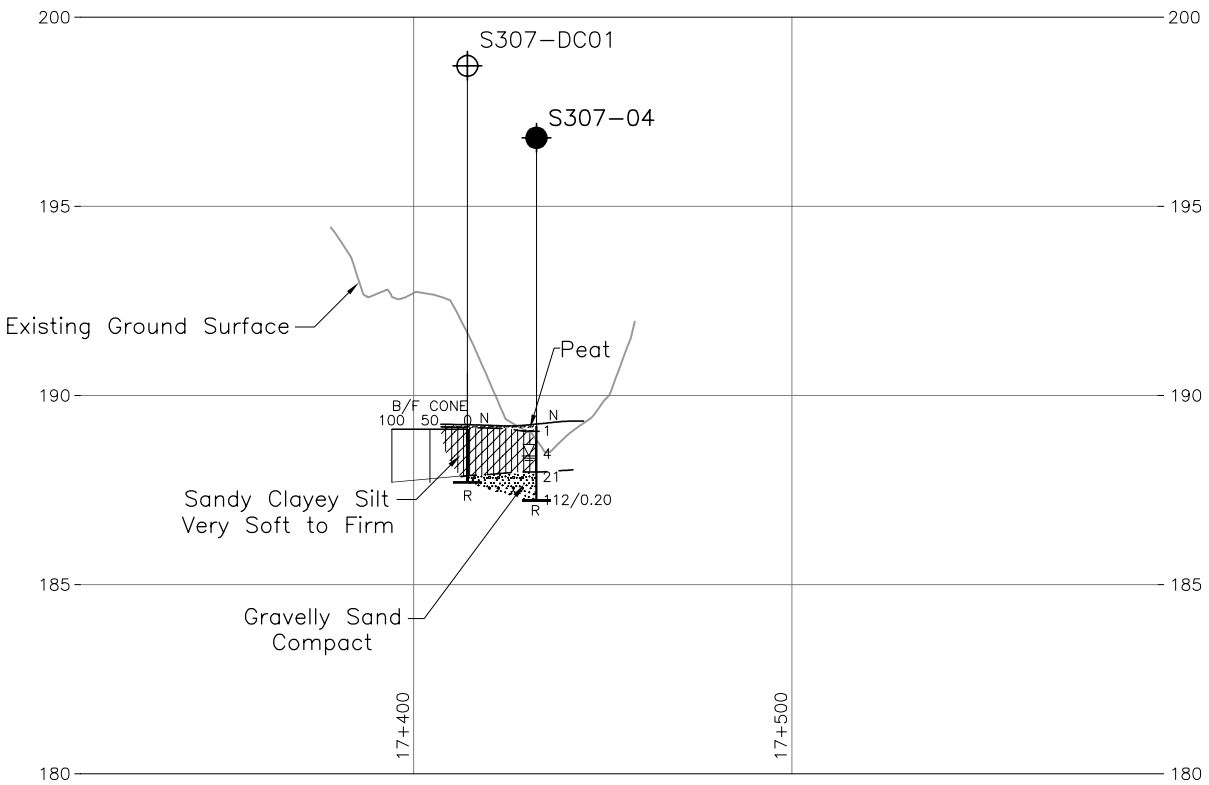
HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m



(B-B')
G1

EMBANKMENT TOE PROFILE
BEKANON ROAD S-E/W RAMP

HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m



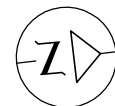
(C-C')
G1

EMBANKMENT TOE PROFILE
BEKANON ROAD S-E/W RAMP

HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m

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

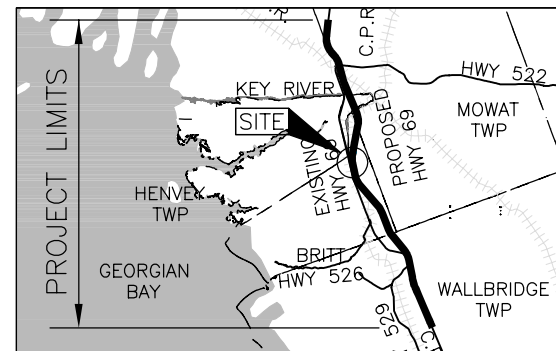
CONT No.
WP No. 5404-05-01



BEKANON ROAD S-E/W RAMP
STA 17+415 TO 17+450 (RAMP)
BOREHOLE LOCATIONS AND SOIL STRATA



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

SCALE
5 0 5 10 km

LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated
(Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling
- R Refusal

BOREHOLE CO-ORDINATES

| No. | ELEVATION | NORTHING | EASTING |
|-----------|-----------|-----------|----------|
| S307-01 | 189.2 | 5079553.2 | 223104.3 |
| S307-02 | 189.2 | 5079551.4 | 223086.8 |
| S307-03 | 189.3 | 5079565.5 | 223106.2 |
| S307-04 | 189.2 | 5079563.7 | 223119.7 |
| S307-05 | 189.4 | 5079577.9 | 223107.7 |
| S307-DC01 | 189.1 | 5079546.4 | 223113.2 |
| S307-DC02 | 189.1 | 5079567.4 | 223092.4 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

REFERENCE

Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and , Original Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Proposed Grade obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.




| NO. | DATE | BY | REVISION |
|---------------|----------|----------------|--------------------------------|
| HWY. 69 | | | PROJECT NO. 09-1111-6014 DIST. |
| SUBM'D. CC | CHKD. TZ | DATE: May 2013 | SITE: |
| DRAWN: JFC/LL | CHKD. CN | APPD. JPD/JMAC | DWG. G1 |



| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S307-01 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079553.2 ; E 223104.3</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>December 7, 2011</u> | | CHECKED BY <u>CN/TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|-----------------|---|---|----------------|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | |
| | | | | | | | | 20 40 60 80 100 | 20 40 60 80 100 | W _p | W | W _L | | |
| 189.2 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | 1 | SS | 3 | | 189 | | | | | | | |
| | CLAYEY SILT with sand, trace organics Soft to firm Brown Moist | | 2 | SS | 5 | | 188 | | | | | | | |
| 188.0 | | | 3 | SS | 17 | | | | | | | | | |
| 1.2 | Silty SAND, trace clay Compact Brown Wet | | 4 | SS | 14 | | 187 | | | | | | | 0 72 27 1 |
| 186.8 | | | | | | | | | | | | | | |
| 2.4 | END OF BOREHOLE AUGER REFUSAL NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 188.0 m) upon completion of drilling. | | | | | | | | | | | | | |

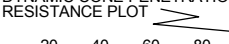
| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S307-02 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079551.4 ; E 223086.8</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>December 7, 2011</u> | | CHECKED BY <u>CN/TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|--|---|---------|------|------------|---|-----------------|--|--|--|--|--|--|---|--|--|---|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | <div><div></div><div></div><div></div></div> | | | | | | | |
| 189.2 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) |  | 1 | SS | 4 |  | 189 | | | | | | | | | | | | | | |
| | CLAYEY SILT, some sand, trace organics Soft to stiff Brown Moist to wet | | 2 | SS | 11 | | | | | | | | | | | | | | | | |
| 188.0 | | | | | | | 188 | | | | | | | | | | | | | | |
| 1.2 | SAND and GRAVEL, trace silt Compact Grey Wet |  | 3 | SS | 12 | | | | | | | | | | | | | | | | |
| 187.2 | | | 4 | SS | 117/0.18 | | | | | | | | | | | | | | | | |
| 2.0 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | | | | | |
| | NOTE: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 188.9 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |

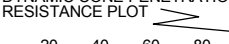
| PROJECT | | RECORD OF BOREHOLE | | No S307-03 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--|---|--------------------|---------|--------------------------|------------|--|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5079565.5 ; E 223106.2 | | ORIGINATED BY | | ARM | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | December 6, 2011 | | CHECKED BY | | | | | | | | | |
| | | | | | | | | CN/TZ | | | | | | | | | |
| 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 | | | | | | | | | |
| 189.3 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | | | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, some sand, trace organics | | 1 | SS | 3 | | | | | | | | | | | | |
| 188.7 | Soft Brown Moist to wet | | 2 | SS | 5 | | | | | | | | | | | | |
| 0.6 | SILT and SAND, trace to some gravel, trace clay | | 3 | SS | 108/0.20 | | | | | | | | | | | | |
| 187.7 | Loose Brown to grey Moist | | | | | | | | | | | | | | | | |
| 1.6 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 0.1 m below ground surface (Elev. 189.2 m) upon completion of drilling. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S307-04 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|---|--|--------------------|---------|--------------------------|------------|--|-----------------|---|----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|----|----|-----|------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5079563.7 ; E 223119.7 | | ORIGINATED BY | | ARM | | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | COMPILED BY | | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | December 7, 2011 | | CHECKED BY | | | | | | | | | | |
| CN/TZ | | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | | | | | | 60 | 80 | 100 | 20 |
| 189.2 | GROUND SURFACE | | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | | | | | | | | | | | | | | | | |
| 0.2 | Sandy CLAYEY SILT, trace organics Very soft to firm Brown Moist | | 1 | SS | 1 | | | | | | | | | | | | | 0 26 62 12 |
| 188.0 | | | 2 | SS | 4 | | | | | | | | | | | | | |
| 1.2 | Gravelly SAND, trace silt, trace clay Compact Grey Wet | | 3 | SS | 21 | | | | | | | | | | | | | |
| 187.2 | | | 4 | SS | 12/0.20 | | | | | | | | | | | | | 26 67 5 2 |
| 2.0 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level at a depth of 0.8 m below ground surface (Elev. 188.4 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S307-05 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--|---|--------------------------|---------|---------------|------------|-------------------------|-----------------|--|--|-------------|--|----------|---|------------------|--|----------------------|---------------------------------------|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATUM | | DATE | | CHECKED BY | |
| 09-1111-6014 | | N 5079577.9 ; E 223107.7 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | MAS | | Geodetic | | December 6, 2011 | | CN/TZ | |
| 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 (%) | | | | |
| 189.4 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | | | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, some sand, trace organics | | 1 | SS | 5 | | | | | | | | | | | | |
| 188.8 | Firm | | | | | | | | | | | | | | | | |
| 0.6 | Brown Moist | | 2 | SS | 5 | | | | | | | | | | | | |
| | CLAYEY SILT with sand, trace to some gravel | | | | | | | | | | | | | | | | |
| 187.6 | Soft to firm | | 3 | SS | 3 | | | | | | | | | | | | |
| | Grey Wet | | | | | | | | | | | | | | | | |
| 1.8 | Silty SAND, trace gravel | | 4 | SS | 8 | | | | | | | | | | | | |
| | Loose | | | | | | | | | | | | | | | | |
| 186.7 | Grey Wet | | 5 | SS | 105/0.13 | | | | | | | | | | | | |
| 2.7 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | |
| NOTE: | | | | | | | | | | | | | | | | | |
| 1. Water level at a depth of 0.8 m below ground surface (Elev. 188.6 m) upon completing of drilling. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF DCPT No S307-DC01 | | SHEET 1 OF 1 | | METRIC | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|---|---|---------------------------------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5079546.4 ; E 223113.2 | | ORIGINATED BY ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | |
| DATUM Geodetic | | DATE December 6, 2011 | | CHECKED BY CN/TZ | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV. DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 189.1 | GROUND SURFACE | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | 189 | | | | |
| 187.7 | | | | | | 188 | | | | |
| 1.4 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.18 m) | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S307-DC02 | | SHEET 1 OF 1 | | METRIC | | | | | |
|--------------------------------------|---|--|--------|--------------------------|----------------------------|-----------------|--|---|--|--|------------|
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5079567.4 ; E 223092.4</u> | | ORIGINATED BY <u>ARM</u> | | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>MAS</u> | | | | | | | |
| DATUM <u>Geodetic</u> | | DATE <u>December 6, 2011</u> | | CHECKED BY <u>CN/TZ</u> | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | | "N" VALUES |
| 189.1 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | 189 | | | | | |
| 186.0 3.1 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.30 m) | | | | | 186 | | | | | |

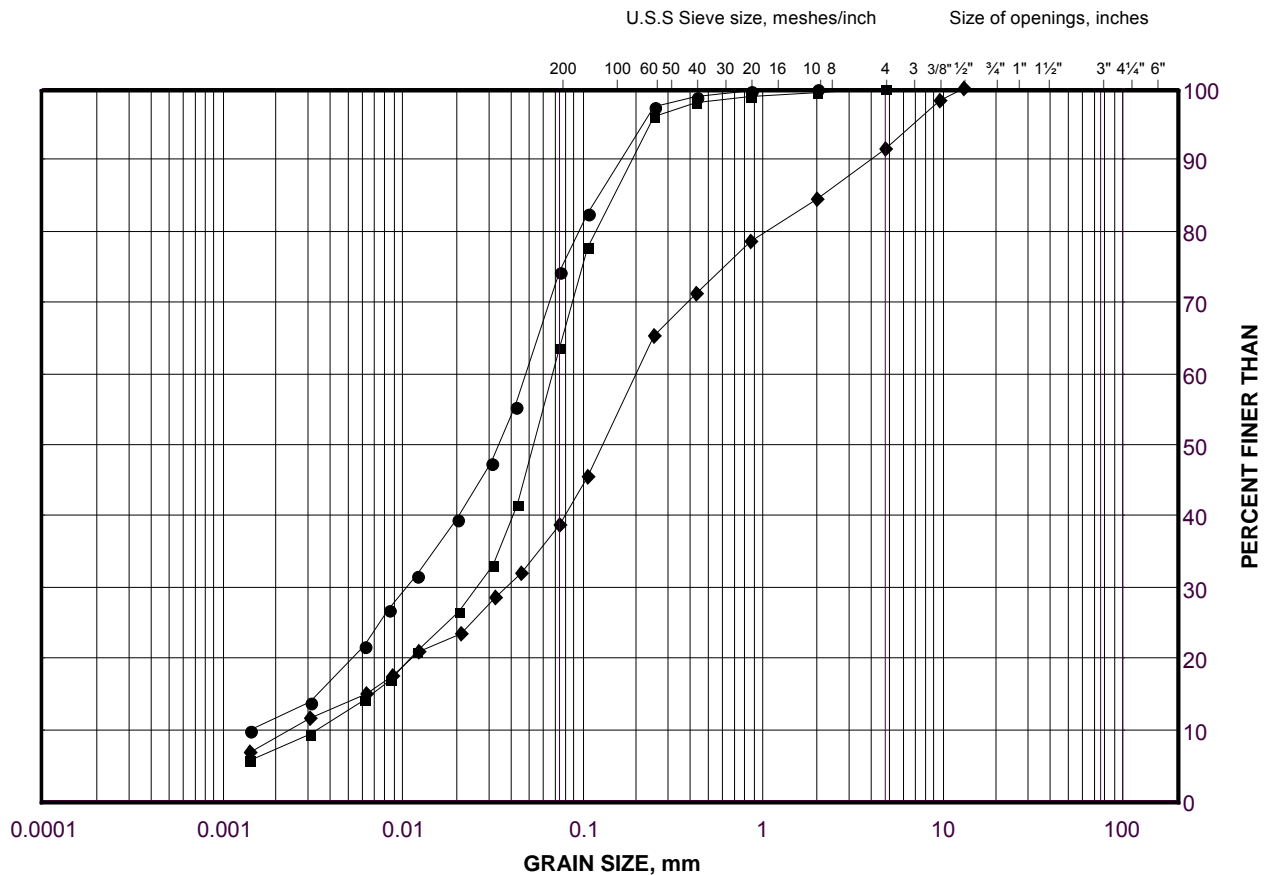
GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

GRAIN SIZE DISTRIBUTION

Clayey Silt with Sand

Bekanon Road S-E/W Ramp STA 17+415 to 17+450 (Swamp 307)

FIGURE G.S307-01



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

LEGEND

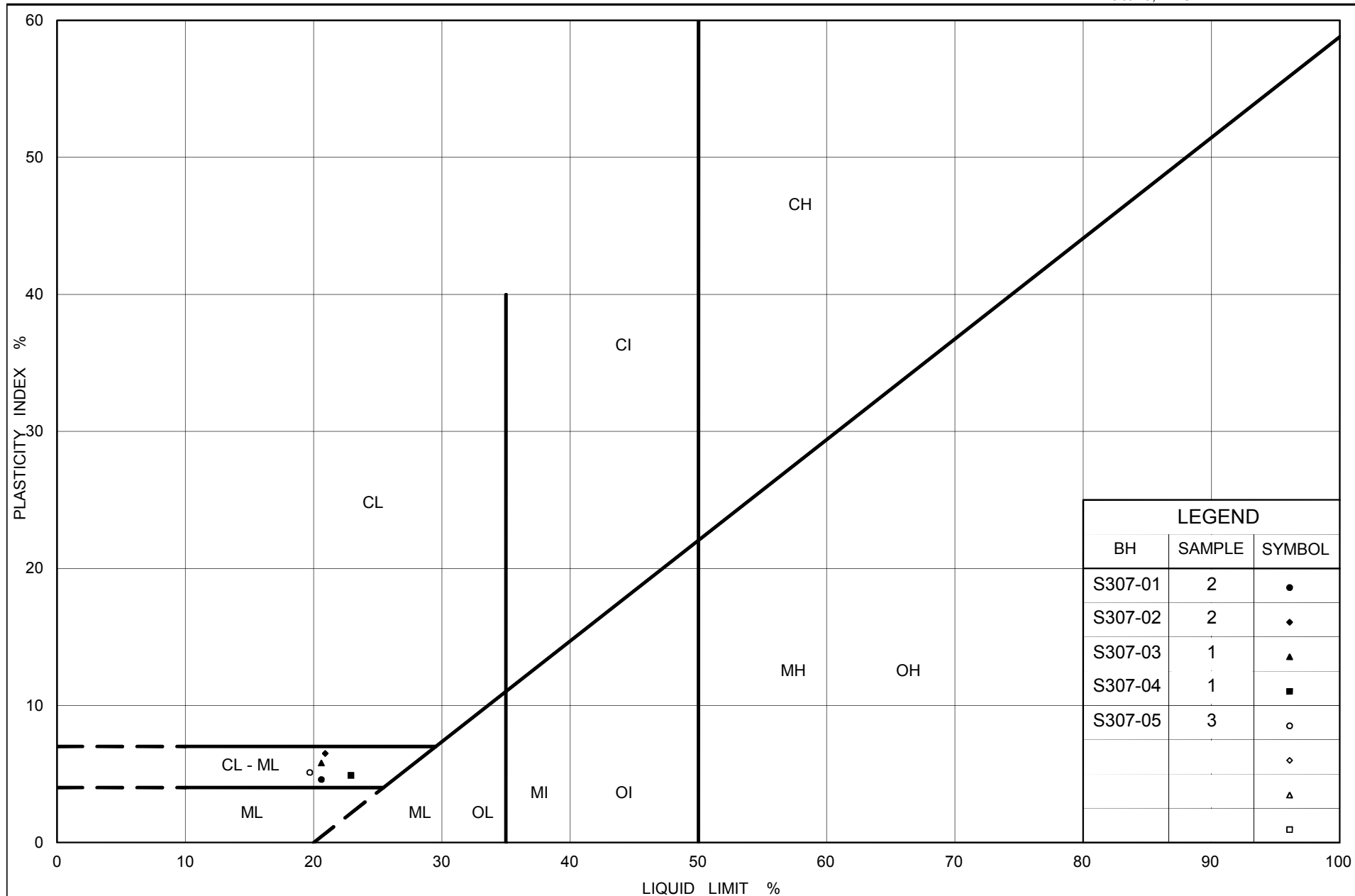
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S307-04 | 1 | 188.9 |
| ■ | S307-01 | 2 | 188.3 |
| ◆ | S307-05 | 3 | 187.9 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 19-Nov-12



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt

Bekanon Road S-E/W Ramp STA 17+415 to 17+450 (Swamp 307)

Figure No. G.S307-02

Project No. 09-1111-6014

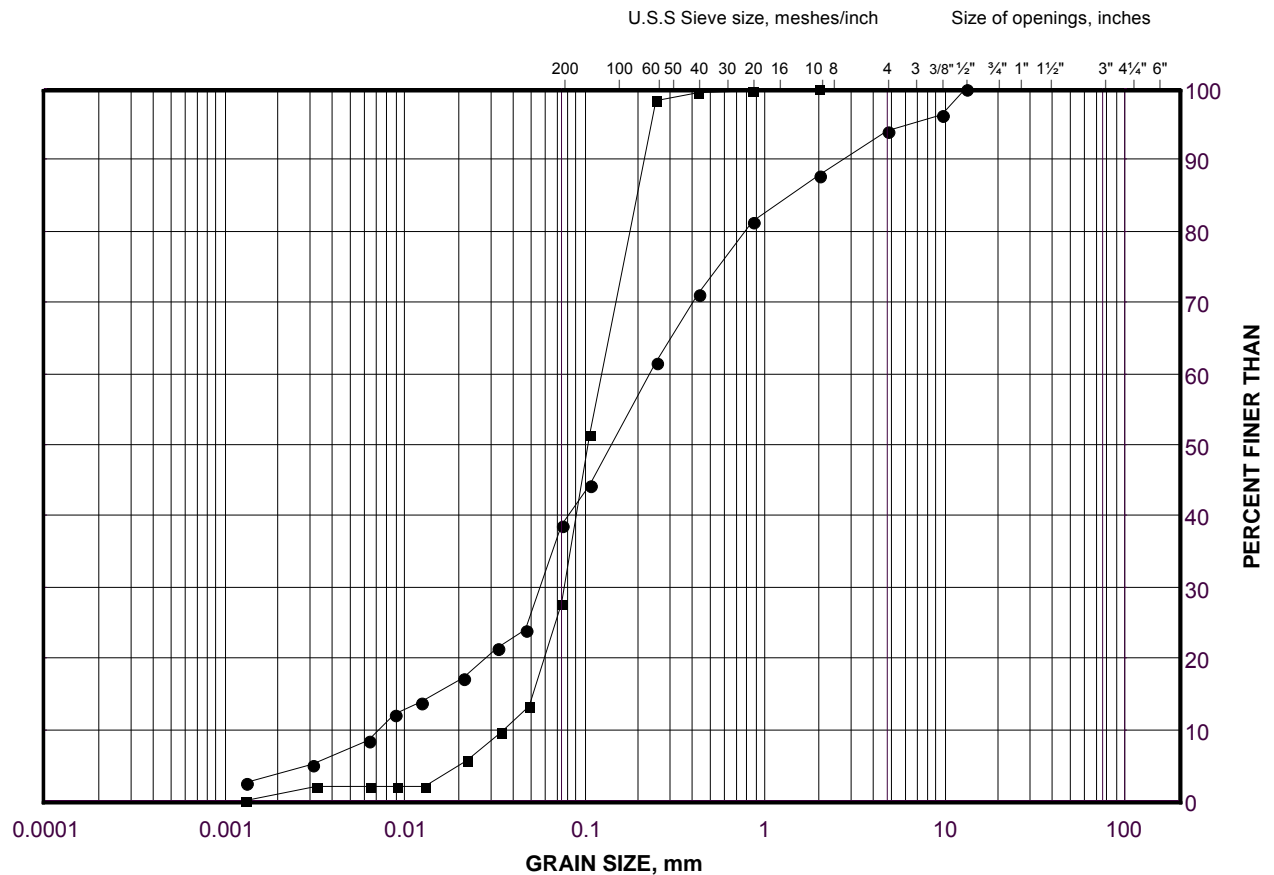
Checked By: TZ

GRAIN SIZE DISTRIBUTION

Silt and Sand to Silty Sand

Bekanon Road S-E/W Ramp STA 17+415 to 17+450 (Swamp 307)

FIGURE G.S307-03



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

LEGEND

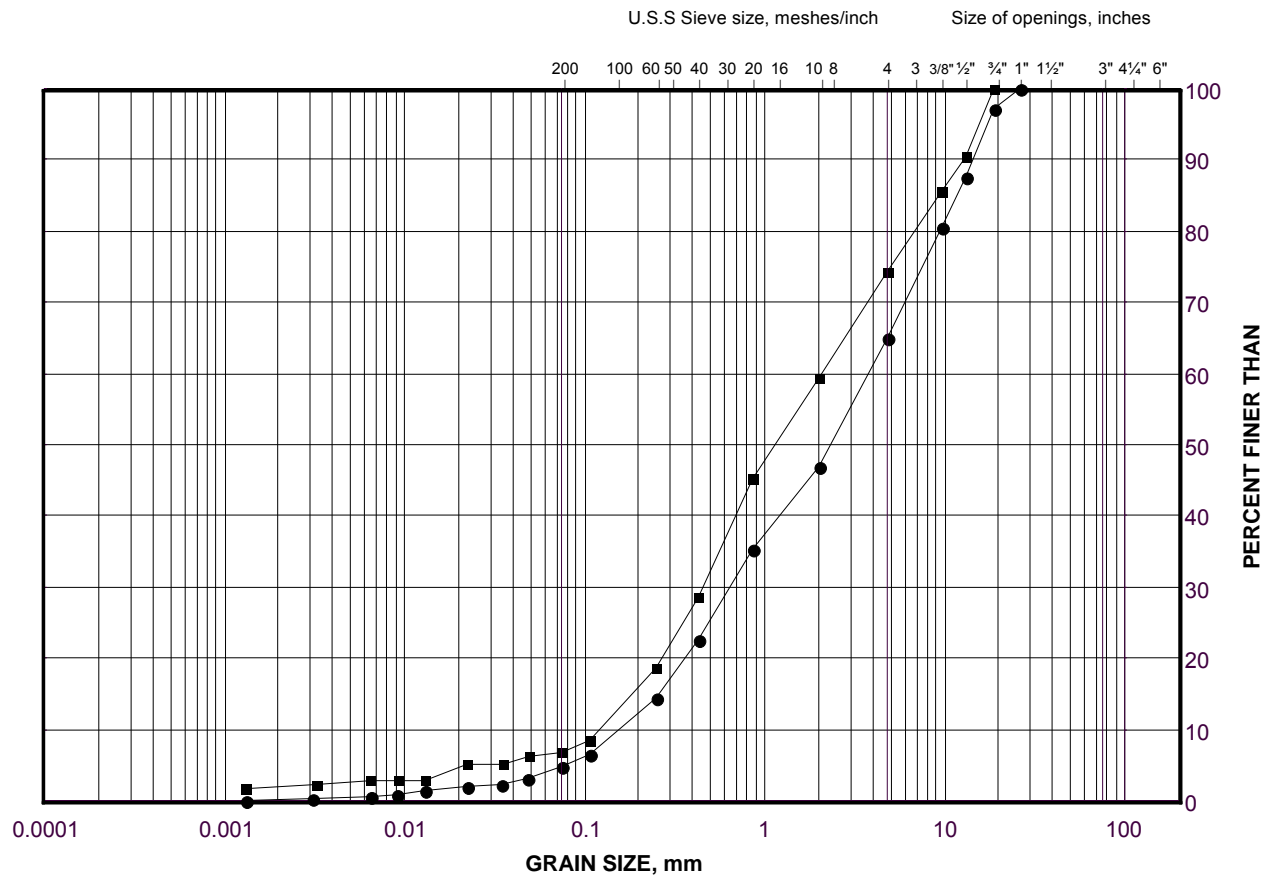
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S307-03 | 3 | 187.9 |
| ■ | S307-01 | 4 | 187.1 |

GRAIN SIZE DISTRIBUTION

Gravelly Sand to Sand and Gravel

Bekanon Road S-E/W Ramp STA 17+415 to 17+450 (Swamp 307)

FIGURE G.S307-04



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S307-02 | 4 | 187.3 |
| ■ | S307-04 | 4 | 187.3 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

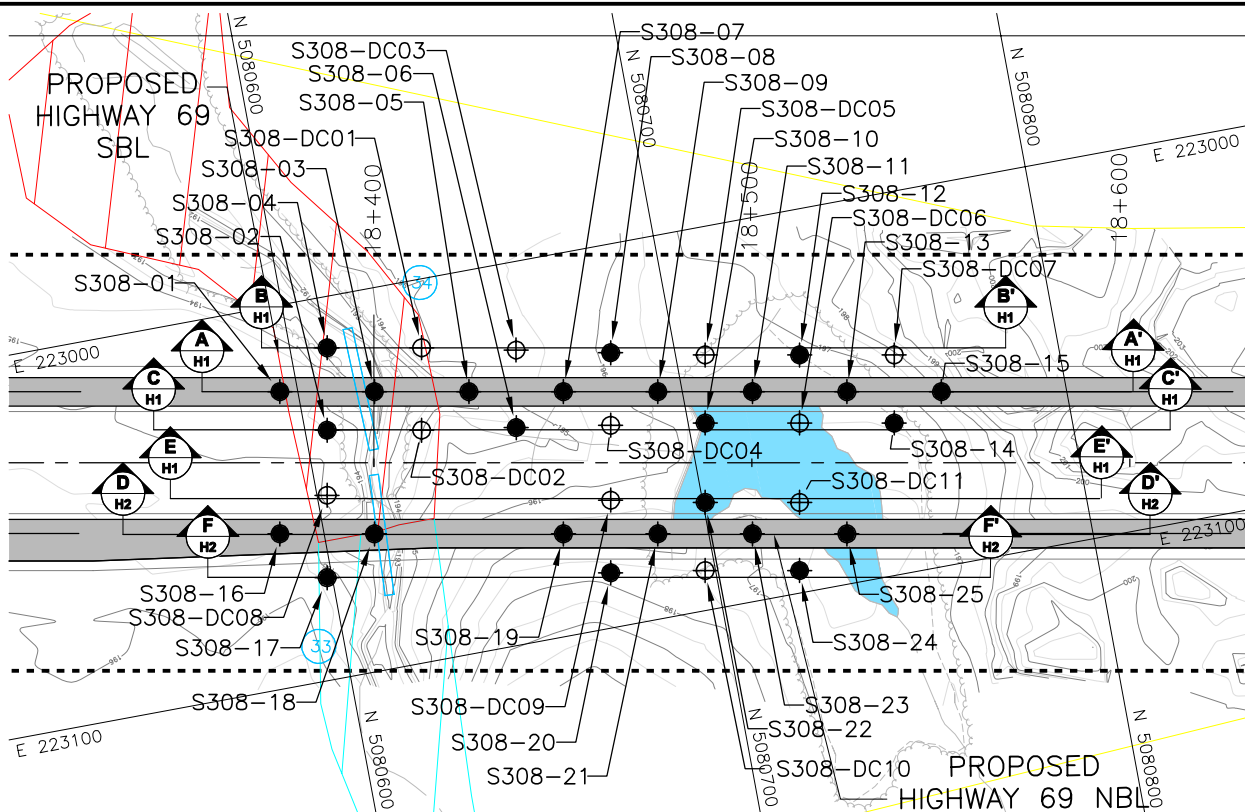
Date: 04-Apr-13



APPENDIX H

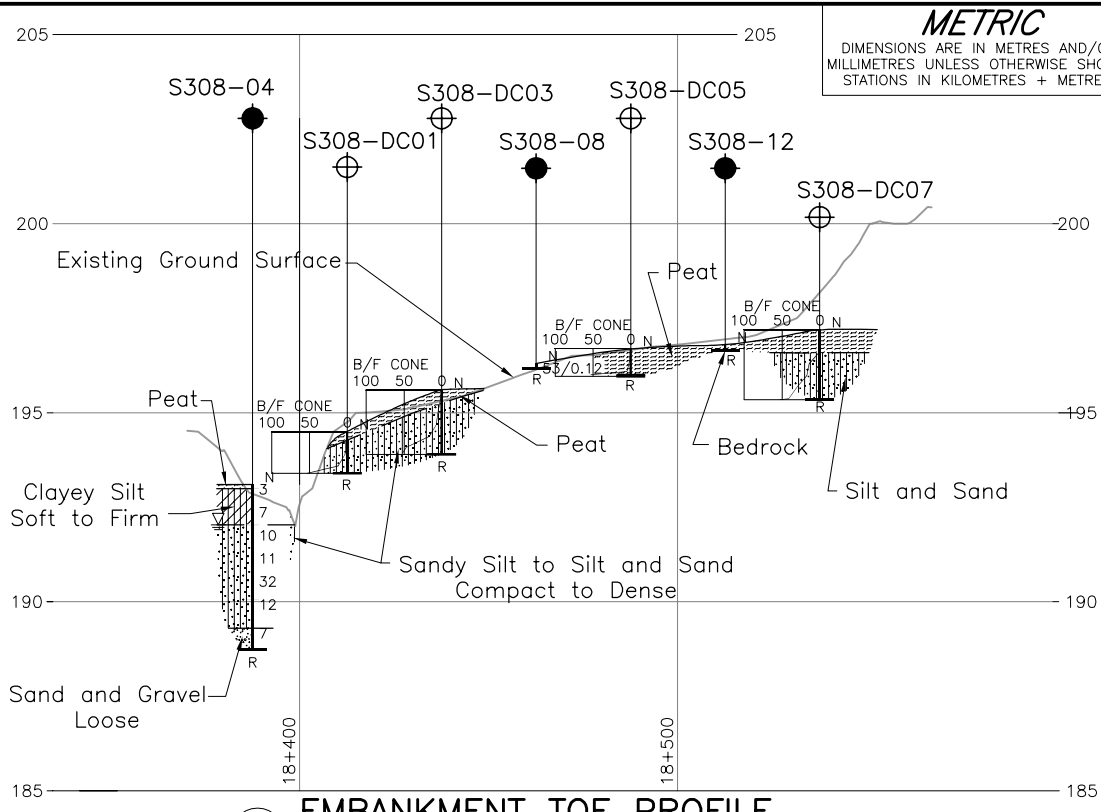
Highway 69 SBL – STA 18+375 to 18+550 (Swamp 308)

Highway 69 NBL – STA 18+375 to 18+535 (Swamp 308)



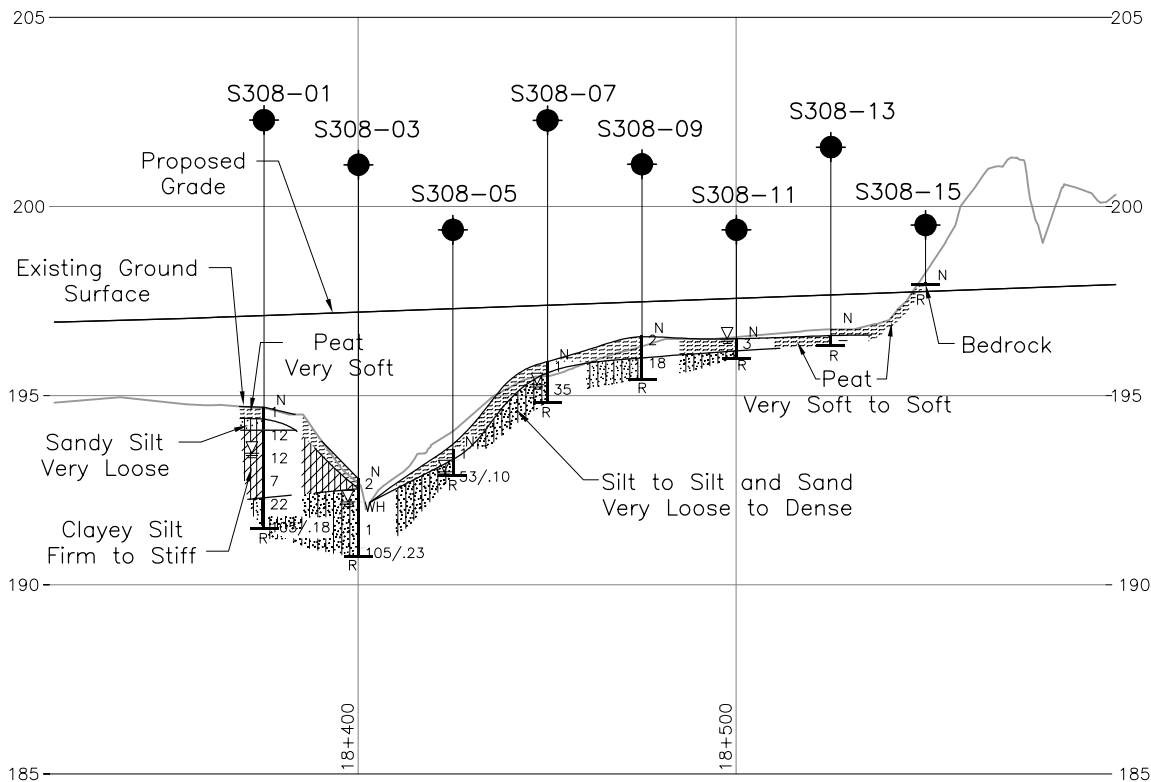
PLAN

SCALE
20 0 20 40 m



EMBANKMENT TOE PROFILE
HIGHWAY 69 (SBL)

HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m



CENTRELINE PROFILE
HIGHWAY 69 (SBL)

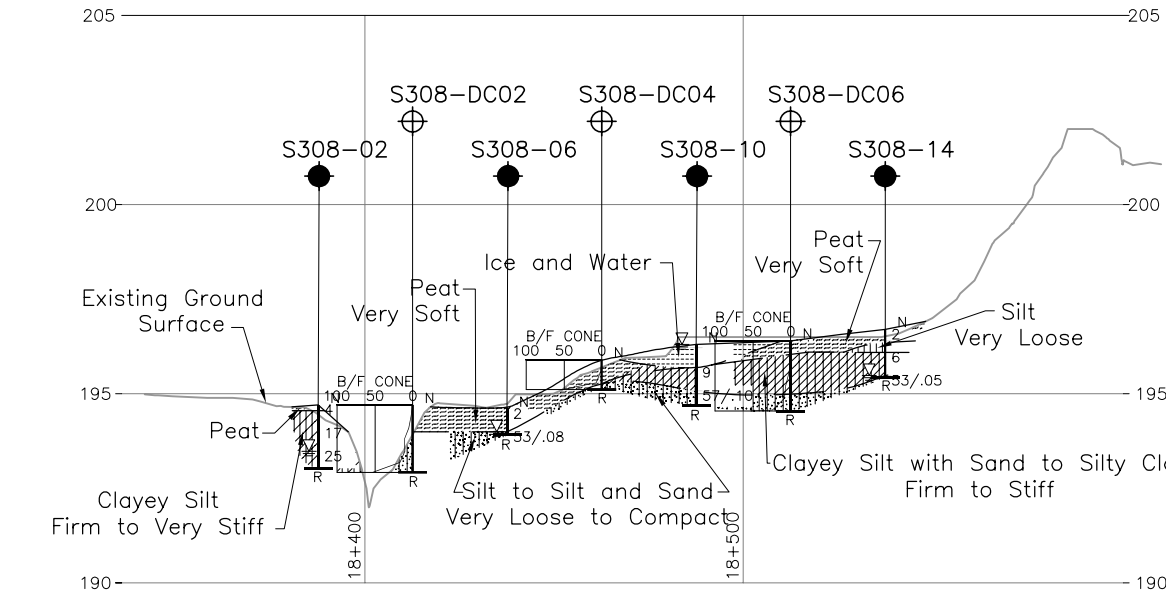
HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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



EMBANKMENT TOE PROFILE
HIGHWAY 69 (SBL)

HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m

REFERENCE

Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and Original Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Proposed Grade obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.

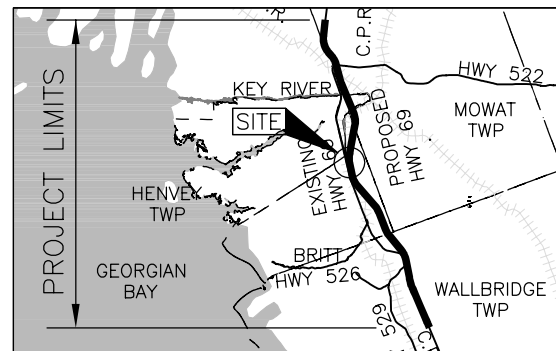


CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 18+375 TO 18+550 (SBL)
STA 18+375 TO 18+535 (NBL)
BOREHOLE LOCATIONS AND SOIL STRATA



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



KEY PLAN

SCALE
5 0 5 10 km

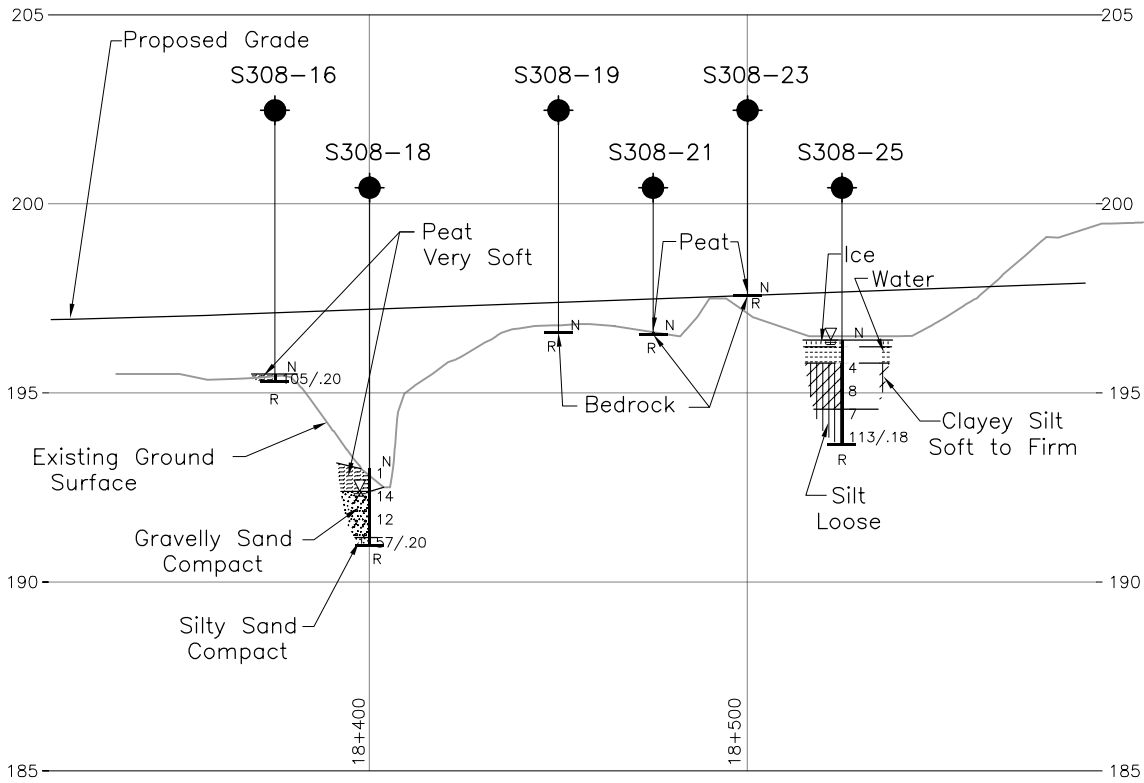
LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ▽ WL upon completion of drilling
- R Refusal

BOREHOLE CO-ORDINATES

| No. | ELEVATION | NORTHING | EASTING |
|---------|-----------|-----------|----------|
| S308-01 | 194.7 | 5080595.3 | 223022.5 |
| S308-02 | 194.7 | 5080605.8 | 223034.8 |
| S308-03 | 192.8 | 5080619.9 | 223027.1 |
| S308-04 | 193.1 | 5080609.7 | 223013.4 |
| S308-05 | 193.6 | 5080644.5 | 223031.6 |
| S308-06 | 194.6 | 5080655.1 | 223043.3 |
| S308-07 | 195.9 | 5080669.1 | 223036.2 |
| S308-08 | 196.3 | 5080683.2 | 223028.4 |
| S308-09 | 196.6 | 5080693.7 | 223040.8 |
| S308-10 | 196.3 | 5080704.4 | 223051.2 |
| S308-11 | 196.5 | 5080718.2 | 223045.3 |
| S308-12 | 196.8 | 5080732.3 | 223038.1 |
| S308-13 | 196.6 | 5080742.8 | 223049.9 |
| S308-14 | 196.7 | 5080753.6 | 223060.3 |
| S308-15 | 198.0 | 5080767.4 | 223054.4 |
| S308-16 | 195.5 | 5080588.5 | 223059.5 |
| S308-17 | 195.9 | 5080598.7 | 223073.2 |
| S308-18 | 193.0 | 5080613.1 | 223064.1 |
| S308-19 | 196.6 | 5080662.2 | 223073.2 |
| S308-20 | 197.9 | 5080672.6 | 223085.6 |
| S308-21 | 196.6 | 5080686.8 | 223077.7 |
| S308-22 | 196.3 | 5080700.6 | 223071.9 |
| S308-23 | 197.6 | 5080711.4 | 223082.3 |
| S308-24 | 196.6 | 5080721.9 | 223094.1 |
| S308-25 | 196.4 | 5080736.0 | 223086.8 |

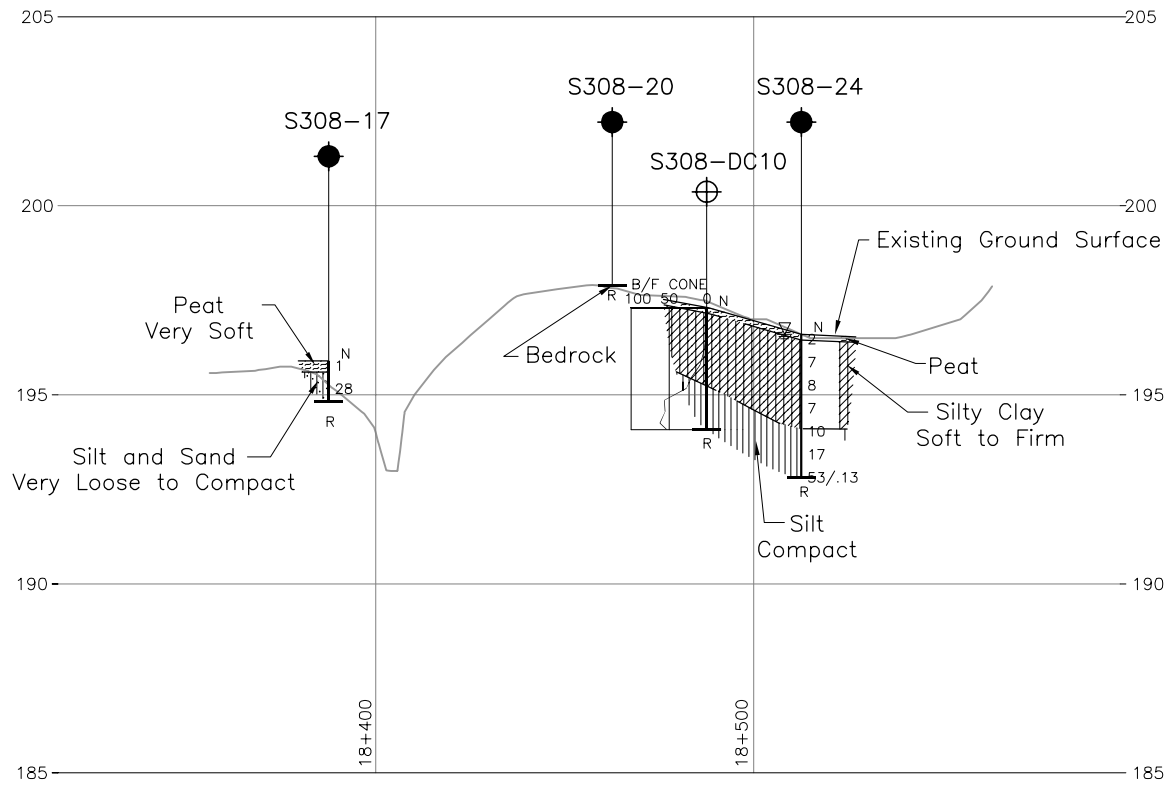
| NO. | DATE | BY | REVISION |
|---------------------|------|--------------------------|----------|
| Geocres No. 41H-134 | | | |
| HWY. | | PROJECT NO. 09-1111-6014 | |
| SUBM'D. CC | | CHKD. TZ | DIST. |
| DRAWN: JFC/LL | | DATE: May 2013 | SITE: |
| | | APPD. JPD/JMAC | DWG. H1 |



D-D'
H1

**CENTRELINE PROFILE
HIGHWAY 69 (NBL)**

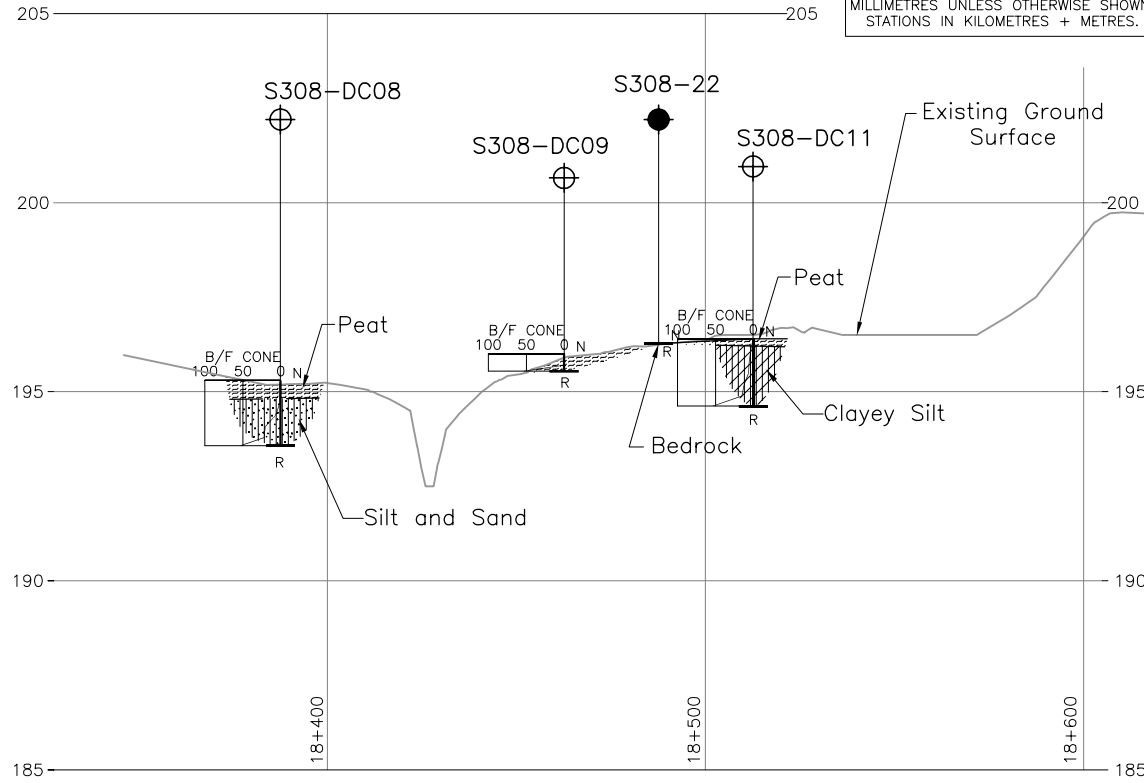
HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m



F-F'
H1

**EMBANKMENT TOE PROFILE
HIGHWAY 69 (NBL)**

HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m



E-E'
H1

**EMBANKMENT TOE PROFILE
HIGHWAY 69 (NBL)**

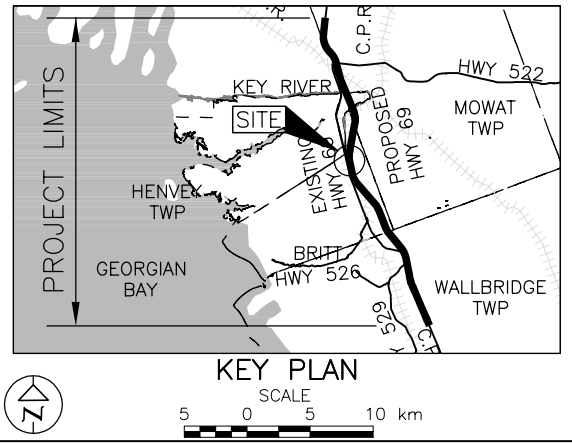
HORIZONTAL SCALE
20 0 20 40 m
VERTICAL SCALE
2 0 2 4 m

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

CONT No.
WP No.5404-05-01

HIGHWAY 69
STA 18+375 TO 18+535 (NBL)
SOIL STRATA

Golder Associates
MISSISSAUGA, ONTARIO, CANADA



LEGEND

| | |
|----|--|
| ● | Borehole - Current Investigation |
| ⊕ | Dynamic Cone Penetration Test |
| N | Standard Penetration Test Value |
| 16 | Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow) |
| ≡ | WL upon completion of drilling |
| R | Refusal |

BOREHOLE CO-ORDINATES

| No. | ELEVATION | NORTHING | EASTING |
|-----------|-----------|-----------|----------|
| S308-16 | 195.5 | 5080588.5 | 223059.5 |
| S308-17 | 195.9 | 5080598.7 | 223073.2 |
| S308-18 | 193.0 | 5080613.1 | 223064.1 |
| S308-19 | 196.6 | 5080662.2 | 223073.2 |
| S308-20 | 197.9 | 5080672.6 | 223085.6 |
| S308-21 | 196.6 | 5080686.8 | 223077.7 |
| S308-22 | 196.3 | 5080700.6 | 223071.9 |
| S308-23 | 197.6 | 5080711.4 | 223082.3 |
| S308-24 | 196.6 | 5080721.9 | 223094.1 |
| S308-25 | 196.4 | 5080736.0 | 223086.8 |
| S308-DC08 | 195.3 | 5080602.6 | 223051.8 |
| S308-DC09 | 196.0 | 5080676.1 | 223066.7 |
| S308-DC10 | 197.3 | 5080697.3 | 223089.5 |
| S308-DC11 | 196.4 | 5080725.2 | 223076.4 |

NOTES

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

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

REFERENCE

Existing Ground Surface cut from contour drawing file provided in digital format by URS, titled Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Existing and Proposed Grades obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.



| NO. | DATE | BY | REVISION |
|-----|------|----|----------|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 16 | | | |
| 17 | | | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |
| 32 | | | |
| 33 | | | |
| 34 | | | |
| 35 | | | |
| 36 | | | |
| 37 | | | |
| 38 | | | |
| 39 | | | |
| 40 | | | |
| 41 | | | |
| 42 | | | |
| 43 | | | |
| 44 | | | |
| 45 | | | |
| 46 | | | |
| 47 | | | |
| 48 | | | |
| 49 | | | |
| 50 | | | |
| 51 | | | |
| 52 | | | |
| 53 | | | |
| 54 | | | |
| 55 | | | |
| 56 | | | |
| 57 | | | |
| 58 | | | |
| 59 | | | |
| 60 | | | |
| 61 | | | |
| 62 | | | |
| 63 | | | |
| 64 | | | |
| 65 | | | |
| 66 | | | |
| 67 | | | |
| 68 | | | |
| 69 | | | |
| 70 | | | |
| 71 | | | |
| 72 | | | |
| 73 | | | |
| 74 | | | |
| 75 | | | |
| 76 | | | |
| 77 | | | |
| 78 | | | |
| 79 | | | |
| 80 | | | |
| 81 | | | |
| 82 | | | |
| 83 | | | |
| 84 | | | |
| 85 | | | |
| 86 | | | |
| 87 | | | |
| 88 | | | |
| 89 | | | |
| 90 | | | |
| 91 | | | |
| 92 | | | |
| 93 | | | |
| 94 | | | |
| 95 | | | |
| 96 | | | |
| 97 | | | |
| 98 | | | |
| 99 | | | |
| 100 | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S308-01 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|---|--|--------------------|---------|--|------------|-------------------------|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5080595.3 ; E 223022.5 | | ORIGINATED BY | | ARM | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | Portable Equipment, NW Casing, Wash Boring | | COMPILED BY | | MAS | | | | | | | | | | |
| DATUM Geodetic | | DATE | | January 25, 2012 | | CHECKED BY | | CN/TZ | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | WATER CONTENT (%) |
| 194.7 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 0.0 194.4 | PEAT (Amorphous) Very soft Black Moist | | 1 | SS | 1 | | | | | | | | | | | | | |
| 194.1 0.6 | Sandy SILT, trace clay, trace organics Very loose Brown Moist | | 2 | SS | 12 | | | | | | | | | | | | | |
| | CLAYEY SILT, trace to some sand, trace organics, containing silt seams Firm to stiff Brown | | 3 | SS | 12 | | | | | | | | | | | | | |
| 192.3 2.4 | Moist becoming wet below a depth of 1.2 m | | 4 | SS | 7 | | | | | | | | | | | | | |
| | Sandy SILT, trace to some clay Compact | | 5 | SS | 22 | | | | | | | | | | | | | |
| 191.5 3.2 | Brown becoming grey below a depth of 3.0 m Wet | | 6 | SS | 105/0.18 | | | | | | | | | | | | | |
| END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | | | | | | |
| NOTE: | | | | | | | | | | | | | | | | | | |
| 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 193.5 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | |
| 2. Samples 1 to 4 were taken using portable drilling equipment with a half-weight hammer. SPT 'N' values shown for these samples have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S308-02 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5080605.8 ; E 223034.8</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 26, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|---|----------------|--------------------------------------|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | w _p | w | w _L | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | | |
| 194.7 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | | | | | | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace to some sand, trace organics, containing silt seams to a depth of 0.6 m Firm to very stiff Brown Moist becoming wet below a depth of 1.2 m | | 1 | SS | 4 | | | | | | | | | | | | | | | |
| | | | 2 | SS | 17 | | | | | | | | | | | | | | | |
| | | | 3 | SS | 25 | | | | | | | | | | | | | | | |
| 193.0 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | | | | |
| 1.7 | NOTES: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 193.5 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S308-03 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5080619.9 ; E 223027.1</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, NW Casing, Wash Boring</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 27, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | |


| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|--|---|--|--|---|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | | |
| 192.8 | GROUND SURFACE | | 1 | SS | 2 | | 192 | | | | | | | 0 43 44 13 | |
| 0.0 | PEAT (Amorphous) Very soft Black Moist | | 2 | SS | WH | | | | | | | | | | |
| 192.2 | SILT and SAND, some clay, trace organics Very loose Grey Wet | | 3 | SS | 1 | | | | | | | | | | |
| 0.6 | | | 4 | SS | 105/0.23 | | | | | | | | | | |
| 190.7 | END OF BOREHOLE SPOON AND CASING REFUSAL | | | | | | | | | | | | | Non-Plastic | |
| 2.1 | NOTE: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 192.2 m) upon completion of drilling. | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S308-04 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|-------------|--|----------|--|------------------|--|------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATUM | | DATE | | CHECKED BY | |
| 09-1111-6014 | | N 5080609.7 ; E 223013.4 | | ARM | | HWY 69 | | Portable Equipment, NW Casing, Wash Boring | | MAS | | Geodetic | | January 26, 2012 | | CN/TZ | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--|---|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 193.1 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | 1 | SS | 3 | | | | | | | | | | | | |
| 192.0 | CLAYEY SILT, trace to some sand, trace organics and containing silt seams Soft to firm Brown Moist | | 2 | SS | 7 | | | | | | | | | | | | |
| 1.1 | Sandy SILT, trace clay Compact to dense Brown becoming grey below a depth of 2.4 m Wet | | 3 | SS | 10 | | | | | | | | | | | | |
| | | | 4 | SS | 11 | | | | | | | | | | | | |
| | | | 5 | SS | 32 | | | | | | | | | | | | |
| 190.0 | SILT and SAND, trace to some gravel, trace clay Compact Grey Wet | | 6 | SS | 12 | | | | | | | | | | | | |
| 3.1 | | | | | | | | | | | | | | | | | |
| 189.3 | SAND and GRAVEL, trace silt Loose Grey Wet | | 7 | SS | 7 | | | | | | | | | | | | |
| 3.8 | | | | | | | | | | | | | | | | | |
| 188.7 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | | | |
| 4.4 | | | | | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 1.1 m below ground surface (Elev. 192.0 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S308-05 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | |
|---|-------|---|------------|---------------|------|--|-------------------------|--|---|-------------|--|-------------|---|-------------------|---------------------------------------|--|------|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5080644.5 ; E 223031.6 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | MAS | | | | | | | | |
| Geodetic | | January 28, 2012 | | CN/TZ | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
| ELEV | DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | GR SA SI CL |
| | | | | | | | | 20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | W _p W W _L 20 40 60 | | | | | |
| 193.6 | | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | 193.3 | PEAT (Amorphous) Very soft Black Moist | | 1 | SS | 1 | | | | | | | | | | | 95.5 | |
| 0.3 | 192.9 | SILT, trace to some sand, containing rootlets, trace organics Very loose Brown Moist becoming wet below a depth of 0.6 m | | 2 | SS | 53/0.10 | ▽ | 193 | | | | | | | | | | |
| 0.7 | | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| NOTES: | | | | | | | | | | | | | | | | | | |
| 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 193.0 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | |
| 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | | |



| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S308-06 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5080655.1 ; E 223043.3</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, 70 mm O.D. Solid Stem Hand Auger</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 28, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | |
|---------------|---|---|---------|------|------------|----------------------------|-----------------|---|--------------|--|---|---------------------------------------|--|--|-------------------|-------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) | |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | | | | | | ● QUICK TRIAXIAL | × REMOULDED |
| 194.6 | GROUND SURFACE | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) Very soft Black Moist |  | 1 | SS | 2 | | | | | | | | | | | |
| 194.0 | | | 2 | SS | 53/0.08 | | | | | | | | | | | |
| 0.7 | SILT and SAND, trace clay, trace organics Very loose Brown Wet END OF BOREHOLE SPOON REFUSAL NOTES: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 194.0 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | |



| PROJECT | | RECORD OF BOREHOLE | | No S308-07 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | | | |
|--------------|-------|---|------------|---------------|------|--|-------------------------|--|---|--|--|-------------|--|-------------------|---------------------------------------|--|---|--|--|-------------|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | | | | | | | | | | | | | |
| DATE | | COMPILED BY | | CHECKED BY | | DATUM | | DATE | | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5080669.1 ; E 223036.2 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | | | | | | | | | | | | | |
| Geodetic | | January 28, 2012 | | CN/TZ | | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | | | |
| ELEV | DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | | | GR SA SI CL | | |
| 195.9 | 0.0 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | | | | | 20 40 60 | | | | | | | | |
| 195.6 | 0.3 | PEAT (Amorphous) | | 1 | SS | 1 | | | | | | | | | | | | | | | | |
| 194.8 | 1.1 | SILT and SAND, trace to some gravel, trace clay, trace organics Very loose to dense Brown Moist becoming wet below a depth of 0.6 m | | 2 | SS | 35 | | 195 | | | | | | | | | | | | 6 52 37 5 | | |
| | | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | | | | | |
| | | NOTES: | | | | | | | | | | | | | | | | | | | | |
| | | 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 195.3 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |
| | | 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | | | | |

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S308-08 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | |
|----------------------|---|--------------------------------------|--------|-------------------|----------------------------|-----------------|---|--------------------|--|--|--|---|-------------------|--|---|--|--|
| W.P. 5404-05-01 | | LOCATION N 5080683.2 ; E 223028.4 | | ORIGINATED BY ARM | | | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment | | COMPILED BY MAS | | | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 28, 2012 | | CHECKED BY CN/TZ | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| 196.3 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 0.1 | PEAT (Amorphous) Black Moist END OF BOREHOLE SPOON REFUSAL NOTES: 1. Open borehole dry upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | /// | 1 | SS | 53/0.12 | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S308-09 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|-------------|--|----------|--|------------------|--|------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATUM | | DATE | | CHECKED BY | |
| 09-1111-6014 | | N 5080693.7 ; E 223040.8 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | MAS | | Geodetic | | January 25, 2012 | | CN/TZ | |

| 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 | | | | | W _p | W | W _L | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 196.6 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) Very soft Black Moist |  | 1 | SS | 2 | | | | | | | | | | | | |
| 196.0 | | | | | | | | | | | | | | | | | |
| 0.6 | SILT and SAND, trace to some clay, trace gravel |  | 2 | SS | 18 | | | | | | | | | | | | |
| 195.4 | Compact Brown Moist | | | | | | | | | | | | | | | | |
| 1.2 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| NOTES: 1. Open borehole dry upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S308-10 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|---|------------------------|--------------------|---------|--------------------------|------------|--|-----------------|---|-----------------|---|----------|--|--|---|
| W.P. 09-1111-6014 | | LOCATION | | N 5080704.4 ; E 223051.2 | | ORIGINATED BY | | ARM | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | COMPILED BY | | | | | | |
| DATUM | | Geodetic | | DATE | | January 28, 2012 | | CHECKED BY | | | | | | |
| CN/TZ | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 40 60 80 100 | 20 40 60 80 100 | W _p W W _L | 20 40 60 | | | |
| 196.3 | ICE SURFACE | | | | | | | | | | | | | |
| 0.7 | Ice | | | | | | | | | | | | | |
| 195.7 | Water | | | | | | | | | | | | | |
| 0.6 | CLAYEY SILT with SAND | | | | | | | | | | | | | |
| 195.1 | Stiff Grey Wet | | 1 | SS | 9 | | | | | | | | | |
| 194.7 | Sandy SILT, trace clay | | 2 | SS | 57/0.10 | | | | | | | | | |
| 1.6 | Compact Grey Wet | | | | | | | | | | | | | |
| END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | |
| NOTES: | | | | | | | | | | | | | | |
| 1. Water level in open borehole at ground surface (Elev. 196.3 m) upon completion of drilling. | | | | | | | | | | | | | | |
| 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT "N" values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE No S308-11 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|---|---|---|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| W.P. 09-1111-6014 | | LOCATION N 5080718.2 ; E 223045.3 | | | | ORIGINATED BY ARM | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment | | | | COMPILED BY MAS | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 28, 2012 | | | | CHECKED BY CN/TZ | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| 196.5 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 0.0 196.2 | PEAT (Amorphous) Soft Black Wet |  | 1 | SS | 3 | | 196 | | | | | | | | | | |
| 0.5 | SILT, some sand, trace organics Very loose Brown Wet |  | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at ground surface (Elev. 196.5 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT "N" values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S308-12 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5080732.3 ; E 223038.1</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Hand Shovel Excavation</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 28, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|---|---|----------------|--------------------------------------|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | W _p | W | W _L | | GR | SA | SI | CL |
| 196.8 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Fibrous) | | 1 | CS | - | | | | | | | | | | | | | | | |
| 0.2 | Black Moist | | | | | | | | | | | | | | | | | | | |
| | END OF EXCAVATION BEDROCK | | | | | | | | | | | | | | | | | | | |
| | NOTES: 1. Bedrock exposed under 200 mm of peat. 2. Excavation dry upon completion of drilling. | | | | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S308-13 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | |
|----------------------|---|--------------------------------------|--------|-------------------|----------------------------|-----------------|---|--------------------|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|-------------------------|--|-------------------|
| W.P. 5404-05-01 | | LOCATION N 5080742.8 ;E 223049.9 | | ORIGINATED BY ARM | | | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Hand Shovel Excavation | | COMPILED BY MAS | | | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 28, 2012 | | CHECKED BY CN/TZ | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) |
| 196.6 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Fibrous) | 1 | CS | - | | | | | | | | | | | | | |
| 196.3 | Black | | | | | | | | | | | | | | | | |
| 0.3 | Moist | | | | | | | | | | | | | | | | |
| | END OF EXCAVATION BEDROCK | | | | | | | | | | | | | | | | |
| | NOTES: | | | | | | | | | | | | | | | | |
| | 1. Bedrock exposed under 300 mm of peat. | | | | | | | | | | | | | | | | |
| | 2. Excavation dry upon completion. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S308-14 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|--|---|--------------------|---------|--|------------|----------------------------|-----------------|---|----------|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION | | N 5080753.6 ; E 223060.3 | | ORIGINATED BY | | ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | COMPILED BY | | MAS | | | | | | |
| DATUM Geodetic | | DATE | | January 28, 2012 | | CHECKED BY | | CN/TZ | | | | | | |
| 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 | | | | | | |
| 196.7 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | |
| 0.0 196.4 | PEAT (Amorphous) Very soft Black Moist | | 1 | SS | 2 | | | | | | | | | |
| 196.1 0.6 | SILT, some sand, trace clay, trace organics Very loose Brown to black Moist | | 2 | SS | 6 | | | | | | | | | 0 7 57 36 |
| 195.5 1.3 | SILTY CLAY, trace to some sand Firm Brown Moist SILT, some sand Brown Wet END OF BOREHOLE SPOON REFUSAL | | 3 | SS | 53/0.05 | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 195.5 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | |



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




GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF BOREHOLE | | No S308-16 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | | |
|---------------|---|--------------------------|---------|---------------|------------|--|-----------------|--|---|-------------|----|-------------|-------------------|----|---------------------------------------|---|--|--|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | GR | | SA | | SI | | | | | | | | | | | |
| 09-1111-6014 | | N 5080588.5 ; E 223059.5 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | MAS | | | | | | | | | | | |
| Geodetic | | January 26, 2012 | | CN/TZ | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | | | | | |
| 195.5 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | | | | |
| 0.0 | PEAT (Amorphous) | | 1 | SS | 105/0.20 | | | | | | | | | | | | | | | | |
| 0.2 | Black Moist | | | | | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | | | | | |
| | NOTE: | | | | | | | | | | | | | | | | | | | | |
| | 1. Open borehole dry upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S308-17 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|-------------|--|----------|--|------------------|--|------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATUM | | DATE | | CHECKED BY | |
| 09-1111-6014 | | N 5080598.7 ; E 223073.2 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | MAS | | Geodetic | | January 26, 2012 | | CN/TZ | |

| 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 | | | | | W _p | W | W _L | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 195.9 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | | | | | | | | | | | | | | | |
| 195.4 | Very soft | | 1 | SS | 1 | | | | | | | | | | | | |
| 0.5 | Black Moist | | | | | | | | | | | | | | | | |
| 194.8 | SILT and SAND, trace clay, trace organics | | 2 | SS | 28 | | | | | | | | | | | | |
| 1.1 | Very loose to compact Brown Moist | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| | NOTES: | | | | | | | | | | | | | | | | |
| | 1. Open borehole dry upon completion of drilling. | | | | | | | | | | | | | | | | |
| | 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S308-18 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|-------------|--|----------|--|------------------|--|------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATUM | | DATE | | CHECKED BY | |
| 09-1111-6014 | | N 5080613.1 ; E 223064.1 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | MAS | | Geodetic | | January 27, 2012 | | CN/TZ | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--|--|---|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 193.0 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) Very soft Black Moist |  | 1 | SS | 1 | | | | | | | | | | | | |
| 192.4 | Gravelly SAND, trace to some silt, trace clay, trace organics Compact Grey Wet |  | 2 | SS | 14 | | | | | | | | | | | | |
| 0.6 | | | 3 | SS | 12 | | | | | | | | | | | | |
| 191.2 | Silty SAND, trace gravel Compact Grey Wet |  | 4 | SS | 57/0.20 | | | | | | | | | | | | |
| 2.0 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 192.4 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT "N" values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | |



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14



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

GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14



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

GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14



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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF BOREHOLE | | No S308-24 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|-------------|--|----------|--|------------------|--|-------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATE | | CHECKED BY | | | |
| 09-1111-6014 | | N 5080721.9 ; E 223094.1 | | ARM | | HWY 69 | | Portable Equipment, 70 mm O.D. Solid Stem Hand Auger | | MAS | | Geodetic | | January 28, 2012 | | CN/TZ | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|-----|----------------|---|----------------|--|--|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | | |
| 196.6 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | PEAT (Amorphous) | | | | | | | | | | | | | | | | |
| 0.2 | SILTY CLAY, trace to some sand Soft to firm Brown Wet | | 1 | SS | 2 | | | | | | | | | | | | |
| | | | 2 | SS | 7 | | | | | | | | | | | | |
| | | | 3 | SS | 8 | | | | | | | | | | | | |
| | | | 4 | SS | 7 | | | | | | | | | | | | |
| 194.1 | SILT, some sand, trace clay Compact Brown becoming grey below a depth of 3.1 m Wet | | 5 | SS | 10 | | | | | | | | | | | | |
| 2.5 | | | 6 | SS | 17 | | | | | | | | | | | | |
| 192.8 | END OF BOREHOLE SPOON REFUSAL | | 7 | SS | 53/0.13 | | | | | | | | | | | | |
| 3.8 | NOTES: 1. Water level in open borehole at ground surface (Elev. 196.6 m) upon completion of drilling. 2. Borehole advanced using portable drilling equipment with a half-weight hammer. SPT "N" values shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |

| | | | | | | | |
|----------------------|--|--|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S308-25 | | SHEET 1 OF 1 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5080736.0 ; E 223086.8 | | ORIGINATED BY ARM | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, NW Casing, Wash Boring | | COMPILED BY MAS | | | |
| DATUM Geodetic | | DATE January 28, 2012 | | CHECKED BY CN/TZ | | | |

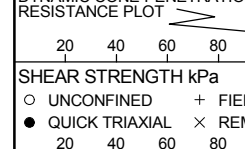
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|--|--|---------|------|------------|----------------------------|-----------------|--|--|--|--|--|--|--|--|---|---|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL |
| | | | | | | | | <div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | |
| 196.4 | ICE SURFACE | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | | | | | | | | | | | | | |
| 0.0 | Ice | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | | | | | | | | | | | | | |
| 0.2 | Water | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | | | | | | | | | | | | | |
| 195.8 | | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | 196 | | | | | | | | | | | | | |
| 0.6 | CLAYEY SILT, trace sand Soft to firm Brown Wet | <div><div></div><div></div><div></div><div></div><div></div></div> | 1 | SS | 4 | | | | | | | | | | | | | | | |
| | | <div><div></div><div></div><div></div><div></div><div></div></div> | 2 | SS | 8 | | 195 | | | | | | | | | | | | | |
| 194.6 | | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | | | | | | | | | | | | | |
| 1.8 | SILT, some sand, trace to some clay Loose Brown Wet | <div><div></div><div></div><div></div><div></div><div></div></div> | 3 | SS | 7 | | | | | | | | | | | | 0 | 13 | 79 | 8 |
| | | <div><div></div><div></div><div></div><div></div><div></div></div> | 4 | SS | 113/0.18 | | 194 | | | | | | | | | | | | | |
| 193.6 | | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | | | | | | | | | | | | | |
| 2.8 | END OF BOREHOLE SPOON AND CASING REFUSAL | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | | | | | | | | | | | | | |
| | NOTES: 1. Water level in open borehole at ground surface (Elev. 196.4 m) upon completion of drilling. 2. Samples 1 and 2 were advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown for these samples have been adjusted to reflect values that would be obtained with a standard weight hammer. | <div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S308-DC01 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5080634.3 ; E 223018.0</u> | | ORIGINATED BY <u>ARM</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>MAS</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 25, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | |

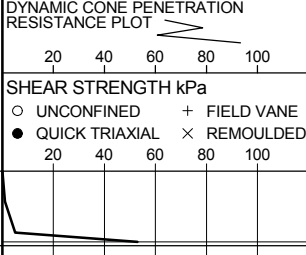
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|---|-----|----------------|---|---|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | W _p | W | W _L | | GR SA SI CL | | | |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 194.5 | GROUND SURFACE | | | | | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | 194 | | | | | | | | | | | |
| 193.4 | | | | | | | | | | | | | | | | | | |
| 1.1 | END OF DCPT Refusal to Further Penetration (53 Blows / 0.20 m) NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | |

| PROJECT 09-1111-6014 | | RECORD OF DCPT No S308-DC02 | | | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|----------------------|---|---|--------|------|-------------------------|-------------------|--|--------------------|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|
| W.P. 5404-05-01 | | LOCATION N 5080630.3 ; E 223039.4 | | | | ORIGINATED BY ARM | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | | | COMPILED BY MAS | | | | | | | | | | | |
| DATUM Geodetic | | DATE January 25, 2012 | | | | CHECKED BY CN/TZ | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) |
| 194.7 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | |
| 192.9 | | | | | | | | | | | | | | | | | |
| 1.8 | END OF DCPT Refusal to Further Penetration (53 Blows / 0.25 m) NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |


GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF DCPT No S308-DC03 | | SHEET 1 OF 1 | | METRIC | | | | |
|-------------------|--|---|--------|-------------------|-------------------------|-----------------|---|---|---------------------------------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5080658.8 ; E 223023.1 | | ORIGINATED BY ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | |
| DATUM Geodetic | | DATE January 25, 2012 | | CHECKED BY CN/TZ | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p — W — W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 195.6 | GROUND SURFACE | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| 193.9 | END OF DCPT Refusal to Further Penetration (53 Blows / 0.18 m) | | | | | | | | | |
| 1.7 | NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect value that would be obtained with a standard weight hammer. | | | | | | | | | |

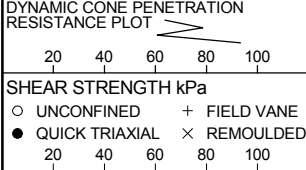
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S308-DC04 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | |
|--------------------------------------|---|--|--------|--------------------------|----------------------------|-----------------|---|--------------------|----|----|----|---|-----------------------------------|--|--|---|--|--|
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5080679.7 ; E 223047.2</u> | | ORIGINATED BY <u>ARM</u> | | | | | | | | | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>MAS</u> | | | | | | | | | | | | | | |
| DATUM <u>Geodetic</u> | | DATE <u>January 25, 2012</u> | | CHECKED BY <u>CN/TZ</u> | | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | W _p W W _L | | | | | |
| 195.9 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 195.1 0.8 | END OF DCPT Refusal to Further Penetration (53 Blows / 0.18 m) NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | | |

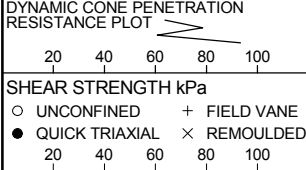
| PROJECT | | RECORD OF DCPT No S308-DC05 | | SHEET 1 OF 1 | | METRIC | | | | |
|-------------------|---|---|--------|-------------------|----------------------------|-----------------|---|--|--|---|
| W.P. 09-1111-6014 | | LOCATION N 5080707.7 ; E 223033.5 | | ORIGINATED BY ARM | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | |
| DATUM Geodetic | | DATE January 25, 2012 | | CHECKED BY CN/TZ | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p W W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 196.7 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| 196.0 0.7 | END OF DCPT Refusal to Further Penetration NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. SPT 'N' values shown has been adjusted to reflect value that would be obtained with a standard weight hammer. | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF DCPT No S308-DC06 | | SHEET 1 OF 1 | | METRIC | | | | |
|-------------------|--|---|--------|-------------------|-------------------------|-----------------|---|---|---------------------------------------|--|
| W.P. 09-1111-6014 | | LOCATION N 5080729.0 ; E 223055.8 | | ORIGINATED BY ARM | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | |
| DATUM Geodetic | | DATE January 25, 2012 | | CHECKED BY CN/TZ | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | |
| 196.4 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | |
| 194.5 1.9 | END OF DCPT Refusal to Further Penetration (53 Blows / 0.03 m) NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

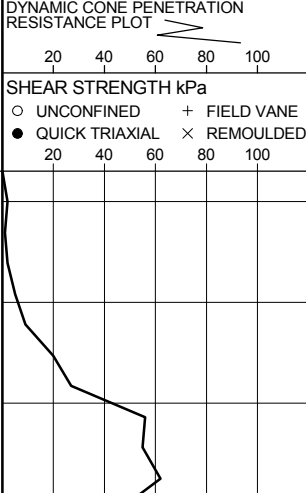
| PROJECT | | RECORD OF DCPT No S308-DC07 | | SHEET 1 OF 1 | | METRIC | | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|--|--|---------------------------------------|--|------------|
| W.P. 09-1111-6014 | | LOCATION N 5080756.9 ; E 223042.6 | | ORIGINATED BY ARM | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | | |
| DATUM Geodetic | | DATE January 25, 2012 | | CHECKED BY CN/TZ | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p W W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | | "N" VALUES |
| 197.2 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | 197 | | | | |
| 195.3 1.9 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.03 m) NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | 196 | | | | |

| PROJECT | | RECORD OF DCPT No S308-DC08 | | SHEET 1 OF 1 | | METRIC | | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|--|---|---------------------------------------|--|------------|
| W.P. 09-1111-6014 | | LOCATION N 5080602.6 ; E 223051.8 | | ORIGINATED BY ARM | | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | | |
| DATUM Geodetic | | DATE January 25, 2012 | | CHECKED BY CN/TZ | | | | | | | |
| 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 WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | | "N" VALUES |
| 195.3 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | |
| 193.6 1.7 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.20 m) NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | 09-1111-6014 | | RECORD OF DCPT No S308-DC09 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|---------------|---|--------------|--------|-----------------------------|------------|---|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. | | 5404-05-01 | | LOCATION | | N 5080676.1 ; E 223066.7 | | ORIGINATED BY | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 28, 2012 | | CHECKED BY | | | | | | | | | |
| CN/TZ | | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | |
| 196.0 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | |
| 195.5 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.15 m) | | | | | | | | | | | | | | | | |
| 0.5 | NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF DCPT No S308-DC10 | | SHEET 1 OF 1 | | METRIC | | | | | |
|-------------------|---|---|--------|-------------------|-------------------------|-----------------|--|--|---------------------------------------|--|------------|
| W.P. 09-1111-6014 | | LOCATION N 5080697.3 ; E 223089.5 | | ORIGINATED BY ARM | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY MAS | | | | | | | |
| DATUM Geodetic | | DATE January 29, 2012 | | CHECKED BY CN/TZ | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT  | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p W W _L WATER CONTENT (%) | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | | | | | "N" VALUES |
| 197.3 0.0 | GROUND SURFACE Dynamic Cone Penetration Test (DCPT) | | | | | 197 | | | | | |
| 194.1 3.2 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.25 m) NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | 195 | | | | | |

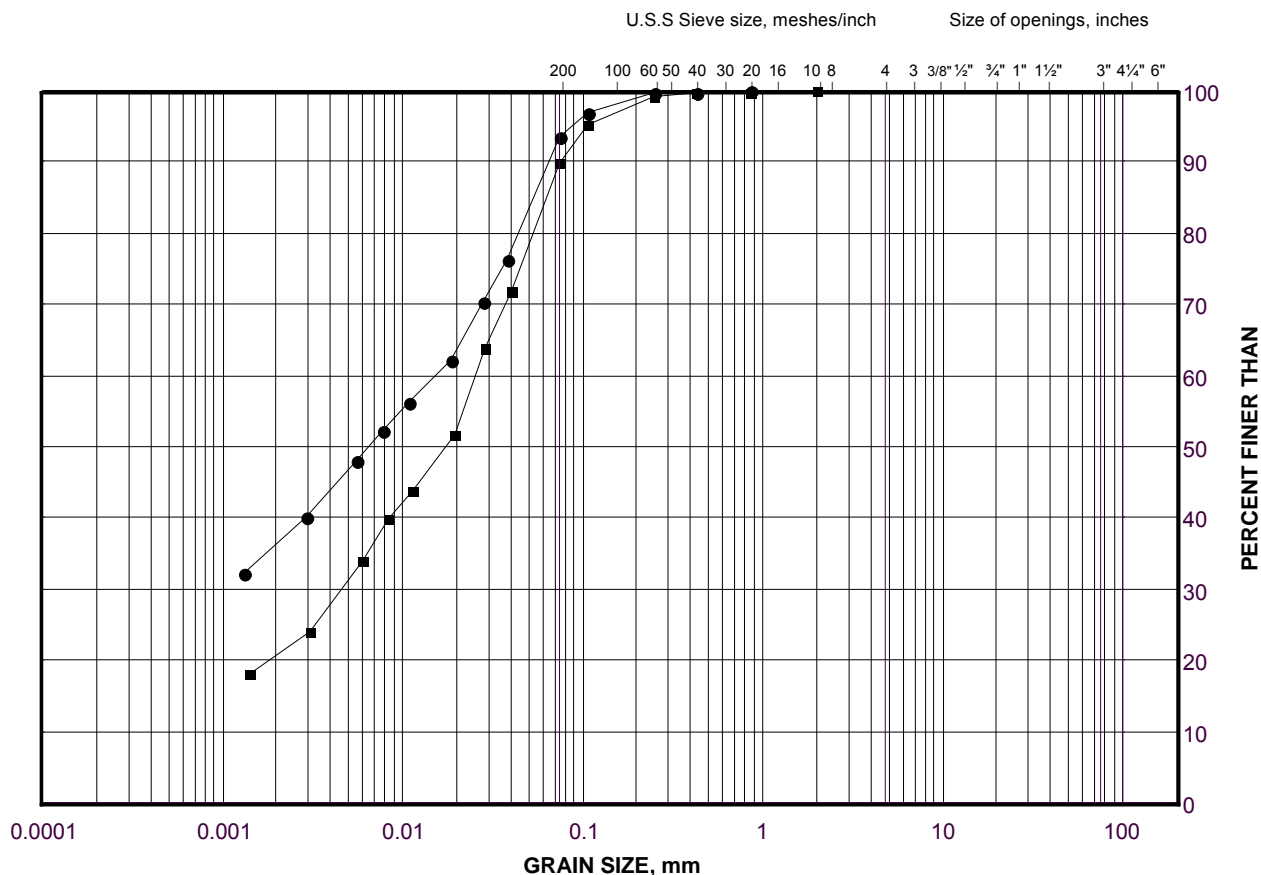
| PROJECT | | 09-1111-6014 | | RECORD OF DCPT No S308-DC11 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|---------------|---|--------------|--------|-----------------------------|-------------------------|---|--|--------------------|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|-------------------|
| W.P. | | 5404-05-01 | | LOCATION | | N 5080725.2 ; E 223076.4 | | ORIGINATED BY | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Portable Equipment, Dynamic Cone Penetration Test | | COMPILED BY | | | | | | | | | |
| DATUM | | Geodetic | | DATE | | January 29, 2012 | | CHECKED BY | | | | | | | | | |
| CN/TZ | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) |
| 196.4 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 194.6 | END OF DCPT Refusal to Further Penetration (105 Blows / 0.25 m) | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |
| 1.8 | NOTE: 1. DCPT advanced using portable drilling equipment with a half-weight hammer. Blows shown have been adjusted to reflect values that would be obtained with a standard weight hammer. | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | |

GRAIN SIZE DISTRIBUTION

Clayey Silt to Silty Clay

Highway 69 (SBL) STA 18+375 to 18+550 (Swamp 308)

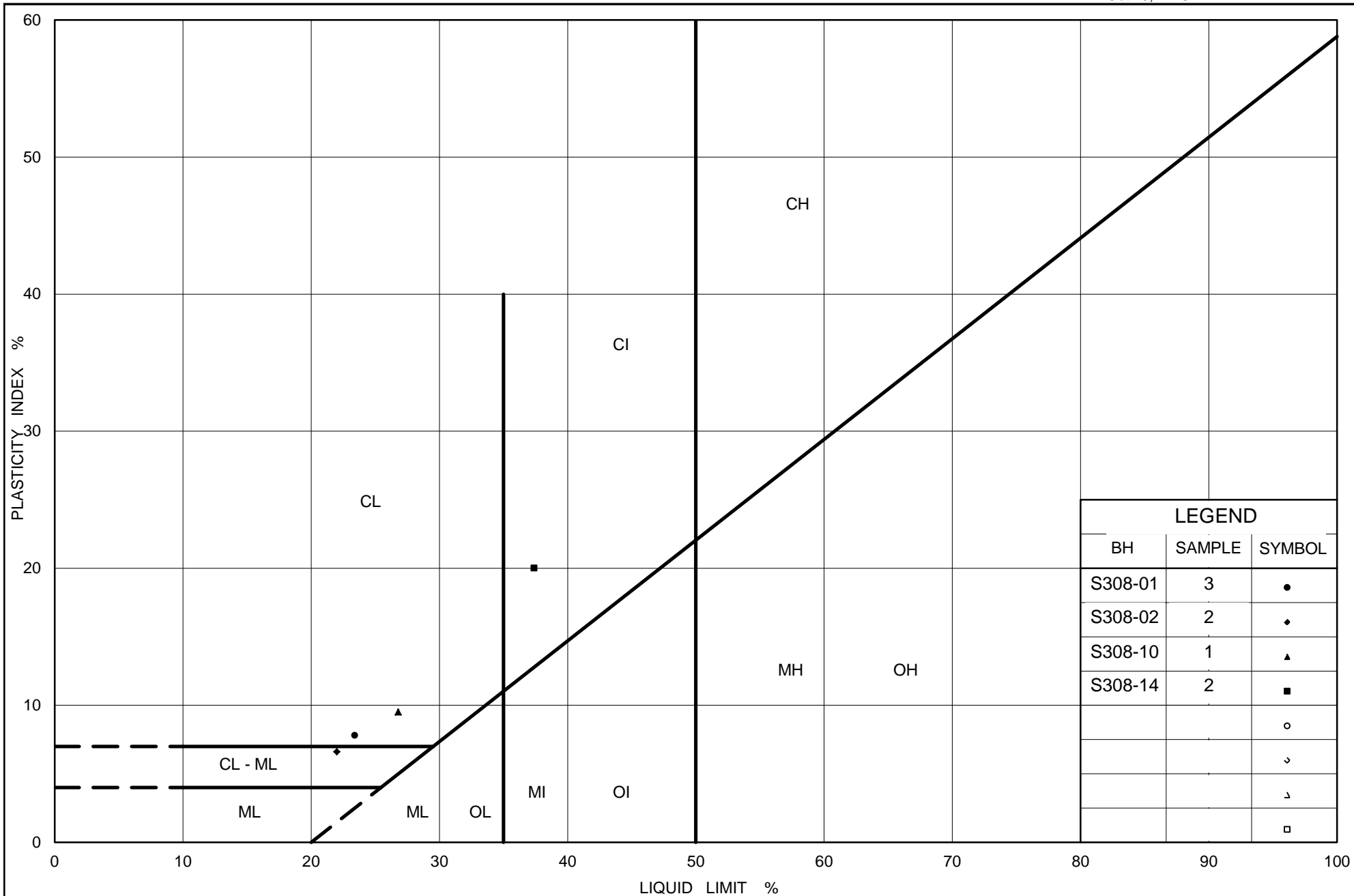
FIGURE H.S308-01



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S308-14 | 2 | 195.8 |
| ■ | S308-01 | 3 | 193.2 |



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt to Silty Clay

Highway 69 (SBL) STA 18+375 to 18+500 (Swamp 308)

Figure No. H.S308-02

Project No. 09-1111-6014

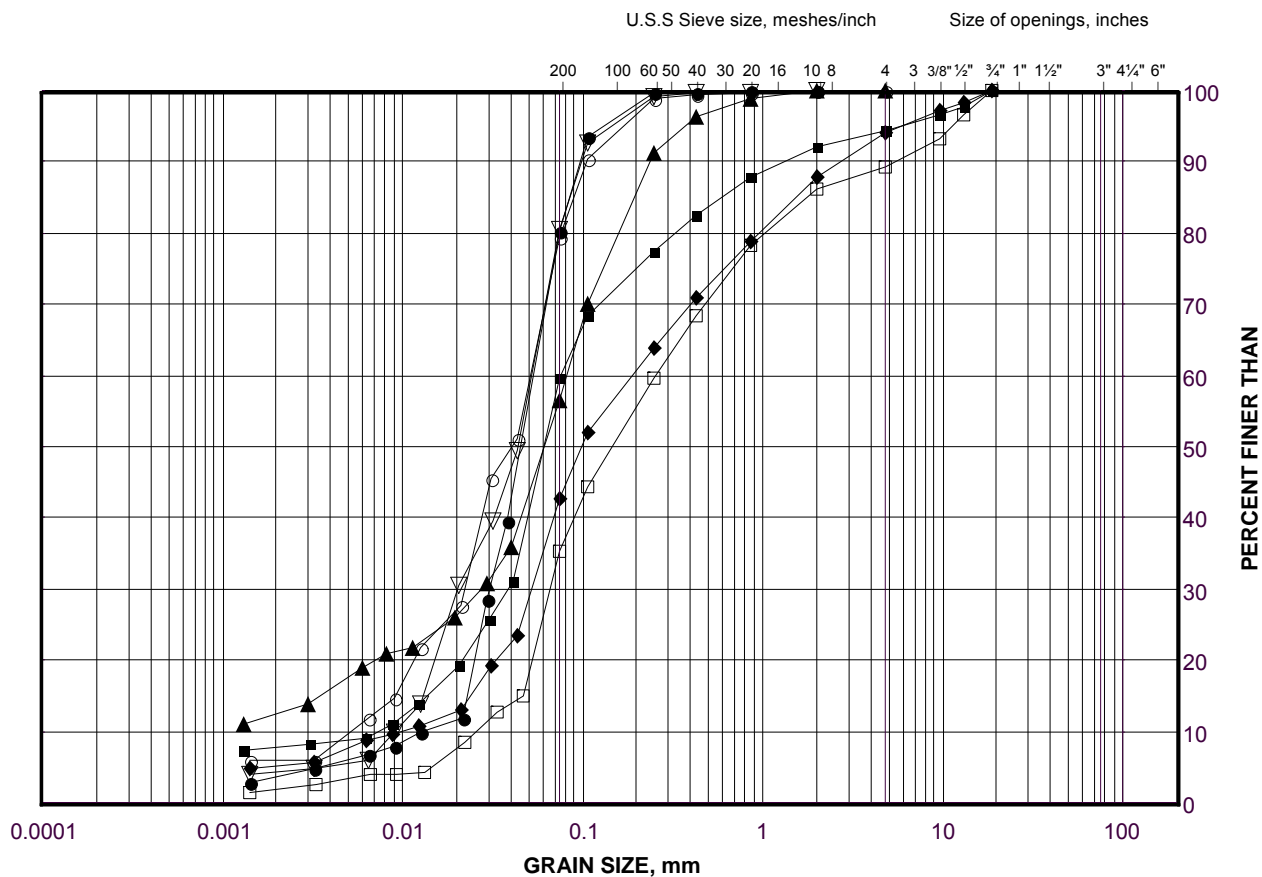
Checked By: TZ

GRAIN SIZE DISTRIBUTION

Sandy Silt to Silt and Sand

Highway 69 (SBL) STA 18+375 to 18+550 (Swamp 308)

FIGURE H.S308-03



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S308-10 | 2 | 194.9 |
| ■ | S308-09 | 2 | 194.7 |
| ◆ | S308-07 | 2 | 195.0 |
| ▲ | S308-03 | 2 | 191.9 |
| ▽ | S308-04 | 4 | 191.0 |
| ○ | S308-01 | 5 | 192.0 |
| □ | S308-04 | 6 | 189.7 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

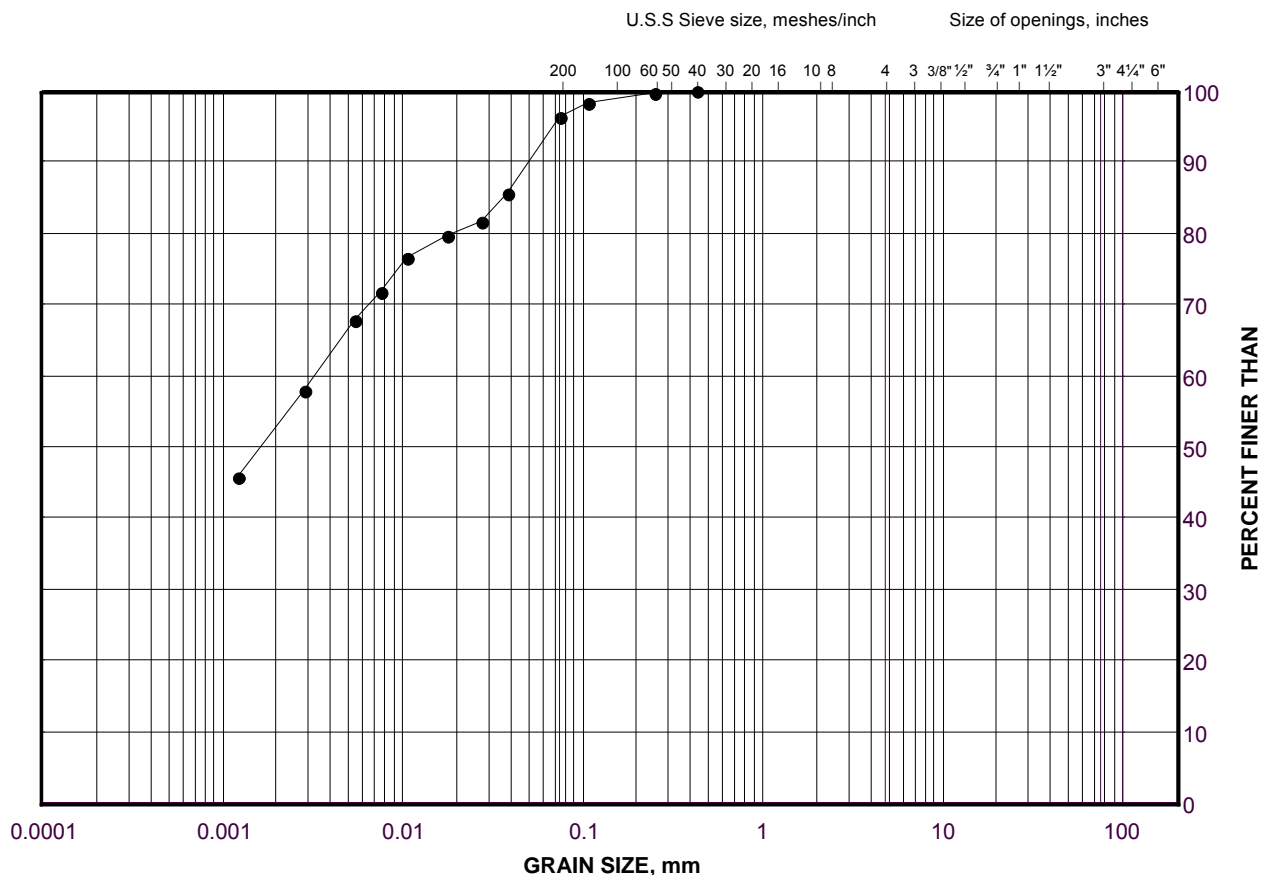
Date: 05-Mar-13

GRAIN SIZE DISTRIBUTION

Silty Clay

Highway 69 (NBL) STA 18+375 to 18+535 (Swamp 308)

FIGURE H.S308-04



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

LEGEND

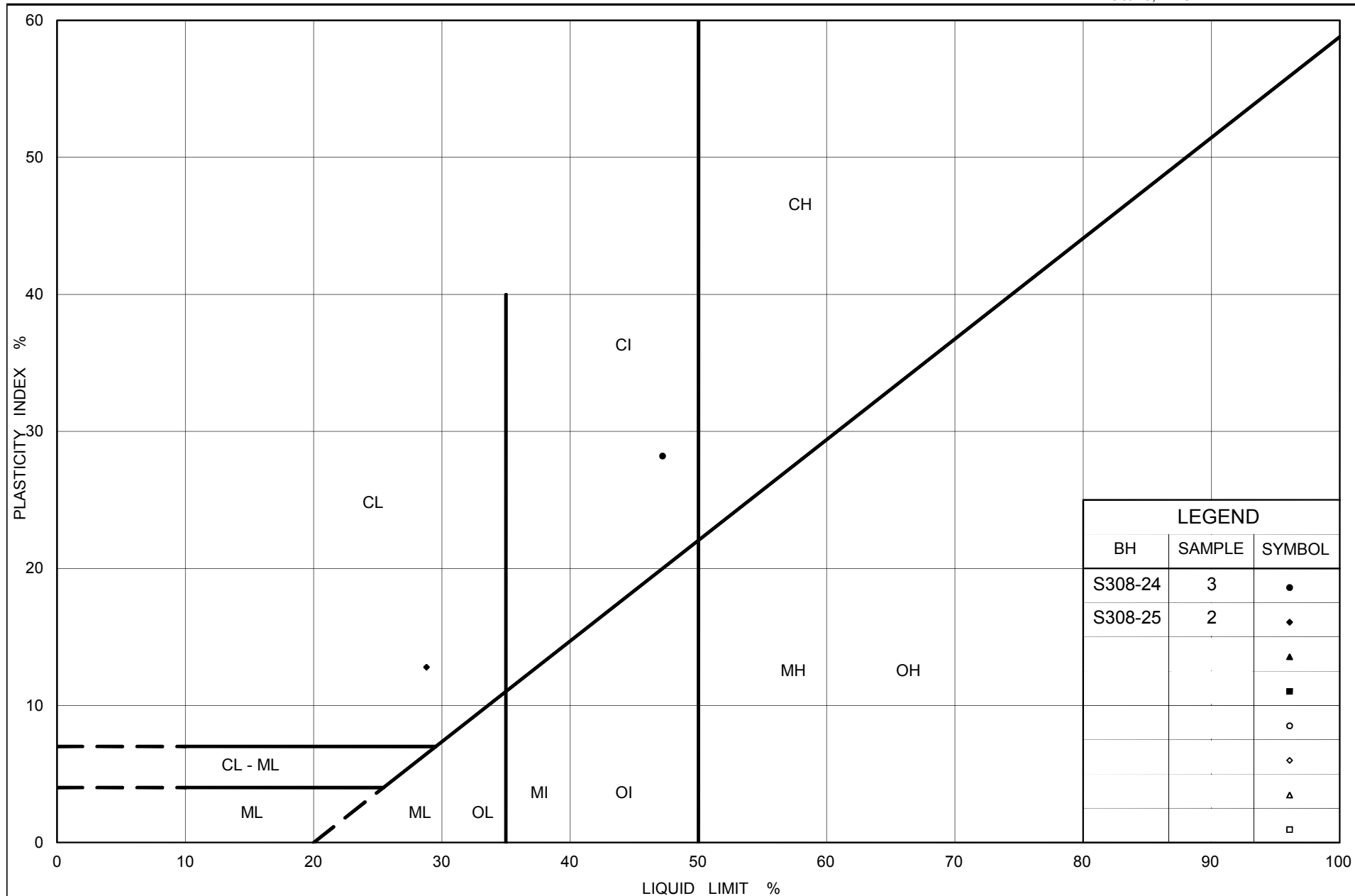
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S308-24 | 3 | 195.1 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 05-Mar-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt to Silty Clay

Highway 69 (NBL) STA 18+375 to 18+535 (Swamp 308)

Figure No. H.S308-05

Project No. 09-1111-6014

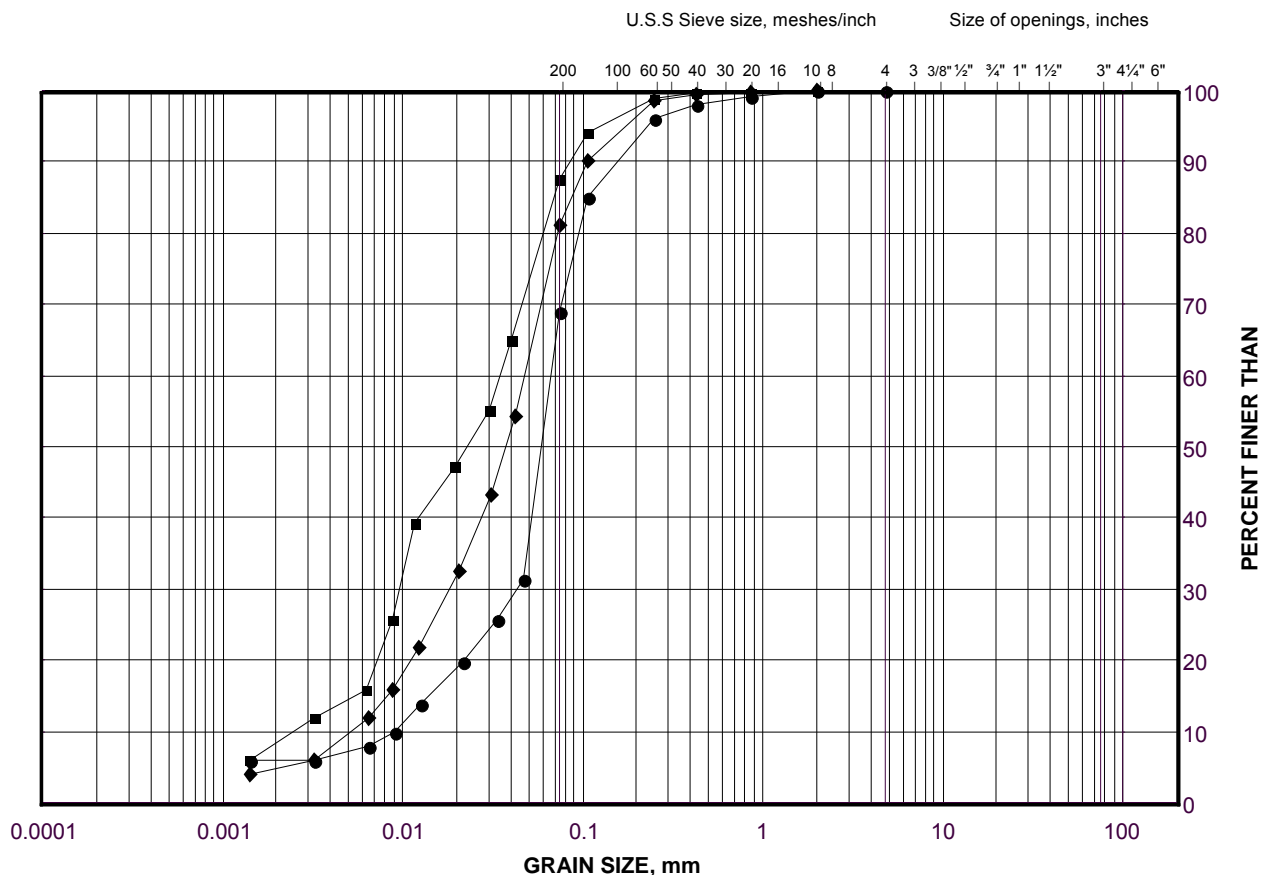
Checked By: TZ

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Highway 69 (NBL) STA 18+375 to 18+535 (Swamp 308)

FIGURE H.S308-06



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

LEGEND

| SYMBOL | STATION | SAMPLE | ELEVATION(m) |
|--------|---------|--------|--------------|
| ● | S308-17 | 2 | 195.1 |
| ■ | S308-25 | 3 | 194.3 |
| ◆ | S308-24 | 6 | 193.2 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

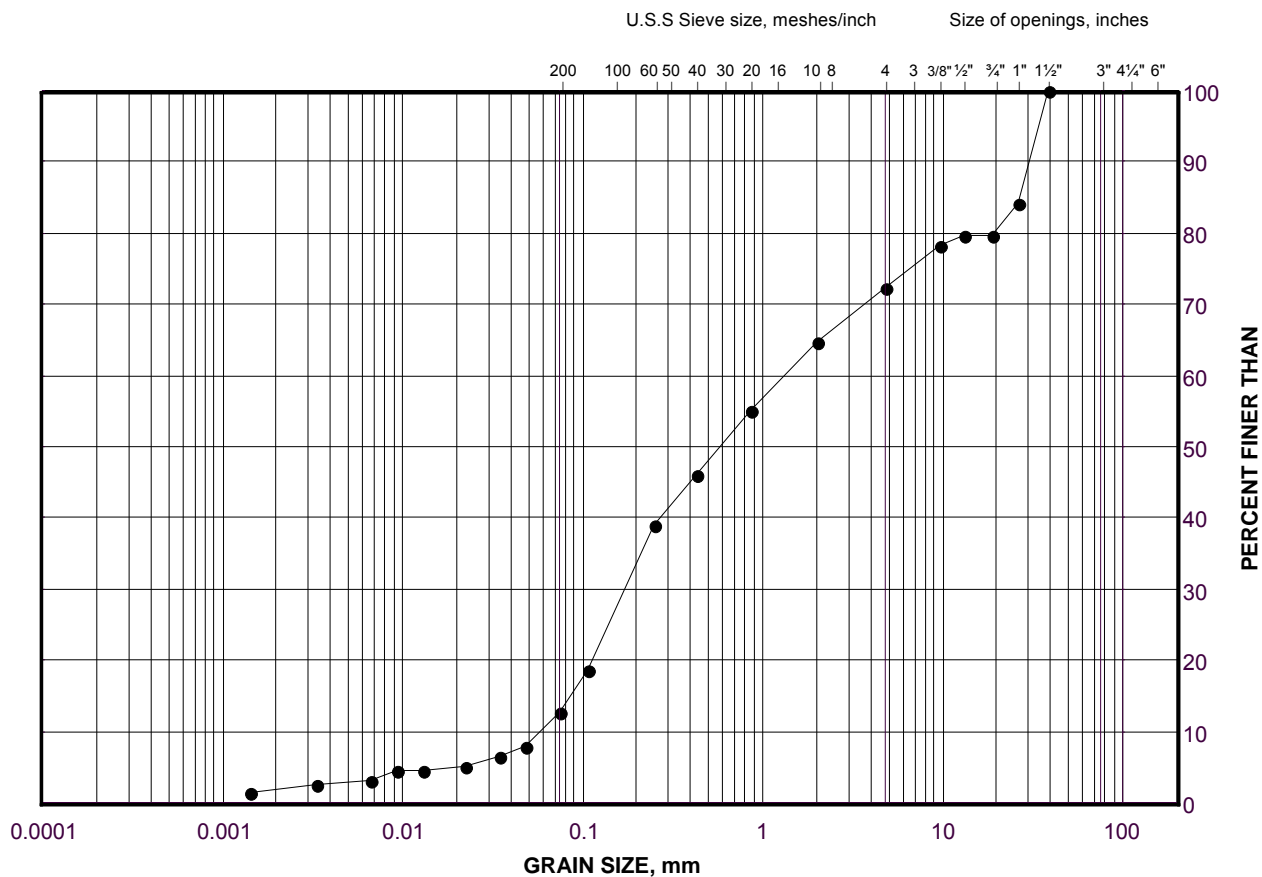
Date: 20-Nov-12

GRAIN SIZE DISTRIBUTION

Gravelly Sand

Highway 69 (NBL) STA 18+375 to 18+535 (Swamp 308)

FIGURE H.S308-07



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S308-18 | 3 | 191.5 |

Project Number: 09-1111-6014

Checked By: TZ

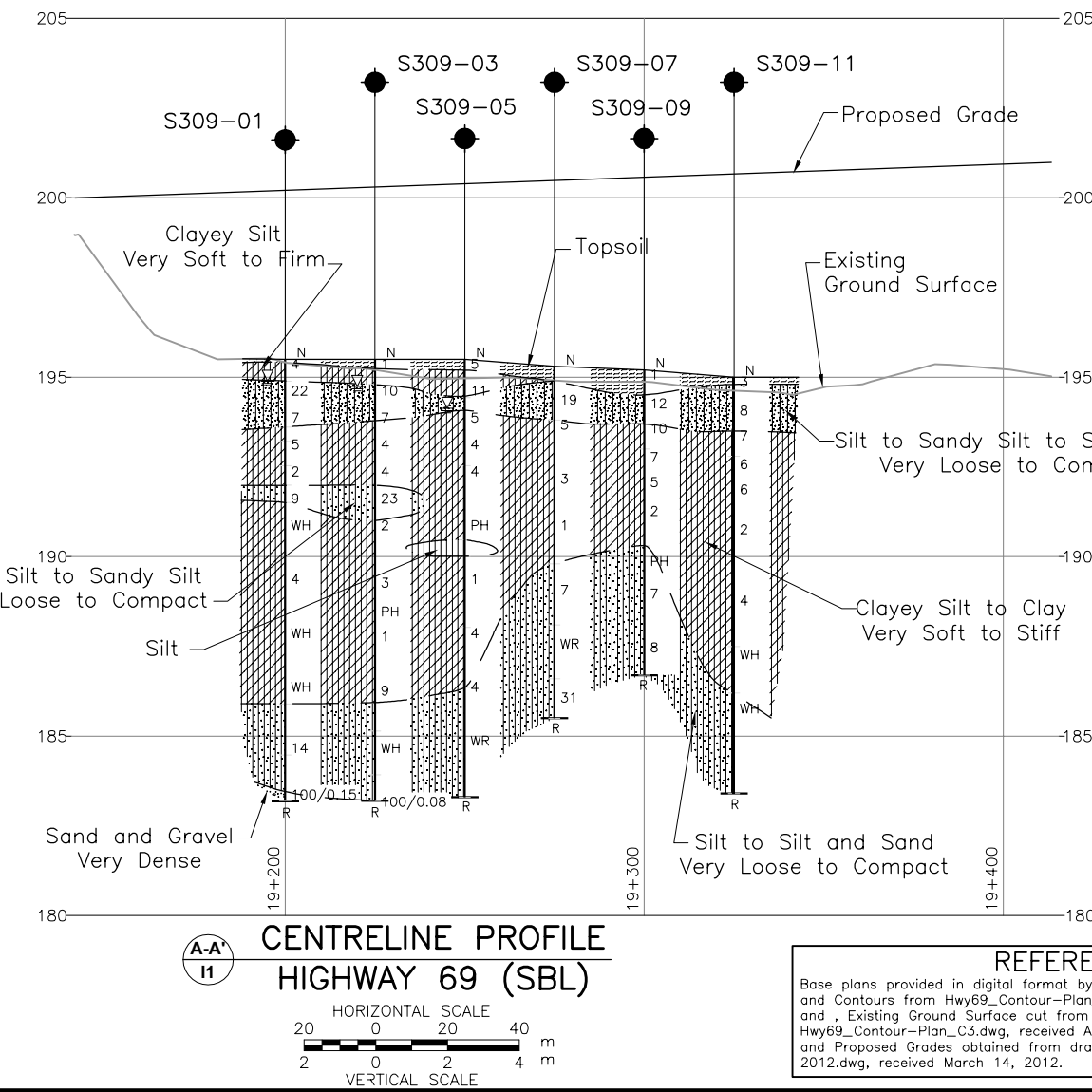
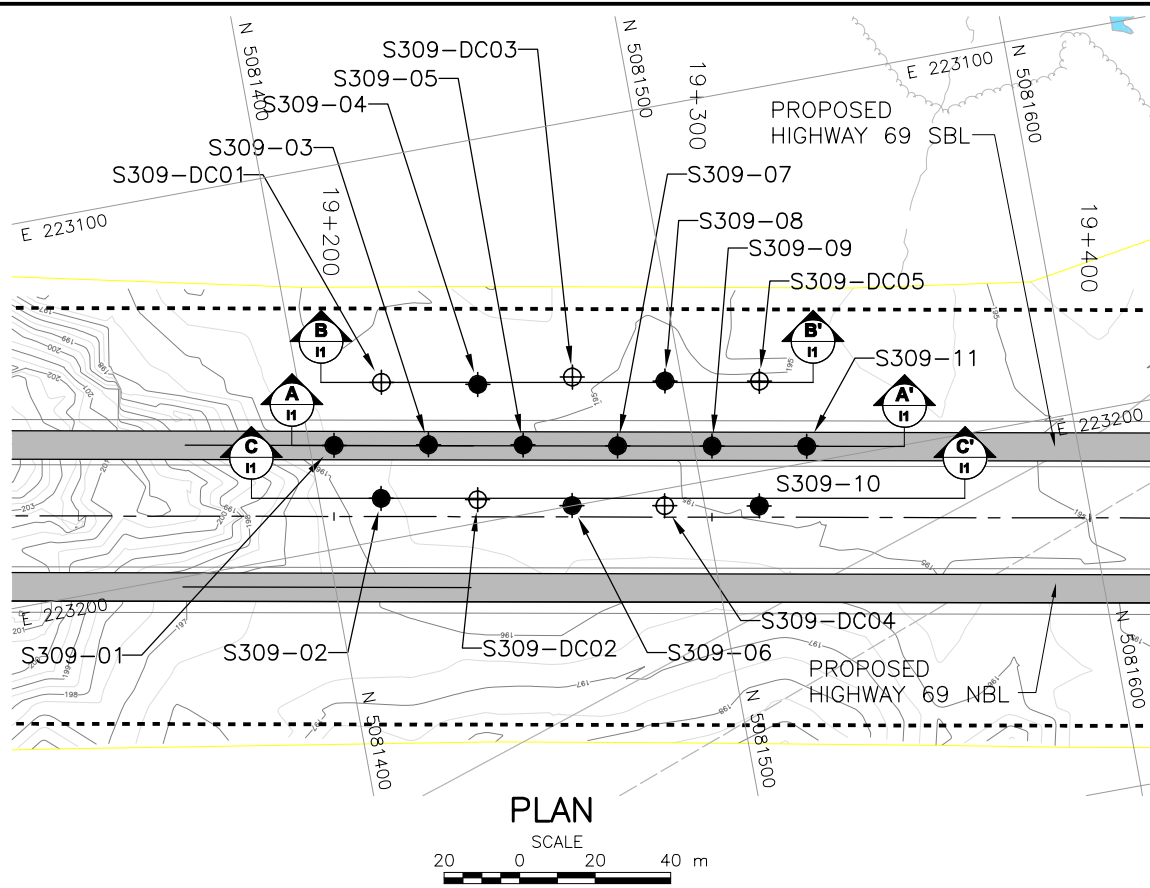
Golder Associates

Date: 05-Mar-13

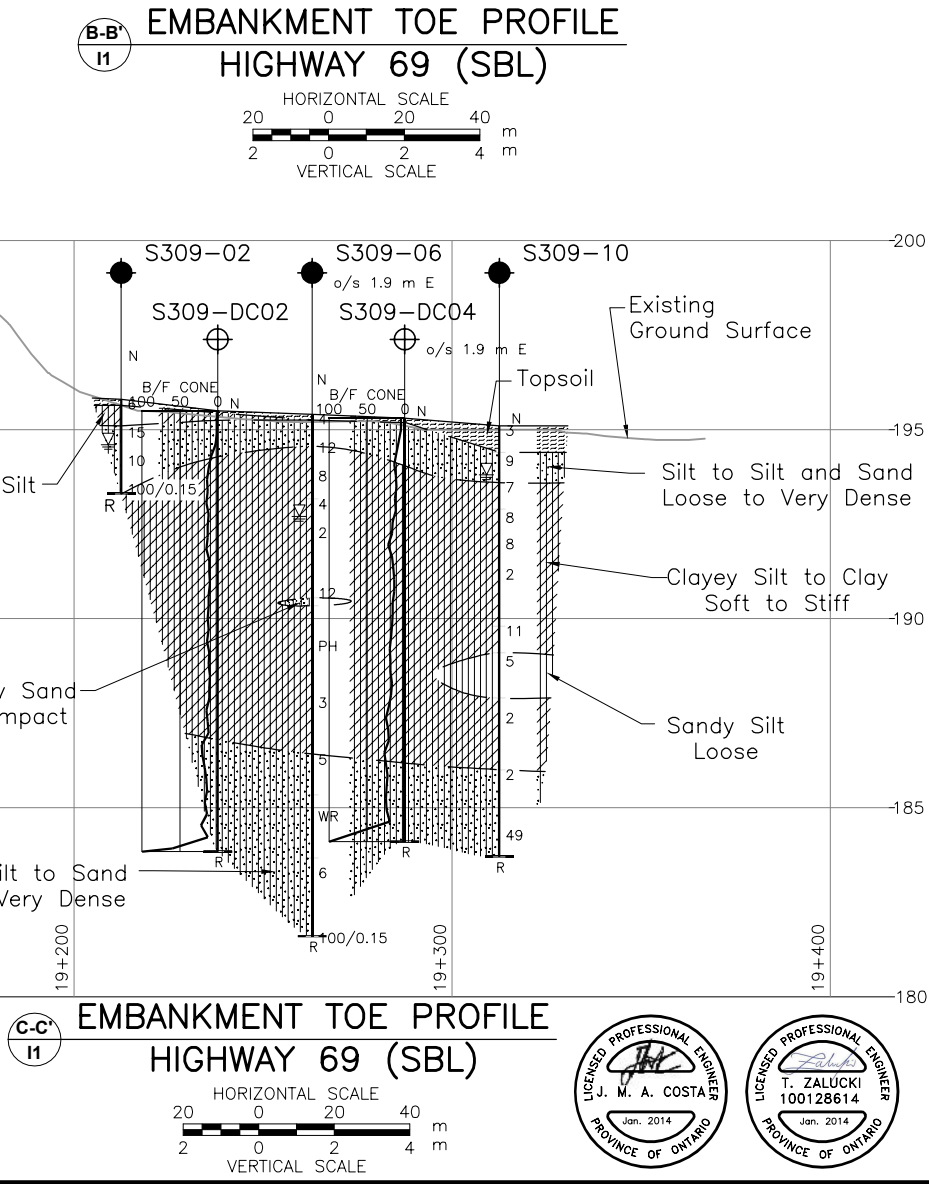
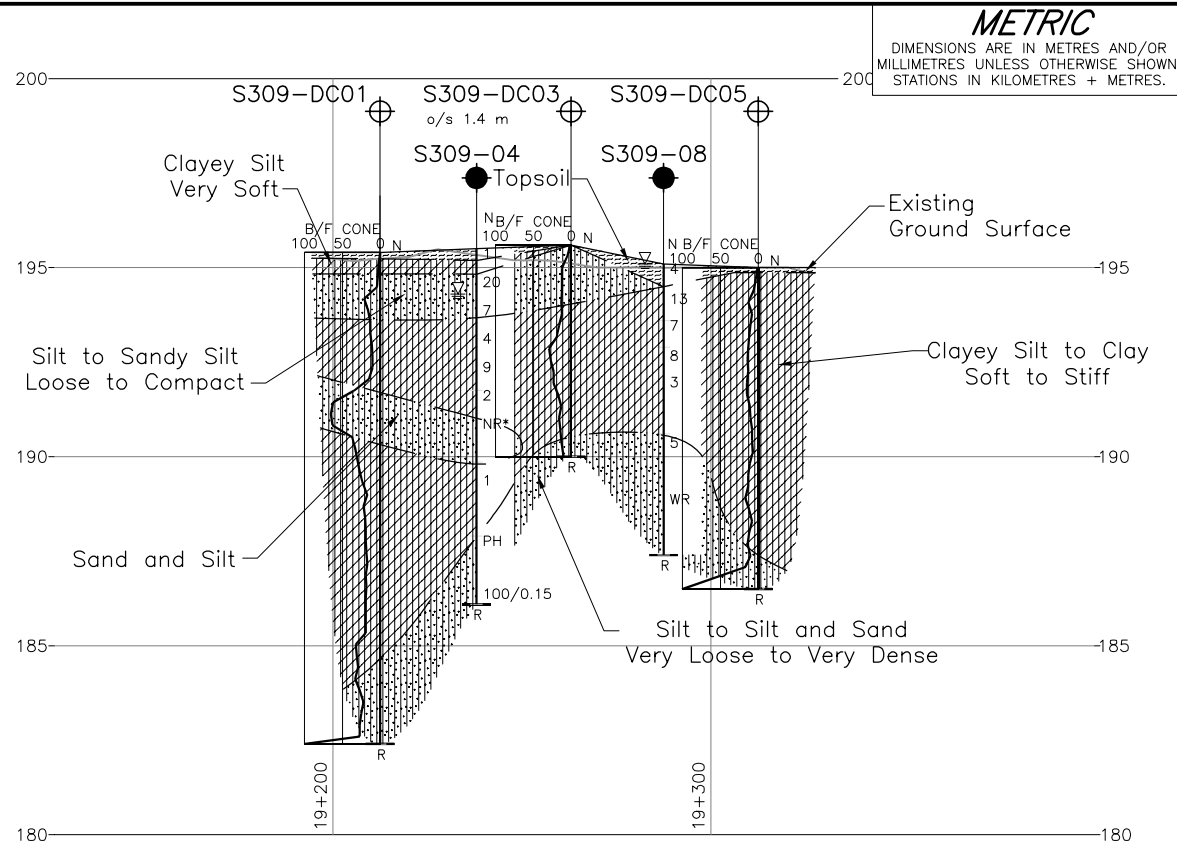


APPENDIX I

Highway 69 SBL – STA 19+200 to 19+325 (Swamp 309)



REFERENCE
Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and , Existing Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Existing and Proposed Grades obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.



PROFESSIONAL ENGINEER
J. M. A. COSTA
Jan. 2014
PROVINCE OF ONTARIO

PROFESSIONAL ENGINEER
T. ZALUCKI
100128614
Jan. 2014
PROVINCE OF ONTARIO

CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 19+200 TO 19+325 (SBL)

BOREHOLE LOCATIONS AND SOIL STRATA

Gold Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA

KEY PLAN
SCALE 1:50,000
5 0 5 10km

LEGEND

- Borehole - Current Investigation
- ⊕ Dynamic Cone Penetration Test
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ≡ WL upon completion of drilling
- R Refusal

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S309-01 | 195.5 | 5081406.4 | 223172.9 |
| S309-02 | 195.8 | 5081416.1 | 223189.0 |
| S309-03 | 195.5 | 5081431.0 | 223177.3 |
| S309-04 | 195.5 | 5081446.7 | 223163.9 |
| S309-05 | 195.5 | 5081455.6 | 223181.8 |
| S309-06 | 195.4 | 5081465.5 | 223199.9 |
| S309-07 | 195.3 | 5081480.1 | 223186.6 |
| S309-08 | 195.1 | 5081495.6 | 223172.0 |
| S309-09 | 195.2 | 5081504.7 | 223191.1 |
| S309-10 | 195.1 | 5081514.1 | 223209.0 |
| S309-11 | 195.0 | 5081529.3 | 223195.7 |
| S309-DC01 | 195.4 | 5081421.7 | 223158.8 |
| S309-DC02 | 195.5 | 5081441.2 | 223193.9 |
| S309-DC03 | 195.6 | 5081471.7 | 223166.5 |
| S309-DC04 | 195.3 | 5081489.6 | 223204.4 |
| S309-DC05 | 195.0 | 5081520.2 | 223176.5 |

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

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

| NO. | DATE | BY | REVISION |
|---------------------|----------|--------------------------------|----------|
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 DIST. | |
| SUBM'D. AV | CHKD. | DATE: May 2013 | SITE: |
| DRAWN: JFC | CHKD. TZ | APPD. JPD/JMAC | DWG. I1 |

SHEET

| PROJECT | | RECORD OF BOREHOLE | | No S309-01 | | SHEET 1 OF 2 | | METRIC | | | | | |
|--|---|--------------------|---------|--|------------|----------------------------|--------------------|---|--|---|--|---|--|
| W.P. 5404-05-01 | | LOCATION | | N 5081406.4 ; E 223172.9 | | ORIGINATED BY | | MA | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE | | 203 mm O.D. Continuous Flight Hollow Stem Augers | | COMPILED BY | | GL/AV | | | | | |
| DATUM Geodetic | | DATE | | February 11, 2013 | | CHECKED BY | | TZ | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | |
| 195.5 | GROUND SURFACE | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 4 | | | | | | | | |
| 194.9 | CLAYEY SILT, trace organics, containing rootlets, silt seams and oxidation staining | | 1B | SS | | | | | | | | | |
| 0.6 | Soft Brown Moist | | 2 | SS | 22 | | | | | | | | |
| | Sandy SILT, trace clay Loose to compact Brown Wet | | 3A | SS | 7 | | | | | | | | |
| 193.6 | CLAYEY SILT, trace to some sand, trace gravel, containing silt seams | | 3B | SS | | | | | | | | | |
| 1.9 | Very soft to firm Brown becoming grey below a depth of 2.3 m Wet | | 4 | SS | 5 | | | | | | | | |
| | | | 5A | SS | 2 | | | | | | | | |
| 192.0 | SILT, trace sand, trace clay Grey Wet | | 5B | SS | | | | | | | | | |
| 3.5 | | | 6A | SS | 9 | | | | | | | | |
| 191.5 | SILTY CLAY to CLAY Firm Grey Wet | | 6B | SS | | | | | | | | | |
| 4.0 | | | 7 | SS | WH | | | | | | | | |
| | | | 8 | SS | 4 | | | | | | | | |
| | | | 9 | SS | WH | | | | | | | | |
| | | | 10 | SS | WH | | | | | | | | |
| 185.9 | SILT and SAND, trace clay Compact Grey Wet | | | | | | | | | | | | |
| 9.6 | Cobbles encountered at a depth of 9.6 m | | 11 | SS | 14 | | | | | | | | |
| | | | 12 | SS | 100/0.15 | | | | | | | | |
| 183.5 | SAND and GRAVEL, some silt, some clay Very dense Grey Wet | | | | | | | | | | | | |
| 12.3 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 0.6 m below ground surface (Elev. 194.9 m) upon completion of drilling. | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14



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

GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF BOREHOLE | | No S309-02 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | | |
|---------------|--|--------------------------|---------|---------------|------------|--|-----------------|--|---|--|--|-------------|-------------------|--|---------------------------------------|-------------------|--|--|-------------|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | | | | | | | | | | | | |
| DATE | | DATE | | CHECKED BY | | COMPILED BY | | GL/AV | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5081416.1 ; E 223189.0 | | MA | | 99 | | 203 mm O.D. Continuous Flight Hollow Stem Augers | | | | | | | | | | | | | |
| Geodetic | | February 13, 2013 | | TZ | | GL/AV | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | γ | | | GR SA SI CL | | |
| 195.8 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | | | | | 20 40 60 | | | kN/m ³ | | | | | |
| 0.0 | TOPSOIL | | 1A | | 6 | | | | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace sand, oxidation staining | | 1B | SS | | | | | | | | | | | | | | | | | |
| 195.1 | Firm | | | | | | | | | | | | | | | | | | | | |
| 0.7 | Grey Moist | | 2 | SS | 15 | | 195 | | | | | | o | | | | | | 0 38 60 2 | | |
| | SILT and SAND, trace clay, containing silt layers to a depth of 1.4 m | | | | | | | | | | | | | | | | | | | | |
| | Compact | | 3 | SS | 10 | | 194 | | | | | | | | | | | | | | |
| | Brown becoming grey below a depth of 2.3 m | | | | | | | | | | | | | | | | | | | | |
| | Wet | | 4 | SS | 100/0.15 | | | | | | | | o | | | | | | | | |
| 193.3 | END OF BOREHOLE SPOON AND AUGER REFUSAL | | | | | | | | | | | | | | | | | | | | |
| 2.5 | NOTE: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 194.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S309-03 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5081431.0 ;E 223177.3</u> | | ORIGINATED BY <u>MA</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>203 mm O.D. Continuous Flight Hollow Stem Augers</u> | | COMPILED BY <u>CC/AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 12, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

[illegible]

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

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

| PROJECT | | RECORD OF BOREHOLE | | No S309-04 | | SHEET 1 OF 1 | | METRIC | | | | | | | |
|--------------|--|--------------------------|--|---------------|--|--------------|--|--|--|-------------|--|-------------------|--|------------|--|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | COMPILED BY | | DATE | | CHECKED BY | |
| 09-1111-6014 | | N 5081446.7 ; E 223163.9 | | MA | | HWY 69 | | 203 mm O.D. Continuous Flight Hollow Stem Augers | | CC/AV | | February 13, 2013 | | TZ | |
| Geodetic | | | | | | | | | | | | | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|------------|-------------------------|-----------------|--|----|----|-----|----|---|----|--|--|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | |
| 195.5 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | | |
| 195.2 | | | 1 | SS | 1 | | | | | | | | | | | | |
| 194.8 | CLAYEY SILT, containing silt seams, oxidation staining Very soft Brown Moist | | 2 | SS | 20 | | | | | | | | | | | | |
| 0.7 | | | | | | | | | | | | | | | | | |
| 193.7 | SILT to Sandy SILT, trace sand, containing clayey silt layers, oxidation staining Loose to compact Brown to grey Wet | | 3A | | | | | | | | | | | | | | |
| 1.8 | | | 3B | SS | 7 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 193.7 | CLAYEY SILT, trace sand, containing sandy silt seams at a depth of 3.6 m Stiff Brown Wet | | 4 | SS | 4 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 5 | SS | 9 | | | | | | | | | | | | |
| 191.7 | SILTY CLAY, trace sand Firm to stiff Grey Wet | | 6 | SS | 2 | | | | | | | | | | | | |
| 3.8 | | | | | | | | | | | | | | | | | |
| | | | 7A | | | | | | | | | | | | | | |
| 190.6 | SILT and SAND Grey Wet | | 7B | SS | NR* | | | | | | | | | | | | |
| 4.9 | | | | | | | | | | | | | | | | | |
| 189.9 | CLAY Firm Grey Wet | | 8 | SS | 1 | | | | | | | | | | | | |
| 5.6 | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 187.9 | SILT and SAND, trace clay Very dense Grey Wet | | 9 | TO | PH | | | | | | | | | | | | |
| 7.6 | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 186.1 | | | 10 | SS | 100/0.15 | | | | | | | | | | | | |
| 9.4 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | |
| | NOTES: 1. Water level in open borehole at a depth of 1.2 m below ground surface (Elev. 194.3 m) upon completion of drilling. 2. An additional borehole was drilled about 1.2 m north-west of Borehole S309-04 to carry out in situ field vanes between depths of 1.2 m and 4.6 m (Elev. 194.3 m and 190.9 m). * NR: Not Recorded | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S309-06 | | SHEET 1 OF 2 | | METRIC | | | | | | |
|---------------|--|--------------------------|---------|---------------|------------|-------------------------|-----------------|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. | | LOCATION | | ORIGINATED BY | | DIST | | BOREHOLE TYPE | | | | | | |
| 5404-05-01 | | N 5081465.5 ; E 223199.9 | | MA | | HWY 69 | | 203 mm O.D. Continuous Flight Hollow Stem Augers | | | | | | |
| DATUM | | DATE | | CHECKED BY | | COMPILED BY | | GL/AV | | | | | | |
| Geodetic | | February 14, 2013 | | TZ | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 195.4 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | |
| 0.2 | SILT, trace sand, containing rootlets and clayey silt seams | | 1 | SS | 4 | | | | | | | | | |
| 194.7 | Loose Brown Moist | | 2 | SS | 12 | | | | | | | | | |
| 0.7 | CLAYEY SILT, trace to some sand, containing silty sand seams | | 3 | SS | 8 | | | | | | | | | |
| | Firm to stiff Brown Moist | | | | | | | | | | | | | |
| 193.2 | SILTY CLAY, trace sand | | 4 | SS | 4 | | | | | | | | | |
| 2.2 | Firm Grey Wet | | 5 | SS | 2 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 190.6 | Silty SAND | | 6A | SS | 12 | | | | | | | | | |
| | Compact Grey Wet | | 6B | | | | | | | | | | | |
| 5.1 | CLAY, trace sand | | 7 | TO | PH | | | | | | | | | |
| | Soft to firm Grey Wet | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 186.4 | SILT, trace to some sand, trace clay | | 9 | SS | 5 | | | | | | | | | |
| 9.0 | Loose Grey Wet | | | | | | | | | | | | | |
| 185.3 | SAND, trace silt | | 10 | SS | WR | | | | | | | | | |
| 10.1 | Very loose Grey Wet | | | | | | | | | | | | | |
| 183.7 | Sandy SILT, trace clay | | 11 | SS | 6 | | | | | | | | | |
| 11.7 | Loose Grey Wet | | | | | | | | | | | | | |
| 181.6 | END OF BOREHOLE | | 12 | SS | 100/0.15 | | | | | | | | | |
| 13.8 | AUGER REFUSAL | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14



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

GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

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

| | | | | | | | |
|--------------------------------------|--|---|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S309-08 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5081495.6 ; E 223172.0</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>203 mm O.D. Continuous Flight Hollow Stem Augers</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 20, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|------------|----------------------------|-------------------------|---|--|--|---|--|--|--------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | WATER CONTENT (%) | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | |
| 195.1 | GROUND SURFACE | | | | | | 20 40 60 80 100 | | | | W _p W W _L | | | | |
| 0.0 | TOPSOIL | | 1 | SS | 4 | | | | | | | | | | |
| 194.5 | CLAYEY SILT, trace to some sand, containing silt seams below a depth of 1.5 m Stiff Brown to grey Wet | | 2 | SS | 13 | | | | | | | | | | |
| 0.6 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 192.9 | SILTY CLAY, containing silt seams Soft to stiff Brown to grey Wet | | 3 | SS | 7 | | | | | | | | | | |
| 2.2 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 4 | SS | 8 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 5 | SS | 3 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 190.5 | SILT, trace to some sand, and clay Very loose to loose Grey Wet | | 6 | SS | 5 | | | | | | | | | | |
| 4.6 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 7 | SS | WR | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 187.4 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | |
| 7.7 | NOTES: 1. Water level in open borehole at ground surface (Elev. 195.1 m) upon completion of drilling. 2. An additional borehole was drilled about 1.0 m north of Borehole S309-08 to carry out in situ field vanes between depths of 1.2 m and 4.6 m (Elev. 193.9 m and 190.5 m). | | | | | | | | | | | | | | |

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

| PROJECT | | RECORD OF BOREHOLE | | No S309-09 | | SHEET 1 OF 1 | | METRIC | | | | | |
|---------------|---|--|---------|---------------|------------|--|-----------------|-----------------|---------------------------------------|-------------------------------|--------------------------------|------------------|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | | | | | | | | |
| DIST | | BOREHOLE TYPE | | COMPILED BY | | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | | | | | | | | |
| 09-1111-6014 | | N 5081504.7 ; E 223191.1 | | MR | | | | | | | | | |
| 5404-05-01 | | 203 mm O.D. Continuous Flight Hollow Stem Augers | | AV | | | | | | | | | |
| Geodetic | | February 20, 2013 | | TZ | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | 20 40 60 80 100 | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | GR SA SI CL |
| 195.2 0.0 | GROUND SURFACE TOPSOIL | | 1 | SS | 1 | | 195 | | | | | | |
| 194.5 0.7 | SILT, trace to some sand, oxidation staining Compact Brown Moist | | 2 | SS | 12 | | 194 | | | | | | |
| 193.7 1.5 | CLAYEY SILT, containing silt seams, oxidation staining Stiff Brown Moist | | 3 | SS | 10 | | 193 | | | | | | |
| 193.0 2.2 | SILTY CLAY, containing silt seams to a depth of 2.9 m Soft to firm Brown to grey Wet | | 4 | SS | 7 | | 192 | | | | | | |
| | | | 5 | SS | 5 | | 191 | | | | | | |
| | | | 6 | SS | 2 | | 190 | | | | | | |
| 190.3 4.9 | Sandy SILT, trace to some clay Loose Grey Wet | | 7 | TO | PH | | 189 | | | | | | |
| | | | 8 | SS | 7 | | 188 | | | | | | |
| | | | 9 | SS | 8 | | 187 | | | | | | |
| 186.7 8.5 | END OF BOREHOLE AUGER REFUSAL NOTE: 1. Water level in open borehole at ground surface (Elev. 195.2 m) upon completion of drilling. | | | | | | | | | | | | |

| PROJECT | | 09-1111-6014 | | RECORD OF BOREHOLE No S309-10 | | SHEET 1 OF 1 | | METRIC | | | | | |
|---|--|--------------|---------|--------------------------------------|------------|--|-----------------|---|----------|---|--|---|--|
| W.P. | | 5404-05-01 | | LOCATION | | N 5081514.1 ; E 223209.0 | | ORIGINATED BY | | MR | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 203 mm O.D. Continuous Flight Hollow Stem Augers | | COMPILED BY | | CC/AV | | | |
| DATUM | | Geodetic | | DATE | | February 21, 2013 | | CHECKED BY | | TZ | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | |
| 195.1 | GROUND SURFACE | | | | | | | 20 40 60 80 100 | 20 40 60 | | | | |
| 0.0 | TOPSOIL | | 1 | SS | 3 | | | | | | | | |
| 194.4 | | | 2 | SS | 9 | | | | | | | | |
| 0.7 | SILT, trace to some sand, oxidation staining Loose Brown to grey Wet | | | | | | | | | | | | |
| 193.6 | | | 3 | SS | 7 | | | | | | | | |
| 1.5 | SILTY CLAY, trace sand, containing silt seams to a depth of 2.2 m Firm to stiff Brown to grey Wet | | | | | | | | | | | | |
| | | | 4 | SS | 8 | | | | | | | | |
| | | | 5 | SS | 8 | | | | | | | | |
| | | | 6 | SS | 2 | | | | | | | | |
| | | | | | | | | | | | | | |
| 189.8 | | | 7 | SS | 11 | | | | | | | | |
| 5.3 | CLAYEY SILT, trace to some sand Stiff Grey Wet | | | | | | | | | | | | |
| 189.1 | | | 8 | SS | 5 | | | | | | | | |
| 6.0 | Sandy SILT, trace to some clay Loose Grey Wet | | | | | | | | | | | | |
| 187.9 | | | 9 | SS | 2 | | | | | | | | |
| 7.2 | SILTY CLAY, varved Firm Grey Wet | | | | | | | | | | | | |
| 186.0 | | | 10 | SS | 2 | | | | | | | | |
| 9.1 | SILT, some sand, trace to some clay Very loose to dense Grey Wet | | | | | | | | | | | | |
| | | | 11 | SS | 49 | | | | | | | | |
| 183.7 | | | | | | | | | | | | | |
| 11.4 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 1.3 m below ground surface (Elev. 193.8 m) upon completion of drilling. | | | | | | | | | | | | | |

| | | | | | | | |
|----------------------|--|--|--|------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S309-11 | | SHEET 1 OF 2 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5081529.3 ; E 223195.7 | | ORIGINATED BY ID | | | |
| DIST HWY 69 | | BOREHOLE TYPE 203 mm O.D. Continuous Flight Hollow Stem Augers | | COMPILED BY AV | | | |
| DATUM Geodetic | | DATE February 21, 2013 | | CHECKED BY TZ | | | |

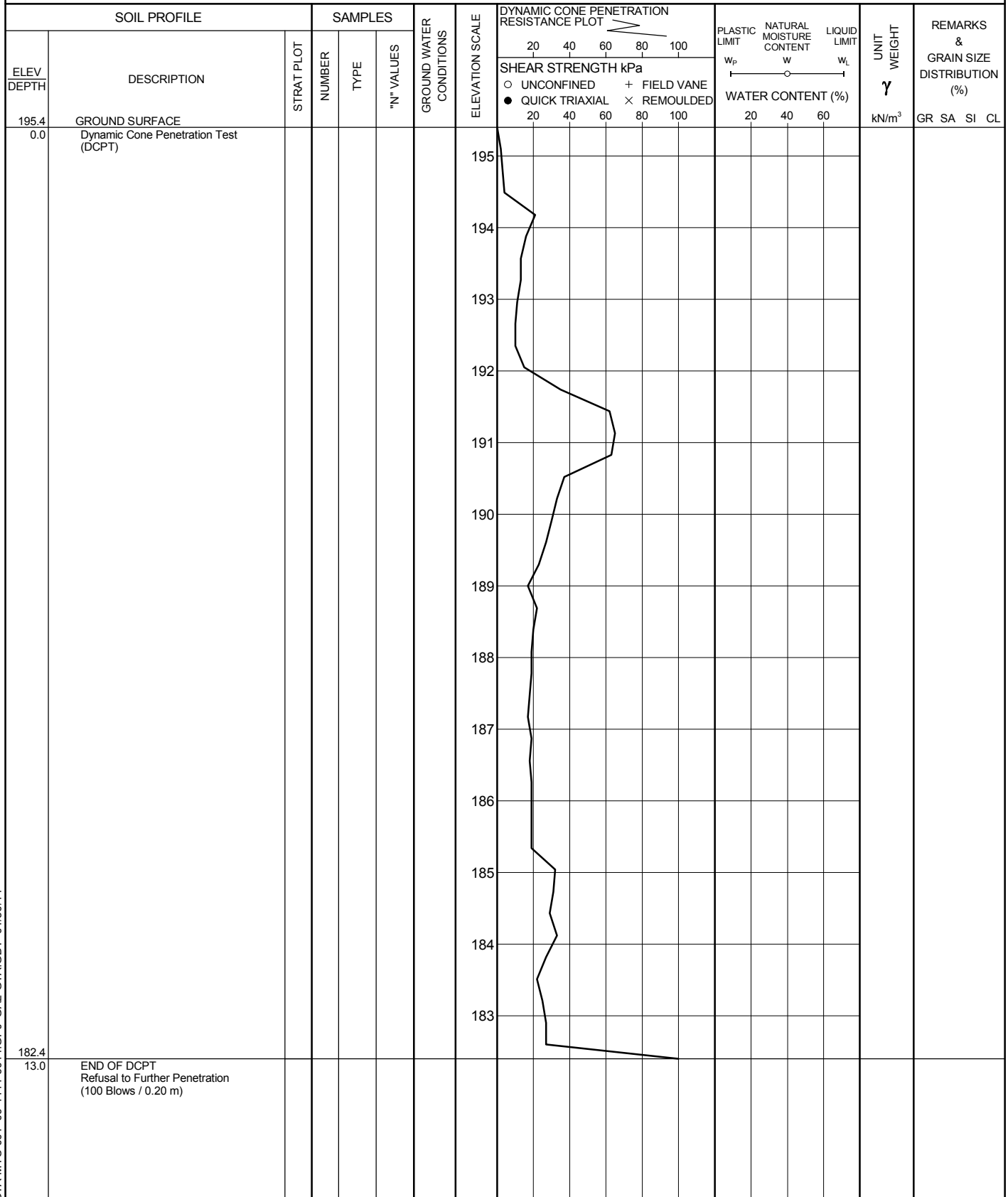
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
|---------------|---|------------|---------|------|------------|---|-----------------|---|----------|--|--|--|---|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | | |
| | | | | | | | | 20 40 60 80 100 | 20 40 60 | | | | | | |
| | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | |
| 195.0 | GROUND SURFACE | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 3 | | | | | | | | | | |
| 0.2 | SILT, trace sand and clay, trace organics, oxidation staining Very loose to loose Brown Wet | | 1B | | | | | | | | | | | | |
| | | | 2 | SS | 8 | | | | | | | | | | |
| 193.5 | | | | | | | | | | | | | | | |
| 1.5 | CLAYEY SILT, trace sand, containing silt seams between depths of 1.5 m and 2.1 m Stiff Brown to grey Wet | | 3 | SS | 7 | | | | | | | | | | |
| | | | 4 | SS | 6 | | | | | | | | | | |
| | | | 5 | SS | 6 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 190.9 | | | | | | | | | | | | | | | |
| 4.1 | SILTY CLAY Soft to firm Grey Wet | | 6 | SS | 2 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 7 | SS | 4 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 8 | SS | WH | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 186.2 | | | | | | | | | | | | | | | |
| 8.8 | SILT and SAND, trace clay Very loose Grey Wet | | 9 | SS | WH | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | 10 | SS | 1 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 183.4 | | | | | | | | | | | | | | | |
| 11.6 | | | | | | | | | | | | | | | |

Continued Next Page

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

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S309-11 | | | | SHEET 2 OF 2 | | METRIC | | | | | | | | | | |
|----------------------|---|--|--------|------|----------------------------|------------------|--|--------------------|--|--|--|--|-------------------|--|---|--|--|--|
| W.P. 5404-05-01 | | LOCATION N 5081529.3 ; E 223195.7 | | | | ORIGINATED BY ID | | | | | | | | | | | | |
| DIST HWY 69 | | BOREHOLE TYPE 203 mm O.D. Continuous Flight Hollow Stem Augers | | | | COMPILED BY AV | | | | | | | | | | | | |
| DATUM Geodetic | | DATE February 21, 2013 | | | | CHECKED BY TZ | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | <div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED </div> | | | | | <div style="display: flex; justify-content: space-between;"> W_p W W_L </div> | | | | | | |
| | END OF BOREHOLE SPOON AND AUGER REFUSAL NOTES: 1. Water level in open borehole at a depth of 0.1 m below ground surface (Elev. 194.9 m) upon completion of drilling. 2. An additional borehole was drilled about 1.2 m south-east of Borehole S309-11 to carry out in situ field vanes between depths of 1.2 m and 4.6 m (Elev. 193.8 m and 190.4 m). 3. An additional borehole was drilled about 1.2 m south-east of Borehole S309-11 to obtain a Shelby tube sample at a depth of 3.0 m (Elev. 192.0 m). | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S309-DC01 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5081421.7 ; E 223158.8</u> | | ORIGINATED BY <u>MA</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 12, 2013</u> | | CHECKED BY <u>TZ</u> | | | |



GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

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

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S309-DC02 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5081441.2 ; E 223193.9</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 13, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | |
|---------------|--------------------------------------|------------|---------|------|------------|----------------------------|--------------------------------|---|-------------------|----|---|-----|----------------|--------------------------------------|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | W _p | W | W _L | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | WATER CONTENT (%) | | | | | | | | | |
| | | | | | | | ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | |
| 195.5 | GROUND SURFACE | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | </ | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14



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

GTGTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S309-DC04 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5081489.6 ; E 223204.4</u> | | ORIGINATED BY <u>MR</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Portable Equipment, Dynamic Cone Penetration Test</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 19 and 20, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--------------------------------------|------------|---------|------|------------|-----------------------------------|-----------------|---|--|--|--|-------------------|----------------|--------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | w _p | w | w _L | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE | | | | WATER CONTENT (%) | | | |
| | | | | | | ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | |
| 195.3 | GROUND SURFACE | | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14



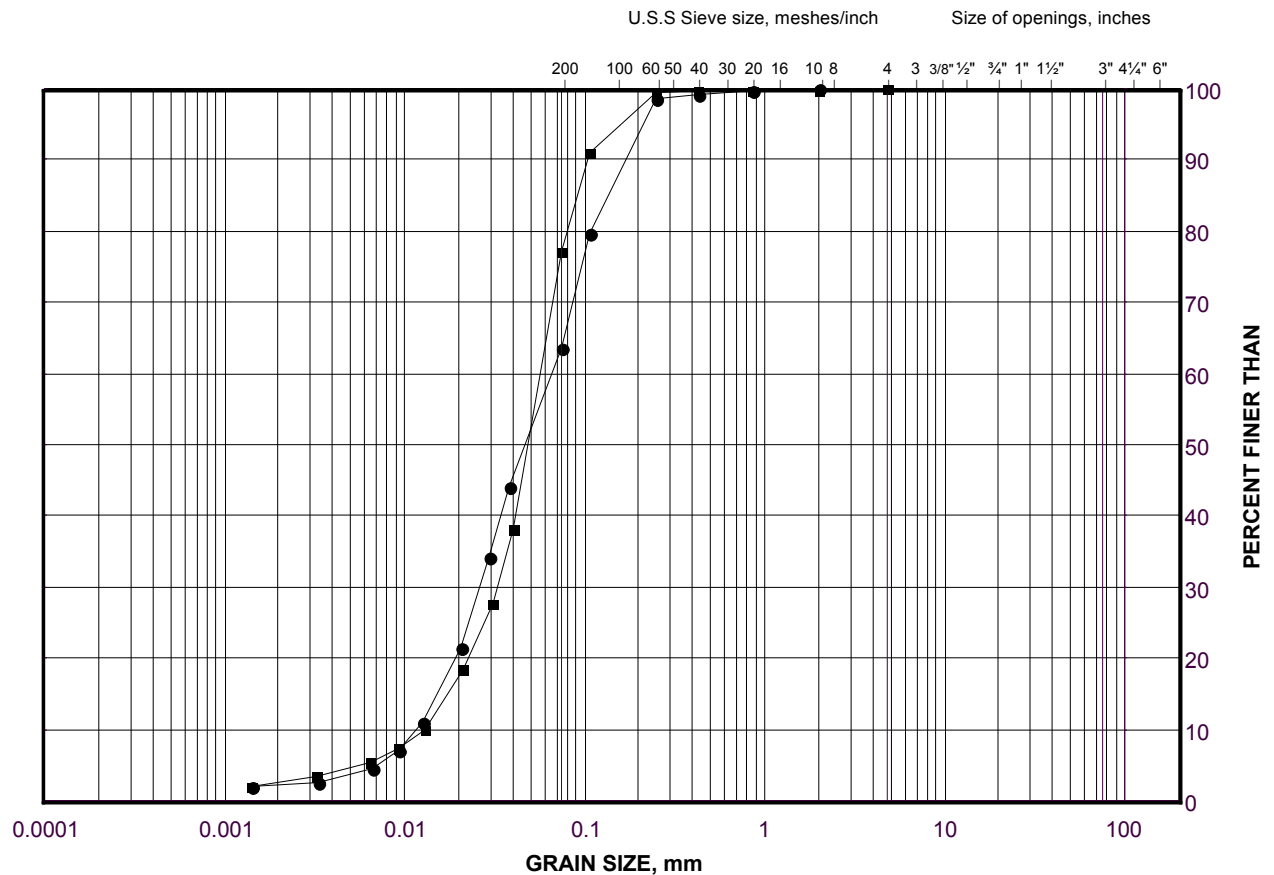
+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/30/14

GRAIN SIZE DISTRIBUTION

Sandy Silt to Silt and Sand (Upper)
Highway 69 (SBL) STA 19+200 to 19+325 (Swamp 309)

FIGURE I.S309-01



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

LEGEND

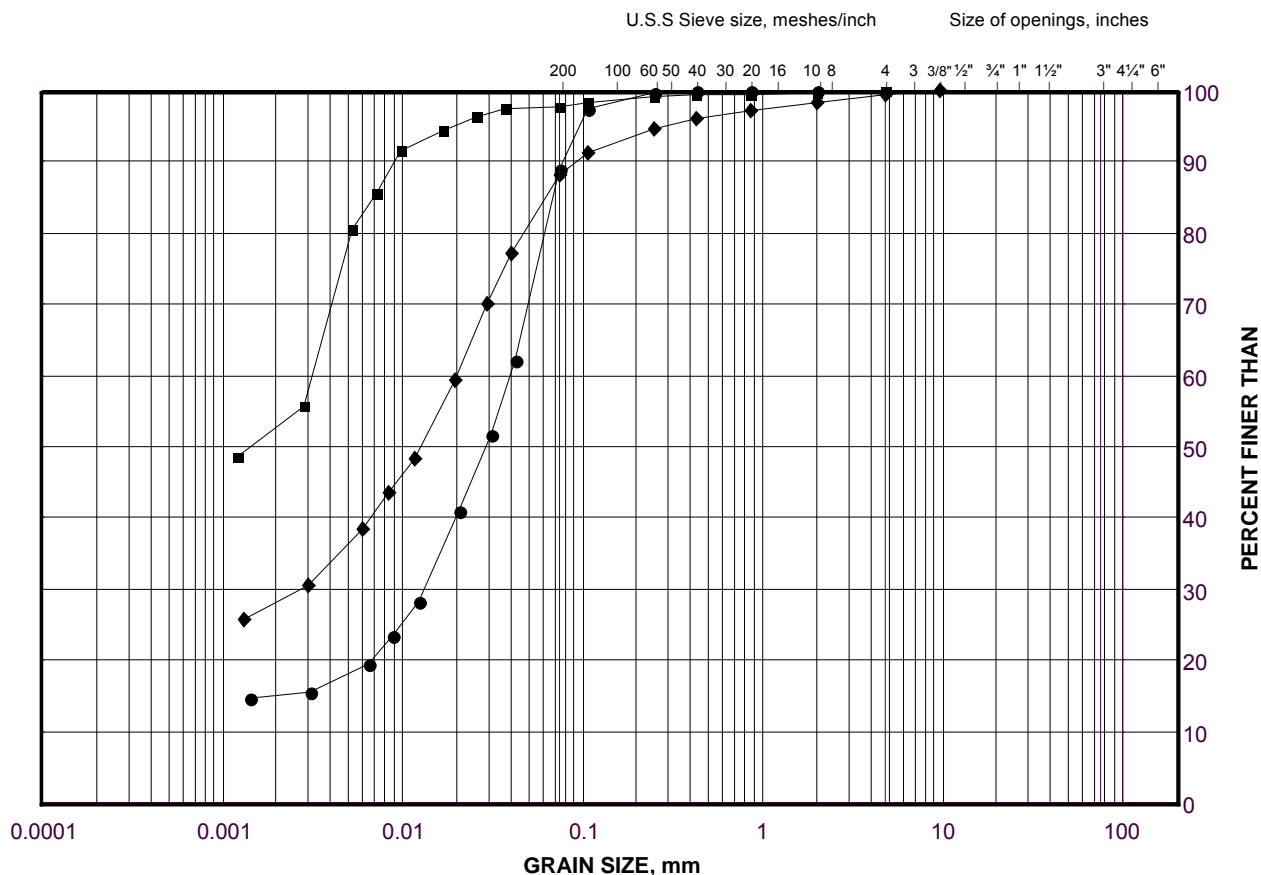
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S309-02 | 2 | 194.7 |
| ■ | S309-01 | 2 | 194.4 |

GRAIN SIZE DISTRIBUTION

Clayey Silt to Clay

Highway 69 (SBL) STA 19+200 to 19+325 (Swamp 309)

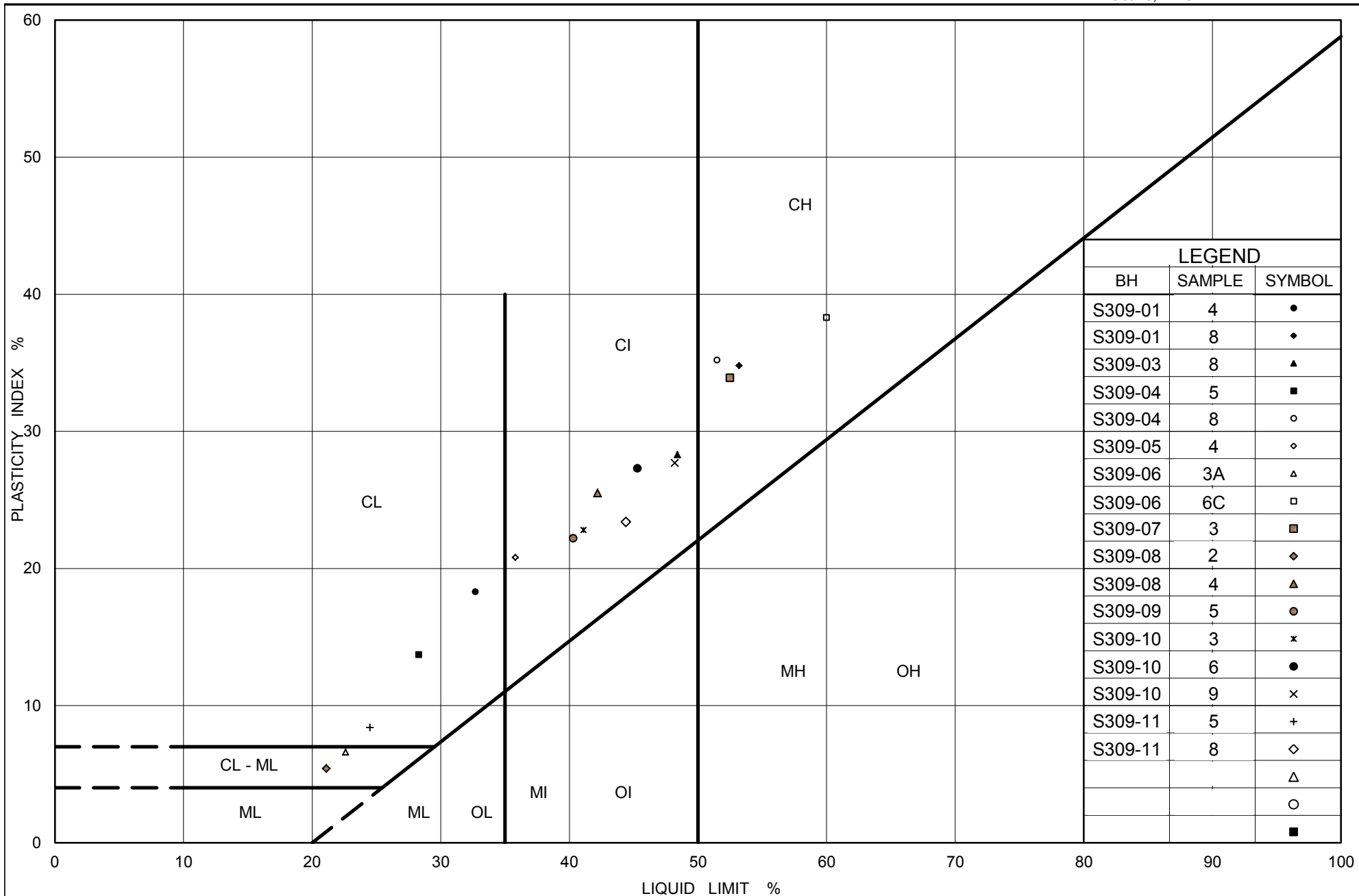
FIGURE I.S309-02



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S309-08 | 2 | 194.0 |
| ■ | S309-07 | 3 | 192.0 |
| ◆ | S309-06 | 3 | 193.7 |



Ministry of
Transportation

Ontario

PLASTICITY CHART Clayey Silt to Clay

Figure No. I.S309-03

Project No. 09-1111-6014

Checked By: TZ

CONSOLIDATION TEST SUMMARY
Highway 69 (SBL) STA 19+200 to 19+325 (Swamp 309)

FIGURE I.S309-04
Sheet 1 of 4

SAMPLE IDENTIFICATION

| | | | |
|-----------------|--------------|-----------------|---------|
| Project Number | 09-1111-6014 | Sample Number | 9 |
| Borehole Number | S309-03 | Sample Depth, m | 6.9-7.5 |

TEST CONDITIONS

| | | | |
|------------------|-----------|-------------------|----|
| Test Type | Standard | Load Duration, hr | 24 |
| Oedometer Number | 2 | | |
| Date Started | 3/19/2013 | | |
| Date Completed | 4/05/2013 | | |

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

| | | | |
|-------------------------|--------|------------------------------------|-------|
| Sample Height, cm | 2.53 | Unit Weight, kN/m ³ | 15.10 |
| Sample Diameter, cm | 6.35 | Dry Unit Weight, kN/m ³ | 9.17 |
| Area, cm ² | 31.71 | Specific Gravity, measured | 2.77 |
| Volume, cm ³ | 80.26 | Solids Height, cm | 0.854 |
| Water Content, % | 64.74 | Volume of Solids, cm ³ | 27.08 |
| Wet Mass, g | 123.59 | Volume of Voids, cm ³ | 53.17 |
| Dry Mass, g | 75.02 | Degree of Saturation, % | 91.3 |

TEST COMPUTATIONS

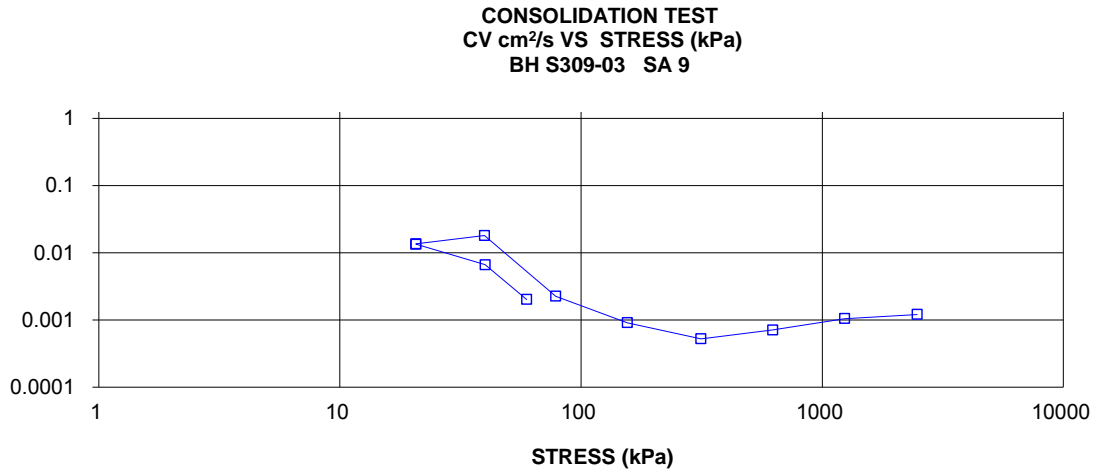
| Stress kPa | Corr. Height cm | Void Ratio | Average Height cm | t ₉₀ sec | cv. cm ² /s | mv m ² /kN | k cm/s |
|---------------|-----------------------|---------------|-------------------------|------------------------|---------------------------|--------------------------|-----------|
| 0.00 | 2.531 | 1.963 | 2.531 | | | | |
| 7.35 | 2.532 | 1.964 | 2.532 | | | | |
| 10.63 | 2.532 | 1.964 | 2.532 | | | | |
| 20.64 | 2.527 | 1.959 | 2.530 | 101 | 1.34E-02 | 1.97E-04 | 2.60E-07 |
| 40.01 | 2.507 | 1.935 | 2.517 | 202 | 6.65E-03 | 4.10E-04 | 2.67E-07 |
| 59.47 | 2.487 | 1.912 | 2.497 | 653 | 2.02E-03 | 3.98E-04 | 7.89E-08 |
| 20.64 | 2.494 | 1.920 | 2.491 | | | | |
| 6.00 | 2.506 | 1.934 | 2.500 | | | | |
| 20.64 | 2.500 | 1.927 | 2.503 | 98 | 1.36E-02 | 1.67E-04 | 2.22E-07 |
| 39.76 | 2.493 | 1.919 | 2.496 | 73 | 1.81E-02 | 1.47E-04 | 2.60E-07 |
| 78.47 | 2.466 | 1.887 | 2.479 | 577 | 2.26E-03 | 2.79E-04 | 6.17E-08 |
| 155.67 | 2.306 | 1.700 | 2.386 | 1325 | 9.11E-04 | 8.18E-04 | 7.30E-08 |
| 314.28 | 1.979 | 1.317 | 2.142 | 1852 | 5.25E-04 | 8.14E-04 | 4.19E-08 |
| 623.07 | 1.790 | 1.096 | 1.885 | 1058 | 7.12E-04 | 2.42E-04 | 1.68E-08 |
| 1240.30 | 1.643 | 0.923 | 1.716 | 595 | 1.05E-03 | 9.44E-05 | 9.71E-09 |
| 2476.48 | 1.517 | 0.776 | 1.580 | 437 | 1.21E-03 | 4.03E-05 | 4.78E-09 |
| 1240.30 | 1.523 | 0.783 | 1.520 | | | | |
| 314.28 | 1.568 | 0.835 | 1.546 | | | | |
| 78.47 | 1.622 | 0.899 | 1.595 | | | | |
| 20.64 | 1.672 | 0.958 | 1.647 | | | | |
| 5.93 | 1.707 | 0.999 | 1.690 | | | | |

Note:
k calculated using cv based on t₉₀ values.

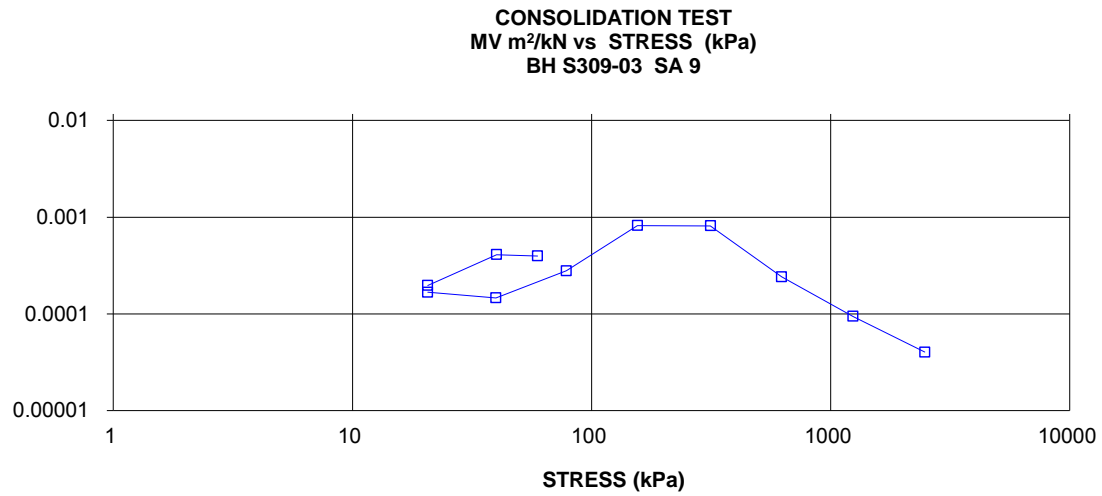
SAMPLE DIMENSIONS AND PROPERTIES - FINAL

| | | | |
|-------------------------|--------|------------------------------------|-------|
| Sample Height, cm | 1.71 | Unit Weight, kN/m ³ | 18.44 |
| Sample Diameter, cm | 6.35 | Dry Unit Weight, kN/m ³ | 13.59 |
| Area, cm ² | 31.71 | Specific Gravity, measured | 2.77 |
| Volume, cm ³ | 54.13 | Solids Height, cm | 0.854 |
| Water Content, % | 35.70 | Volume of Solids, cm ³ | 27.08 |
| Wet Mass, g | 101.80 | Volume of Voids, cm ³ | 27.05 |
| Dry Mass, g | 75.02 | | |

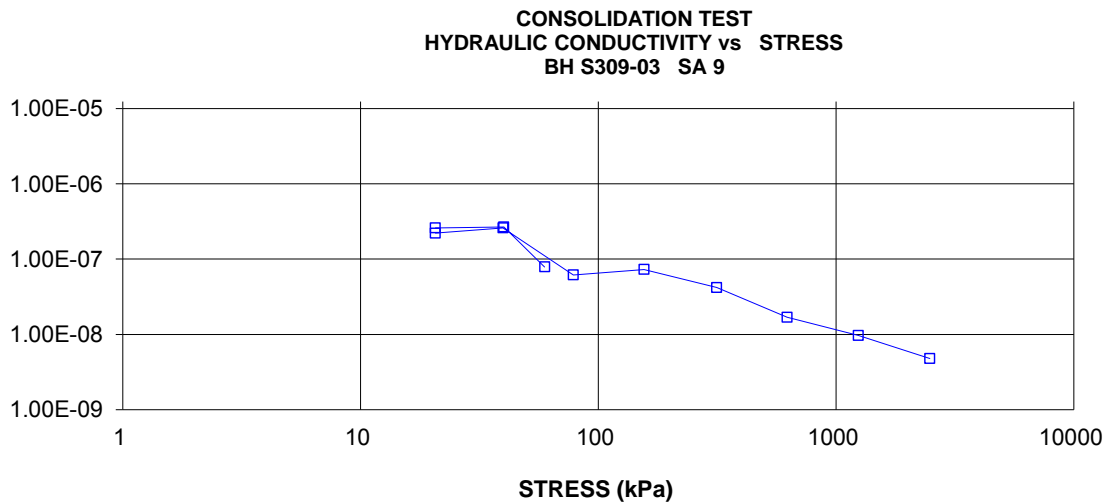
COEFFICIENT OF CONSOLIDATION,
cm²/s



VOLUME COMPRESSIBILITY, m²/kN



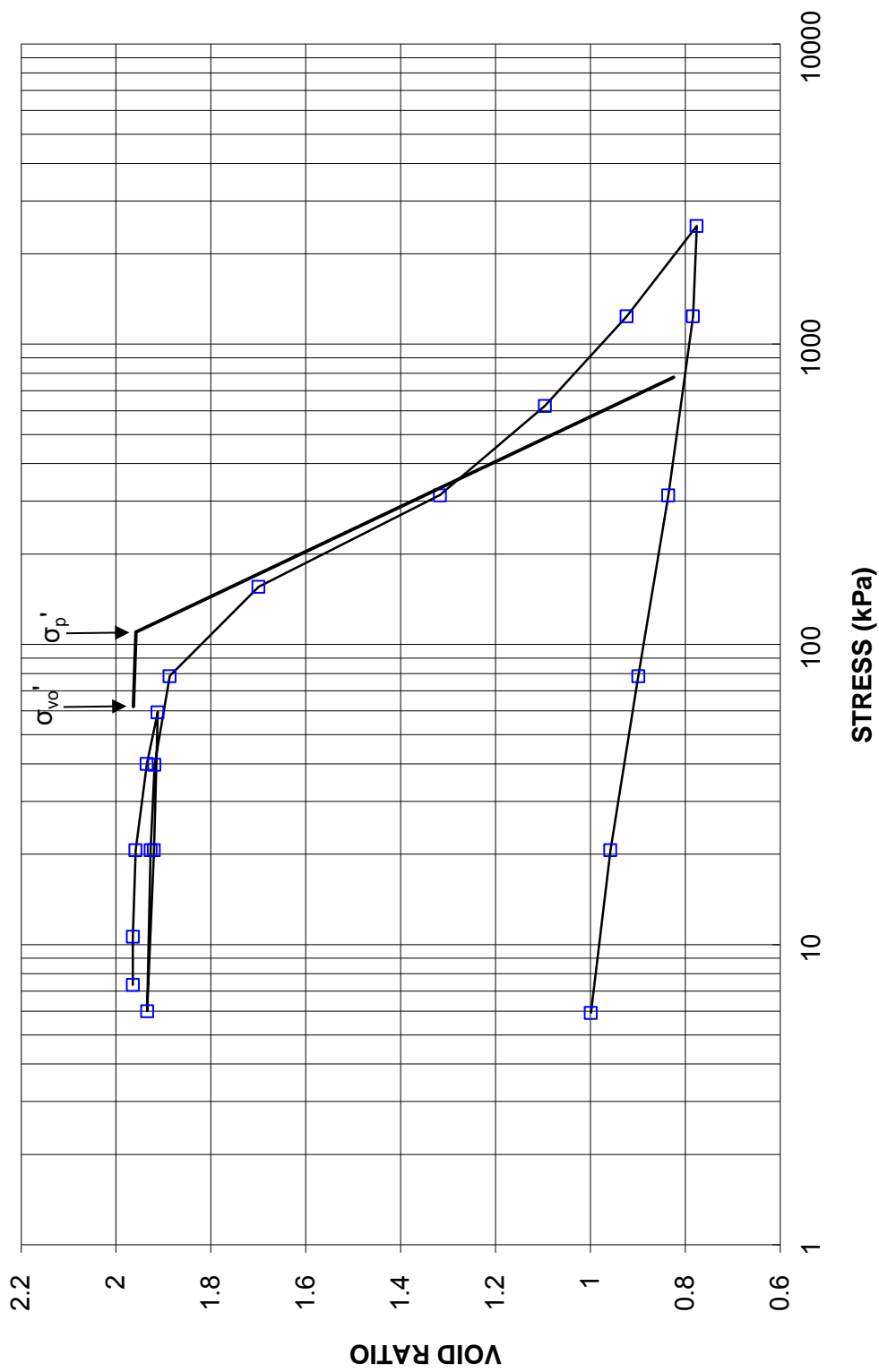
HYDRAULIC CONDUCTIVITY, cm/s



CONSOLIDATION TEST
VOID RATIO VS LOG STRESS

FIGURE I.S309-04
Sheet 3 of 4

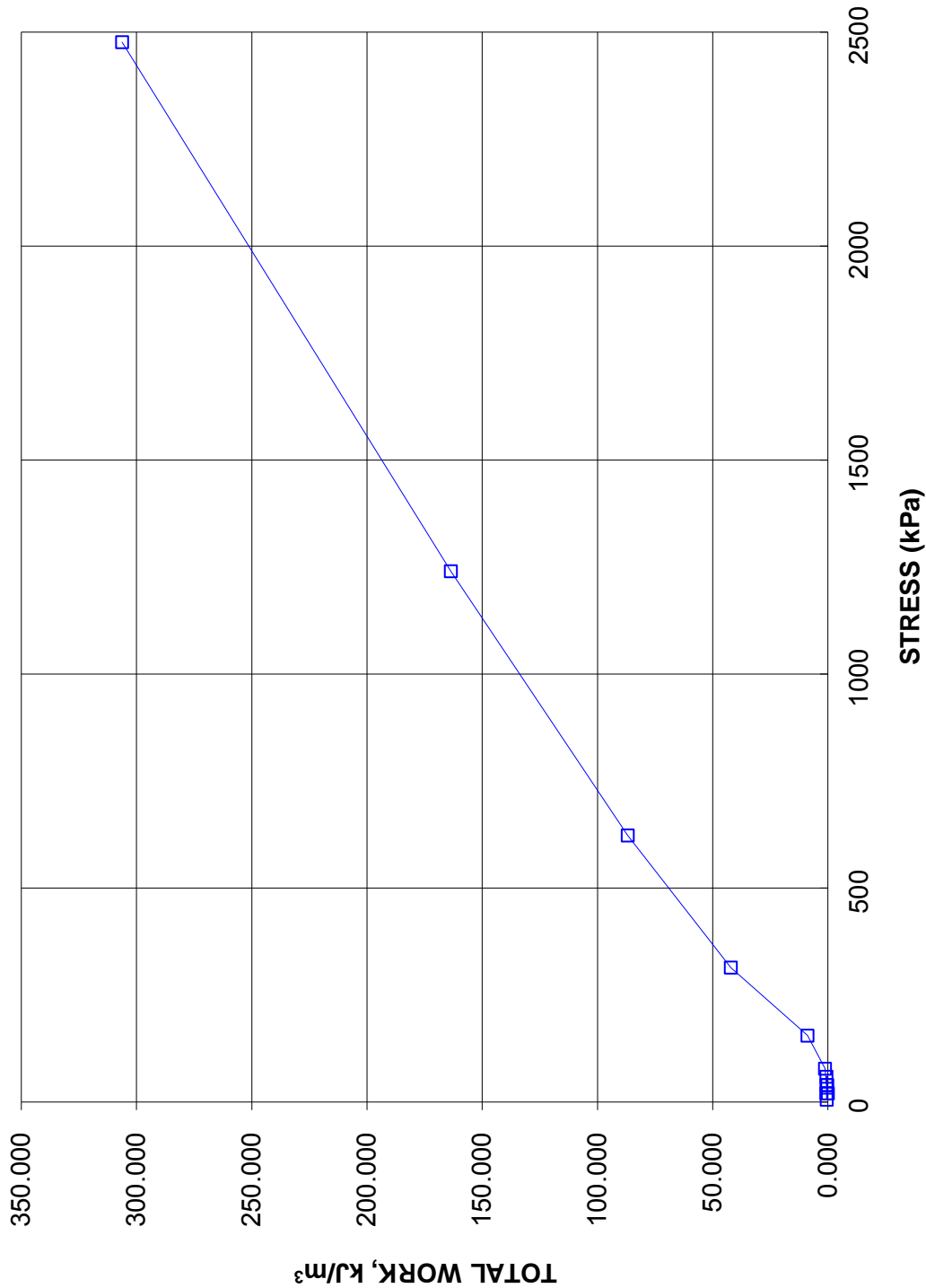
CONSOLIDATION TEST
VOID RATIO vs STRESS
BH S309-03 SA 9



CONSOLIDATION TEST
TOTAL WORK VS STRESS

FIGURE I.S309-04
Sheet 4 of 4

CONSOLIDATION TEST
TOTAL WORK, kJ/m³ vs STRESS
BH S309-03 SA 9

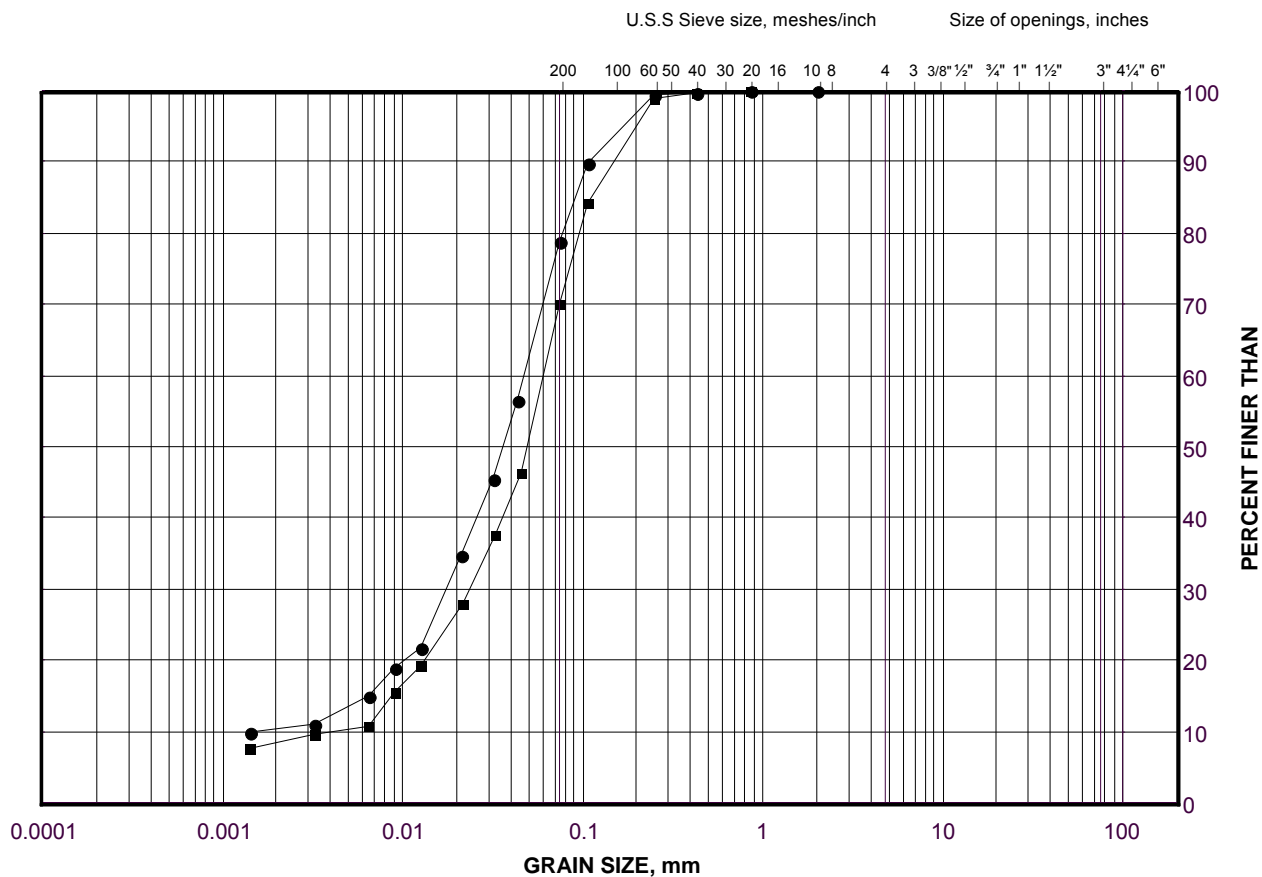


GRAIN SIZE DISTRIBUTION

Sandy Silt (Pockets)

Highway 69 (SBL) STA 19+200 to 19+325 (Swamp 309)

FIGURE I.S309-05



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S309-03 | 6 | 191.4 |
| ■ | S309-10 | 8 | 188.7 |

Project Number: 09-1111-6014

Checked By: TZ

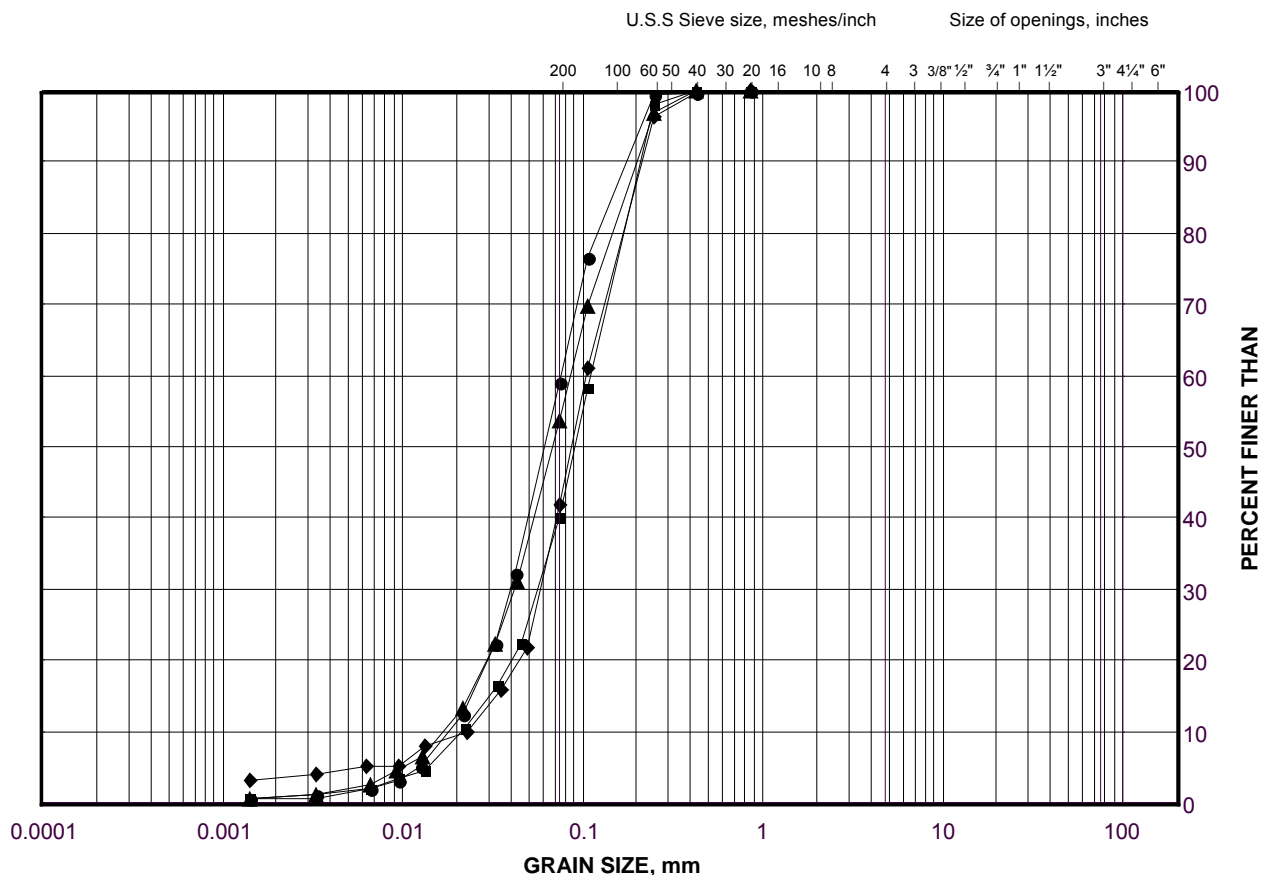
Golder Associates

Date: 26-Mar-13

GRAIN SIZE DISTRIBUTION

Silt and Sand (Lower)
Highway 69 (SBL) STA 19+200 to 19+325 (Swamp 309)

FIGURE I.S309-06A



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S309-05 | 10 | 184.7 |
| ■ | S309-01 | 11 | 184.5 |
| ◆ | S309-11 | 9 | 185.6 |
| ▲ | S309-04 | 9 | 187.6 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

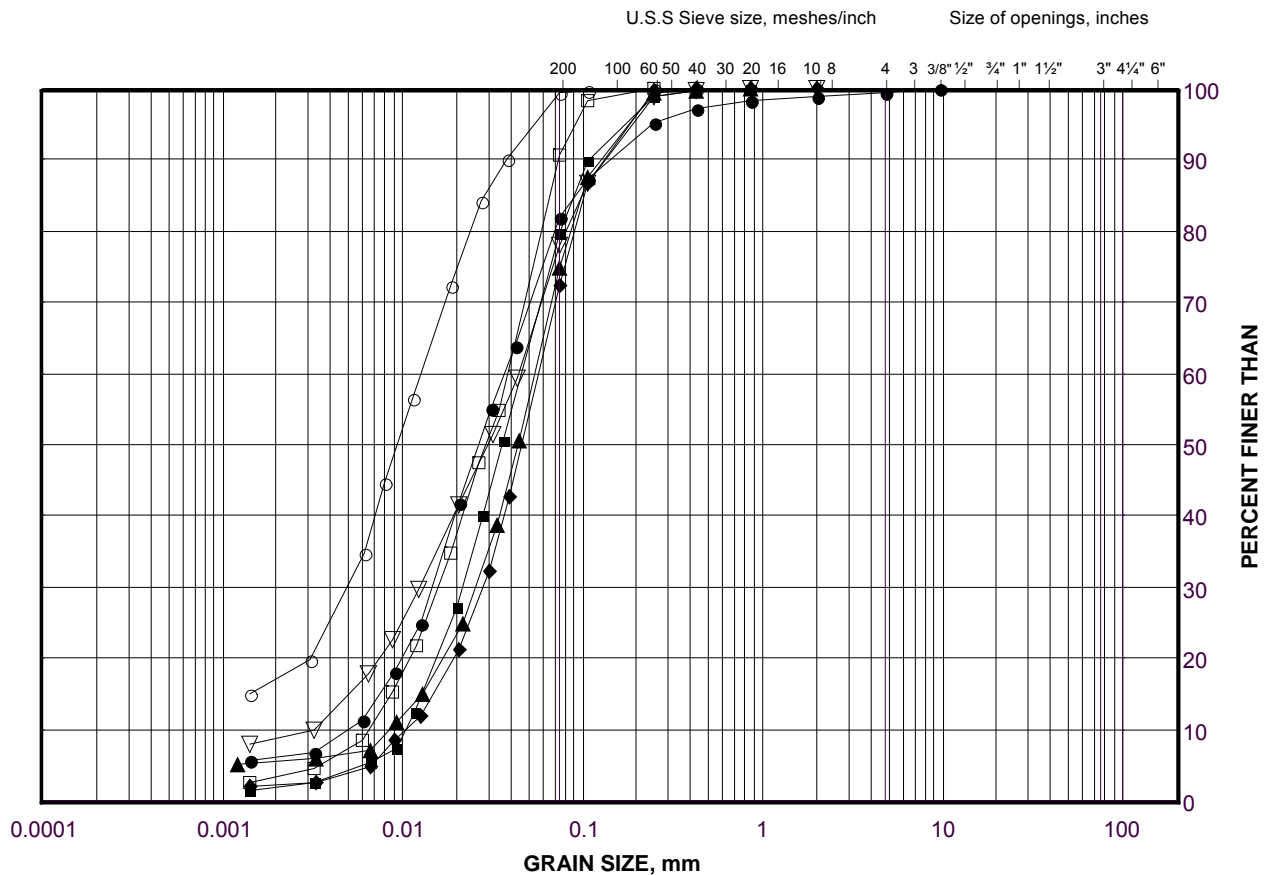
Date: 26-Mar-13

GRAIN SIZE DISTRIBUTION

Silt to Sandy Silt (Lower)

Highway 69 (SBL) STA 19+200 to 19+325 (Swamp 309)

FIGURE I.S309-06B



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

LEGEND

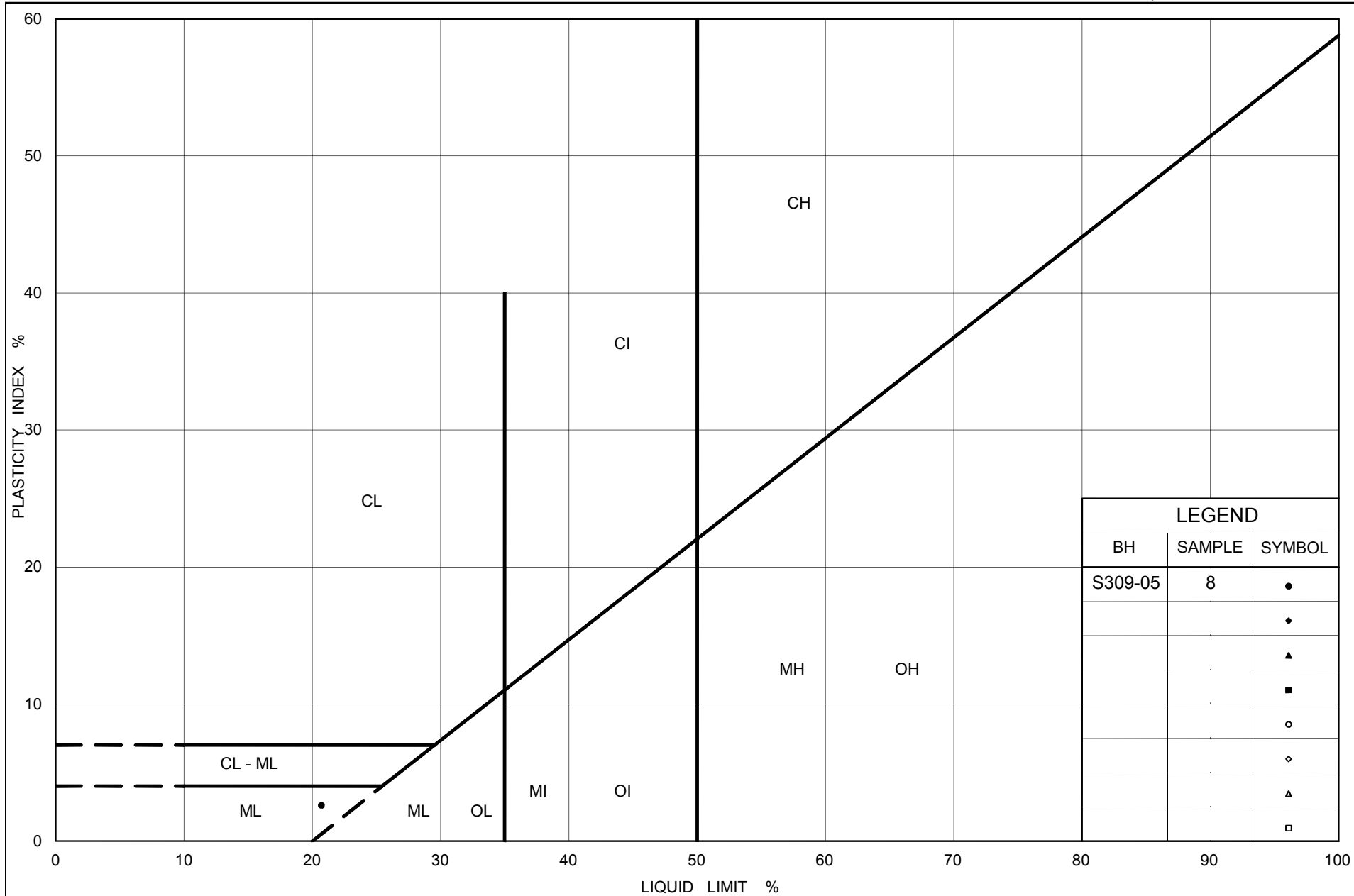
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S309-10 | 11 | 184.1 |
| ■ | S309-06 | 11 | 183.1 |
| ◆ | S309-03 | 12 | 184.6 |
| ▲ | S309-07 | 6 | 187.4 |
| ▽ | S309-09 | 8 | 188.8 |
| ○ | S309-05 | 8 | 187.7 |
| □ | S309-06 | 9 | 186.1 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 26-Mar-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Silt (Lower)

Highway 69 (SBL) STA 19+200 to 19+325 (Swamp 309)

Figure No. I.S309-07

Project No. 09-1111-6014

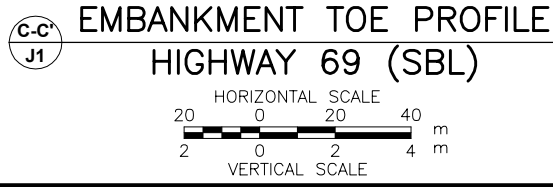
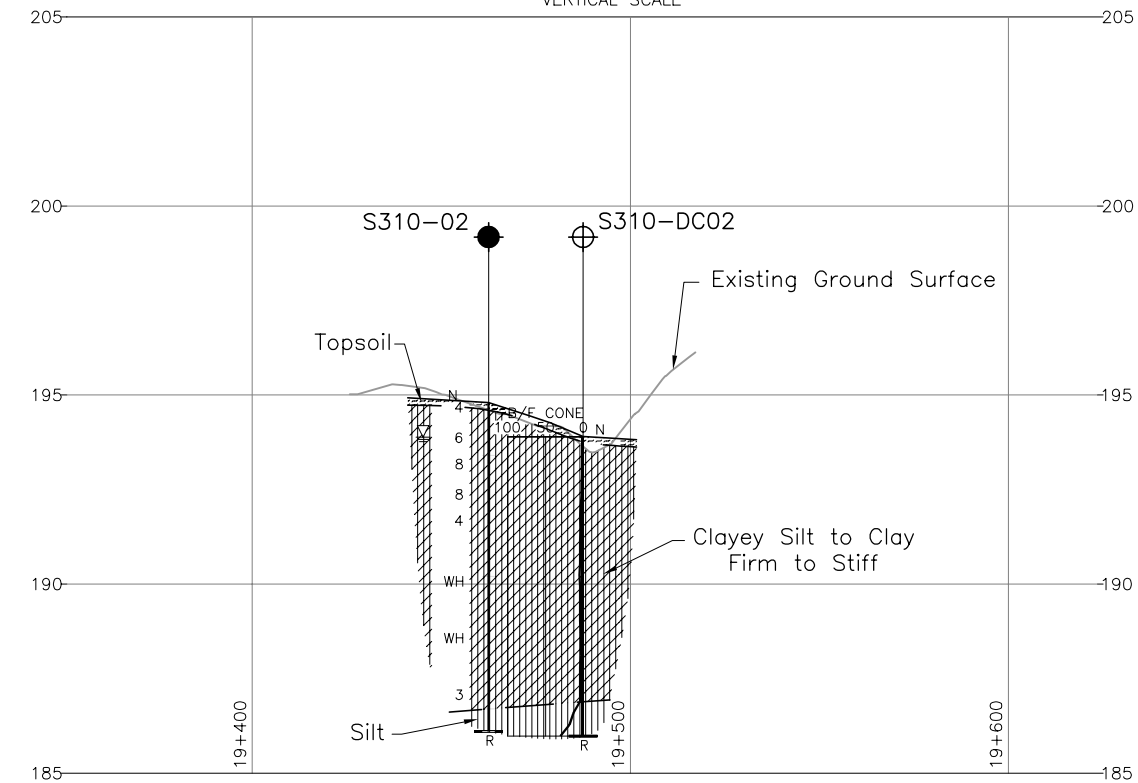
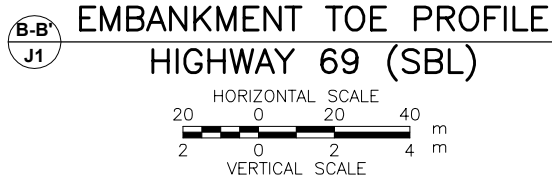
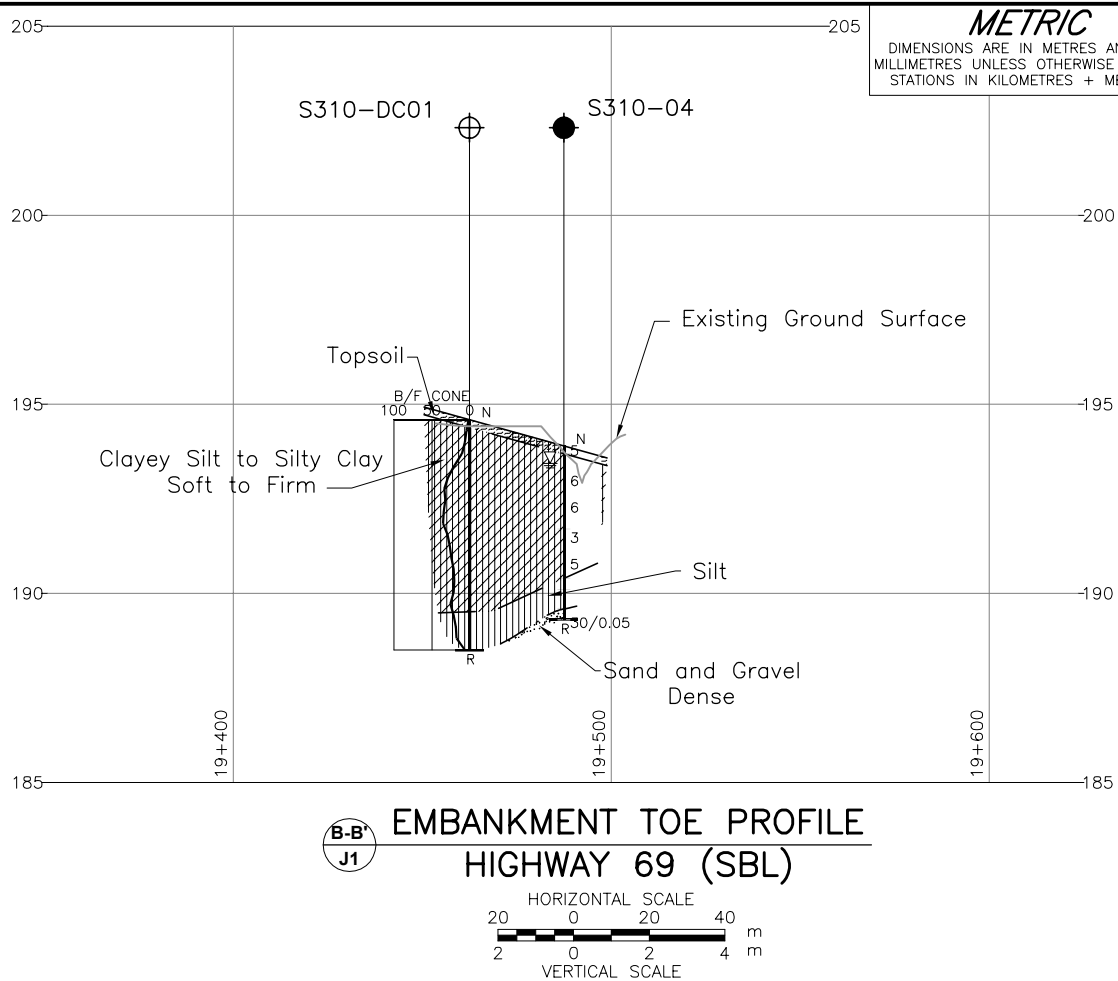
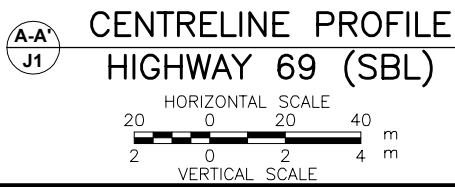
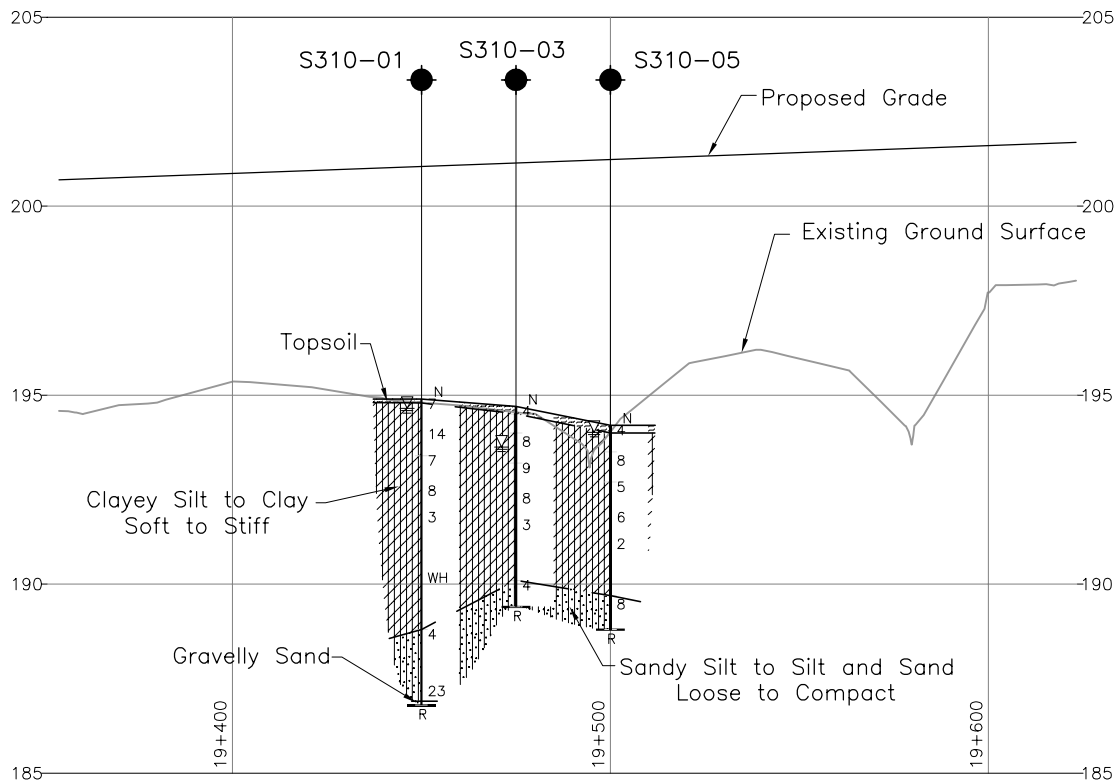
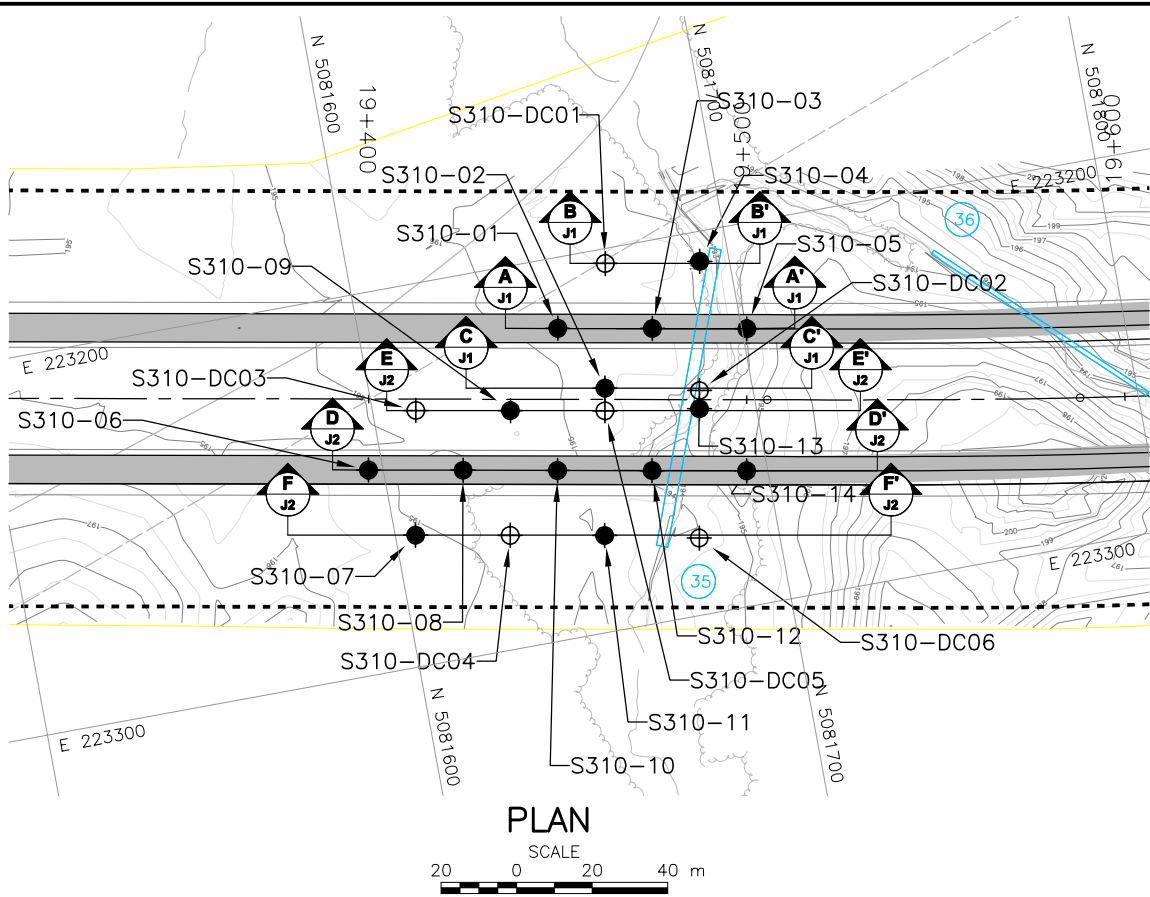
Checked By: TZ



APPENDIX J

Highway 69 SBL – STA 19+450 to 19+500 (Swamp 310)

Highway 69 NBL – STA 19+400 to 19+500 (Swamp 310)



NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

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

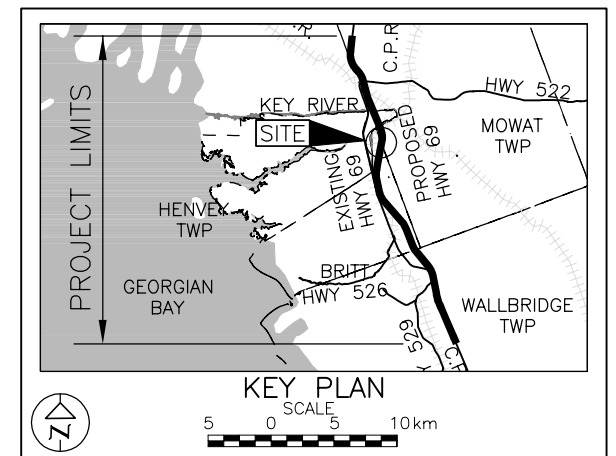
The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS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



CONT No.
WP No. 5404-05-01

HIGHWAY 69
STA 19+450 TO 19+500 (SBL)
STA 19+400 TO 19+500 (NBL)

BOREHOLE LOCATIONS AND SOIL STRATA



LEGEND

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

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S310-01 | 194.9 | 5081652.2 | 223218.5 |
| S310-02 | 194.8 | 5081661.6 | 223236.3 |
| S310-03 | 194.7 | 5081676.8 | 223223.0 |
| S310-04 | 193.9 | 5081692.3 | 223207.8 |
| S310-05 | 194.2 | 5081701.4 | 223227.6 |
| S310-06 | 194.9 | 5081596.2 | 223246.3 |
| S310-07 | 195.0 | 5081605.4 | 223265.5 |
| S310-08 | 195.0 | 5081620.8 | 223250.9 |
| S310-09 | 195.1 | 5081635.9 | 223237.6 |
| S310-10 | 194.9 | 5081645.4 | 223255.5 |
| S310-11 | 194.9 | 5081654.5 | 223274.6 |
| S310-12 | 194.3 | 5081669.9 | 223260.0 |
| S310-13 | 194.0 | 5081685.2 | 223246.2 |
| S310-14 | 194.7 | 5081694.5 | 223264.6 |
| S310-DC01 | 194.6 | 5081667.6 | 223203.9 |
| S310-DC02 | 193.9 | 5081686.1 | 223241.4 |
| S310-DC03 | 195.2 | 5081611.4 | 223233.1 |
| S310-DC04 | 195.0 | 5081629.9 | 223270.1 |
| S310-DC05 | 194.8 | 5081660.5 | 223242.2 |
| S310-DC06 | 194.6 | 5081679.0 | 223279.8 |

REFERENCE




Base plans provided in digital format by URS, drawing file nos. Alignment and Contours from Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and Existing Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Existing and Proposed Grades obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.

| NO. | DATE | BY | REVISION |
|---------------------|----------|--------------------------|----------|
| NO. | DATE | BY | REVISION |
| Geocres No. 41H-134 | | | |
| HWY. 69 | | PROJECT NO. 09-1111-6014 | DIST. |
| SUBM'D. AV | CHKD. AV | DATE: May 2013 | SITE: |
| DRAWN: JFC | CHKD. TZ | APPD. JPD/JMAC | DWG. J1 |



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



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

| BOREHOLE CO-ORDINATES | | | |
|-----------------------|-----------|-----------|----------|
| No. | ELEVATION | NORTHING | EASTING |
| S310-06 | 194.9 | 5081596.2 | 223246.3 |
| S310-07 | 195.0 | 5081605.4 | 223265.5 |
| S310-08 | 195.0 | 5081620.8 | 223250.9 |
| S310-09 | 195.1 | 5081635.9 | 223237.6 |
| S310-10 | 194.9 | 5081645.4 | 223255.5 |
| S310-11 | 194.9 | 5081654.5 | 223274.6 |
| S310-12 | 194.3 | 5081669.9 | 223260.0 |
| S310-13 | 194.0 | 5081685.2 | 223246.2 |
| S310-14 | 194.7 | 5081694.5 | 223264.6 |
| S310-DC03 | 195.2 | 5081611.4 | 223233.1 |
| S310-DC04 | 195.0 | 5081629.9 | 223270.1 |
| S310-DC05 | 194.8 | 5081660.5 | 223242.2 |
| S310-DC06 | 194.6 | 5081679.0 | 223279.8 |

Base plans provided in digital format by URS. Existing Ground Surface cut from contour drawing file Hwy69_Contour-Plan_C3.dwg, received April 23, 2012 and the Existing and Proposed Grades obtained from drawing file Hwy69_profile March 2012.dwg, received March 14, 2012.

| | | | | | |
|---------------------|------|----------|--------------------------|--|---------|
| NO. | DATE | BY | REVISION | | |
| Geocres No. 41H-134 | | | | | |
| HWY. 69 | | | PROJECT NO. 09-1111-6014 | | DIST. |
| SUBM'D. AV | | CHKD. AV | DATE: May 2013 | | SITE: |
| DRAWN: JFC | | CHKD. TZ | APPD. JPD/JMAC | | DWG. J2 |

| PROJECT | | RECORD OF BOREHOLE | | No S310-01 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|-------------------|--|--------------------|---------|--------------------------|------------|---|-----------------|--|--|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5081652.2 ; E 223218.5 | | ORIGINATED BY | | ID | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| DATUM Geodetic | | DATE | | February 11, 2013 | | CHECKED BY | | TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 194.9 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 7 | | | | | | | | | |
| | CLAYEY SILT, some sand, trace organics Firm to stiff Brown to grey Moist to wet | | 1B | | | | | | | | | | | |
| | | | 2 | SS | 14 | | | | | | | | | |
| 193.4 | | | | | | | | | | | | | | |
| 1.5 | CLAY, containing silt seams to a depth of 4.6 m Stiff Brown Wet | | 3 | SS | 7 | | | | | | | | | |
| | | | 4 | SS | 8 | | | | | | | | | |
| | | | 5 | SS | 3 | | | | | | | | | |
| 190.8 | | | | | | | | | | | | | | |
| 4.1 | SILTY CLAY Firm Grey Wet | | 6 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 188.8 | | | | | | | | | | | | | | |
| 6.1 | SILT and SAND, trace to some clay Loose to compact Grey Wet | | 7 | SS | 4 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 186.9 | | | 8A | SS | 23 | | | | | | | | | |
| | | | 8B | | | | | | | | | | | |
| 8.1 | Gravelly SAND, trace to some silt Red and brown Wet END OF BOREHOLE SPOON AND CASING REFUSAL NOTE: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 194.6 m) upon completion of drilling. | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S310-02 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|--|--|--------------------|---------|--------------------------|------------|---|-----------------|--|--|------------------------------|---|----------------|----------------------|---------------------------------------|
| W.P. 09-1111-6014 | | LOCATION | | N 5081661.6 ; E 223236.3 | | ORIGINATED BY | | ID | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| DATUM Geodetic | | DATE | | February 12, 2013 | | CHECKED BY | | TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | W _L | | |
| 194.8 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace organics, containing rootlets Stiff Brown Moist | | 1B | SS | 4 | | | | | | | | | |
| 193.4 | | | 2 | SS | 6 | | | | | | | | | |
| 1.4 | SILTY CLAY, trace sand Firm to stiff Brown becoming grey below a depth of 3.0 m Wet | | 3 | SS | 8 | | | | | | | | | |
| | | | 4 | SS | 8 | | | | | | | | | |
| | | | 5 | SS | 4 | | | | | | | | | |
| 190.2 | | | | | | | | | | | | | | |
| 4.6 | CLAY, trace to some sand Firm Grey Wet | | 6 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | 7 | SS | WH | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 186.7 | | | 8A | SS | 3 | | | | | | | | | |
| 8.1 | SILT, trace to some sand, trace to some clay Grey Wet | | 8B | | | | | | | | | | | |
| 186.1 | | | | | | | | | | | | | | |
| 8.7 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 0.9 m below ground surface (Elev. 193.9 m) upon completion of drilling. 2. An additional borehole was advanced about 1.2 m West of Borehole S310-02 to carry out in situ field vanes between depths of 1.2 m and 4.6 m (Elev. 193.6 m and 190.2 m). | | | | | | | | | | | | | | |

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

| PROJECT | | RECORD OF BOREHOLE | | No S310-03 | | SHEET 1 OF 1 | | METRIC | | | | | |
|---------------|--|---|---------|---------------|------------|--|-----------------|-----------------|---------------------------------------|-------------------------------|--------------------------------|------------------|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | ID | | | | | | | |
| DIST | | BOREHOLE TYPE | | COMPILED BY | | AV | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | TZ | | | | | | | |
| 09-1111-6014 | | N 5081676.8 ; E 223223.0 | | | | | | | | | | | |
| 5404-05-01 | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | | | | | | | | | | |
| Geodetic | | February 12, 2013 | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | 20 40 60 80 100 | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | GR SA SI CL |
| 194.7 | GROUND SURFACE | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | |
| 0.2 | CLAYEY SILT, containing rootlets | | 1B | SS | 4 | | 194 | | | | | | |
| 194.0 | Firm Brown Wet | | | | | | | | | | | | |
| 0.7 | SILTY CLAY, trace organics, containing silt seams | | 2 | SS | 8 | | 193 | | | | | | |
| 193.2 | Stiff Brown Wet | | | | | | | | | | | | |
| 1.5 | SILTY CLAY, containing silt seams between depths of 1.5 m and 2.3 m and sand layers between depths of 3.0 m and 3.7 m | | 3 | SS | 9 | | 192 | | | | | | |
| | Soft to stiff Brown becoming grey below a depth of 2.9 m Wet | | 4 | SS | 8 | | 191 | | | | | | |
| | | | 5 | SS | 3 | | 190 | | | | | | |
| 190.1 | Sandy SILT, trace to some clay | | | | | | | | | | | | |
| 4.6 | Loose Grey Wet | | 6 | SS | 4 | | | | | | | | |
| 189.4 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | |
| 5.3 | NOTE: 1. Water level in open borehole at a depth of 1.1 m below ground surface (Elev. 193.6 m) upon completion of drilling. | | | | | | | | | | | | |

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S310-04 | | SHEET 1 OF 1 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5081692.3 ; E 223207.8</u> | | ORIGINATED BY <u>ID</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 10, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
|--|--|------------|---------|------|------------|----------------------------|-----------------|---|-----|----|----|-----|---|---|----------------|--------------------------------------|---|----|----|----|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | | GR | SA | SI | CL | |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | w _p | w | w _L | | | | | | |
| 193.9 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | | | | | | | | | | | | | | | | | | | |
| 0.2 | CLAYEY SILT, trace sand, trace organics, containing rootlets and silty sand seams Firm Brown becoming grey below a depth of 2.3 m Wet | | 1A | SS | 5 | ▽ | 193 | | | | | | | | | | | | | | |
| | | | 1B | | | | | | | | | | | | | | | | | | |
| | | | 2 | SS | 6 | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 6 | | | | | | | | | | | | | | | | |
| 191.7 | | | | | | | | | 192 | | | | | | | | | | | | |
| 2.2 | SILTY CLAY, trace sand Soft to firm Grey Wet | | 4 | SS | 3 | | | | 191 | | | | | | | | | | | | |
| | | | 5A | | | | | | | | | | | | | | | | | | |
| 190.4 | | | 5B | SS | 5 | | | | | | | | | | | | | | | | |
| 3.5 | SILT, trace sand, trace to some clay Grey Wet | | | | | | | | 190 | | | | | | | | | | | | |
| 189.6 | | | | | | | | | | | | | | | | | | | | | |
| 189.3 | SAND and GRAVEL, trace to some silt Dense Grey Wet | | 6 | SS | 30/0.05 | | | | | | | | | | | | | | | | |
| 4.6 | END OF BOREHOLE SPOON REFUSAL | | | | | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 0.5 m below ground surface (Elev. 193.4 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S310-05 | | SHEET 1 OF 1 | | METRIC | | | | | |
|---|--|---|---------|---------------|------------|--|-----------------|-----------------|---------------------------------------|-------------------------------|--------------------------------|------------------|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | ID | | | | | | | |
| DIST | | BOREHOLE TYPE | | COMPILED BY | | AV | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | TZ | | | | | | | |
| 09-1111-6014 | | N 5081701.4 ; E 223227.6 | | | | | | | | | | | |
| 5404-05-01 | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | | | | | | | | | | |
| Geodetic | | February 10, 2013 | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | 20 40 60 80 100 | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | GR SA SI CL |
| 194.2 | GROUND SURFACE | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | 194 | | | | | | |
| 0.2 | CLAYEY SILT, trace organics, containing rootlets Firm Grey to brown Moist to wet | | 1B | SS | 4 | | | | | | | | |
| | | | 2 | SS | 8 | | 193 | | | | | | |
| 192.7 | | | | | | | | | | | | | |
| 1.5 | SILTY CLAY, trace sand, containing silt seams to a depth of 2.2 m Soft to firm Brown becoming grey below a depth of 3.0 m Wet | | 3 | SS | 5 | | 192 | | | | | | |
| | | | 4 | SS | 6 | | | | | | | | |
| | | | 5 | SS | 2 | | 191 | | | | | | |
| | | | | | | | | | | | | | |
| 189.7 | | | | | | | 190 | | | | | | |
| 4.5 | SILT and SAND, trace clay Loose Grey Wet | | 6 | SS | 8 | | 189 | | | | | | |
| 188.8 | | | | | | | | | | | | | |
| 5.4 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 0.2 m below ground surface (Elev. 194.0 m) upon completion of drilling. 2. An additional borehole was advanced about 0.6 m north of Borehole S310-05 to carry out in situ field vanes between depths of 3.2 m and 3.5 m (Elev. 191.0 m and 190.7 m). | | | | | | | | | | | | | |

| | | | | | | | |
|------------------------------------|--|---|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S310-06 | | SHEET 1 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5081596.2 ;E 223246.3</u> | | ORIGINATED BY <u>ID</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>203 mm O.D. Continuous Flight Hollow Stem Augers</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 21, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

[illegible]

Continued Next Page

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

GTGA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S310-06 | | SHEET 2 OF 2 | | METRIC | | | | | | | | | | |
|----------------------|--|--|--------|------------------|-------------------------|-----------------|--|--------------------|--|--|--|---|-------------------|--|----------------------|---------------------------------------|
| W.P. 5404-05-01 | | LOCATION N 5081596.2 ; E 223246.3 | | ORIGINATED BY ID | | | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 203 mm O.D. Continuous Flight Hollow Stem Augers | | COMPILED BY AV | | | | | | | | | | | | |
| DATUM Geodetic | | DATE February 21, 2013 | | CHECKED BY TZ | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV. DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | |
| 179.5 | | | 13 | SS | 47/0.15 | | | | | | | | | | | |
| 15.4 | END OF BOREHOLE SPOON REFUSAL NOTES: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 194.6 m) upon completion of drilling. 2. An additional borehole was advanced about 1.0 m south of Borehole S310-06 to carry out in situ field vanes between depths of 1.2 m and 5.3 m (Elev. 193.7 m and 189.6 m). | | | | | | | | | | | | | | | |

| | | | | | | | |
|----------------------|--|---|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S310-07 | | SHEET 1 OF 2 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5081605.4 ; E 223265.5 | | ORIGINATED BY ID | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY CC/AV | | | |
| DATUM Geodetic | | DATE February 13 and 14, 2013 | | CHECKED BY TZ | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|---|-----|----|---|--|--|--|--|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED | | | | | | | | | | | | |
| 195.0 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | | | | | | | | |
| 0.2 | SILT, some sand, trace to some clay Loose Brown to grey Wet | | 1B | SS | 7 | | | | | | | | | | | | | | | |
| | | | 2 | SS | 4 | | | | | | | | | | | | | | | |
| 193.5 | | | | | | | | | | | | | | | | | | | | |
| 1.5 | SILTY CLAY, containing silt seams to a depth of 3.0 m Firm to stiff Brown becoming grey below a depth of 3.0 m Wet | | 3 | SS | 6 | | | | | | | | | | | | | | | |
| | | | 4 | SS | 6 | | | | | | | | | | | | | | | |
| | | | 5 | SS | 3 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | 6 | TO | PH | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | 7 | SS | 3 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 186.9 | | | 8A | SS | 5 | | | | | | | | | | | | | | | |
| 186.5 | SILT, trace sand, trace clay Grey Wet | | 8B | | | | | | | | | | | | | | | | | |
| 8.5 | CLAY Firm Grey Wet | | | | | | | | | | | | | | | | | | | |
| | | | 9 | SS | 2 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | 10 | TO | PH | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 183.0 | | | | | | | | | | | | | | | | | | | | |
| 12.0 | SILT, some clay, trace gravel, trace sand Loose Grey Wet | | 11 | SS | 6 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | 12 | SS | 8 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

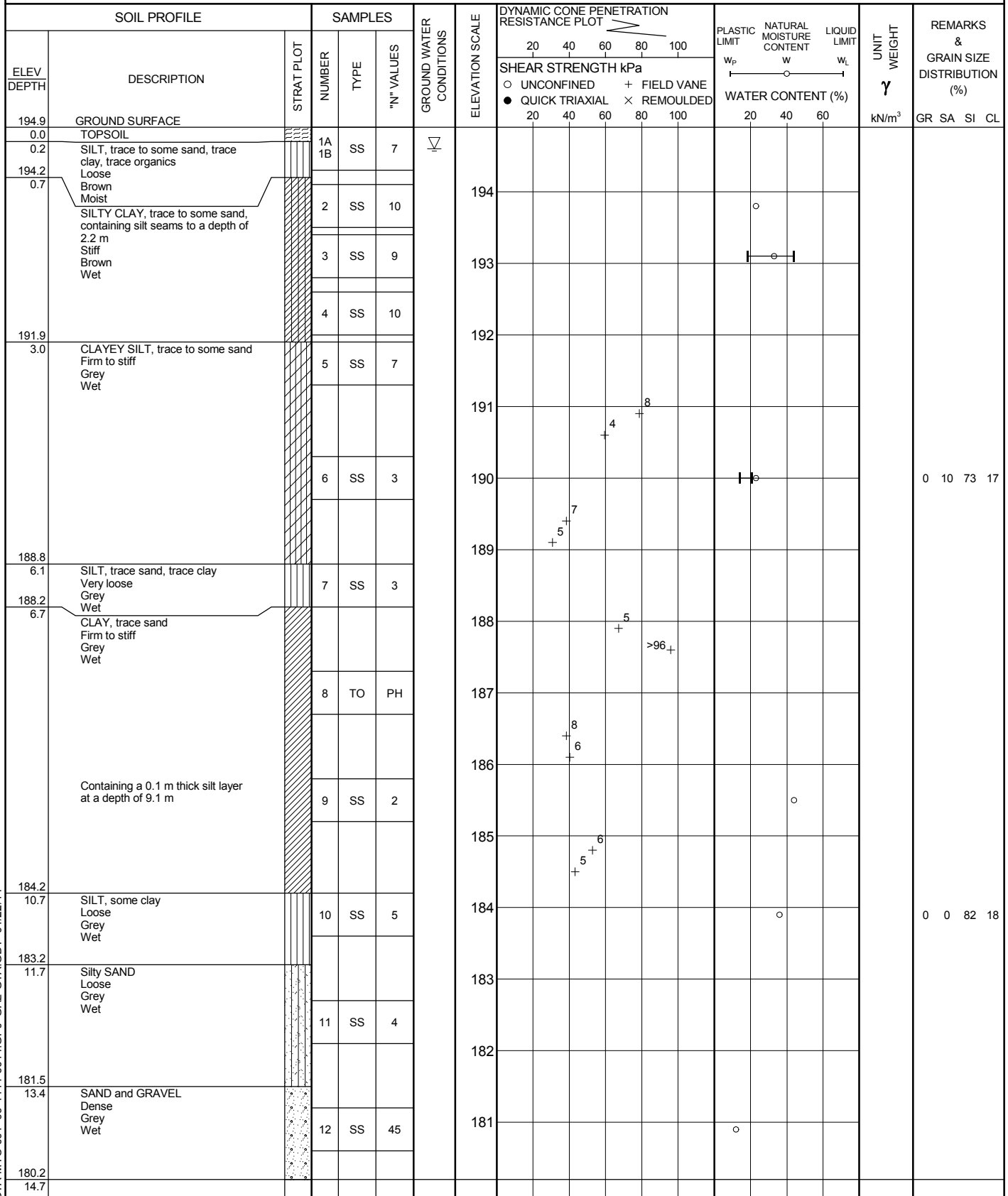
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S310-07 | | | | SHEET 2 OF 2 | | METRIC | | | | | | | | |
|--------------------------------------|---|---|--------|------|----------------------------|-------------------|---|--------------------|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 5404-05-01 | | LOCATION N 5081605.4 ; E 223265.5 | | | | ORIGINATED BY ID | | | | | | | | | | |
| DIST _____ HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | | | COMPILED BY CC/AV | | | | | | | | | | |
| DATUM Geodetic | | DATE February 13 and 14, 2013 | | | | CHECKED BY TZ | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | | | | |
| --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | |
| 177.2 | SILT, some clay, trace gravel, trace sand Loose Grey Wet | | 13 | SS | 4 | | 179 | | | | | | | | | |
| | | | 14 | SS | 6 | | 178 | | | | | | | | | |
| 17.8 | SAND, trace to some gravel Compact Red and brown Wet | | 15 | SS | 16 | | 177 | | | | | | | | | |
| 175.6 | | | 16 | SS | 6/0.15 | | 176 | | | | | | | | | |
| 19.4 | END OF BOREHOLE SPOON AND CASING REFUSAL NOTE: 1. Water level in open borehole at a depth of 0.3 m) below ground surface (Elev. 194.7 m) upon completion of drilling. | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S310-08 | | SHEET 1 OF 1 | | METRIC | | | | | |
|---|--|--|---------|---------------|------------|--|-----------------|-----------------|---------------------------------------|-------------------------------|--------------------------------|------------------|-------------|
| W.P. | | LOCATION | | ORIGINATED BY | | ID | | | | | | | |
| DIST | | BOREHOLE TYPE | | COMPILED BY | | AV | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | TZ | | | | | | | |
| 09-1111-6014 | | N 5081620.8 ; E 223250.9 | | | | | | | | | | | |
| 5404-05-01 | | 203 mm O.D. Continuous Flight Hollow Stem Augers | | | | | | | | | | | |
| Geodetic | | February 20, 2013 | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | GROUND WATER CONDITIONS | ELEVATION SCALE | 20 40 60 80 100 | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | GR SA SI CL |
| 195.0 | GROUND SURFACE | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | SS | 5 | | | | | | | | |
| | SILTY CLAY, trace sand, trace organics, containing silt seams Stiff Brown to grey Wet | | 1B | | | | | | | | | | |
| 193.6 | | | 2 | SS | 9 | | 194 | | | | | | |
| 1.4 | CLAYEY SILT, containing silt seams to a depth of 3.7 m Soft to stiff Brown becoming grey below a depth of 3.0 m Moist | | 3 | SS | 6 | | 193 | | | | | | |
| | | | 4 | SS | 5 | | 192 | | | | | | |
| | | | 5 | SS | 3 | | 191 | | | | | | |
| 190.1 | | | 6A | | | | 190 | | | | | | |
| 4.9 | Sandy SILT, trace clay Very loose Grey Wet | | 6B | SS | 1 | | 189 | | | | | | |
| | | | 7 | SS | 1 | | 188 | | | | | | |
| 187.8 | | | | | | | | | | | | | |
| 7.2 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 0.5 m below ground surface (Elev. 194.5 m) upon completion of drilling. 2. An additional borehole was advanced 1.0 m south of Borehole S310-08 to carry out in situ field vanes between depths of 1.2 m and 5.3 m (Elev. 193.8 m and 189.7 m). | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S310-09 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | |
|-------------------|--|--------------------|---------|--------------------------|------------|---|--------------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5081635.9 ; E 223237.6 | | ORIGINATED BY | | ID | | | | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers | | COMPILED BY | | | | | | | | | |
| DATUM Geodetic | | DATE | | February 13, 2013 | | CHECKED BY | | TZ | | | | | | | | | |
| 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 | | | | | | | | | |
| 195.1 | GROUND SURFACE | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | | | | | |
| 0.2 | SILTY CLAY, containing sand seams and wood fragments | | 1B | SS | 9 | | | | | | | | | | | | |
| 194.4 | Stiff Brown to grey | | | | | | | | | | | | | | | | |
| 0.7 | Most Silty SAND, trace organics | | 2 | SS | 9 | | | | | | | | | | | | |
| | Loose to compact | | | | | | | | | | | | | | | | |
| | Brown | | 3 | SS | 16 | | | | | | | | | | | | |
| | Wet | | | | | | | | | | | | | | | | |
| 192.9 | SILT and SAND, trace clay, cobbles at 2.6 m depth | | 4 | SS | 24/0.15 | | | | | | | | | | | | |
| 2.2 | Loose | | | | | | | | | | | | | | | | |
| | Grey | | | | | | | | | | | | | | | | |
| | Wet | | 5 | SS | 8 | | | | | | | | | | | | |
| 191.6 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | |
| 3.5 | NOTES: 1. Water level in open borehole at a depth of 1.4 m below ground surface (Elev. 193.7 m) upon completion of drilling. * Split-spoon and auger refusal encountered at a depth of 2.6 m on inferred cobbles. An additional borehole was drilled about 2.5 m east of Borehole S310-09 to obtain a split-spoon sample at a depth of 3.0 m. | | | | | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S310-10 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | | | | | |
|--------------|-------|---|------------|---------------|------|-------------------------|--|--------|-----------------|--|--|--|--|--|---|--|--|-------------|--|--|---------------------------------------|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | ID | | | | | | | | | | | | | | | | | | |
| DIST | | BOREHOLE TYPE | | COMPILED BY | | CC/AV | | | | | | | | | | | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | TZ | | | | | | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5081645.4 ; E 223255.5 | | | | | | | | | | | | | | | | | | | | | | |
| 5404-05-01 | | 203 mm O.D. Continuous Flight Hollow Stem Augers | | | | | | | | | | | | | | | | | | | | | | |
| Geodetic | | February 19 and 20, 2013 | | | | | | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | | | ELEVATION SCALE | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
| ELEV | DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | | | | | | | | | | | | | | | | |
| 194.9 | 0.0 | GROUND SURFACE | | | | | | | | | | | | | | | | | | | | | | |
| | 0.2 | TOPSOIL | | 1A | | | | | | | | | | | | | | | | | | | | |
| | | CLAYEY SILT, trace to some sand, trace organics, containing silt to silty sand seams and rootlets to a depth of 1.5 m Firm to very stiff Brown Moist to wet | | 1B | SS | 6 | | | | | | | | | | | | | | | | | | |
| | | | | 2 | SS | 21 | | | | | | | | | | | | | | | | | | |
| 193.4 | 1.5 | SILTY CLAY, trace sand, containing silt seams Firm to stiff Brown becoming grey below a depth of 3.0 m Moist to wet | | 3 | SS | 9 | | | | | | | | | | | | | | | | | | |
| | | | | 4 | SS | 6 | | | | | | | | | | | | | | | | | | |
| | | | | 5 | SS | 4 | | | | | | | | | | | | | | | | | | |
| 191.0 | 3.9 | CLAYEY SILT Stiff Grey Wet | | | | | | | | | | | | | | | | | | | | | | |
| 189.9 | | | | 6A | SS | 3 | | | | | | | | | | | | | | | | | | |
| 189.6 | 5.3 | SILT Grey Wet | | 6B | | | | | | | | | | | | | | | | | | | | |
| | | SILTY CLAY Firm Grey Wet | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 7 | TO | PH | | | | | | | | | | | | | | | | | | |
| 187.6 | 7.3 | SAND, trace silt Very loose Grey Wet | | 8 | TO | WH | | | | | | | | | | | | | | | | | | |
| 186.4 | 8.5 | END OF BOREHOLE AUGER REFUSAL | | | | | | | | | | | | | | | | | | | | | | |
| | | NOTE: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 194.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | |
|----------------------|--|---|--|-------------------|--|---------------|--|
| PROJECT 09-1111-6014 | | RECORD OF BOREHOLE No S310-11 | | SHEET 1 OF 2 | | METRIC | |
| W.P. 5404-05-01 | | LOCATION N 5081654.5 ; E 223274.6 | | ORIGINATED BY ID | | | |
| DIST HWY 69 | | BOREHOLE TYPE 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY CC/AV | | | |
| DATUM Geodetic | | DATE February 14, 2013 | | CHECKED BY TZ | | | |



Continued Next Page

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

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT <u>09-1111-6014</u> | | RECORD OF BOREHOLE No S310-11 | | SHEET 2 OF 2 | | METRIC | | | | | | | | | | | |
|--------------------------------------|--|--|--------|--------------------------|----------------------------|-----------------|---|--------------------|--|--|--|---|----------------|---|--|--|----------------|
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5081654.5 ; E 223274.6</u> | | ORIGINATED BY <u>ID</u> | | | | | | | | | | | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring</u> | | COMPILED BY <u>CC/AV</u> | | | | | | | | | | | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 14, 2013</u> | | CHECKED BY <u>TZ</u> | | | | | | | | | | | | | |
| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | | "N" VALUES | SHEAR STRENGTH kPa | | | | | W _p | W | | | W _L |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | |
| | END OF BOREHOLE CASING REFUSAL NOTE: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 194.6 m) upon completion of drilling. | | | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | RECORD OF BOREHOLE | | No S310-12 | | SHEET 1 OF 1 | | METRIC | | | | | | | | | | | | | | | | | |
|--|-------|---|------------|---------------|------|-------------------------|--|--------|-----------------|--|--|--|--|--|---|--|--|-------------|--|--|---------------------------------------|--|--|--|--|
| W.P. | | LOCATION | | ORIGINATED BY | | ID | | | | | | | | | | | | | | | | | | | |
| DIST | | BOREHOLE TYPE | | COMPILED BY | | CC/AV | | | | | | | | | | | | | | | | | | | |
| DATUM | | DATE | | CHECKED BY | | TZ | | | | | | | | | | | | | | | | | | | |
| 09-1111-6014 | | N 5081669.9 ; E 223260.0 | | ID | | | | | | | | | | | | | | | | | | | | | |
| 5404-05-01 | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | CC/AV | | | | | | | | | | | | | | | | | | | | | |
| Geodetic | | February 10, 2013 | | TZ | | | | | | | | | | | | | | | | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | | | ELEVATION SCALE | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT | | | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
| ELEV | DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | | | | | | | | | | | | | | | | | |
| 194.3 | 0.0 | GROUND SURFACE | | 1A | SS | 3 | | | | | | | | | | | | | | | | | | | |
| 194.0 | 0.3 | TOPSOIL | | 1B | SS | 7 | | | | | | | | | | | | | | | | | | | |
| | | CLAYEY SILT, trace organics, containing silt seams to a depth of 1.5 m Firm to stiff Brown Wet | | 2 | SS | 11 | | | | | | | | | | | | | | | | | | | |
| | | | | 3 | SS | 6 | | | | | | | | | | | | | | | | | | | |
| 192.1 | 2.2 | CLAYEY SILT, trace to some sand Firm to stiff Brown becoming grey below a depth of 4.6 m Wet | | 4 | SS | 5 | | | | | | | | | | | | | | | | | | | |
| | | | | 5 | SS | WH | | | | | | | | | | | | | | | | | | | |
| | | | | 6 | SS | 4 | | | | | | | | | | | | | | | | | | | |
| | | | | 7 | SS | 4 | | | | | | | | | | | | | | | | | | | |
| 188.2 | 6.1 | SILT, trace to some sand Loose Grey Wet | | 8 | SS | WH | | | | | | | | | | | | | | | | | | | |
| | | | | 9 | TO | PH | | | | | | | | | | | | | | | | | | | |
| | | | | 10A | SS | 8 | | | | | | | | | | | | | | | | | | | |
| | | | | 10B | | | | | | | | | | | | | | | | | | | | | |
| 183.9 | 10.4 | Silty SAND Loose Grey Wet | | | | | | | | | | | | | | | | | | | | | | | |
| 183.2 | 11.4 | SAND and GRAVEL, trace silt Loose Grey Wet | | | | | | | | | | | | | | | | | | | | | | | |
| | | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | | | | | | | | | | | |
| NOTE: 1. Water level in open borehole at a depth of 0.3 m below ground surface (Elev. 194.0 m) upon completion of drilling. | | | | | | | | | | | | | | | | | | | | | | | | | |

| PROJECT | | 09-1111-6014 | | RECORD OF BOREHOLE No S310-13 | | SHEET 1 OF 1 | | METRIC | | | | | |
|---------------|--|--------------|---------|-------------------------------|------------|---|-----------------|--|--|------------------------------|---|----------------------|---------------------------------------|
| W.P. | | 5404-05-01 | | LOCATION | | N 5081685.2 ; E 223246.2 | | ORIGINATED BY ID | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY CC/AV | | | | | |
| DATUM | | Geodetic | | DATE | | February 9, 2013 | | CHECKED BY TZ | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC NATURAL LIQUID LIMIT | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | W _p | W | | |
| 194.0 | GROUND SURFACE | | | | | | | | | | | | |
| 0.0 | TOPSOIL | | 1A | | | | | | | | | | |
| 0.2 | SILT, some sand, trace clay, containing sand seams | | 1B | SS | 5 | | | | | | | | |
| 193.3 | Loose Brown Moist to wet CLAYEY SILT, trace to some sand, trace organics | | 2 | SS | 10 | | | | | | | | |
| 0.7 | Firm to stiff Grey Wet | | 3 | SS | 6 | | | | | | | | |
| 191.8 | SILTY CLAY | | | | | | | | | | | | |
| 2.2 | Soft to firm Grey Wet | | 4 | SS | 4 | | | | | | | | |
| | | | 5 | SS | 2 | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | 6 | TO | PH | | | | | | | | |
| 188.4 | CLAY | | | | | | | | | | | | |
| 5.6 | Firm Grey Wet | | 7 | SS | WH | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | 8 | SS | WH | | | | | | | | |
| 185.0 | CLAYEY SILT | | | | | | | | | | | | |
| 9.0 | Soft Grey Wet | | 9 | SS | 3 | | | | | | | | |
| 183.8 | Silty SAND | | | | | | | | | | | | |
| 10.2 | Loose Grey Wet | | 10 | SS | 6 | | | | | | | | |
| 182.6 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | |
| 11.4 | NOTE: 1. Water level in open borehole at a depth of 0.1 m below ground surface (Elev. 193.9 m) upon completion of drilling. | | | | | | | | | | | | |

| PROJECT | | RECORD OF BOREHOLE | | No S310-14 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|---|---|--------------------|---------|--------------------------|------------|---|-----------------|--|--|---|--|--|--|--|
| W.P. 09-1111-6014 | | LOCATION | | N 5081694.5 ; E 223264.6 | | ORIGINATED BY | | ID | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | 165 mm O.D. Continuous Flight Solid Stem Augers, NW Casing, Wash Boring | | COMPILED BY | | | | | | |
| DATUM Geodetic | | DATE | | February 7, 2013 | | CHECKED BY | | TZ | | | | | | |
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | WATER CONTENT (%) | | | | |
| 194.7 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.1 | TOPSOIL | | | | | | | | | | | | | |
| | CLAYEY SILT, trace to some sand, trace organics, containing sandy silt to silt seams Stiff Grey and brown Moist to wet | | 1 | SS | 12 | | | | | | | | | |
| | | | 2 | SS | 8 | | | | | | | | | |
| | | | 3 | SS | 8 | | | | | | | | | |
| 192.5 | SILTY CLAY, trace sand Soft to stiff Brown becoming grey below a depth of 4.6 m | | 4 | SS | 5 | | | | | | | | | |
| 2.2 | | | 5 | SS | 2 | | | | | | | | | |
| | | | 6 | SS | 1 | | | | | | | | | |
| 188.6 | SILT, trace sand Loose Grey Wet | | 7A | SS | 4 | | | | | | | | | |
| 6.4 | CLAY Firm Grey Wet | | 7B | | | | | | | | | | | |
| 186.8 | SILT, some sand Loose Grey Wet | | 8A | SS | 7 | | | | | | | | | |
| 7.9 | | | 8B | | | | | | | | | | | |
| 186.3 | END OF BOREHOLE CASING REFUSAL | | | | | | | | | | | | | |
| 8.4 | | | | | | | | | | | | | | |
| NOTES: 1. Water level in open borehole at a depth of 1.1 m below ground surface (Elev. 193.6 m) upon completion of drilling. 2. An additional borehole was advanced 1.0 m south of Borehole S310-14 to carry out in situ field vane between depths of 1.2 m and 4.6 m (Elev. 193.5 m and 190.1 m) and to obtain a Shelby tube sample at a depth of 2.3 m (Elev. 192.4 m). | | | | | | | | | | | | | | |



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

GTA-MTO001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

| PROJECT | | 09-1111-6014 | | RECORD OF DCPT No S310-DC03 | | SHEET 1 OF 1 | | METRIC | | | | | | |
|---------------|--|--------------|--------|-----------------------------|------------|-------------------------------|-----------------|---|-------------------|------------------------------------|-------------------------------------|-----------------------------------|---|--|
| W.P. | | 5404-05-01 | | LOCATION | | N 5081611.4 ; E 223233.1 | | ORIGINATED BY | | | | | | |
| DIST | | HWY 69 | | BOREHOLE TYPE | | Dynamic Cone Penetration Test | | COMPILED BY | | | | | | |
| DATUM | | Geodetic | | DATE | | February 20, 2013 | | CHECKED BY | | | | | | |
| | | | | | | | | TZ | | | | | | |
| 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 (%) | | | | | |
| 195.2 | GROUND SURFACE | | | | | | | | | | | | | |
| 0.0 | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | |
| | | | | | | | 195 | | | | | | | |
| | | | | | | | 194 | | | | | | | |
| | | | | | | | 193 | | | | | | | |
| | | | | | | | 192 | | | | | | | |
| | | | | | | | 191 | | | | | | | |
| 190.5 | END OF DCPT Refusal to Further Penetration (12 Blows/0.10 m) | | | | | | | | | | | | | |
| 4.7 | | | | | | | | | | | | | | |

GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14



GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

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



GTA-MTO 001 09-1111-6014.GPJ GAL-GTA.GDT 01/22/14

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

| | | | | | | | |
|--------------------------------------|--|--|--|-------------------------|--|---------------|--|
| PROJECT <u>09-1111-6014</u> | | RECORD OF DCPT No S310-DC06 | | SHEET 2 OF 2 | | METRIC | |
| W.P. <u>5404-05-01</u> | | LOCATION <u>N 5081679.0 ; E 223279.8</u> | | ORIGINATED BY <u>ID</u> | | | |
| DIST <u> </u> HWY <u>69</u> | | BOREHOLE TYPE <u>Dynamic Cone Penetration Test</u> | | COMPILED BY <u>AV</u> | | | |
| DATUM <u>Geodetic</u> | | DATE <u>February 8, 2013</u> | | CHECKED BY <u>TZ</u> | | | |

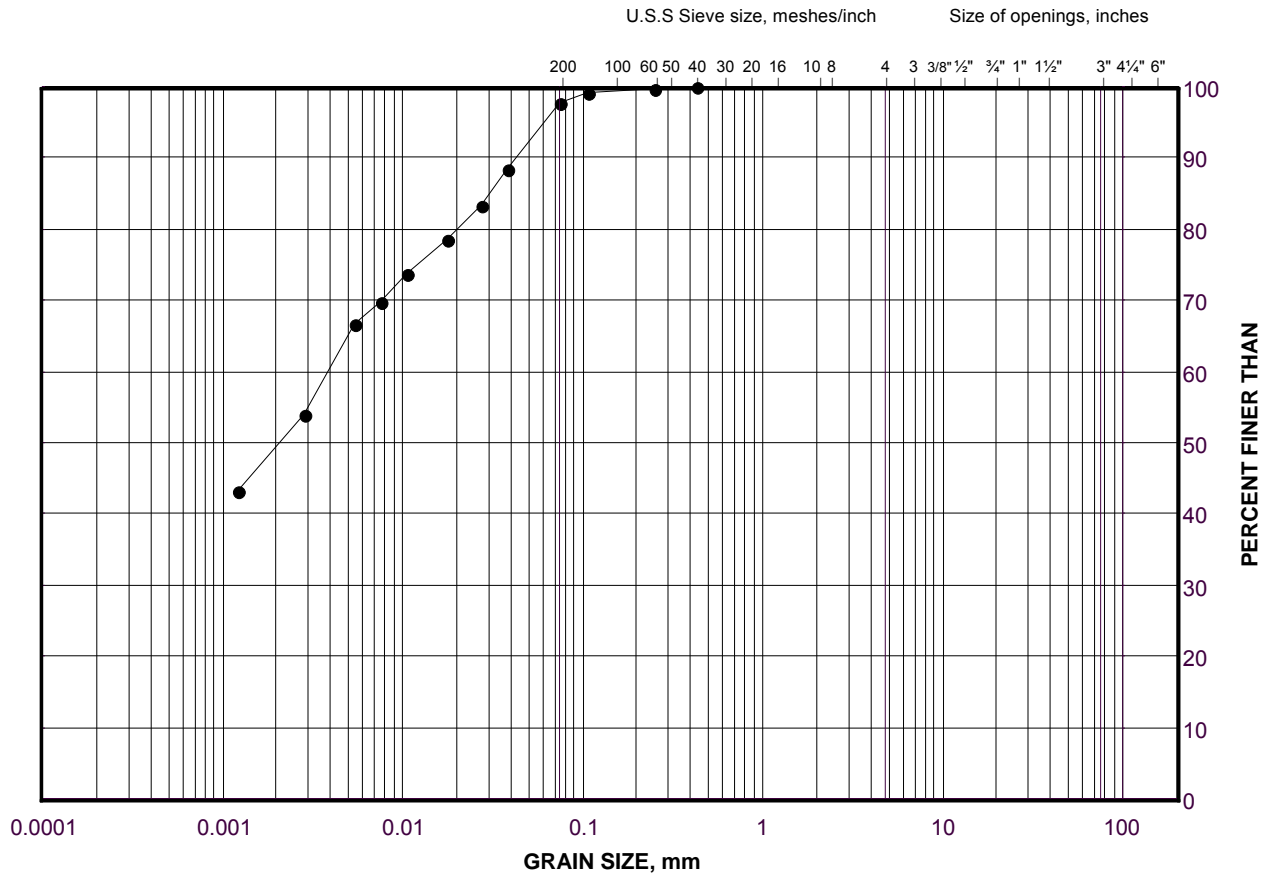
| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|------------------|---|---|---|-----------|-------------------|--------------------------------------|---|----|----|----|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | W _p | W | W _L | | GR | SA | SI | CL | |
| | | | | | | | | ○ UNCONFINED | ● QUICK TRIAXIAL | + | × | FIELD VANE | REMOULDED | WATER CONTENT (%) | | | | | | |
| | --- CONTINUED FROM PREVIOUS PAGE --- | | | | | | | | | | | | | | | | | | | |
| | Dynamic Cone Penetration Test (DCPT) | | | | | | | | | | | | | | | | | | | |
| 177.4 | | | | | | | | | | | | | | | | | | | | |
| 17.2 | END OF DCPT Refusal to Further Penetration (50 Blows / 0.15 m) | | | | | | | | | | | | | | | | | | | |

GRAIN SIZE DISTRIBUTION

Silty Clay

Highway 69 (SBL) STA 19+450 to 19+500 (Swamp 310)

FIGURE J.S310-01



LEGEND

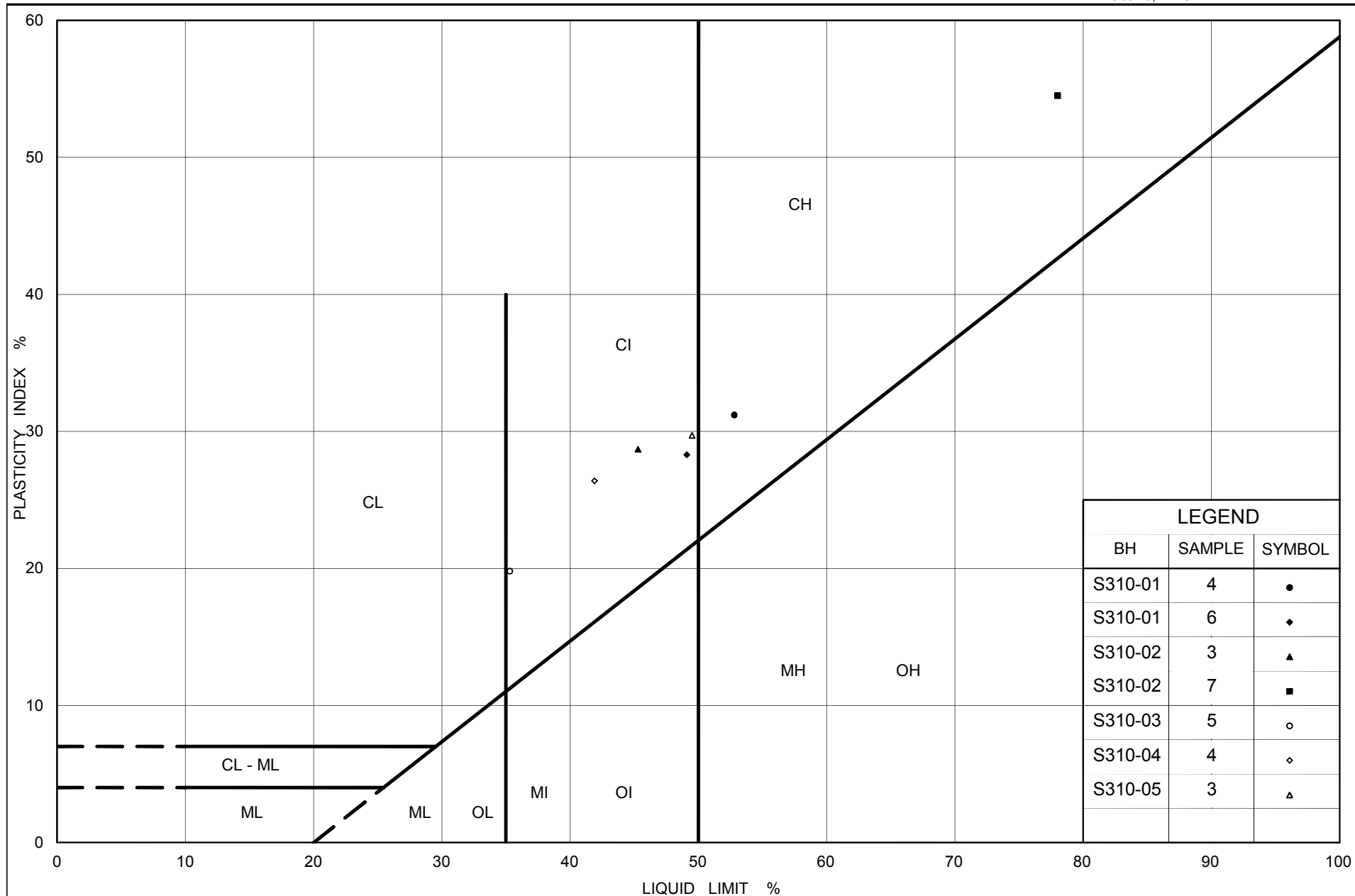
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S310-02 | 3 | 193.0 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 27-Mar-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Silty Clay to Clay

Highway 69 (SBL) STA 19+450 to 19+500 (Swamp 310)

Figure No. J.S310-02

Project No. 09-1111-6014

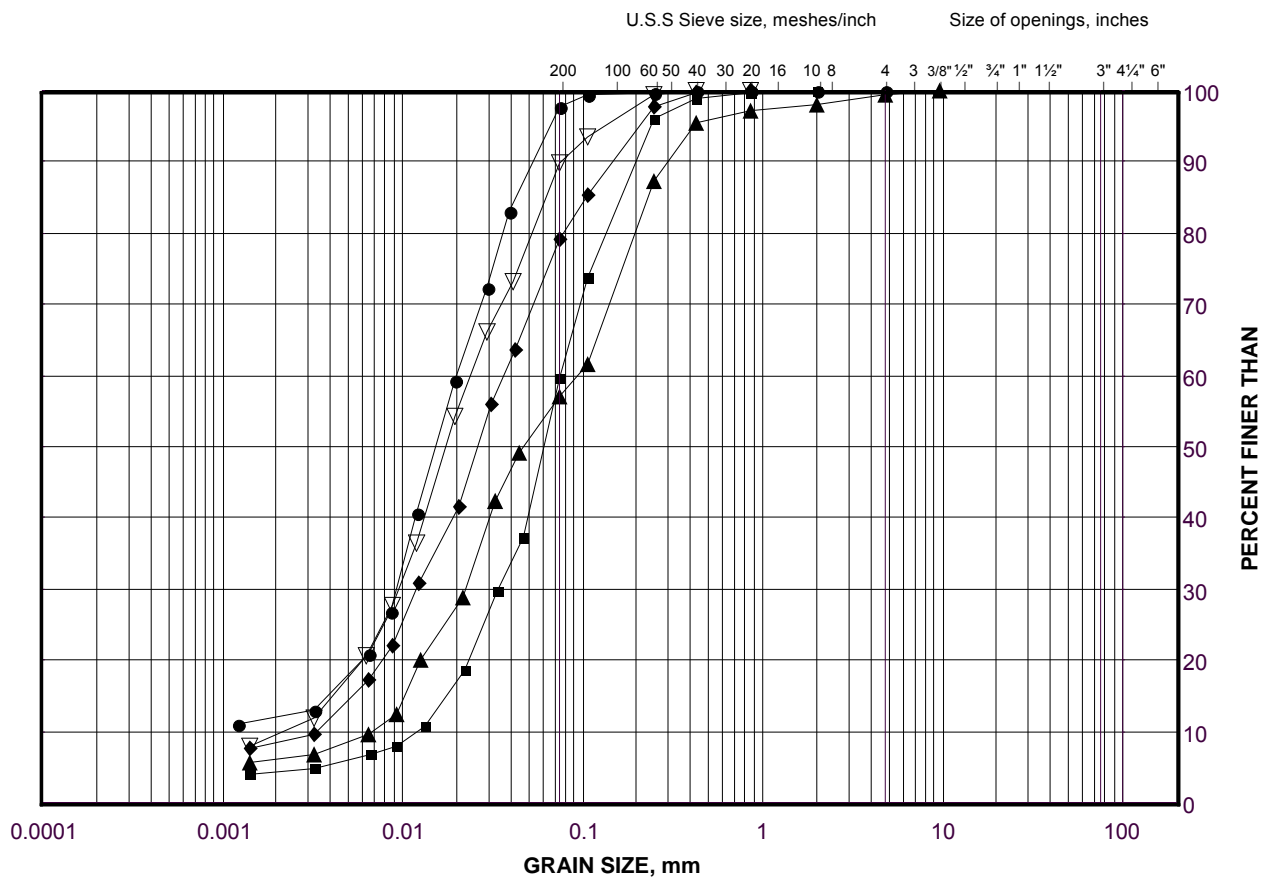
Checked By: AV

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Highway 69 (SBL) STA 19+450 to 19+500 (Swamp 310)

FIGURE J.S310-03



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S310-04 | 5B | 190.3 |
| ■ | S310-05 | 6 | 189.3 |
| ◆ | S310-03 | 6 | 189.8 |
| ▲ | S310-01 | 8A | 187.1 |
| ▽ | S310-02 | 8B | 186.6 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

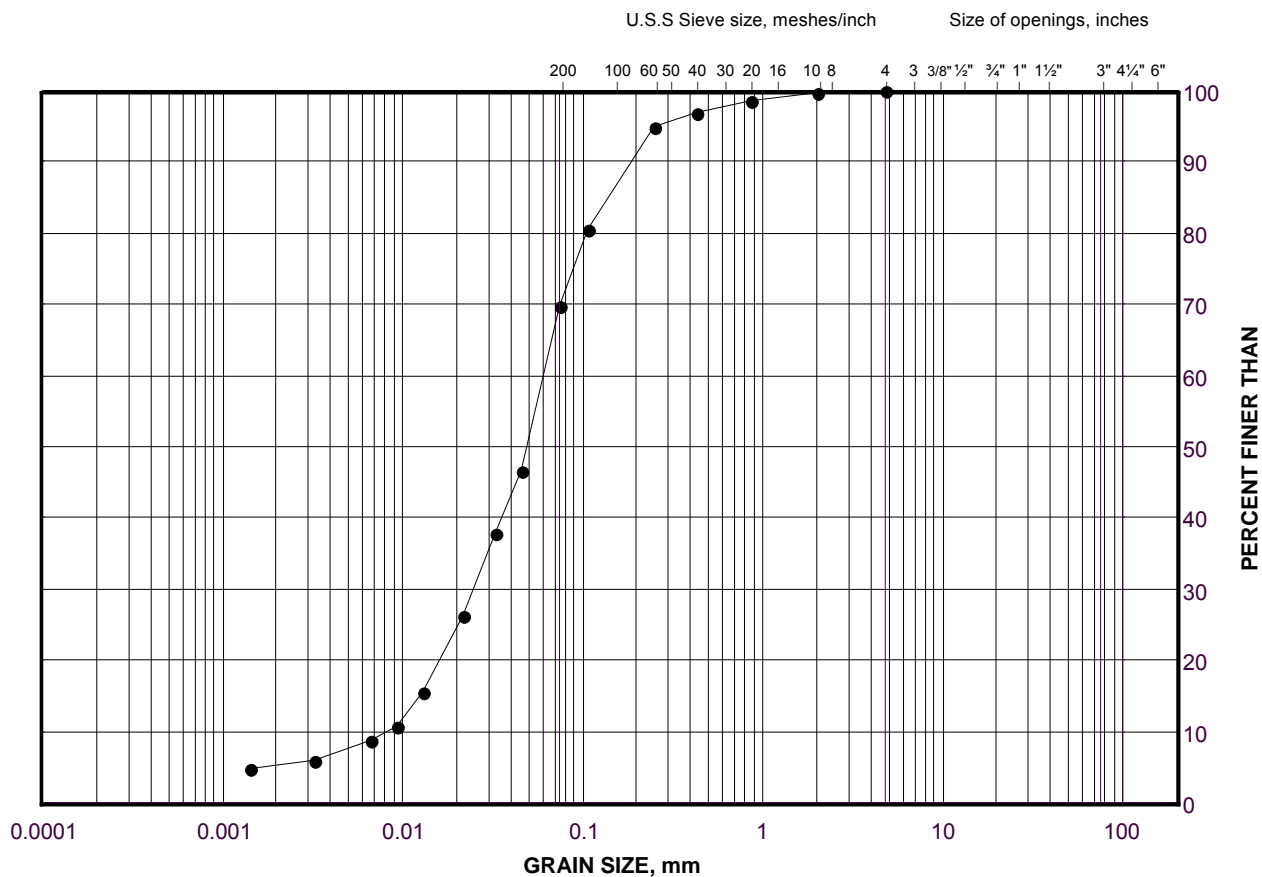
Date: 23-Apr-13

GRAIN SIZE DISTRIBUTION

Silt and Sand

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

FIGURE J.S310-04



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

LEGEND

| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S310-09 | 5 | 191.8 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

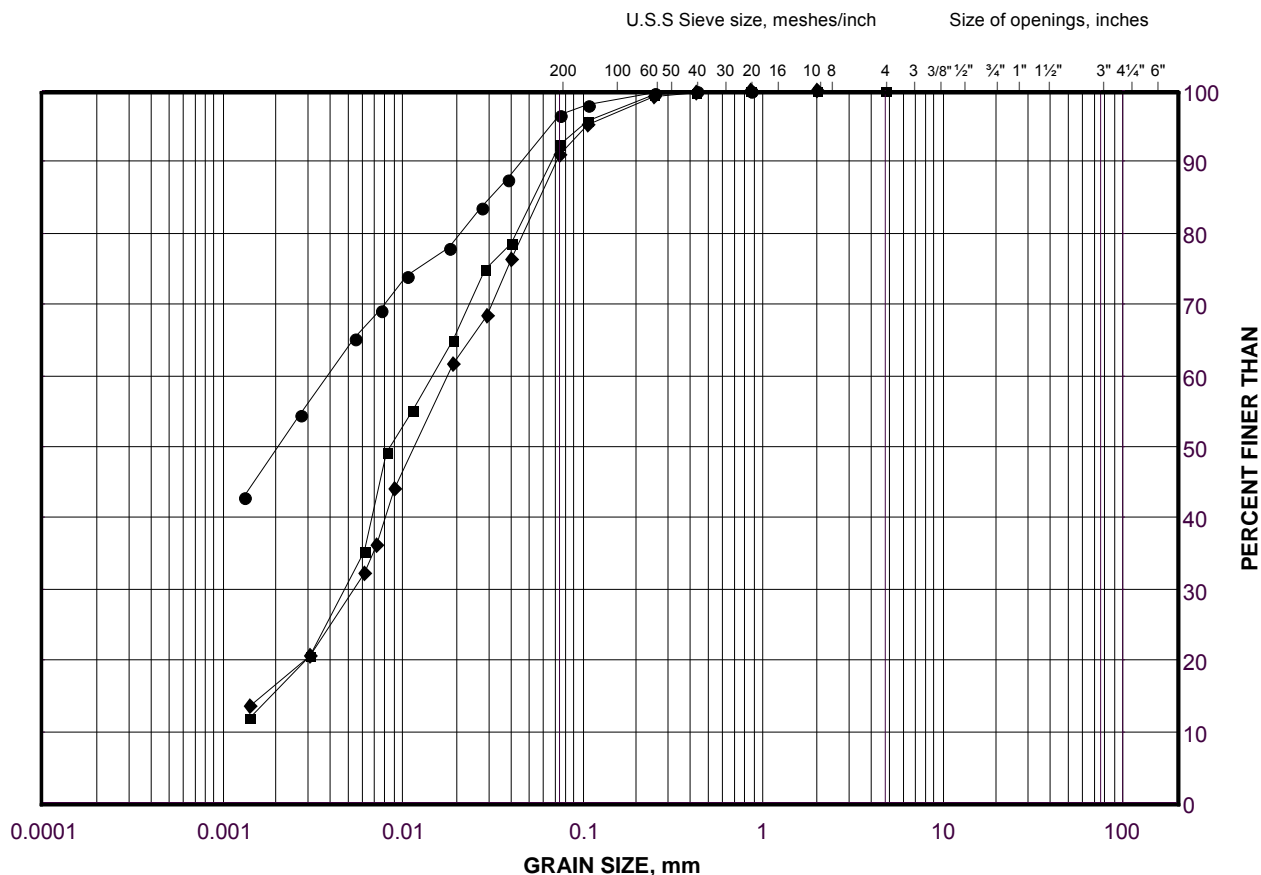
Date: 23-Apr-13

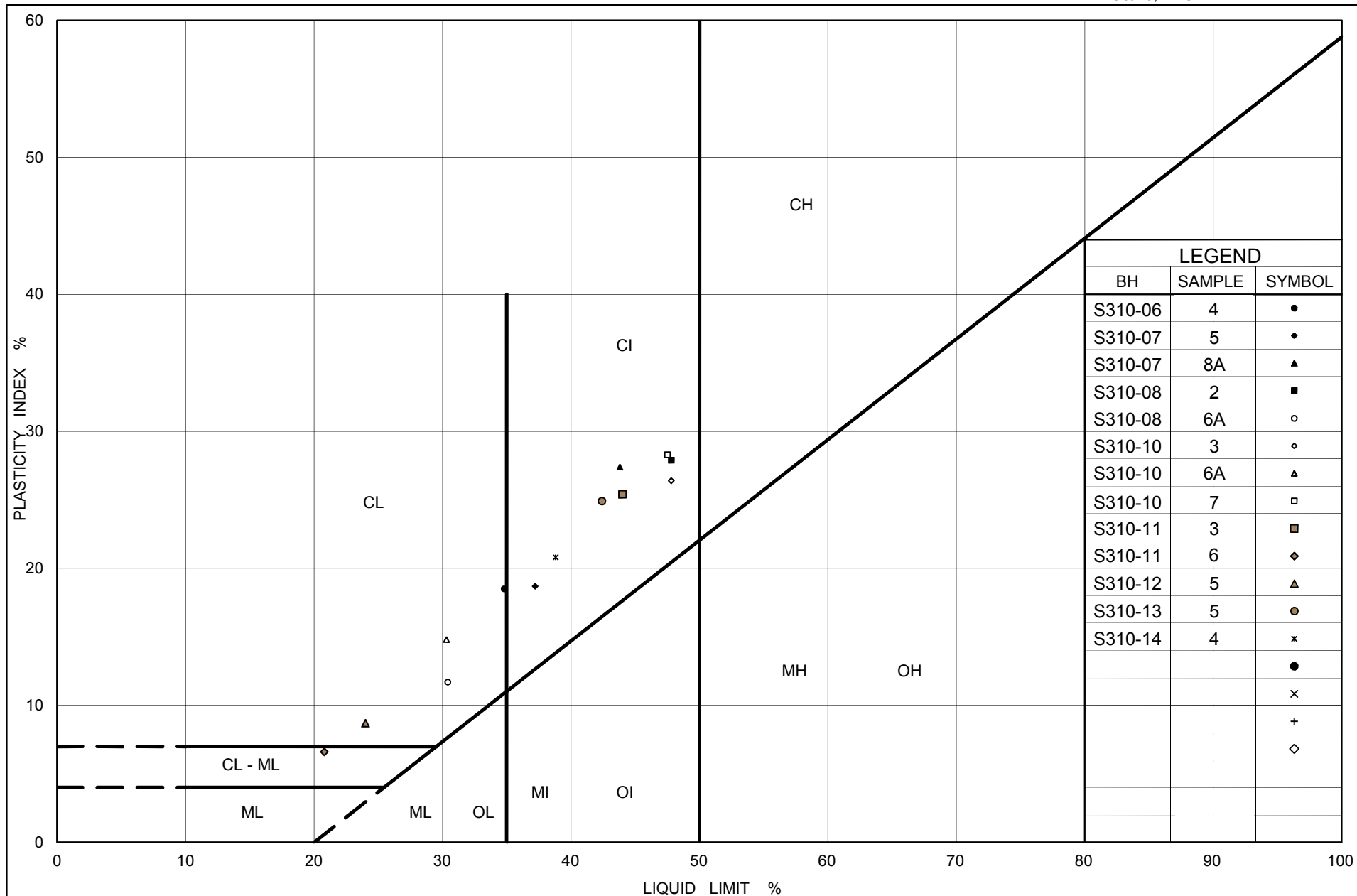
GRAIN SIZE DISTRIBUTION

Clayey Silt to Silty Clay

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

FIGURE J.S310-05





Ministry of
Transportation

Ontario

PLASTICITY CHART

Clayey Silt to Silty Clay

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

Figure No. J.S310-06

Project No. 09-1111-6014

Checked By: AV

CONSOLIDATION TEST SUMMARY

FIGURE J.S310-07
Sheet 1 of 4

SAMPLE IDENTIFICATION

| | | | |
|-----------------|--------------|-----------------|---------|
| Project Number | 09-1111-6014 | Sample Number | 7 |
| Borehole Number | S310-10 | Sample Depth, m | 6.1-6.7 |

TEST CONDITIONS

| | | | |
|------------------|-----------|-------------------|----|
| Test Type | Standard | Load Duration, hr | 24 |
| Oedometer Number | 1 | | |
| Date Started | 3/19/2013 | | |
| Date Completed | 4/01/2013 | | |

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

| | | | |
|-------------------------|--------|------------------------------------|-------|
| Sample Height, cm | 2.53 | Unit Weight, kN/m ³ | 16.41 |
| Sample Diameter, cm | 6.35 | Dry Unit Weight, kN/m ³ | 10.57 |
| Area, cm ² | 31.71 | Specific Gravity, measured | 2.79 |
| Volume, cm ³ | 80.19 | Solids Height, cm | 0.977 |
| Water Content, % | 55.14 | Volume of Solids, cm ³ | 30.99 |
| Wet Mass, g | 134.15 | Volume of Voids, cm ³ | 49.20 |
| Dry Mass, g | 86.47 | Degree of Saturation, % | 96.9 |

TEST COMPUTATIONS

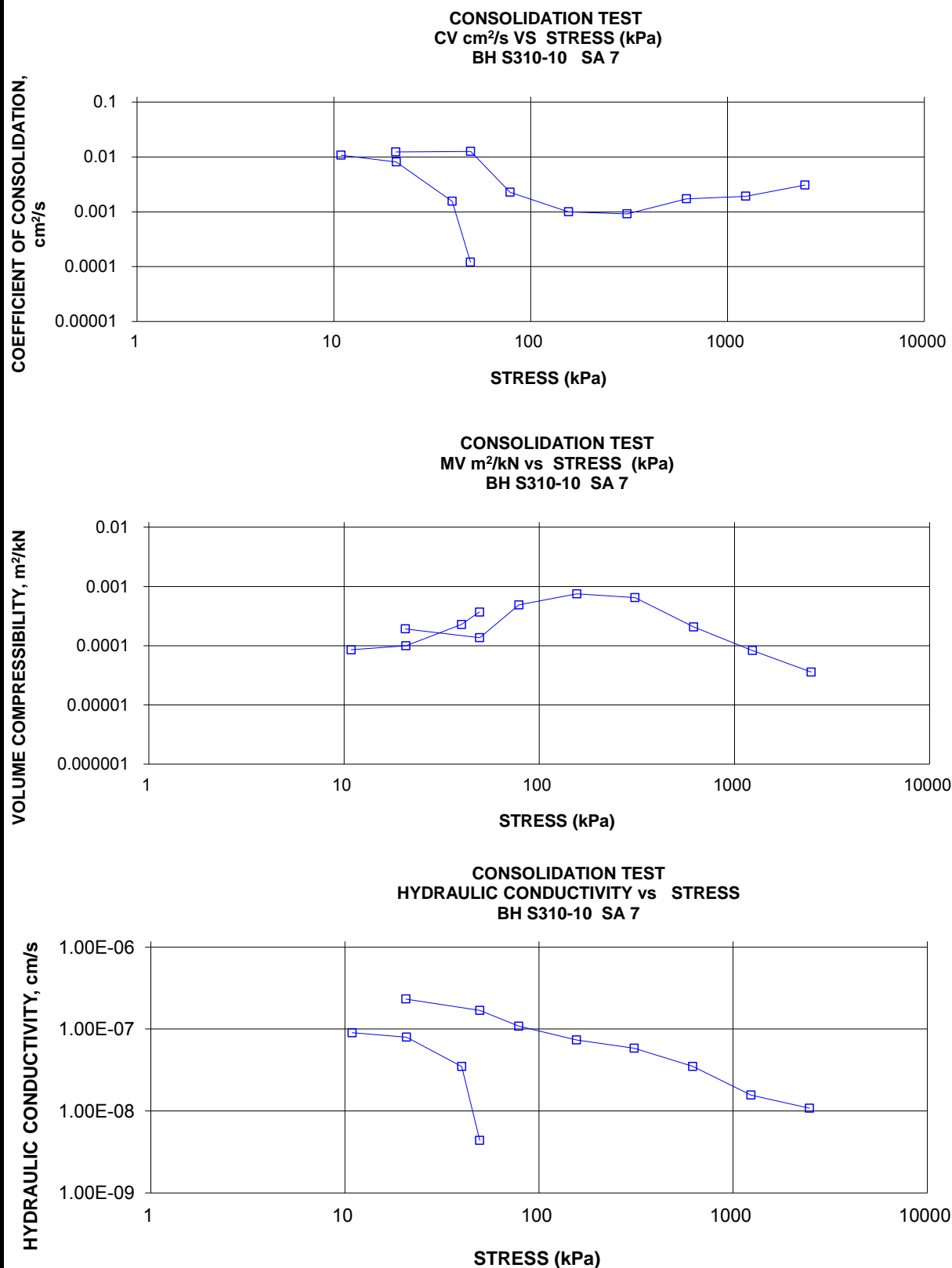
| Stress kPa | Corr. Height cm | Void Ratio | Average Height cm | t ₉₀ sec | cv. cm ² /s | mv m ² /kN | k cm/s |
|---------------|-----------------------|---------------|-------------------------|------------------------|---------------------------|--------------------------|-----------|
| 0.00 | 2.529 | 1.587 | 2.529 | | | | |
| 6.24 | 2.531 | 1.589 | 2.530 | | | | |
| 10.88 | 2.530 | 1.588 | 2.531 | 126 | 1.08E-02 | 8.52E-05 | 9.00E-08 |
| 20.77 | 2.528 | 1.586 | 2.529 | 167 | 8.12E-03 | 1.00E-04 | 7.95E-08 |
| 39.97 | 2.516 | 1.575 | 2.522 | 866 | 1.56E-03 | 2.29E-04 | 3.49E-08 |
| 49.46 | 2.508 | 1.565 | 2.512 | 11140 | 1.20E-04 | 3.71E-04 | 4.36E-09 |
| 20.77 | 2.510 | 1.568 | 2.509 | | | | |
| 6.24 | 2.522 | 1.580 | 2.516 | | | | |
| 20.62 | 2.515 | 1.573 | 2.518 | 109 | 1.23E-02 | 1.92E-04 | 2.33E-07 |
| 49.56 | 2.505 | 1.562 | 2.510 | 106 | 1.26E-02 | 1.37E-04 | 1.69E-07 |
| 78.67 | 2.469 | 1.526 | 2.487 | 577 | 2.27E-03 | 4.86E-04 | 1.08E-07 |
| 155.94 | 2.322 | 1.375 | 2.395 | 1215 | 1.00E-03 | 7.52E-04 | 7.38E-08 |
| 309.12 | 2.070 | 1.118 | 2.196 | 1116 | 9.16E-04 | 6.50E-04 | 5.83E-08 |
| 618.45 | 1.908 | 0.952 | 1.989 | 487 | 1.72E-03 | 2.08E-04 | 3.50E-08 |
| 1236.70 | 1.778 | 0.819 | 1.843 | 375 | 1.92E-03 | 8.30E-05 | 1.56E-08 |
| 2472.01 | 1.666 | 0.704 | 1.722 | 205 | 3.07E-03 | 3.59E-05 | 1.08E-08 |
| 1236.70 | 1.673 | 0.712 | 1.669 | | | | |
| 309.12 | 1.707 | 0.746 | 1.690 | | | | |
| 78.67 | 1.750 | 0.791 | 1.728 | | | | |
| 20.77 | 1.785 | 0.827 | 1.768 | | | | |
| 6.24 | 1.822 | 0.864 | 1.803 | | | | |

Note:

k calculated using cv based on t₉₀ values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

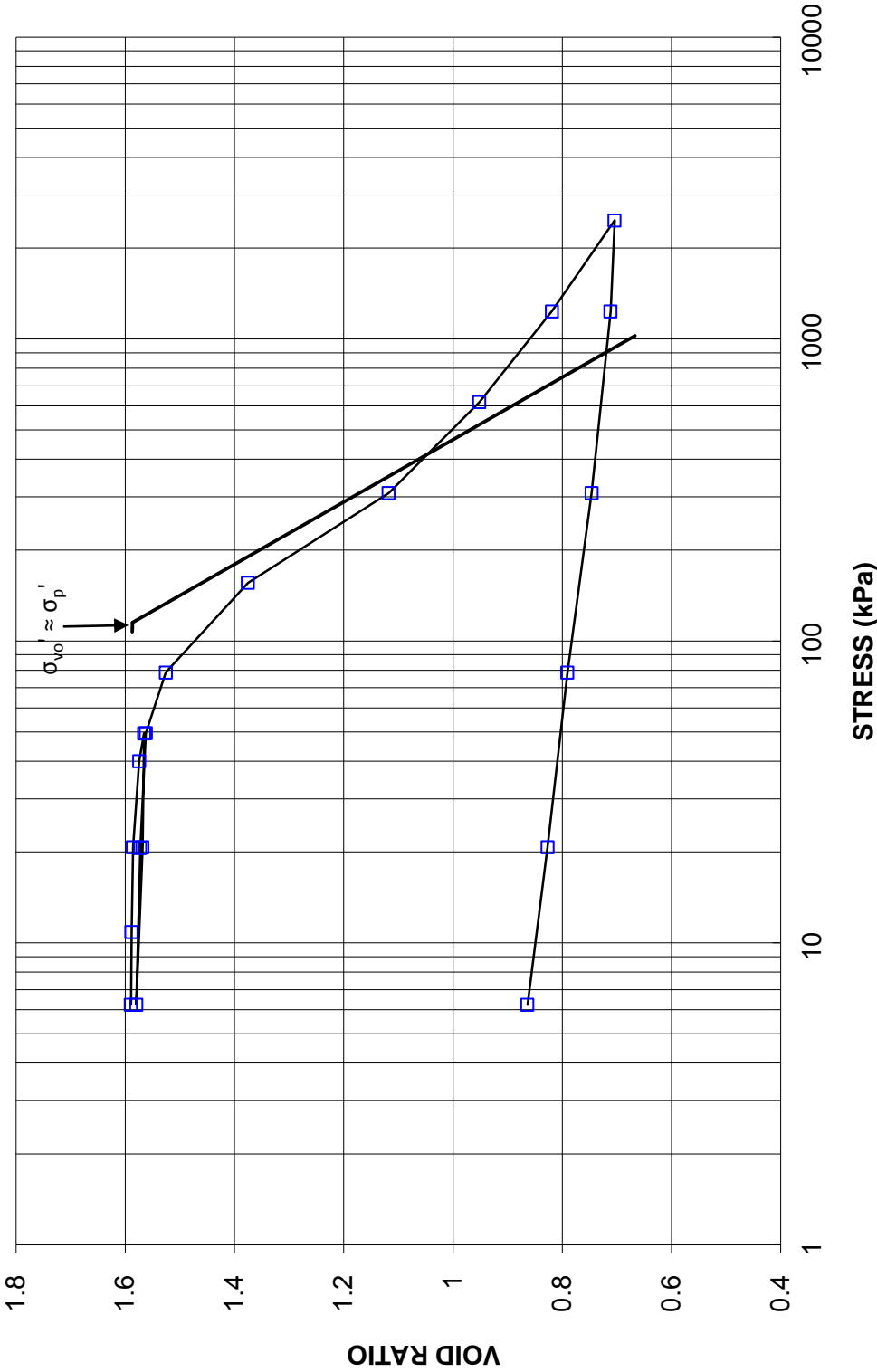
| | | | |
|-------------------------|--------|------------------------------------|-------|
| Sample Height, cm | 1.82 | Unit Weight, kN/m ³ | 19.11 |
| Sample Diameter, cm | 6.35 | Dry Unit Weight, kN/m ³ | 14.68 |
| Area, cm ² | 31.71 | Specific Gravity, measured | 2.79 |
| Volume, cm ³ | 57.76 | Solids Height, cm | 0.977 |
| Water Content, % | 30.16 | Volume of Solids, cm ³ | 30.99 |
| Wet Mass, g | 112.55 | Volume of Voids, cm ³ | 26.77 |
| Dry Mass, g | 86.47 | | |



CONSOLIDATION TEST
VOID RATIO VS LOG STRESS

FIGURE J.S310-07
Sheet 3 of 4

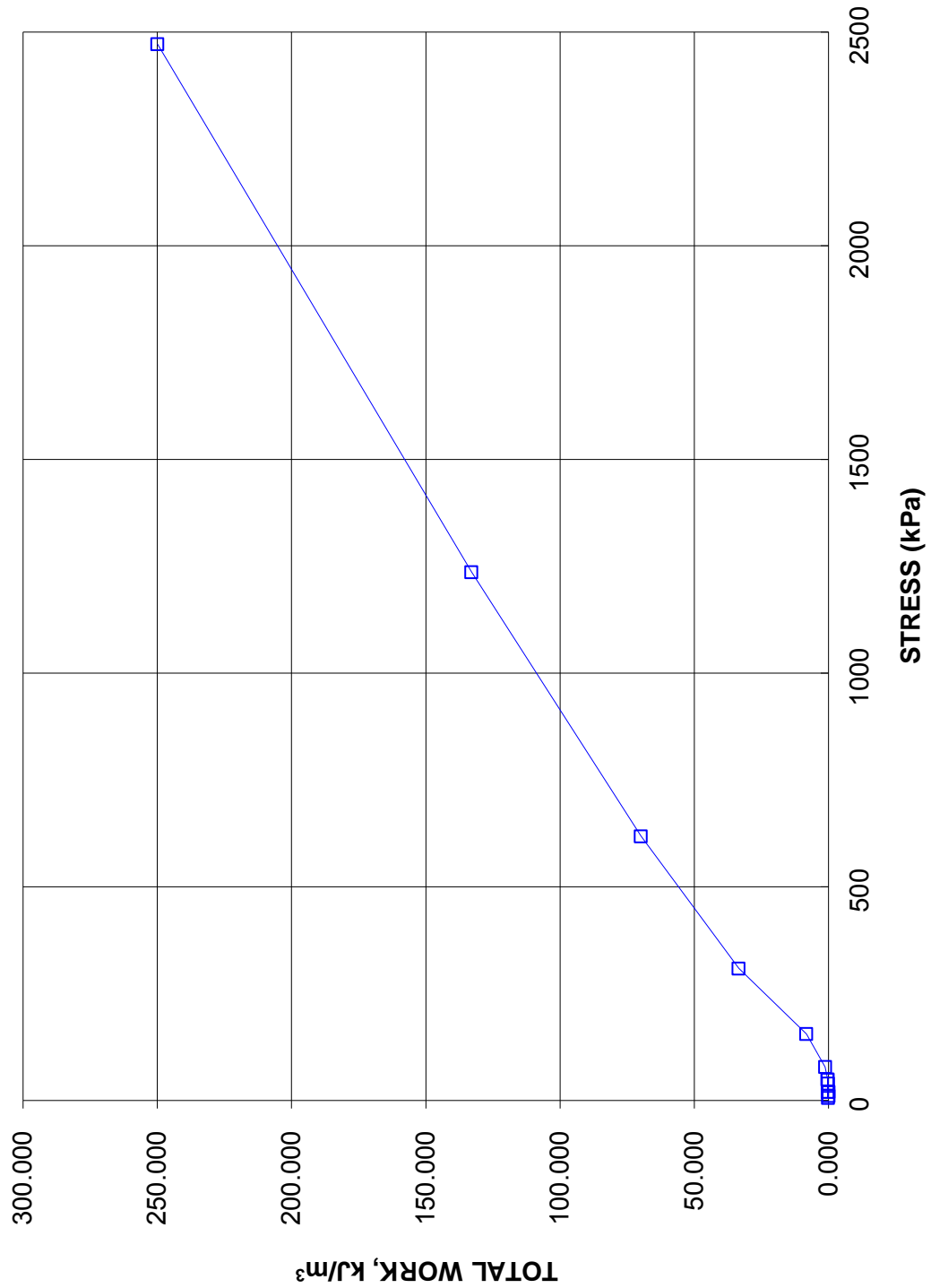
CONSOLIDATION TEST
VOID RATIO VS STRESS
BH S310-10 SA 7



**CONSOLIDATION TEST
TOTAL WORK VS STRESS**

**FIGURE J.S310-07
Sheet 4 of 4**

**CONSOLIDATION TEST
TOTAL WORK, kJ/m³ vs STRESS
BH S310-10 SA 7**

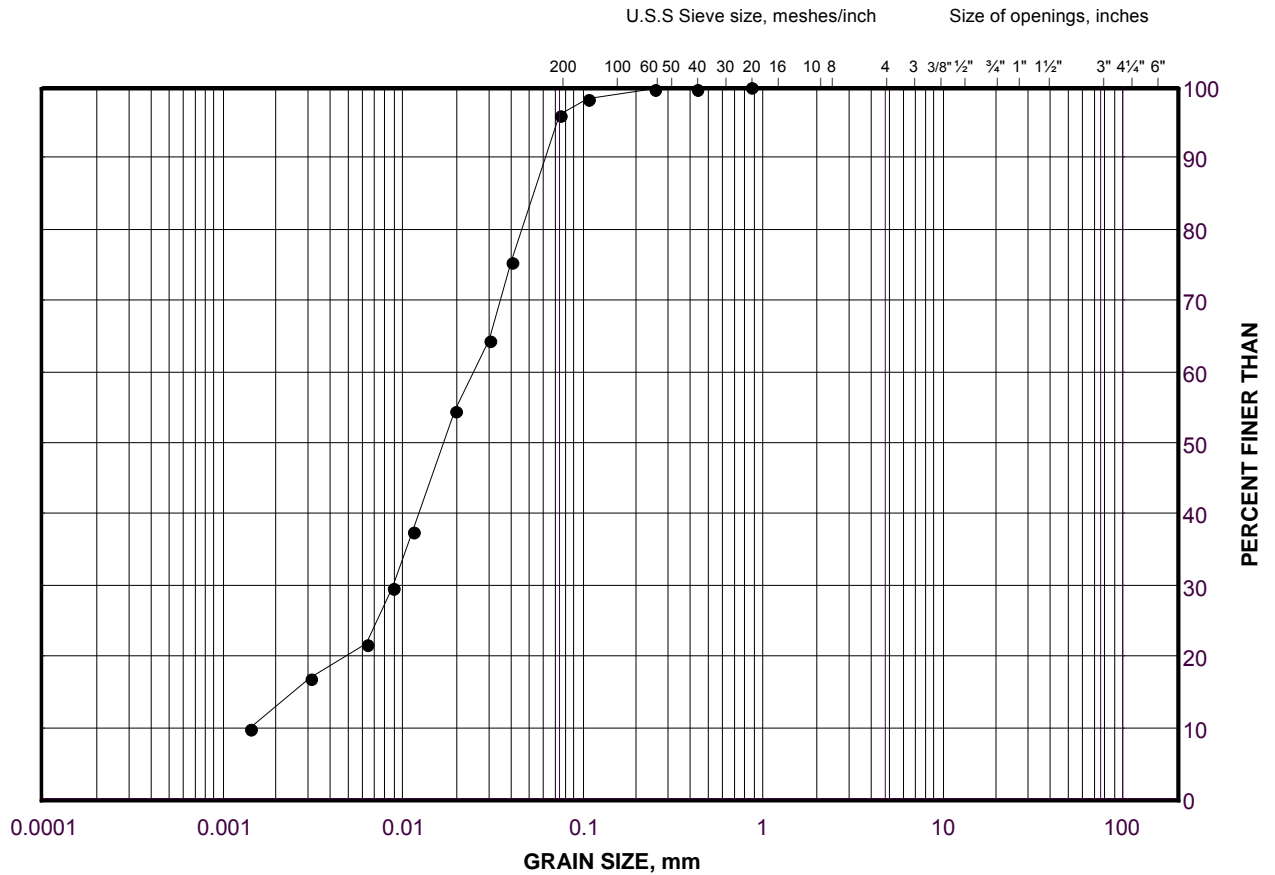


GRAIN SIZE DISTRIBUTION

Silt (Interlayer)

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

FIGURE J.S310-08



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

LEGEND

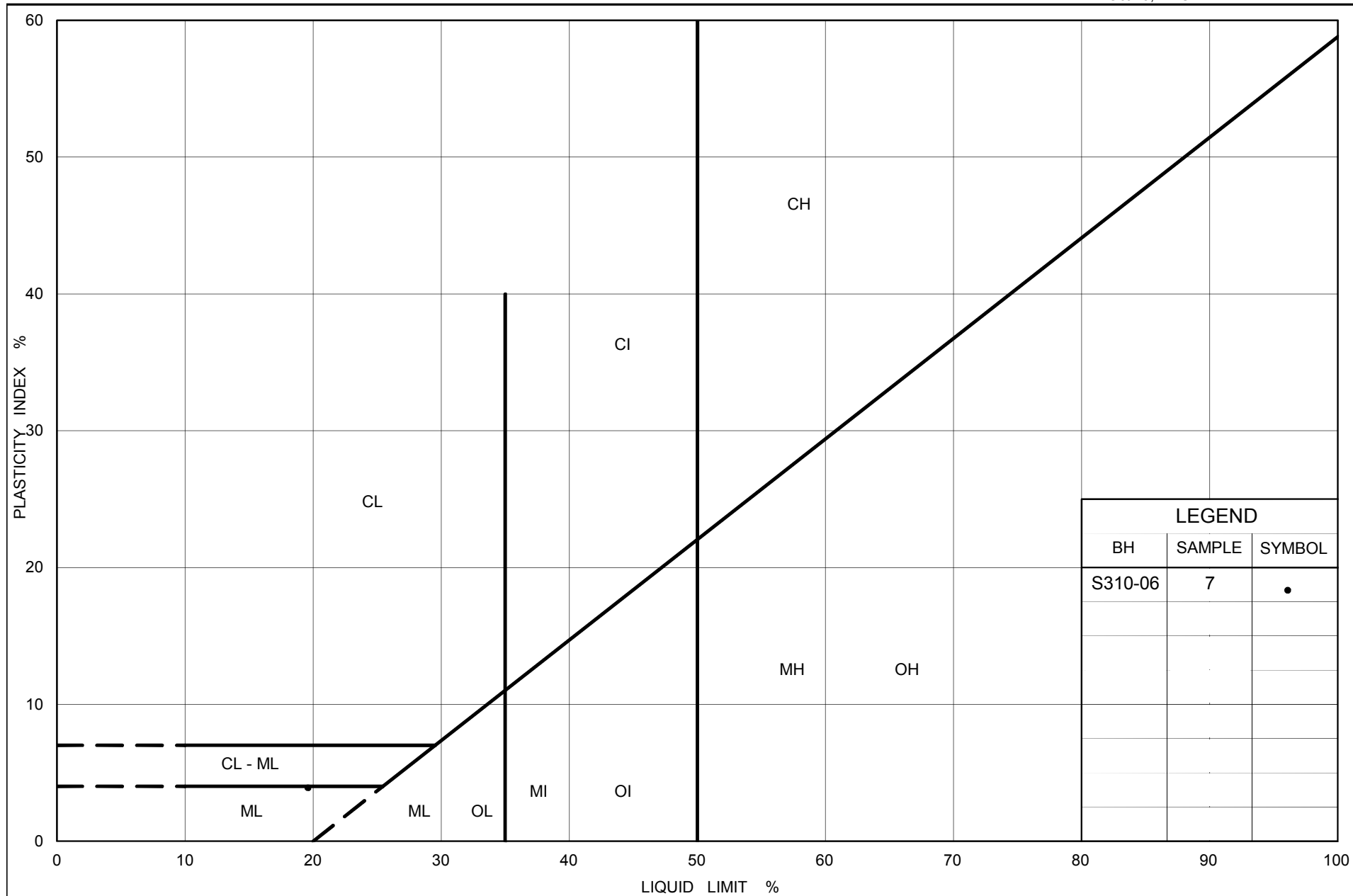
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| • | S310-06 | 7 | 188.5 |

Project Number: 09-1111-6014

Checked By: AV

Golder Associates

Date: 27-Mar-13



Ministry of Transportation

Ontario

PLASTICITY CHART Silt (Interlayer)

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

Figure No. J.S310-09

Project No. 09-1111-6014

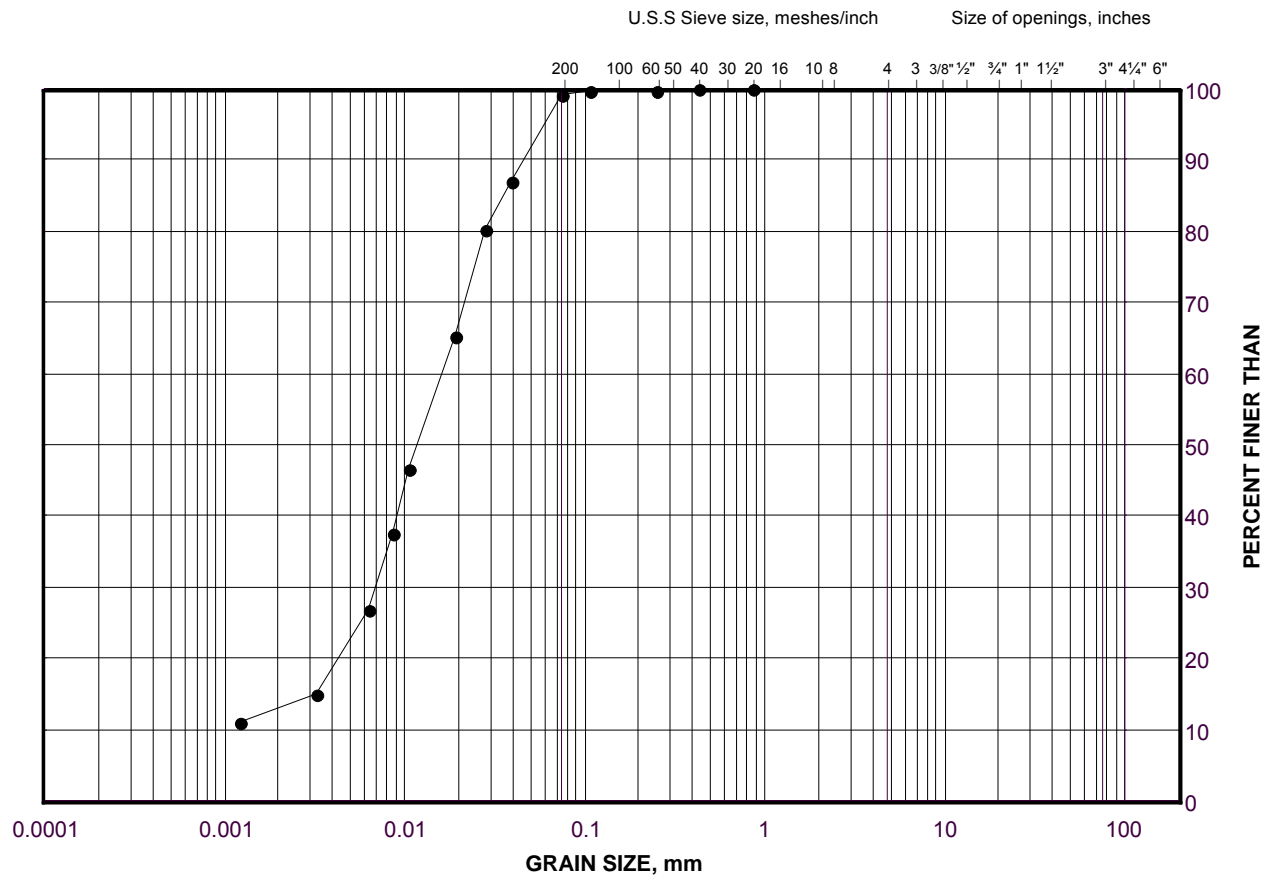
Checked By: AV

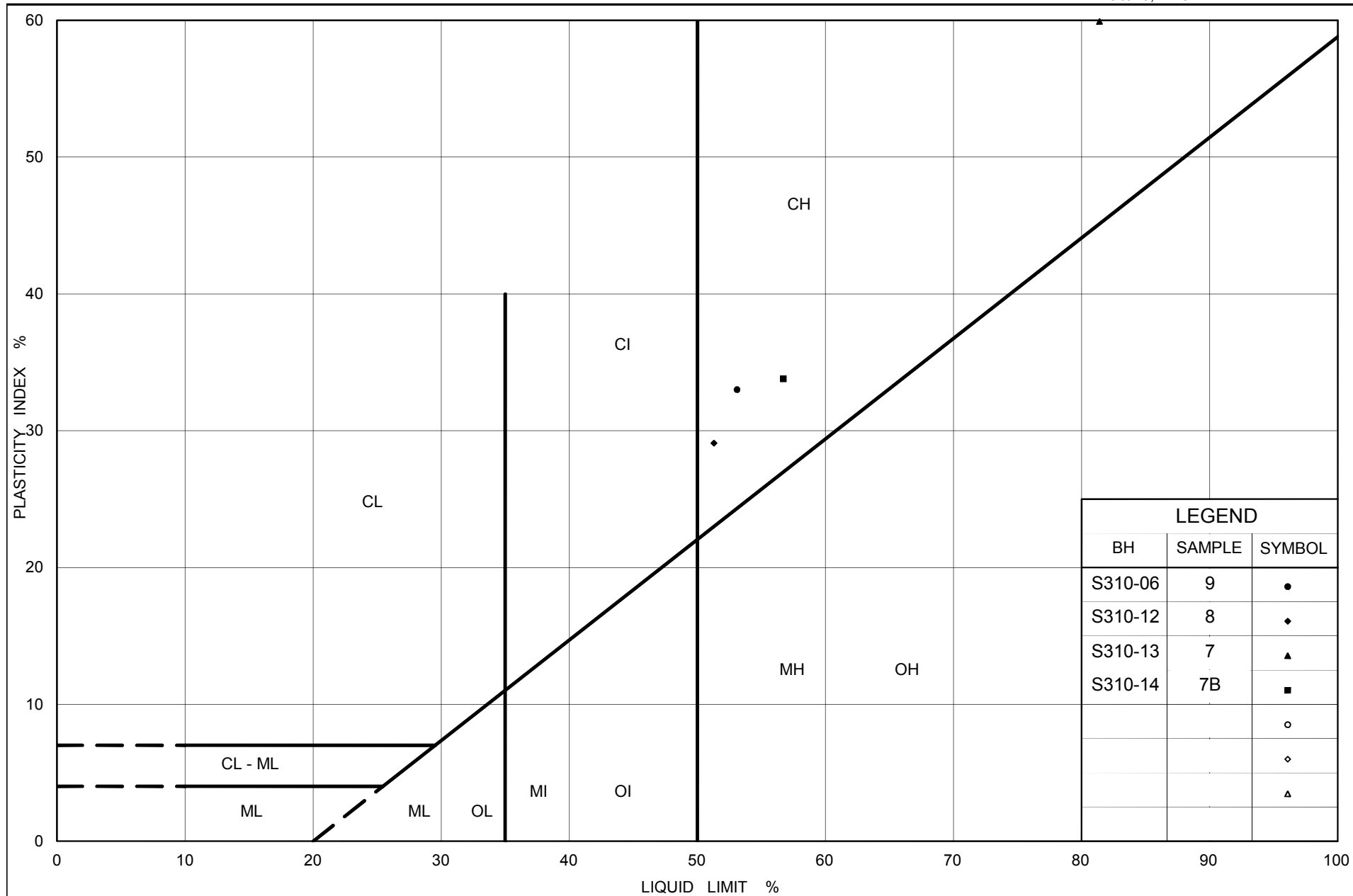
GRAIN SIZE DISTRIBUTION

Clayey Silt

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

FIGURE J.S310-10





Ministry of Transportation

Ontario

PLASTICITY CHART

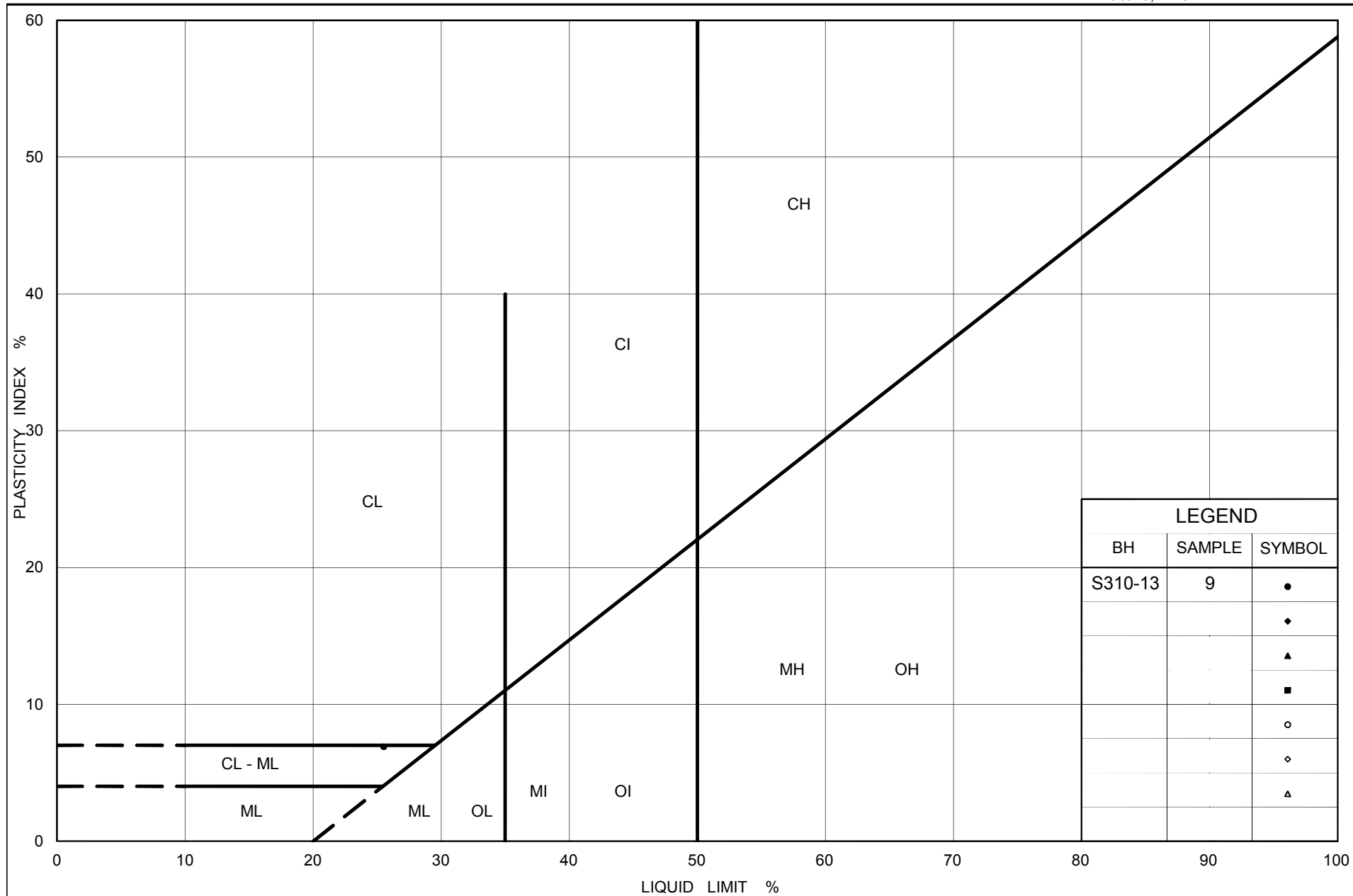
Clay

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

Figure No. J.S310-11

Project No. 09-1111-6014

Checked By: AV



Ministry of Transportation

Ontario

PLASTICITY CHART

Clayey Silt

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

Figure No. J.S310-12

Project No. 09-1111-6014

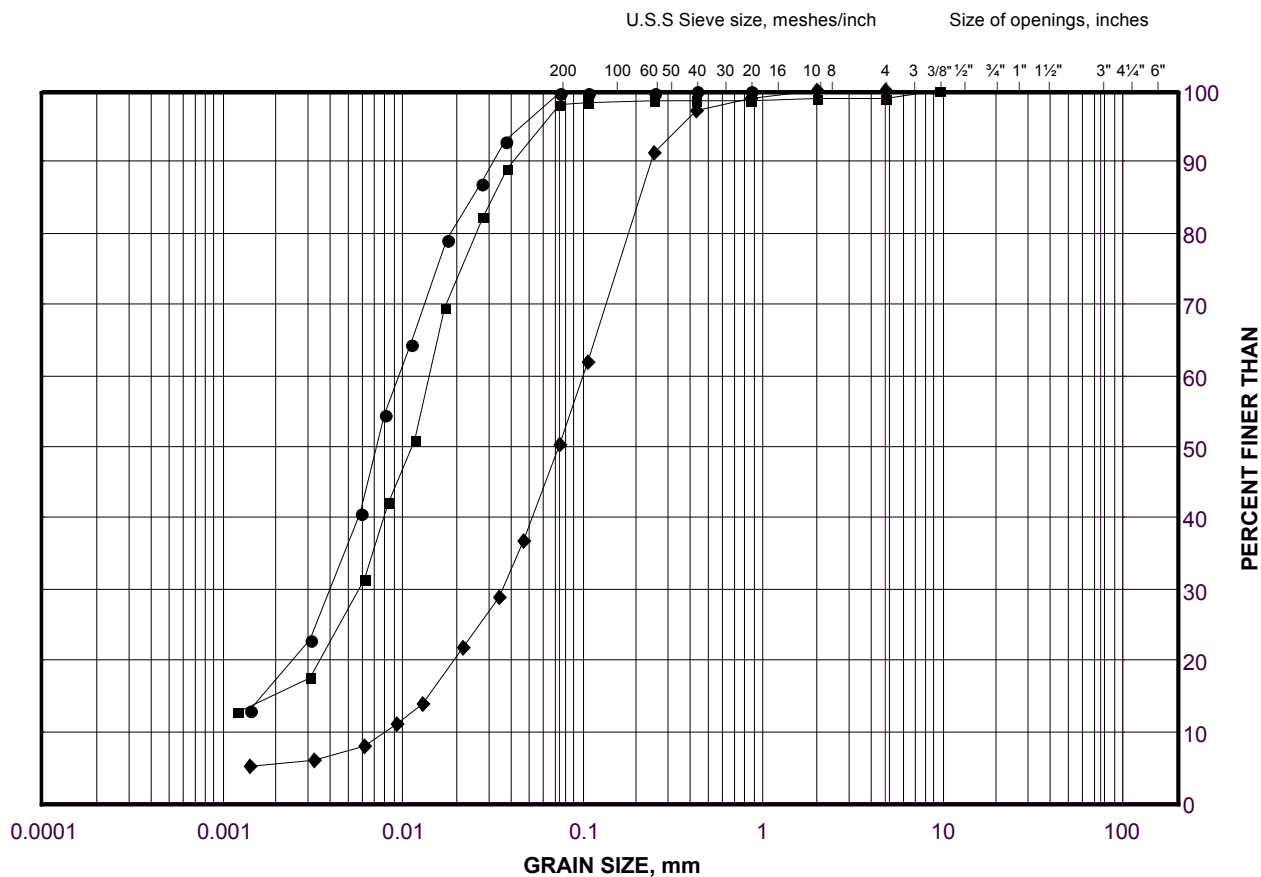
Checked By: AV

GRAIN SIZE DISTRIBUTION

Silt to Silt and Sand

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

FIGURE J.S310-13



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

LEGEND

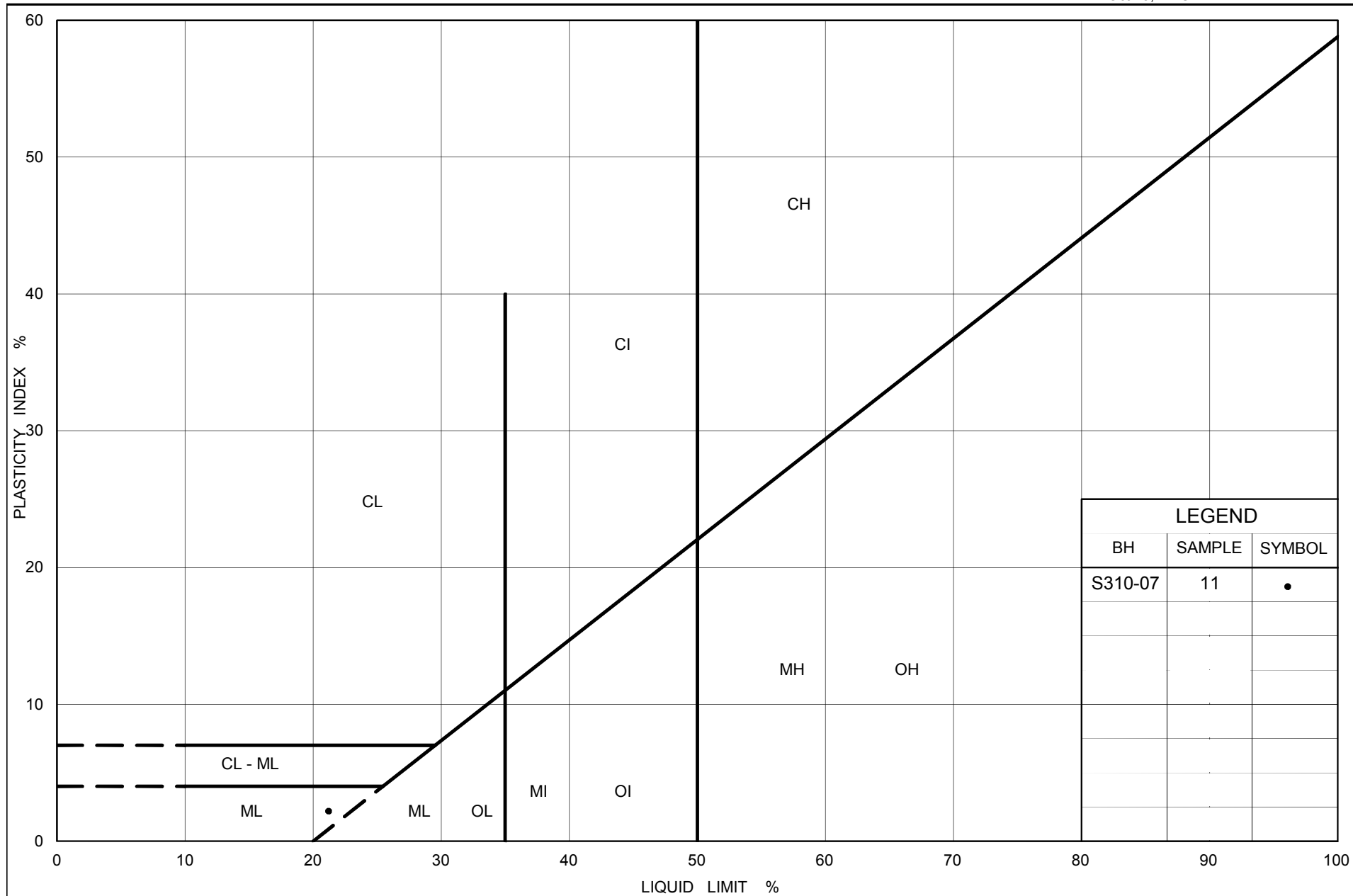
| SYMBOL | BOREHOLE | SAMPLE | ELEVATION(m) |
|--------|----------|--------|--------------|
| ● | S310-11 | 10 | 183.9 |
| ■ | S310-07 | 11 | 182.5 |
| ◆ | S310-06 | 12 | 180.9 |

Project Number: 09-1111-6014

Checked By: TZ

Golder Associates

Date: 23-Apr-13



Ministry of Transportation

Ontario

PLASTICITY CHART

Silt

Highway 69 (NBL) STA 19+400 to 19+500 (Swamp 310)

Figure No. J.S310-14

Project No. 09-1111-6014

Checked By: TZ

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

| | |
|---------------|-------------------|
| Africa | + 27 11 254 4800 |
| Asia | + 86 21 6258 5522 |
| Australasia | + 61 3 8862 3500 |
| Europe | + 356 21 42 30 20 |
| North America | + 1 800 275 3281 |
| South America | + 55 21 3095 9500 |

solutions@golder.com
www.golder.com

Golder Associates Ltd.
6925 Century Avenue, Suite #100
Mississauga, Ontario, L5N 7K2
Canada
T: +1 (905) 567 4444

